AstroDrive-Z3 User's Manual

Software Version: AstroDrive-Z3 081818v1

AstroDrive-Z3 User's Manual

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SYSTEM OVERVIEW

The AstroDrive-Z3 field configurable Fan-Filter Unit (FFU) control console with environment monitoring intelligently monitors and controls cleanroom facility environments.

The AstroDrive-Z3 console supports fan control networks consisting of up to 120 FFU units organized in up to 12 groups.

Global commands enable the user to set the FFU speeds and states by group or for the entire facility.

The AstroDrive-Z3 can be configured by the user to:

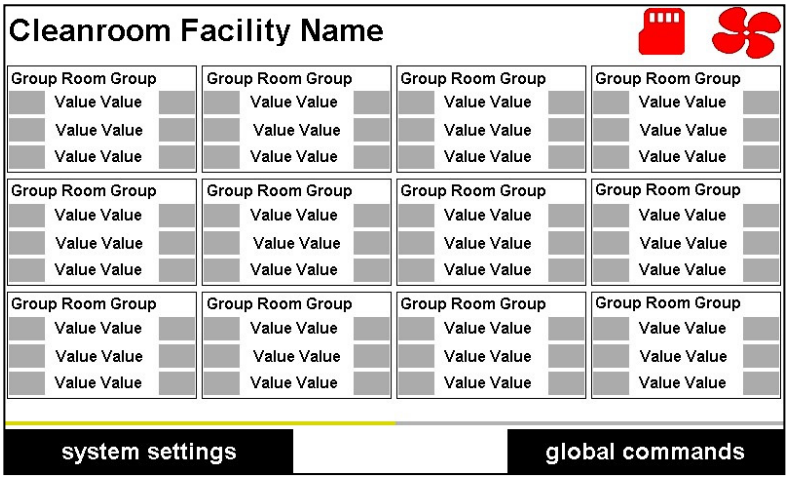
- Define the facility name and group names.
- Define FFU group assignments and RPM alarm limits.
- Define alarm limits for environment monitoring

The AstroDrive-Z3 has a digital output that signals a common alarm; and a digital input enabling a remote signal to stop the FFUs.

The AstroDrive-Z3 can monitor up to 12 Distributed Sensor Modules (DSMs) that can include pressure, temperature, and humidity. The sensors can monitor in either US or SI units.

The AstroDrive-Z3 can also log the data of the sensors and the FFUs.

The screen that comes up when the AstroDrive-Z3 is first energized and that is an appropriate screen to always leave up is the overview screen (top screen).



The banner at the top should be the name of the facility, the file symbol to the right of the name will indicate if data is being logged (See Node Status & Color Coding). The fan symbol to its right indicates the status of the FFUs (See Node Status & Color Coding). Underneath the banner are summary displays of the status of all rooms being monitored. The top line is the pressure reading for the room, the second line is the temperature, and the third line is the humidity of the room (See Node Status & Color Coding).

Modes & Nodes

The term 'node' in this manual refers to an FFU or Sensor. Nodes are assigned a unique identifier consisting of room name and unit #. The FFU's LAN address # is equal to its unit # (1 – 120). The Sensors are numbered 1 – 36 with up to three assigned per room.

The user can put each node –individually, all units in a room; or all units in the facility – in any one of the following modes:

Run– In this state, the fan runs at its commissioned speed. The fan is continuously monitored per user defined high and low limits. Neither the clock/calendar function nor the external standby switch will affect this node. The sensor nodes are monitoring the room condition against the run mode limits.

Standby– In this state, the fan runs at a reduced speed for energy savings during periods when the clean room is not in use. The fan is continuously monitored per user-defined high and low limits. Neither the clock/calendar function nor the external standby switch will affect this node. The sensor nodes are monitoring the room condition against standby mode limits.

Auto– In this state, the node operates in the run state until it automatically switches to its standby settings during periods defined via the clock/calendar function or an external standby switch. The sensor nodes are monitoring the room condition against either the run or standby mode limits.

Stop– In this state, the fan's speed is zero. All limit checking for this node is disabled. Communication between the node and AstroDrive-Z3 remains active. The sensor nodes stop actively monitoring the conditions in the room, the last good reading will continue to be displayed.

Offline– In this state, communication between fan and console is deactivated. The fan continues running at its latest speed setting. All limit checking for this node is disabled. The sensor nodes will stop monitoring the conditions in the room, the last good reading will continue to be displayed.

The AUTO state should generally be used for normal operation of the clean room.

The run and standby modes override the clock/calendar and the remote standby input.

Error Monitoring

The following errors are monitored at each node:

- Communication error on the LAN
- RPM high & low limits (run & standby) exceeded for EC FFUs
- Fan fault found on an FFU
- Sensor value high & low limits exceeded (run & standby)

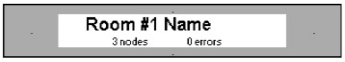
When an error is found the alarm is activated, and the error is recorded in the event log. Acknowledge the alarm (facility display) to turn it off.

THE NODE MUST BE TAKEN OFFLINE TO RESET ITS ERROR STATUS.

NODE STATUS & COLOR CODING

A node's status is indicated by the following color-coding scheme:

Red – Indicates the node has an **error** status. 

Grey – Indicates the node is in the **offline** mode. 

Blue – Indicates the node is in the **stop** mode. 

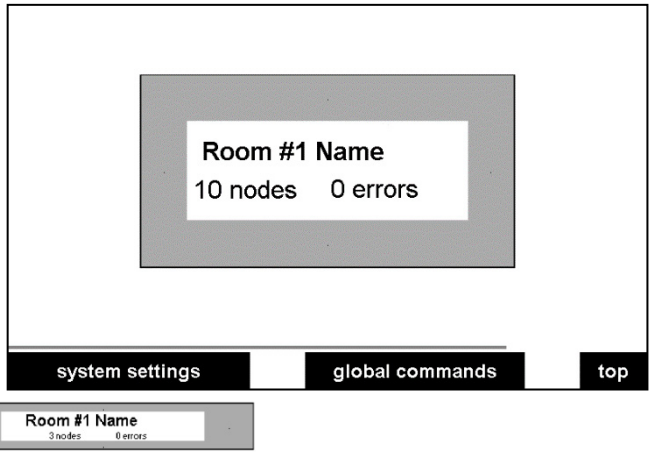
Yellow – Indicates the node is in the **standby** mode. 

Green – Indicates the node is in the **run** mode. 

The status of a group or of the facility is also indicated by the same color scheme. Priority levels for statuses are in the order listed above with Red (error) having the highest priority and Green (run) having the lowest priority.

GROUP OVERVIEW

This screen displays the status of up to 6 groups. The status of the room will be the highest priority of all the FFUs/Sensors assigned to that room



Touching a group icon will take you to the FFU/Sensor node screen to be able to control and monitor each individual FFU/Sensor assigned to that room. The line below the room name lists the number of FFUs/Sensors assigned to that room and the number of errors among those nodes.

If an error is found on an FFU/Sensor, the border will highlight red.

Global Commands (called from the Group overview screen)

In this screen the operator can set the run speed, or standby speed, or state for all fans in the system. The system is updated with the new values only after the 'update all' button is pressed. Press the 'cancel changes' button to abort the entry process without implementing the change. If the state is changed, the status of the Sensor nodes are changed to the same state (e.g. If you use the global command to put all the FFUs into the stop state, the sensors also are turned to the stop state and quit monitoring the status of the room). If you still want to monitor the cleanroom environment and data log the status, it is recommended that you do not use the Global Command functions to control the FFUs.

If auto state is selected, the fan may automatically switch to standby state per the user-defined clock/calendar standby periods and the external standby override input. If run or standby states are selected, the clock/calendar standby periods will not be implemented.

FFU/Sensor Node Displays

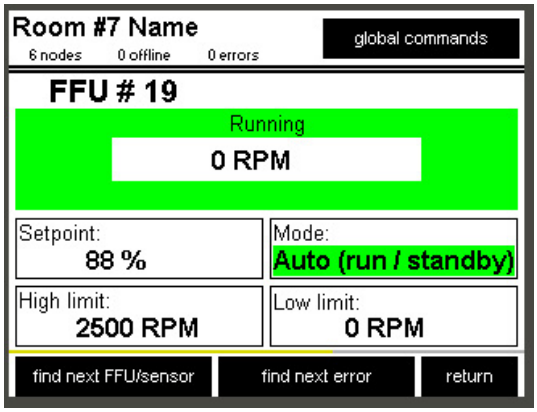
To view individual nodes, touch the respective group status button in the group overview display. Each node in the group can be displayed and modified. Global commands for each group can be executed here (only the nodes in the group are affected by the global command and not all nodes in the facility).

The 

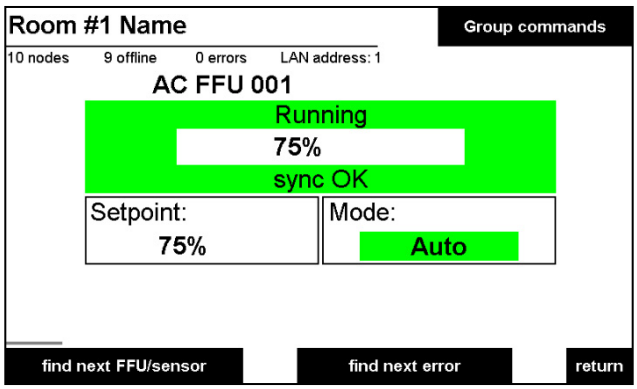
button allows the operator to navigate to the next fan/sensor in that group. The button allows the operator to quickly navigate to the next error fan/sensor in that group.

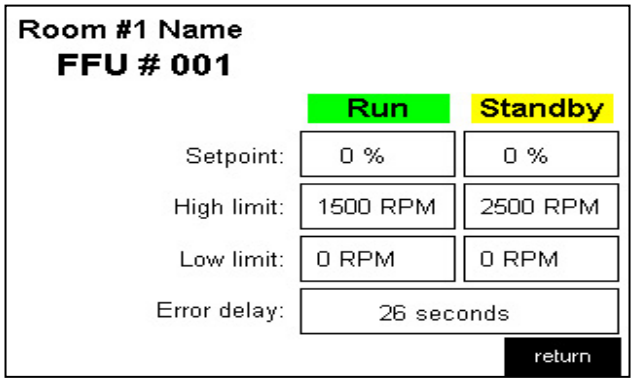
AC/EC FFU's

This screen shows the FFU's actual RPM value, set point, mode, and high/low alarm limits. If the FFU is an AC type, then the RPM value and alarm limits are not applicable. The FFU's LAN address # is equal to its unit #. The FFU's set points and high/low limits for the run and standby modes can be set via this screen by tapping one of the limit boxes.



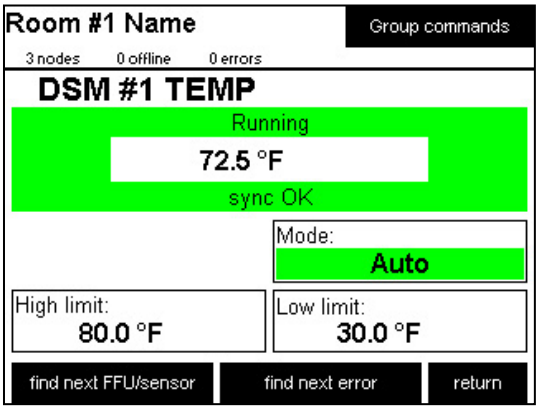
There are two different set point screens depending on the type of FFU used, AC or EC.



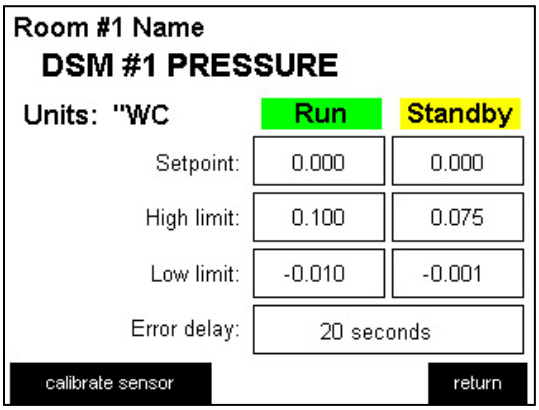


Sensors

This screen shows the Sensor's actual value, mode, and high/low alarm limits. The Sensor's set points and high/low limits for the run and standby modes can be set via this screen by tapping one of the limit boxes.



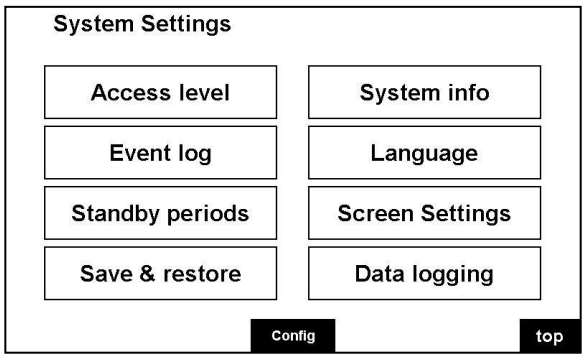
The sensor limits are set by clicking on the desired box and using the screen to enter the value.



Set point entry screen. Use the return button to enter the desired value. The ESC button will exit the screen without saving any entries.

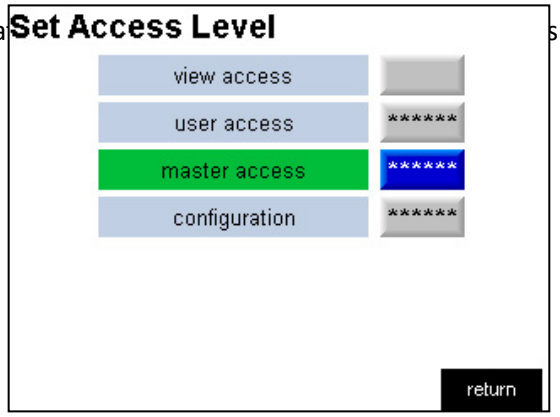
SYSTEM SETTINGS

When the 'System Settings' button is selected at the bottom of any screen, the following menu will be displayed. Selecting any of the buttons will take you to a new screen.



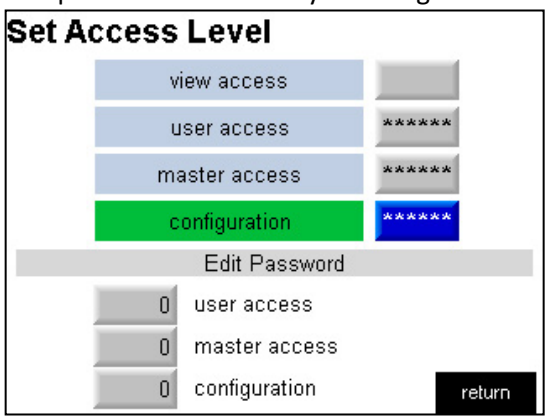
ACCESS LEVELS

Four levels of password-protected access are provided. These are:



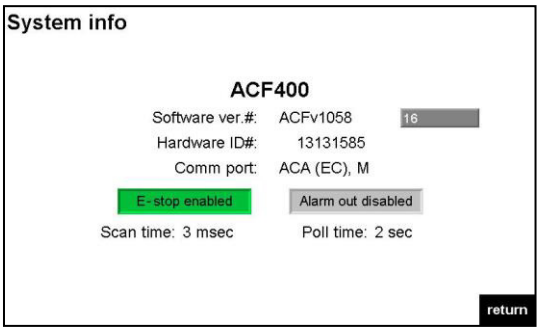
- View Access: The operator can only view the facility opera s. No changes are allowed. Page **8** of **17**
- User Access: The operator can view the facility operation, room operation and node setting screens. Operator has limited access to make changes.
- Master Access: The operator has complete access to all features and functions.
- Configuration: The operator has complete access to all features and functions and has the access to set the system up.

Default password is "0" without the quotes for all levels. The active level will always be highlighted in green. When in the Configuration mode, the operator has the ability to change and save passwords for each level access.



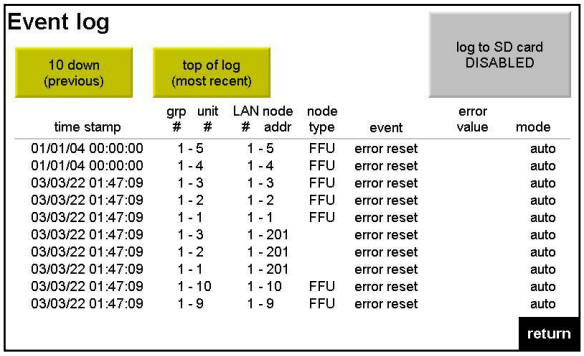
System Info

This screen displays basic information regarding the software version and system performance.



Event Log

A history of up to 1000 error messages and other events are logged by the ACC7. The most recent failure message is shown at the top of the list.



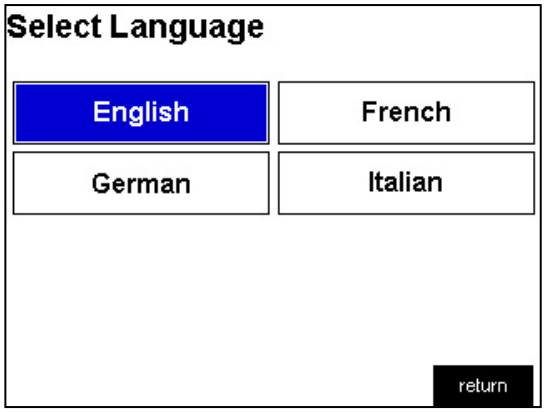
The error log can be automatically recorded to a micro-SD card. **The micro-SD card must be formatted using the Tools program** found in the Unitronics SD Card Suite and can be downloaded from this site:

http://www.unitronics.com/Content.aspx?page=Downloads.

The data on the SD card can be accessed remotely via the Ethernet using the SD Card Explorer in the Unitronics SD Card Suite. Alternatively, the SD card can also be read with a PC by physically inserting it in a memory card reader attached to that PC.

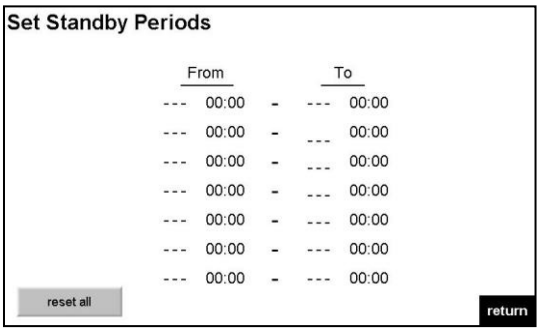
Language

You may select one of four languages for the systems to use for all screens.



Standby Periods

Seven standby periods can be programmed by weekday and time. Each period may extend over multiple days. Clicking on the "---" will toggle the operator through the days of the week, starting with Sunday. The time is clicking on the "00:00" and an entry screen will come up.



Time entry screen.

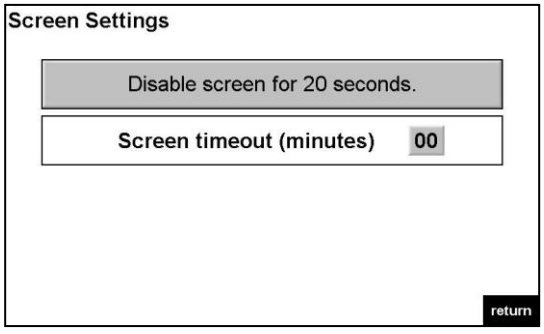
The programmed standby periods will only affect nodes in the auto mode.

The "Reset All" button will reset all periods to zero.

Screen Settings

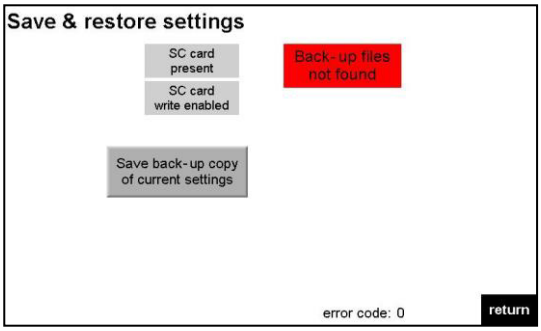
The operator may set the time for the screen to go to sleep. The operator may set the screen to sleep for 20 seconds by pressing the upper button

The screen timeout parameter determines when the AstroDrive-Z3's screen will black out when the screen has not been touched. If the value is 0, then the screen will never black out.



Save and Restore

A back-up copy of the current node settings (all fans and sensors) can be saved to a micro-SD card inserted in the AstroDrive-Z3. A saved copy can also be restored (written) to the AstroDrive-Z3.

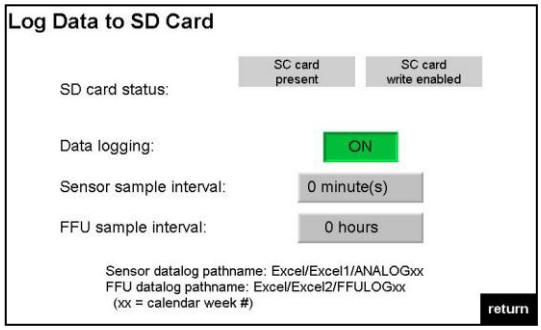


This feature is useful once the fans have been commissioned on site. Saving a back-up copy of the fan settings provides assurance that these will not be lost and can easily be rewritten to the AstroDrive-Z3.

The micro-SD card must be formatted using the Tools program found in the Unitronics SD Card Suite and can be downloaded from this site: http://www.unitronics.com/Content.aspx?page=Downloads.

Data Logging

A continuous record of each fan's state and RPM (for EC fans) and each sensor's measured value and state can be stored on a micro-SD card inserted in the AstroDrive-Z3.



The top two buttons alert the operator that an SD card is available and formatted correctly to receive data.

The button next to "Data logging" toggles data logging on or off.

The operator can use the button next to "Sensor Sample Interval" to select how often data will be logged.

The operator can use the button next to "FFU Sample Interval" to select how often data will be logged recording the operation of the FFUs.

The sampling period for sensor data can be set in increments of 1 minute, and for fan data in increments of 1 hour.

The micro-SD card must be formatted using the Tools program found in the Unitronics SD Card Suite and can be downloaded from this site: http://www.unitronics.com/Content.aspx?page=Downloads.

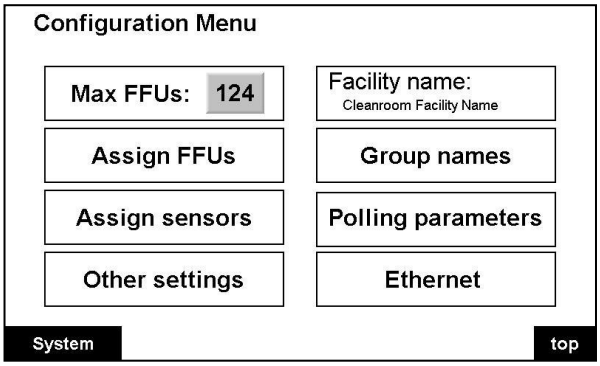
The data on the SD card can be accessed remotely via the Ethernet using the SD Card Explorer in the Unitronics SD Card Suite. Each week a new file will be created in the EXCEL1 subdirectory. The filenames will have a 2-digit suffix indicating the ISO calendar week # of the sample data.
The timestamp recorded in the data log is the number of seconds since 31 Dec 1899 at 00:00 AM. The Excel cell formulas for extracting the date and time from the timestamps are:

Date cell formula: =2+TRUNC('timestamp'/(24*60*60)) *Note: cell formatted for a date value*

Time cell formula: =MOD('timestamp'/(24*60*60)) *Note: cell formatted for a time value*

CONFIGURATION MENU

The "Configuration" button will appear at the bottom of the System Settings screen if the user is in the Configuration Access Level. Selecting most of the buttons on the Configuration Menu will take you to a new screen.



MAX FFUS

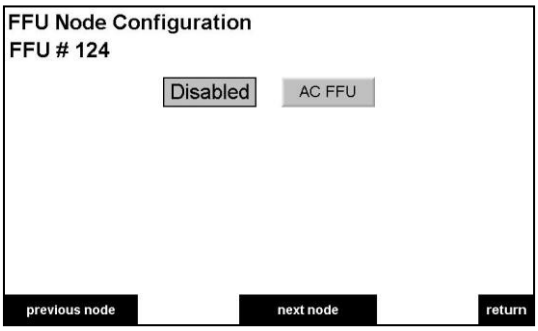
This parameter determines the highest FFU address allowed. This value must be less than or equal to 120. FFUs within the range allowed can be disabled (see 'FFU nodes'). NOTE – The FFU unit # is equal to its LAN address.

FACILITY NAME

Selecting the "Facility Name" button brings up a keyboard to allow the operator to enter the name of the facility. 24 characters, including spaces, are allowed. The  buttons in the upper left corner change the keyboard to lower case or special characters for use in entering the name.

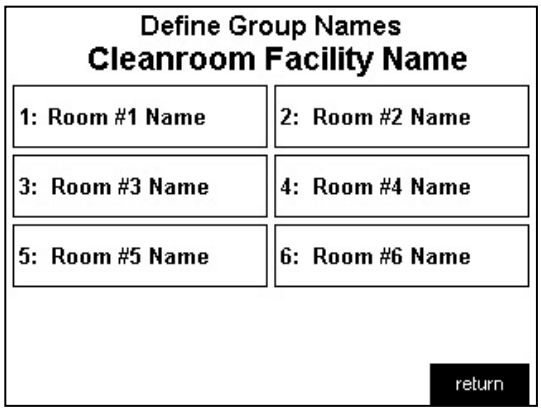
ASSIGN FFUS

Selecting the "Assign FFUs" button brings up a screen to allow the operator to enable/disable each FFU and to assign a type to each unit. The FFU unit # is equal to its LAN address. An EC FFU is an Envirco LEDC or MAC 10 IQ unit. An AC FFU is an Envirco LEAC unit. Information on Envirco FFUs can be found at https://www.envirco-hvac.com/products/index.aspx .



GROUP NAMES

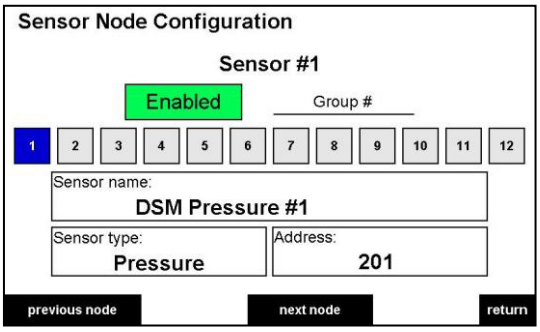
Selecting the “Group Names” button will bring up a screen with the names of all the rooms in the facility (maximum allowed is 6). Clicking on the desired room button takes the operator to a entry keyboard. The name of each room may be entered, 12 characters, including spaces, are allowed. The address of the Distributed Sensor Modules (DSMs) is the room number plus 200, i.e. 201 – 206.



The  in the upper left corner change the keyboard to lower case or special characters for use in entering the name.

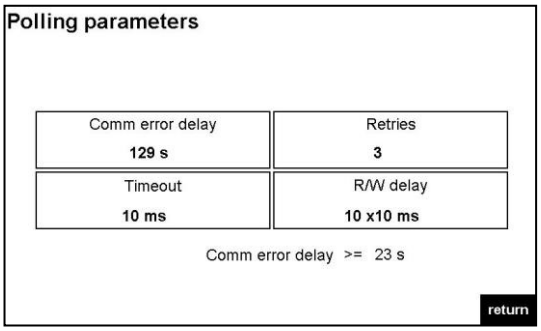
ASSIGN SENSORS

Selecting the “Assign Sensors” button brings up a screen to allow the operator to enable/disable each sensor and change names if required. The room number for the sensor is displayed. Each DSM can have a pressure sensor, temperature sensor and humidity sensor. The standard configuration is all three. Use the previous node next node buttons to cycle through all sensors and ensure they are enabled/disabled as required.



POLLING PARAMETERS

Polling parameters affect the communication between the controller and the FFUs/Sensors. It is recommended that the comm error delay should be a minimum of 20 seconds + 1 second per FFU. For example, if 25 FFUs are enabled, then the comm error delay would be 45 seconds. Retries specifies how many times the system will try to communicate before an error message is generated.

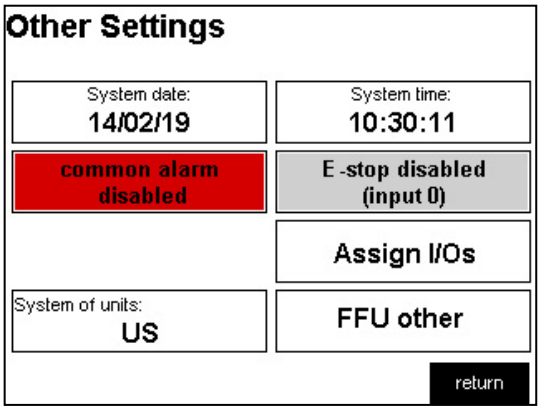


OTHER SETTINGS

The system's current clock and calendar can be set here.

Common alarm is a signal that is sent out to notify operators that there is an alarm in the system and that attention should be given it. The common alarm does not specify the type of alarm, the system must be queried to determine the type of alarm.

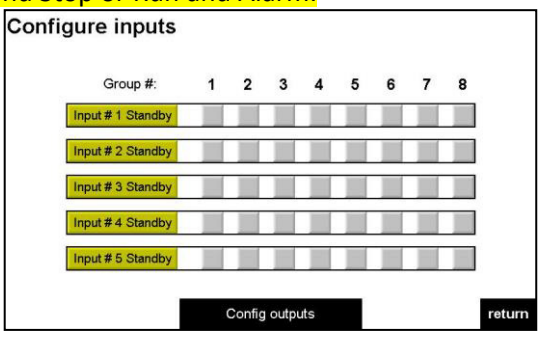
If the alarm output is enabled, then relay output #0 will close when any alarm is raised. This will also cause a red 'alarm' screen to be displayed on the screen.

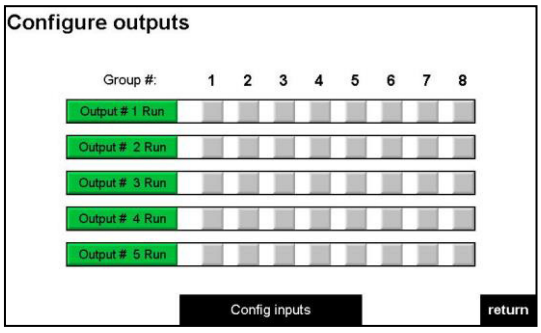


The email notification function can be disabled here.

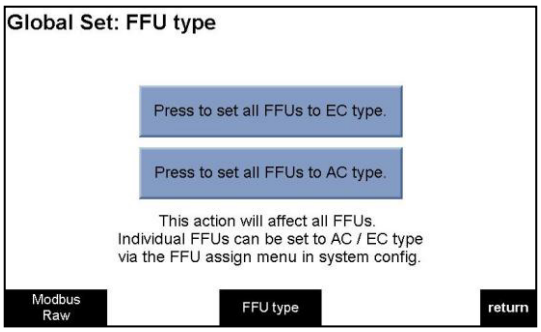
E-stop: The FFUs will all stop, regardless of their mode, if input #0 is activated by an external signal. This signal can be either normally closed (active when open) or normally open (active when closed). IMPORTANT: THE EXTERNAL SIGNAL MUST BE VOLTAGE-FREE.

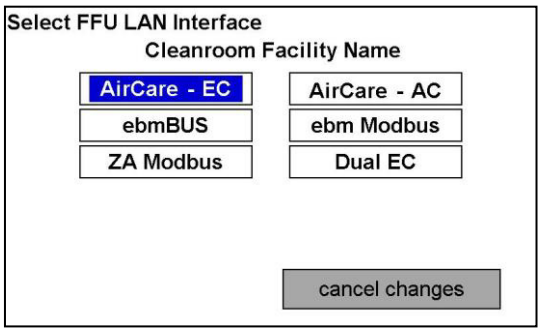
The "Assign I/O" button allows the operator to assign Inputs and Outputs to groups and toggle them between Standby and Stop or Run and Alarm.





Toggling the "System of Units" button switches display between US units to SI units. The "FFU Other" button allows an operator to globally change the types of FFUs and to set the communication type.

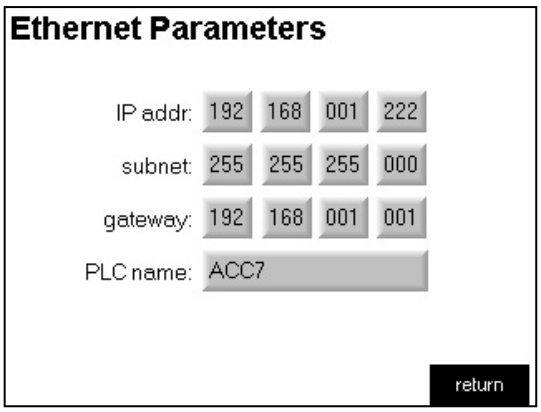




ETHERNET

This display allows the user to define the:

- Unit IP address
- Subnet mask Page **15** of **17**
- Gateway (or router) IP address
- PLC name – max 8 characters, case sensitive, must be unique on the LAN



The IP address is the address of the AstroDrive-Z3 (PLC) unit. This must have the same subnet address as the host PC, router, or gateway to which the AstroDrive-Z3 (PLC) is directly connected.

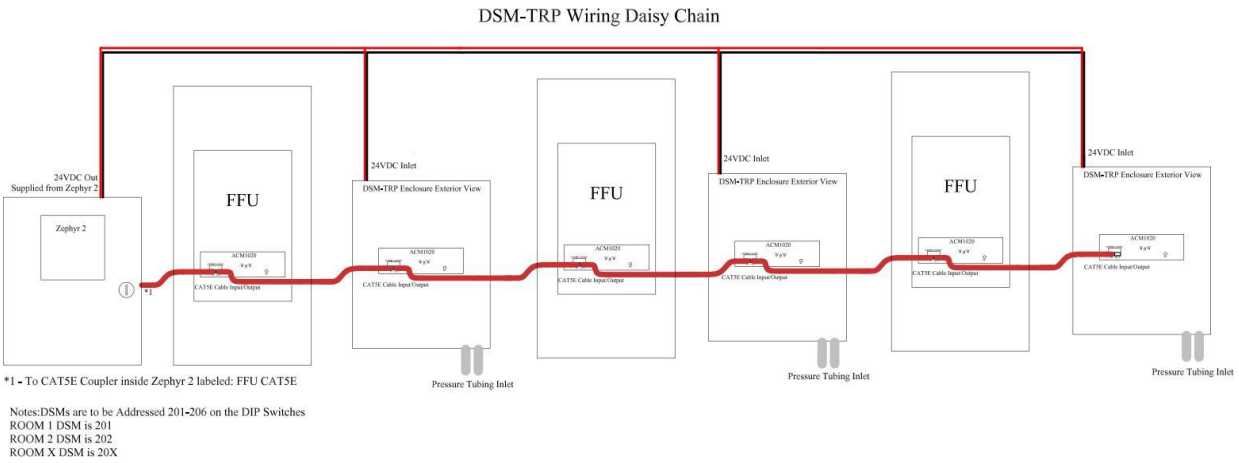
The subnet mask depends on the type of network employed. In almost all cases the subnet mask will be either 255.255.0.0 (for a medium-sized intranet) or 255.255.255.0 (small networks). The former reserves last two octets in the IP address for the subnet address. The latter reserves only the last octet for the subnet address.

The default gateway address is the IP address of the host PC, router, or gateway to which the AstroDrive-Z3(PLC) is directly connected.

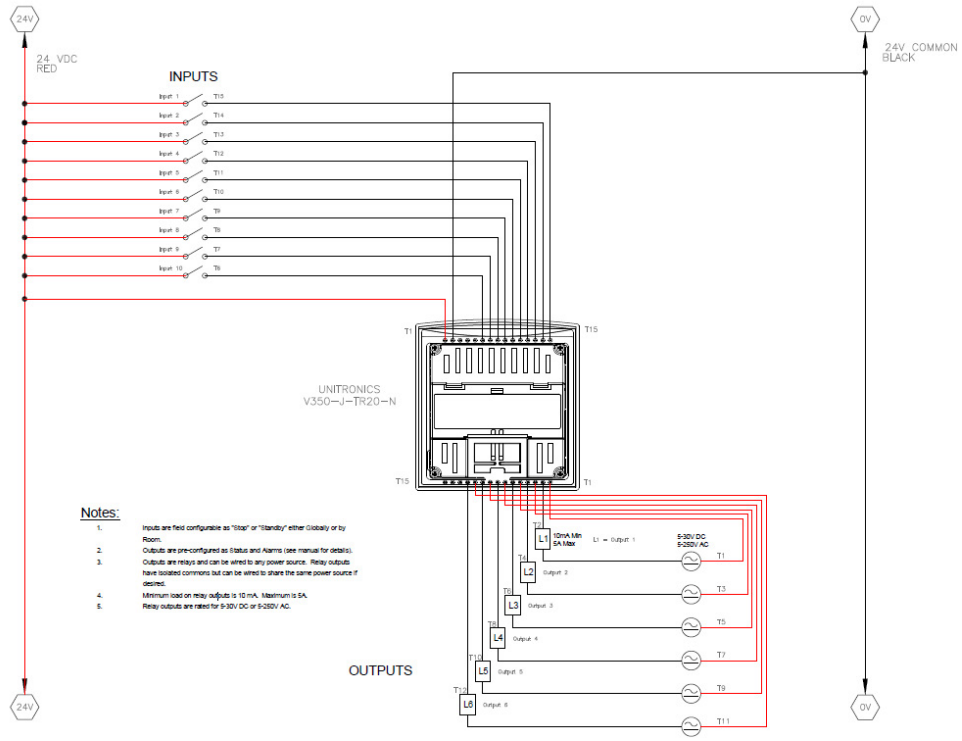
The PLC name consists of up to 8 ASCII characters. This is required and used as a unique identifier by all programs that employ the Ethernet connection to communicate with the AstroDrive-Z3. Examples of such programs are: Remote Operator, UniOPC Server, and UniDownLoader. The correct capitalization is necessary for using this name in application programs.

AstroDrive-Z3 Wiring Diagram

A) Network communications cable diagram



B) I/O wiring



Power Supply

The controller requires an external 24VDC power supply.

The power supply must include double insulation. Outputs must be rated as SELV/PELV/Class2/Limited Power. Use separate wires to connect the functional earth line (pin 3) and the 0V line (pin 2) to the system earth ground. Install an external circuit breaker. Guard against short-circuiting in external wiring. Double- check all wiring before turning on the power supply. Do not connect either the 'Neutral' or 'Line'

signal of the 110/220VAC to device's 0V pin. In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

ACC 7072 Wiring Diagram