# APPLICATION NOTE

## OJ DV GEN II BACnet MS/TP protocol

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## Introduction

BACnet is a communication protocol for BAC networks (Building Automation and Control).
BACnet was developed to exchange information in a standardized way between sensors, actuators and controls. In this way, a BMS system can be created with devices from different manufacturers.
BACnet MS/TP is a BACnet protocol that uses an RS-485 interface for communication.

BACnet MS/TP is available in all DVs with AOC 2.50 and higher.

## BACnet MS/TP connection

The OJ DV is equipped with three connectors for BACnet MS/TP communication:

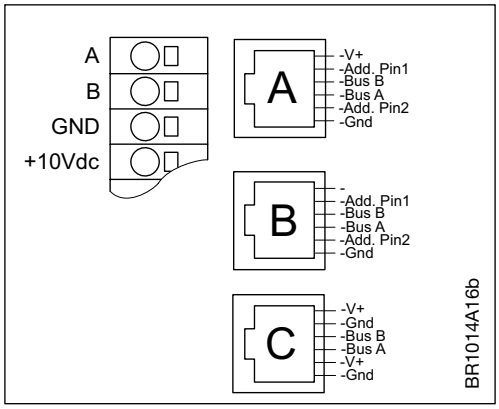
Two RJ12 connectors and one set of spring terminals.

On the strip of spring terminals for control signals (A/D I/O), the terminals for RS-485 interface connection are marked ”A”, ”B” and ”GND”. See figure 1.

The RS-485 spring terminals, marked “A” and “B” are internally connected in parallel to the RS-485 interface pins in the RJ12 connectors marked ”A”and ”B”.

The RJ12 connector marked ”C” is solely for the connection of external Modbus devices. (See OJ DV Manual)

*Figure 1*




## Cable

The following can be used for RS-485 interface communication cable:

- Round communication cable, which should be connected to the OJ DV terminals marked ” A” and “B” and “GND”.
- Ribbon/telecom cable, 6-core, unshielded, 30 AWG, 0.066 mm$^2$ or similar ribbon cable.

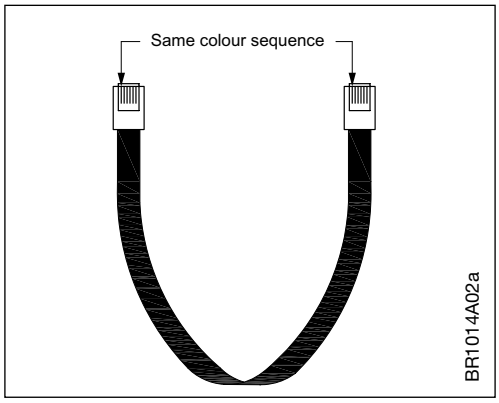
**Note**

If ribbon/telecom cable is used, RJ12 connectors must be attached to both ends of the cable using a special-purpose tool.

**Note**

IMPORTANT! The RJ12 connectors must be attached to both ends in such a way that the two connectors follow the same sequence of wire colours in the cable. See figure 2

*Figure 2*

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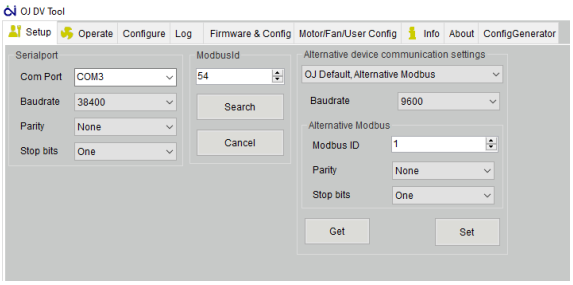
## BACnet MS/TP Setup

Bacnet MS/TP needs to be configured via Modbus registers. The following section explaining how to configure BACnet MS/TP using the OJ-DV-PC-Tool and the lists the relevant Modbus registers

## OJ-DV-PC-Tool

Connect to the OJ DV for the first time using the default Modbus address of:

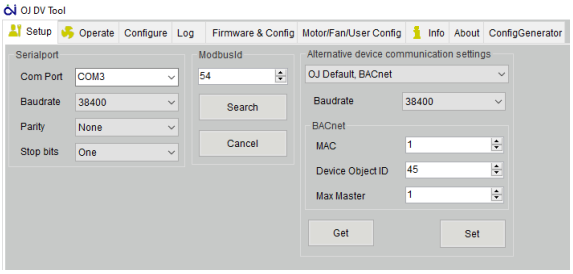
ID: 54
Baud rate: 38400
Parity: None
Stop bits: One




Click on Get. It will then be possible to use a drop-down menu under Alternative device communications

From the drop-down menu choose OJ Default, BACnet. Choose BACnet MS/TP settings:

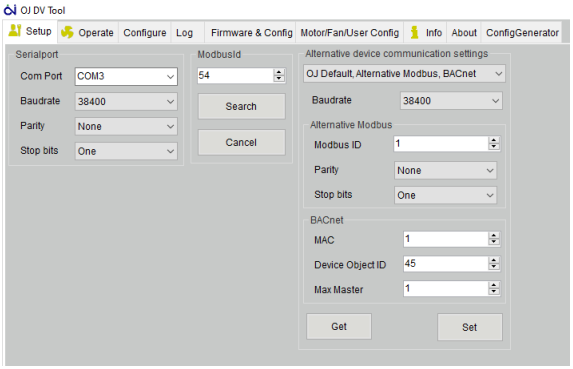
Baud rate: 9600, 19200, 38400, 57600, 115200 kbs
MAC: 0 – 127
Max Master: 1 - 127
Device object ID: 0 - 4194302




There is also the possibility of setting an alternative Modbus Address and BACnet MS/TP together.

**Note**

When using the Alternative device communication settings on the Setup page of the OJ-DV-PC-Tool, it will always be possible to communicate with the OJ DV using the default Modbus address.




## Setup of BACnet MS/TP via Modbus registers

The table below shows how to enable/disable for communication protocols via coil bits via the Modbus interface.

| Coil stats | Address | Function | OJ Default | OJ Default, BACnet MS/TP | OJ Default, Modbus Alt, BACnet MS/TP | BACnet MS/TP [1] |
|---|---|---|---|---|---|---|
| 0x0009 | 8 | Use Alternate Comm Settings | 0 | X | X | 1 |
| 0x0010 | 9 | Autodetect Communication | 0 | 0 | 1 | 0 |
| 0x0036 | 35 | BACnet Enable | X | X | X | 1 |
| 0x0037 | 36 | AutoDetect BACnet | 0 | 1 | 1 | 0 |

[1] : If this option is selected Modbus interface will not be available. To deactivate BACnet MS/TP: Enter BACnetEnable (Binary_value:4) and change the present value from 1 to 0.

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## BACnet MS/TP Communication Configuration

To configure the BACnet MS/TP communication use the following holding registers via the Modbus interface.

| Register | Address | Function | Range | Resolution |
|---|---|---|---|---|
| 4x0023 | 22 | CommRate | 1=9600, 2=19200, 3= 38400, 4= 57600, 5=115200 | Bds |
| 4x0057 | 56 | BACnetMAC | 0 -127 | 1 |
| 4x0058 | 57 | BACnetMaxMaster | 1 - 127 | 1 |
| 4x0059 | 58 | BACnetDeviceObjectInstance Low | 0 – 4194302 | 1 |
| 4x0060 | 59 | BACnetDeviceObjectInstance Low | | |

## BACnet Objects

The following sections lists the BACnet object instances. The EDE can be found on the OJ Electronics products homepage.

## BACnet Binary Values

| Object ID | Object Name | Read/Write (Present value) | Range | Active state | Remarks |
|---|---|---|---|---|---|
| BV:0 | Motor ON/OFF | R/W | 0 - 1 | 1 = ON | Will set to 0 if any error occurs |
| BV:1 | Reset Alarms | R/W | 0 - 1 | 1 = Reset | Will return to 0 after reset is performed |
| BV:2 | Fire Mode | R/W | 0 - 1 | 1 = Active | |
| BV:3 | Motor Output OFF | R/W | 0 - 1 | 1 = Keep motor output off | |
| BV:4 | BACnet Enable | R/W | 0 - 1 | 1= BACnet active | This will turn off the BACnet communication if set to 0. It can only recovered by using the Modbus interface or if protocol autodetect is enabled in the udf BACnet will be available after max. 10sec |
| BV:5 | V LO Alarm | R | 0 - 1 | 1= Alarm | |
| BV:6 | V HI Alarm | R | 0 - 1 | 1= Alarm | |
| BV:7 | I HI Alarm | R | 0 - 1 | 1= Alarm | |
| BV:8 | Temperature High | R | 0 - 1 | 1= Warning | |
| BV:9 | Input Phase Error | R | 0 - 1 | 1= Warning | |
| BV:10 | Rotor Blocked | R | 0 - 1 | 1= Alarm | |
| BV:11 | Current Limit | R | 0 - 1 | 1=Warning | |
| BV:12 | Voltage Limit | R | 0 - 1 | 1=Warning | |
| BV:13 | Rotor Direction | R | 0 - 1 | 1= Alarm | |
| BV:14 | EEPROME error | R | 0 - 1 | 1=Warning | |
| BV:15 | Internal Stop | R | 0 - 1 | 1= Alarm (Stop) | |
| BV:16 | Earth Fault | R | 0 - 1 | 1= Alarm | |
| BV:17 | Motor Phase Error | R | 0 - 1 | 1= Alarm | |
| BV:18 | Communication Error MOC | R | 0 - 1 | 1= Alarm | |
| BV:19 | Ext 24 V Supply overload | R | 0 - 1 | 1=Overload | |
| BV:20 | MOC in Bootloader | R | 0 - 1 | 1= Alarm | |
| BV:21 | Communication Error IOM | R | 0 - 1 | 1= Warning | |
| BV:22 | Motor Overheat IOM | R | 0 - 1 | 1= Alarm | |
| BV:23 | STO Fault | R | 0 - 1 | 1= Alarm | |
| BV:24 | STO test failed | R | 0 - 1 | 1= Self test failed | |

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## BACnet Integer Values

| Object ID | Object Name | Read/Write (Present value) | Range | Resolution | Unit | Remarks |
|---|---|---|---|---|---|---|
| IV:0 | Prc Set | R/W | 0 - 10000 | 0.01 | % | When Analog control is active, it reflects the actual set point. |
| IV:1 | min RPM | R/W | 0 - 5000 | 1 | RPM | |
| IV:2 | max RPM | R/W | 0 - 5000 | 1 | RPM | |
| IV:3 | Up Ramp Time | R/W | 15 - 240 | 1 | Sec. | |
| IV:4 | Down Ramp Time | R/W | 15 - 240 | 1 | Sec. | |
| IV:5 | AOC SW Version | R | 0 - 65535 | 0.01 | - | |
| IV:6 | MOC SW Version | R | 0 - 65535 | 0.01 | - | |
| IV:7 | Prc Out | R | 0 -10000 | 0.01 | % | |
| IV:8 | RPM Out | R | 0 - 3000 | 1 | RPM | |
| IV:9 | Intern Temp | R | -5000 - 15000 | 0.01 | °C | |
| IV:10 | V IN_RMS | R | 0 - 500 | 1 | V | |
| IV:11 | I Out | R | 0 - 65535 | 1 | mA | |
| IV:12 | Power In (Filtered) | R | 0 - 20000 | 1 | W | |
| IV:13 | Operation Minutes | R | 0 - 1439 | 1 | Min | |
| IV:14 | Operations Days | R | 0 - 9999 | 1 | Day | |
| IV:15 | Extern Set | R | 0 - 10000 | 1 | V | |
| IV:16 | V DC Bus (Peak) | R | 0 - 800 | 1 | V | |
| IV:17 | V motor (Peak) | R | 0 - 500 | 1 | V | |
| IV:18 | Power Consumption Wh | R | 0 - 999 | 1 | Wh | |
| IV:19 | Power Consumption kWh | R | 0 - 999 | 1 | kWh | |
| IV:20 | Power Consumption MWh | R | 0 - 65535 | 1 | MWh | |
| IV:21 | BACnet Software version | R | 0 - 65535 | 0.01 | | |
| IV:22 | Vin L1 - GND (RMS) | R | 0 - 500 | 1 | V | |
| IV:23 | Vin L2 - GND (RMS) | R | 0 - 500 | 1 | V | |
| IV:24 | Vin L3 - GND (RMS) | R | 0 - 500 | 1 | V | |
| IV:25 | Vibration_SUM_RMS | R | 0 - 7094 | 1 | 2 mg | |
| IV:26 | AOC Thermist.Temp | R | -4000 - 7500 | 0.01 | °C | |
| IV:27 | CurrentTimeLow1 | R | 0 - 65535 | 1 | sec | |
| | CurrentTimeHigh1 | R | 0 - 32767 | 65535 | sec | |

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