



## **HPC/HPC Plus Programming and Monitoring Instructions**

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## Description

The Heat Pump Controller (HPC) and the Heat Pump Controller Plus (HPC Plus) are dedicated, direct digital control modules that provide precise integrated control for heat pump applications.

The HPC is applied to single-stage (1 H/1 C) water-source heat pumps that energize the reversing valve internally and require a “call for heat” or a “call for cooling” like a conventional thermostat. It features a time delay that allows a loop water pump time to respond to a call for heating or cooling before it actually energizes the heating or cooling outputs.

The HPC Plus energizes the reversing valve, compressors, and auxiliary heat directly. Like the HPC, it incorporates a compressor delay to allow time for a loop water pump to turn on before energizing the compressors. The HPC Plus also features a special general fault input to receive a contact closure signal from a unit safety switch. This input can be used to initiate an alarm or shut down the heat pump unit when the signal is received from the switch.

The programming instructions provided in this document pertain primarily to the HPC Plus. To program an HPC, the user must select **UVC** as the load type and identify it as a **UVC-5**. Refer to Novar’s *UVC Programming and Monitoring Instructions* (Doc. No. TD-0640), available on the Novar Software Package CD.

## Accessing the Control Settings/Parameters Screen

To set or change parameters on an HPC Plus, a user must first access the ESS32 Function Menu (Figure 1) and select the **Load Control** option to open the Load Directory Screen.

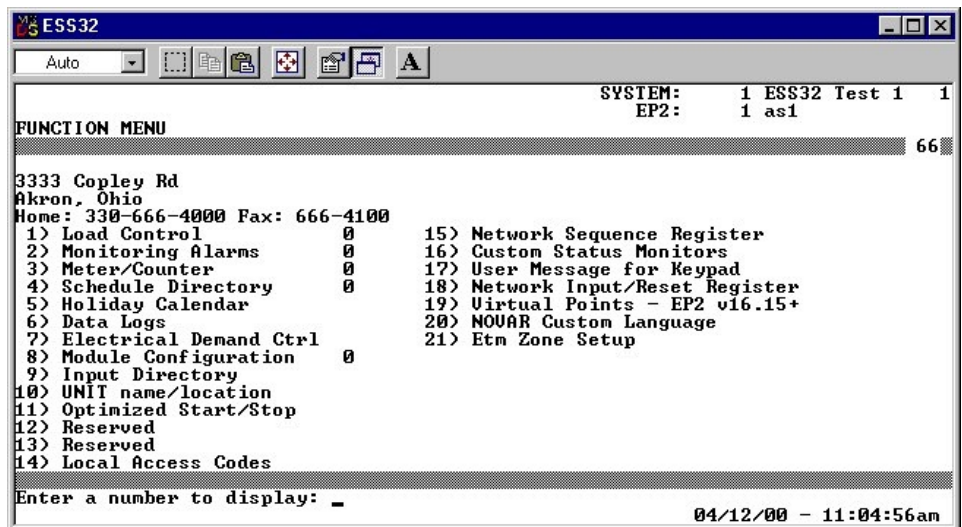


Figure 1. HPC Plus Control Settings/Parameters screen 1

After accessing the Load Directory screen, the user can create a new HPC Plus load or modify an existing HPC Plus load. To create a new HPC Plus load, the user must first assign a name to the load in the Load Directory screen. After assigning a name and pressing **enter**, a Load Type popup screen opens in which the user selects **HPC Plus** and presses **enter** to open the HPC Plus Control Settings and Parameters screen.

In the Control Settings and Parameters screen, the user can select the parameter(s) to be changed by typing the parameter's number at the "Enter number to modify" prompt.

Various methods are used to change the individual parameters. Instructions provided at the prompt line tell users how to select the appropriate options or enter the required information.

### Control Settings and Parameters

HPC Plus loads are configured in the HPC Plus Control Settings/Parameters screens, the first of which is shown in Figure 2.

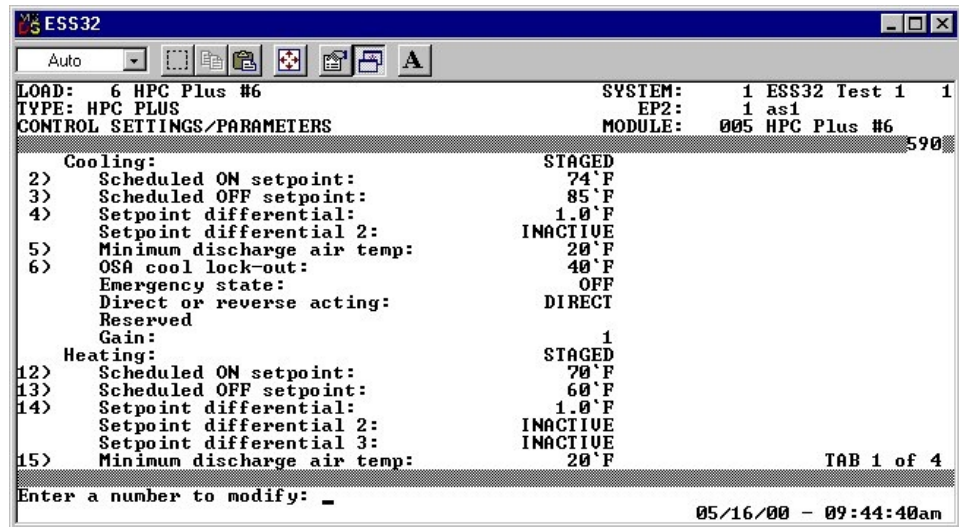


Figure 2. HPC Plus Control Settings/Parameters screen

The message, "Tab 1 of 4" in the lower right corner of the screen indicates that there are more parameters associated with this load. Pressing the **tab** key advances to the next screen of parameters.

The following parameters are listed.

## Cooling Settings/Parameters

### Cooling: Staged

This parameter is set when **HPC Plus** is selected as the load type. It cannot be changed.

---

### Scheduled On Setpoint

This parameter sets the temperature range to be used as the cooling setpoint during scheduled on periods.

- Default: 74°F
  - Range: One degree above the Heat Setpoint value to 127°F
- 

### Scheduled Off Setpoint

This parameter sets the temperature range to be used as the cooling setpoint during scheduled off periods.

- Default: 85°F
  - Range: One degree above the Heat Setpoint value to 127°F
- 

### Setpoint Differential (Staged cooling only)

This parameter determines when the first stage of cooling is turned on or off. The differential is split across the cooling setpoint, with the first stage of cooling coming on above the setpoint and shutting off below the setpoint.

- Default: 1°F
  - Range: 0.5°F–7.5°F
- 

### Setpoint Differential 2

This parameter determines when the second stage of cooling is turned on or off. The differential is in effect above the setpoint only. A setting of **0** deactivates the second stage of cooling.

- Default: Inactive (0°F)
  - Range: 1.0°F–7.5°F; 2–90 min.
- 

### Minimum Discharge Air Temp

This parameter sets the minimum discharge air temperature between 20°F and 127°F to be used when the HPC Plus is in the cooling mode. If the temperature drops below this setpoint, the damper and/or mechanical cooling will be modified accordingly.

- Default: 20°F
  - Range: 20°F–127°F
- 

### OSA Cool Lockout

This parameter specifies an outdoor temperature below which cooling is locked out.

- Default: 40°F
  - Range: –31°F to 127°F
-

### Emergency State (Modulating Cooling Only)

This parameter does not apply to the HPC Plus.

---

### Direct or Reverse Acting (Modulating Cooling Only)

This parameter does not apply to the HPC Plus.

---

### Gain

This parameter does not apply to the HPC Plus.

---

## Heating Settings/Parameters

### Heating: Staged

This parameter is set when **HPC Plus** is selected as the load type. It cannot be changed.

---

### Scheduled On Setpoint

This parameter specifies the range of temperatures to be used as the heating setpoint during scheduled on periods.

- Default: 70°F
  - Range: 20°F to one degree less than the Cool Setpoint value
- 

### Scheduled Off Setpoint

This parameter specifies the range of temperatures to be used as the heating setpoint during scheduled off periods.

- Default: 60°F
  - Range: 20°F to one degree less than the Cool Setpoint value
- 

### Setpoint Differential (Staged heating only)

This parameter determines when the first stage of compressor heating turns on or off. The differential is split across the heating setpoint.

- Default: 1°F
  - Range: 0.5°F–7.5°F
- 

### Setpoint Differential 2

This parameter determines when the second stage of compressor heating turns on or off. The differential is in effect below the heating setpoint only.

- Default: Inactive (0°F)
  - Range: 1°F–7.5°F
- 

### Setpoint Differential 3

This parameter determines when the third stage of heating (auxiliary heat) turns on or off. The differential is in effect below the heating setpoint only.

Default: Inactive (0°F)  
Range: 1°F–7.5°F

---



### Minimum Discharge Air Temp

This parameter specifies the minimum discharge air temperature to be used when the HPC Plus is in heating mode. If the discharge air temperature falls below this setpoint, the damper and/or heating operation is modified accordingly.

- Default: 20°F
  - Range: 20°F–127°F
- 

### OSA Heat Lockout

This parameter does not apply.

---

### Emergency State (Modulating Heating Only)

This parameter does not apply.

---

### Direct or Reverse Acting (Modulating Heating Only)

This parameter does not apply.

---

### Gain (Modulating Heating Only)

This parameter does not apply.

---

## **Damper Control Settings/Parameters**

The Damper Control settings/parameters control the operation of the damper. The setting is normally modulating and is locked in when **HPC Plus** is selected as the load type. The damper is controlled to zone temperature and will modulate to maintain the cooling minimum discharge air temperature.

---

### ASHRAE Cycle

This parameter defaults to Cycle 2 and cannot be modified. Cycle 2 maintains a minimum damper percentage setting during scheduled on operation and operates the damper as an economizer if outside air temperatures are appropriate. During the scheduled off mode, the damper is closed except during a call for cooling.

---

### Cool Setpoint Offset (ASHRAE 1&2)

This parameter specifies an offset number that is subtracted from the cooling setpoint to determine the damper setpoint.

Default: –0.5

Range: –0.5, –1.0, –1.5, or –2.0

---

### Damper OSA High Limit

This parameter specifies a temperature to be used as the maximum outside air temperature. If the outside air temperature rises above this setpoint, economizer operation is canceled and the damper is moved to the minimum position.

- Default: 65°F
  - Range: –20°F to 120°F
-

### Minimum Position

This parameter establishes a percentage figure that sets the damper output signal so it does not close completely for more effective ventilation control.

Default: 0%  
Range: 0%–100%

The minimum position is established by assigning the damper a percentage that it is to remain open. For example, a 10% setting indicates that the damper will remain at least 10% open during occupied hours (scheduled on). During unoccupied hours (scheduled off) the damper moves to fully closed.

---

### Emergency State

This parameter sets the position of the damper during an emergency state (as defined in the **Site Emergency** parameter).

Selecting **On** opens the damper.  
Selecting **Off** closes the damper.

---

### Gain

This parameter establishes a speed factor that determines how quickly the voltage level changes against the error from setpoint.

- Default: 1
- Range: 1 (slowest) to 8 (fastest)

This operation works in conjunction with **Zone Temperature Sensor Response Time** parameter to control the modulating action of the damper output.

---

## Miscellaneous Settings/Parameters

### Warmup Setpoint Adjust

This parameter specifies an offset temperature that keeps the damper closed at morning startup. Its purpose is to reduce operating costs by not heating outside air when the building is unoccupied.

- Default: 0°F
- Range: –7°F to 7°F

This parameter functions when the HPC Plus makes the transition from scheduled off to scheduled on. The warmup cycle continues until the maximum warmup time is reached or the space temperature approaches the adjusted scheduled on setpoint. The cycle is then terminated.

#### *Example:*

If:     Space temperature = 60°F  
          Heat setback = 60°F  
          Heat setpoint (scheduled on) = 70°F  
          Setpoint adjust = –4°F

Then:   Warmup control point = 66°F (70°F minus 4°F).

---

### Warmup Timeout

This parameter establishes the maximum length of time for the warmup cycle. If the modified setpoint is not reached within the time specified, the warmup cycle ends and the damper moves to its minimum position and/or normal control.

- Default: 0 minutes
  - Range: 0–90 minutes
- 

### Zone Temp Sensor Response Time

This parameter specifies a time that a modulated output waits to adjust its position.

- Default: 0 minutes, 0 seconds
- Range: 0 minutes, 0 seconds to 7 minutes, 30 seconds

The parameter's setting is used to prevent overshoot. It is not used when an output is controlling to its minimum or maximum discharge air temperature setpoint.

---

### Schedule On Fan Mode

This parameter selects the fan's mode of operation during periods when the HPC Plus is scheduled on.

- Default: Auto
  - Range: Auto or On
- 

### Schedule Off Fan Mode

This parameter selects the fan's mode of operation during periods when the HPC Plus is scheduled off.

- Default: Auto
  - Range: Auto or On
- 

### Setpoint Adjust Mode

This parameter enables local heating and cooling setpoint adjustments.

- Default: Inactive
- Range: Inactive, Active Always, or Active—Schedule Mode Sensitive

Selecting **Inactive** disables the setpoint adjust mode.

Selecting **Active Always** activates the setpoint adjust mode auxiliary input during scheduled on times.

Selecting **Active—Schedule Mode Sensitive** requires the occupant to push the timed override button prior to adjusting the setpoint adjust dial on the auxiliary input during scheduled on times. The adjustment automatically cancels when the unit schedules off. During the scheduled off mode, it is not active. During a timed override mode, it is always active.

---

### Relief Damper

This parameter does not apply.

---

### Demand Control

This parameter activates or deactivates the HPC Plus's participation in the system's demand control function.

- Default: Inactive
- Range: Active or Inactive

Load shedding is subject to the constraints of the control settings and parameters for each individual load.

If a load has been included in one of the shed registers listed under demand control and this setting has been changed to **Inactive** at a later date, the HPC Plus disregards shedding instructions from the demand control routine.

---

### Demand Active in Cool Mode

This parameter determines if demand control is to be active during cooling.

- Default: No
  - Range: Yes or No
- 

### Demand Active in Heat Mode

This parameter determines if demand control is to be active during heating.

- Default: No
  - Range: Yes or No
- 

### Demand Period Continuous Fan

This parameter determines if the fan is to operate continuously during demand shed periods.

- Default: No
  - Range: Yes or No
- 

### Demand Setpoint Adjust

This parameter determines if the HPC Plus is to turn off or only alter its setpoints by a specified amount during demand shed periods.

- Default: 0°F
  - Range: Off or 0°F– 9°F
-

### Optimized Start/Stop

This parameter enables or disables the optimized start/stop function for the equipment controlled by the HPC Plus and specifies the allowable temperature drift during optimized stop.

- Default: Inactive
- Range: Active or Inactive

A primary schedule must be defined before this field can be adjusted.

---

### Phase Loss

This parameter activates or deactivates emergency shutdown if the executive module detects a utility phase loss.

- Default: Inactive
- Range: Active or Inactive

For the HPC Plus, digital outputs turn off (or open) and modulating outputs return to their defined emergency states during the emergency shutdown.

---

### Drift Limit Alarm

This parameter activates or deactivates an HPC Plus drift limit alarm if the HPC Plus is unable to come within 3°F of its heating or cooling setpoint. The alarm is automatically inhibited as long as the space temperature is approaching the setpoint by at least 0.5°F per 10 minutes.

- Default: Inactive
- Range: Active or Inactive

Selecting **Active** displays the drift limit alarm if the module is unable to achieve the heating or cooling setpoint. The alarm condition is reported to ESS32.

Selecting **Inactive** displays the drift limit alarm if the module is unable to achieve the heating or cooling setpoint. The alarm condition is not reported to ESS32.

---

### Site Emergency

This parameter activates or deactivates emergency shutdown when the executive module detects a site emergency.

- Default: Inactive
- Range: Active or Inactive

For the HPC Plus, digital outputs turn off (or open) and modulating outputs return to their defined emergency states during the emergency shutdown.

---

### Network Emergency

Network emergency is shown as active or inactive but is specified from a monitoring alarm output function.

- Default: Inactive
- Range: Active or Inactive

For the HPC Plus, digital outputs turn off (or open) and modulating outputs return to their defined emergency states during the emergency shutdown.

---

### Network Sequence

This parameter is used to sequence operation of the HPC Plus to other loads, virtual points, or global outputs (NovarNet<sup>®</sup> systems only).

- Default: Inactive
- Range: Active or Inactive

If the user selects **Active** for this parameter, three options are offered:

- Loads

Selecting **Loads** sequences the HPC Plus's operation to loads that the user selects in the Load Directory screen. Once the user selects the loads and presses **enter** to return to the Control Settings and Parameters screen, ESS32 automatically highlights the **Network Sequence Status** parameter for the user to select additional options that apply to this sequence.

- Virtual Points

Selecting **Virtual** sequences the HPC Plus's operation to virtual points that the user selects in the Virtual Points Directory screen. After the user selects the appropriate points and presses **enter** to return to the Control Settings and Parameters screen, ESS32 automatically highlights the **Network Sequence Status** parameter so the user can select additional options that apply to this sequence.

- Global Outputs (NovarNet systems only).

Selecting the **Global** option sequences the HPC Plus's operation to user-selected global outputs on other executive modules in a NovarNet system. When the user selects the **Global** option, the Unit Directory screen opens. The user can select the same executive module or another one and press **enter** to open that executive module's Load Directory screen. If a unitary controller load is selected, a screen opens from which the user can choose cooling, heating, and/or fan sequence.

NovarNet systems can have 128 global output sequences for each executive module. For each unitary controller sequenced, the user can choose any or all of the cooling, heating, and fan sequence operations. If all three are chosen, it counts as 3 sequences out of the possible 128. This is an important consideration to remember when programming these parameters.

After completing the selections at the Load Directory screen, the user must press **enter** to return to the Unit Directory screen. The user can either select another executive module or press **enter** to return to the HPC Plus Control Settings/Parameters screen. ESS32 then automatically highlights the **Network Sequence Status** parameter so the user can select additional options that apply to this sequence.

---

### Network Sequence Status

This parameter defines the network sequencing to any or all of the specified loads, points, or outputs based on their on or off state.

- Default: Inactive
- Range: Active or Inactive

If unitary controller loads were selected in the **Network Sequence** parameter, the user can choose between heat, cool, or heat/cool sequence states. The **Virtual Points** option has no additional selection. The **Global Outputs** option automatically assigns a multiple state.

---

### Zone Sensor Failure Control Mode

This parameter determines the control mode to which the HPC Plus reverts if the zone temperature sensor connected to it fails.

- Default: Off
  - Range: Off, Cool, or Heat
- 

### Airflow Input

This parameter determines if the HPC Plus searches for a contact closure on its fan status input when the fan output is commanded on..

- Default: Inactive
- Range: Active or Inactive

Selecting **Active** causes the HPC Plus to search for a contact closure on its airflow input 1 minute after calling for the fan. If one is not found, it sends out an alarm. Once the airflow is confirmed, it must open for 30 seconds during fan operation for an alarm to occur.

---

### Force Outputs to Emergency States

This parameter determines if the relay outputs are forced off (open) and the modulating outputs are forced to their defined emergency states when an airflow alarm occurs (selectable only if airflow input is defined as **active**).

- Default: No
  - Range: Yes or No
-

## Timed Override Period

This parameter establishes an override time interval up to 4 hours and 13 minutes.

- Default: Inactive
- Range: 0 hours, 0 minutes to 4 hours, 14 minutes

Selecting **4 hours** and **14 minutes** creates a continuous override. The HPC Plus controls to scheduled on setpoints when the override button is pushed. This scheduled override can be canceled by pushing the button again.

After entering the timed override period, the following request appears:

“Timed override FORCED FROM ESS? (Y or N):”

A forced override can be initiated during the scheduled on time to keep the load on. It clears at the beginning of the next regularly scheduled on time (usually the next morning).

## Module Type

This parameter identifies the load as an HPC Plus. When the user types the parameter number and presses **enter**, a popup screen (Figure 3) opens, showing the output configuration for the HPC Plus. This information can be helpful for configuring the output wiring.

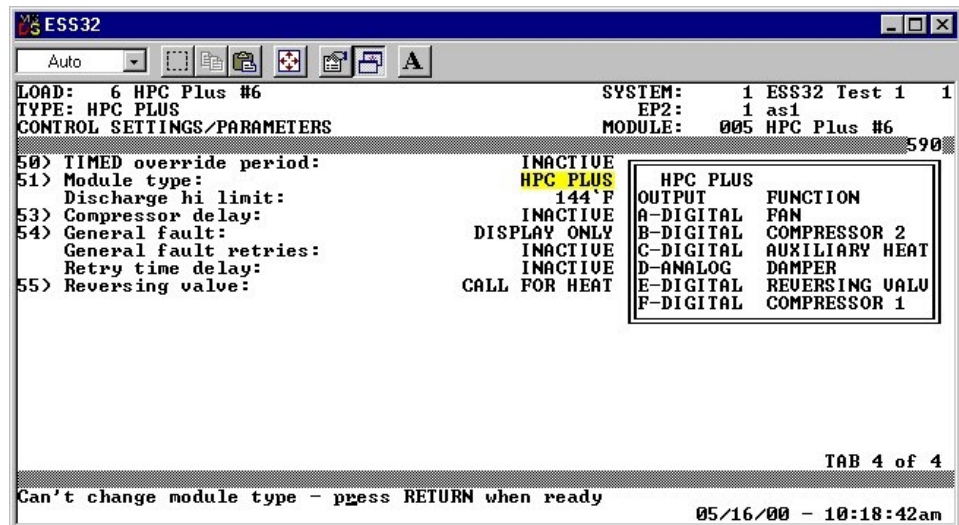


Figure 3. HPC Plus Load Type screen

## Discharge High Limit (Heating Mode Only)

This parameter does not apply.



### Compressor Delay

This parameter determines how long the compressor waits after a call for heating or cooling before turning on. This parameter is typically used when the HPC Plus is controlling a water-source heat pump to allow the system pump time to start.

- Default: Inactive
  - Range: 0–7 minutes, 0–30 seconds
- 

### General Fault

This parameter determines if the HPC Plus shuts down if a contact is closed across the general fault input.

- Default: Display Only
  - Range: Shutdown or Display Only
- 

### General Fault Retries

This parameter determines how many times the HPC Plus should try to restart the compressors.

- Default: Inactive
- Range: 0 to 6 attempts

The number of retries specified is cumulative for each scheduled on or off period.

For example, if four retries are specified and a general fault clears after two retries, the next general fault within the same schedule period will only receive two retries.

---

### Retry Time Delay

This parameter determines how long the HPC Plus should wait between attempts to correct a general fault.

- Default: Inactive
  - Range: Inactive or 5–180 minutes (with options being offered at 15-minute increments)
- 

### Reversing Valve

This parameter determines if the HPC Plus energizes the reversing valve on a call for heat or a call for cool. The valve changes state half way between the active heating and cooling setpoints.

- Default: Call for Heat
  - Range: Call for Heat, Call for Cool
-

HPC Monitoring

Monitoring Functions Screen

The parameters listed on a Monitoring Functions screen (Figure 4) for an HPC or HPC Plus will vary, depending on which type of device (HPC or HPC Plus) is being monitored.

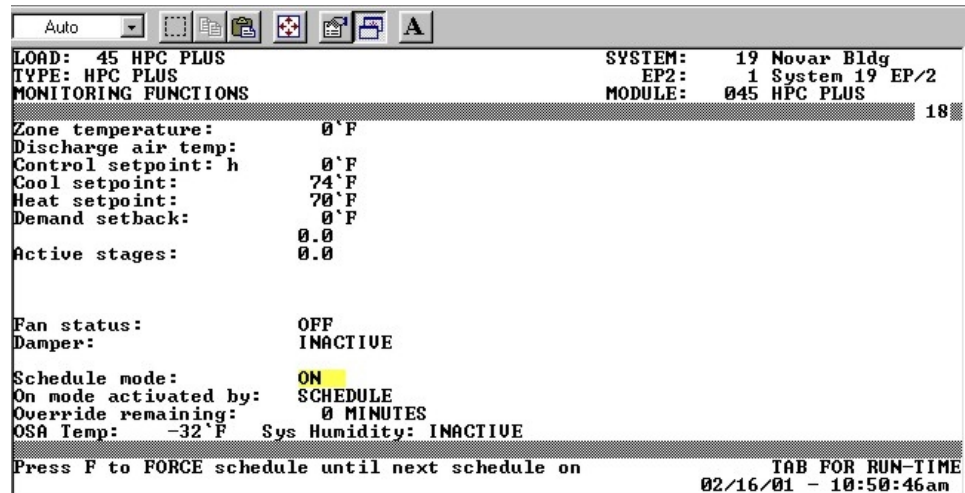


Figure 4. Typical HPC Plus Monitoring Functions screen

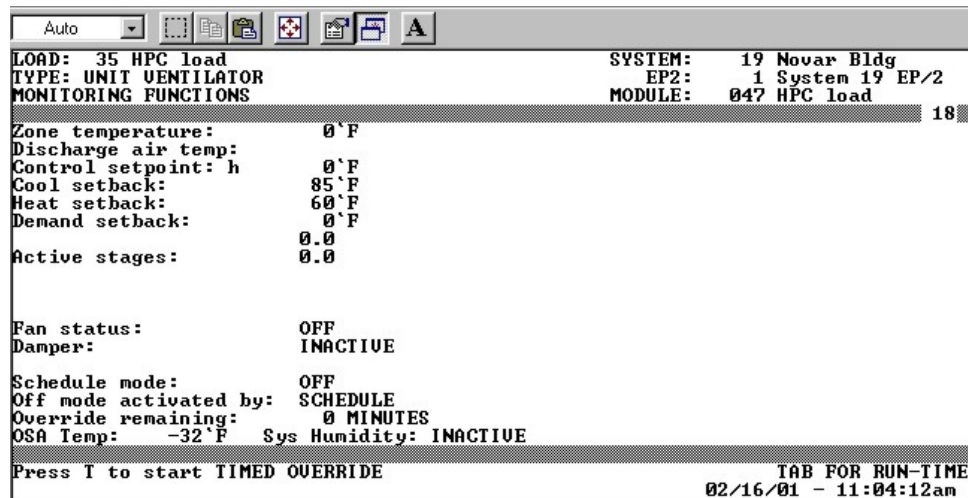


Figure 5. Typical HPC Monitoring Functions screen

The prompt line at the bottom of the screen displays instructions for initiating timed overrides, forcing overrides, or canceling an override, depending on the module's current schedule status and whether or not the timed override feature is enabled. The following table explains the options.

<b>OVERRIDE FUNCTION</b>	<b>EXPLANATION</b>
Initiate a timed override	<p>If the module is in scheduled off mode, typing the letter <b>T</b> (timed override) at the prompt initiates a timed override.</p> <hr/> <p><b>NOTE!</b> When a timed override is initiated from the monitoring screen, the LED located on the front of the module does not flash as it would if the user initiated the override at the module. The module communications LED does continue to flash normally.)</p> <hr/>
Force an override	<p>Typing the letter <b>F</b> (force) at the prompt forces the module to remain on if it is scheduled to turn off.</p> <p>This override automatically terminates at the next scheduled on period.</p>
Cancel a timed override	<p>Typing the letter <b>C</b> (cancel) at the prompt cancels a timed override.</p>
Cancel a forced override	<p>Typing the letter <b>Q</b> (quit) at the prompt cancels a forced override.</p>

---

**NOTE!** It is not necessary to press **enter** after pressing the override function keys.

---

As indicated in the lower right corner of the screen, if the user presses the **tab** key, the system displays the run times in hours since the end of the last maintenance interval.

The Monitoring Functions screen lists the following parameters and their current values.

---

**Parameter Values**

**Zone Temperature**

This field shows the current temperature detected by the HPC's zone sensor.

---

**Discharge Air Temp**

This field shows the current temperature of the HPC's discharge air.

---

**Control Setpoint**

This field shows the current controlling setpoint value based on heating/cooling condition, schedule status, and demand status.

An "h" next to this field indicates the heating setpoint is being used. A "c" indicates the cooling setpoint is being used.

---

### Cool Setpoint /Cool Setback/Heat Setpoint/Heat Setback

These fields show the setpoint values for the desired operating conditions.

The display changes from setpoint to setback based on the unit's on/off schedule. Setpoints are shown when the module is in an override or occupied schedule mode. The setback temperature is shown during an unoccupied period.

---

### Demand Setback

This field shows the number of degrees the setpoint is to be adjusted to reduce energy consumption during a peak demand period. This function indicates if and how much demand control is changing the control setpoint.

---

### Active Stages

This field shows the current status of the heating, cooling, and damper outputs.

A Zero Band message means the zone temperature is within the comfort range (neither heating nor cooling is required).

Any analog output is displayed as a voltage reading. Digital outputs are displayed if they are on. If network sequences are not met, "Sequence Inhibit" appears next to this parameter.

---

### Fan Status

This field shows the fan status output as on, off, or auto.

---

### Damper

This field shows the status or position of the damper as an analog value.

---

### Schedule Mode

This field shows the HPC's current schedule status as on or off.

---

### On/Off Mode Activated By

This field shows if the HPC's on or off status is activated by its schedules or by a timed override. The status can be changed by any of the following items:

- Time-of-day schedule
  - Optimized start/stop
  - Timed override
  - Other schedule events
- 

### Override Remaining

If activated, this field shows the time remaining in an activated timed override period.

---

### OSA Temp

This field shows the current outside air temperature as received from the executive module.

---

### Sys Humidity

This field shows the current system humidity value as defined in the Unit Parameters screen (option #21 in the Unit Directory).

---

### HPC Alarms and Faults

When an alarm or fault occurs, one of the following messages appears on the screen.

MESSAGE	EXPLANATION
Emergency Status	<p>The unit is forced off due to a system-wide emergency condition. The following items are examples of such conditions:</p> <ul style="list-style-type: none"> <li>■ Site emergency</li> <li>■ Phase loss</li> <li>■ A monitoring alarm point defined as a site emergency</li> </ul>
Temperature Drift Limit Alarm	The zone temperature (heating or cooling) is 3 degrees beyond the setpoint and is not approaching the setpoint at a rate faster than 0.5 degrees per 10-minute interval.
Airflow Alarm	The fan output is active but the HPC's airflow input does not detect air flow.
Phase Loss Alarm	<p>A phase loss has been detected at the executive module or monitoring input point.</p> <p>Staged heat and the fan go off. The positioners remain in place.</p>
General Fault Alarm	<p>Depending on how the HPC is configured, a general fault condition does <i>one</i> of the following things:</p> <ul style="list-style-type: none"> <li>■ Shuts down any active stages.</li> <li>■ Sends out an alarm.</li> </ul> <p>If shutdown is defined, the HPC follows the programmed sequence of delays and restart attempts.</p>
Zone Temperature Sensor Fault	The HPC's self-test routine indicates that the space sensor has failed (opened or shorted).
Mod Com Loss	The HPC is not communicating with the executive module.
Inactive Module	The HPC is not being communicated with by the executive module, as defined in Module Configuration (Option #* in the Function Menu).

The messages are displayed until the fault condition clears.

---

### Monitoring Screen Operations

The following table explains the options available to the user when an alarm message appears.

FUNCTION	EXPLANATION
Acknowledge an Alarm	Type the letter <b>A</b> at the prompt to acknowledge an alarm.  The system logs the time, date, and user who acknowledged the alarm at the executive module. It does not clear the alarm.
Reset an Alarm	Type the letter <b>R</b> at the prompt to reset an alarm. The reset takes about 1 minute.
Inhibit an Alarm	Type the letter <b>I</b> at the prompt to inhibit or keep the alarm from being displayed at the executive module touchscreen, if present.

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**NOTE!** It is not necessary to press **enter** after pressing the alarm function keys.

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