



# Option Modules

## DeviceNet Option

HA501840U001 Issue 2  
Technical Manual

aerospace  
climate control  
**electromechanical**  
filtration  
fluid & gas handling  
hydraulics  
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# AC30 DeviceNet Option

## Technical Manual HA501840U001 Issue 2

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# Safety Information



## Requirements

**IMPORTANT:** Please read this information *BEFORE* installing the equipment.

### Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, EMC considerations, and to enable the user to obtain maximum benefit from the equipment.

Complete the following table for future reference detailing how the unit is to be installed and used.

INSTALLATION DETAILS	
<b>Model Number</b> (see product label)	
<b>Where installed</b> (for your own information)	


### Application Area

The equipment described is intended for industrial motor speed control utilising AC induction or AC synchronous machines.

### Personnel

Installation, operation and maintenance of the equipment should be carried out by competent personnel. A competent person is someone who is technically qualified and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

### Product Warnings

 <b>DANGER</b> Risk of electric shock	 <b>WARNING</b> Hot surfaces	 <b>Caution</b> Refer to documentation	 <b>Earth/Ground</b> Protective Conductor Terminal
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## CAUTION!

### APPLICATION RISK

- The specifications, processes and circuitry described herein are for guidance only and may need to be adapted to the user's specific application. We cannot guarantee the suitability of the equipment described in this Manual for individual applications.

### RISK ASSESSMENT

Under fault conditions, power loss or unintended operating conditions, the drive may not operate as intended. In particular:

- Stored energy might not discharge to safe levels as quickly as suggested, and can still be present even though the drive appears to be switched off
- The motor's direction of rotation might not be controlled
- The motor speed might not be controlled
- The motor might be energised

A drive is a component within a drive system that may influence its operation or effects under a fault condition. Consideration must be given to:

- Stored energy
- Supply disconnects
- Sequencing logic
- Unintended operation

# Safety Information



## **DANGER! - Ignoring the following may result in injury**

1. This equipment can endanger life by exposure to rotating machinery and high voltages.
2. The equipment must be permanently earthed due to the high earth leakage current, and the drive motor must be connected to an appropriate safety earth.
3. Ensure all incoming supplies are isolated before working on the equipment. Be aware that there may be more than one supply connection to the drive.
4. There may still be dangerous voltages present at power terminals (motor output, supply input phases, DC bus and the brake, where fitted) when the motor is at standstill or is stopped.
5. For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range. CAT I and CAT II meters must not be used on this product.
6. Allow at least 5 minutes for the drive's capacitors to discharge to safe voltage levels (<50V). Use the specified meter capable of measuring up to 1000V dc & ac rms to confirm that less than 50V is present between all power terminals and between power terminals and earth.
7. Unless otherwise stated, this product must NOT be dismantled. In the event of a fault the drive must be returned. Refer to "Routine Maintenance and Repair".

## **WARNING! - Ignoring the following may result in injury or damage to equipment**

### **SAFETY**

**Where there is conflict between EMC and Safety requirements, personnel safety shall always take precedence.**

- Never perform high voltage resistance checks on the wiring without first disconnecting the drive from the circuit being tested.
- Whilst ensuring ventilation is sufficient, provide guarding and /or additional safety systems to prevent injury or damage to equipment.
- When replacing a drive in an application and before returning to use, it is essential that all user defined parameters for the product's operation are correctly installed.
- All control and signal terminals are SELV, i.e. protected by double insulation. Ensure all external wiring is rated for the highest system voltage.
- Thermal sensors contained within the motor must have at least basic insulation.
- All exposed metalwork in the Inverter is protected by basic insulation and bonded to a safety earth.
- RCDs are not recommended for use with this product but, where their use is mandatory, only Type B RCDs should be used.

### **EMC**

- In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
- This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.
- This is a product of the restricted sales distribution class according to IEC 61800-3. It is designated as "professional equipment" as defined in EN61000-3-2. Permission of the supply authority shall be obtained before connection to the low voltage supply.

# Disposal

## Waste Electrical and Electronic Equipment (WEEE)



Waste Electrical and Electronic Equipment - must not be disposed of with domestic waste.

It must be separately collected according to local legislation and applicable laws.

Parker Hannifin Company, together with local distributors and in accordance with EU directive 2002/96/EC, undertakes to withdraw and dispose of its products, fully respecting environmental considerations.

For more information about how to recycle your Parker supplied waste equipment, please contact your local Parker Service Centre.

### ***Packaging***

During transport our products are protected by suitable packaging. This is entirely environmentally compatible and should be taken for central disposal as secondary raw material.

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# AC30 DEVICENET OPTION

## Introduction

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### Features

- DeviceNet
- Up to 500 Kbits/s baud rate and automatic baud rate detection
- Galvanically isolated bus via a 5-way terminal block
- Network and Module status LEDs
- Up to 256 bytes of consumed data and 256 bytes of produced data
- CIP Parameter Object support
- Explicit messaging
- Bit-strobed I/O
- Change-of-state / Cyclic I/O
- Polled I/O
- EDS file provided

## Product Code

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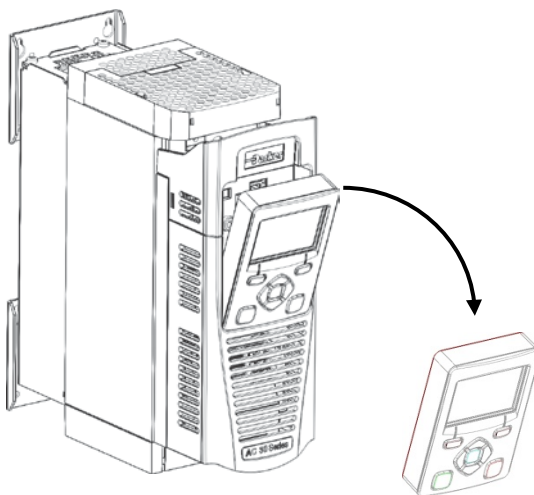
The product code for the DeviceNet Option is:

7003-DN-00

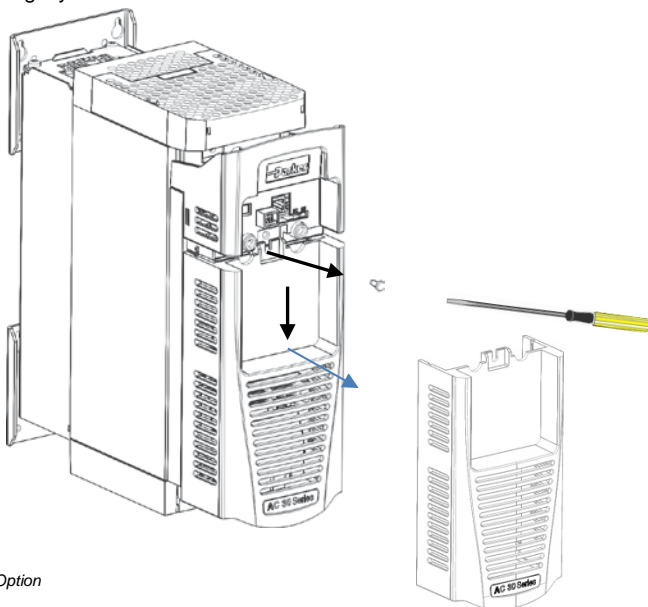
## Installation

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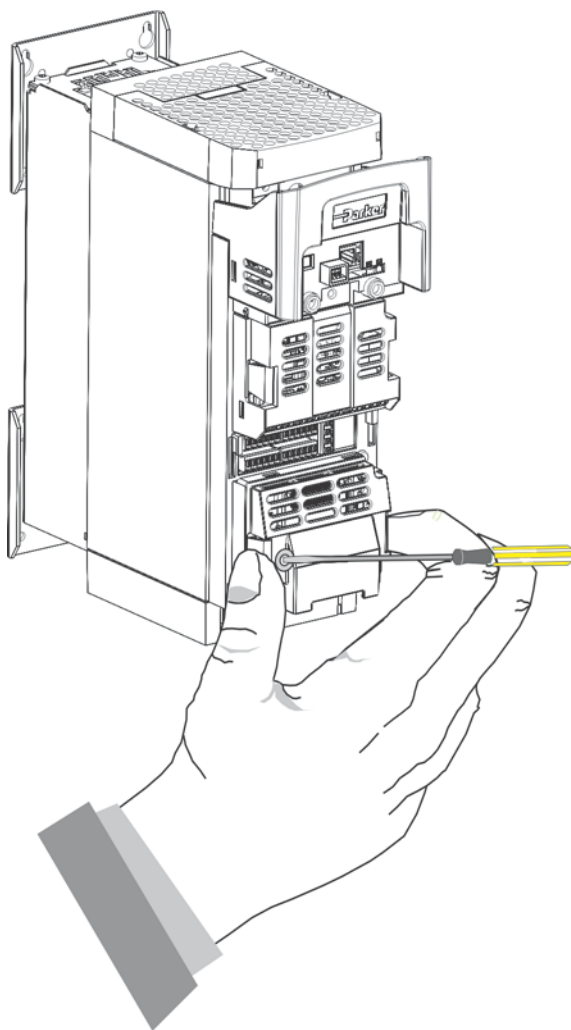
1. Remove the Graphical Keypad (GKP) by pulling from the top down, and remove.



2. After removing the screw slide the control module lower cover down slightly and then remove.

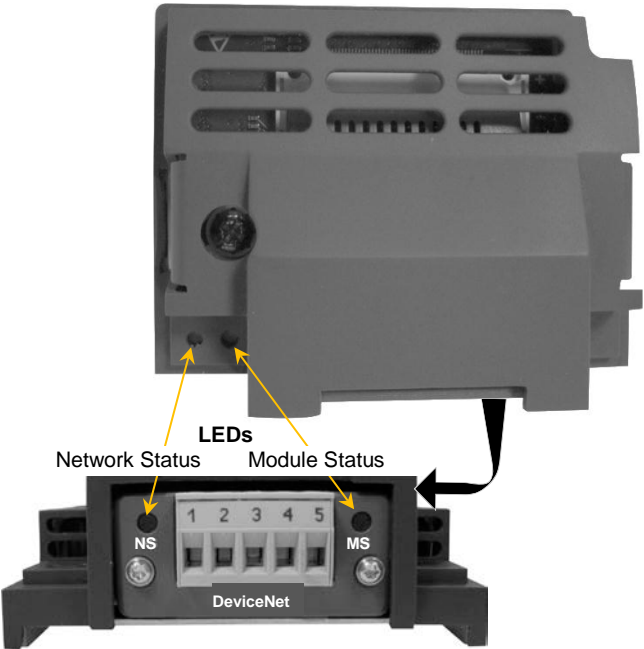


3. Click the Option into place and tighten the retaining screw, as shown.



4. Slide and click back the control module lower cover, tighten the retaining screw and slot back the GKP

# Connecting to the DeviceNet Network



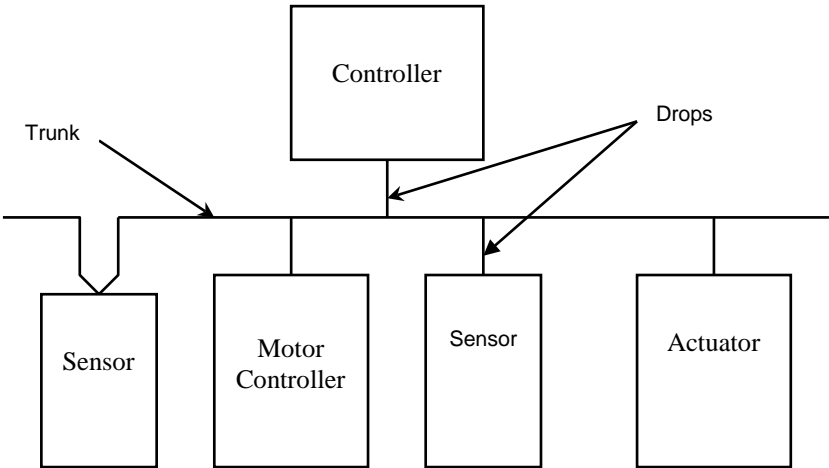
*Note: DeviceNet with optional connector attached*

Pin	Signal	Description	Wire Colour
1	V-	Negative bus supply voltage	Black
2	CAN_L	CAN low bus line	Blue
3	SHIELD	Cable shield. Connected to protective earth via a filter	
4	CAN_H	CAN high bus line	White
5	V+	Positive bus supply voltage	Red

DeviceNet is a 4-wire system. Two wires convey the DeviceNet data and the remaining two wires convey power if the product is remotely powered. Remote powering is recommended and is necessary if the network is to remain operational between other devices when the drive is powered down.

**Cable Specification**

The DeviceNet specification makes recommendations for cable type depending on whether the cable is to serve in a trunk or a drop.



Full cable specifications are provided in the ODVA DeviceNet specification, Volume1 appendix B.

A summary is given here.

	Trunk cable	Drop cable
Signal wires	Twisted pair, #18. Blue / white	Twisted pair, #24. Blue / white
Power wires	Twisted pair, #15. Black / red	Twisted pair, #22. Black / red
Shield	Foil / braid with drain wire (#18); bare. Each pair shielded separately in aluminized mylar. Combined pair shielded	Foil / braid with drain wire (#22); bare. Signal pair shielded in foil. Overall braid shield
Internal insulation	PVC insulation on power pair	PVC insulation on power pair
Electrical	High speed ( $VP \geq 0.75$ ), low loss, low distortion data pair.	High speed ( $VP \geq 0.75$ ), low loss, low distortion data pair.
Characteristic impedance of data pair	$120 \Omega \pm 10\%$	$120 \Omega \pm 10\%$

**Maximum Cable Lengths**

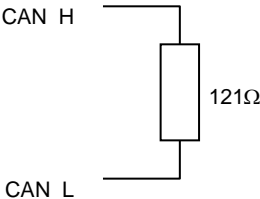
The maximum cable length depends on the baud rate selected:

Data Rate	Trunk Distance	Drop Length	
		Maximum	Cumulative
125kbaud	500 metres (1600 ft.)	3 metres (10ft)	156 metres (512 ft.)
250kbaud	200 metres (600 ft.)		78 metres (256 ft.)
500kbaud	100 metres (300 ft.)		39 metres (128 ft.)

**Bus Termination**

If the drive is at the end of the trunk it must have a terminating resistor. Connect a terminating resistor to the last drive between Pin 2 and Pin 4 as shown. (The resistor is  $\pm 1\%$ , minimum  $\frac{1}{4}$  Watt).

The DeviceNet specification recommends  $121\Omega$ , but it should be chosen to equal as closely as possible the characteristic impedance of the cable.

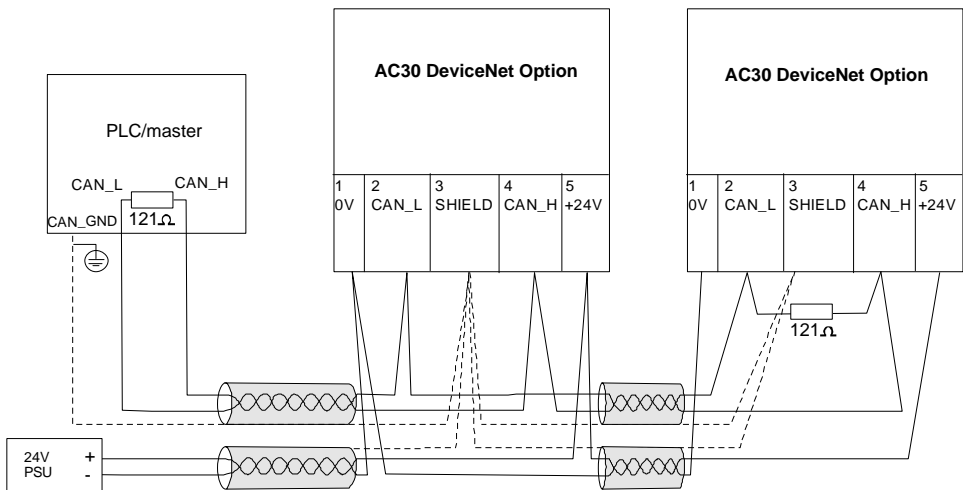


**Important:** Failing to fit terminating resistors correctly may result in unreliable operation.

For more information about cabling and terminators, refer to [www.ODVA.org](http://www.ODVA.org)

**NOTE** The connector conforms to the DeviceNet recommended terminal assignment.

Wiring Diagram Example



LEDs

Network Status (NS) LED

State	Indication
Off	Not online / No power
Green	On-line, one or more connections are established
Flashing Green (1Hz)	On-line, no connections established
Red	Critical link failure
Flashing Red (1Hz)	One or more connections timed-out
Alternating Red/Green	Self test

Module Status (MS) LED

State	Indication
Off	No power
Green	Operating in normal condition
Flashing Green (1Hz)	Missing or incomplete configuration
Red	Unrecoverable Fault(s)
Flashing Red (1Hz)	Recoverable Fault(s)
Alternating Red/Green	Self test

## Configuration

---

The option requires configuration of the MAC ID, baud rate and mapping of the process data to the master. The Producer Assembly instance number and Consumer Assembly instance number may be changed from the defaults if required. Note that some communication parameters only become active after the AC30 leaves the configuration state.

The **0044 Comms Required** parameter must be set to **DEVICENET**.

### MAC ID

The **0219 DeviceNet MAC ID** parameter must be set. The range is 0 - 63.

### Baud Rate

The **0220 DeviceNet Baud Rate** parameter must be set. If AUTO is chosen then the baud rate will be automatically detected.

### Producing / Consuming Instance Numbers

The Producing Instance Number may be changed from its default of 0064h if required using the parameter **0222 DNET Producing Inst**

The Consuming Instance Number may be changed from its default of 0096h if required using the parameter **0223 DNET Consuming Inst**

### Process Data

The cyclic I/O data is configured by using the read and write process data mapping tables in the AC30. These tables are two parameter arrays in which AC30 parameter numbers may be added.

String-type parameters may not be mapped.

#### *Read Mapping*

The read process data represents cyclic data sent from the PLC to the AC30. Only writable AC30 parameters, that are not configuration parameters, may be added to the read process data.

#### *Write Mapping*

The write process data represents cyclic data sent from the AC30 to the PLC.



### ***Mapping Arrays***

Parameter arrays may be added into the process data, however this could lead to large amounts of data being passed across the communications. An alternative is to only reference the element(s) of the array required. This is possible as each element of a parameter array has its own parameter number. See the [Appendix A—Array Parameter Numbers](#).

### ***Default Mapping***

The process data mapping will contain a factory default mapping. The default mapping may be overwritten if required.

### ***Cyclic Data Exchange***

Cyclic data exchange will occur when a Class 0 connection is established (active or idle). However, the read process data will only update the mapped parameters when in the PROCESS ACTIVE state.

On a transition into the PROCESS ACTIVE state all read process mapped parameters will be updated.

When in the PROCESS ACTIVE state the read process mapped parameters will all update only when a change in the read process data occurs.

## **DeviceNet Supported CIP Objects**

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The following CIP objects are supported:

- Identity Object (01h)
- Message Router (02h)
- DeviceNet Object (03h)
- Assembly Object (04h)
- Connection Object (05h)
- Parameter Object (0Fh)
- Acknowledge Handler Object (2Bh)
- Vendor Specific Object (A2h)

## Example Configuration

### Configuration Summary

Communications Settings	
MAC ID	5
Baud Rate	AUTO

Read Process Mapping Table		Data Type	Bytes
000	0627 Comms Control Word	WORD	2
001	0681 Comms Reference	REAL	4
002	000		
003	000		

Write Process Mapping Table		Data Type	Bytes
000	0661 Status Word	WORD	2
001	0395 Actual Speed Percent	REAL	4
002	000		
003	000		

## Example Using RSNetWorx for DeviceNet

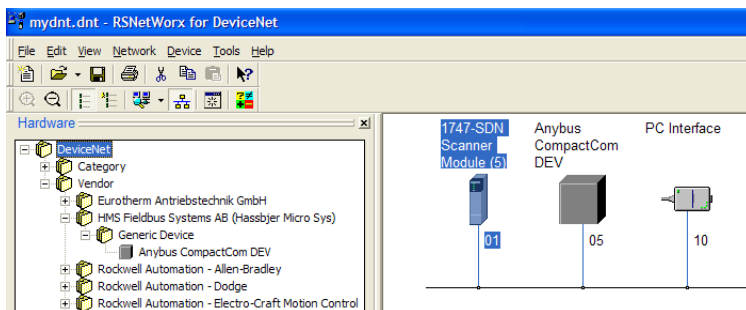
Prior knowledge of the Allen Bradley RSNetWorx for DeviceNet software is assumed. The following is an example of configuring the PLC.

1. Create a new configuration file and install EDS file

Start RSNetwork for DeviceNet. From the menu, click on **File** and **New** to create a new DeviceNet configuration.

From the menu, click on **Tools** and **EDS Wizard** to install the EDS file. When prompted select **Register a single file**. The EDS file can be downloaded from [www.parker.com/ssd](http://www.parker.com/ssd)

2. Add the devices to the network.



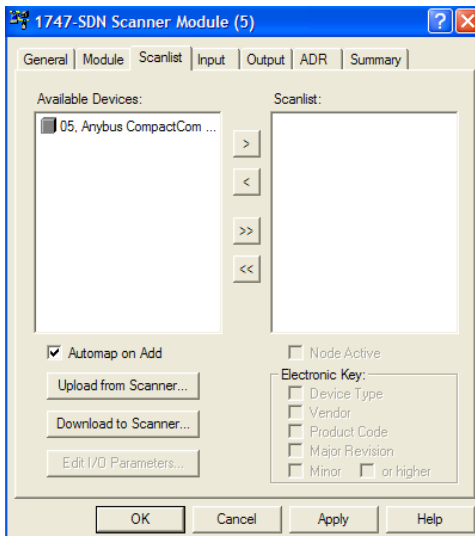
The PLC DeviceNet Scanner, any DeviceNet PC interface and DeviceNet devices may be added to the network by selecting from the Hardware list and dragging onto the network.


The AC30 DeviceNet option is found under **Vendor::HMS Fieldbus Systems AB::Generic Device::Anybus CompactCOM DEV**

Alternatively, any DeviceNet devices that are configured and powered-up on the network can be automatically browsed for by clicking on the menu **Network** and **Single Pass Browse**.

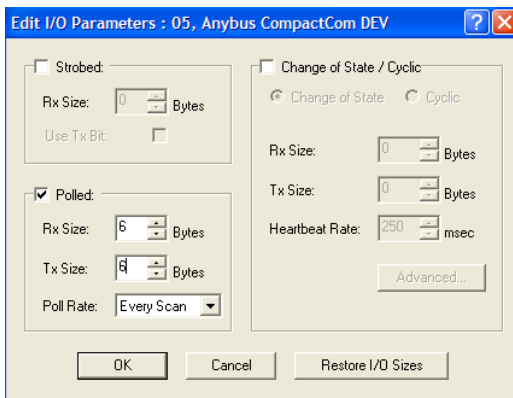
### 3. Connecting an AC30 option to a scanner.

To make a connection between the scanner and the option, double-click on the scanner icon, and then click on the **Scanlist** tab.



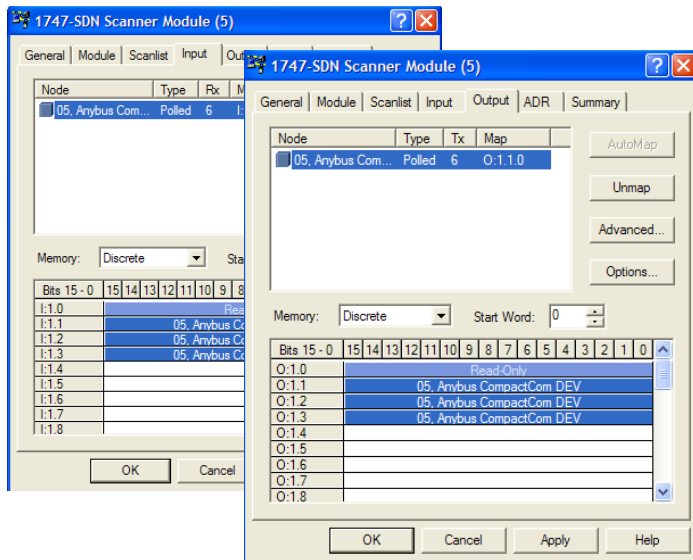
Add the device into the Scanlist by clicking on 

Next, click on Edit I/O parameters to specify the number of bytes to be transferred.



In this example polled I/O will be used with 6 bytes receive and 6 bytes transmit to match the process data configuration in the AC30. Click on OK and confirm the Automapping warning.

Click on the Input and Output tabs to view the mappings. Click OK when finished.



#### 4. Download the configuration.

From the menu select **Network** and **Download to Network**, ensure that the PLC is in the PROG mode.

When the download is complete, switch the PLC to RUN mode to start data transfer between the PLC and AC30.

## Configuring the AC30

### AC30 Parker Drive Quicktool (PDQ)

When performing an online configuration, the fitted option card will automatically be selected. In offline mode, parameter **0044 Comms Required** must be set to **DEVICENET**.

**Parker** Create a New Drive - Drive

Choose a Task Drive Application Motor Motor Control Input/Output

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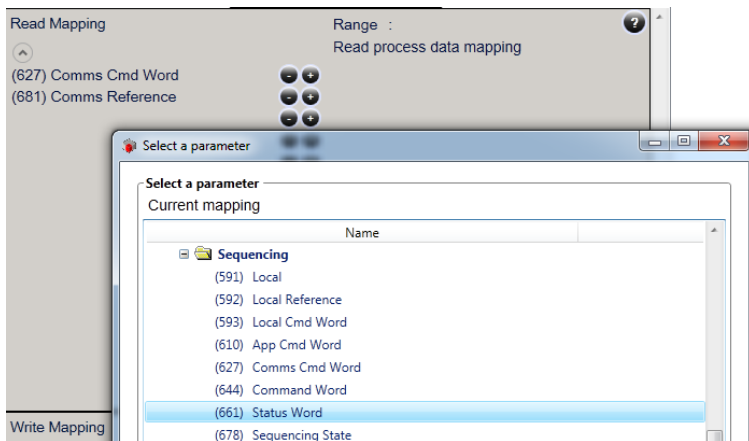
Power Stack	4.5A 400V
? Comms Required	DEVICENET
Range :	NONE
Type of communication option required by application	BACNET IP
IO Option Type	BACNET MSTP
Drive Name	CANOPEN
	CC LINK
	CONTROLNET
	DEVICENET
	ETHERCAT
	ETHERNET IP
	MODBUS RTU
	MODBUS TCP
	PROFIBUS DPV1
	PROFINET IO

In the Application tab, the following settings are available in the Communications block.

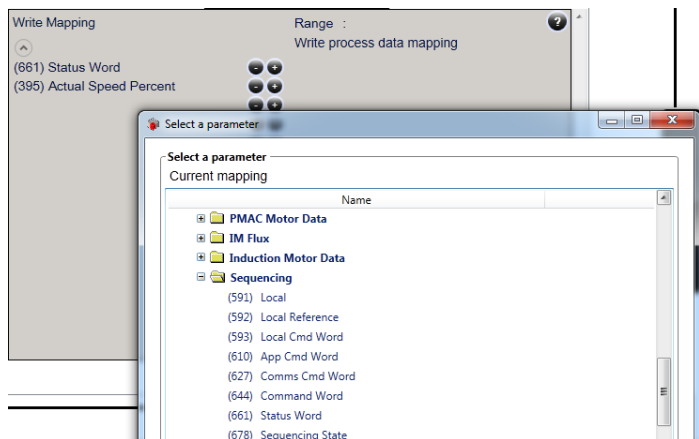
Set the **0219 DeviceNet MAC ID** and **0220 DeviceNet Baud Rate** as below:

? DeviceNet MAC ID	0
Range : 0 ---> 63	
MAC ID	
DeviceNet Baud Rate	AUTO

Add the required parameters to the Read Process Mapping table (parameter **0055 Read Mapping**) by selecting them from the popup window:



Add the required parameters to the Write Process Mapping table (parameter **0120 Write Mapping**) by selecting them from the popup window:



*Note the Process Data mapping ends on the first empty entry.*

## Acyclic Data Exchange

AC30 parameters may be accessed acyclically using explicit messaging via vendor specific object **A2h**.

### Overview

The instance number of this object corresponds directly to the AC30 parameter number. The supported services are **Get Attribute Single** and **Set Attribute Single**. The instance attributes are summarized as:

#	Attribute Name	Access / Type	Description
1	Name	Get / SHORT_STRING	Parameter name
2	Data Type**	Get / USINT	Data Type Code
3	No. of elements	Get / USINT	No. of elements of the parameter
4	Descriptor	Get / USINT	Bit 0=Get Access Bit 1= Set Access
5	Value	Get/Set / Depends on parameter	Parameter value
6	Max Value	Get / Depends on parameter	Maximum allowed parameter value
7	Min Value		Minimum allowed parameter value
8	Default Value		Not supported

\*\* The Data Type Code can be found Appendix B – Data Types

The class attributes are summarized as:

#	Attribute Name	Access / Type	Description
1	Revision	Get / UINT	Object revision (0001h)
2	Max Instance	Get / UINT	Highest parameter number
3	No. of instances	Get / UINT	Number of instances



## Arrays

Parameter arrays may be accessed either as a whole or as a single element.

Using the parameter number (instance number) that represents the whole parameter with attribute 5 will return / modify the contents of all elements. Using the parameter number that represents a single element will allow access only to that element.

See [Appendix A – Array Parameter Numbers](#).

## Strings

String parameters may be accessed via its parameter number. This is in the format of a SHORT\_STRING. See [Appendix B – Data Types](#).

String arrays may not be accessed as a whole array, but may be accessed via each element. Each element has its own parameter number. See the AC30 Product Manual HA501718U001 for more information.

## Lost Communications Trip

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### Supervised Parameter

The **0047 Comms Supervised** parameter indicates that the DeviceNet network participation is supervised by another DeviceNet device.

The Supervised parameter value is set to TRUE when the connection object has a connection.

### Comms Break Trip

The Comms Break trip will generate a trip if a break in communications is detected. A trip event will be generated when a transition from TRUE to FALSE of the parameter **0047 Comms Supervised** occurs.

To enable the Comms Break trip, the parameter **0048 Comms Trip Enable** must be set to TRUE *and* the **COMMS BREAK** bit set in the parameter **0697 Enable 1-32**.

For more information on enabling trips see Chapter 10 Trips & Fault Finding in the AC30 Product Manual HA501718U001.

## Diagnostic Event

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A single diagnostic event may be created. The severity is fixed as Minor Recoverable.

This is represented on the network through the CIP Identity Object:  
Identity Object (01h)

Instance #1

Attribute #5 (Status)

Bit #8 (Minor Recoverable Faults)

Three AC30 parameters are associated with the diagnostic event:

### **0187 Comms Event Set**

A rising edge signal from FALSE to TRUE will create a diagnostic event. The Event Clear parameter must be set FALSE.

### **0188 Comms Event Clear**

A rising edge signal from FALSE to TRUE will remove a diagnostic event. The Event Set parameter must be set to FALSE.

### **0186 Comms Event Active**

This parameter indicates if a diagnostic event is active or not.

*Note: The rising edge signals for Comms Event Set and Comms Event Clear must be held for at least 10ms in FALSE and at least 10ms in TRUE to take effect.*

When a diagnostic event is active the Module Status LED will flash red.

## Parameters

### Configuration Parameters

0044 Comms Required		Range	RW	Saved	Config
Type	USINT (enumerated)	(1) NONE	✓	✓	✓
Default	NONE	(2) BACNET IP			
Communications option parameter.  Sets the required communications option.		(3) BACNET MSTP			
		(4) CANOPEN			
		(5) CC LINK			
		(6) CONTROLNET			
		(7) DEVICENET			
		(8) ETHERCAT			
		(9) ETHERNET IP			
		(10) MODBUS RTU			
		(11) MODBUS TCP			
		(12) PROFIBUS DPV1			
		(13) PROFINET IO			

0219 DeviceNet MAC ID		Range	RW	Saved	Config
Type	USINT	0	✓	✓	✓
Default	0	...			
DeviceNet communications option parameter.  Sets the MAC ID of the device.		63			

0220 DeviceNet Baud Rate		Range	RW	Saved	Config
Type	USINT (enumerated)	(0) 125 KPS	✓	✓	✓
Default	AUTO	(1) 250 KPS			
		(2) 500 KPS			
DeviceNet communications option parameter. Sets the baud rate. If AUTO is chosen then the baud rate will be automatically detected.		(3) AUTO			

0055 Read Mapping		Range	RW	Saved	Config
Type	Array of UINT	0	✓	✓	✓
Default	-	...			
Communications option parameter. Sets the required read process data mapping.  Each entry in the table represents the required parameter number.		Last parameter number			

0120 Write Mapping		Range	RW	Saved	Config
Type	Array of UINT	0	✓	✓	✓
Default	-	...			
Communications option parameter. Sets the required write process data mapping.  Each entry in the table represents the required parameter number.		Last parameter number			

0048 Comms Trip Enable		Range	RW	Saved	Config
Type	BOOL	FALSE  TRUE	✓	✓	✕
Default	TRUE				
Communications option parameter.  Enables the communications trip.					

0222 DNet Producing Inst		Range	RW	Saved	Config
Type	WORD	0x0000  0xFFFF	✓	✓	✓
Default	0064				
DeviceNet communications option parameter.  Sets the Producing Instance Number for DeviceNet.					

0223 DNet Consuming Inst		Range	RW	Saved	Config
Type	WORD	0x0000  0xFFFF	✓	✓	✓
Default	0096				
DeviceNet communications option parameter.  Sets the Consuming Instance Number for DeviceNet.					

Runtime Parameters

0187 Comms Event Set		Range	RW	Saved	Config
Type	BOOL	FALSE  TRUE	✓	x	x
Default	FALSE				
Communications option parameter.					
A rising edge (FALSE to TRUE) will create a diagnostic event.					

0188 Comms Event Clear		Range	RW	Saved	Config
Type	BOOL	FALSE	✓	✗	✗
Default	FALSE				
		TRUE			
Communications option parameter.					
A rising edge (FALSE to TRUE) will remove a diagnostic event.					

Diagnostic Parameters

0045 Comms Fitted		Range
Type	USINT (enumerated)	(0) UNKNOWN
		(1) NONE
Communications option parameter.		(2) BACNET IP
Indicates the communications option fitted.		(3) BACNET MSTP
		(4) CANOPEN
		(5) CC LINK
		(6) CONTROLNET
		(7) DEVICENET
		(8) ETHERCAT
		(9) ETHERNET IP
		(10) MODBUS RTU
		(11) MODBUS TCP
		(12) PROFIBUS DPV1
		(13) PROFINET IO

0046 Comms State		Range
Type	USINT (enumerated)	<div>(0) SETUP – setup in progress</div> <div>(1) NW INIT – network-related initialisation tasks are being performed</div> <div>(2) WAIT PROCESS – the module will stay in this state until a Class 0 connection is opened</div> <div>(3) IDLE – Class 0 connection idle</div> <div>(4) PROCESS ACTIVE – Error free Class 0 connection</div> <div>(5) ERROR – Class 0 connection error, bus off event detected or dup-MAC-fail</div> <div>(6) RESERVED</div> <div>(7) EXCEPTION – major fault</div> <div>(8) NONE – option not fitted</div>
Communications option parameter.  Indicates the state of the communications option fitted.		



0218 DeviceNet State		Range
Type	USINT (enumerated)	<div>(0) SETUP – setup in progress</div> <div>(1) NW INIT – network-related initialisation tasks are being performed</div> <div>(2) WAITING TO CONNECT – the module will stay in this state until a Class 0 connection is opened</div> <div>(3) CONNECTION IDLE – Class 0 connection idle</div> <div>(4) CONNECTION ACTIVE – Error free Class 0 connection</div> <div>(5) ERROR – Class 0 connection error, bus off event detected or dup-MAC-fail</div> <div>(6) RESERVED</div> <div>(7) EXCEPTION – major fault</div> <div>(8) NONE – option not fitted</div>
<div>DeviceNet communications option parameter.</div> <div>Indicates the state of the communications option fitted as the <b>0046 Comms State</b> parameter, but using specific enumerated strings for DeviceNet.</div>		

0221 DeviceNet Actual Baud		Range
Type	USINT (enumerated)	(0) 125 KPS  (1) 250 KPS  (2) 500 KPS  (3) AUTO
DeviceNet communications option parameter.		
The actual baud rate of the device. AUTO indicates auto-detection of the baud rate is in progress.		

0047 Comms Supervised		Range
Type	BOOL	FALSE  TRUE
Communications option parameter.  Indicates that the DeviceNet network participation is supervised by another DeviceNet device.		

0049 Comms Module Version		Range
Type	DWORD	0x00000000  ...  0xFFFFFFFF  The most significant byte is the major version number, followed by the minor version number. The least significant byte is the build number.
Communications option parameter.		
Firmware version of the option communications module.		

0050 Comms Module Serial		Range
Type	DWORD	0x00000000  ... 0xFFFFFFFF
Communications option parameter.		
Serial number of the option communications module.		

0051 Comms Diagnostic		Range
Type	USINT (enumerated)	<div>(0) NONE</div> <div>(1) HARDWARE MISMATCH – required communications option does not match that fitted, or no option fitted but one is required.</div> <div>(2) INVALID CONFIGURATION – the configuration of the option is not valid.</div> <div>(3) MAPPING FAILED – the process data mapping is not permitted, e.g. adding read-only parameters to the read process data mapping.</div> <div>(4) EXCEPTION – configuration error</div> <div>(5) UNSUPPORTED OPTION – the fitted option is not currently supported</div>
Communications option parameter.		
Indicates the state of the communications option fitted.		

0052 Comms Diagnostic Code		Range
Type	DWORD	0x00000000  ...  0xFFFFFFFF
Communications option parameter.  Diagnostic code associated with the Diagnostic parameter.		

0053 Comms Exception		Range
Type	BYTE	0x00  ...  0xFF
Communications option parameter.  Exception code associated with the Diagnostic parameter being in EXCEPTION		

0054 Comms Net Exception		Range
Type	BYTE	0x00  ...  0xFF
Communications option parameter.  Network specific exception code associated with the Diagnostic parameter being in EXCEPTION		

0186 Comms Event Active		Range
Type	BOOL	FALSE  TRUE
Communications option parameter.  Indicates a diagnostic event is active.		

## Troubleshooting

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Configuration problems can often be identified by looking at the Network Status and Module Status LEDs and from the **DeviceNet State** and **Comms Diagnostic** parameters. Under normal operating conditions the Diagnostic parameter should indicate NONE. Other values are summarized in the Diagnostic Parameters section.

### Hardware Mismatch

*Diagnostic = HARDWARE MISMATCH*

- The required option does not match the actual fitted option.
- No option is fitted but one is required.

### Invalid Configuration

*Diagnostic = INVALID CONFIGURATION*

- Invalid read or write process data mapping
- No read or write process data mapped
- Invalid communication settings

*Diagnostic = MAPPING FAILED*

- Attempting to map a parameter that does not exist.
- Attempting to map a configuration parameter.
- Attempting to map a string parameter.
- Attempting to map a read-only parameter to the read process data.

## Appendix A – Array Parameter Numbers

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Some parameters have multiple elements and are classified as parameter arrays. A parameter array has a parameter number that accesses the *whole* of the array. It also has parameter numbers that represent each *element* of the array.

### Array Example

A parameter array called **My Array** has 4 elements.

Parameter Number	Parameter - My Array
0152	Whole array
0153	index 0
0154	index 1
0155	index 2
0156	index 3

If the parameter number of the whole array is 0152, then the parameter number of the element index 0 of the array will be 0153, the parameter number of the element index 01 will be 0154, etc.

Note that *string* array parameters access their elements via parameter numbers that are calculated in a different way. See the AC30 Product Manual HA501718U001 for more details.

## Appendix B – Data Types

The relationship between AC30 parameter and CIP data type is given in the table below.

AC30 Parameter		CIP	
AC30 Data Type	Description	Data Type	Bytes
BOOL	Boolean	BOOL	1
SINT	Short integer	SINT	1
INT	Integer	INT	2
DINT	Double integer	DINT	4
USINT	Unsigned short integer	USINT	1
UINT	Unsigned integer	UINT	2
UDINT	Unsigned double integer	UDINT	4
REAL	Floating point	FLOAT	4
TIME	Duration	UDINT	4
DATE	Date	UDINT	4
TIME_OF_DAY	Time of day	UDINT	4
DATE_AND_TIME	Date and time of day	UDINT	4
STRING	String	SHORT_STRING**	<i>n</i>
BYTE	Bit string length 8	USINT	1
WORD	Bit string length 16	UINT	2
DWORD	Bit string length 32	UDINT	4

\*\* SHORT\_STRING consists of a single-byte length field followed by the actual character data.

The Data Type Code returned using explicit messaging via vendor specific object A2h, attribute 2 is given in the table below.

AC30 Data Type	Data Type Code
BOOL	0
SINT	1
INT	2
DINT	3
USINT	4
UINT	5
UDINT	6
REAL	18
TIME	6
DATE	6
TIME_OF_DAY	6
DATE_AND_TIME	6
STRING	7
BYTE	4
WORD	5
DWORD	6
USINT (enumerated)	8

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