

Controller for Redundant Telecom HVAC Systems



GENERAL DESCRIPTION

The CommStat 4 is an HVAC controller designed specifically for controlling two redundant air conditioners, heat pumps, air conditioners with two stage compressors and air conditioners with gas heat in a telecommunications shelter or enclosure. In addition to the control of the air conditioners or heat pumps, the CommStat 4 has multiple outputs for remote alarms or notification.

The CommStat 4 is factory programmed with standard industry set points, but can be configured on site. Settings are retained indefinitely in the event of a power loss.

► Control Up To Four Air Conditioners Or Heat Pumps In a Shelter

The CommStat 4 has the capability to be daisy chained with a second CommStat 4 controller for controlling up to four air conditioners or heat pumps in a shelter. When two CommStat 4 controllers are daisy chained together, one of the controllers is the Master and controls the second CommStat 4 controller. Any settings to the Master unit immediately take effect on the Slave unit. The interface for the daisy chain is an RJ11 connector.

► Ease of Control and Configuration

A large, backlit LCD display shows the status of the system and provides a convenient user interface. Status LEDs indicate Heat, Cool, Power and the Lead Unit. When a fault is detected, an alarm LED flashes and the LCD screen displays the fault. If multiple faults are detected, the display will scroll the faults across the screen.

The CommStat 4 is easily configured with four buttons. A Comfort button changes the temperature in the shelter for 90 minutes. After 90 minutes, the temperature reverts back to the programmed set points. A lead swap button alternates the lead and lag unit, allowing service techs to quickly check the operation of each unit.

For security, the keypad can be locked out to prevent unwanted changes to the set points. English, Spanish or French is selectable as the language shown on the display. °F or °C is selectable.

► RoHS Compliant

The CommStat 4 controller contains no hazardous materials and is RoHS compliant.



Features and Benefits

Programmable Logic Board with Lead/Lag Control

- Balanced Use of Conditioning Equipment
- Sequence the Operation of Two ComPac Units
- Ensures Maximum Efficiency
- Independent Economizer Control

Alarms and Lockouts

- High Pressure Alarm/Lockout
- Low Pressure Alarm/Lockout
- Damper Alarm
- Dirty Filter Alarm
- Communications Alarm
- Landline Power Alarm

Dry Contact Alarm Outputs

- Notification of HVAC Unit Failure
- High/Low Pressure Lockout, Loss of Landline Power

SPECIFICATIONS/FEATURES

► Marvair Part Number: S/07846

► Thermostat

- Cooling Set Point: 65°F through 95°F (18°C through 35°C) in 1° increments.
- Heating Set Point: 50°F through 80°F (10°C through 27°C) in 1° increments.

► Differential

- All stages ON differential: 2°F through 5°F (1° through 3°C) in 1° increments.
- All stages OFF differential: 1°F through 5°F (1° through 3°C) in 1° increments. The 2nd stage differential is referenced to the 1st stage differential and the outputs will stage off as each stage's differential is satisfied.
- Changeover Differential between cooling and heating: Minimum of 3°F (2°C).
- 3rd stage cooling Differential: 0°F through 7°F (0°C through 4°C) in 1° increments

► Control Voltage

- The CommStat 4 is powered by a nominal 24 VAC or with a user provided 24 VDC or 48 VDC power supply. Should AC power be lost, the display, user interface and the alarm outputs remain functional. System outputs (Y, G, W, O and the Mixed Air Relay) will not be functional when 24 VAC is not present. If the control voltage is not present, the Low Voltage Loss alarm relay is energized.

► Operating Range: -40°F through 150°F (-40°C through 66°C)

► Minimum Voltage: 18 VAC

► Maximum Voltage: 30 VAC

► Ease of Installation

- Wiring connection insensitive to phasing of the units.
- Easy terminal connections for thermostat wire.
- Remote temperature sensors insure accurate temperature readings in the shelter.
- Easy attachment to the wall.

► Lead/Lag Operation

- User selectable changeover from ½ to 7 days in ½ day increments. If the lead unit loses power, the lag unit automatically becomes the lead unit with all the set points of the lead unit. A lead swap button alternates the lead and lag unit, allowing service techs to easily check the operation of each unit.

► Alarms

Dry contacts can be used for remote alarm or notification. Relays can be wired Normally Open (NO) or Normally Closed (NC). Most alarm relays can be reset by turning the CommStat 4 OFF and then ON OR the UP and DOWN buttons are held simultaneously for 4 seconds. Alarms can be reset provided there is no longer an input from the smoke detector. All alarms are functional when 24 VAC is applied to the board. If 24 VAC is not present, no alarms will be displayed unless DC power is present. If DC power is supplied to the board, the display is operational.

- Low (Control) Voltage – activated if control voltage is not present.
- Lockout – activated if any air conditioner or heat pump is off due to either high or low refrigerant pressure lockout. If all the air conditioners or heat pumps are locked out, the Mixed Air Relay (MAR) will be activated on each of the air conditioners or heat pumps. This air conditioner or heat pump will go into the Ventilation mode, provided there is a call for cooling. (Note: The Mixed Air Relay is only on units with an economizer) If desired, the lockout alarm can be disabled by the user in the Configuration Set-up.
- Low Building Temperature Alarm – Activated if the temperature in the building drops to the selected temperature. If the low building temperature alarm is activated, the LCD displays, “Low Building Temperature”.
- First Stage High Building Temperature Warning – If the set point temperature is reached, the display will show, “First Stage High Building Temperature” on the LCD display.
- Second Stage High Building Temperature Alarm- Activated if the set point temperature is reached, the display will show, “Second Stage High Building Temperature” on the LCD display.
- Smoke Alarm – the contacts will be energized when the smoke detector inputs receive a signal from an external detector. All air conditioners or heat pumps are immediately shut down. A physical reset is required to clear the alarm in the manual mode. If auto reset has been selected, the alarm will reset after the user specified time (3-10 minutes).
- Controller Fail Alarm - If the CommStat 4 controller does not function, but has power, all alarms are activated to indicate a failure of the CommStat 4.
- AUX1 and AUX2 – Two auxiliary dry contact outputs that can be energized based upon AUX1 and AUX2 inputs. See AUX1-IN/AUX2 INPUT on page 4 for complete description.

COMMSTAT 4 LEAD/LAG CONTROLLER INPUTS

1. Input Power

The R and C terminals are the input power terminals for each respective air conditioner or heat pump.

2. Modem Connection

The modem connection is used for remote communication and remote programming of the CommStat 4. It has the capability of providing shelter temperatures, mode of operation, as well as remote diagnosis. All configuration settings can be viewed and changed remotely.

3. Control Voltage (24 VAC)

The CommStat 4 is powered by 24 VAC or with a user provided 24 VDC or 48 VDC power supply. Should AC power be lost, the display, user interface and alarm outputs of the CommStat 4 will still be functional. However, the system outputs of the CommStat 4 (Y, G, W, O, and MAR) will not be functional when 24 VAC is not present.

4. Temperature Sensors

The CommStat 4 uses remote temperature sensor(s) to measure the temperature in the shelter and determine when the system is calling for heating or cooling. Up to three sensors can be connected to each CommStat 4. There are two options for the sensors. If **No** (the default setting) is selected and multiple sensors are being used, the temperatures will be averaged. If **Yes** is selected and multiple sensors are being used, the sensor with the highest reading will be used for cooling operation and the one with the lowest reading will be used for heating. When multiple sensors are being used and there is a temperature differential greater than or equal to 5°F (4°C) between the sensors, the CommStat 4 lead/lag controller will energize the indoor blowers (G) on all connected units.

Screen #20 in the Configuration Mode allows the user to determine how the temperature sensors will be configured.

5. Smoke Detector

The smoke detector **input terminals** determine when there is a signal from an external smoke detector. They can be configured for either a **Normally Open** (N.O.) or **Normally Closed** (N.C.) smoke signal in Configuration screen # 18. During a smoke fault condition, all AC units will be turned off.

The smoke alarm relay reset has two selections -**Manual** and **Auto** (default). If **Manual** is selected, a physical reset of the fault is required by holding the Up and Down buttons for 4 seconds. Cycling power will not reset a smoke fault if **Manual** is selected.

If **Auto** is selected the alarm will reset after an adjustable time delay of 3-10 minutes. The default is 5 minutes. Screen #17 in the Configuration Mode allows the user to determine how the smoke alarm relay reset will be configured.

Note: The Smoke Detector input is for DRY CONTACTS ONLY, applying voltage to the smoke alarm input will damage the controller.

6. Hydrogen Detector

The hydrogen detector input terminals will determine when there is a 24 VAC signal from an external hydrogen detector. The unit will switch the lead unit to Emergency Ventilation mode (air conditioners or heat pumps with economizers only) when high hydrogen levels are detected. It will switch back to normal air conditioning mode once the hydrogen levels are acceptable and the 24 VAC signal is removed from the hydrogen detector input terminals.

7. Generator Relay

The generator input will monitor for a 24 VAC signal which will be used to determine when the CommStat 4 is operating on generator power. When 24 VAC is recognized at the generator relay input, the CommStat 4 controller will only operate the units selected by the user in screen # 16 of the Configuration Menu. The options are:

1. to run only the lead unit (default),
2. the lead unit and one lag unit,
3. the lead unit and two lag units, or
4. the lead unit and three lag units.

Note: in the Generator Mode, only the Lead unit will operate in the Mechanical Cooling Mode; the economizer will not operate in the Generator Mode. However, if a hydrogen fault occurs during the Generator Mode, the Mechanical Cooling will be terminated on the Lead unit and the Lag unit will operate in the Economizer Mode. When set to economizer configuration 2 in screen #19, the CommStat 4 will only allow the lead unit to operate in mechanical cooling.

8. Economizer Mode Status Monitoring

The 2 terminal in the air conditioner is monitored for a 24 VAC signal. When the 2 terminal has 24 VAC present, mechanical cooling will be energized and the cooling LED will be lit. When 24 VAC is not present at the 2 terminal, the unit will be in economizer mode and this status will be annunciated on the LCD display. Economizer mode is defined as a call for cooling (24VAC output at Y and O) with no 24VAC signal at the 2 terminal. Mechanical cooling is defined as a call for cooling (24VAC output at Y and O) while there is a 24 VAC signal at the 2 terminal.

Note: See the Economizer Operational Modes on page 9. When set to economizer configuration 2 in screen #19, the AUX1 and AUX2 inputs are used for economizer mode status monitoring. See wiring diagram on page 7.

9. Lockout Relay (LOR)

The CommStat 4 has a lockout relay input (LOR) and will provide a Normally Open (NO) or Normally Closed (NC) output in accordance to this input. This feature is enabled in the Configuration Mode, screen #10 by either selecting 0,1,2 or 3 (2 default). If 0 or 1 is selected, the control will turn the lockout relay output off and announce which unit is locked out on the LCD display. If 2 or 3 is selected, the control will turn the lockout relay output on, energize the lockout relay output (NO or NC), and announce which unit is locked out on the LCD display. If all the units are locked out, the mixed air relay will be activated on each unit to provide emergency ventilation, provided there is a call for cooling. The mixed air relay and emergency ventilation are only available on units with economizers.

Cycling power at the locked out air conditioner will reset the Lockout fault. A physical reset of the fault will be required by pressing the Up and Down buttons for 4 seconds.

10 AUX1-IN/AUX2

The CommStat 4 has the option for two, dry contact, auxiliary outputs that will energize based on the AUX1 and AUX2 inputs. Each AUX input can be configured to look for a normally open (NO) or normally closed (NC) signal in Configuration Mode, screens # 21 and # 22. Each screen will allow the user the option of **NO**, **NC**, or **OFF** to disable the feature. Note: AUX1 and AUX2 are not available when the Economizer configuration 2 is selected in screen 19. AUX1 and AUX2 are independent from the operation of the board and the air conditioners or heat pumps.

COMMSTAT 4 LEAD/LAG CONTROLLER OUTPUTS

(Refer to the Thermostat and Line Voltage Connection Schematic on page 7)

1. Y or 1

The Y or 1 output energizes the compressor when the economizer is not selected. Upon a call for cooling, the Y (1) and O terminals are energized. On a call for 1st stage heating, the Y(1) output will be energized. There is a minimum compressor time off delay of 3 minutes for the lead unit and 4 minutes for the lag unit. A minimum compressor run time is preset at three minutes by the controller.

2. G or 3

The G or 3 output terminal energizes the indoor fan during either heating or cooling.

3. W or 4

The W or 4 output terminal energizes the electric heat.

4. O (Heat Pumps) or Y2 (Air Conditioners with 2 Stage Compressors)

The O output terminal energizes the reversing valve on heat pumps. The valve is energized on a call for cooling. If staged air conditioners are selected in Configuration screen #25, the O output becomes the second stage cooling output, Y2.

5. Lockout Alarm

When enabled in screen #10 of the Configuration Menu, the CommStat 4 monitors the Lockout Relay (LOR) input for a contact closure. If there is a contact closure between the LOR terminals, the control will turn off all outputs, energize the NO or NC contacts, and display which unit is locked out on the LCD display. The default setting in the configuration is 2. If all of the connected units are locked out, the Mixed Air Relay (MAR) will be activated on each of the connected units and the units will go into Emergency Ventilation mode. Cycling power will reset the Lockout Alarm.

6. Low (Control) Voltage Loss Alarm

The low voltage loss alarm relay provides a dry contact closure if control voltage is not present.

7. Low Building Temperature Alarm

The Low Building Temperature Alarm has an adjustable temperature range of 32°F thru 65°F (0°C thru 18.3°C) that may be adjusted in screen #8 of the configuration menu. If the temperature drops to this setting, all outputs will be turned off, the LCD display will announce Low Building Temperature and the Low Building Temperature alarm output relay will be activated. There is a 2°F (1°C) differential for this alarm to reset.

8. First Stage High Building Temperature Warning

The set point temperature is adjustable from 70°F thru 140°F (21°C thru 60°C). If this set point is reached, the control will display a First Stage High Building Temperature warning on the LCD display. The default setting for this is 85°F (29°C). There is a 2°F (1°C) differential for this alarm to reset. The first stage high temperature warning set point is adjustable in screen #6 of the Configuration Menu.

9. Second Stage High Building Temperature Alarm

This set point is adjustable from 75°F thru 145°F (24°C thru 63°C). If this set point is reached, the control will display a Second Stage High Building Temperature alarm on the LCD display. There is a 2°F (1°C) differential for this alarm to reset. The temperature set point for the second stage high temperature alarm is adjustable in screen #7 of the Configuration Menu. The default setting for this is 90°F (32°C).

10. Smoke alarm

The smoke alarm is energized when the smoke detector inputs sense a smoke fault condition. All outputs are off and the smoke alarm relay is energized during a smoke fault. This is a dry contact output that can be configured for NO

or NC (default) operation in setting #18 of the configuration menu.

The smoke alarm has two selections -**Manual** and **Auto** (default). The smoke alarm relay can be manually reset by either cycling the 24 VAC power or clearing the fault and holding the UP & DOWN buttons for 4 seconds.

If **Auto** is selected the alarm will reset after an adjustable time delay of 3-10 minutes, with a default time of 5 minutes. Screen #17 in the Configuration Mode allows the user to determine how the smoke alarm relay reset will be configured.

11. Mixed Air Relay (MAR)

The MAR output will be energized by the CommStat 4 when all connected units have locked out. This is referred to as the Emergency Ventilation Mode. The mixed air relay and Emergency ventilation are only available on units with economizers.

12. DC Air Mover Relay (AMR)

The DC Air Mover Relay has a dry contact output and is energized in the Emergency Ventilation Mode. These contacts can be used to signal an external air mover during the emergency ventilation mode.

13. AUX1 and AUX2

The CommStat 4 has the option for two, dry contact, auxiliary outputs that are energized based on the AUX1 and AUX2 inputs. Each AUX input can be configured to look for a normally open (NO) or normally closed (NC) signal in configuration screens #21 and #22. Each configuration screen allows the user the option of **NO**, **NC**, or **OFF** (default) to disable the feature. The AUX1 and AUX2 outputs provide a NO, NC, and COM terminal. Note: AUX1 and AUX2 are not available when the Economizer configuration 2 is selected in screen 19.

Output	Type	Nominal	Minimum	Maximum
Y or 1	Relay	24VAC	18VAC	30VAC
G or 3	Relay	24VAC	18VAC	30VAC
W or 4	Relay	24VAC	18VAC	30VAC
O	Relay	24VAC	18VAC	30VAC
Lockout Alarm	3PDT	N/A	N/A	10 Amps @ 120VAC
Low (Control) Voltage Loss Alarm	3PDT	N/A	N/A	10 Amps @ 120VAC
Low Building Temperature Alarm	Relay	N/A	N/A	10 Amps @ 120VAC
First Stage High Building Temperature Warning	Relay	N/A	N/A	10 Amps @ 120VAC
Second Stage High Building Temperature Alarm	Relay	N/A	N/A	10 Amps @ 120VAC (Isolated Dry Contacts)
Smoke Alarm	Relay	N/A	N/A	10 Amps @ 120VAC
Mixed Air Relay (MAR)	Relay	24VAC	18VAC	30VAC
DC Air Mover Relay (AMR)	Relay	N/A	N/A	10 Amps @ 120VAC
AUX1 / AUX2 (Auxiliary Contacts) See Setting #19	Relay	N/A	N/A	10 Amps @ 120VAC

Table 1. Contact Ratings

IMPORTANT SAFETY PRECAUTIONS

WARNING

ALWAYS TURN OFF POWER AT THE MAIN POWER SUPPLY BEFORE INSTALLING, CLEANING, OR REMOVING THERMOSTAT.

WARNING

DO NOT USE BATTERY OPERATED OR ELECTRIC TOOLS TO TIGHTEN SCREWS ON COVER OF THE COMMSTAT 4.

- This thermostat is for 24 VAC applications only; do not use on voltages over 30 VAC
- Do not short across terminals of system control to test operation; this will damage your thermostat and may void your warranty
- All wiring must conform to local and national electrical and building codes
- Use this thermostat only as described in this manual

TO INSTALL COMMSTAT 4 TELECOM CONTROLLER

WARNING

ELECTRICAL SHOCK HAZARD

TURN OFF POWER AT THE MAIN SERVICE PANEL BY REMOVING THE FUSE OR SWITCHING THE APPROPRIATE CIRCUIT BREAKER TO THE OFF POSITION BEFORE REMOVING THE EXISTING THERMOSTAT.

IMPORTANT

CommStat 4 installation must conform to local and national building and electrical codes and ordinances.

Note: Mount the CommStat 4 about five feet above the floor. Do not mount the CommStat 4, in direct sunlight, behind a door, or in an area affected by a vent or duct. The CommStat 4 is designed for interior use only.

1. Turn off power to the heating and cooling system by removing the fuse or switching off the appropriate circuit breaker.
2. Put controller against the wall where you plan to mount it (Be sure wires will feed through the wire opening in the base of the CommStat 4).
3. Mark the placement of the mounting holes.
4. Using a drill bit, drill holes in the places you have marked for mounting.
5. Align CommStat 4 with mounting holes and feed the control wires through wire opening.
6. Use screws to mount CommStat 4 to wall.
7. Insert stripped, labeled wires in matching wire terminals. See Wiring Diagrams. **CAUTION!: Be sure exposed portion of wires do not touch other wires.**
8. Gently tug wire to be sure of proper connection. Double check that each wire is connected to the proper terminal.
9. Seal hole for wires behind CommStat 4 with non-flammable insulation or putty.
10. Replace cover on CommStat 4.
11. Turn on power to the system at the main service panel.
12. Test CommStat 4 operation as described in "Testing the CommStat 4".

REMOTE SENSOR INSTALLATION

(Refer to the Alarm Connections Schematic on page 8)

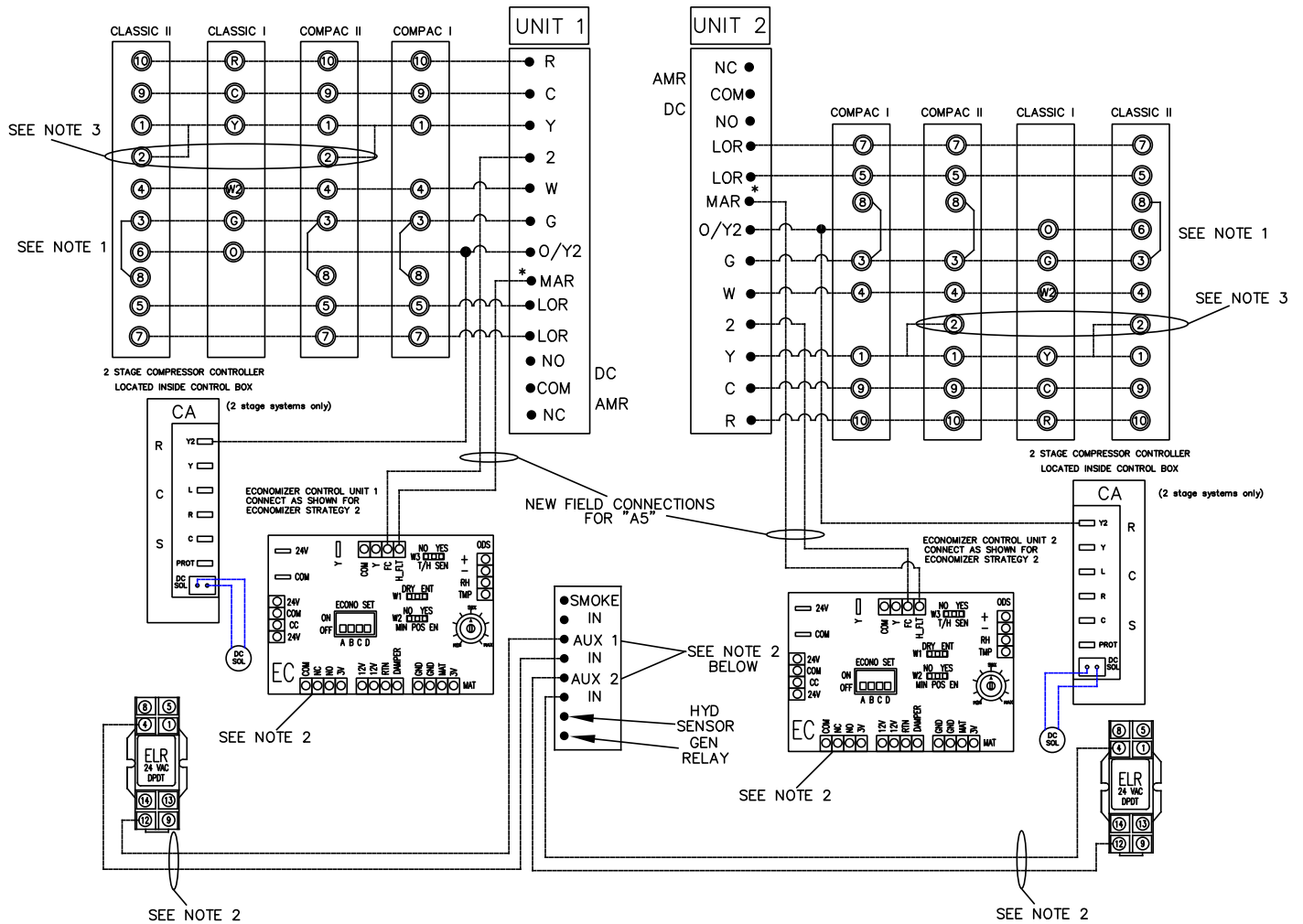
1. Remove cover from remote sensor(s) housing.
2. Select an appropriate location for mounting the remote sensor(s).
3. Mount remote sensor(s) unit using hardware provided.
4. Install two wires between remote sensor(s) and CommStat 4 (use shielded cable that is adequately grounded).
 - Wire 1 should run between an unused THERM terminal on the CommStat 4 and the S1 terminal on the remote sensor
 - Wire 2 should run between an unused THERM terminal on the CommStat 4 and the S2 terminal on the remote sensor

OPTIONAL ACCESSORIES

- Onboard Sensor (P/N 50189)
- Expansion Cable (P/N 80515) To be used when two CommStat 4 controllers are installed in a Master/Slave configuration.
- Remote sensor with 25 ft. (762 cm) cable. P/N 80503

THERMOSTAT AND LINE VOLTAGE CONNECTIONS SCHEMATIC FOR MARVAIR AIR CONDITIONERS

with the Engineering Designator A5



SEE NOTE 2

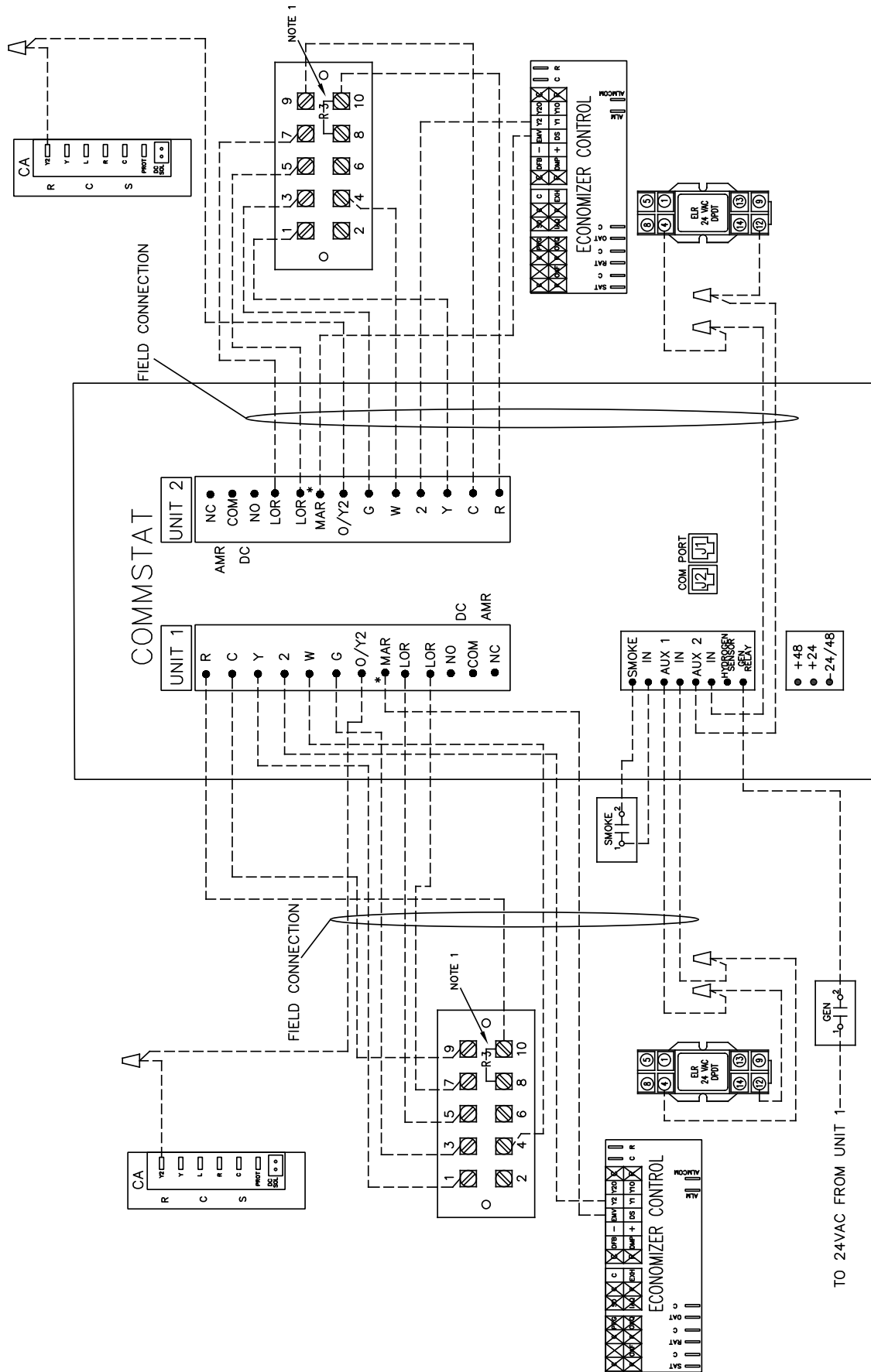
* Input/Output to ComPac II air conditioner for emergency ventilation. (Economizer strategy mode #2 only)

NOTES:

1. For immediate shutdown of air conditioner upon a signal from smoke alarm, the jumper between terminals 8 and 10 in ComPac I, ComPac II and Classic II units must be removed and a jumper placed between terminals 8 and 3.
2. For units equipped with ELR relay, make connection from ELR relay terminals 4 and 12 to the CommStat 4 AUX1 and AUX2 inputs. For units not equipped with ELR relay, make connection from EC terminals COM and NC to the CommStat 4 AUX1 and AUX2 inputs.
3. For applications where the economizer is not used for cooling, connect the Y signal from the CommStat 4 to the 2 terminal inside the air conditioner. This will bypass the economizer operation and allow only mechanical cooling. The economizer will only operate in the emergency ventilation mode. All other wiring shall be connected as shown respective to the HVAC type.

THERMOSTAT AND LINE VOLTAGE CONNECTIONS SCHEMATIC FOR MARVAIR AIR CONDITIONERS

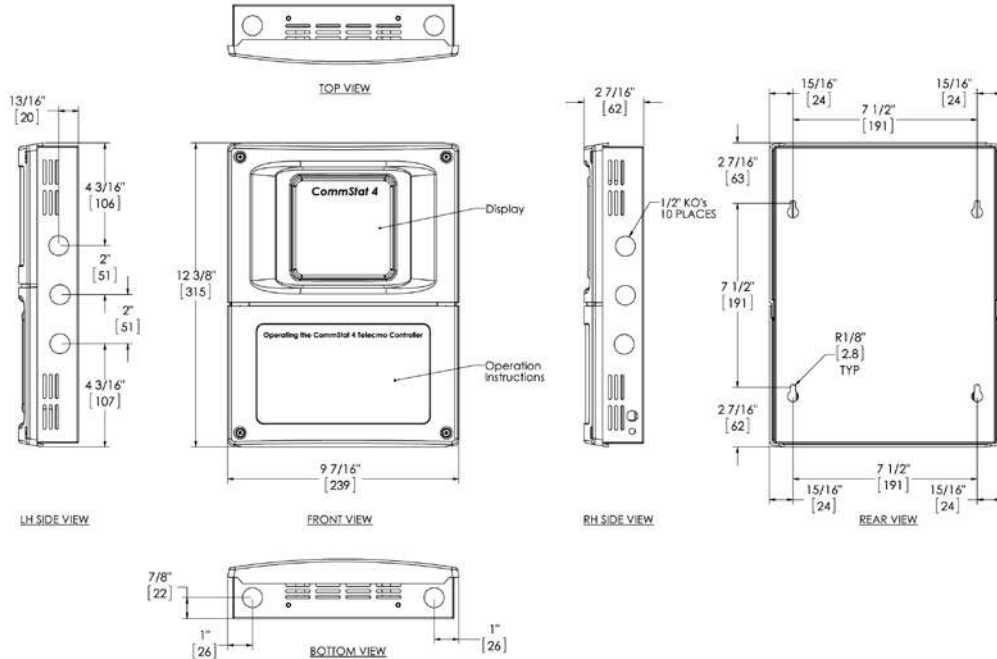
with the Engineering Designator VZ



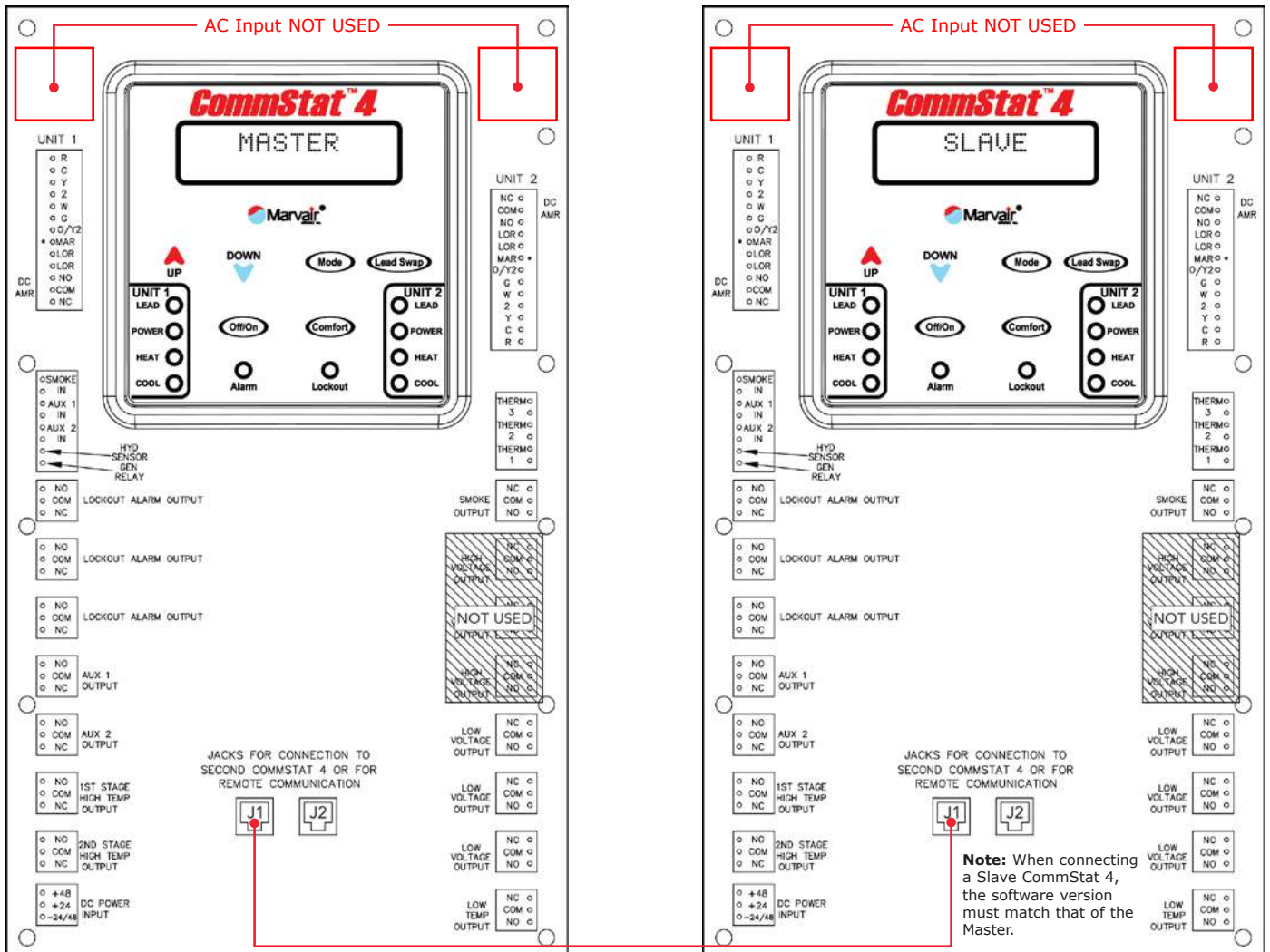
NOTES

1. REMOVE FACTORY INSTALLED JUMPER FROM TERMINALS 8 AND 10 AND PLACE A JUMPER BETWEEN TERMINALS 3 AND 8.

DIMENSIONAL DATA



CONNECTIONS SCHEMATIC



OPERATING THE COMMSTAT 4 TELECOM CONTROLLER

The CommStat 4 is controlled with buttons as described below.

On/Off Button

The **On/Off** button turns the CommStat 4 on or off. If the system is running in the cooling or heating cycle when this button is pressed, all outputs will turn off. It also clears unit lockouts and reset alarms as long as all faults have cleared. To clear alarms and reset alarms, push and hold the **On/Off** button for 5 seconds.

Comfort Button

The **Comfort** button enables comfort mode operation. Pushing the **Comfort** button twice while in normal operating mode allows the user access to adjust the cooling and heating temperature settings for Comfort mode. The CommStat 4 will revert to normal operation after 90 minutes in the Comfort mode. It can also be removed from Comfort mode manually by pressing the **Comfort** button once.

The Comfort mode allows the service tech to be comfortable while working in the shelter. By reverting back to the desired set points after 90 minutes, energy costs can be minimized if the tech forgets to reset the temperature.

Up Button

The **Up** button is only functional when in the Configuration mode or when used in conjunction with the **Down** or **Mode** buttons in the normal operating mode. It is primarily used to set values while configuring the controller. Simultaneously pressing the **Up** and **Down** buttons for 4 seconds, while in normal operation, will reset the alarm relays, and status LEDs with the exception of the lockout alarm which requires the power to be cycled at the AC units. Simultaneously pressing the **Up** and **Mode** buttons for 4 seconds, while in normal operation, changes all settings to the default values.

Down Button

The **Down** button is only functional when in the Configuration mode or when used in conjunction with the **Up** button in the normal operating mode. It is primarily used to set values while in the configuration mode. Simultaneously pressing the **Up** and **Down** buttons for 4 seconds, while in normal operation, will reset the alarm relays, and status LEDs with the exception of the lockout alarm which requires the power to be cycled at the AC units.

Mode Button

The **Mode** button is only functional in normal operating mode. Pushing the **Mode** button for 4 seconds in the normal operating mode will activate the CommStat 4 Configuration mode. The settings can be adjusted using the **Up** or **Down** buttons. The Mode button is mashed to accept the values and advance to the next setting. Pressing the **Mode** and **Up** buttons simultaneously for 4 seconds, while in normal operation, will change all settings to the default values.

Fault History Storage

The CommStat 4 has a fault history storage feature that stores the last 10 faults that were registered. The fault history is accessed by holding the **Comfort** button for 5 seconds. Scroll through the fault history by pressing the **Up** and **Down** buttons. To return to the normal operating screen and keep the faults stored in memory, press the **Comfort** button once. To clear the fault memory, hold the **Comfort** button for 5 seconds while on the fault viewing screen. This will clear the fault history and return to the normal operating screen.

Lead Swap Button

Hold down to alternate the Lead and Lag units. Functional only when in the Normal or Comfort operating mode and both units are functional.

ECONOMIZER OPERATIONAL MODES

The CommStat 4 provides for two Operational Modes for Marvair air conditioners with economizers. The desired mode can be selected in Configuration screen 19 and are described below.

Economizer Mode #1

Economizer mode #1 allows the enthalpy controller in the lead unit to determine whether to run in mechanical or economizer cooling. On a rise in temperature exceeding the 1st stage temperature differential, the controller signals the lag unit to operate in mechanical cooling. This mode should be selected when lead and lag unit operation is needed to maintain desired building temperatures or when air conditioners are not sized for 100% redundancy.

Economizer Mode #2 (default setting)

If economizer mode #2 is selected, the lead unit's enthalpy controller determines whether the lead unit operates in mechanical or economizer cooling and only the lead unit will be allowed to operate. If the lead unit operates in the economizer mode and building temperature rises above the 1st stage temperature differential, the lead unit will be forced to operate in the mechanical cooling mode and the economizer will close. This mode should be selected when air conditioners are sized for true redundancy and only one unit is needed to maintain the desired temperatures.

Note: For air conditioners manufactured prior to January 2010 with H205 economizer controls, the economizer controls must be upgraded to the solid state economizer controls with kit number K/03681 for proper operation in economizer mode #2.

Cooling Stage Operation:

- **1st Stage call for cooling: (default is Economizer Mode 2)**
Lead Unit – Enthalpy controller determines if unit is in mechanical or economizer cooling.
Lag Unit - OFF
- **1st Stage Differential Temperature met (2nd stage call for cooling):**
Lead Unit – Forced to mechanical cooling.
Lag Unit – OFF
- **2nd Stage Differential Temperature met (3rd stage call for cooling):**
Lead Unit - Continues in mechanical cooling.
Lag unit - OFF.
- **3rd Stage Differential Temperature met (4th stage call for cooling):**
Lead unit - Continues in mechanical cooling.
Lag unit - OFF

Emergency Ventilation Mode: The Emergency Ventilation Mode allows for units with economizers to ventilate the conditioned space in the event of two conditions, ALL connected units have a lockout fault or if a hydrogen fault occurs. During these faults, the MAR output of the CommStat 4 will energize to force the unit economizer damper open upon a call for cooling. The damper opens to allow outside air to enter the conditioned space and to also exhaust hot air from the space. Emergency Ventilation Mode is deactivated when the fault condition is cleared and the units are returned to normal operation. Emergency Ventilation is only available on units with economizers.

COMMSTAT 4 LEAD/LAG CONTROLLER CONFIGURATION SCREENS

To enter the Configuration Mode:

1. Make sure that the CommStat 4 is in the normal operating mode.
2. Push the Mode button for 4 seconds.
3. Press the Up and Down buttons to change the set points.
4. Press the Mode button to accept the settings and advance to the next screen.

To change all settings to the default values, press the Mode and Up buttons simultaneously for 4 seconds while in normal operation.

To exit configuration mode, do not touch any of the buttons for 90 seconds.

Screen Number	Description	Default
1	Keypad Lockout Select OFF to disable lockout or a 3-digit number to enable lockout. (9,9,9 is the default password)	OFF
2	°F or °C	°F
3	Lead/Lag air conditioner changeover. 0.5 to 7 days in ½ day increments	7 days
4	Cooling set point. 65°F thru 95°F (18°C thru 35°C) in 1° increments	79°F (24°C)
5	Heat set point. 50°F thru 80°F (10°C thru 27°C) in 1° increments	65°F (18°C)
6	First stage high temperature warning set point. 70°F thru 140°F (21°C thru 60°C) in 1° increments	85°F (29°C)
7	Second stage high temperature alarm set point. 75°F thru 145°F (24°C thru 63°C) in 1° increments.	90°F (32°C)
8	Low building temperature alarm set point. 32°F thru 65°F (0°C thru 18°C) in 1° increments	45°F (7.2°C)
9	Continuous indoor blower on all units. Select ON, AUTO or ON (Lead only)	AUTO (Lead Only)
10	Alarms 0 = No alarm output. 1 = No alarm output. 2 = Alarm output.	2
11	Anti-short cycle timer. 0 = no delay or 3-10 minutes in 1 minute increments. The Time Delay in the HVAC unit should be set to 0 if the default value of 5 minutes is selected.	0
12	1st stage temperature differential 1°F thru 5°F (1°C thru 3°C) in 1° increments. This setting only affects the turning on of the system. The turn off differential is fixed at 1°F/C.	1°F (1°C)
13	2nd stage temperature differential 2°F thru 5°F (1°C thru 3°C) in 1° increments. This differential is in reference to the 1st stage differential and the outputs are staged off each stage's differential is satisfied.	1°F (2°C)
14	OFF differential option of all stages. 1°F thru 4°F (1°C thru 3°C) in 1° increments. The actual differential OFF setting range is limited by the factory set dead band of 3°F/3°C minimum separation between Heat & Cool set points.	4°F (2°C)
15	Indoor blower off time delay. 0-90 seconds in 1 second increments	90 seconds

Screen Number	Description	Default
16	Operation of units on generator power. See page 3 for description of options. 1 = Lead unit only NOTE: Economizer Mode 2 will ONLY allow Lead unit operation regardless of number of units selected 2 = Lead unit & one lag unit 3 = Lead unit and two lag units 4 = Lead unit and three lag units	1
17	Smoke alarm relay reset. Select either manual or automatic reset. If an automatic reset is desired, select the number of minutes – from 3 to 10. The default is 5 minutes. The smoke alarm relay can be manually reset by holding the UP & DOWN buttons for 4 seconds or by cycling the 24 VAC power to clear the fault.	5 Minutes
18	Smoke detector contacts Normally Open or Normally Closed. When configured for N.O., an open circuit between the smoke terminals will be considered a smoke fault. When configured for N.C., a closed circuit between the smoke input terminals will be considered a smoke fault.	Normally Closed
19	Economizer Configuration No = No economizer 1 = Marvair units with economizer using operational mode #1 2 = Marvair units using economizer operational mode #2 (See Economizer Operational Modes description)	2
20	Remote temperature Sensor(s). If No is selected and multiple sensors are being used, the temperatures will be averaged. If multiple sensors are being used and Yes is selected, the sensor with the highest temperature reading will be used to control the units when in the cooling mode. In heating, the sensor with the lowest reading will be used to control the units.	Yes
21	AUX 1 dry contact output. Selection are: NO = Output will be energized when there is no contact closure between the AUX1-IN terminals. NC = Output will be energized when there is contact closure between the AUX1-IN terminals OFF = Disabled. When configuration screen #19 is set to 1 or 2, this configuration screen is not accessible.	Off
22	AUX 2 dry contact output. Selection are: NO = Output will be energized when there is no contact closure between the AUX2-IN terminals. NC = Output will be energized when there is contact closure between the AUX2-IN terminals OFF = Disabled. When configuration screen #19 is set to 1 or 2, this configuration screen is not accessible.	Off
23	Excessive compressor operation. Select between 5-10 cycles per two hour period or "No" to disable. When set between 5-10 cycles and the compressor cycles more than the set point, the first stage differential will increase by 2°F (1°C).	NO
24	Language Select either English, French or Spanish	English
25	Select either 1-stage air conditioner, 2-stage air conditioner or heat pump. 1 = 1-stage air conditioner 2 = 2-stage air conditioner No = Heat pump	2
26	Master/Slave setting. When connected to another CommStat 4, the user selects whether this unit is the Master (Yes) or Slave (No).	Yes
27-36	Set the differential between stages from 0°F through 7°F (0°C through 4°C) in 1° increments. The screens are only visible when using two CommStat 4 controllers in a Master/Slave configuration. Screens 27-36 are only used with multi-stage air conditioners and heat pumps with electric heat.	#27: 5°F (3°C) #28-36: 2°F (1°C)
37	This setting is used to select the number of HVAC units used in the application. Selecting the correct number of HVAC units will eliminate nuisance alarms. 1 = One HVAC unit connected to the CommStat 4. 2 = Two HVAC units connected to the CommStat 4. One lead and one lag unit. 3 = Three HVAC units connected to the CommStat 4. One lead and two lag units. 4 = Four HVAC units connected to the CommStat 4. One lead unit and 3 lag units.	2
38	Economizer Stage Differential. 1°F thru 5°F (1°C thru 3°C) in 1° increments. This setting provides an adjustable temperature differential between stages of Economizer Cooling only. This setting does not affect the stage differential of Mechanical Cooling.	1°F (1°C)

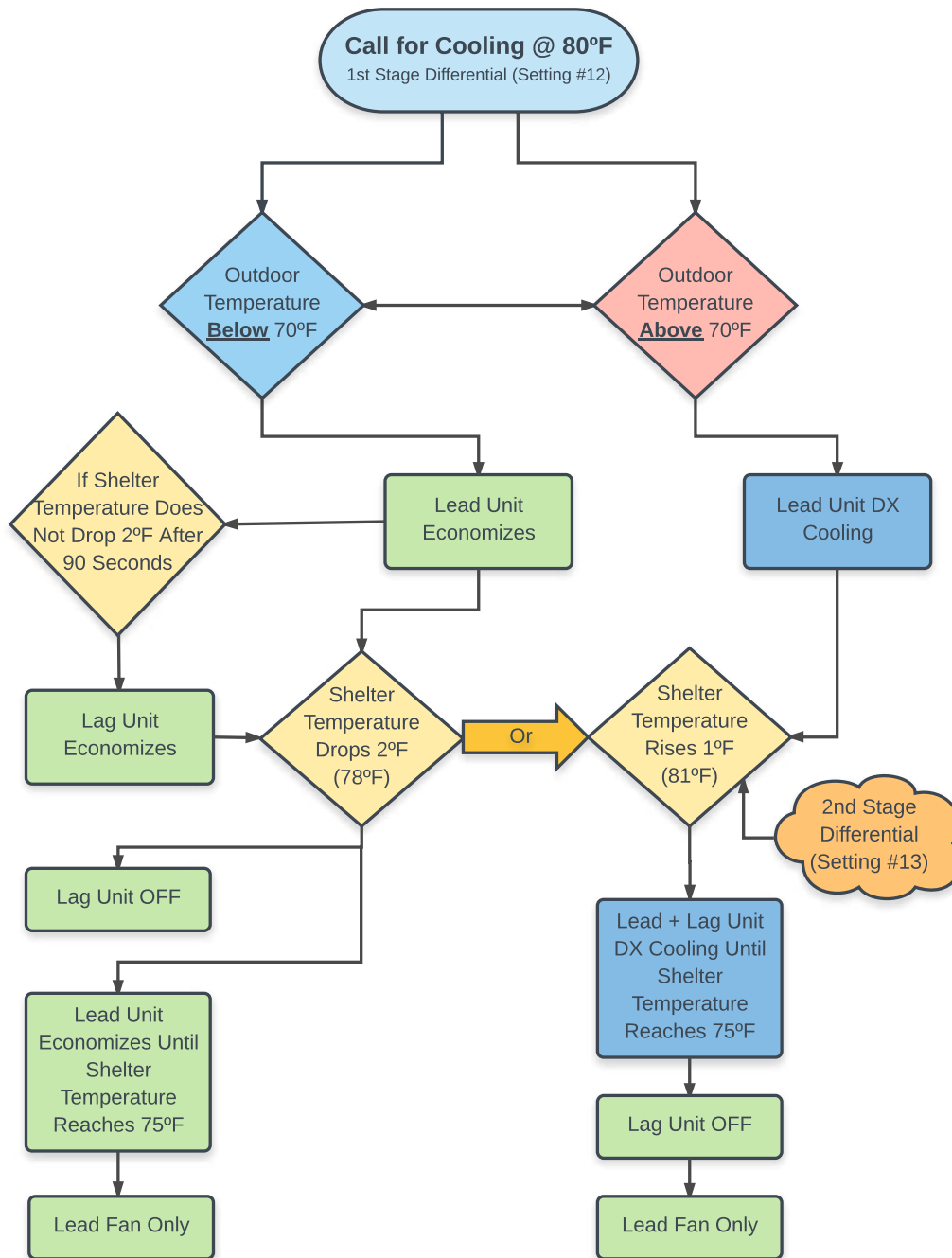
ECONOMIZER OPERATIONAL MODES

The CommStat 4 provides for two Operational Modes for Marvair air conditioners with economizers. The desired mode can be selected in Configuration screen 19. For details, see the following Economizer Modes sections.

Emergency Ventilation Mode: The Emergency Ventilation Mode allows for units with economizers to ventilate the conditioned space in the event of two conditions, ALL connected units have a lockout fault or if a hydrogen fault occurs. During these faults, the MAR output of the CommStat 4 will energize to force the unit economizer damper open upon a call for cooling. The damper opens to allow outside air to enter the conditioned space and to also exhaust hot air from the space. Emergency Ventilation Mode is deactivated when the fault condition is cleared and the units are returned to normal operation. Emergency Ventilation is only available on units with economizers..

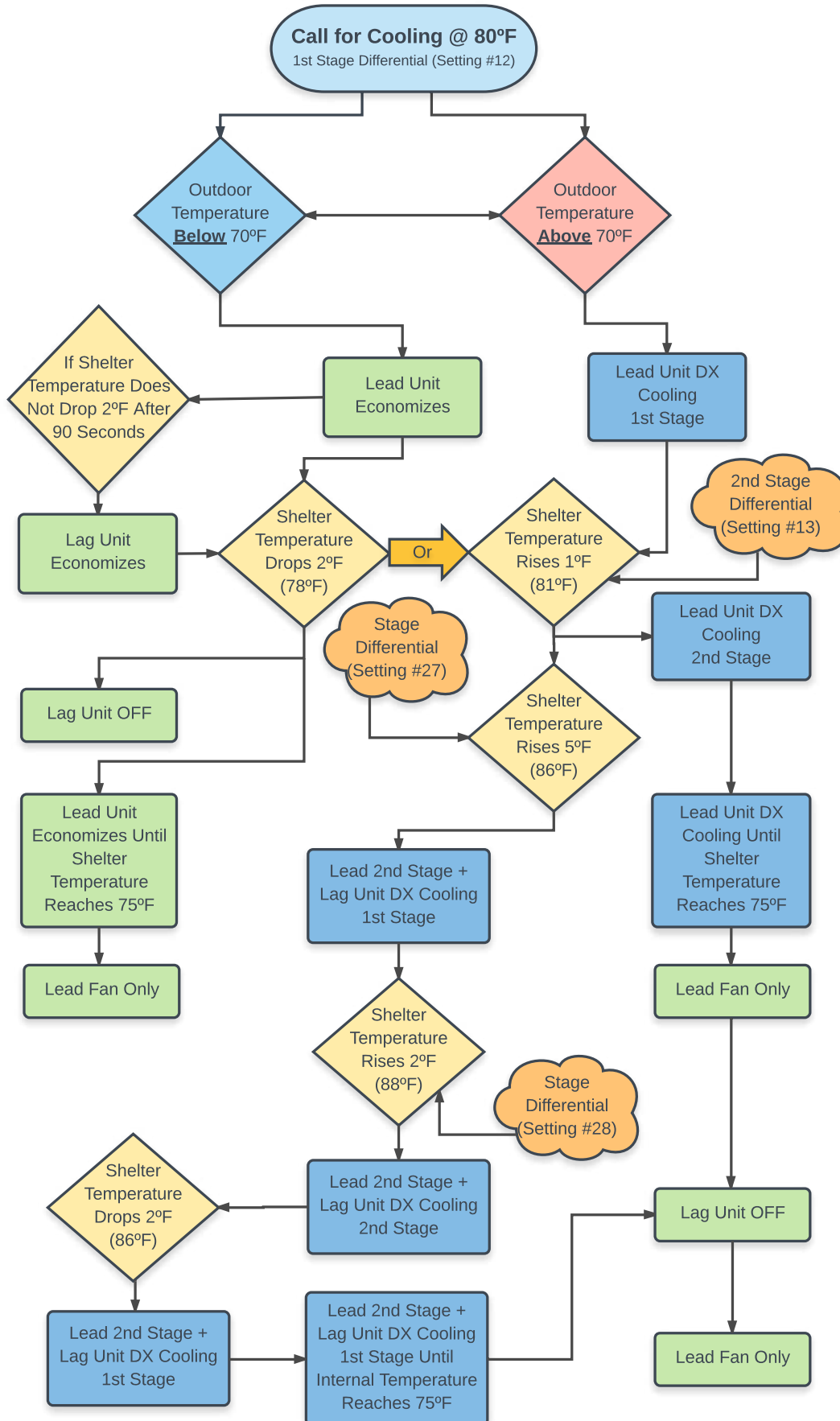
COMMSTAT 4 ECONOMIZER MODE 1 WITH TWO SINGLE-STAGE COMPRESSORS

with Cooling Set Point at 79°F



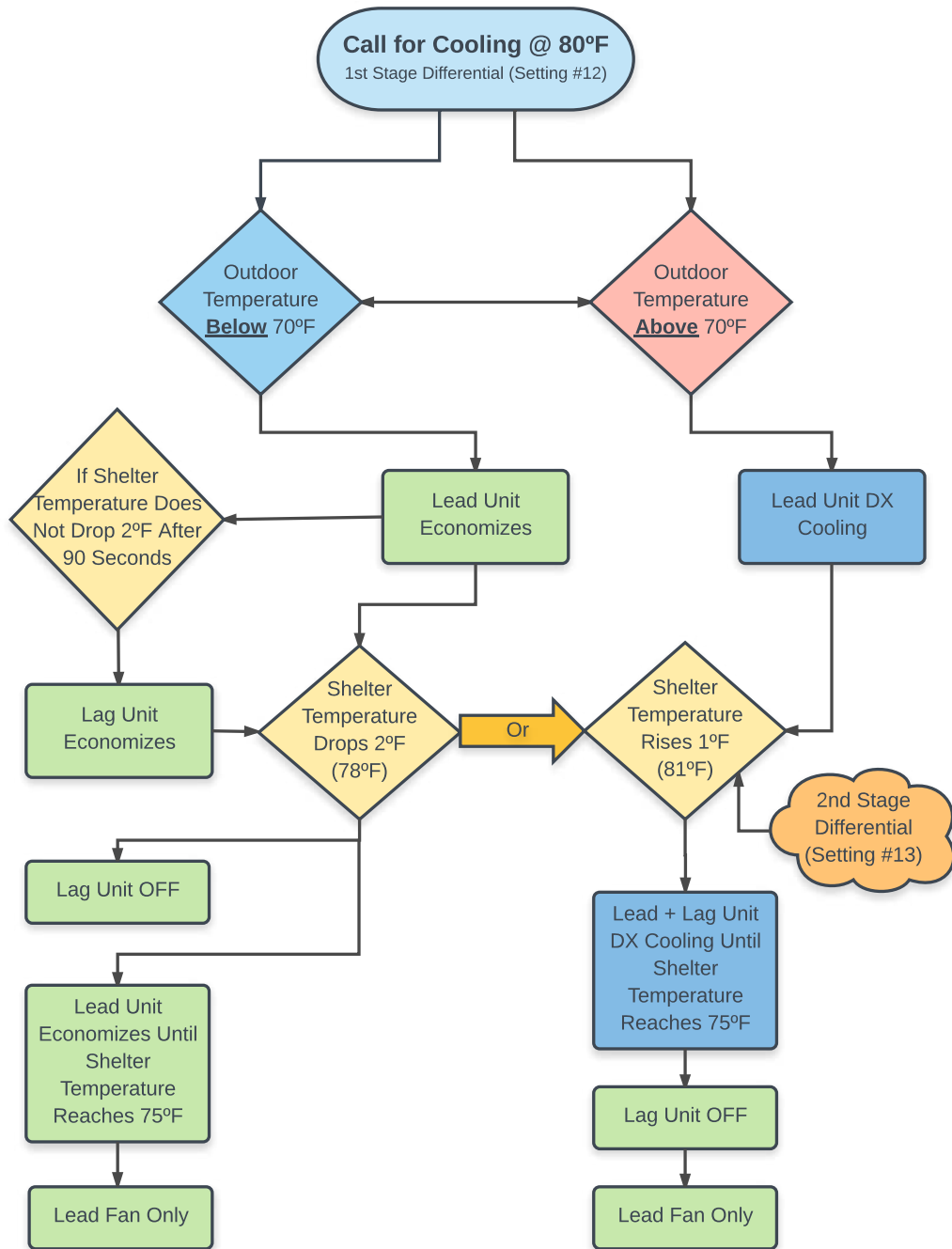
COMMSTAT 4 ECONOMIZER MODE 1 WITH TWO 2-STAGE COMPRESSORS

with Cooling Set Point at 79°F



COMMSTAT 4 ECONOMIZER MODE 2 WITH TWO SINGLE-STAGE COMPRESSORS

with Cooling Set Point at 79°F



COMMSTAT 4 ADAPTIVE STAGING SEQUENCE

OFF time between cooling calls	Wait time before going to 2nd stage on Lead Unit
Greater Than 8 Minutes	15 Minutes
Between 7 - 8 Minutes	10 Minutes
Between 6 - 7 Minutes	5 Minutes
Between 5 - 6 Minutes	2 Minutes
Between 4 - 5 Minutes	1 Minutes
Between 3 - 4 Minutes	40 Seconds
Less than 3 Minutes	20 Seconds

Adaptive staging is based on rate of change in temperature over time between Cooling calls on the Lead Unit. This assures that the operating capacity of the HVAC is constantly matched for internal heat load while maintaining efficiency.

Note: Only available in Economizer Mode 2 with Two 2-Stage compressors.

TESTING THE COMMSTAT 4 THERMOSTAT CONTROLLER

Check-Out of Cooling Cycle

Due the wide range of configurations, the following instructions are limited to checking the operation of the cooling and heating modes. If alarm or fault conditions are displayed, recheck all field wiring and the configuration screens.

Important:

Be sure that the crankcase heater (if used) has been energized for at least 24 hours before starting the unit(s). Double-check all electrical connections before applying power. Marvair air conditioners with scroll compressors running on 3Ø power must be checked for proper rotation during the initial start-up. Please refer to A/C unit Installation & Operation manual for determining if the 3Ø compressors are rotating correctly. Incorrect rotation can damage the compressor and may not be covered by the warranty

Procedure:

1. In the Configuration screen No. 4, set the cooling set point temperature to a point higher than the ambient temperature. In the Configuration screen No. 5, set the heating set point temperature to a temperature that is lower than the ambient.
2. Set the time delay in the A/C unit control box to three minutes. On air conditioners with the economizer, check the changeover setting of the sensor and reset it if needed. (See Marvair air conditioner Installation & Operation manual).
3. Using configuration screen No. 4, slowly lower the thermostat's cooling set point temperature until the switch closes. The indoor fan should operate. Once the indoor fan turns on, allow approximately three minutes (5 minutes if the default of 5 minutes is selected in screen number 11) for the compressor to start. Note that the outdoor fan may not come on immediately, because it is cycled by refrigerant pressures.

NOTE: (A/C with economizer only). To check the system operation under different ambient conditions, the air temperature and enthalpy sensors must be "tricked". When outdoor ambient conditions are higher than the control setting, a component cooler aerosol may be sprayed directly into the enthalpy sensor to simulate low enthalpy conditions, causing the economizer damper to open. Alternately, when outdoor conditions are lower than the set point, a source of heat such as a hair dryer can be directed on the air temperature sensor to simulate warmer conditions, which will bring on mechanical cooling and start the compressor.

4. To stop cooling, slowly raise the thermostat cooling set point to a temperature higher than the ambient. Follow the same procedure for additional units.

NOTE: The fan purge allows the indoor fan to run for approximately 90 seconds after the compressor is off. This operation provides a small improvement in system rated efficiency.

TESTING THE COMMSTAT 4 THERMOSTAT CONTROLLER

Check-Out of Heating Cycle

Procedure: (Applies only to heat pumps or air conditioners with resistance elements)

1. Using Configuration screen No. 5, raise the heating set point temperature to a setting which is higher than the ambient temperature. The fan and electric heat should immediately cycle on.
2. Move the system switch to the "OFF" position. All functions should stop.

NOTE: (A/C with economizer only) The damper blade should remain closed during the heating cycle (unless the minimum position potentiometer has been set for constant ventilation A fully counterclockwise position corresponds to full closure of the damper. See Marvair Installation & Operation manual for details.

NOTES



Please consult the Marvair® website at www.marvair.com for the latest product literature. Detailed dimensional data is available upon request. A complete warranty statement can be found in each product's Installation/Operation Manual, on our website or by contacting Marvair at 229-273-3636. As part of the Marvair continuous improvement program, specifications are subject to change without notice.



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