

AN003-Connecting to Ethernet





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Connecting the Clean Power VFD to Ethernet Network

This application note describes how to configure the Clean Power Variable Frequency Drive (VFD) to connect to the Ethernet network.

Connecting the Clean Power VFD to an Ethernet network brings several valuable advantages for monitoring, control, and maintenance, especially in industrial and automation environments.

1. Remote Monitoring and Control

- **Usage:** Through Ethernet, you can monitor the Clean Power VFD parameters (such as speed, torque, current, and voltage) and control its operation (start, stop, change speed and direction) from a central location.
- **Benefits:** This remote capability enhances flexibility and saves time by reducing the need for on-site adjustments, enabling fast response to changes in operating conditions.

2. Real-Time Data Collection and Analytics

- **Usage:** Clean Power VFDs connected to Ethernet networks can send real-time data to a PLC, SCADA, or IoT system for data logging and analysis.
- **Benefits:** This real-time data supports predictive maintenance by identifying performance trends, detecting anomalies, and potentially reducing downtime by addressing issues before they become critical.

3. Integration with Automation Systems

- **Usage:** Clean Power VFDs on an Ethernet network can easily integrate with PLCs, SCADA systems, and other networked automation devices to create synchronized, automated workflows.
- **Benefits:** This connectivity allows for coordinated control across multiple devices, which can improve process efficiency, reduce energy consumption, and enable complex applications, like coordinating multiple motors for conveyor belts or other multi-motor systems.

4. Enhanced Safety and Reduced Costs

- **Usage:** Ethernet connectivity allows for immediate adjustments or shutdowns in case of an emergency, reducing the need for manual intervention.

- **Benefits:** This remote management reduces risks to personnel, especially in hazardous environments, and lowers maintenance costs by reducing the need for physical site visits.

5. Energy Management and Optimization

- **Usage:** Connected Clean Power VFDs can provide energy usage data and be integrated into energy management systems.
- **Benefits:** By tracking energy consumption, you can implement energy-saving strategies, optimize motor performance, and potentially lower operational costs.

In summary, connecting a Clean Power VFD to an Ethernet network improves control, monitoring, and diagnostics, supporting both operational efficiency and cost savings. It is a powerful tool in modern industrial automation, contributing to data-driven decision-making and better asset management.

Application details: Ethernet Connectivity

Application Overview

Connecting the Clean Power VFD to an Ethernet network allows you to remotely monitor and control the motor with different industrial and automation systems.

Seamless connectivity of the Clean Power VFD and using standard communication protocols (such as Modbus TCP, BACnet IP and more):

- **Seamless Integration:** Reduce the need for proprietary solutions, allowing the VFD to integrate seamlessly into existing systems, which reduces setup time and costs.
- **Enhanced Control and Monitoring:** The Clean Power VFD, with its native protocols, provides real-time control and monitoring capabilities, enabling the PLCs, SCADA, or BMS to adjust speed, torque, and other parameters based on demand and environmental conditions.

Technical Requirements and Considerations:

- **IP Network Infrastructure:** Requires a compatible IP network infrastructure, often within the facility's existing LAN.
- **Security:** Implementing cybersecurity measures like network segmentation, firewalls, and encrypted communication protocols to protect communications from unauthorized access.

Implementation Process

- **Configuration:** Set up and configure the Clean Power VFD with appropriate IP network parameters, including DHCP or static IP address, submask, gateway, DNS.
- **Testing:** Conduct testing to verify communication reliability and make adjustments to control parameters based on system performance.

Implementation guide: Ethernet Connectivity

The Clean Power VFD has 2 Ethernet ports, they are used to connect to your local area network (LAN). They are currently configured in switch mode.

In switch mode, the VFD only has one (1) IP address for both ETH1 and ETH2, and all traffic coming from ETH1 can be forwarded to ETH2 and vice-versa.

IP address assignment	Selectable: Automatic (DHCP) or manual
DNS server assignment	Automatic or manual
Speed	Automatic (10/100/1000 Mbps)
Protocol	IPv4

Network Topologies

Star (Recommended)

The star topology is the recommended network topology to be used when you have multiple VFDs on the network. This topology offers a centralized management and troubleshooting, it is more reliable in case of VFD failure, no impact on the entire network. It is easy to expand by adding new VFDs into the switch. However the number VFDs connected is limited to the available ports on the switch. And the central switch becomes a single point of failure (unless redundancy of the switch is added).



Daisy Chain

The daisy chain topology is simple and cost-effective to setup. It is easy to expand by adding new VFDs to the end of the chain. However If one VFD or cable fails, all downstream VFDs are disconnected from the network.

It is recommended to daisy chain up to 8 VFDs, as more VFDs are added, they may increase latency and potential bandwidth bottlenecks.



Ring RSTP (Rapid Spanning Tree Protocol)

The ring RSTP topology is more reliable than the daisy chain topology, if one VFD fails, the other VFDs can still reach by traveling the opposite direction. It is easy to expand by adding new VFDs into the ring. However to the circular aspect of the ring, it is mandatory to have loop prevention and traffic flow management on the Ethernet switch, which will increase its cost.



Please note that these instructions are general guidelines. For specific instructions related to your particular hardware and application, refer to the manufacturer's documentation.

Connect Clean Power VFD to the Ethernet network

[Refer to the Clean Power VFD user guide for full information](#)

Please follow the steps below to connect the Clean Power VFD to the Ethernet network:

1- Connect Ethernet Cable:

Plug an Ethernet cable from the network switch or Ethernet wall port into the Ethernet port on the Clean Power VFD.

By default the Clean Power VFD is configured to use DHCP (Dynamic Host Configuration Protocol) to obtain automatically an IP address on the Local Area Network (LAN).

The Clean Power VFD's Ethernet port LED should blink. If not please make sure that the cable is connected on both ends: Clean Power VFD Ethernet port and the LAN switch/router.

2- Verify if the Clean Power VFD has been assigned an IP address:

- Click on the **Menu** button to access the menu



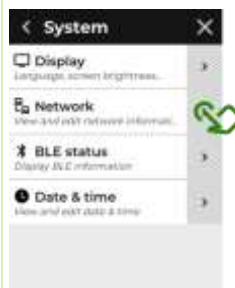
- Click on **Configuration** to access the configuration menu



- Click on **System** to access the Clean Power VFD configuration



- Click on **Network** to access the network configuration



- Check if the Clean Power VFD has successfully obtained an IP address.
- The **Link status** should indicate **Up**.
- The **IP address** should have an IP address.

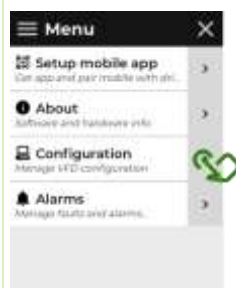


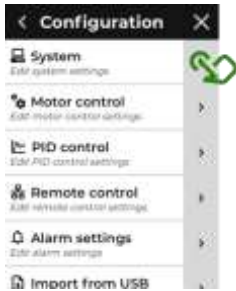
3- Configure a static IP address on the Clean Power VFD:

- Click on the **Menu** button to access the menu

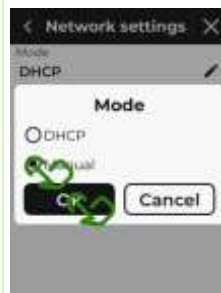


- Click on **Configuration** to access the configuration menu



Click on System to access the Clean Power VFD configuration	
Click on Network to access the network configuration	
Click on Network settings to change to manual network configuration	
Click on the pencil next to DHCP to change the Mode	

- Click on **Manual** and **OK** to set to assign the IP address manually



- Click on the **pencil** of the **IP address** field to specify the IP address



- Enter the **static IP address** and click on **OK**



- Click on the **pencil** of the **Network mask** field to specify the network mask



Enter the network mask and click OK	
Click on the pencil of the Gateway field to specify the gateway IP address	
Enter the gateway IP address and click OK	
Click on the pencil of the DNS field to specify the DNS IP address	

- Enter the **DNS IP address** and click **OK**

- Click on the **Save** icon on the top to save the network configuration

- Click on **Yes** when you are prompt to save and apply the new network configuration

- Click on **OK** to acknowledge that the new network configuration has been saved and applied

4- Confirm Link Status:

Check for indicator light on the Ethernet port of the Clean Power VFD, it should blink to confirm an active connection.

Conclusion

This application note has outlined the substantial benefits and enhanced performance capabilities provided by SmartD Technologies' Clean Power VFD.

By leveraging its advanced control algorithms and maintaining optimal motor function, the Clean Power VFD ensures superior efficiency, reliability, and sustainability in motor control applications.

We encourage industries looking to upgrade or install new motor control systems to consider the Clean Power VFD for its exceptional benefits.

For further information, and detailed specifications, or to initiate an implementation in your operations, please visit our website: <https://smartd.tech/> or contact us at +1-866-776-2783

Let SmartD help you achieve operational excellence with cleaner, more efficient power solutions.