

# Modicon Quantum automation platform

I/O architectures  
Distributed I/O

## Presentation

The Modicon Quantum platform DIO architecture (*Distributed I/O*) uses the same I/O modules as a local or remote I/O (RIO) subsystem, and reduces installation costs by using low-cost, twisted-pair cables.

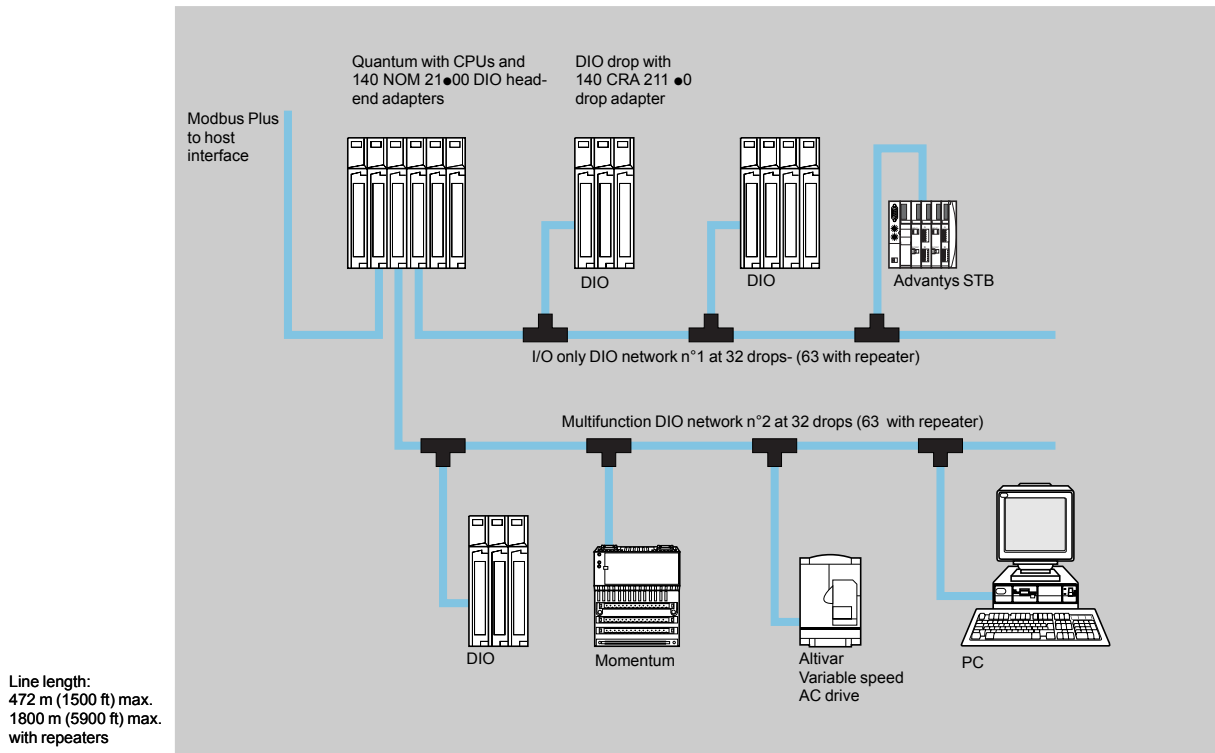
A special DIO drop adapters with a built-in power supply is used at each drop. The Quantum DIO drop adapter is specifically designed to link I/O modules to the head via twisted-pair shielded cable. A drop adapter also provides the I/O with power (maximum 3A) from a 24 V d.c. or 115/230 V a.c. source. DIO drops may also be powered by standard 8 A power supply modules. In this case the 3 A supply built into the drop adapter is not used.

The DIO architecture supports up to three network heads per CPU and up to 1800 m (6000 ft) per network (using RR85 repeaters). Even greater distances can be achieved using fiber optic repeaters.

The DIO architecture is based on Modbus Plus technology. Each DIO network can support 32 nodes over 472 m (1500 ft) (with repeaters, 64 nodes over 2000 m (6000 ft)). Up to three DIO networks are supported, one is native to the CPU itself, and the other two by adding optional 140 NOM 211 ●0/212 ●0 network interface modules into the local Quantum backplane. DIO can be combined with RIO in the same CPU system for significantly larger I/O counts.

All products that currently support Modbus Plus (for example IHM equipment) can coexist on the DIO network. For example, a programming panel can be connected to the DIO network to monitor and troubleshoot an operating control system from the remote site, without running a separate communication link.

## Typical Multi-Network Distributed I/O System



#### Presentation (continued)

##### Using Modbus Plus for distributed I/O

Modbus Plus can be used as the fieldbus for a distributed I/O network under the control of a Quantum CPU. The Modbus Plus master at the head end of the network is a Quantum CPU with a built-in Modbus Plus interface or a 140 NOM 211● module. A 140 CRA 211● module must reside in each distributed I/O drop on the network. A 140 CRA 211●0 module acts as both a distributed I/O adapter and a power supply for the drop (no additional power supply modules are required). Each DIO drop can address up to 30 input words and 32 output words.

A single or redundant cable topology may be employed in the distributed I/O system. Depending on your system's requirements, one of the following module combinations can be used to set up a Modbus Plus-based DIO system:

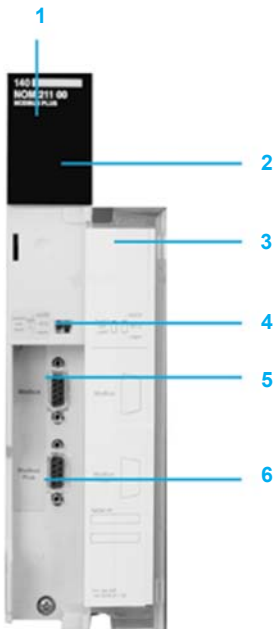
Head-end network n° 1	Head-end network n° 2 or n° 3	DIO drop	Type of DIO system
CPU with Modbus Plus	DIO adapter 140 NOM 211 00	140 CRA 211 10	Single cable with 115/230 V a.c. power at the drop
CPU with Modbus Plus	DIO adapter 140 NOM 211 00	140 CRA 211 20	Single cable with 24 V d.c. power at the drop
–	DIO adapter 140 NOM 212 00	140 CRA 212 10	Redundant cable with 115/230 V a.c. power at the drop
–	DIO adapter 140 NOM 212 00	140 CRA 212 20	Redundant cable with 24 V d.c. at the drop

#### Description

The 140 NOM 211/212 00 Modbus Plus for DIO network nb 2 or nb 3 (1) comprise on the front panel:

- 1 A model number and color code,
- 2 A LED Status indicators comprising:
  - Ready (green),
  - Fault (red),
  - Pwr ok (green),
  - Modbus + (green),
  - Error A (red),
  - Error B (red),
- 3 A removable, hinged door with customer identification label,
- 4 A microswitch,
- 5 A Modbus port,
- 6 A Modbus Plus.

(1) The Modbus Plus embedded in the 140 CPU processor is used for the D10 network nb 1. See description pages 48207/7 and 48202/5.



Drop adapters characteristics					
Model		140 CRA 211 10	140 CRA 212 10	140 CRA 211 20	140 CRA 212 20
Function		DIO drop interface ~ source voltage		DIO drop interface --- source voltage	
Cable connections		Single (1 port)	Redundant (2 ports)	Single (1 port)	Redundant (2 ports)
Input voltage		~ 85...276 V		--- 20...30 V	
Frequency range	Hz	47...63		-	
Input current	A	0.4 at ~ 115 V, 0.2 at ~ 230 V		1.6	
Inrush current	A	10 at ~ 115 V, 20 at ~ 230 V		30	
Power input	VA	50		-	
Buffer time		0.5 cycle at full load and minimum line voltage/frequency and less than 1 s between interrupts		Max.1 ms	
Fusing	A	1.5 external		2.5 external	
Bus output	Voltage	---	5,1 V		
	Current	A	3		
	Minimum load	A	0		
	Protection		Against over-current and over-voltage		
I/O words per DIO		30 I/32 O (two additional input words are reserved for I/O drop status)			
Typical backplanes		2, 3 or 4 positions			
Diagnostics startup	RAM		Yes		
	RAM address		Yes		
	Checksum		Yes		
	Processor		-		
Run time	RAM		Yes		
	RAM address		Yes		
	Checksum		Yes		
	Processor		-		
Field wiring		Terminal block, 7-pole (043 503 328 terminal block included)			
Power dissipation	W	11			

Head-end modules characteristics (Nb 2 and Nb 3) (1)				
Model		140 NOM 211 00	140 NOM 212 00	140 NOM 252 00
Function		DIO head-end interface		
Cable connection		Single copper (twisted-pair cable)	Redundant copper (twisted-pair cable)	Single fiber optic cable (2 TX/RX fibers)
Built-in communication ports		1 Modbus (RS 232) 1 Modbus Plus (RS 485)	1 Modbus (RS 232) 2 Modbus Plus (RS 485)	1 Modbus (RJ 45) 1 Modbus Plus (fiber optic cable)
Words		30 I/32 O (two additional input words are reserved for I/O drop status)		
Diagnostics	RAM	Yes		
	RAM address	Yes		
	Checksum	Yes		
	Processeur	Yes		
Bus current required	<b>mA</b>	780		750
Power dissipation	<b>W</b>	4		4
Data rate	<b>Mbit/s</b>	1		1
Pulse width distortion/jitter	<b>ns</b>	–		5 or better
Wavelength	<b>nm</b>	–		820
Power loss budget (including 3dB margin)	50/125 mm fiber	<b>dB</b>	–	6.5
	62,5/125 mm fiber	<b>dB</b>	–	11
	100/140 mm fiber	<b>dB</b>	–	16.5
Optical transmission	50/125 mm fiber	<b>dBm</b>	–	- 12.8...- 19.8
	62,5/125 mm fiber	<b>dBm</b>	–	- 9...- 16
	100/140 mm fiber	<b>dBm</b>	–	- 3.5...110.5
Rise/fall time	<b>ns</b>	–		20 or better
Optical receiver	Sensibility	<b>dBm</b>	–	30 or better
	Dynamique range	<b>dB</b>	–	20
	Detected silence	<b>dBm</b>	–	- 36

(1) Head-end Nb 0 is included in each 140 CPU (see pages 48280/3 and 48202/3).

### References

Description	Medium	Number and type of ports	Reference	Weight kg
DIO drop adapters (including power supply)	Single	~ 115/230	140 CRA 211 10	–
		≡ 24	140 CRA 211 20	–
	Redundant	~ 115/230	140 CRA 212 10	–
		≡ 24	140 CRA 212 20	–
Quantum CPUs DIO head-end Nb 1	Single	–	140 CPU ●●● (1)	–
DIO head-end adapters Nb 2 et Nb 3	Single	Twisted-pair cable	140 NOM 211 00	–
	Redundant	Twisted-pair cable	140 NOM 212 00	–
	Single	Fiber optic cable	140 NOM 252 00	–

(1) See pages 43517/7 and 43511/5.