



VAV-4040 Programming and Monitoring Instructions

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Description

Novar's Variable Air Volume Controller (VAV-4040) is a fully digital control device that provides closed-loop control of modulating variable air volume systems or modulating heating/cooling boxes. The VAV-4040 contains an integral actuator and on-board airflow sensor for pressure-independent variable air volume control. Setpoints, airflow settings, reheat, and fan control allow it to be used in variable air volume, variable volume and temperature, and other modulating airflow applications.

This document covers the following topics:

- Programming overview
- VAV-4040 Control Settings and Parameters
- VAV-4040 Monitoring

The firmware (software) that actually executes the control and alarm strategies in the VAV-4040 is loaded at the factory. The firmware rarely changes except in cases of software upgrades or other unforeseen circumstances. If the firmware needs to be reloaded, the VAV-4040 can receive the download from an executive module. Therefore, this document also provides instruction for downloading firmware.

Programming Overview

To set or change the VAV-4040's parameters, a user must access the ESS32 Function Menu and select the **Load Control** option to access the Load Directory screen. This screen can be used to:

- Create a new VAV-4040 load.
- Access a load's Menu screen and Control Settings/Parameters screen to set or modify its parameters.

NOTE! If the fan output of the VAV-4040 is not needed for VAV applications, it can be used for a variety of external (non-VAV box) applications. To take over control of its relay, create a Digital Output Control load and select any existing VAV-4040 module. It will automatically take control of the fan output.

NOTE! The VAV-4040 requires a Savvy[®], Lingo[®], or Envoi[®] executive module.

Creating a VAV-4040 Load

The following procedure should be used to create a new VAV-4040 load.

STEP	PROCEDURE
1	Type an unassigned number at the prompt at the bottom of the Load Directory screen and press enter to highlight the field next to that number.
2	Type a name for the load in the highlighted field and press enter to display a load type menu.
3	Use the keyboard arrow keys to move the cursor to and highlight the VAV-4040 option and press enter . <ul style="list-style-type: none">■ Be sure to select the VAV-4040 option, not the VAV option.

Once the load has been created, it can be programmed.

Modifying/Setting a VAV-4040's Parameters

The parameters for a load are listed in that load's Control Settings and Parameters screen. To access this screen from the Load Directory, the user must:

- Type the load's number at the prompt and press **enter**.
- Select **1** (Modify/Display) and press **enter** to display a Menu for that load.
- Select the **Control Settings and Parameters** option and press **enter**. The following options will be offered:
 - **Damper/Cooling Parameters**
 - **Heating Parameters**
 - **General Parameters**

The actual control settings and parameters are explained on the pages that follow.

VAV-4040 Control Settings and Parameters

When a user selects one of the Control Settings and Parameters options, the software displays the appropriate parameters and their current settings. The parameters are explained below.

Damper/Cooling Parameters

Figure 1 shows the Damper/Cooling parameters and their current settings. The parameters are explained below.

```

LOAD: 20 VAV-4040                                SYSTEM: 1 test system
TYPE: VAV-4040                                  LINGO: 1 lingo
DAMPER/COOLING PARAMETERS                       MODULE: 008 VAV
:-----:
1) Temperature setpoint:                        74 `F
2) Unoccupied setpoint:                        85 `F
3) Demand adjust:                              INACTIVE
4) Schedule ON Min CFM:                        200 CFM
5) Schedule ON Max CFM:                        800 CFM
6) Schedule OFF Min CFM:                       200 CFM
7) Schedule OFF Max CFM:                       800 CFM
8) Damper actuator:                             INTEGRAL
9) Integral damper actuator action:             CW
10) Actuator gain:                              5
11) Time delay between re-positions:           0 min 10 sec

:-----:
Enter a number to modify:
    
```

Figure 1. VAV-4040 Damper/Cooling Parameters screen

Temperature Setpoint

This parameter specifies a scheduled on cool setpoint temperature.

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

Unoccupied Setpoint

This parameter specifies a scheduled off cool setpoint temperature.

- Default: 85°F
- Range: One degree above the Heat Setback value up to a maximum of 127°F

Demand Adjust

This parameter specifies the number of degrees that the cooling setpoint is shifted up when this load is shed by the demand control program.

- Default: Inactive (0°F)
- Range: 0°–9°F

Cooling Airflow Parameters

The next few parameters listed on the screen control the cooling airflow.

- Scheduled On Minimum CFM establishes the minimum cooling airflow rates in cubic feet per minute (cfm) during occupied time.
 - Default: 200 cfm
 - Range: 0–32,767
 - Scheduled On Maximum CFM establishes the maximum cooling airflow rates in cfm during occupied time.
 - Default: 800 cfm
 - Range: 0–32,767
 - Scheduled Off Minimum CFM establishes the minimum cooling airflow rate in cfm during unoccupied times.
 - Default: 200 cfm
 - Range: 0–32,767
 - Scheduled Off Maximum CFM establishes the maximum cooling airflow rate in cfm during unoccupied times.
 - Default: 800 cfm
 - Range: 0–32,767
-

Damper Actuator

This parameter specifies the type of damper actuator to be used. The choices are:

- Integral
 - Tri-state
 - 2–10 Volt
-

Integral Damper Actuator Action

This parameter establishes the direction of rotation to open the integral damper when one is looking straight at the VAV-4040. The choices are:

- Clockwise (CW)
 - Counter-clockwise (CCW)
-

Actuator Gain

This parameter affects the speed of movement of the actuator. The range is 1–10, with 1 being the slowest, and 10 being the fastest. If the preset gains need to be adjusted, the P and the I parameters can be manually set by pressing **Control + Enter** instead of **enter**, when selecting #10, Actuator Gain.

Time Delay Between Repositions

After the damper actuator has made an adjustment to its position, this parameter specifies the minimum amount of time it must wait before it can make another adjustment.

- Default: 10 seconds
- Range: 4 seconds to 8 minutes, 30 seconds

Heating Parameters

Figures 2 and 3 show the Heating parameters and their current settings.

```
LOAD: 20 VAV-4040                                SYSTEM: 1 test system
TYPE: VAV-4040                                    LINGO: 1 lingo
HEATING PARAMETERS                                MODULE: 008 VAV
:-----:-----:-----:-----:-----:-----:-----:-----:-----:
1) Temperature setpoint:                          70 `F
2) Unoccupied setpoint:                            60 `F
3) Demand adjust:                                  INACTIVE
4) Reheat stage 1 differential:                     INACTIVE
5) Reheat stage 2 differential:                     INACTIVE
6) Schedule ON Min CFM:                            200 CFM
7) Schedule ON Max CFM:                            800 CFM
8) Schedule OFF Min CFM:                           200 CFM
9) Schedule OFF Max CFM:                           800 CFM
10) Heating type:                                  MODULATING
11) Modulating actuator type:                       TRI-STATE
12) Actuator time:                                  0 min 0 sec
13) Actuator gain:                                  5
14) Time delay between re-positions:                0 min 30 sec
                                                    TAB 1 of 2
:-----:-----:-----:-----:-----:-----:-----:-----:-----:
Enter a number to modify:
```

Figure 2. VAV-4040 heating parameters, screen 1

```
LOAD: 20 VAV-4040                                SYSTEM: 1 test system
TYPE: VAV-4040                                    LINGO: 1 lingo
HEATING PARAMETERS                                MODULE: 008 VAV
:-----:-----:-----:-----:-----:-----:-----:-----:-----:
15) VVT switchover point:                          INACTIVE
16) VVT switchover setpoint:                        INACTIVE
17) warm-up mode switchover point:                  INACTIVE
18) warm-up mode switchover setpoint:               INACTIVE
19) warm-up mode time-out:                          0 min
20) warm-up mode damper position:                    0 CFM
                                                    TAB 2 of 2
:-----:-----:-----:-----:-----:-----:-----:-----:-----:
Enter a number to modify:
```

Figure 3. VAV-4040 heating parameters, screen 2

The parameters are explained below.

Temperature Setpoint

This parameter specifies a scheduled on heating setpoint temperature.

Unoccupied Setpoint

This parameter specifies a scheduled off heating setpoint temperature.

Demand Adjust

This parameter specifies the number of degrees that the heating setpoint is shifted down when this load is shed by the demand control program.

- Default: Inactive (0°F)
 - Range: 0°–9°F
-

Reheat Stages 1 and 2 Differentials

If Staged reheat is used (for example, two stages of electric reheat), this parameter defines the setpoint differentials applied to each. Stage 1 differential is split half above the heating setpoint and half below the heating setpoint. Stage 2 differential lies completely below the heating setpoint.

On the VAV-4040, staged reheat is available for use even if the 2–10 volt analog output is used for heat. However, staged reheat cannot be used if tri-state modulating reheat is used because these functions share the same triac output points.

Heating Airflow Parameters

Figures 4 and 5 show the damper operation during VAV and VVT heat mode. The next few parameters listed on the Heating parameters screen are used to control the airflow.

- Scheduled On Minimum CFM is used during scheduled on time when the zone temperature is below the midpoint of the heating and cooling setpoints.
 - Default: 50 CFM
 - Range: 0–32,767
- Scheduled On Maximum CFM is used during scheduled on time when heat is needed in the zone.
 - Default: 800 cfm
 - Range: 0–32,767
- Scheduled Off Minimum CFM is used during scheduled off time when the zone temperature is below the midpoint of the heating and cooling setpoints.
 - Default: 50 CFM
 - Range: 0–32,767
- Scheduled Off Maximum CFM is used during scheduled off time when heat is needed in the zone.
 - Default: 800 cfm
 - Range: 0–32,767

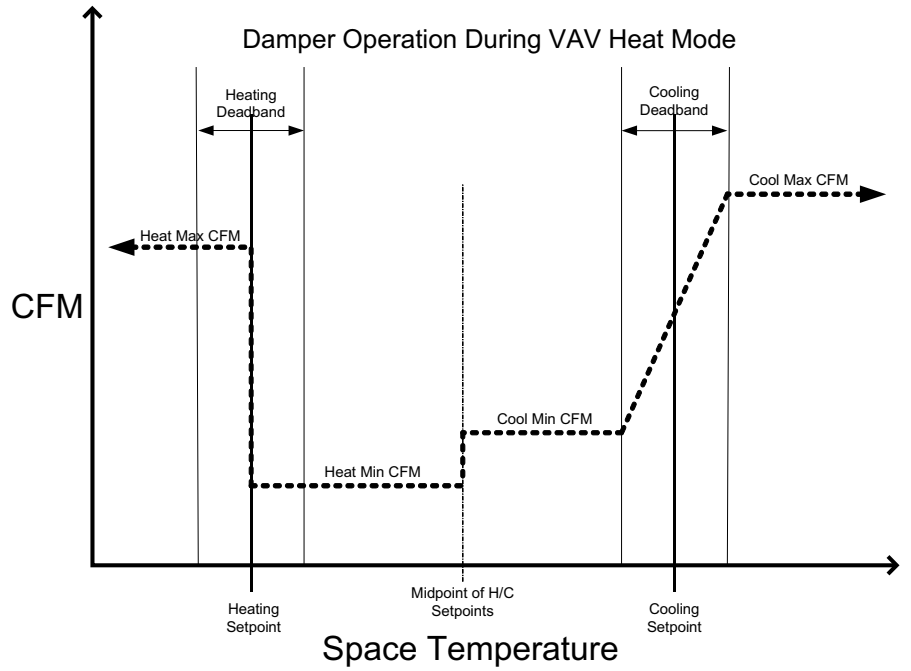


Figure 4. Damper operation during VAV heat mode

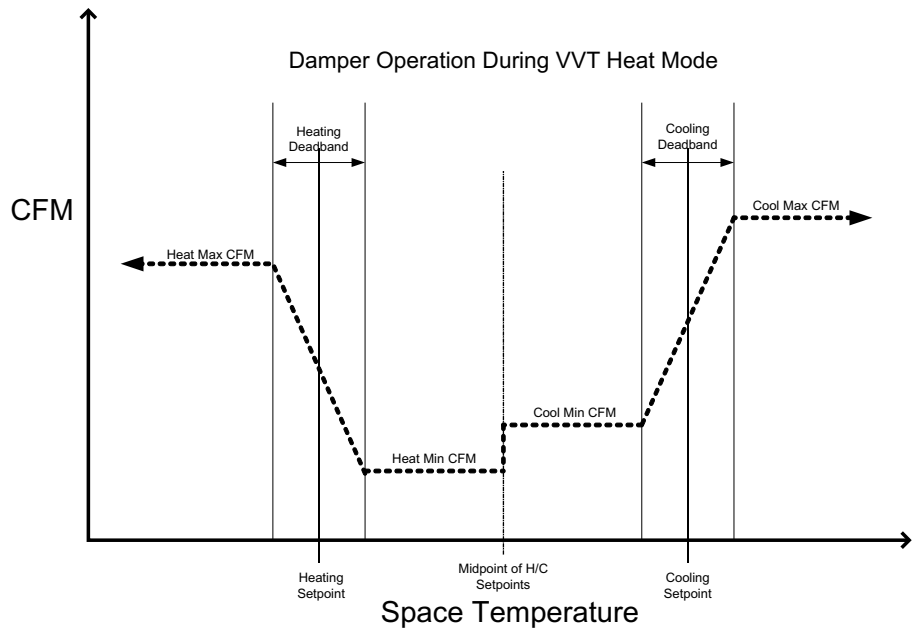


Figure 5. Damper operation during VVT heat mode

Heating Type

This parameter defines the type of heat used with the VAV-4040. The options are:

- Single duct—no heat
- Single duct—modulating reheat (the default)
- Single duct—staged reheat
- Dual duct
- VVT

The option selected determines how the system assigns outputs and controls the heat and what options are available for the remaining heat parameters.

Modulating Actuator Type

This parameter affects how the outputs are used and controlled.

- Default: Tri-state
 - Range: Tri-state or 2–10 VDC
-

Actuator Time

For tri-state actuators, this parameter is used to enter the approximate travel time it should take for the actuator to go from full closed to full open. This helps the positioning algorithm determine the length of open/close correction signals.

- Default: 0 minutes, 0 seconds
 - Range: 58 seconds to 8 minutes, 30 seconds
-

Actuator Gain

For 2–10 volt actuators, the gain affects how slowly or quickly the control signal will ramp up and down. A gain of 1 is the slowest, and a gain of 10 is the fastest.

Default: 5
Range: 1–10

Time Delay Between Repositions

After the actuator changes its position, this parameter specifies the time delay that must occur before the actuator can change position again. This is used to allow the control sensor to pick up the full result of the first change, to prevent the actuator from hunting.

- Default: 30 seconds
 - Range: 10 seconds to 8 minutes, 30 seconds
-

VVT Switchover Point

This parameter defines the Input, Output, or Virtual Point in the system that signals this actuator to reverse its position and work like a heating actuator. Depending on how the switchover point is defined, the switch to heat mode will occur when the following items are set as indicated:

- Output Point: On
 - Digital Input: Closed
 - Analog Input: Exceeds the assigned setpoint.
-

VVT Switchover Setpoint

If an analog point for VVT switchover has been assigned, this parameter sets the setpoint that must be exceeded for the damper to operate in the heat mode.

Warm-up Mode Switchover Point

The parameter is used to identify the Input, Output, or Virtual Point in the system that signals the VAV-4040 to go to its assigned position during the morning warm-up cycle. The warm-up cycle is an air-handler function that temporarily provides heat to warm up a building after a cold night of being shut down. When the warm-up cycle is terminated, the damper reverts to its normal cooling actuator control mode. Depending on how the warm-up point is defined, the switch to heat mode will occur when the following items are set as indicated:

- Output Point: On
- Digital Input: Closed
- Analog Input: Exceeds the assigned setpoint.

Warm-up Mode Switchover Setpoint

If an analog point has been assigned for warm-up mode switchover, this parameter defines the setpoint that must be exceeded to cause the damper to go to its defined position.

Warm-up Mode Timeout

This parameter defines the maximum amount of time that the VAV-4040 is allowed to stay in the warm-up mode before it reverts to normal control.

Morning Warm-up Damper Position

This parameter defines the damper position (in CFM) that occurs when the morning warm-up cycle is in effect.

- Default: 0 CFM
- Range: 0–32,767 CFM

General Parameters

When the user selects the **General Parameters** option, the General Parameters and their current settings are displayed over two screens (Figures 6 and 7).

```
LOAD: 20 VAV-4040                                SYSTEM: 1 test
system
TYPE: VAV-4040                                    LINGO: 1 lingo
GENERAL PARAMETERS                                MODULE: 008 VAV
|||||||||||||||||||||||||||||||||||||||||||7
10||
1) Program operating mode:                        RUN
2) Reserved
3) Reserved
4) Airflow sensor:                                ACTIVE
5) Airflow scaling factor:                        1000 CFM
6) Damper full stroke time:                       0 min 0 sec
7) Occupant setpoint adjustment:                  INACTIVE
8) Schedule ON fan mode:                          INACTIVE
9) Schedule OFF fan mode:                         INACTIVE
10) TIMED override period:                        INACTIVE
11) Demand control:                               INACTIVE
12) Optimized start:                              NONE(ON ) SCHEDULE
```

Figure 6. VAV-4040 general parameters, screen 1

```
LOAD: 20 VAV-4040                                SYSTEM: 1 test system
TYPE: VAV-4040                                    LINGO: 1 lingo
GENERAL PARAMETERS                                MODULE: 008 VAV
|||||||||||||||||||||||||||||||||||||||||||||||710||
18) Reserved
19) CO2 point:                                    INACTIVE
20) CO2 setpoint:                                INACTIVE
21) Microset II:                                ACTIVE
    Backlight                                    AUTO

||||||||||||||||||||||||||||||||||||||||||||||
Enter a number to modify:
```

Figure 7. VAV-4040 general parameters, screen 2

Each of the parameters is explained below.

Program Operating Mode

This parameter establishes the load's operating mode.

- Default: Run
- Range: Run, Standby, or Force To
 - **Run** causes the controller to operate normally.
 - **Standby** turns off heating outputs. Modulating heating/cooling outputs remain in their current positions.
 - **Force To** causes the damper output to modulate to maintain the specified setpoint. During air balancing, this option can be used to force a damper open or closed by specifying extreme setpoints.

Airflow Sensor

When the airflow sensor is active (the default setting), the VAV-4040 operates in a pressure-independent mode. If the airflow sensor is made inactive, the unit will operate in a pressure-dependant mode and control directly to space temperature. When the airflow sensor is inactive, CFM setpoints cannot be entered.

Airflow Scaling Factor

This parameter sets a velocity pressure (Delta-P) scaling factor for the airflow sensor to calculate the proper cfm for a VAV-4040 module.

- Default: 1000
- Range: 0–32,767

Refer to the chart supplied with the VAV box (typically mounted on the side of the box). If 1 inch of velocity pressure (V_p) is shown on the chart, the rated cfm at one inch should be used as the scaling factor. If 1 inch of velocity pressure is not shown on the chart, the following formula should be used to calculate the cfm at 1 inch of velocity pressure and results should be entered as the scaling factor.

$$\text{Scaling Factor} = \text{cfm} \div V_p$$

Calibrating the Scaling Factor

If the calculated cfm value displayed on the ESS32 monitoring screen does not match the job site measured cfm value, the scaling factor can be automatically rescaled by entering the ESS32 measured value on the monitoring screen and the cfm value measured at the job site. The new scaling factor is updated and entered as the control value.

Occupant Setpoint Adjust

This parameter enables local heating and cooling setpoint adjustments.

- Default: Inactive
- Range: 0–9°F

Schedule On Fan Mode

This parameter sets the module's fan output operation in the VAV mode only:

- Default: First Stage Heat
- Range: Inactive, Continuous, Airflow Setpoint, or First Stage Heat

The range options operate as indicated in the following table.

OPTION	EXPLANATION
Inactive	Deactivates the fan output in both heating and cooling modes.
Continuous	Causes the fan output to be energized continuously.
Airflow Setpoint	Causes the fan output to be energized below a specified cfm setpoint.
First Stage Heat	Causes the fan output to be energized at and below the heating temperature setpoint.

Operation of Heating Stages and Reheat Fan

- Staged Heat—No Fan

The first stage of reheat has its setpoint differential split half above and half below the heating setpoint. The second stage of reheat has its differential completely below the heating setpoint.

- Staged Heat with Fan Defined as First Stage Heat

The differential for the fan is 0.2 degrees below and 0.2 degrees above the heating setpoint. The second stage of the reheat differential is completely below the heating setpoint.

- Modulating Reheat with No Fan

There is no defined setpoint differential involved.

- Modulating Reheat with Fan Defined as First Stage Heat

The fan turns on at the heating setpoint and off at 0.6 degrees above the heating setpoint. The modulating reheat becomes activated at 0.4 degrees below the heating setpoint. After it becomes active, it modulates to maintain the heating setpoint as closely as possible.

Schedule Off Fan Mode

This parameter sets the module's fan output operation mode in the VAV mode only:

- Default: First Stage Heat
- Range: Inactive, Continuous, Airflow Setpoint, or First Stage Heat

The range options operate as indicated in the following table.

OPTION	EXPLANATION
Inactive	Deactivates the fan output in all modes.
Continuous	Causes the fan output to be energized continuously.
Airflow Setpoint	Causes the fan output to be energized below a specified cfm setpoint.
First Stage Heat	Causes the fan output to be energized at and below the heating temperature setpoint.

Timed Override Period

This parameter activates or inactivates a specified time interval that determines the period of time an override period is active.

- Default: Inactive
- Range: 0 to 4 hours, 0 to 59 minutes (to a maximum of 4 hours, 13 minutes)

NOTE! An entry of 4 hours, 14 minutes, sets the timed override period to continuous. The load will operate in timed override mode until the next scheduled on time or until the timed override button is pressed again.

When this parameter is selected, the user is prompted to enter a time interval. Once the time interval is entered, the parameter is active and the VAV-4040 controls to scheduled on setpoints when the override button is pushed. This scheduled override can be canceled by pushing the button again. Override time is logged and accumulated on a monthly basis and can be viewed on the monitoring screen.

Selecting 0 minutes and 0 seconds disables the override.

After entering the timed override period, the user is prompted to answer the following question:

“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). Forcing an override from ESS32 is not the same as initiating a timed override from the load monitoring screen.

Demand Control

This parameter activates or deactivates the demand control mode.

- Default: Inactive
- Range: Active or Inactive

Selecting **Active** causes the VAV-4040 to adjust setpoint on a shed command from the executive module. Load shedding is subject to the constraints of the other demand control parameters.

Selecting **Inactive** prevents the VAV-4040 from shedding on command from the executive module.

Optimized Start/Stop

This parameter sets the method by which optimized start and stop routines operate.

- Default: Inactive
- Range: Active or Inactive

Selecting **Active** causes the start time to advance in accordance with the optimized start routine. Selecting a value of 1 for the Stop value will permit optimized start with no optimized stop. Selecting a value of 2 through 10 for a stop parameter activates the optimized stop feature, permitting the zone to drift by this specified number of degrees by the scheduled off time. A primary schedule must be created before this parameter can be changed.

Selecting **Inactive** causes the load to follow the programmed schedule.

Temperature Drift Limit Alarm

This parameter activates or deactivates the drift limit alarm if the VAV-4040 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 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 VAV-4040 is unable to achieve the heating or cooling setpoint. The alarm condition is reported to the executive module.

Selecting **Inactive** displays the drift limit alarm if the VAV-4040 is unable to achieve the heating or cooling setpoint. The alarm condition is not reported to the executive module.

Site Emergency Output State (and Network Emergency)

These parameters establish the load's operating parameters when a site or network emergency is detected.

- Default: Inactive
- Range: Inactive, Cool Max Airflow, Full Open, or Full Closed

The range options operate as indicated in the following table.

OPTION	EXPLANATION
Inactive	Prevents the load from responding to the emergency condition.
Cool Max Airflow	Causes the output to be controlled to maintain the Cool Maximum cfm setpoint.
Full Open	Energizes the output to open the damper continuously.
Full Closed	Energizes the output to close the damper continuously.

Network Sequence/VVT Mode Point

This parameter is used to define what other loads, outputs, or virtual points in the system must be on or off before the VAV-4040 is allowed to operate normally.

- Default: Inactive
- Range: Active or Inactive

Selecting **Inactive** causes the network sequence condition to be disregarded.

- Selecting **Loads** sequences the VAV-4040's operation to loads that the user selects in the Load Directory screen. When the user selects the loads and presses **enter**, ESS32 automatically highlights the **Network Sequence Status** parameter for the user to select the options that apply to this sequence.
- Selecting **Virtual** sequences the VAV-4040's operation to the system's virtual points at the Virtual Points Directory screen.
- If the system contains multiple executive modules, a **Global** option will also be available. This option sequences the VAV-4040's operation to global loads on other Lingo executive modules in the system. When this option is selected, ESS32 opens the Unit Directory screen. Selecting another (or the same) executive module opens that executive module's Load Directory screen.

If a unitary controller load is selected, the user must also select cooling, heating, and/or fan sequences and press **enter** to advance to the next screen. If all three sequences are selected, it counts as three sequences.

Network Sequence Status

NOTE! The Network Sequence parameter (explained above) must be active before this parameter can be changed.

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

- Default: Inactive
- Range: Active or Inactive

If **Active** is selected, the user will be asked to select **Any** or **All** and **On** or **Off**.

Sequence Off Position

This parameter determines damper operation when the Network Sequence condition is not satisfied.

- Default: Inactive
- Range: Inactive, Standby, Cool Max

The range options operate as indicated in the following table.

OPTION	EXPLANATION
Inactive	Prevents the load from responding to a network sequence.
Cool Minimum	Causes the damper to go to its scheduled on cooling minimum airflow setpoint.
Cool Maximum	Causes the damper to go to its scheduled on cooling maximum airflow setpoint.
Full Closed	Energizes the output that causes the damper to close continuously.

CO₂ Point

This parameter defines the local or network input that is to be used for CO₂ override of the damper. The input can be analog or digital.

CO₂ Setpoint

This parameter defines the setpoint that must be exceeded before the VAV-4040 will open its damper to the Cool Max position to facilitate ventilation. It will stay in that position until the CO₂ level drops below the specified setpoint.

Microset II

This parameter is used if the Microset II digital sensor is being used in place of conventional sensors. The parameter should be set to **Active**. The backlight can be set to **Continuous** (on all the time) or **Auto** (on only when the user presses the keys).

VAV-4040 Monitoring

Figures 8 and 9 show the VAV-4040 Monitoring screens.

```

LOAD: 1 VAV 4040
TYPE: VAV-4040
MONITORING
SYSTEM:1 VAV4040 Test
SAVVY31:1 Savvy
MODULE:002 VAV 2
*****
Zone Temperature: 73`F
Supply Air Temperature: 60`F
Control setpoint: c 74`F
Cool setpoint: 76`F
Heat setpoint: 64`F
Demand setback: 0`F
Airflow: 0 CFM
Inches: 0.000
Active stages:

Analog out: INACTIVE
Fan status: ON
Schedule mode: ON
    
```

Figure 8. VAV-4040 monitoring screen #1

```

LOAD: 1 VAV 4040
TYPE: VAV-4040
MONITORING
SYSTEM: 1 VAV4040 Test
SAVVY31: 1 Savvy
MODULE: 002 VAV 2
*****711*****
VAV VERSION: 0.1

VAV Load Run-Times since last Maintenance Interval

FAN : 0 hours
HEAT1/OPENING: 0 hours
HEAT2/CLOSING: 0 hours

Airflow scaling factor: 1000 CFM
Airflow target: 1250 CFM
    
```

Figure 9. VAV-4040 monitoring screen #2

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. The following table explains the options.

OVERRIDE FUNCTION	EXPLANATION
Initiate a timed override	<p>If the module is in scheduled off mode, typing the letter T (timed override) at the prompt initiates a timed override.</p> <hr/> <p>NOTE! When a timed override is initiated from the monitoring screen, the LED located on the front of the VAV-4040 does not flash as it would if the user initiated the override at the VAV-4040. (The module communications LED does continue to flash normally.)</p> <hr/>
Force an override	<p>Typing the letter F (force) at the prompt forces a load to remain on if it is scheduled to turn off.</p> <p>This override automatically terminates when the load returns to the scheduled on mode.</p>
Cancel a timed override	<p>Typing the letter C (cancel) at the prompt cancels a timed override.</p>
Cancel a forced override	<p>Typing the letter Q (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; see Figure 4) since the end of the last maintenance interval.

The Monitoring Functions screen lists the following parameters and their current values. If a field's parameter has been modified by a temporary user or with temporary setpoints, the word "***LOCAL**" appears next to it.

Zone Temperature

This field shows the current temperature detected by the temperature sensor located in the VAV-4040's zone.

Supply Air Temperature

This field shows the current supply air temperature detected by the temperature sensor.

Control Setpoint

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

A potentiometer on the zone temperature sensor can be used to adjust the setpoint to allow it to vary above or below the actual heating or cooling setpoint.

Cool Setpoint, Heat Setpoint

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

The display changes based on the on/off schedule. During scheduled on time the occupied setpoints are displayed and during scheduled off time the unoccupied setpoints are displayed.

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 field's data also indicates if and how much demand control is changing the control setpoint.

Airflow

This field shows the calculated cubic feet per minute (cfm) airflow value at the module's location.

Inches

This field shows in inches the measured value of the airflow at the module's location.

Active Stages

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

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

For VVT control, this field also indicates if the unit is currently operating in heating or cooling mode. If network sequences are not met, "Sequence Inhibit" appears in this field.

Analog Out

If used, the value of the 2- to 10-volt analog output will be displayed.

Fan Status

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

Schedule Mode

This field shows the module's on or off schedule status. The status can be changed by any of the following items:

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

On Mode Activated By

This field shows whether the on condition was activated by the module's schedule or by a timed override.

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Override Remaining

This field shows the number of minutes remaining in an activated timed override.

OSA Temp

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

CO2 Override

This field will display “Active” if the CO₂ override function is currently affecting the damper position.

NOTE! If an analog CO₂ sensor is defined in the control settings and the sensor is not connected or fails open, it will read a CO₂ value of 666 ppm.

Warm-up Mode

This field will display “Active” if the VAV-4040 is currently in the warm-up mode position, as defined by the warm-up setpoints.

VAV Alarms and Faults

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

MESSAGE	EXPLANATION
Emergency Status	The unit's operation is forced off due to a system-wide emergency condition. The following items are examples of such conditions: <ul style="list-style-type: none">■ Site emergency■ Phase loss■ A software-defined monitoring alarm point.
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.
Zone Temperature Sensor Fault	The module's self-test routine indicates that the space sensor has failed (opened or shorted).
Mod COMM Loss Fault	The module is not communicating with the executive module.

The message is displayed until the fault condition clears. The following table explains the options available to the user when an alarm message appears.

FUNCTION	EXPLANATION
Acknowledge an Alarm	Typing the letter “A” at the prompt acknowledges an alarm. The system logs the time, date, and user who acknowledged the alarm at the executive module. It does not clear the alarm.
Inhibit an Alarm	Typing an “I” at the prompt inhibits or keeps the alarm from being displayed at the executive module.
Cool Actuator Limit Reached/ Heat Actuator Limit Reached	See explanation below.

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

Cool Actuator Limit Reached/ Heat Actuator Limit Reached

To prevent actuators from wearing out, the VAV-4040 has a special operational mode. If the actuator has been driven in the same direction for a total cumulative time that is double the actuator “full stroke” time, it goes into a mode where it will only issue a signal once every 8 minutes. It will stay in this mode until the damper is commanded in the other direction for any reason, at which time it will resume normal operation again.

The modulating heating outputs will also go into this mode if the total cumulative time in the same direction exceeds double the heating “actuator time.”

Downloading Firmware to the VAV-4040

NOTE! This is an optional feature that should be used only in special circumstances when the firmware version of the VAV-4040 needs to be upgraded.

The VAV-4040 contains at least two types of software code:

- Firmware—the software that actually executes the control strategies and alarm strategies.
- Control Settings and Parameters—the software used to specify temperature setpoints, alarm setpoints, sensor types, etc. These settings can change according to applications and end-user specifications.

The firmware is loaded into the VAV-4040 at the factory. The control settings are loaded at the time the VAV-4040 is powered up when the VAV-4040 requests this data from the executive module. The controls settings and parameters can change often and regularly according to the customer's specifications and maintenance requirements. The firmware rarely changes except in the case of software upgrades or other unforeseen circumstances.

If the VAV-4040 firmware needs to be reloaded, the VAV-4040 can receive the download from an executive module. The following criteria must be met to download new firmware into the VAV-4040:

- An operating, fully functional control system must be in place and the power to each component must be turned on.
- A computer with ESS32 software Version 4.60.4 or higher must be available and communicating with the system.
- The technician(s) performing the download must have the latest version of the VAV-4040 firmware.

Firmware is downloaded to the VAV-4040 modules in the Download File Setup screen (Figure 10).

NOTE! The Download File Setup screen can be viewed in Network Monitoring mode only. It can be accessed from Option 27, Download Server. The screen is not available in System Format mode.

```

0-SYSTEM: 402 Lingo/2 Ofc Bldg
Lingo SE: 1 Lingo2Controller

DOWNLOAD FILE SETUP
|||||> ALARM ON UNIT 1 3 5 <||||175|
1) VAV-4040 firmware file: vav0103.dl
2) Download activity fault timer: 15 min
3) Transfer firmware file to exec
4) Download selected modules
5) Abort selected modules
6) Tag ALL to Download
7) Untag ALL to Download
8) Tag ALL to Abort
9) Untag ALL to Abort
-----
LD# NAME BLOCK RETRY COMPL FAIL STATUS
16 VAV 4040 022 Idle
23 vav2 Idle
28 VAV4040 Ld28 026 Idle
29 VAV4040 Ld29 025 75 0 2 0 Transfer complete 7m 14s

|||||
Cursor UP/DOWN, SPACE(tag to download), 'A(tag to abort), ESC(done)
    
```

Figure 10. Download File Setup screen

The following table explains how this screen is used to download the firmware. The process involves:

- Transferring the firmware to the executive module.
- Selecting the VAV-4040 modules to receive the firmware.
- Downloading the VAV-4040 firmware from the executive module to the VAV-4040 modules.
- Monitoring the download’s status in the download screen.

SCREEN FIELD	EXPLANATION
VAV-4040 Firmware File	<p>This field is used to identify the VAV-4040 firmware file that is to be transferred to the executive module. The file name will have a “.DL” extension. The file must be located in the DLF folder in the installed directory folder (which, by default, is the NOVARCTL folder) located on the computer’s hard drive. The user must:</p> <ul style="list-style-type: none"> ■ Type the VAV-4040 firmware file’s name in the field. ■ Press enter. <p>A popup screen will display the message “*.dl will be transferred at this time. Continue with transfer?”</p> <ul style="list-style-type: none"> ■ Select Yes to transfer the file. <hr style="width: 80%; margin: 10px auto;"/> <p style="text-align: center;">NOTE! The transfer process will take several minutes. ESS will not accept any commands during the transfer.</p> <hr style="width: 80%; margin: 10px auto;"/>

continued

SCREEN FIELD	EXPLANATION
Download Activity Fault Timer	This field is used to establish a user-specified length of time (10 to 60 minutes) for each download. If a download is not completed within the user-specified time limit, the download will be terminated and the status will show download failure.
Transfer firmware file to exec	This field is used if the firmware needs to be downloaded to the executive module again at a later date.
Download selected modules	<p>This field is used to select one or more VAV-4040 modules to receive the download. To identify (tag) modules that are to receive the download, the user must:</p> <ul style="list-style-type: none"> ■ Use the up and down keyboard arrow keys to move the cursor to and highlight (select) a module. ■ Press the spacebar to tag the module. ■ Repeat this process until the appropriate modules have been tagged/selected. ■ Select the Download Selected Modules option to begin the download process.
Abort selected modules	<p>This option is used to abort a download to a VAV-4040 module. To abort the download to a module, the user must:</p> <ul style="list-style-type: none"> ■ Use the up and down keyboard arrow keys to move the cursor to and highlight (select) a module. ■ Press A to tag the module. ■ Repeat this process until the appropriate modules have been tagged/selected. ■ Select the Abort selected modules option to abort the downloads.
Tag All to Download	<p>This option is used to tag all modules for download. The user must:</p> <ul style="list-style-type: none"> ■ Select this option. ■ Select the Download Selected Modules option.
Untag All to Download	<p>If any modules have been selected for download and the user opts not to perform the download, the user can use this option to untag all modules. The user must:</p> <ul style="list-style-type: none"> ■ Select this option.
Tag All to Abort	<p>If any modules have been selected for download and the download is in progress or the module is waiting its turn to be downloaded, this option can be used to abort the download to all modules. The user must:</p> <ul style="list-style-type: none"> ■ Select this option.
Untag All to Abort	<p>If the user has tagged modules to abort a download and chooses not to abort, this option can be used to untag the modules. The user must:</p> <ul style="list-style-type: none"> ■ Select this option and press enter.

When the download begins, the status of each module's download can be monitored on the download screen.

- The BLOCK column is an indicator that the download is proceeding. It shows the number of blocks downloaded.
- The RETRY column will show the number of retries.
- The COMPL column will show the number of completed downloads.
- The FAIL column will show the number of failed downloads.

NOTE! If the download fails or is aborted before the download completes, the VAV module will not operate. A new download will need to be performed before it will resume operation.

The time required to complete each download will depend on the total number of modules installed in the system. Once the download is complete, the VAV version number will be displayed on the VAV-4040 Monitoring screen #2.

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