

Powerful New Networking Solutions Using ALTIVAR 31 DRIVES



What is new?

Two new option cards extend the communications capabilities on the Altivar 31 Series Drives to support DeviceNet™ and EtherNet/IP™. Either of these cards enables an Altivar 31 Drive to function seamlessly in a Rockwell Automation architecture based on a Logix processor (ControlLogix or CompactLogix).

The Ethernet Option Card also supports Modbus TCP. With Modbus TCP the AV31 is a Modbus TCP Server that can be controlled by any Modbus TCP Client like a Quantum or or Premium Family Controller from Schneider Electric. When using Modbus TCP the entire Modbus register set of the AV31 is mapped to Modbus TCP.

Are these options simple to set up?

Absolutely. The 284DN (DeviceNet) and 284EN (EtherNet/IP) option cards mount in an Altivar 31 drive enclosure near the Modbus connector and power terminals. The cards are mounted on a bracket that snaps into the enclosure for easy mounting.

The cards connect to the RJ11 option card connector inside the drive. A standard RJ45 connects the 284EN option card to an EtherNet/IP network. A Phoenix 5-pin terminal connects the 284DN option card to a DeviceNet network.

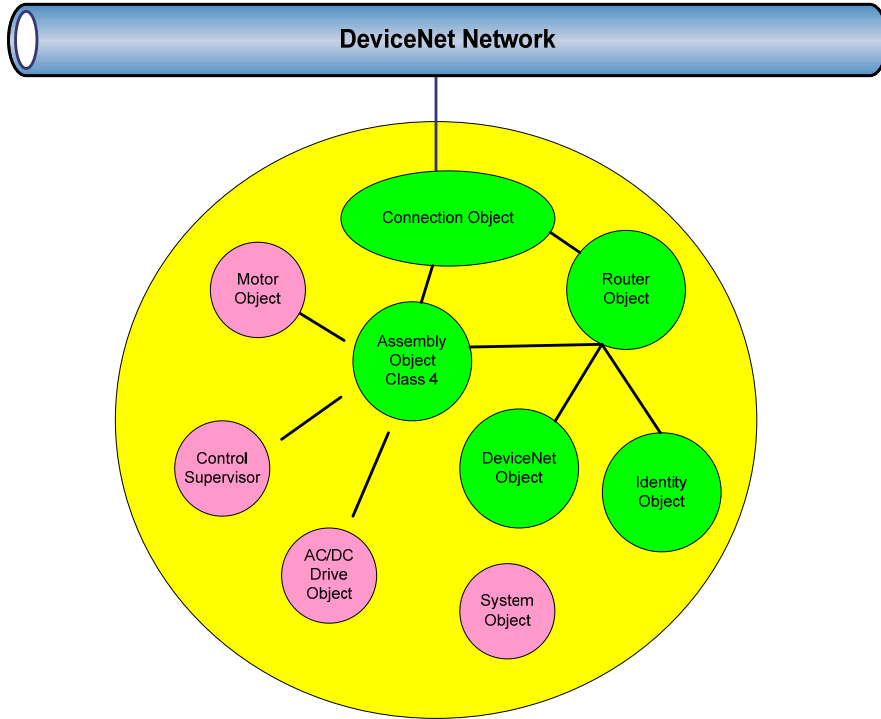
DeviceNet
CONFORMANCE TESTED

EtherNet/IP
conformance tested

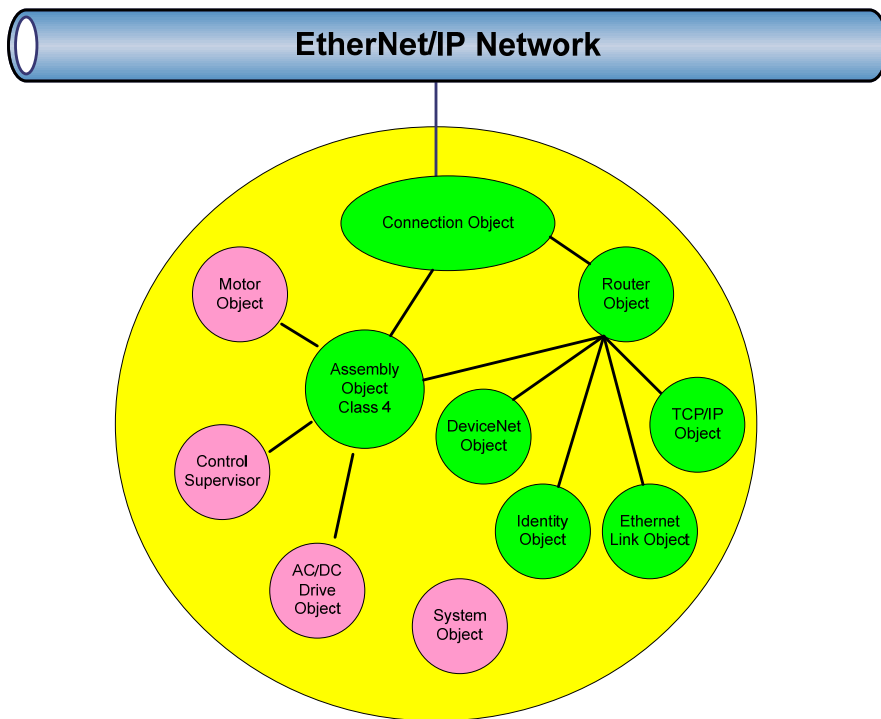
What objects do the option cards support?

Both the 284DN (DeviceNet) and 284EN (EtherNet/IP) option cards support the standard Drive profiles defined by the ODVA (Open DeviceNet Vendors Association).

These profiles standardize the representation of the Altivar 31 drive on the DeviceNet and the EtherNet/IP networks. All major drive manufacturers support these Drive profiles. The following figures show the required objects. These objects and their attributes are listed in tables at the end of this document.



Altivar DeviceNet Object Model



Altivar EtherNet/IP Object Model

The following instructions show just how simple it is to use these option cards.

Using the DeviceNet Option Card (284DN)

The following sections provide instructions for configuring the 284DN, reading the LEDs, and using the 284DN with a Rockwell Automation Logix PLC.

Configuring the DeviceNet Option Card (284DN)

To configure the 284DN (DeviceNet) Option Card, use the following two steps to set the eight dip switches on the 284DN option card. These are the standard switch configurations found in most DeviceNet products.

Note: The factory default switch settings are Address 63 and 125K.



1. Set the first six switches (1-6) to identify the MAC ID or DeviceNet address of the option card.

Address (Decimal)	SW1 2^0	SW2 2^1	SW3 2^2	SW4 2^3	SW5 2^4	SW6 2^5
01	ON	OFF	OFF	OFF	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF
40	OFF	OFF	OFF	ON	OFF	ON
Default 63	ON	ON	ON	ON	ON	ON

Table 1 – DeviceNet Dipswitch MAC ID

2. Set the two dip switches (7-8) that indicate the DeviceNet network baud rate, 125K, 250K or 500K baud.

Baud Rate / SW Mode	SW7 2^0	SW8 2^1
125K	OFF	OFF
250K	ON	OFF
500K	OFF	ON
Software	ON	ON

Table 2 – DeviceNet Dipswitch Baud Rate

Reading the DeviceNet Option Card's (284DN) LEDs

The DeviceNet Option Card has two LEDs. The NS (Network Status) LED supports the standard Network bicolor LED operations, and the DS (Device Status) LED provides status information for the 284DN option card. The following tables show these operations.

Color	State	Indication
None	Off	No Power
Red	Solid	Unrecoverable Fault
	Flashing	Recoverable Fault I/O Connection Timed Out
Green	Solid	Normal runtime operation
	Flashing	Device is in idle or not allocated to a master
Red / Green	Alternating	Identify (Offline Connection Set)

Table 3 –NS (Network Status) LED

Color	State	Indication
None	Off	No Power
Red	Solid	Unrecoverable Fault
	Flashing	Recoverable Fault
Green	Solid	Normal operation
	Flashing	Configured but not operating
Red / Green	Alternating	Self Test

Table 4 –DS (Device Status) LED for the 284DN

Using the DeviceNet Option Card on an Altivar Drive with a Rockwell Logix PLC

To use an Altivar 31 Drive with a DeviceNet Option Card on a Rockwell Automation Logix PLC, do the following two steps.

1. Scan the DeviceNet devices.
The Altivar 31 drive icon displays.
2. Click on the drive icon.
The Altivar 31 drive is automatically integrated into the device table of the PLC.

Once the device is integrated into the Logix PLC, the PLC begins exchanging I/O data with the drive. Unless you change it, the data exchanged with the drive is the default data specified by the drive protocol.

The default Input data delivered by the drive to the PLC consists of four bytes specified in Input Instance 70 of the Assembly Object:

1. Status byte containing a run bit and fault bit
2. Reserved byte
3. Actual Speed low byte
4. Actual Speed high byte

The default Output data delivered by the PLC to the drive also consists of four bytes specified by Output Instance 20 of the Assembly object:

1. Command byte containing a run forward bit and reset fault bit
2. Reserved byte
3. Commanded Speed low byte
4. Commanded Speed high byte

This default communication between the drive and the PLC is identical to the communication now available from Yaskawa Electric, Rockwell Automation, and other drive manufacturers.

Using the EtherNet/IP Option Card 284EN

The following sections provide instructions for configuring the 284EN and using it with a Rockwell Automation Logix PLC.

Configuring the EtherNet/IP Option Card (284EN)

To configure the 284EN (EtherNet/IP) Option Card, use any standard web browser from a PC to access an internal web server. Use this internal web server to set the TCP/IP address, the Mask, and the default gateway for your application.

Using the EtherNet/IP Option Card on an Altivar Drive with a Rockwell Logix PLC

To use an Altivar 31 Drive with an EtherNet/IP Option Card on a Rockwell Automation Logix PLC, do the following steps.

1. Use the RsLogix 5000 software tool to manually add the Altivar 31 drive to the device table of the PLC.
2. Configure the Input/Output connection parameters using the Properties screen for the device.

Once the device is integrated into the Logix PLC, the PLC will begin exchanging I/O data with the drive. Unless you change it, the data exchanged with the drive is the default data specified by the drive protocol.

The default Input data delivered by the drive to the PLC consists of four bytes specified in Input Instance 70 of the Assembly Object:

1. Status byte containing a run bit and fault bit
2. Reserved byte
3. Actual Speed low byte
4. Actual Speed high byte

The default Output data delivered by the PLC to the drive also consists of four bytes specified by Output Instance 20 of the Assembly object:

1. Command byte containing a run forward bit and reset fault bit
2. Reserved byte
3. Commanded Speed low byte
4. Commanded Speed high byte

This default communication between the drive and the PLC is identical to the communication now available from Yaskawa Electric, Rockwell Automation, and other drive manufacturers.

OBJECT MODEL

Assembly Object (04_{HEX} – 12 Instances)

Class Attributes (Instance 0)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
1	Revision	UINT	2	Get
2	Max Instance	UINT	71	Get
100	Input Index 2 = Instance 70 3 = Instance 71	USINT	0	Get / Set ¹
101	Input Size (in bytes)	UINT	4	Get
102	Output Index 0 = Instance 20 1 = Instance 21	USINT	0	Get / Set ^{Error!} Bookmark not defined.
103	Output Size (in bytes)	UINT	4	Get

Input (T20) Instance Attributes

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
3	Input Data	UINT[]	0	Get

Input Instance 70 (0x46) – Basic Speed Control Input

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Running1		Faulted
1								
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							

Input Instance 71 (0x47) – Extended Speed Control Input

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Ref	Ref From Net	Ctrl From Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
1	Drive State							
2	Speed Actual (Low Byte)							
3	Speed Actual (High Byte)							

¹ Stored to NVRAM

Input Data Mapping

Data Component Name	Class Name	Class Number	Instance Number	Attribute Number
Faulted	Control Supervisor	0x29 (41)	0x01 (1)	0x0A (10)
Warning	Control Supervisor	0x29 (41)	0x01 (1)	0x0B (11)
Running1 (Fwd)	Control Supervisor	0x29 (41)	0x01 (1)	0x07 (7)
Running2 (Rev)	Control Supervisor	0x29 (41)	0x01 (1)	0x08 (8)
Ready	Control Supervisor	0x29 (41)	0x01 (1)	0x09 (9)
Ctrl From Net	Control Supervisor	0x29 (41)	0x01 (1)	0x0F (15)
Drive State	Control Supervisor	0x29 (41)	0x01 (1)	0x06 (6)
Ref From Net	AC/DC Drive	0x2A (42)	0x01 (1)	0x1D (29)
At Ref	AC/DC Drive	0x2A (42)	0x01 (1)	0x03 (3)
Speed Actual	AC/DC Drive	0x2A (42)	0x01 (1)	0x07 (7)

Output (O2T) Instance Attributes

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
3	Output Data	UINT[]	0	Get

Output Instance 20 (0x14) – Basic Speed Control Output

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0						Fault Reset		Run Fwd
1								
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							

Output Instance 21 (0x15) – Extended Speed Control Output

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		Net Ref	Net Ctrl			Fault Reset	Run Rev	Run Fwd
1								
2	Speed Reference (Low Byte)							
3	Speed Reference (High Byte)							

Output Data Mapping

Data Component Name	Class Name	Class Number	Instance Number	Attribute Number
Run Fwd	Control Supervisor	0x29 (41)	0x01 (1)	0x03 (3)
Run Rev	Control Supervisor	0x29 (41)	0x01 (1)	0x04 (4)
Fault Reset	Control Supervisor	0x29 (41)	0x01 (1)	0x0C (12)
Net Ctrl	Control Supervisor	0x29 (41)	0x01 (1)	0x05 (5)
Net Ref	AC/DC Drive	0x2A (42)	0x01 (1)	0x04 (4)
Speed Reference	AC/DC Drive	0x2A (42)	0x01 (1)	0x08 (8)

Common Services

Service Code	Implemented for		Service Name
	Class Level	Instance Level	
0E _{HEX}	Yes	Yes	Get_Attribute_Single
10 _{HEX}	Yes	Yes	Set_Attribute_Single

Motor Data Object (28_{HEX} - 1 Instances)

Class Attributes (Instance 0)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
1	Revision	UINT	1	Get

Instance Attributes (Instance 1)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
3	Motor Type	USINT	0	Get / Set ²
6	Rated Current	UINT	0	Get / Set ²
7	Rated Voltage	UINT	0	Get / Set ²

Common Services

Service Code	Implemented for		Service Name
	Class Level	Instance Level	
0E _{HEX}	Yes	Yes	Get Attribute Single
10 _{HEX}	No	Yes	Set Attribute Single

Control Supervisor Object (29_{HEX} - 1 Instances)

Class Attributes (Instance 0)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
1	Revision	UINT	1	Get

Instance Attributes (Instance 1)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
3	Run1 (Forward)	BOOL	0	Get / Set
4	Run2 (Reverse)	BOOL	0	Get / Set
5	Network Control (NetCtrl)	BOOL	0	Get / Set
6	Drive State	USINT	0	Get
7	Running1 (Forward)	BOOL	0	Get
8	Running2 (Reverse)	BOOL	0	Get
9	Ready	BOOL	0	Get
10	Faulted	BOOL	0	Get
11	Warning	BOOL	0	Get
12	Fault Reset (FaultRst)	BOOL	0	Get / Set
13	Fault Code	UINT	0	Get
15	Ctrl From Net	BOOL	1	Get

Common Services

Service Code	Implemented for		Service Name
	Class Level	Instance Level	
05 _{HEX}	No	Yes	Reset
0E _{HEX}	Yes	Yes	Get Attribute Single
10 _{HEX}	No	Yes	Set Attribute Single

² Stored to NVRAM

AC/DC Drive Object (2A_{HEX} - 1 Instances)

Class Attributes (Instance 0)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
1	Revision	UINT	1	Get

Instance Attributes (Instance 1)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
3	At Reference	BOOL	0	Get
4	Net Ref	BOOL	0	Get / Set
6	Drive Mode	USINT	0	Get / Set ³
7	Speed Actual	INT	0	Get
8	Speed Ref	INT	0	Get / Set

Common Services

Service Code	Implemented for		Service Name
	Class Level	Instance Level	
0E _{HEX}	Yes	Yes	Get Attribute Single
10 _{HEX}	No	Yes	Set Attribute Single

Speed Conversions

Assuming the full scale is 1800 RPM = 60.0 Hz, then

1 RPM = 0.0333 Hz

RPM	Hz	Hexadecimal
0	00.0	0x0000
450	15.0	0x01C2
900	30.0	0x0384
1350	45.0	0x0546
1800	60.0	0x0708

³ Stored to NVRAM

System Object (64_{HEX} - 1 Instances)

Class Attributes (Instance 0)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
1	Revision	UINT	1	Get

Instance Attributes (Instances 1)

Attribute ID	Name	DeviceNet Data Type	Data Value	Access Rule
1	DRIVECOM Control Word "Start Forward"	UINT	0x8002	Get / Set ⁴
2	DRIVECOM Control Word "Start Reverse"	UINT	0x8802	Get / Set ⁴
3	DRIVECOM Control Word "Stop"	UINT	0x9002	Get / Set ⁴
4	DRIVECOM Control Word "Clear Errors"	UINT	0x0080	Get / Set ⁴
5	FR1 – Local	UINT	163	Get / Set ⁴
6	FR1 – Network	UINT	164	Get / Set ⁴
7	CD1 – Local	UINT	3	Get / Set ⁴
8	CD1 – Network	UINT	10	Get / Set ⁴

Common Services

Service Code	Implemented for		Service Name
	Class Level	Instance Level	
0E _{HEX}	Yes	Yes	Get Attribute Single
10 _{HEX}	No	Yes	Set Attribute Single

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⁴ Stored to NVRAM