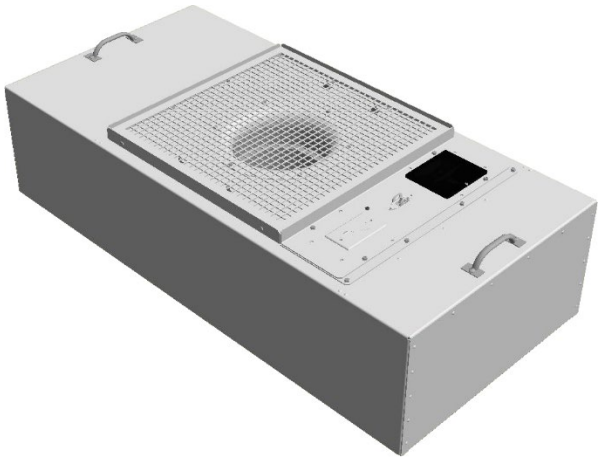
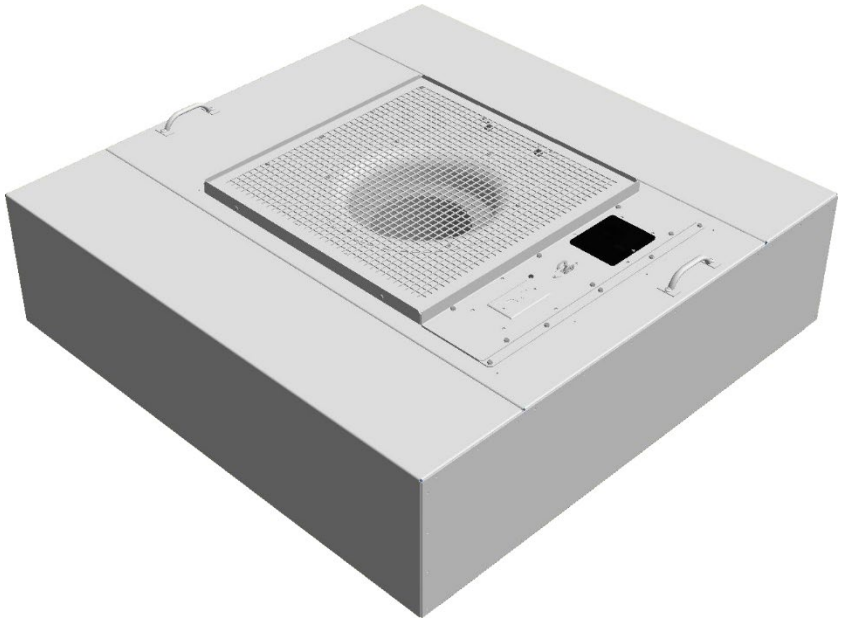
NORTEK AIR SOLUTIONS
CLEANPAK

FAN FILTER UNIT
CLEANPAK MODEL CPFFU-EC-ZA

INSTALLATION & OPERATION MANUAL





READ THESE INSTRUCTIONS PRIOR TO USE
KEEP FOR FUTURE REFERENCE

Observe the following to reduce the risk of fire, shock, or injury:
In accordance with all applicable standards and codes, only qualified personnel shall perform this work. Check for hidden utilities, particularly electrical lines, with building owner and other contractors prior to cutting or drilling into walls, floors, or ceilings. Switch power off at electrical service panel and lock out/tag out electrical panel prior to servicing or working on unit. Unit should not be serviced at installation site even if electrical power is turned off.
Use this unit only in the manner that the manufacturer intended it to be used. Using this unit in a manner not specified by the manufacturer may result in damage to persons or material property. The manufacturer will not be liable for any such damages resulting from non-intended use.

Unit is electronically protected. For technical specifications and electrical power supply requirements, refer to the job-specific submittal package.

WARNING - ELECTRICAL SHOCK HAZARD. CAN CAUSE INJURY OR DEATH. DISCONNECT ALL REMOTE ELECTRIC POWER SUPPLIES BEFORE SERVICING. USE COPPER SUPPLY WIRES.
UNIT CONTAINS PERMANENT MAGNET MOTORS. HIGH VOLTAGE CAN BE GENERATED WHENEVER THE MOTOR IS ROTATING, EVEN IF POWER IS OFF. ALWAYS MAKE SURE MOTORS CANNOT ROTATE DURING SERVICING.
AVERTISSEMENT - RISQUE DE CHOC ELECTRIQUE. PEUT CAUSER DES BLESSURES OU LA MORT. DÉBRANCHEZ TOUTES LES ALIMENTATIONS ÉLECTRIQUES À DISTANCE AVANT L'ENTRETIEN.
UTILISER DES FILS D'ALIMENTATION EN CUIVRE.
L'UNITÉ CONTIENT DES MOTEURS À AIMANTS PERMANENTS. UNA HAUTE TENSION PEUT ÊTRE GÉNÉRÉE LORSQUE LE MOTEUR TOURNE, MÊME SI L'ALIMENTATION EST COUPÉE. ASSUREZ-VOUS TOUJOURS QUE LES MOTEURS NE PEUVENT PAS TOURNER PENDANT L'ENTRETIEN.

CAUTION - Do not obstruct air intake or stand on the pre-filter rack or fan intake.
Unit contains rotating parts. Fan may continue to rotate without electrical power due to back pressure within the building system. Ensure that fan has completely stopped running before conducting internal inspection. Do not put fingers into the unit or touch fan wheel during operation to avoid serious injury.
Power wiring must be connected by qualified personnel.
Avoid electrical shocks to power cable and cable connector. Ensure power cable and cable connectors are not damaged. Ensure that wiring is properly connected.
Do not attempt to reconstruct this unit. Contact factory for information and service.
Unit must be installed at least 8 feet above floor.
EXTERNAL WIRING SHALL COMPLY WITH THE REQUIREMENTS FOR A CLASS 1 CIRCUIT.

ATTENTION - Ne bloquez pas l'admission d'air et ne vous tenez pas sur la grille du pré-filtre ou sur l'entrée du ventilateur. Assurez-vous que le ventilateur a complètement cessé de fonctionner avant de procéder à une inspection interne. L'unité contient des pièces en rotation. Le ventilateur peut continuer à tourner sans alimentation électrique en raison de la contre-pression. Ne mettez pas vos doigts dans l'appareil et ne touchez pas la roue du ventilateur pendant le fonctionnement pour éviter des blessures graves.
Le câblage électrique doit être connecté par du personnel qualifié.
Évitez les chocs électriques sur le câble d'alimentation et le connecteur de câble. Assurez-vous que le câble d'alimentation et ses connecteurs ne sont pas endommagés. Assurez-vous que le câblage est correctement connecté.
N'essayez pas de reconstruire cette unité. Contacter l'usine pour plus d'informations et de service.
L'unité doit être installée à au moins 8 pieds du sol.
LE CÂBLAGE EXTÉRIEUR DOIT ÊTRE CONFORME AUX EXIGENCES APPLICABLES AUX CIRCUITS DE CLASSE 1.

Service
Replace parts only with factory approved parts of like duty.

Warranty
Manufacturer warrants products to be free of defects in material and workmanship if properly installed, cared for, and operated under normal conditions with competent supervision.
The warranty period is one year from date of start-up or 18 months from date of shipment, whichever occurs first. All material or equipment found to be defective within this period shall be replaced or repaired to like-new condition, including all parts (excluding final filters) and labor at no cost. Manufacturer assumes no liability for expenses or repairs made by unauthorized personnel. This warranty shall be considered void if equipment failure is the result of mishandling, abuse, operation beyond capacities, or from other external sources. All components including miscellaneous ship-loose items must be stored in a dry, climate-controlled indoor area. Manufacturer assumes no liability for damage to equipment caused by outside storage. Equipment must be stored in dry, indoor storage.
Refer to purchase agreement for further warranty terms.

Components
Fan housings in boxes and/or palettes.
Final filters (ULPA or HEPA) from original filter manufacturer in separate boxes (optional). Follow filter manufacturer's instructions for handling.
Final filter cartridges (for bottom-load filter option) on separate pallets.
Optional handheld A-G-247NW control terminal.

Handling
Prior to any assembly or installation work, perform a physical count of all items on the master ship list. Report any shortages to the factory immediately.
Handle all parts with care to prevent damage during installation. Parts are cleaned and wrapped to factory standards at the factory. FROM RECEIPT THROUGH COMPLETE INSTALLATION, THE INSTALLER IS RESPONSIBLE FOR HANDLING ALL PRODUCTS ON THE JOB SITE.
After receiving the parts from the shipper, do not store them outside. Do not store them in high-traffic or unprotected areas.
All parts should be stored in a controlled environment, especially when delivered to job sites with variable (hot or cold) or humid climates. The optimal storage temperature is 70° F (21° C).
It is the responsibility of the installer to protect the parts from damage at all times. Manufacturer does not take responsibility for damage to packaging that may result in damage to the parts.
All parts should be unpackaged in a manner consistent with site/project specific protocol requirements.
Avoid double handling of parts.
Unpack all parts in protocol-approved area prior to moving parts into staging area to be installed.
Wipe down parts as required by protocol taking care not to scratch painted surfaces.
WHEN UNPACKAGING FILTER MEDIA, TAKE CARE IN REMOVING THE PLASTIC BAG SO THAT THE MEDIA IS NOT SCRATCHED IN ANY WAY. DO NOT PUT ANY TYPE OF FORCE, EVEN BY HAND, ON FILTER MEDIA (INCLUDING FACE SCREEN) DURING HANDLING AND INSTALLATION SINCE IT WILL DAMAGE THE FILTER.
JERKING THE FFU WHEN IN A SIDEWAYS ORIENTATION OR DROPPING IT CAN DAMAGE INTERNAL COMPONENTS.

Installation

Scope
Supply and hookup of all power wiring, communication cabling, gateways, PLC, and screen setups, if applicable, are not in CLEANPAK's scope.

Installation instructions by FFU configuration

FFU on top-load filter

For the FFU on top-load filter option, install filter onto grid with the appropriate gel or gasket seal. Place FFU atop filter. See **Power wiring** and **FFU control** for electrical and data cable setup.

FFU on bottom-load final filter cartridge

If bottom-load final filter cartridges are provided as an option, install these cartridges into the grid system with the appropriate gel or gasket seal. Place FFU atop filter cartridge. Prior to installing the final filter, check that the clip is at a height just below the bottom of the final filter when fully seated. With the clips rotated against the side of the cartridge, install final filter into the cartridge and then rotate out the clips in the cartridge to hold the final filter. Turn the bolt (counter-clockwise when looking up from the bottom) to raise the clip to hold the final filter in place. The bolt to raise the clip should not be over-tightened—it should be turned just enough for the filter to seat completely against the bottom surface of the top ledge of the cartridge. Use a miniature ratcheting box-end wrench to turn the bolt—this is available by contacting the factory or at automotive stores. See **Power wiring** and **FFU control** for electrical and data cable setup.

Bottom-load FFU and final filter

A. De-energize the electric circuit to the install area.
B. Follow the original filter manufacturer's handling instructions at all times. Do not rack or twist the filter or put pressure (even hand pressure) on the filter media or face screen at any time. It is recommended that two people handle each filter install and that lifts/jigs be used where appropriate to facilitate a safe install.
C. Contractor to install a code compliant flexible electrical power connection to the FFU.
D. Rotate the clip tabs away to be next to the grid member so that the filter can be pushed up as shown in Figure 1. The nut on the clip may need to be loosened a bit to rotate the clip tab. Also remove the triangular plates and two screws shown in Figure 3. The plates and screws will be used for re-install later.
E. Place the filter assembly on top of the FFU hoist. Make sure the filter is seated correctly upon the hoist. There should be minimal movement when attempting to slide the filter while on the hoist. The outer catches should be engaged, preventing the filter components from falling off the lift. It is important to make sure no part of the filter media is in contact with the hoist.
F. Inspect the gel/gasket in the filter channel to see that it is not damaged.
G. Once the filter is settled on the hoist, install the FFU on top of the filter. The FFU should slide inside of the outer edge of the filter unit and rest on a gasketed ledge. Make sure the FFU is seated uniformly around the filter unit and is level. The completed assembly is shown in Figure 2.
H. Coil the field-provided electrical connection cable on top of the FFU unit so it is not in the way during the install.
I. Roll the FFU hoist into position underneath the ceiling install location.
J. Take care when raising or lowering the lift to make sure the FFU does not fall or catch on anything. Because the fan unit is not permanently attached to the filter, they could separate.

Figure 1. Non-walkable bottom load filter clip shown rotated out of the way for filter installation. Rotate out perpendicular to grid and tighten nut.

Figure 2. FFU shown on top of lifting hoist.

K. Raise the lift to an elevation where the electrical and data connections can be made. Make the electrical connection to the incoming power source from an adjacent opening, or if it needs to be made from the same opening, do this with a flexible connection prior to fully raising the assembly up into the opening. Also make the data connection from an adjacent opening. See **Power wiring** and **FFU control** for detailed connection information.

L. Tuck the excess cables away into the ceiling or on top of the FFU so it will be out of the way when the unit is installed the rest of the way into the ceiling.

M. Carefully raise the assembly flat and level into the grid opening until the gel in the filter channel engages the knife-edge in the bottom load grid. Be careful when seating the filter within the grid opening so that the lift does not to put excessive force on the ceiling.

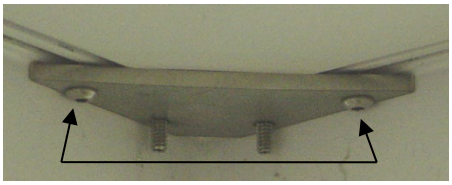


Figure 3. FFU on bottom-load filter or walkable bottom-load filter clip at corners of grid opening. Torque the screws.

N. Bottom-load FFUs (and any walkable bottom-load accessories) require special plates be installed in the corners, as shown in Figure 3. Slip the corner triangular plate over the set screws. Place the split lock washer under the head of the button head screw. Tighten plate evenly. Torque the button head screws to 24 in.-lbs. Note: The set screws pictured are for alignment purposes. No nuts are required on the set screws.

O. Rotate the 4 clip tabs shown in Figure 1 out perpendicular to the grid member to support the filter. Tighten the nuts as required.

P. Once the FFU is installed release the pressure in the lift and slowly lower the lift until the lift is returned to its starting position.

Reverse the above instructions for removal of filters.

Major internal electrical components

Double-Pole Toggle Switch

Electronically commutated brushless DC motor with integrated controller and Modbus RTU communication

FFU Interface

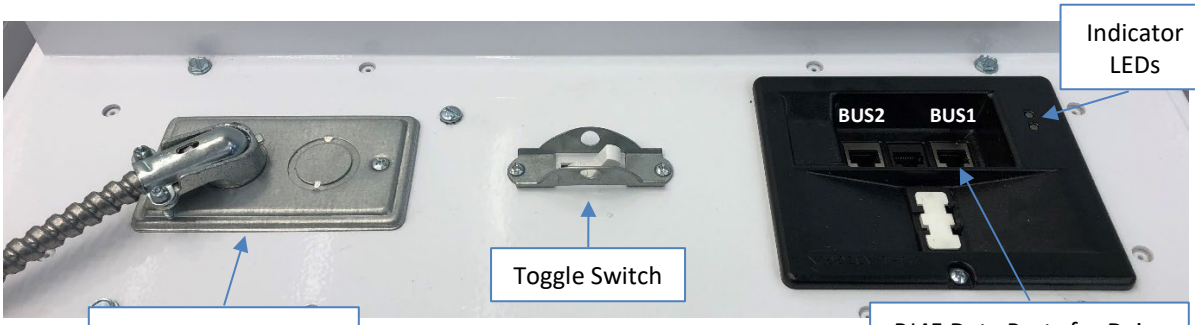


Figure 4. Typical FFU Interface

Power wiring

Wire the 200-277VAC single-phase power into the junction box on top of each FFU. Check the label for the correct voltage of the specific unit. This should be performed by a qualified electrician with all appropriate safety measures. The input power wiring into the junction box can be as follows (or follow specific site wiring requirements):

black = hot

white = neutral
green = ground

Operation
Energize the switch on top of the FFU.

Misalignment of cone
If a ticking noise is heard it may be the wheel rubbing against the cone due to misalignment during handling or installation. Flip the switch off and lockout at the disconnect switch and at all appropriate points based on the site safety requirements. Remove the inlet finger guard. Be extremely cautious as the wheel may be back-spinning due to air pressure from other FFUs, even with power off. If the wheel is back-spinning, place plastic film across the lower face of the FFU to stop airflow — this should stop the wheel from back-spinning. Loosen the screws on the inlet cone and readjust the cone ensuring that there is uniform gap all around between wheel and cone. Tighten the cone screws. Replace the inlet guard.

Replacing the Top Plate Assembly (TPA)
The TPA includes the electrical enclosure, inlet cone, fan wheel, motor with integrated controller, and baffle. If it becomes necessary to remove the TPA, switch the FFU off and lockout at the toggle switch and at all appropriate points based on the site safety requirements. Remove the inlet finger guard. Be extremely cautious as the wheel may be back-spinning due to air pressure from other FFUs, even with power off. If the wheel is back-spinning, place plastic film across the lower face of the FFU to stop airflow — this should stop the wheel from back-spinning. Remove the screws on the perimeter of the TPA. Lift the TPA out of the FFU housing. If necessary, disconnect the two cables from the back of the motor.

To replace the TPA: a qualified electrician should disconnect power from the old TPA and reconnect to the new TPA. Follow the above steps in reverse to re-attach the TPA to the FFU.

To replace motor/wheel: disconnect the two cables from the back of the motor. Remove the hex screws attaching the motor bracket to the top plate. Remove the socket screws attaching the motor to the motor bracket. Save all hardware to mount the new motor/wheel. Follow these steps in reverse to install the new motor/wheel and re-attach the TPA to the FFU.

FFU control
The FFU is designed to communicate on a network via Modbus RTU. To connect an FFU to the network, use a Category 5 plenum-rated patch cable with an RJ45 connector to plug into the BUS1 port on the FFU Modbus card. Multiple FFUs can be “daisy-chained” in series (up to 62 per Modbus Master line), with each cable connecting BUS2 of one FFU to BUS1 of the next, as in Figure 5. Refer to the layout-specific drawing for the job.

There are 3 options for controlling the FFUs on the network, depending on the system selected:

- Handheld Terminal: Refer to the **Handheld Terminal** section in the back of this manual.
- Dedicated Control System Module: **Control System Module** supplied and installed by others.
- Building Management System: For this option, all hardware, gateways, and software are supplied and installed by others. Refer to the **Direct Networking to BMS** section in the back of this manual.

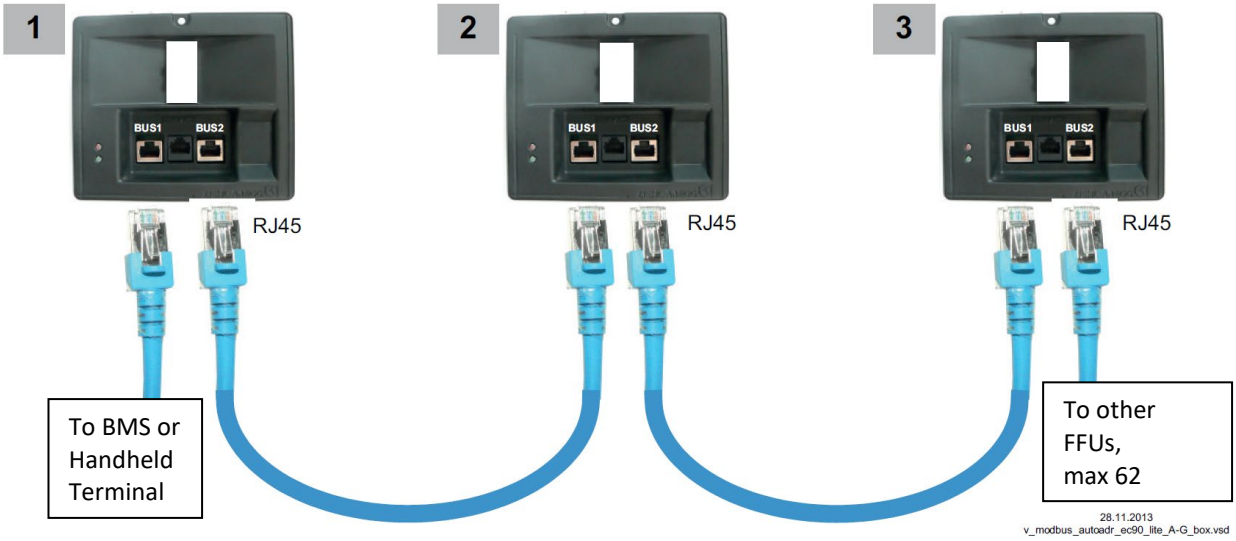


Figure 5. Networking FFUs using Cat5 cables.

OPTIONAL HANDHELD TERMINAL A-G-247NW

NAS P/N: 290-00-122

Connect to FFU for Service

Refer to the Figure 6 to connect the handheld to the FFU. With the FFU connected to power and switched on, plug the Handheld Terminal into the middle "Service" RJ45 port on FFU. Ensure the BUS1 and BUS2 ports are disconnected.

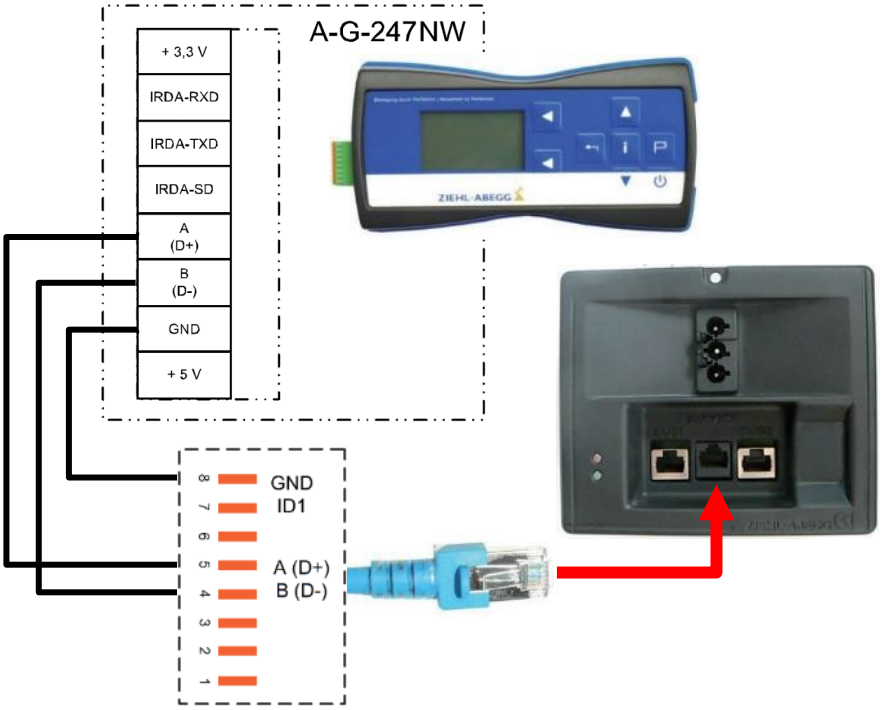


Figure 6. Handheld Terminal to FFU connection

Power on the Handheld Terminal (⏻ in Figure 7).

Navigation

Use ▲ and ▼ to navigate the current menu, use **(P)** to select the highlighted option, and use (⮌) to return to the previous menu.

Figure 7. Handheld Terminal Buttons

Establish Connection to FFU

From the Main Menu, select AM-MODBUS App's → Configuration online → RS-485. On the Select Device screen, confirm the device Modbus address (factory default is 247). If the Handheld Terminal successfully connects to the FFU, the display should look similar to the last screen in Figure 8.The Speed display shows the current RPM of the FFU motor.

If the screen instead displays "**NSG, Fanbad**", there is a communication error with the FFU. Either an invalid address was entered, or the connection via the Cat5 cable is not functioning.

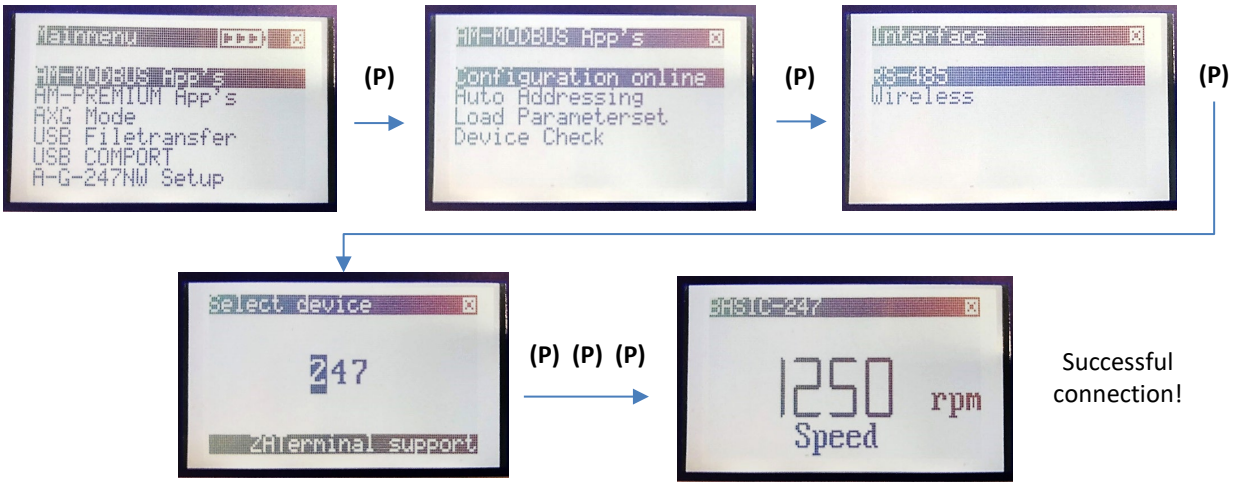


Figure 8. Navigating menus to connect to FFU.

Adjusting RPM

The FFUs are set to Control Mode 1 at the factory. If you want to adjust speed on a particular FFU locally you need to change to Control Mode 4. From the Speed display, press (⮌) to reach the FFU top menu. Press ▼ to reach the Controller Setup menu heading and select using **(P)**. The first item is Controlmode; press **(P)** to edit, and use ▲ to change the value to 4. Speed can now be adjusted using the Handheld Terminal.

Press (⮌) to return to the FFU top menu. Press ▼ to reach the Setting menu heading (Figure 9) and select using **(P)**. The first item in the Setting menu is Set Intern 1, the stored RPM value that sets the motor's Speed. To adjust the value, press **(P)** again. The thousands digit starts flashing; use ▲ and ▼ to select a value. Repeat for each digit of Set Intern 1. Then press **(P)** again to confirm the change. Set Intern 1 will display the chosen value, and the motor will adjust to match the new speed setting. Press **(i)** to return to the Speed display to confirm the motor RPM.

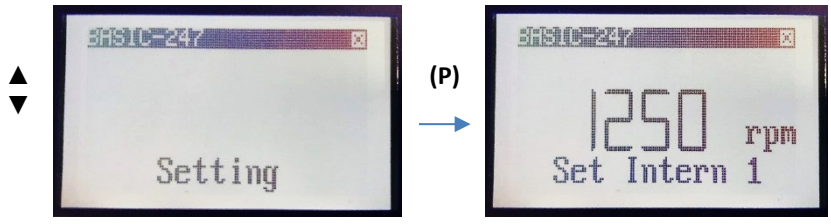


Figure 9. Speed adjustment via Set Intern 1

Setting Modbus RTU Addresses

All FFUs come set to address 247 from the factory. The address on all FFUs needs to be set to a unique value either manually or with the Auto Addressing function.

Manually Address an Individual FFU

The Handheld Terminal can assign a unique address to an individual FFU. Repeat this process with each FFU, ensuring that no duplicate addresses are assigned. For more information refer to the detailed manual for the A-G-247NW Handheld Terminal.

1. Connect the Handheld Terminal to the middle "Service" RJ45 port on the FFU, as in Figure 6, with BUS1 and BUS2 disconnected.
2. Follow instructions above for establishing connection to the FFU.
3. Press (⮌) to return to the top-level motor menu.
4. Press ▼ to find **IO Setup.** Press **(P)** to select.
5. Press ▼ to find **Bus Address.** Press **(P)** to adjust the **Bus Address.**
6. Enter new address. Press and hold ▼ to count down faster. Press **(P)** to confirm entry.
7. Press the top left ◄ to return to the main menu.
8. Flip the FFU power switch to OFF (keep the handheld connected to the FFU).
9. Wait for the green LED on the FFU to turn off (takes about 20 seconds), then flip the switch ON. This power cycle applies the new address to the FFU.

Auto Addressing a Line of FFUs

The Handheld Terminal can automatically address all FFUs that are directly attached on the communication daisy chain line. The FFUs are addressed sequentially, starting from the Handheld Terminal (e.g., the first FFU gets address 1, the second gets address 2, etc.).

Connect the Handheld Terminal to the FFU daisy-chain as shown in Figure 10. Note that ID1 (pin 7) is bridged to GND (pin 8) at the Handheld; *this is critical to the auto-addressing function.*

Ensure all FFUs are powered on. On the Handheld Terminal, from the Main Menu select AM-MODBUS App's → Configuration online → Auto Addressing. When prompted, press **(P)** to start auto addressing. Confirm that the number of addressed members matches the number of FFUs on the line.

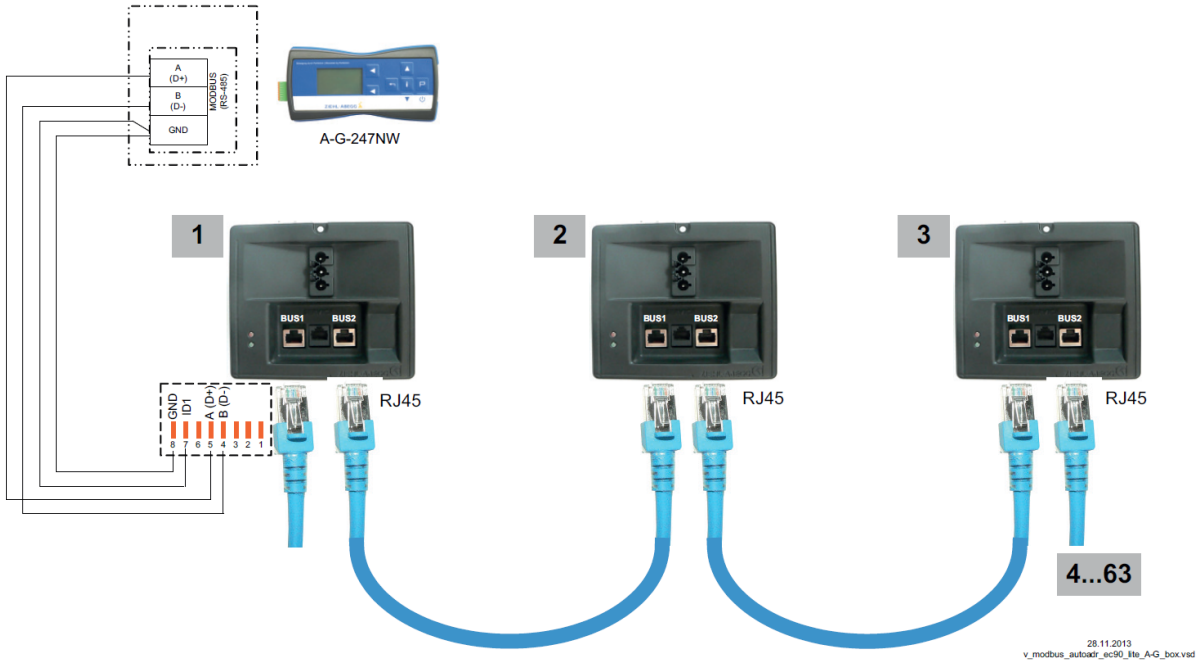


Figure 10. Connecting Handheld Terminal to FFU daisy chain for auto-addressing.

OPTIONAL DEDICATED CONTROL SYSTEM MODULE (BY OTHERS)

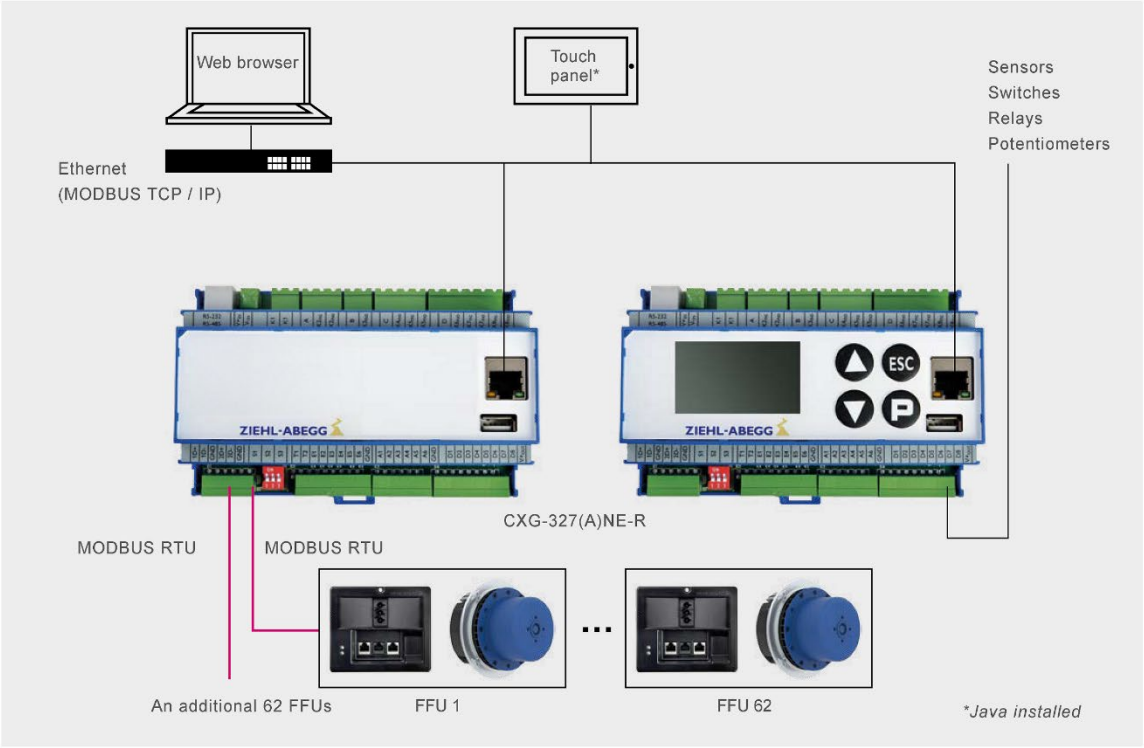
Control module
UNIcon CXG-327 (A)NE-R

Premium control module UNIcon CXG-327NE-R

NAS P/N: 290-00-123

- Connect up to 124 fans via MODBUS RTU (2 master channels)
- 6 PID controllers integrated
- Integrated real-time clock and timer
- I/Os for connection of sensors and other field components (6 analog inputs, 8 digital inputs, 6 analog outputs, 7 relays)
- Auto-addressing up to 62 fans per MODBUS channel (2 channels)
- Error log file via USB drive up to 4GB
- Embedded server in the control unit, operation via web browser on central control computer (PC) or locally via touch panel (as standard Microsoft Windows or microbrowser based)
- LED display and operating keys as standard
- Supply via 24VDC
- Mounting on DIN rail
- Connection via MODBUS-TCP to building control technology possible

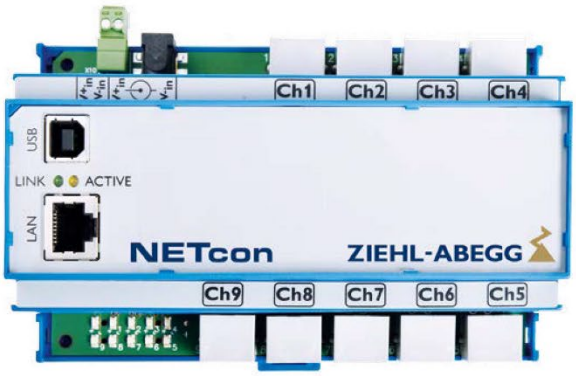
Control of a FFU network with UNIcon CXG-327(A)NE-R:



DIRECT NETWORKING TO BMS (BY OTHERS)

CLEANPAK supplies the FFUs with Modbus RTU built in. All upstream networking including gateways are not in our scope and is to be provided and installed by others. The following is a suggested networking methodology and register shortlist for hookup to the BMS.

Modbus gateway NETcon DIG-9NE

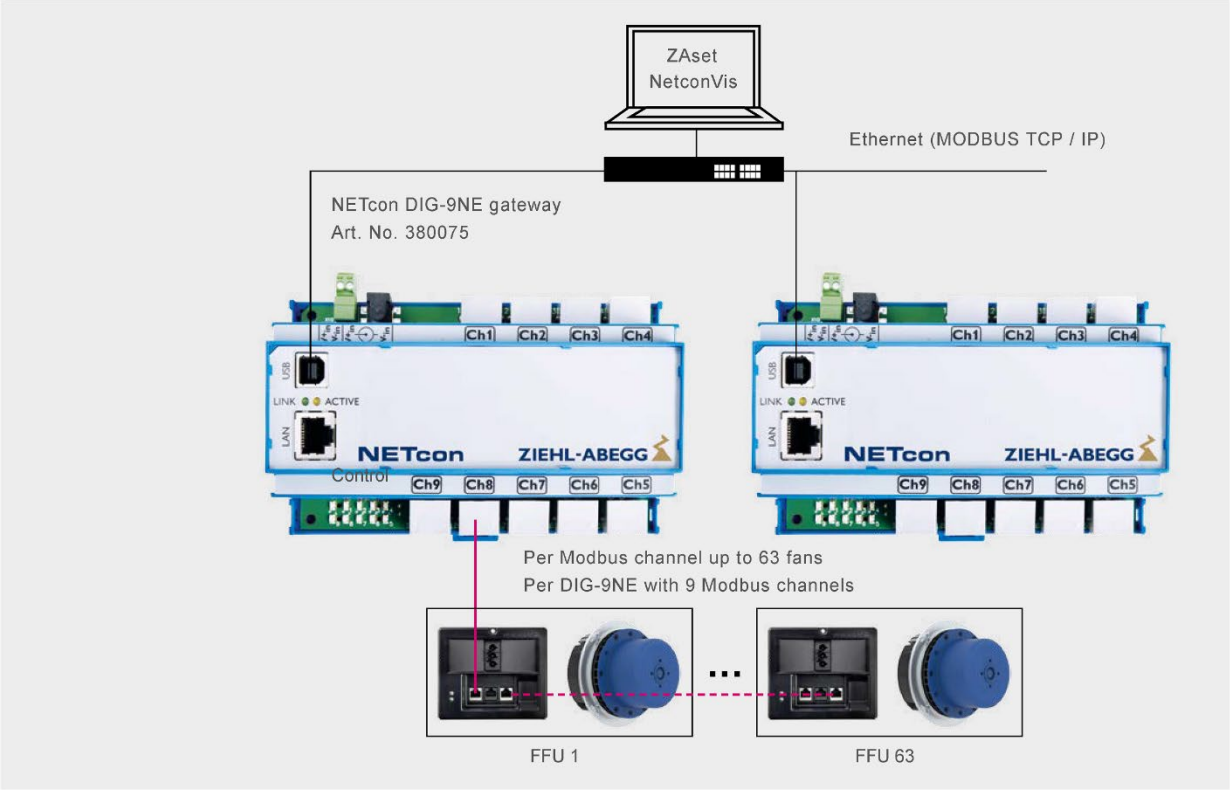


MODBUS gateway NETcon DIG-9NE

NAS P/N: 290-00-124

- Gateway between MODBUS RTU (to fans) and MODBUS TCP/IP (to control)
- 9 RS485 channels, which can connect up to 63 MODBUS RTU nodes respectively, i.e. in total 567 MODBUS RTU addresses are possible
- Supports MODBUS auto-addressing
- 9 traffic LEDs display the activity of the 9 channels
- RJ45 sockets for MODBUS RTU channels, easy connection with connection box via Ethernet cable
- Mounting on DIN rail
- Power supply DC 24V (400 mA)

Networking of a FFU network via MODBUS gateway:



Suggested FFU Register Shortlist for BMS Programming

This shortlist is intended to provide simple speed control of the unit via a Modbus RTU network. See the full manual for complete register descriptions.

General Notes

Communication Parameters: The default Modbus address for the unit is 247, unless changed manually or by running auto-addressing (see Handheld Terminal Manual). The maximum number of FFUs per master line is 62. Baud rate: 19200; Bits: 8; Parity: Even; Stop Bits: 1; Handshake: None; Recommended poll interval: ≥100 ms

WARNING: *All holding registers in this shortlist marked "limited write" have LIMITED WRITE CYCLES (10,000).* These registers should be written to only occasionally; if the write cycle limit is exceeded for a specific register, it will cease functioning. Therefore, this shortlist is NOT intended for cyclic control (with the exception of speed adjustment, see below).

Register Notation: All Modbus registers in the unit are 16-bit registers. Some registers store a single parameter using all 16 bits; others store several discrete parameters in individual bits or groups of bits. In the latter case, this manual uses brackets to refer to the bit(s) that store a single parameter. For instance, for a generic register the notation "bits [3:1]" references a parameter stored in bits 3, 2, and 1, as highlighted in Figure 11 below.

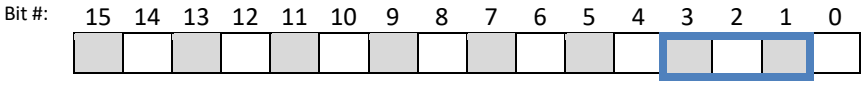


Figure 11. 16-bit register, bits [3:1]

Initial Configuration

The following parameters are typically set at the factory to optimize the FFU for Modbus control but should be verified before attempting to alter the FFU's speed.

Control Mode: Set *Holding Register 5* (address h4, limited write) bits [3:0] = 1. This configures the unit for RPM speed control via Modbus. This can also be done using the Handheld Terminal (see Handheld Terminal Manual).

D1 Function: Set *Holding Register 15* (address h14, limited write) = 1. This allows the use of an "enable" bit to start/stop the unit (see below).

Speed after Reset: Set *Holding Register 17* (address h16, limited write) bits [3:1] = 5. If a power loss occurs, this parameter instructs the unit to save its current speed setting, to be used when power is restored. This does NOT instruct the unit to start automatically when power is restored (see **Fan Enable** below).

Operation

See manual for full register descriptions. This information is summarized in the table on the following page.

Fan Speed: To adjust fan speed while the FFU is powered, enter the desired FFU speed (RPM) into *Holding Register 3* (address h2). NOTE: *Holding Register 3 has unlimited write cycles*. Regular updates to this register will not significantly shorten the life of the motor.
To monitor fan speed, the motor has a built-in tachometer. The RPM feedback from the tachometer is stored in *Input Register 15* (address i14, read-only).

Fan Enable*: Holding Register 11* (address h10, limited write) bit [1] is used as an "enable" bit, for starting (1) and stopping (0) the unit over the network. This register is permanently stored even when power is disconnected, meaning the FFU will return to its last state when power is restored.

Alarms: Motor errors are indicated in *Input Register 13* (address i12, read-only); if no error is indicated, the register value is 0. Error reason codes are stored in *Input Register 14* (address i13, read-only) bits [7:0]. Warnings and warning reason codes are stored in *Input Register 12* (address i11, read-only). Codes for each register are translated in the full manual (Section 3.9).
NOTE: Reason codes are only available for motor firmware versions 13.31 and higher. Check *Input Register 1* (address i0, read-only) for firmware version number.

BUILT-IN MODBUS COMMUNICATION REGISTERS for Nortek CPFFU-EC-ZA	
MODBUS RTU protocol	Network wiring method: Dual RJ-45 sockets (2 wire)
Selectable Physical medium: RS485 2-wire	Up to 62 unique addresses, programmable
Selectable baud rate 19200, 8, E, 1	"Non-volatile" indicates limited write cycles (10,000)

Register	Upper Byte	Lower Byte	Type	Description
(holding) 40011	Bit [1] Start/Stop		R/W (non-volatile)	Enter decimal value 4-stop, 6-start (also sets default)
(holding) 40003	Motor speed setting (RPM), 0-65535, Default Speed		R/W (volatile)	Enter motor speed in RPM; automatically saved on power loss
(input) 30015	Motor speed feedback (RPM), 0-65535		R	Motor speed feedback in RPM
(input) 30013	Error status (alarms)		R	General alarms/errors (0 = normal operation)
(input) 30014	Error status (alarms)	Reason Codes	R	Alarms/errors and reason codes
(input) 30012	Operation condition (warnings)	Reason Codes	R	Warnings and reason codes
(input) 30011	Operation Condition (flags)		R	Operating conditions/warnings
(input) 30001	Firmware version		R	Firmware version number (xx.xx)
(holding) 40009	Max Speed (RPM), 0-65535		R/W (non-volatile)	Max speed for motor in RPM
(holding) 40001	PIN input (controller reset)		R/W (volatile)	Write decimal 2143 to activate parameter changes

CPFFU-EC-ZA: Startup Checklist

Items in **BOLD** reference headings in the CPFFU-EC-ZA Manual.

- ☐ FFUs installed in the grid (see **Installation instructions by FFU configuration**).
- ☐ Power connections to FFUs completed (see **FFU Interface** and **Power wiring**).
  - ☐ 277VAC single-phase.
- ☐ FFUs switched ON and wheels rotating (see **Operation**).
  - ☐ No cone rubbing.
- ☐ Communications connections between FFUs completed (see **FFU control**).
  - ☐ BUS2 of one FFU connected to BUS1 of the next FFU in line.
  - ☐ No more than 62 FFUs per line.
- ☐ Addressing (see detailed manual for the A-G-247NW Handheld Terminal).
  - ☐ Connect Handheld Terminal to BUS1 of the first FFU in line. Run Auto-addressing for each line.
  - ☐ OR manually address each FFU through the Service port, with BUS1 and BUS2 disconnected.