

CenCon

Communication Manual for Modbus and BACnet (MSTP and IP)

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INTRODUCTION

This Manual is designed to be used and read in conjunction with the *CenCon User Manual*. A digital printable copy of all manuals can be found at <https://www.engineeredair.com/manuals/>

The CenCon is a configurable logic controller designed to be the primary controller of Engineered Air heating, cooling and ventilation equipment. The CenCon is designed to control the cooling, heating, and mixing economizer. In this manual, the primary setpoint and sensor refer to the final leaving temperature. All temperature register readings are based on degrees Fahrenheit. Conversion to degrees Celsius can be accomplished at the front end software.

The CenCon is equipped with two RS485 ports equipped for Modbus RTU the BACnet® MS/TP protocols and an Ethernet port equipped for the BACnet® TCP/IP protocol. This manual describes the BACnet® objects and the information contained in each object. In this manual, BACnet® objects that can be written to are said to be EMS (Energy Management System) commanded, identified by R/W (Read/ Write).

Wiring

The CenCon can be connected to either an RS-485 network or a to an Ethernet/IP network. The BACnet MS/TP RS-485, & BACnet/IP communication cables must conform to BACnet specifications.

RS485

The CenCon has a gray terminal strip that is used for all RS-485 communication connections.

Terminals SmA and SmB have been designated and must be used to connect to the RS-485 Modbus network terminals.

Terminals BnA and BnB have been designated and must be used to connect to the RS-485 BACnet network.

The RS-485 communication cable to the CenCon should be a 24awg shielded twisted pair (STP) with a shunt capacitance of 16pF per foot and 100 ohm characteristic impedance.

Ethernet

The CenCon is equipped with a standard RJ45 Ethernet port located on the top of the controller. The Ethernet port is designed to be incorporated with a BACnet® over IP network that is used to communicate with the building EMS.

BACnet Communication Default Factory Settings

These default settings can be configured on the CenCon service display.

Modbus RTU

Baud Rate	19200
Address	1

BACnet MSTP

Instance	27000
Baud Rate	38400
Address	27
Max Master	127

BACnet IP

Instance	27000
IP	192.168.0.10
Subnet	255.255.255.0
Gateway	000.000.000.000
DNS 1	000.000.000.000
UDP Port#	47808 (not adjustable)

Note:

After making any changes to the default communication setting you must cycle the power to the controller to reset it and force the updates.

PICS & BTL Approved

BACnet PICS (Protocol Implementation Conformance Statement) defines the options available by BACnet that are implemented in the CenCon. These PICS are available from the factory upon request. The following defines the BACnet objects available on the network. EMS is used to describe the objects that can be commanded by any 3rd party 'Energy Management System'.

CenCon POINTS LIST

Available points depend on appliance type and arrangement.

Read / Write

BACnet 27055 / Modbus 55

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Discharge Air Setpoint	O	40001	A01	Int/10=°F	R/W
Damper Minimum Position	O	40002	A02	Integer %	R/W
VFD Minimum Speed	O	40003	A03	Integer %	R/W
Humidification Setpoint	O	40004	A04	Integer %	R/W
Dehumidification Setpoint	O	40005	A05	Integer %	R/W
Supply Fan Enable	O	00001	B01	0/1	R/W
C-XM Enable	O	00002	B02	0/1	R/W
J-XM Enable	O	00003	B03	0/1	R/W
G-XM Enable	O	00004	B04	0/1	R/W
M-XM Enable	O	00005	B05	0/1	R/W
S-XM Enable	O	00006	B06	0/1	R/W
H-XM Enable	O	00007	B07	0/1	R/W
ER-XM Enable	O	00008	B08	0/1	R/W
C-XM Dehumidification Enable	O	00009	B09	0/1	R/W

Read Only

BACnet 27001 / Modbus 01

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Alarm	O	00005	BO5	1/0	R
Ambient Air Temperature	I	30020	AI20	Int/10=°F	R
Damper Actuator	O	00002	BO2	1/0	R
Damper End Switch	I	10005	BI5	1/0	R
Dehumidification	I	10009	BI9	1/0	R
Dehumidification Demand	O	40009	AO9	Integer %	R
Discharge Air Temperature	I	30021	AI21	Int/10=°F	R
DX Coil Temperature	I	30018	AI18	Int/10=°F	R
Enable Fan	I	10008	BI8	1/0	R
Feedback Damper	I	10002	BI2	1/0	R
Heating Demand	O	40005	AO5	Integer %	R
Humidification Demand	O	40007	AO7	Integer %	R
Mixed Air Temperature	I	30019	AI19	Int/10=°F	R
Modulating Cooling	O	40003	AO3	Integer %	R
Modulating Economizer	O	40002	AO2	Integer %	R
Modulating Heating	O	40001	AO1	Integer %	R
Modulating Room Thermostat	I	30009	AI9	Integer %	R
Occupied/ Unoccupied	I	10006	BI6	1/0	R
Outside Humidity	I	30003	AI3	Integer %	R
Recovery Demand	O	40008	AO8	Integer %	R
Remote VFD Setpoint	I	30010	AI10	Integer %	R
Return/ Room Humidity	I	30006	AI6	Integer %	R
Return/ Room Temperature	I	30017	AI17	Int/10=°F	R
Secondary BACnet Alarm	I	10001	BI1	1/0	R
Supply Air	O	00003	BO3	1/0	R
Supply Duct Pressure	I	30002	AI2	Integer	R
VFD Bypass	I	10004	BI4	1/0	R
VFD Command Speed	O	40004	AO4	Integer %	R
VFD Feedback Speed	I	30007	AI7	Integer %	R

EXPANSION MODULES POINTS LIST

C-XM

BACnet 27002 / Modbus 02

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Condenser Fan Stage #1	O	00007	BO7	1/0	R
Condenser Fan Stage #2	O	00008	BO8	1/0	R
Cooling stage #1	O	00001	BO1	1/0	R
Cooling stage #2	O	00002	BO2	1/0	R
Cooling stage #3	O	00003	BO3	1/0	R
Cooling stage #4	O	00004	BO4	1/0	R
Cooling stage #5	O	00005	BO5	1/0	R
Cooling stage #6	O	00006	BO6	1/0	R
Dehumidify Setpoint	I	30021	AI21	Integer %	R
Enable Cooling	I	10002	BI2	1/0	R
Enable Reheat	I	10001	BI1	1/0	R
Modulating Compressor	O	40001	AO1	Integer %	R
Modulating Condenser Fan #1	O	40002	AO2	Integer %	R
Modulating Condenser Fan #2	O	40003	AO3	Integer %	R
Modulating Reheat	I	40004	AO4	Integer %	R
Stepped Reheat Stage #1	O	00009	BO9	1/0	R
Stepped Reheat Stage #2	O	00010	BO10	1/0	R

J-XM

BACnet 27055 / Modbus 55

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Blocked Flue Switch	I	10001	BI1	1/0	R
Combustion Air Switch	I	10003	BI3	1/0	R
Condensate Probe	I	30005	AI5	Integer	R
Enable Heat	I	10002	BI2	1/0	R
Feedback Air	I	30004	AI4	Integer	R
Feedback Gas	I	30003	AI3	Integer	R
Flame Relay	O	00007	BO7	1/0	R
High Limit	I	10005	BI5	1/0	R
Modulating Ball Valve	O	40001	AO1	Integer	R
MX Valve	O	40005	AO5	Integer	R
Pilot Valve	O	00005	BO5	1/0	R
Safety Relay	O	00006	BO6	1/0	R

G-XM

BACnet 27008 / Modbus 08

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Blocked Flue Switch	I	10001	BI1	1/0	R
Combustion Air Switch	I	10003	BI3	1/0	R
Combustion Blower	O	00001	BO1	1/0	R
Condensate probe sensor	I	30005	AI5	Integer	R
Enable Heat	I	10002	BI2	1/0	R
Feedback Air	I	30004	AI4	Integer	R
Feedback Gas	I	30003	AI3	Integer	R
Flame Relay	O	00007	BO7	1/0	R
High Limit	I	10005	BI5	1/0	R
Modulating Ball Valve	O	40001	AI1	Integer	R
Modulating Combustion Air	O	40002	AI2	Integer	R
Pilot Valve	O	00005	BO5	1/0	R
Safety Relay	O	00006	BO6	1/0	R

M-XM

BACnet 27010 / Modbus 10

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Dual Flame Rod	O	00003	BO3	1/0	R
Enable Heat	I	10002	BI2	1/0	R
Exhaust Fan Interlock	O	00002	BO2	1/0	R
Feedback Gas	I	30003	AI3	Integer	R
Flame Relay	O	00007	BO7	1/0	R
High Limit	I	10005	BI5	1/0	R
High Speed	O	00001	BO1	1/0	R
High Speed Enable	I	10001	BI1	1/0	R
Modulating Ball Valve	O	40001	AO1	Integer	R
MX Valve	O	40005	AO5	Integer	R
Pilot Valve	O	00005	BO5	1/0	R
Profile Pressure	O	40002	AO2	Integer	R
Safety Relay	O	00006	BO6	1/0	R
Water Pump	O	00004	BO4	1/0	R

ER-XM

BACnet 27016 / Modbus 16

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
By-Pass Damper	O	00001	BO1	1/0	R
Enable Heat	I	10001	BI1	1/0	R
Enable Wheel	O	00005	BO5	1/0	R
Exhaust Air Temperature	I	30021	AI21	Int/10= °F	R
Leaving Air Temperature	I	30020	AI20	Int/10= °F	R
Modulating By-Pass Damper	O	40001	AO1	Integer	R
Modulating Energy Recovery	O	40002	AO2	Integer	R
Rotation Sensor	I	10002	BI2	1/0	R

S-XM

BACnet 27012 / Modbus 12

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Blocked Flue Switch	I	10001	BI1	1/0	R
Condensate Probe	I	30005	AI5	Integer Ω	R
Direct Humidity Control	I	30001	AI1	Integer	R
Drain Sensor	I	30016	AI16	Integer Ω	R
Drain Valve	O	00003	BO3	1/0	R
Duct High Limit	I	10003	BI3	1/0	R
Enable Heat	I	10002	BI2	1/0	R
Feedback Gas	I	30003	AI3	Integer	R
Fill Valve	O	00001	BO1	1/0	R
Fill Valve Side	O	00004	BO4	1/0	R
Fill Water Probe	I	30007	AI7	Integer Ω	R
Flame Relay	O	00007	BO7	1/0	R
High Limit	I	10005	BI5	1/0	R
Low Water Probe	I	30006	AI6	Integer Ω	R
Mixing Valve	O	00002	BO2	1/0	R
Modulating Ball Valve	O	40001	AO1	Integer	R
Modulating High Limit	I	30004	AI4	Integer	R
MX Valve	O	40005	AO5	Integer	R
Pilot Valve	O	00005	BO5	1/0	R
Safety Relay	O	00006	BO6	1/0	R

H-XM

BACnet 27014 / Modbus 14

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Door Switch	I	10004	BI4	1/0	R
Enable Heat	I	10001	BI1	1/0	R
Heating Stage #1	O	00001	BO1	1/0	R
Heating Stage #2	O	00002	BO2	1/0	R
Heating Stage #3	O	00003	BO3	1/0	R
Heating Stage #4	O	00004	BO4	1/0	R
Heating Stage #5	O	00005	BO5	1/0	R
Heating Stage #6	O	00006	BO6	1/0	R
Heating Stage #7	O	00007	BO7	1/0	R
High Limit	I	10005	BI5	1/0	R
Modulating Output	O	40002	A02	Integer %	R

CD-XM

BACnet 27021 - 27022 / Modbus 21 - 22

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Combustion Blower	O	00001	BO1	1/0	R
Safety Relay	O	00002	BO2	1/0	R

P-XM

BACnet 27025 - 27031 / Modbus 25 - 31

DESCRIPTION	In / Out	MODBUS Register	BACnet Address	TYPE	R/W
Pressure Sensor	O	30001	AI1	Integer "wc	R
Pressure Switch	O	00002	BO2	1/0	R
Pressure Transducer	O	40001	A01	Integer mV	R

POINT DESCRIPTIONS

Read / Write

Discharge Air Setpoint

Final calculated discharge setpoint.

Damper Minimum Position Setpoint

Minimum outside air setpoint.

VFD Minimum Speed Setpoint

VFD minimum speed setpoint; 35% minimum.

Humidification Setpoint

Room or return air humidity setpoint.

Dehumidification Setpoint

Room or return air dehumidification setpoint.

Supply Fan Enable

Enable start for system operation.

C-XM Enable

Mechanical cooling expansion module.

Read Only

CenCon

Alarm

General alarm output annunciation.

Ambient Air Temperature

Ambient/outside air temperature.

Damper Actuator

Damper actuator status.

Damper End Switch

Mechanical damper end switch.

Dehumidification

Dehumidification mode enabled.

Discharge Air Temperature

Final leaving temperature.

DX Coil Temperature

Pre-cool leaving air temperature.

J-XM Enable

Indirect fired gas heating expansion module for DJS, DJE, DJX (up to 140) appliances.

G-XM Enable

Indirect fired gas heating expansion module for DG and DJX 200/300 appliances.

M-XM Enable

Direct fired gas heating expansion module.

S-XM Enable

Gas fired humidifier expansion module.

H-XM Enable

Electric heat expansion module.

ER-XM Enable

HRW heat wheel energy recovery enabled.

C-XM Dehumidification Enable

Mechanical cooling with reheat appliances.

Enable Fan

Appliance enable.

Feedback Damper

Economizer / mix box damper actuator position feedback signal.

Heating Demand

Output signal to heating device.

Humidification Demand

Output signal to humidifier.

Mixed Air Temperature

Economizer or mixing damper leaving air temperature

Modulating Cooling

Modulating auxiliary cooling.

Modulating Economizer

Modulating economizer / mix box actuator.

Modulating Heating

Modulating auxiliary heating.

Modulating Room Thermostat

Roomstat heating / cooling signal.

Occupied/ Unoccupied

Enable occupied mode

Outside Humidity

Outside / ambient air relative humidity sensor.

Recovery Demand

Output signal to energy recovery device.

Remote VFD Setpoint

VFD speed demand signal.

Return/ Room Humidity

Room / return air RH% sensor.

Return / Room temperature

Return / room air temperature signal.

Secondary BACnet Alarm

Spare alarm input for BACnet annunciation

Supply Air

Blower enable status.

Supply Duct Pressure

Duct pressure sensor.

VFD Bypass

VFD bypass mode active.

VFD Command Speed

VFD control signal.

VFD Feedback Speed

Confirmation of VFD speed.

C-XM**Condenser Fan Stage #1 & #2**

Ambient temperature based condenser fan #1 or #2 enabled.

Cooling stage #1 to #6

Cooling stages enabled.

Dehumidify Setpoint

RH% setpoint for dehumidification operation.

Enable Cooling

Mechanical cooling enabled

Enable Reheat

Hot gas reheat enabled.

Modulating Compressor

Output to modulating compressor.

Modulating Condenser Fan #1 & #2

Output to variable speed condenser fans.

Modulating Reheat

Output to modulating hot gas reheat coil.

Stepped Reheat Stage #1 & #2

Stepped / staged reheat output.

J-XM**Blocked Flue Switch**

Opens on blocked flue.

Combustion Air Switch

Proof of combustion air flow.

Condensate Probe

Condensate probe sensor.

Enable Heat

Expansion module heating function enabled.

Feedback Air

Modulating combustion air actuator feedback signal.

Feedback Gas

Modulating gas valve actuator feedback signal.

Flame Relay

Flame relay contact enabled.

High Limit

Opens on high heat exchanger section temperature.

Modulating Ball Valve

Modulating gas valve actuator output.

MX Valve

DC current output to the magnetic style modulating gas valve.

Pilot Valve

Interrupted pilot valve status.

Safety Relay

Secondary safety lockout contact.

G-XM**Blocked Flue Switch**

Normally closed, opens on blocked flue.

Combustion Air Switch

Proof of combustion air flow.

Combustion Blower

Combustion blower motor start contact.

Condensate Probe

Condensate probe sensor

Enable Heat

Expansion module heating function enabled.

Feedback Air

Modulating combustion air actuator feedback signal.

Feedback Gas

Modulating gas valve actuator feedback signal.

Flame Relay

Flame relay enabled.

High Limit

Normally closed safety, opens on high temperature.

Modulating Ball Valve

Modulating gas valve actuator output.

Modulating Combustion Air

Combustion air actuator output.

Pilot Valve

Interrupted pilot valve status.

Safety Relay

Secondary safety lockout.

M-XM**Dual Flame Rod**

Relay output to switch flame rods.

Enable Heat

Expansion module heating function enabled.

Exhaust Fan Interlock

Single or low speed exhaust fan start contact.

Feedback Gas

Modulating gas valve actuator feedback signal.

Flame Relay

Flame relay enable contacts.

High Limit

Normally closed, opens on high temperature.

High Speed

High speed fan start contact.

High Speed Enable

Initiate high speed operation.

Modulating Ball Valve

Modulating gas valve actuator output.

MX Valve

DC current output to the modulating gas valve.

Pilot Valve

Interrupted pilot valve status.

Profile Pressure

Modulating profile pressure damper actuator position.

Safety Relay

Secondary safety lockout contacts.

Water Pump

Enable evaporative (swamp cooler) water pump.

ER-XM**By-Pass Damper**

Bypass damper enabled.

Enable Heat

Expansion module energy recovery operation.

Enable Wheel

Wheel motor start enabled.

Exhaust Air Temperature

Temperature of the air at heat recovery device's exhaust plenum, in °F

Leaving Air Temperature

Temperature of the air at heat recovery device's discharge plenum, in °F

Modulating By-Pass Damper

Modulating output to bypass damper actuator.

Modulating Energy Recovery

Modulating output to energy recovery device.

Rotation Sensor

Input from rotation sensor.

S-XM**Blocked Flue Switch**

Normally closed, opens on blocked flue.

Condensate Probe

Condensate probe (SHX) sensor input.

Direct Humidity Control

Input for direct control of humidifier.

Drain Sensor

Drain probe sensor input.

Drain Valve

Enable drain valve.

Duct High Limit

Duct mounted high humidity sensing opens on high humidity.

Enable Heat

Gas fired humidifier expansion module enabled.

Feedback Gas

Modulating gas valve actuator feedback signal

Fill Valve

Enable primary tank fill valve.

Fill Valve Side

Enable side tank (SHX) fill valve.

Fill Water Probe

Fill water level sensor.

Flame Relay

Flame relay enable contacts.

High Limit

Normally closed, opens on high temperature.

Low Water Probe

Low water level sensor.

Mixing Valve

Drain tempering valve.

Modulating Ball Valve

Modulating gas valve actuator output.

Modulating High Limit

Duct mounted high humidity sensing.

MX Valve

DC current output to the modulating gas valve.

Pilot Valve

Interrupted pilot valve status.

Safety Relay

Secondary safety lockout contacts.

H-XM**Door Switch**

External safeties input.

Enable Heat

Expansion module electric heating enabled.

Heating Stage #1 to #7

Staged heating output.

High Limit

Normally closed, opens on high temperature.

Modulating Output

Modulating output to external SCR controller.

CD-XM**Combustion Blower**

Modulating output command to combustion air blower motor.

Safety Relay

Contact open on failure.

P-XM**Pressure Sensor**

Pressure sensor output 0-4" w.c.

Pressure Switch

Output contact.

Pressure transducer

Pressure transducer scaled output from 0 to 10 VDC based on 0-4 "wc.