

iQ Ultrasonic Generators - Industrial Networking Guidelines

Introduction:

All Dukane iQ Series ultrasonic probe generators implement a 'slave'/device relationship with the controlling PLC. They all require a 'master' PLC to communicate with and control them. Most typical HMI models are NOT capable of direct communication with a networked iQ generator. This is because they are also designed to implement the slave role, NOT the master role.

When appropriately optioned, iQ probe generators support the following protocols: EtherNet/IP, PROFINET, EtherCAT, POWERLINK, PROFIBUS, CC-LINK, and MODBUS. All these protocols are intended to be used on their own separate, sequestered network with dedicated network hardware. This network is not part of the larger "business" network of the building.

Hardware Requirements

EtherNet/IP, PROFINET and MODBUS are all implemented using standard TCP/IP technology and work with standard network hardware such as Ethernet switches. Industrial versions of this hardware which are designed to withstand the industrial environment are HIGHLY recommended. Their advantages include longer lifetimes and greater reliability.

Please note that if standard network hardware is used for EtherNet/IP "multicasting" should not be used. Specialized Industrial Ethernet switches implementing a feature called "IGMP Snooping" should be used with "multicasting".

POWERLINK does NOT use standard TCP/IP networking technology and is not compatible with standard Ethernet switches. However, Ethernet hubs will work, but must be 100Mbps models. Industrial models are HIGHLY recommended.

EtherCAT does NOT use standard TCP/IP networking technology and is not compatible with Ethernet switches or hubs. Instead, each EtherCAT node has at least two ports which implement the required specialized switch functionality.

PROFIBUS and **CC-LINK** do not operate on an Ethernet physical layer, they use RS-485 to transmit signals. RS-485 is a multidrop, half-duplex, shared bus. This means it supports multiple devices on the same 'wires' without any hubs or switches, but only a single device can transmit at any given time. RS485 repeaters/signals booster exist but are not typically required. Due to the multidrop arrangement, the maximum number of devices on the bus is usually smaller than with an Ethernet based protocol.

Connections

EtherNet/IP implements two types of connections between the PLC/master and device/slave. "Implicit" connections are meant to emulate discrete I/O with constant, real-time data exchange. "Explicit" connections are meant to transfer iQ generator settings in a non-real-time manner and only in response to PLC program logic. iQ generators require an Implicit connection to be able to operate with an EtherNet/IP capable PLC. Explicit connections are not strictly required, unless altering setup parameters is necessary. Many low-end / budget PLC models advertising EtherNet/IP only implement Explicit connections. While this is suitable for communicating with many HMI models, it is not suitable for real time control of an iQ generator. Furthermore, different PLC models can support a different maximum number of connections. Sometimes the Implicit connections are tallied independently of the Explicit connections, and many times a single EtherNet/IP device/slave will count as multiple connections.

PROFINET, EtherCAT, and POWERLINK protocols do not have multiple types of connections, and PLCs advertising their support are usually full featured and capable of full control of iQ generators. These PLCs may still have maximum connection restrictions that need to be accounted for during network design.

PLC Brands and Sample Code Availability

Protocol	PLC Manufacturer	PLC Code	HMI Code	Multi-generator Support Code
Ethernet/IP	Allen Bradley	Yes	Yes	Yes
Ethernet/IP	Omron	Yes	No	No
Profinet	Siemens	Yes	Yes	Yes
Profibus	Siemens	Yes	Yes	No
POWERLINK	B&R Automation	Yes	Yes	Yes
EtherCat	Beckhoff Automation	Sample	No	No
CC-Link	Mitsubishi	Yes	Yes	No
Modbus TCP	Allen Bradley	Yes	Yes	No

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