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1.0 Document Overview

This document summarizes the operation of the Wi-Stat IIIp-S pneumatic thermostat for HVAC monitoring and control purposes. It provides details of use cases and the overall solution that will be delivered to meet the needs of supported HVAC applications.

2.0 Wi-Stat IIIp-S Overview

2.1 HVAC Operation

The Wi-Stat IIIp-S wireless pneumatic thermostat is an intelligent energy conservation device that provides remote zone monitoring and control for commercial, industrial, and municipal HVAC environments. It can work as a standalone Weekday/Weekend programmable thermostat or can be converted to wireless DDC thermostat. As a standalone programmable thermostat, Wi-Stat IIIp-S can independently operate on a user configurable Weekday/Weekend schedule.

If converted to wireless DDC (see Section 2.3 Standalone Operation) Wi-Stat IIIp-S enables local temperature controls within the range set by company-wide energy policy rules, bi-directionally communicated via a mesh network to and from a remote monitoring and control application. It is an electronic pneumatic wireless thermostat for intelligent room temperature control in heating and air conditioning applications.

Designed to replace existing manual pneumatic thermostats, the Wi-Stat IIIp-S provides Direct Digital Control features, such as remote wireless setpoint control and occupancy scheduling, continuous room temperature, branch line pressure and battery status monitoring, all of which were previously unavailable in pneumatic HVAC systems. The innovative design of Wi-Stat IIIp-S completely reshapes pneumatic HVAC controls - the controller does not utilize any mechanical parts. A solid state temperature sensor replaces bi-metallic strip elements for precise room temperature monitoring and the advanced Piezo electric valve actuator replaces a mechanical valve for improved branch line pressure control. These advanced technologies guarantee longer, more dependable and maintenance-free operation.

Wi-Stat IIIp-S functionality is regulated by a number of operational modes which can be triggered at scheduled times. Each mode is designed to optimize energy use under certain conditions and has a set of rules that will manage HVAC equipment operation and restrict local thermostat requests. All Wi-Stat IIIp-S variable configuration, management and mode scheduling is done remotely using a monitoring and control software application.

There are two types of Operational Modes – Scheduled and Manual. Scheduled Modes are triggered by occupancy schedules and provide energy savings by aligning HVAC operation to actual building occupancy. Manual Modes can only be initiated by the user at the Wi-Stat level. They are used to adjust HVAC operation manually outside of the schedule, but within set energy policy parameters.
2.2 Operating Principle of Wi-Stat IIIp-S pneumatic thermostat

Wi-Stat IIIp-S has been designed to support any 0 ~ 22 PSI pneumatic HVAC control system. Variation in branch line pressure is proportional to deviation of room temperature from Set Point; the proportional factor is determined by the Gain, which is defined as the change in branch line pressure in PSI in response to a 1°F change in room temperature.

Figure 2 below shows the linear relationship between branch line pressure and room temperature at a given Set Point for Direct Acting Thermostat configuration (for Reverse Acting the graph would be flipped horizontally).

A direct acting system is shown in Figure 2 above, where Wi-Stat IIIp-S will increase branch line pressure in response to an increase in room temperature. When room temperature is within the Dead Zone (default ±1°F) around the Set Point, branch line pressure is regulated at Set Point Pressure, and the pneumatic actuator will be at the minimum heat, cool or neutral position. When room temperature rises above Set Point plus Dead Zone, branch line pressure will increase in proportion to temperature increase, with the proportional factor defined by the Gain value. On the other hand, if room temperature decreases below Set Point minus Dead Zone, branch line pressure will decrease in proportion to temperature decrease. The proportional band defines the temperature range where branch line pressure changes in proportion to temperature change. Note that Set Point Pressure, Dead Zone, Gain, and Proportional Band can be adjusted using the menu buttons on Wi-Stat IIIp-S or within the Wi-EMS web application.
### 2.3 Standalone Operation

*This section outlines Wi-Stat IIIp-S operation and programming when configured as a standalone device. Person figure in the top right corner of LCD screen indicates thermostat is in Standalone Mode.*

#### 2.3.1 Standalone Wi-Stat IIIp-S Operational Modes

**Scheduled Modes:**
The following operational modes are regulated by the Schedule programmed on the device.

- **Occupied Mode** – Occupancy mode is used when the zone is scheduled to be occupied. The room temperature during this mode will be adjusted by people in the room by pressing Up and Down buttons on the Wi-Stat IIIp-S. Wi-Stat IIIp-S allows manual temperature control ±14°F around programmed set point (28F total range). Users will be able to program Set Point while programming the device (see instruction below). Range cannot be changed.

  For example, if the Set Point value is 70°F, people in the room will be able to change temperature manually between 56° and 84° F.

- **Unoccupied Mode** – Energy saving mode for the times when rooms are unoccupied. Temperature in the zone will be controlled by Upper and Lower limits - when the room temperature is between the upper and lower Unoccupied Mode temperature limits the Wi-Stat IIIp-S will not call for heat or cool. If the temperature falls outside the Unoccupied Mode upper and lower temperature range, the Wi-Stat IIIp-S will control the HVAC system accordingly to bring the environment back into range. Upper and lower limits are programmable (see instructions below).

**Manual Modes:**
The following modes cannot be programmed. They can only be initiated locally by the user interfacing with the Wi-Stat IIIp-S.

- **Override Mode** – manual mode will turn Wi-Stat IIIp-S to occupied mode.

  Manual mode can only be initiated by the user by pressing the Override button on the Wi-Stat IIIp-S. Override is limited to a 2 hours duration; when it expires, the Wi-Stat IIIp-S returns to its regularly scheduled mode. The Override mode overrides the scheduled Occupied or Unoccupied Mode by allowing the user to control the HVAC system through the local thermostat. If the temperature is outside the Override Comfort Zone range, the Wi-Stat IIIp-S will disable local thermostat controls. **Override mode overrules your Energy Policy, so always check with your administrator before using it.**

- **Shoulder Mode** – Energy Saving transition from occupied to unoccupied modes.

  It can be triggered locally at the Wi-Stat IIIp-S level by pressing Shoulder button. While in Shoulder mode, Wi-Stat IIIp-S will not call for heat or cool when the room temperature is ± 5F within the set point. Shoulder Mode is used to reset the room temperature Set Point manually if occupants leave the facility earlier than the scheduled time; essentially overriding the current schedule until the next scheduled mode change occurs. For example, if a zone is running a five-day, 8AM to 6PM occupancy schedule, but one day occupants are leaving at 2PM, they can manually set the zone into shoulder mode at 2PM. The Wi-Stat IIIp-S will remain in Shoulder mode until 6PM and then will follow its regular schedule.
2.3.2 Standalone Wi-Stat IIIp-S Occupancy Programming

This section outlines how the scheduling module operates when Wi-Stat IIIp-S is configured as a standalone device. For schedule step-by-step programming instructions please refer to the part 3.5 Programming Schedule on a Standalone Wi-Stat IIIp-S

Wi-Stat IIIp-S is equipped with an independent time clock and can be programmed with a Weekday/Weekend occupancy schedule. A complete 7-day schedule consists of two autonomous components:

- Weekday Schedule – Monday through Friday
- Weekend Schedule – Saturday and Sunday

Each component is split into two parts to be scheduled as occupied or unoccupied mode:

- Weekday 1
- Weekday 2
- Weekend 1
- Weekend 2

To accommodate for daytime or nighttime shift schedules, each part can be configured to occupied or unoccupied mode independently.

For each Occupied Mode the following features can be configured:

- Occupied Mode start time
- Temperature Set Point value – adjustable by ±14°F by room occupants

For each Unoccupied Mode the following features can be configured:

- Unoccupied Mode start time
- Upper Temperature limit
- Lower Temperature limit (Thermostat will be off while temperature is within these limits)

The start time of each schedule part is automatically an end time of the previous one. (i.e. for 6am – 6pm occupied schedule, occupied mode to start at 6am and unoccupied at 6pm). Figures below illustrate Occupied and Unoccupied schedule setup screens.

For schedule step-by-step programming instructions please refer to 3.5 Programming Schedule on a Standalone Wi-Stat IIIp-S
2.3.3 Standalone Wi-Stat IIIp-S Occupancy Programming Examples

Standard Office Hours
Set point - 70°F
Occupied from 9am to 5pm Monday to Friday
Saturday and Sunday – unoccupied, upper limit - 85°F, lower - 55°F

Program Wi-Stat IIIp-S Schedule Setup Screens:

Night Shift Hours
Set point - 70°F
Occupied from 3pm to 6am 7 days a week

Program Wi-Stat IIIp-S Schedule Setup Screens:

Extended Office Hours w/ Weekend Schedule
Set point - 70°F
Occupied from 8am to 6pm Monday to Friday
Occupied from 10am to 1pm Saturday and Sunday

Program Wi-Stat IIIp-S Schedule Setup Screens:

For schedule step-by-step programming instructions please refer to 3.5 Programming Schedule on a Standalone Wi-Stat IIIp-S
2.4 Wireless DDC Operation

This section is only applicable if Wi-Stat IIIp-S is being used as wireless DDC device. Configured as a standalone programmable device it will not communicate data wirelessly. Antenna icon or empty field in the top right corner of LCD screen indicates thermostat is in Wireless DDC mode.

Wi-Stat IIIp-S can operate as a wireless thermostat designed to monitor and control pneumatic HVAC systems as part of the overall Millennial Net Wireless Energy Management Solution. Wi-Stat IIIp-S is equipped with 2.4GHz IEEE 802.15.4 radio and can communicate via MeshScape® mesh network protocol. The wireless mesh network forms itself and data communications enable remote monitoring, adjustment and trending to ensure long term performance. It communicates data over the wireless network in conjunction with other wireless Millennial Net devices. In the wireless mesh network Wi-Stat IIIp-S operates as a battery-powered end node. When installed in buildings with common sheetrock walls, its nominal radio communication range is approximately 200 feet. However, if the Wi-Stat IIIp-S is located more than 200 feet from the network controller, Wi-Routers must be deployed to relay data generated by the Wi-Stat IIIp-S back to the network controller. Being an end node, Wi-Stat IIIp-S does not support routing functionality to relay data for other devices in the mesh network. It communicates with the wireless mesh network as an individual device that transmits and receives its own data only, to and from the network controller or through other routing devices.

The first step of the installation process is planning the layout of devices on the building’s floor plan, including the identification of desired locations for all Wi-Stat IIIp-S devices as well as the network controller. Measure the radial distances between the Wi-Stat IIIp-S devices and the network controller to determine if the Wi-Stat IIIp-S devices are within 200 feet. If not, Wi-Routers must be installed to relay signals between the Wi-Stat IIIp-S and the network controller. The ideal installation provides each end node device, Wi-Stat IIIp-S, with at least two routes of transmission to the network controller to ensure signal transmission success. Nominal transmission range of Wi-Routers in common buildings is 300 feet. To ensure complete coverage of a wireless mesh network, there should be at least two Wi-Routers or one Wi-Router and the network controller located within a 300 foot radius of every Wi-Stat IIIp-S.

2.4.1 Wireless DDC Wi-Stat IIIp-S Operational Modes

Scheduled Modes:
The following operational modes are regulated by the HVAC Schedule as defined by the user. Schedules can be set well in advance through a monitoring and control software application and Wi-Stat IIIp-S will execute them automatically.

- **Occupied Mode** – Occupancy mode is used when the zone, or room, is scheduled to be occupied. The room temperature during this mode is defined by two values: Set Point (the targeted room temperature for the season) and Comfort Zone (the optimal temperature range around the Set Point). Both values are set by the Energy Policy and the Wi-Stat IIIp-S will maintain the room temperature within the Comfort Zone. If the temperature in the room falls outside of the Comfort Zone range, Wi-Stat IIIp-S will react accordingly and will automatically request to heat or cool. To enhance user compliance with the Energy Policy, Wi-Stat IIIp-S will allow users to adjust the room temperature using the local thermostat, as long as the desired temperature is within the range of the Comfort Zone. If the user requests heat or cool outside of the set Comfort Zone, the request at the local thermostat will be overridden by the Energy Policy. For example, the Set Point value is 70° F and the Comfort Zone Delta is 3° F. The user will only be able to affect the temperature manually between 67° and 73° F.
Unoccupied Mode – Energy saving mode for the times when rooms are unoccupied. When the room temperature is between the upper and lower Unoccupied Mode temperature limits the Wi-Stat IIIp-S will not call for heat or cool. If the temperature falls outside the Unoccupied Mode upper and lower temperature range, the Wi-Stat IIIp-S will control the HVAC system accordingly to bring the environment back into range.

Manual Modes:
The following modes cannot be scheduled or triggered remotely. They can only be initiated locally by the user interfacing with the Wi-Stat IIIp-S.

Override Mode – manual mode
Manual mode can only be initiated by the user by pressing the Override button on the Wi-Stat IIIp-S. Override is limited to a 2 hours duration set by the Energy Policy; when it expires, the Wi-Stat IIIp-S returns to its regularly scheduled mode. The Override mode overrides the scheduled Occupied or Unoccupied Mode by allowing the user to control the HVAC system through the local thermostat and permits a wider Comfort Zone range. If the room temperature is outside the Override Comfort Zone range, the Wi-Stat IIIp-S will disable local thermostat controls. Override mode Comfort Zone range and Override duration time are set by the Energy policy. Override mode overrules your Energy Policy, so always check with your administrator before using it.

Shoulder Mode – Energy Saving transition from occupied to unoccupied modes.
It can be triggered locally at the Wi-Stat IIIp-S level by pressing Shoulder button. While in Shoulder mode, Wi-Stat IIIp-S will not call for heat or cool when the room temperature is between Upper and Lower Shoulder mode temperature limits. Shoulder Mode is used to reset the room temperature Set Point manually if occupants leave the facility earlier than the scheduled time, essentially overriding the current schedule until the next scheduled mode change occurs. For example, if a zone is running a five-day, 8AM to 6PM occupancy schedule, but one day occupants are leaving at 2PM, they can manually set the zone into shoulder mode at 2PM. The Wi-Stat IIIp-S will remain in Shoulder mode until 6PM and then will follow its regular schedule. Shoulder mode can also be utilized as a Demand Response mode and can be triggered remotely from the monitoring and control application.

All parameter-defining rules of each mode are configurable. Please see the “Wi-Stat IIIp-S Configuration Parameters” table below, in section 2.6.

2.4.2 Fail-Safe Features
Wi-Stat IIIp-S has a number of programmed fail-safe features to ensure continuous HVAC operation. In the event of communication failure with servers, wireless network, or HVAC equipment a fail-safe mechanism will ensure devices continue to operate in a logical fashion without diverging into extensive failure. When failure condition no longer exists, the device will recover from safe mode and resume normal operation.

- Server communication failure – Site Controller (communicant device between Wi-Stat IIIp-Ss and the server) cannot receive latest commands or send data to the server
In instances when the Site controller fails to communicate with the server, the Site controller will continue to use the 7-day schedule stored in its memory (assuming a schedule is used) and all Wi-Stat IIIp-S devices will continue controlling HVAC equipment accordingly. During server communication failure, Site controller will continue to log data from the wireless network until its flash memory is full. Data will no longer be logged once the memory is full however; when communication is restored, Site controller will be able to send all archived data to the server and receive the updated schedule from the server.
• **Wi-Stat IIIp-S loses radio communication with Site Controller**  
  Should the Wi-Stat IIIp-Ss experience radio communication failure with the Site controller, Wi-Stat IIIp-Ss will follow default single day schedules, preset on the Wi-Stat IIIp-S. Wi-Stat IIIp-S has a built-in real time clock (RTC) which is synchronized with the wireless mesh network, therefore, it can operate with a default, hard-coded day schedule even when it is offline. When the Site controller comes back online, the Wi-Stat IIIp-Ss will automatically receive updated mode status, Set Point values and other configuration commands based on the latest user schedule.

• **Protection Zone**  
  To protect building infrastructure, equipment, and occupants, Wi-Stat IIIp-S has extreme temperature limits (configurable by Administrator) that will allow temperatures to float independently from any mode settings. If these limits are reached, Wi-Stat IIIp-S will automatically react by adjusting Heat or Cool, regardless of which scheduled mode is running. The default value for Upper bound is 95°F, and the Lower bound default value is 40°F.
### 2.5 Wireless DDC Wi-Stat IIIp-S Configuration Parameters

The following variables define Energy policy rules and regulate Wi-Stat IIIp-S operation.

**Table 1. Configuration Parameters**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
<th>Configuration Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Occupied Mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set Point value</td>
<td>Zone Set Point temperature.</td>
<td>Software</td>
</tr>
<tr>
<td>Comfort Zone upper delta (3° F default)</td>
<td>Upper temperature bound on deviation from energy policy Set Point during occupied mode.</td>
<td>Software</td>
</tr>
<tr>
<td>Comfort Zone lower delta (3° F default)</td>
<td>Lower temperature bound on deviation from energy policy Set Point during occupied mode.</td>
<td>Software</td>
</tr>
<tr>
<td><strong>Unoccupied Mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constrained float upper limit (85° F default)</td>
<td>Defines upper temperature limit in unoccupied mode. HVAC equipment will remain off while the zone temperature is between upper and lower limits.</td>
<td>Software</td>
</tr>
<tr>
<td>Constrained float lower limit (55° F default)</td>
<td>Defines lower temperature limit in unoccupied mode. HVAC equipment will remain off while the zone temperature is between upper and lower limits.</td>
<td>Software</td>
</tr>
<tr>
<td><strong>Override Mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Override duration (default 120 minutes)</td>
<td>Wi-Stat override duration. After time limit expires, Wi-Stat IIIp-S will resume regularly scheduled mode. Maximum 240 minutes.</td>
<td>Software</td>
</tr>
<tr>
<td>Override mode Comfort Zone upper delta (5° F default)</td>
<td>Comfort Zone upper delta during override mode.</td>
<td>Software</td>
</tr>
<tr>
<td>Override mode Comfort Zone lower delta (5° F default)</td>
<td>Comfort Zone lower delta during Override mode.</td>
<td>Software</td>
</tr>
<tr>
<td><strong>Other Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC mode (Auto default)</td>
<td>Auto: Wi-Stat IIIp-S will call for heat or cool. Heat: Wi-Stat IIIp-S will only call for heat (for heat only systems). Cool: Wi-Stat IIIp-S will only call for cool (for cool only systems).</td>
<td>Software, Wi-Stat IIIp-S</td>
</tr>
<tr>
<td>HVAC transition delta (5° F default)</td>
<td>Temperature delta before Wi-Stat IIIp-S will automatically transition from heat to cool or from cool to heat based on zone temperature.</td>
<td>Software</td>
</tr>
<tr>
<td>Operational Modes</td>
<td>1: Occupied; 2: Unoccupied</td>
<td>Wi-EMS Scheduler</td>
</tr>
<tr>
<td>Dead zone delta (1° F default)</td>
<td>Temperature range around Set Point to prevent HVAC from chattering.</td>
<td>Software</td>
</tr>
<tr>
<td>Wi-Stat protection zone upper temperature (95° F default)</td>
<td>Maximum temperature allowed in zone. Fail-safe feature, applicable to all zones.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Wi-Stat protection zone lower temperature (40° F default)</td>
<td>Minimum temperature allowed in zone. Fail-safe feature, applicable to all zones.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Modification</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Heat cycle timer</td>
<td>Minimal heat-on to heat-on interval; value range 0 ~ 30 minutes, increment in minutes; default 0 minute.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Compressor restart delay</td>
<td>Minimal cool-off to cool-on interval; value range 0 ~ 30 minutes, increment in minute; default 0 minute.</td>
<td>Software</td>
</tr>
<tr>
<td>Default occupied mode start time in the event of wireless communication failure (06:00am default)</td>
<td>Time of day in hour (0 ~ 24); used in the event the Wi-Stat IIIp-S goes offline for extended durations.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Default occupied Set Point value in the event of wireless communication failure (70°F default)</td>
<td>Used in the event the Wi-Stat IIIp-S goes offline for extended durations.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Default unoccupied Set Point start time in the event of wireless communication failure</td>
<td>Time of day in hour (0 ~ 24); used in event the Wi-Stat IIIp-S goes offline for extended durations; disabled in default configuration, and therefore unit does not go into unoccupied mode when offline.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Temp sensor calibration factor (°F)</td>
<td>To calibrate Wi-Stat IIIp-S temperature sensor for offset compensation.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Wall time interval for synchronized data reporting (default not reporting on synchronized wall time)</td>
<td>Data reporting interval when device reports on synchronized wall time, in minutes of the hour; allowable values: 1 (5 minutes), 2 (6 minutes), 3 (10 minutes), 4 (12 minutes), 5 (15 minutes), 6 (20 minutes), 7 (30 minutes), and 8 (1 minute).</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Shoulder mode Comfort Zone upper delta</td>
<td>Defines upper temperature limit in shoulder mode.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Shoulder mode Comfort Zone lower delta</td>
<td>Defines lower temperature limit in shoulder mode.</td>
<td>Modification on request</td>
</tr>
<tr>
<td>Direction</td>
<td>Direct Acting - branch line pressure increase turns on Cooling, decrease turns on Heating. Reverse Acting - branch line pressure increase turns on Heating, decrease turns on Cooling.</td>
<td>Software, Wi-Stat IIIp-S</td>
</tr>
<tr>
<td>Set Point PSI</td>
<td>Branch line pressure when the room temperature and Set Point are equal; no Heating or Cooling outputs.</td>
<td>Software, Wi-Stat IIIp-S</td>
</tr>
<tr>
<td>Gain /Sensitivity</td>
<td>Number of degrees impacted by 1 PSI change.</td>
<td>Software, Wi-Stat IIIp-S</td>
</tr>
<tr>
<td>Prop band - Proportional range/throttling range</td>
<td>Temperature range that represents the controlled device’s movement from fully closed to fully open. Typically it is 4°F or 6°F.</td>
<td>Software, Wi-Stat IIIp-S</td>
</tr>
<tr>
<td>Unoccupied Mode PSI</td>
<td>Branch line pressure during unoccupied mode when zone temperature is within unoccupied constrained upper and lower limits.</td>
<td>Software, Wi-Stat IIIp-S</td>
</tr>
</tbody>
</table>
## 2.6 Technical Wi-Stat IIIp-S Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pneumatic Features</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermostat Type</td>
<td>2 - Pipe, Multiple Temperature Setpoints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Action</td>
<td>Direct / Reverse Acting, Dead Band Control, Summer / Winter thermostat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Element Type</td>
<td>Piezo electric valve actuator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Connections</td>
<td>¼” or (6.35 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5/32” (4.00 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airflow Usage</td>
<td>0.011 scfm (5.2 mL/s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttling Range</td>
<td>0 – 10 F</td>
<td></td>
<td>User configurable</td>
</tr>
<tr>
<td><strong>Pressure Measurement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor type</td>
<td>Surface mount pre-amplified pressure gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>0 ~ 30 PSI</td>
<td>PSI</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>1.5% full scale %</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pneumatic Output Ports</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main line</td>
<td>Port M</td>
<td>port</td>
<td>Maximum main line pressure 30 psi</td>
</tr>
<tr>
<td>Branch line</td>
<td>Part Br</td>
<td>port</td>
<td>Actively controlled with pressure sensor feedback for various pressure level requirements</td>
</tr>
<tr>
<td><strong>Optional Opto-isolated Output Channels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>1</td>
<td>channel</td>
<td>For additional on / off Fan control</td>
</tr>
<tr>
<td>Maximum voltage</td>
<td>50</td>
<td>V, AC or DC</td>
<td></td>
</tr>
<tr>
<td>Maximum current</td>
<td>1</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Measurement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor type</td>
<td>Integrated circuit sensor</td>
<td></td>
<td>Low current drain, &lt; 90 μA</td>
</tr>
<tr>
<td>Measurement range</td>
<td>-50°C ~ +300°C (~-10°C ~ +149°C)</td>
<td>°F (°C)</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1.00 (±0.56)</td>
<td>°F (°C)</td>
<td></td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal batteries</td>
<td>4.5</td>
<td>VDC</td>
<td>Four AA size batteries</td>
</tr>
<tr>
<td>External DC supply</td>
<td>6 maximum</td>
<td>VDC</td>
<td>Through screw terminal</td>
</tr>
<tr>
<td>Minimum supply voltage</td>
<td>3.1</td>
<td>VDC</td>
<td></td>
</tr>
<tr>
<td>Estimated battery life</td>
<td>Up to 5</td>
<td>Years</td>
<td>With minimum pneumatic line leakage (w/ Lithium)</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display type</td>
<td>Liquid crystal</td>
<td></td>
<td>Displays temperature, branch line pressure, set point, occupied / set back mode, heat / cool / fan status, battery voltage &amp; wireless connection status; supports set point adjustment, HVAC mode (auto / heat only / cool only) selection, fan mode selection (auto / on), and maintenance mode selection</td>
</tr>
</tbody>
</table>
### Radio

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating frequency range</td>
<td>2405 ~ 2475 MHz ISM band</td>
</tr>
<tr>
<td>Number of available channels</td>
<td>15</td>
</tr>
<tr>
<td>Channel spacing</td>
<td>5 MHz</td>
</tr>
<tr>
<td>Maximum RF transmit power</td>
<td>18 dBm</td>
</tr>
<tr>
<td>Receiver sensitivity</td>
<td>-95 dBm</td>
</tr>
<tr>
<td>RF data transmission rate</td>
<td>250 Kbits/sec</td>
</tr>
<tr>
<td>Sampling interval</td>
<td>5 (default) min</td>
</tr>
<tr>
<td>Channel agility</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- **Operating frequency range**: 2405 ~ 2475 MHz ISM band
- **Number of available channels**: 15
- **Channel spacing**: 5 MHz
- **Maximum RF transmit power**: 18 dBm
- **Receiver sensitivity**: -95 dBm
- **RF data transmission rate**: 250 Kbits/sec
- **Sampling interval**: 5 (default) min
- **Channel agility**: Yes

Automatically realigns RF channel when gateway switches to a new channel.

### Environmental & Mechanical

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>41°F to 99°F (5°C to 37°C)</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>-4°F to 158°F (-20°C to 70°C)</td>
</tr>
<tr>
<td>Dimension</td>
<td>4.75x3.5x1.0 in (117x95x25) mm</td>
</tr>
<tr>
<td>Weight</td>
<td>6 oz Without Batteries</td>
</tr>
</tbody>
</table>

### Regulatory Compliance

FCC & IC for unlicensed operation
3.0 Wi-Stat IIIp-S Configuration

Wi-Stat IIIp-S configuration can be done at the device before installation or through software (wireless DDC only) when installation is complete. The following steps describe pre-installation device level configuration.

3.1 Wi-Stat IIIp-S Configuration Steps

Configuration is only needed if equipment was shipped without customizing pneumatic configurations. Skip this step if you already supplied Millennial Net or their reseller with configurations such as Acting direction, Set Point and Set Back branch line PSI, Throttling range, Gain and HVAC mode. It is always a good practice to check configurations by following the steps outlined below.

Wi-Stat IIIp-S thermostat is compatible with wide array of pneumatic HVAC systems. Once installed, it will begin controlling HVAC equipment based on the settings it was configured to. To ensure proper operation, its pneumatic and particular operational settings must be configured to work with your HVAC system. Because Wi-Stat IIIp-S is a battery-powered device with internal memory, configuration can be done prior to or right after installation. To prevent any possible operation conflicts, we recommend that you configure all Wi-Stat IIIp-S thermostats before the installation.

3.2 Wi-Stat IIIp-S Configurable Settings

Below is the list of configuration variables that define how Wi-Stat IIIp-S pneumatic pressure commands will correlate with the temperature values. Refer to your HVAC equipment documentation or service personnel for the actual values that should be configured into Wi-Stat IIIp-S.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Details</th>
<th>Range</th>
<th>Increments</th>
<th>System Defaults</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC Mode</td>
<td>Heat Only – for Heat only systems. Cool Only – for Cool only systems.</td>
<td>N/A</td>
<td>N/A</td>
<td>Auto</td>
</tr>
<tr>
<td>Fan Mode</td>
<td>Only applicable if Fan Relay is used. See Figure 8. Auto – to run Fan</td>
<td>N/A</td>
<td>N/A</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>only with Heating or Cooling. On – to run Fan continuously during</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>occupied mode. Speed X – not supported in this version.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direction</td>
<td>Direct Acting - branch line pressure increase turns on Cooling, decrease</td>
<td>N/A</td>
<td>N/A</td>
<td>Direct Acting</td>
</tr>
<tr>
<td></td>
<td>turns on Heating.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reverse Acting - branch line pressure increase turns on Heating, decrease</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>turns on Cooling.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set Point PSI</td>
<td>Branch line pressure when the room temperature and Set Point are equal.</td>
<td>1 - 22 PSI</td>
<td>0.5 PSI</td>
<td>9 PSI</td>
</tr>
<tr>
<td></td>
<td>Heating and Cooling outputs are OFF.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.3 Wi-Stat IIIp-S Configuration Mode

1. Separate the wall plate from the Wi-Stat IIIp-S thermostat.
2. Install four Lithium 3.6V batteries (supplied) into battery compartment. Be sure to match positive (+) battery ends with positive (+) battery terminals in the battery compartment. (See Figure 9.)
3. Once powered, if configured as wireless DDC Wi-Stat IIIp-S will initialize in:
   - a. 30 sec if it can connect to the network
   - b. 3 minutes if network is not present

   **Do not press any buttons during initialization process! Configuration changes made during initialization will not be saved!**

   See Figure 10, for LCD screen during initialization.

4. Press and hold Shoulder and Override buttons at the same time for 10 seconds to set Wi-Stat IIIp-S into Configure Mode. The LCD screen will change to the Firmware Info Menu first (see Figure 5, below) and in 10 seconds Configuration Menu will appear (see Figure 6, below).
5. Use Up (+) and Down (-) buttons to navigate through the Menu – see directions below.
6. If the Configuration Screen is left idle for 10 seconds, it will return to the normal operation screen.
7. All further configurations must be made while in Configuration Mode.

<table>
<thead>
<tr>
<th>Gain/Sensitivity</th>
<th>Branch line pressure change for every °F deviation in room temperature from set point.</th>
<th>1 - 5 PSI</th>
<th>0.5 PSI</th>
<th>2 PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prop band - Proportional range/throttling range</td>
<td>Temperature range that corresponds to controlled device’s movement from fully closed to fully open. Typically it is 6° F.</td>
<td>0 - 10° F</td>
<td>1° F</td>
<td>6° F</td>
</tr>
<tr>
<td>Unoccupied Mode PSI</td>
<td>Branch line pressure during unoccupied mode. Heat/Cool outputs are OFF.</td>
<td>0 – 22 PSI</td>
<td>0.5 PSI</td>
<td>0 PSI</td>
</tr>
</tbody>
</table>

**DF:** Display Firmware Number

**RF:** Radio Module Firmware Number

**CH:** Radio Channel Number

**GI:** Device Network Group ID

**DI:** Unique Thermostat Device ID
3.4 Configuration from Standalone to Wireless DDC

1. Press and hold Shoulder and Override buttons at the same time for 10 seconds to set Wi-Stat IIIp-S into Configure Mode. The LCD screen will change to the Firmware Info Menu first (see Figure 5. above) and in 10 seconds Configuration Menu will appear (see Figure 6. above). The first line in the Configuration Menu will indicate current configuration:
   a. "Standalone" – Standalone configuration
   b. "Mesh" - Wireless DDC configuration

2. When in Configuration menu, press button to highlight first line. Use Up (+) and Down (-) buttons to change value.

3. Press button again to save new configuration.

4. Press button to exit the menu.

Changing from Standalone to Wireless DDC

Wi-Stat IIIp-S will initialize in:
   a. 30 sec if it can connect to the network
   b. 3 minutes if network is not present

Do not press any buttons during initialization process! Configuration changes made during initialization will not be saved!

See Figure 10. for LCD screen during initialization.

Changing from Wireless DDC to Standalone:
Set the time right away, error code 1024 will be displayed until the time is configured (see Part 4.1 LCD Display for more information on error codes.) Directions on how to set the time and occupancy program are below. Every time you change configuration from Standalone to Mesh and back, previous time settings will be lost. Please reconfigure time every time you switch to Standalone.

3.5 Programming Schedule on a Standalone Wi-Stat IIIp-S

To configure Standalone Wi-Stat IIIp-S schedule follow the directions below:
1. Set time
2. Program Weekday/Weekend Occupancy and temperature set points

**Configuration Menu**

1. Press and hold Shoulder and Override buttons at the same time for 10 seconds to set Wi-Stat IIIp-S into Configure Mode. LCD screen will change to Firmware Info Menu first (see Figure 5. above) and in 10 seconds Configuration Menu will appear (see Figure 6. above). Confirm the first line in Configuration Menu shows “Standalone”. If it indicates “Mesh”, follow directions above to switch to Standalone mode.
2. Use Up (+) and Down (-) buttons to underline lower Standalone menu item
3. Press Confirm button to enter Standalone Configuration Menu

**Time Clock Setup**

4. With Date & Time item underlined, press button to enter setup screen
5. In the Date & Time menu highlight each line you need to edit by pressing button.
6. Use Up (+) and Down (-) buttons to change value.
7. Press button to save.
8. Repeat until Year, Month, Day, Hour and Time is configured correctly.
9. Use Up (+) and Down (-) buttons to scroll between lines.
Set Point Programming

Refer to section 2.3.3 Standalone Wi-Stat IIIp-S Occupancy Programming for full programming description and examples.

10. While in Configuration menu use Up (+) and Down (-) buttons to navigate to Weekday item to set up Weekday schedule.

11. Press button to open it.
12. Start with setting Weekday 1 (usually start of the Occupied mode):
   a. Leave top line as “Weekday 1”.
   b. Use Up (+) and Down (-) buttons to navigate
   c. Use button to open item, then Up (+) and Down (-) buttons to change values and button again to save.

13. Set Weekday 2 Schedule:
   a. Use Up (+) and Down (-) buttons to navigate to “Weekday 1” item.
   b. Press button to highlight it.
   c. Use Down (-) button to change it to “Weekday 2”
   d. Press button to save.
   e. Use the same procedure to change starting time, mode and upper and lower temperature limits.

14. While in Configuration menu use Up (+) and Down (-) buttons to navigate to Weekend item to set up Weekend schedule.
15. Follow procedures in Steps 11 – 14 to set up your Weekend Schedule.
16. Once you finished, press button to exit.

Refer to section 2.3.3 Standalone Wi-Stat IIIp-S Occupancy Programming for full programming description and examples.
3.6 HVAC Mode Screen *(Note: HVAC Mode, FAN Mode and Maintenance configuration are the same for standalone and wireless DDC configured thermostats.)*

<table>
<thead>
<tr>
<th>HVAC Mode</th>
<th>Fan Mode</th>
<th>Standalone</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC Mode</td>
<td>Heat Only</td>
<td>Cool Only</td>
<td>Standalone</td>
</tr>
</tbody>
</table>

17. When in Configuration Mode, press Up/Down buttons to Underline HVAC Mode item.

18. Press Confirm button.

19. Use Up/Down buttons to choose between **Auto**, **Cool** and **Heat**.

20. Press Confirm button.

21. The LCD Screen will return to the normal operation screen, and changes will be effective immediately.
3.7 Fan Mode Screen

The Fan Mode screen controls Fan Relay output on the Wi-Stat IIIp-S. It is only applicable if your HVAC System is using an external relay to control fan operation. Most Pneumatic HVAC systems control fan operation at the equipment level. If your system does not have wires connected to the Fan Relay, you will not need to use the Fan Mode option. Refer to your HVAC System documentation for fan operation details.

If your FAN Relay is not connected, you may skip this programming step.

1. When in Configuration Mode, press Up/Down buttons to Underline FAN Mode item.

2. Press Confirm button.

3. Use Up/Down buttons to choose between:
   a. Auto – to run Fan only with heat or cool output.
   b. On – to run Fan continuously during Occupied and Unoccupied modes.
   c. Speed X – Adjustable fan speed - not supported in the version.

4. Press Confirm button.

5. The LCD Screen will return to the normal operation screen, and changes will be effective immediately.
3.8 Maintenance – Pneumatic Settings

1. When in Configuration Mode, press Up/Down buttons to Underline Maintenance item.

2. Press Confirm button.

3. Use Up/Down buttons to choose between Dir Acting, SP Psi, Gain, Prop Bnd and Unoc PSI.

4. Press Confirm button to edit selected item – it will highlight on the menu as follows:

5. Change Acting Direction:

6. Press Confirm button when done.

7. Change Set Point Pressure:

8. Press Confirm button when done.
9. Change **Gain**:

<table>
<thead>
<tr>
<th>Dir Acting</th>
<th>SP Psi</th>
<th>Gain</th>
<th>Prop Bnd</th>
<th>Unoc Psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.0</td>
<td>2.0</td>
<td>6.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

- Press **+** button to increase Pressure Gain, valid range 1.0 ~ 5.0Psi with 0.5Psi increment; default 2.0Psi.
- Press **-** button to decrease Pressure Gain.

10. Press **Confirm Button** when done.

11. Change **Temperature Proportional Range**:

<table>
<thead>
<tr>
<th>Dir Acting</th>
<th>SP Psi</th>
<th>Gain</th>
<th>Prop Bnd</th>
<th>Unoc Psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.0</td>
<td>2.0</td>
<td>6.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

- Press **+** button to increase temperature proportional band; valid range 0.0 ~ 10.0F with 1F increment; default = 6.0F.
- Press **-** button to decrease Temperature Proportional Band.

12. Press **Confirm Button** when done.

13. Change **Unoccupied Mode Pressure**:

<table>
<thead>
<tr>
<th>Dir Acting</th>
<th>SP Psi</th>
<th>Gain</th>
<th>Prop Bnd</th>
<th>Unoc Psi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.0</td>
<td>2.0</td>
<td>6.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

- Press **+** button to increase branch line pressure during unoccupied mode periods; valid range 0 ~ 22 PSI with 0.5 PSI increment; default = 0 PSI.
- Press **-** button to decrease branch line pressure during unoccupied mode periods.

14. Press **Confirm Button** when done.

15. Press **Go Back to Previous Screen Button** when done.
16. Left idle for 10 seconds Configuration Screen will go back to the normal operation screen.
4.0 Wi-Stat IIlp-S Installation
Wi-Stat IIlp-S only operates as a standalone pneumatic thermostat or as wireless DDC device, a part of the overall Millennial Net Energy Management Solution. To function properly as wireless DDC, Wi-Stat IIlp-S requires a Site Controller (Site controller, Wi-BACserv, MeshGate II, etc.) and wireless signal repeaters (Wi-Router). Please refer to the Wireless MeshScape® Energy Management Solution Installation Guide for details.

4.1 List of Tools and Hardware Required for Installation
- Couplings or reducers to connect Wi-Stat IIlp-S to existing air tubes (not supplied)
- Needle-nose pliers
- Small level
- Fasteners and anchors to secure wireless devices (Site Specific)
- Plastic tie wraps (for securing Wi-Routers, Site Specific)
- Electric Drill (optional)
- Building floor plans for where the system will be installed. These floor plans will serve multiple purposes:
  - To plan the wireless network before installation by identifying thermostat locations;
  - To document the locations where wireless devices will be installed; and
  - After installation, digital images of the floor plans with the locations of all devices can be placed on the Wi-EMS software.

4.2 Electrostatic Sensitive Devices (ESD) Safety Measures
Wi-Stat IIlp-S contains ESD sensitive circuit boards. Please use caution when handling Wi-Stat IIlp-S with back plate (wall plate) removed. Always carry Wi-Stat IIlp-S in the anti-static bags in which they were shipped. If you are not wearing ESD protective gear, do not touch any part of the circuit board with your hands while mounting tubes to the valves. Even minimal electrostatic discharge (static shock) can severely damage Wi-Stat IIlp-S.

4.3 Clean Air Requirement
Before beginning to install Wi-Stat IIlp-S thermostats, please ensure air in the pneumatic lines is properly cleaned. Clean, dry and oil-free air in the main supply line is required for normal Wi-Stat IIlp-S pneumatic thermostat operation. The pneumatic system must contain a properly operating air dryer and coalescing filter to remove water, oil, and other impurities from the main supply air before it reaches the Wi-Stat IIlp-S. If the existing system is contaminated with oil and/or water, Millennial Net recommends installation of a pre-filter before each Wi-Stat IIlp-S device to protect it from containment and failure.

Wi-Stat IIlp-S failures due to main supply air contamination with impurities including oil, water, dust or other solid particles will not be replaced under warranty.

Millennial Net recommends using the following in-line filters with Wi-Stat IIlp-S:
- Johnson Controls Air Filter, Part Number A-4000-137
- NECC (www.neccdelivers.com) Air Filter, Part Number DF114

Before installation, ensure the following:
- Air dryer is functioning properly
- Coalescing air filter is replaced and maintained property
- Inline filters are installed where possible
4.4 Wi-Stat IIlp-S Order of Installation

Wi-Stat IIlp-S Configuration Confirmation

Wi-Stat IIlp-S is shipped configured as a standalone or wireless DDC device based on customer requirements. Always confirm the configuration before installing devices by referring to the icon in the upper right corner of the LCD Screen:

If configured as wireless DDC Wi-Stat IIlp-S, the thermostat begins looking for a wireless network as soon as it is powered up. We strongly suggest installing the Site Controller and Wi-Routers to establish a network before putting in Wi-Stat IIlp-S thermostats.

If you are installing Wi-Stat IIlp-S thermostats before establishing wireless network, please be aware of the following:

- Once powered, Wi-Stat IIlp-S will initialize and look for network for 3 min. During initialization, LCD will display code 512. (See Figure 10 for details)
- **Do not press any buttons during initialization process! Configuration changes made during initialization will not be saved!**
- Wi-Stat IIlp-S will operate in Occupied Mode with default settings:
  - Set Point Temperature – 70F
  - Comfort zone - ±3F
- These default values can only be changed form the software once Site Controller is installed.
- Once you install Site Controller and Wi-Routers, confirm each Wi-Stat IIlp-S thermostat is connected to the network by checking LCD screen (see Figure 13).
- Please be aware, default sampling interval is 5 minutes, therefore it might take some time for all thermostats to connect.

Wireless DDC Wi-Stat IIlp-S Installation Steps:

1. Install Site Controller (Site controller, Wi-BACserv, MeshGate II, etc.)
2. Install Wi-Routers (refer to the Wireless MeshScape® Energy Management Solution Installation Guide)
3. Configure Wi-Stat IIlp-S thermostat
4. Install Wi-Stat IIlp-S thermostat
4.5 Wi-Stat IIIp-S Installation Steps

NOTE: Use care when attaching air tubes to Branch and Main nozzles. Excessive force could result in nozzle damage or breakage.

Follow the steps below to install the Wi-Stat IIIp-S. Only install if you are familiar with HVAC maintenance and commercial thermostats.

1. Remove the old thermostat from the wall and disconnect air tubes. Be sure to mark the Branch and Main Lines.
2. Separate the wall plate from the Wi-Stat IIIp-S thermostat.
3. Mount the Wi-Stat IIIp-S wall plate to the mounting surface:
   a. Thread the existing air tubes from the wall through the large opening in the Wi-Stat IIIp-S wall plate. Position the wall plate against the mounting surface to be sure it seats flush.
   b. Use a small level or visually check that the Wi-Stat IIIp-S wall plate is level.
   c. Mounting holes on the wall plate are designed to fit a standard electrical box. If you need additional holes, mark the locations of the mounting holes on the mounting surface and then remove the wall plate from the mounting surface and drill additional mounting holes at the marked locations as needed.
   d. Using mounting hardware appropriate for the mounting surface (not supplied) and secure the Wi-Stat IIIp-S wall plate to the mounting surface.
4. Thread the air tubes from the wall through the Wi-Stat IIIp-S wall plate and connect them to the Branch (B) and Main (M) Wi-Stat IIIp-S pipes, or use an appropriate coupling as necessary. (Figure 8.)

Please refer to part 3.3 Clean Air Requirement to ensure quality air in the tubes.

![Figure 8. Wi-Stat IIIp-S Air Tubes](image)
5. Install four (4) Lithium 3.6V batteries (supplied) into battery compartment in parallel (Figure 9.) Please note, Wi-Stat IIIp-S will run on only 2 batteries, but for a significantly shorter time. To maximize battery life, be sure to install all 4 batteries.

![Battery Compartment](image)

**Figure 9. Battery Compartment**

6. Once powered, Wi-Stat IIIp-S will initialize in:
   a. 30 sec if it can connect to the network
   b. 3 minutes if network is not present

   *Do not press any buttons during initialization process! Configuration changes made during initialization will not be saved!*

   See Figure 10. below for LCD screen during initialization.

![LCD screen during initialization](image)

**Figure 10. LCD screen during initialization**

7. Check the wireless connectivity at the intended thermostat installation location – it may take about 30 seconds for Wi-Stat IIIp-S to initialize:
   a. **Look at the Wireless Connection Status indicator on the LCD screen (upper right corner)** – wireless DDC only (Figure 13):
      i. – Connection is established – correct operation
      ii. Blank – No connection
b. **Look at the Number of Routes to the Site controller on the LCD screen (Figure 13):**
   
i. Blank – Wi-Stat IIIp-S is not connecting to the Site controller
   
   ii. 1 – one connection – direct to the Site Controller – correct operation
   
   iii. 2 – two or more paths established – correct operation

8. Attach Wi-Stat IIIp-S to the installed wall plate by aligning the thermostat enclosure with the wall plate. The clips on the wall plate should be inside the thermostat enclosure cover. When aligned properly, press thermostat to wall plate until clips engage.

9. Document the Device ID (DID) and location of each Wi-Stat IIIp-S on the floor plan. The Device ID label is located on the right side of the Wi-Stat IIIp-S (see Figure 11.).

![Figure 11. Device ID Label](image-url)
5.0 Wi-Stat IIIp-S Operation

Wi-Stat IIIp-S provides full electronic controls to pneumatic HVAC thermostat. Below are Control buttons and Display LCD Screen descriptions.

5.1 LCD Display

1. Operating Mode:
   a. Occupied – scheduled occupied mode – temperature can be adjusted within the Comfort Zone.
   b. Unoccupied – scheduled unoccupied mode – HVAC controls are off, temperature cannot be adjusted. To turn HVAC on, put Wi-Stat IIIp-S into Override mode by

   ![Figure 12. Wi-Stat IIIp-S Button Descriptions](image)

   ![Figure 13. Wi-Stat IIIp-S LCD Display](image)
pressing Override mode button and then adjust temperature setting using Up/Down buttons.

c. Override – manual override mode - temperature can be adjusted within the Comfort Zone.


2. **Wireless Connection Status** – indicates if Wi-Stat IIIp-S is connected to the Site Controller:

   a. ![Connection](image) – Connection is established
   b. Blank – No connection

3. **Number of Routes/Paths to the Site controller** – indicates how many communications paths to the Site Controller that the Wi-Stat IIIp-S can see:

   a. Blank – Wi-Stat IIIp-S is not connecting to the Site Controller
   b. 1 – one connection – correct operation
   c. 2 – two or more paths established – correct operation

4. **Battery Voltage Level:**

   a. ![Full battery](image) - Full battery
   b. ![Low battery](image) - Low battery, time to replace

5. **Heat or Cool output:**

   a. ![Cooling](image) – Cooling is on
   b. ![Heating](image) – Heating is on

6. **Fan Output** (only applicable with a Wi-Stat IIIp-S where electric Fan Relay is supported; see Installation Instructions):

   a. ![Fan](image) – Fan is On
   b. Blank – Fan is Off

7. **Requested Branch Line Pressure (PSI)** – required branch line pressure based on the control calculation.

8. **Actual branch line pressure (PSI)** – measured values of the branch line pressure – should be within 1.2 of the Requested Branch Line Pressure.

9. **Error Code Display:**

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0 PSI available in main line</td>
</tr>
<tr>
<td>4</td>
<td>Insufficient branch line pressure</td>
</tr>
<tr>
<td>8</td>
<td>Pressure down leak in the system (pressure decreasing while it should remain constant)</td>
</tr>
<tr>
<td>12</td>
<td>Insufficient branch line pressure and down leak in the system</td>
</tr>
<tr>
<td>16</td>
<td>Pressure up leak in the system (pressure increasing while it should remain constant)</td>
</tr>
<tr>
<td>22</td>
<td>Insufficient branch line pressure and up leak in the system</td>
</tr>
<tr>
<td>24</td>
<td>Both down leak and up leak in the system</td>
</tr>
<tr>
<td>128</td>
<td>Low Battery Warning (version 1.15.16 onwards)</td>
</tr>
<tr>
<td>512</td>
<td>Wireless DDC thermostat is initializing, buttons are disabled</td>
</tr>
<tr>
<td>1024</td>
<td>Standalone Device: Current Date/Time configuration required</td>
</tr>
<tr>
<td>Any other number</td>
<td>Product Error – please contact Millennial Net for further instructions</td>
</tr>
</tbody>
</table>
10. Received Signal Strength Indicator – Relative Wireless Signal Strength Indicator between Wi-Stat IIIp-S and the device with which it communicates:
   a. **-39 and higher** – strong and solid wireless link. No further analysis needed.
   b. **-44 to -40** – wireless signal is getting through, but this device should be monitored. If signal strength deteriorates further there is a risk of data loss. Consider adding a Wi-Router between devices to strengthen the signal.
   c. **-45 and below or "---"** – device has very weak link or failing connect to other devices on the network and might be loosing a significant number of data packets. It may be too far from other devices or there may be wireless interference in the area. To strengthen the wireless link, add a Wi-Router between problematic device and other devices on the network to create an additional connection point.

11. Room Temperature or Requested Set Point – shows current room temperature. When Up/Down buttons are pressed once, it shows the current user the locally-defined Set Point.

5.2 Adjusting Room Temperature
Wi-Stat IIIp-S works in conjunction with the preset Building Energy Policy; therefore you will only be able to change a room temperature within the predefined Room Comfort Zone.

1. Confirm that the Wi-Stat IIIp-S is in scheduled Occupied Mode – top of the LCD Screen must read “Occupied”.
2. The temperature reading on LCD screen will display current room temperature.
3. To increase/decrease room temperature – press Up/Down buttons to select the desired room temperature.
   a. When you press Up/Down buttons once, LCD display will show the user-defined room Set Point value and the LCD will read “Set Point”. (When room temperature and Set Point are the same, HVAC equipment is off.)
   b. If neither Up or Down button is pressed again, within 5 seconds the display will return to the Main Screen.
   c. When the Set Point in displayed, keep pressing Up/Down buttons to reach desired room Set Point temperature.
   d. If you are pressing Up/Down buttons, but:
      i. Set Point stops increasing/decreasing - you have reached Comfort Zone limits.
      ii. Set Point is not changing - your local controls are disabled.
      iii. Contact your building Administrator if the room temperature min/max is not comfortable for you.
   e. Wi-Stat IIIp-S will decide to heat or to cool based on the current room temperature and Set Point you specify.
4. When the desired Set Point is specified, within 5 seconds the display will go back to the Main Screen.
5. If the LCD screen reads “Unoccupied”, the Wi-Stat IIIp-S is scheduled to be in unoccupied mode. If you need to Heat or Cool the area while the Wi-Stat IIIp-S is in unoccupied mode, put the Wi-Stat IIIp-S into Override mode by pressing Override button . See section 4.3 below for more details.
5.3 Using Override Mode Button

If LCD screen reads “Unoccupied” the Wi-Stat IIIp-S is scheduled to be in unoccupied mode and local thermostat controls are disabled. If you need to Heat or Cool the area:

1. Put the Wi-Stat IIIp-S into Override mode by pressing Override button
2. Wi-Stat IIIp-S will stay in Override mode for a length of time as defined by your Energy Policy (default - 2 hours). You will be able to adjust room temperature (within the Comfort Zone) for the duration of the Override.
3. Follow Step 3 in Section 4.2 Adjusting Room Temperature (above) to change room temperature.
4. Once the Override mode duration time expires, Wi-Stat IIIp-S will return to its originally scheduled mode.
5. If you need to extend the heating or cooling duration, press Override Button again and follow Step 3 instructions above.

5.4 Using Shoulder Mode Button

Shoulder Mode Button allows you to put the Wi-Stat IIIp-S into a “shallow” set back mode. When the Wi-Stat IIIp-S is activated, it will not use HVAC equipment as long as the temperature is within the Set Point limits configured on Wi-EMS control software (default ± 5°F). For example, with a Setpoint of 70°F and the Shoulder Mode activated, the Wi-Stat IIIp-S will not turn HVAC equipment on as long as the room temperature is between 65°F and 75°F. Shoulder Mode can be utilized to reduce energy waste when you are leaving a room or zone earlier than when the scheduled Unoccupied Mode time starts.

1. Press the Shoulder Mode button to activate Shoulder Mode.
2. Shoulder Mode has a limited duration time - Wi-Stat IIIp-S will go back into its regularly scheduled mode at the next scheduled Unoccupied Mode change.
3. To return to Occupied Mode, simply press the Shoulder Mode Button again.
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