



Option Modules

BACnet IP Communications Option

HA501939U001 Issue 1
Technical Manual

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
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AC30 BACnet/IP Option

Technical Manual

HA501939U001 Issue 1

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

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

 DANGER Risk of electric shock	 WARNING Hot surfaces	 Caution Refer to documentation	 Earth/Ground 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 BACNET/IP OPTION

Introduction

Features

- BACnet/IP device
- Linear network topology supported
- 10/100Mbit, full/half duplex operation
- Galvanically isolated 2-port Ethernet interface
- Network Status and Module Status LEDs
- Change Of Value (COV) notification and Alarm/Event functionality supported
- May be used with the GPIO option with a real-time clock
- Web server
- FTP server

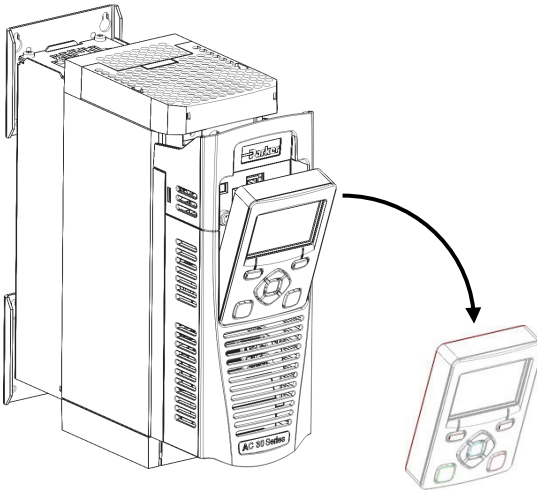
The Product Code

The product code for the BACnet/IP Option is:

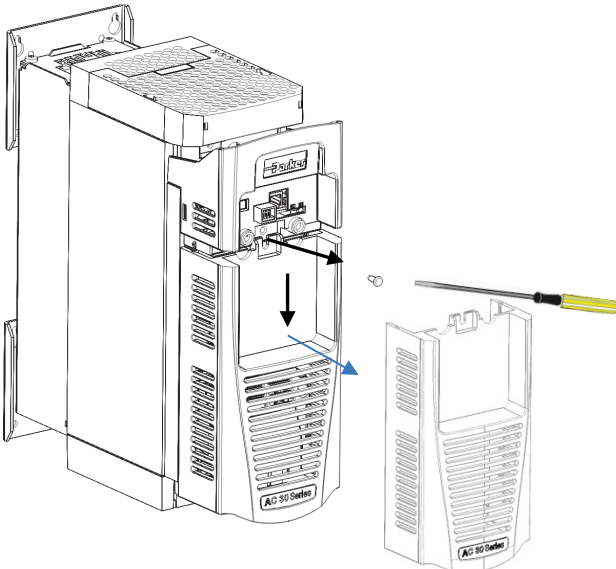
7003-BI-00

Installation

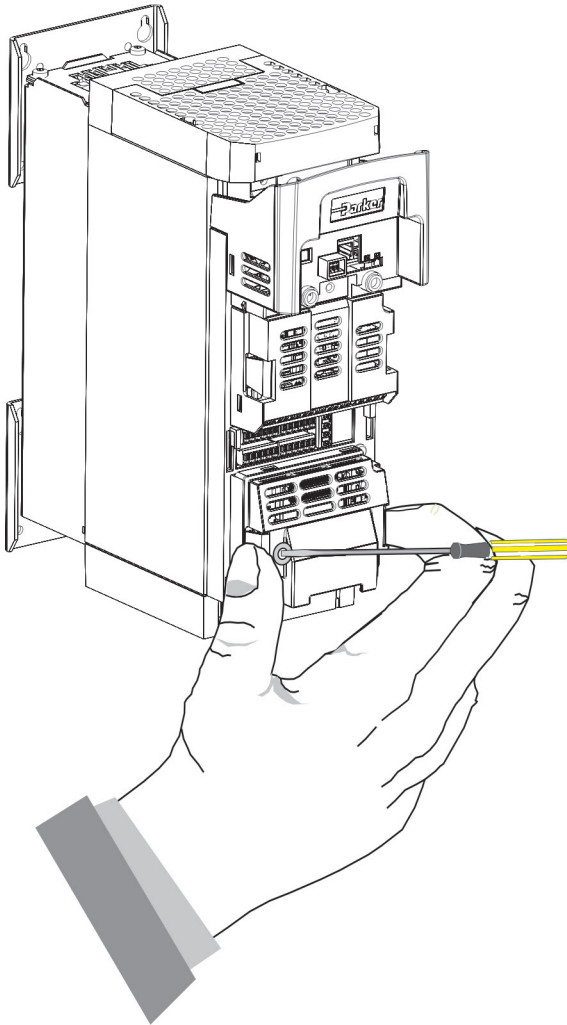
1. Remove the Graphical Keypad (GKP) by pulling from the top down, and remove.



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

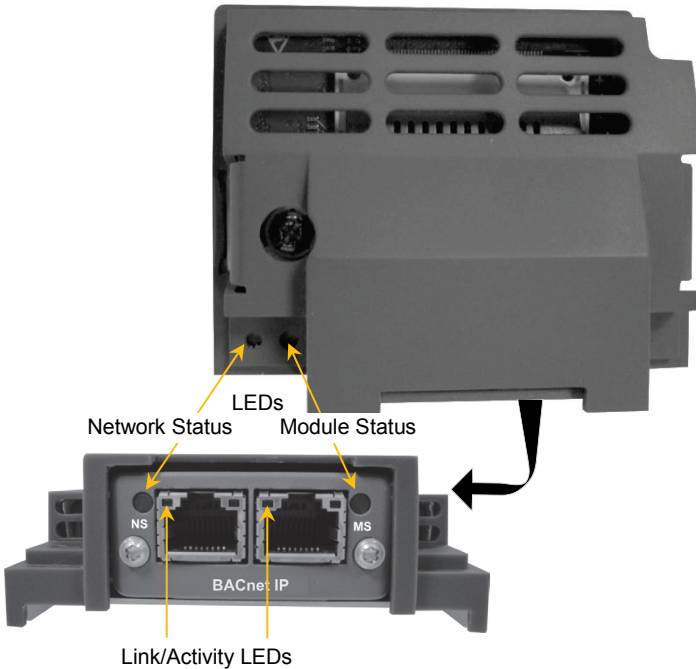


3. Click the Option into place and tighten the retaining screw, as shown.



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

Connecting to the BACnet/IP Network

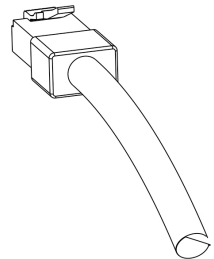


Two RJ45 Ethernet sockets are provided. Either or both sockets may be used. Having 2 ports reduces the need for additional Ethernet switches. The network *should not* be configured in a ring.

The socket shields are connected to protective earth via a filter.

Cable Type

CAT5E or CAT6 cable is recommended - up to 100m between nodes.



LEDs

Network Status (NS) LED

State	Indication
Off	No power or no IP address
Green	<ul style="list-style-type: none"> - Online, one or more BACnet messages have arrived - Module has active COV subscriptions - At least one value object has one or more events enabled
Green, flashing	Online waiting for first BACnet message
Red	Duplicate IP address, Fatal error
Red, flashing	<ul style="list-style-type: none"> - Connection timeout. No BACnet message has been received within the configured process active timeout time. - A COV or Alarm/Event notification could not be sent to its recipient

Module Status (MS) LED

State	Indication
Off	No power
Green	Normal operation
Red	Major fault (Exception state, Fatal error)
Red, flashing	Recoverable fault(s)

Link/Activity LED

State	Indication
Off	No link, no activity
Green	Link established, 100Mbit/s
Green, flickering	Activity, 100Mbit/s
Yellow	Link established, 10Mbit/s
Yellow, flickering	Activity, 10Mbit/s

Configuration

The option requires configuration of the address, Device ID and mapping of AC30 parameters used in COV (Change Of Value) and Alarm/Event notifications. Optionally, a process active timeout may be set. Note that some communication parameters only become active after the AC30 leaves the configuration state.

The **0044 Comms Required** parameter must be set to **BACNET IP**.

Address

There are three methods to set the IP address, subnet mask and gateway address of the device: the slave sets its own address, the address is set externally or the address is set by a DHCP server. The parameter **0199 Address Assignment** is used to choose the method.

If the IP address is set by the slave (**Address Assignment = FIXED**) then three further parameters must be set. These are:

0200 Fixed IP Address

0201 Fixed Subnet Mask

0202 Fixed Gateway Address

Device ID

The **0209 BACnet IP Device ID** parameter sets the Device ID (Device Instance).

Process Active Timeout

The **0210 BACnet IP Timeout** parameter specifies how long the option shall stay in the PROCESS ACTIVE state after receiving a BACnet request.

If this is set to zero, then the option will remain in the PROCESS ACTIVE state after receiving the first BACnet request.

COV and Alarm/Event Mapping

AC30 parameters used for COV (Change Of Value) notification and for Alarms and Events must be mapped to the write process data. If not, the option has no way of detecting any changes in the value of the parameter.

If the mapping is changed, all COV and Alarm/Event information, that has been stored in non-volatile memory, will be cleared.

Default Mapping

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

BACnet Objects

The following BACnet objects are supported:

Device Object	Class 8
Notification Class Object	Class 15
Analog Value Object	Class 2
Binary Value Object	Class 5
Multi-State Value Object	Class 19

Within the option there is one Device Object and six Notification Class Objects. The Analog Value, Binary Value and Multi-State Value objects are mapped to the AC30 parameters.

Descriptions of the object properties follow. The following abbreviations are used in the notes:

R	read-only property
RW	read-write property
NV	property is stored in non-volatile memory
M	property is only available if the corresponding AC30 parameter has been mapped to the write process data.

Device Object

The Device object contains information about the module as a node on the BACnet network.

Property Identifier	Notes
Object_Identifier	RW -
Object_Name	RW This is set to the AC30 Drive Name parameter
Object_Type	R DEVICE
System_Status	R The status of the system is reported as NON_OPERATIONAL if the option has entered the ERROR state. Otherwise it is reported as OPERATIONAL
Vendor_Name	R -
Vendor_Identifier	R 486
Model_Name	R -
Firmware_Revision	R Firmware revision of the option
Application_Software_Revision	R -
Protocol_Version	R 1
Protocol_Revision	R 7
Protocol_Service_Supported	R Bit map stating what protocol services are supported in the object. 1001 0100 000 1011 1100 1000 0010 000 1110 0001

Property identifier	Notes	
Protocol_Object_Types_Supported	R	Bit map stating what object types are supported in the object. 0010 0100 1000 0001 0001 0000
Object_List	R	List filled based on the implemented objects.
Max_APDU_Length_Accepted	R	1476
Segmentation_Supported	R	Segmentation supported for both Rx and Tx APDU. SUPPORTED_BOTH
Max_Segments_Accepted	R	Number of maximum length APDUs that can be received in a segmented message. 22
Local_Time	R	The local time is synchronized from the optional Real Time Clock at power up or set from the BACnet network via the TimeSynchronization service.
Local_Date	R	(As above)
APDU_Timeout	RW NV	Default: 10000 milliseconds
Number_of_APDU_Retries	RW NV	Default: 3
Device_Address_Binding	R	Managed by the APL layer and contains the list of all device address bindings of active client processes inside the BACnet option.
Database_Revision	R NV	Incremented each time an object identifier is changed or the name of a BACnet object is changed.
APDU_Segment_Timeout	RW NV	Default: 5000 milliseconds
Active_COV_Subscriptions	R	Active COV subscription (max.60) entries registered with SubscribeCOV service.

Notification Class Object

The option has 6 instances of the Notification Class object. Each instance contains a list of devices that need to be informed about events and alarms.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	RW NV	Notification_Class_# (default) # = instance number
Object_Type	R	NOTIFICATION_CLASS
Notification_Class	R	Equal to instance number
Priority	RW NV	BACnet array of Unsigned values: 0: Number of elements (read-only) 1: TO-OPERATIONAL 2: TO-FAULT 3: TO-NORMAL Default: {3,0,0,0} Values 0 - 255 allowed, a lower value has a higher priority.
Ack_Required	RW NV	BACnet Bit string of 3 bits: Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: {0,0,0} 0 = not set
Recipient_List	RW NV	BACnet list of BACnetDestination primitives. There are 60 list entries available to be configured among the 6 Notification Class instances.
Vendor Property 600: Recipient_Error_Field	R	BACnet bit string of a maximum of 60 bits. The string has one bit per element present in the Recipient_List. If a bit is set an event notification error is present for the corresponding recipient entry in the Recipient_List property.

Analog Value Object

The Analog Value object is mapped to AC30 parameters that represent analog values.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	R	Mapped AC30 parameter name
Object_Type	R	ANALOG_VALUE
Present_Value	RW	Mapped AC30 parameter value converted to Real.
Status_Flags	R	Bit string of Status flags indicating the status of the object. Bit 0: IN_ALARM Bits 1-3: not used – set to FALSE Default: {F,F,F,F}
Event_State	R	Valid states: 0: NORMAL 3: HIGH_LIMIT 4: LOW_LIMIT Default: NORMAL
Out_Of_Service	R	Always FALSE
Units	R	-
COV_Increment	RW NV	Min value: 0 Max value: The max value of the data type of the AC30 parameter. Default: 0
Time_Delay	RW NV	Time delay for an event to be triggered after occurrence (seconds). Default: 0
Notification_Class	RW NV	Min value: 0 Max value: 5 Default: 0
High_Limit	RW NV	Min value: The min value of the data type of the AC30 parameter.
Low_Limit	RW NV	Max Value: The max value of the data type of the AC30 parameter. Default: 0
Deadband	RW NV	Min value: 0 Max value: The max value of the data type of the AC30 parameter. Default: 0
Limit_Enable	RW NV	Bit string that determines what TO event limits are enabled. Bit 0: LOW_LIMIT_ENABLE Bit 1: HIGH_LIMIT_ENABLE Default: {F,F}

Property identifier	Notes	
Event_Enable	RW NV	Bit string that determines what TO events are enabled. Bit 0: TO-OFFNORMAL Bit 1: not used – set to FALSE Bit 2: TO-NORMAL Default: {F,F,F}
Notify_Type	RW NV	Specifies the classification of a TO event that is sent by this object. 0: ALARM 1: EVENT Default: ALARM
Acked_Transitions	R M	Bit string that determines what TO events have been acknowledged by a BACnet recipient. Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: {T,T,T}
Event_Time_Stamps	R M	Array of BACnetTimeStamp that specifies the last TO event stamp that was triggered. Index 0: Number of elements (3) Index 1: TO-OFFNORMAL Index 2: TO-FAULT Index 3: TO-NORMAL

Binary Value Object

The Binary Value object is mapped to AC30 parameters of data type BOOL.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	R	Mapped AC30 parameter name
Object_Type	R	BINARY_VALUE
Present_Value	RW	Mapped AC30 parameter value.
Status_Flags	R	Bit string of Status flags indicating the status of the object. Bit 0: IN_ALARM Bits 1-3: not used – set to FALSE Default: {F,F,F,F}
Event_State	R	Valid states: 0: NORMAL 2: OFF_NORMAL Default: NORMAL
Out_Of_Service	R	Always FALSE
Time_Delay	RW NV	Time delay for an event to be triggered after occurrence (seconds). Default: 0
Notification_Class	RW NV	Min value: 0 Max value: 5 Default: 0
Alarm_Value	RW NV	Default: INACTIVE (0)
Event_Enable	RW NV	Bit string that determines what TO events are enabled. Bit 0: TO-OFFNORMAL Bit 1: not used – set to FALSE Bit 2: TO-NORMAL Default: {F,F,F}
Notify_Type	RW NV	Specifies the classification of a TO event that is sent by this object. 0: ALARM 1: EVENT Default: ALARM
Acked_Transitions	R M	Bit string that determines what TO events have been acknowledged by a BACnet recipient. Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: {T,T,T}
Event_Time_Stamps	R M	Array of BACnetTimeStamp that specifies the last TO event stamp that was triggered. Index 0: Number of elements (3) Index 1: TO-OFFNORMAL Index 2: TO-FAULT Index 3: TO-NORMAL

Multi-State Value Object

The Multi-State Value object is mapped to AC30 parameters of enumerated data type.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	R	Mapped AC30 parameter name
Object_Type	R	MULTISTATE_VALUE
Present_Value	RW	Multistate states begin at 1; therefore the BACnet Present_Value is 1 greater than the AC30 parameter value.
Status_Flags	R	Bit string of Status flags indicating the status of the object. Bit 0: IN_ALARM Bit 1: FAULT Bits 2-3: not used – set to FALSE Default: {F,F,F,F}
Event_State	R	Valid states: 0: NORMAL 1: FAULT 2: OFF_NORMAL Default: NORMAL
Out_Of_Service	R	Always FALSE
Number_Of_States	R	Corresponds to the AC30 parameter maximum value + 1
Time_Delay	RW NV	Time delay for an event to be triggered after occurrence (seconds). Default: 0
Notification_Class	RW NV	Min value: 0 Max value: 5 Default: 0
Alarm_Values	RW NV	Default: <i>empty list</i>
Fault_Values	RW NV	Default: <i>empty list</i>
Event_Enables	RW NV	Bit string that determines what TO events are enabled. Bit 0: TO-OFFNORMAL Bit 1: TO_FAULT Bit 2: TO-NORMAL Default: {F,F,F}
Notify_Type	RW NV	Specifies the classification of a TO event that is sent by this object. 0: ALARM 1: EVENT Default: ALARM

Property identifier	Notes	
Acked_Transitions	R M	Bit string that determines what TO events have been acknowledged by a BACnet recipient. Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: {T,T,T}
Event_Time_Stamps	R M	Array of BACnetTimeStamp that specifies the last TO event stamp that was triggered. Index 0: Number of elements (3) Index 1: TO-OFFNORMAL Index 2: TO-FAULT Index 3: TO-NORMAL
State_Text	R	This is mapped to the AC30 parameter enumerated strings
Reliability	R M	Object reliability. 0: NO_FAULT_DETECTED 9: MULTI_STATE_FAULT Default: NO_FAULT_DETECTED

BACnet Services

Services Summary

The following services are supported by the BACnet option.

Service	Description
ReadProperty	Reads a single property from a BACnet object
ReadPropertyMultiple	Reads multiple properties from a BACnet object
WriteProperty	Writes a single property to a BACnet object
WritePropertyMultiple	Writes multiple properties to a BACnet object
Who-Is	Used to find out which devices are present on the network and their addresses.
Who-Has	Used to find out what devices in a network are implementing a specific object, using either the object identifier or the object name.
I-Am	The service is sent in response to a matching Who-Is request.
I-Have	The service is sent in response to a matching Who-Has request.
DeviceCommunicationControl †	Turns off the BACnet communication of the device. <ul style="list-style-type: none"> - Once disabled the device will only respond to DeviceCommunicationControl request and ReinitializeDevice messages. - If only Initiation instead of all communication is disabled, the module will also respond to Who-Is requests.
ReinitializeDevice †	Resets devices over BACnet. Only Warm Start is supported on the option.
TimeSynchronization	Synchronizes the current time and date of the module.
SubscribeCOV	Subscribes for changes of value with a BACnet object. The AC30 parameter has to be mapped onto the write process data.
GetAlarmSummary	Responds with a list containing information about all active alarms.
GetEventSummary	Responds with a list containing information about all active alarms and events.
AcknowledgeAlarm	Acknowledge an active alarm.

† The password for these services is "Admin".

AC30 Specific

Who-Has

The Who-Has service is used to find out what devices in a network are implementing a specific object, using either the object identifier or the object name.

When used to lookup a Value Object via its name, use the format “Pnnnn” where nnnn is the AC30 parameter number.

For example, to lookup AC30 parameter **0044** use “P0044”.

Time Synchronization

The BACnet option may be used with or without a GPIO option that has a Real-Time Clock (RTC).

Without a GPIO RTC option the time and date of the BACnet option is not initialised at power-up or reset. To use the time and date of the BACnet option a network TimeSynchronization message must be received.

With a GPIO RTC option fitted the time and date of the BACnet option will be set to that of the GPIO option at power-up or reset. If a network TimeSynchronization message is received, then this will be used to modify the time and date of the BACnet option and modify the RTC in the GPIO option.

BACnet Parameter Mapping

The AC30 parameters are mapped to BACnet Value objects as summarised in the table below.

The relationship between AC30 parameter number and Value object instance is one-to-one

AC30 Type	BACnet Object
BOOL	Binary Value
WORD named bits ^(a)	
DWORD named bits ^(a)	
USINT (enumerated) ^(b)	Multi-State Value
SINT	Analog Value
INT	
DINT ^(c)	
USINT	
UINT	
UDINT ^(c)	
REAL	
BYTE	
WORD	
TIME ^(c)	
DATE	Not mapped
TIME_OF_DAY	
DATE_AND_TIME	
STRING	
DWORD	
Arrays ^(d)	

- (a) Some AC30 bit string parameters have individual named bits. These bits are assigned their own parameter number and are mapped to the BACnet Binary Value object. See [Appendix B – Bit String Parameter Numbers](#).
- (b) Multistate states begin at 1; therefore the BACnet Present_Value is 1 greater than the AC30 parameter value.
- (c) 32-bit integer types may lose precision when converted to/from the BACnet Real value.
- (d) Parameter arrays cannot be directly mapped to Value objects. However AC30 parameter arrays elements are assigned their own parameter number and are mapped to Value objects depending on their data type. See [Appendix A – Array Parameter Numbers](#).

COV (Change of Value) Notifications

A BACnet device can subscribe for a COV notification from the AC30 BACnet option. The SubscribeCOV service is used to send the identifier of the desired object to activate the notification. A change in the Present_Value property will then trigger a COV notification.

To use this feature the AC30 parameter must be mapped to the Write Process Data. If not, a change in value will go unnoticed and a SubscribeCOV will return the error code COV_Subscription_Failed.

For Binary Value and Multi-State Value objects any change in the Present_Value property will cause a notification to be sent. For Analog_Value objects the property COV_Increment is used to device how much a Present_Value needs to change in order for a notification to be sent.

Note: If the Write Process Data is changed or the AC30 is reset or power-cycled then all COV information will be cleared.

Alarm/Event Functionality

A change in the present value of an object can be used to trigger an alarm or event.

Each Value object is associated to a Notification Class object instance, of which 6 are available (0 – 5). Each instance contains a list of recipients of a specific Alarm/Event notification. A total of 60 list entries are available divided among the 6 instances.

Alarm/events are issued every time a value object changes state. The reasons for changing state are specific to each of the three Value objects. The possibility to issue an alarm or an event has to be enabled in each object. This functionality is only available if the associated AC30 parameter is mapped to the Write Process Data.

Note: If the Write Process Data is changed then all Alarm/Event information stored in non-volatile memory will be cleared.

Example Configuration

Configuration Summary

Communications Settings	
IP Address, Subnet Mask, Gateway Address	
Device ID	1003
Process Active Timeout	3000 ms

Write Process Mapping Table		AC30 Data Type	BACnet Value Object
0000	0395 Actual Speed Percent	REAL	ANALOG
0001	0000		

Analog Value Alarm & COV Settings	
Instance	395 (Actual Speed Percent)
Notification_Class	0
Notify_Type	Alarm
Event_Enable	To-Offnormal, To-Normal
Limit_Enable	High_Limit_Enable
High_Limit	80.0
Deadband	10.0
COV_Increment	10.0

Notification Class Settings	
Instance	0
Recipient List:	
ValidDays	MTWTFSS
FromTime	00:00:00.00
ToTime	23:59:59.99
Recipient	DE100
ProcessIdentifier	1
IssueConfirmedNotifications	Confirmed
Transitions	To-Offnormal, To-Fault, To-Normal

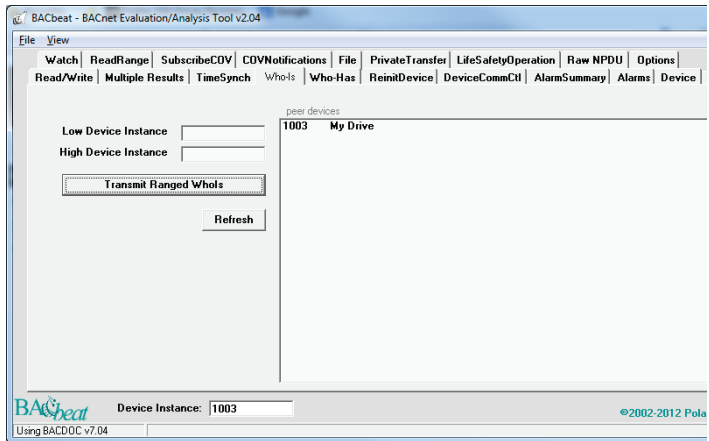
Example Using BACbeat

An example is shown using the software analysis tool BACbeat from PolarSoft Inc ®. Some prior knowledge of the BACnet protocol is assumed.

The Device ID of the BACbeat is set to 100.

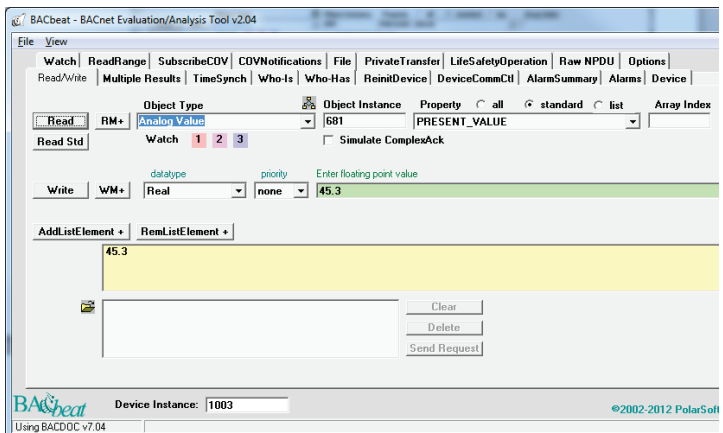
Who-Is

Select the **Who-Is** tab and click on the **Transmit Ranged Whols**. A list of BACnet devices will be shown. The AC30 BACnet device names will be the same as the AC30 Drive Name.



ReadProperty and WriteProperty

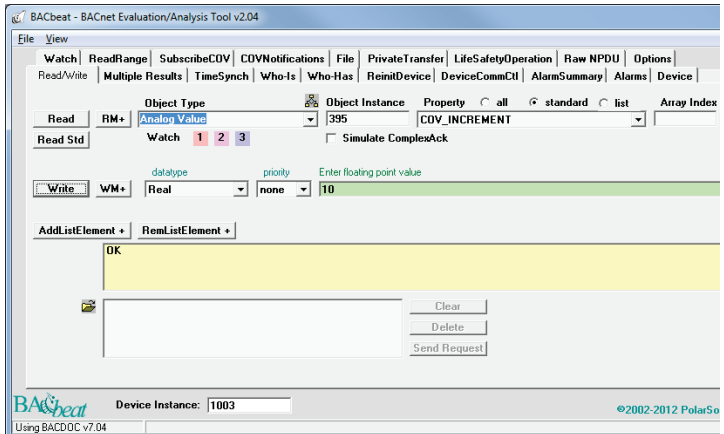
In this example the AC30 parameter **0681 Comms Reference** value is being read and written to.



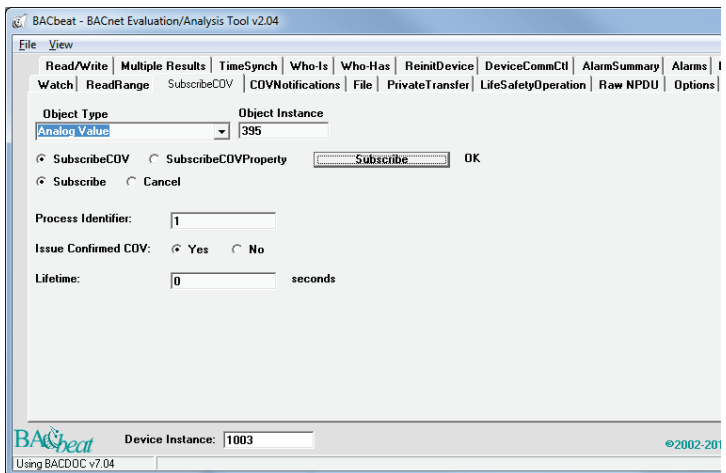
Change Of Value (COV) Notifications

In this example the AC30 parameter **0395 Actual Speed Percent** is being monitored. This must be added to the Write Process Data.

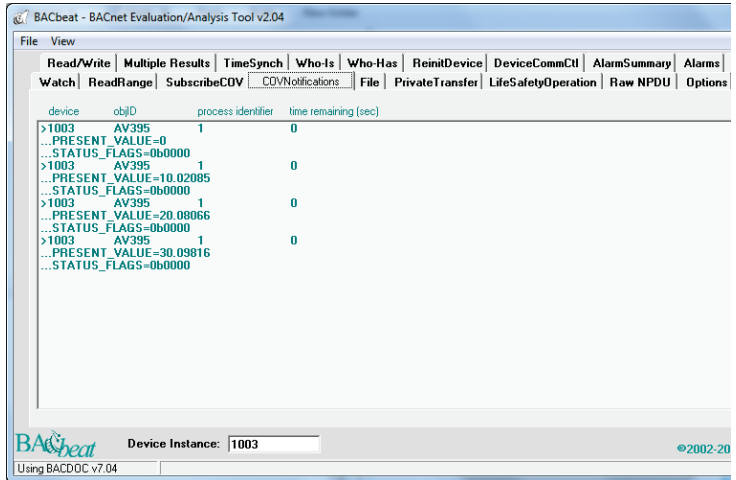
The COV Increment property sets how much the Present Value of an Analog Value object must change by before a COV notification is sent. On instance 395 this is set to 10.0



A device may subscribe to a COV of this instance.

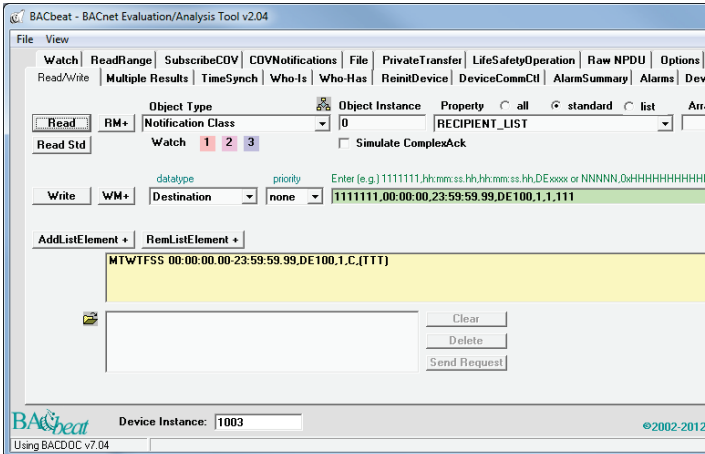
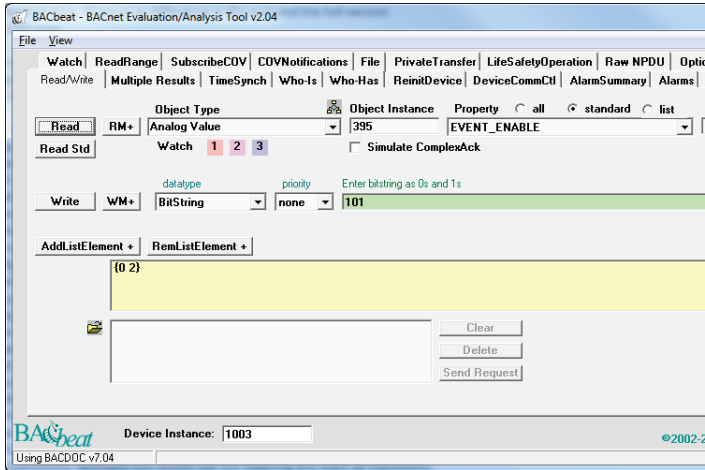


A notification will be sent to the subscribing device when the parameter **0395 Actual Speed Percent** changes by 10.0% or more. This is shown below as the **Actual Speed Percent** parameter value increases from 0 to over 30%

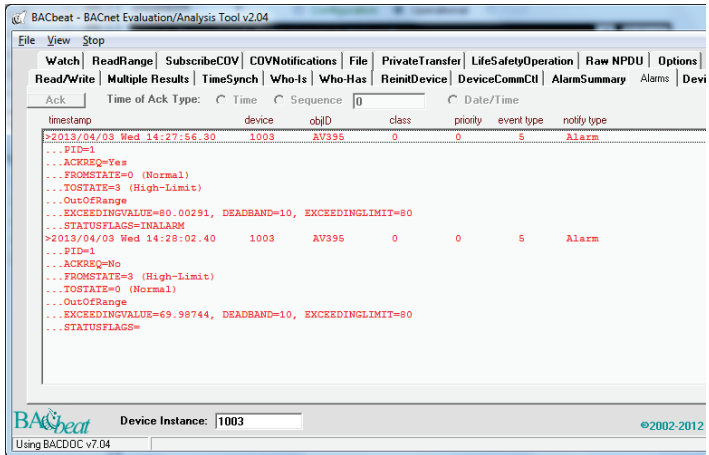


Alarms/Events

In this example an alarm is set up using the Analog Value Alarm Settings and Notification Class Settings in the Configuration Summary above.




A notification will be sent when the parameter **0395 Actual Speed Percent** value exceeds 80% in which case the Analog Value status flags will change to **In Alarm**. Subsequently when the parameter value drops below 70% the status flags will be cleared.



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 **BACNET IP**.

 Create a New Drive - Drive

Choose a Task | Drive | Application | Motor | Motor Control | Input/Output

(987) Power Stack	38.0A 400V
Comms Required	NONE
Range :	NONE
ID : 44	BACNET IP
The required communications option type.	
(1178) IO Option Type	
(961) Drive Name	'AC30

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

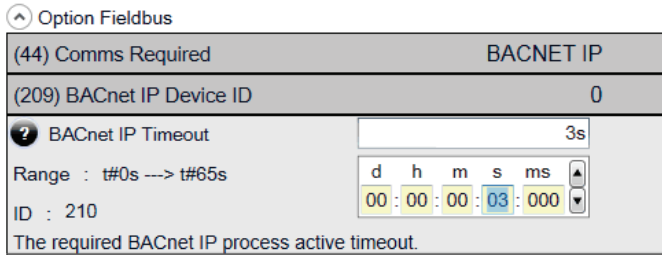
Select the method to set the IP address, subnet mask and gateway address using the **0199 Address Assignment** parameter.

Address Assignment	FIXED
Range :	
ID : 199	
The required method for setting the communications option IP address, subnet mask and gateway address.	

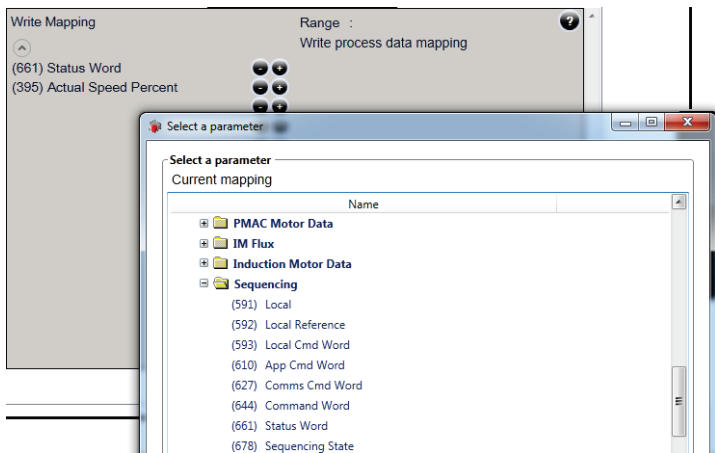
If this parameter is set to **FIXED** then the parameters **0200 Fixed IP Address**, **0201 Fixed Subnet Mask**, **0202 Fixed Gateway Address** must be set.

Fixed IP Address	192.168.1.0
Range :	
ID : 200	
The required communications option IP address if the Address Assignment parameter is set to FIXED.	
(201) Fixed Subnet Mask	0
(202) Fixed Gateway Address	0

Set the **0209 BACnet IP Device ID** and **0210 BACnet IP Timeout** parameters to the required values.



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



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

Lost Communications Trip

Supervised Parameter

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

The Supervised parameter value is set to TRUE when the option is in the PROCESS ACTIVE state.

The Supervised parameter will subsequently change to FALSE if the module changes from the PROCESS ACTIVE state.

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**. The parameter **0210 BACnet IP Timeout** must be set to a value other than zero.

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

Ethernet

Web Server

The option has a built-in web server enabling some configuration and diagnostics for the option.

To enable the web server the parameter **0203 Option Web Enable** must be set to TRUE. The web pages may be accessed by a web browser by entering the IP address of the option.

A number of built-in pages are available. The main index page provides a link to the Network Interface pages and the Parameter Data pages.

Network Interface Pages

The Network Interface page provides basic information about the option.

Anybus-CompactCom
Network interface

Serial#:	0xA0161403
MAC ID:	00:30:11:06:7B:33
Firmware version:	1.02 Build 1
Uptime:	0 days, 0h 0m 51s
CPU load:	15%

[▶ Main](#)
 [▶ Network configuration](#)
[▶ Network statistics](#)

The Network Configuration page allows TCP/IP settings to be changed. The Host name can also be set here. This will be used if DHCP is enabled.

The Network Statics page provides information about the Ethernet ports and communications statistics.

Parameter Data Pages

The Parameter Data pages allow access to some AC30 parameters. To enable access to this page the parameter **0204 Web Parameters Enable** must be set to TRUE.

Anybus-CompactCom

Parameter data

Number of parameters per page:

#	Parameter	Value
1	0661: Status Word	40
2	0395: Actual Speed Percent	0.000000
3	1900: Selected Application	BASIC SPEED CONTROL <input type="button" value="Set"/>

1-3
4-6
7-9
10-12
Next >>
13-15
16-18
19-21
22-24
25-27
28-30
31-33
34-36
37-39
40-42

▶ Main

The parameter page lists the mapped process data parameters and any soft parameters that have been defined. The Parameter column contains the parameter number followed by its name.

Authorization

Directories can be protected from web access by placing a file called 'web_accs.cfg' in the directory to protect (see the FTP Server section). All the built-in web files are virtual files and are located in the root directory.

The file shall contain a list of users that are allowed to access the directory and its subdirectories.

File format:

```
Username1:Password1
Username2:Password2
...
UsernameN:PasswordN
```

→ List of approved users

```
[AutName]
(message goes here)
```

→ Optional login message

FTP Server

The option has a built-in FTP server enabling access to the FLASH-based file system which hosts 2MByte of non-volatile storage.

To enable the FTP server the parameter **0205 Option FTP Enable** must be set to TRUE. To access the file system an FTP client is required such as Windows Explorer. Enter the IP address in to the address bar, for example ftp://192.168.1.57

By default no files are stored on the file system (the built-in web files are virtual files).

User Accounts

User accounts are stored in the configuration file '\ftp.cfg'. This file holds the usernames, passwords and home directory for all users. Usernames and password must not exceed 15 characters in length. Users are not able to access files outside of their home directory.

File format:

```
Username1:Password1:Homedir1  
Username2:Password2:Homedir2  
...  
UsernameN:PasswordN:HomedirN
```

If there is no '\ftp.cfg' file or if the parameter **0206 Option FTP Admin Mode** parameter is set to TRUE then there will be unrestricted access to the file system.

Parameters

Configuration Parameters

0044 Comms Required		Range	RW	Saved	Config
Type	UINT (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			

0199 Address Assignment		Range	RW	Saved	Config
Type	USINT (enumerated)	(0) SLAVE SETS ADDRESS	✓	✓	✓
Default	SLAVE SETS ADDRESS	(1) EXTERNAL			
Communications option parameter. Sets the method for setting the IP address, subnet mask and gateway address.		(2) DHCP			

0200 Fixed IP Address		Range	RW	Saved	Config
Type	DWORD (IP address)	0.0.0.0	✓	✓	✓
Default	0.0.0.0	...			
		255.255.255.255			
<p>Communications option parameter.</p> <p>IP address to be set by the slave. The parameter Address Assignment must be set to SLAVE SETS ADDRESS for this parameter to take effect.</p>					

0201 Fixed Subnet Mask		Range	RW	Saved	Config
Type	DWORD (IP address)	0.0.0.0	✓	✓	✓
Default	0.0.0.0	...			
		255.255.255.255			
<p>Communications option parameter.</p> <p>Subnet mask to be set by the slave. The parameter Address Assignment must be set to SLAVE SETS ADDRESS for this parameter to take effect.</p>					

0202 Fixed Gateway Address		Range	RW	Saved	Config
Type	DWORD (IP address)	0.0.0.0	✓	✓	✓
Default	0.0.0.0	...			
		255.255.255.255			
<p>Communications option parameter.</p> <p>Gateway address to be set by the slave. The parameter Address Assignment must be set to SLAVE SETS ADDRESS for this parameter to take effect.</p>					

0203 Option Web Enable		Range	RW	Saved	Config
Type	BOOL	FALSE	✓	✓	✓
Default	TRUE	TRUE			
Communications option parameter.					
Enable access to the option's web server.					

0204 Web Parameters Enable		Range	RW	Saved	Config
Type	BOOL	FALSE	✓	✓	✓
Default	TRUE	TRUE			
Communications option parameter.					
Allows access to the parameter page via the option's web server.					

0205 Option FTP Enable		Range	RW	Saved	Config
Type	BOOL	FALSE	✓	✓	✓
Default	TRUE	TRUE			
Communications option parameter.					
Allows access to the option's FTP server.					

0206 Option FTP Admin Mode		Range	RW	Saved	Config
Type	BOOL	FALSE	✓	✓	✓
Default	TRUE	TRUE			
Communications option parameter.					
Allows unrestricted access to the option's FTP server. The parameter Option FTP Enable must be set to TRUE to access the server.					

0207 IPConfig Enable		Range	RW	Saved	Config
Type	BOOL	FALSE	✓	✓	✓
Default	TRUE	TRUE			
Communications option parameter.					
Enables the option to be accessed via the IPConfig PC utility.					

0209 BACnet IP Device ID		Range	RW	Saved	Config
Type	UDINT	0	✓	✓	✓
Default	0	...			
BACnet/IP communications option parameter.		4194302			
Sets the BACnet Device ID.					

0210 BACnet IP Timeout		Range	RW	Saved	Config
Type	TIME	0	✓	✓	✓
Default	3.0 seconds	...			
BACnet/IP communications option parameter.		65.0 seconds			
Sets the process active timeout of the option. A value of zero disables the timeout.					

0120 Write Mapping		Range	RW	Saved	Config
Type	Array of UINT	0	✓	✓	✓
Default	-	...			
Communications option parameter.		Last parameter number			
Each entry in the table represents the required parameter number.					
Parameters used for COV notifications and Alarms/Events must be added to this table.					

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

Diagnostic Parameters

0045 Comms Fitted		Range
Type	USINT (enumerated)	(0) UNKNOWN
		(1) NONE
		(2) BACNET IP
Communications option parameter. 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)	(0) SETUP – setup in progress (1) NW INIT – network-related initialisation tasks are being performed (2) WAIT PROCESS – awaiting BACnet request (3) IDLE – N/A (4) PROCESS ACTIVE – a BACnet request addressed to this node has been received within the last Process Active Timeout period, or, if no timeout is specified, the module will stay in this state after the first received BACnet request. (5) ERROR – IP conflict (6) RESERVED (7) EXCEPTION – unrecoverable error (8) NONE – option not fitted
Communications option parameter. Indicates the state of the communications option fitted.		

0208 BACnet IP State		Range
Type	USINT (enumerated)	(0) SETUP – setup in progress (1) NW INIT – network-related initialisation tasks are being performed (2) WAIT PROCESS – awaiting BACnet request (3) IDLE – N/A (4) PROCESS ACTIVE – a BACnet request addressed to this node has been received within the last Process Active Timeout period, or, if no timeout is specified, the module will stay in this state after the first received BACnet request. (5) ERROR – IP conflict (6) RESERVED (7) EXCEPTION – unrecoverable error (8) NONE – option not fitted
BACnet/IP communications option parameter. Indicates the state of the communications option fitted as the parameter 0046 Comms State , but specifically for BACnet/IP.		

0189 Option MAC Address		Range
Type	STRING	Null terminated string.
Communications option parameter. Indicates the Ethernet MAC address of the option.		

0195 Option IP Address		Range
Type	DWORD (IP address)	0.0.0.0 ... 255.255.255.255
Communications option parameter. Indicates the current IP address of the option.		

0196 Option Subnet Mask		Range
Type	DWORD (IP address)	0.0.0.0 ... 255.255.255.255
Communications option parameter. Indicates the current subnet mask of the option.		

0197 Option Gateway		Range
Type	DWORD (IP address)	0.0.0.0 ... 255.255.255.255
Communications option parameter. Indicates the gateway address of the option.		

0198 Option DHCP Enabled		Range
Type	BOOL	FALSE TRUE
Communications option parameter. Indicates if the DHCP client of the option is enabled.		

0047 Comms Supervised		Range
Type	BOOL	FALSE TRUE
Communications option parameter. Indicates that the BACnet network participation is supervised by another BACnet 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)	(0) NONE (1) HARDWARE MISMATCH – required communications option does not match that fitted, or no option fitted but one is required. (2) INVALID CONFIGURATION – the configuration of the option is not valid. (3) MAPPING FAILED – the process data mapping is not permitted, e.g. adding read-only parameters to the read process data mapping. (4) EXCEPTION – configuration error (5) UNSUPPORTED OPTION – the fitted option is not currently supported
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		

Troubleshooting

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

Hardware Mismatch

Comms Diagnostic = HARDWARE MISMATCH

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

Invalid Configuration

Comms Diagnostic = INVALID CONFIGURATION

- Invalid write process data mapping
- Invalid communication settings

Comms Diagnostic = MAPPING FAILED

- Attempting to map a parameter that does not exist.
- Attempting to map a string parameter

AC30 Parameter is not Mapped

Some AC30 parameters are not mapped to BACnet Value objects. See [BACnet Parameter Mapping](#) section.

Cannot Access Value Object Property

For COV and Alarm/Event functionality some BACnet Value object properties are only available if the respective AC30 parameter is in the Write Process mapping.

Appendix A – Array Parameter Numbers

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.

The BACnet option only maps the parameter numbers representing the elements; it does not map the parameter numbers representing the whole 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 1 will be 0154, etc.

Appendix B – Bit String Parameter Numbers

Some AC30 bit string parameters of data type WORD or DWORD have individual named bits. These bits are assigned their own parameter number and are mapped to the BACnet Binary Value object.

Bit String Example with Named Bits

The parameter **0661 Status Word** is a 16-bit word with named bits. The parameter number of bit 0 is 0662, the parameter number of bit 1 is 0663, etc.

Parameter Number	Bit	Parameter – Status Word	BACnet Value Object
0661	-	Whole word	Analog
0662	00	READY TO SWTCH ON	Binary
0663	01	SWITCHED ON	Binary
0664	02	OPERATION ENABLED	Binary
0665	03	FAULTED	Binary
0666	04	VOLTAGE ENABLED	Binary

Note that bits that are not named are not mapped to a Binary Value object.

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* HA 5 0 1 9 3 9 U 0 0 1 0 1 *