EngA ENGINEERED AIR

CenCon™

User Manual

Unit Controller Version 1.00
Manual Revision 1.03

RECOGNIZED COMPONENT
C ETL LISTED US
Intertek

These instructions are intended as an aid to qualified, licensed installers and service personnel for proper installation, adjustment and operation of this unit. Read and understand these instructions thoroughly before attempting installation or operation. Failure to follow these instructions may result in improper installation, adjustment, service or maintenance possibly resulting in fire, electrical shock, carbon monoxide poisoning, explosion, personal injury or property damage.

www.engineeredair.com

INTRODUCTION

Read this manual thoroughly before operating or servicing this unit.

The CenCon and all of its expansion modules have been certified by Intertek (ETL) for use with Engineered Air appliances only, evaluated to CSA 22.2 No. 24 Temperature Indicating and Regulating Equipment and UL873 Standard for Safety Temperature Indicating and Regulating Equipment. This is a User Operation Manual and therefore not subject to evaluation.

If any errors or omissions are noted please contact the nearest Engineered Air Technical Service Department.

To ensure warranty is honored, only qualified personnel should be employed for service or troubleshooting. If further information is required please contact the nearest Engineered Air sales office.

There are two sets of electrical drawings and function sheets provided with the appliance. One set is in an envelope which also contains the Operation, Installation and Maintenance manual(s). This package is for copying, then should either be returned to the appliance or stored in a safe place. The other set is attached to the control panel door and should never be removed.

Environmental Concerns

Recovery, reuse, recycling, reclamation, and safe disposal of refrigerant is the only acceptable practice today. Venting of refrigerant into the atmosphere during installation or servicing is unacceptable. To avoid damage, use an accepted refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government safety and environmental laws.

Copyright

Revision History

1.0	Initial release January 2019
1.01	Minor editing, added M-XM
1.02	Added digital input notice

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WARNINGS, CAUTIONS AND NOTICES

Warning, Caution and Notice statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent damage.

⚠ WARNING:
Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION:
Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

⚠ NOTICE:
Indicates information considered important but not hazard related.

⚠ WARNING:
Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operation and maintenance instructions thoroughly before installing or servicing this equipment.

⚠ ⚠ WARNING:
This unit is connected to high voltages. Electrical shock could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work must be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.

⚠ CAUTION:
All the remote wiring must be complete and functional before attempting to start the appliance.

⚠ CAUTION:
It is important that the service technician understands the CenCon is a configurable controller. Its operation on one appliance of equipment may not mimic another.

⚠ CAUTION:
Adding a variable air volume system to equipment originally designed with constant air flow will void warranty, unless approved and recorded by Engineered Air.

⚠ CAUTION:
The CenCon is specifically programmed for this specific appliance. Do not replace with another controller without confirming its program suitability with Engineered Air.

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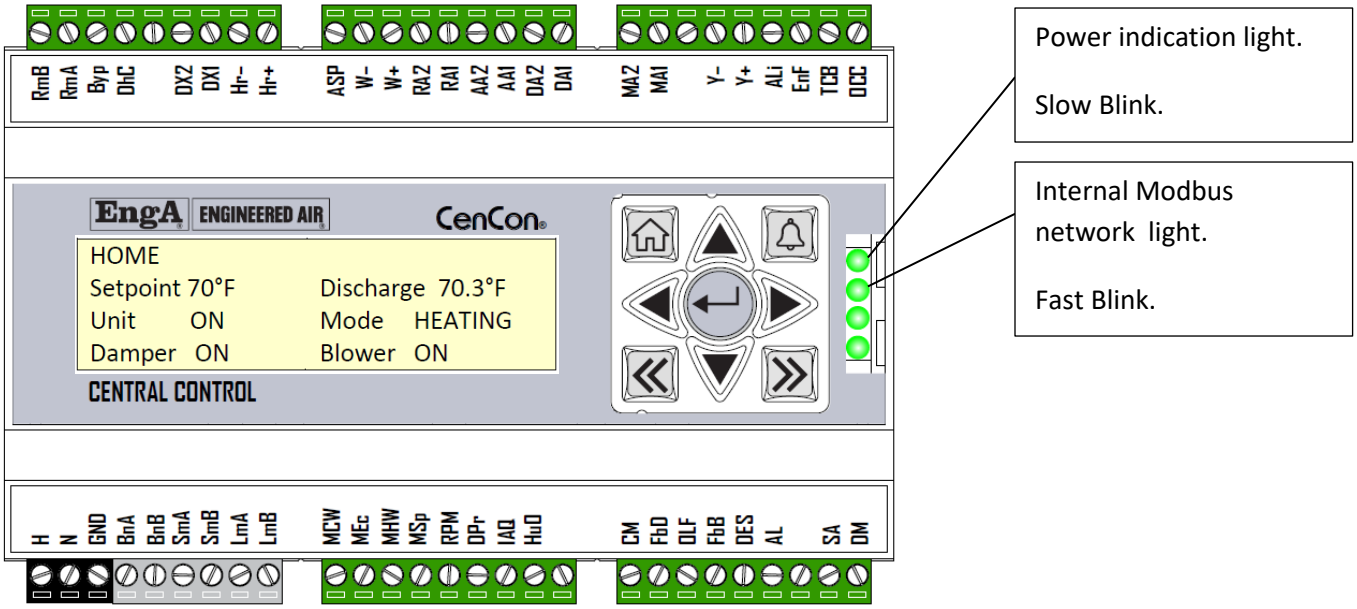


OVERVIEW

The Engineered Air CenCon controller is the primary operational component for the majority of custom manufactured Engineered Air HVAC equipment. Functions include:

- Outdoor, discharge and room temperature monitoring.
- Outdoor and room humidity sensing.
- Single and variable speed fan control.
- Analog heating and cooling outputs.
- Damper and economizer control.
- Alarm annunciation.
- Freeze protection.

Expansion modules (-XM) may be added to extend the operational capabilities to direct and indirect gas fired heating, staged and modulating cooling, humidification and energy recovery systems.

Each CenCon controller is factory programmed specifically for the equipment installed.

HARDWARE INFORMATION

Control Voltage	24Vac 60Hz
Digital Output Rating	120V 10A
Analog Output	0-10Vdc
Analog Input	0-10Vdc or 4-20mA
Temperature Rating	-40 – 150˚F (65˚C)
Temperature Sensor	10k Type 2 NTC

⚠ **NOTICE:** Digital inputs connections to the CenCon or any of the expansion modules cannot use mosfet solid state switches. Input switching must be mechanical.

COMMUNICATION

Direct connection may be made to a laptop computer using a Cat.5 cable. Once connected, a web page will appear showing the various operational conditions and settings. Pressing the arrow keys will enable additional setup screens.

CONTROLLER KEYPAD

The 9 button keypad has been configured to easily manipulate any user variables available for modification. Typically, this would include the temperature setpoint(s) and outside air minimum position.

- The home button displays the main page.
- Pressing the alarm button changes the display to the alarm page.
- The left and right double arrow keys increment the display to the next page.
- Use the left and right arrows to navigate the location of the cursor within each page.
- Press the enter key once the cursor is located at the variable to be changed.
- The up and down arrows change the value of the indicated variable.*

Note: Changing the variable is 'live'. Pressing enter is not required to set the value.

DISPLAY SCREEN

HOME	
Setpoint 70°F	Discharge 70.3°F
Unit ON	Mode HEATING
Damper ON	Blower ON
Alarm Display	

The Home screen displays the required setpoint, actual discharge temperature, and various active modes of operation.

The display screen saver will automatically go blank after 5 minutes. Pressing any key will reactivate the screen and return to the home page.

GENERAL ALARM LIST

Low limit	The low limit setpoint is the lower of 40°F or 15°F below the discharge air setpoint.
Air Proving Fault	VFD Feedback is greater than the minimum VFD speed for more than 30 seconds with the supply fan output off.
Shorted Air Proving	Air Proving switch shorted on startup.
Low airflow	Air Proving switch opens during operation for 30 seconds or the VFD feedback drops below the minimum speed for 30 seconds.
Discharge Air Sensor Failure	Discharge Air sensor is outside of its range (-60°F to 220°F) for 10 seconds or more.
Ambient Air Sensor Failure	Outdoor Ambient sensor is outside of range (-60°F to 220°F) for 10 seconds or more.
Damper End Switch Warning	Shorted damper end switch. Meaning the damper end switch is made before energizing the damper output.
Damper Mechanical Alarm	End switch enabled codex is true and end switch is not made after energizing damper output.
Communication Error	Triggered on loss of communication with application modules.

ALARM RESET

Alarms may be reset either from the laptop computer or the CenCon keypad.

Press the 🔔 button, then ↵ to move the cursor to the reset area. Then press ▲.

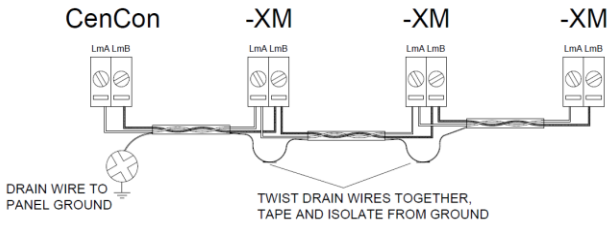
EXPANSION MODULES (XM)

The CenCon controller can be connected to any Engineered Air expansion module. The expansion module provides the required wiring terminals for each additional feature. As expansion modules are added, the display screen selections will automatically update to include the new information. These screens display information and set points for the additional features.

All expansion modules have (2) lights. The Green light is indication of power, and the yellow light is to show communication to the CenCon is connected.

Expansion modules communicate to the CenCon via an internal Modbus network. The wire is a shielded twisted pair, specified for Modbus communication.

The white wire connects to the LmA terminal, while the black wire connects to LmB.



C-XM

The Cooling module will control all aspects of the operation of mechanical cooling.

Basic operation:

On a call for cooling sequenced stages of cooling are available for operation.

J-XM

The DJ heating module will control all burner aspects of the DJ line of indirect fired heaters.

Basic operation:

On a call for heating the combustion blower will be enabled to full speed to prepurge the heat exchanger. Once the prepurge time has elapsed the combustion blower speed will reduce to ignition speed and then enable the ignition control to start and prove pilot flame, then open the main safety valve (SSOV). Once the pilot flame has proven and the main flame is established, the J-XM will then disable the pilot valve. The burner is allowed to operate to maintain the requested discharge air temperature from the CenCon by modulating the control valve and the combustion blower speed. If heating is not required the burner will be disabled and the combustion blower will enter a post purge time, and then shut down.

Alarm List:

Gas Valve Wiring	Gas valve feedback has power before the FR and SR contact are energized.
Shorted Air proving	Combustion blower feedback exceeds 500 rpm for more than 60 seconds when there is no demand.
Open Air Proving	Combustion blower does not exceed 3000 rpm during purge.
60 Hz	Combustion blower frequency has exceeded 60 Hz (3590 RPM)
Plugged Condensate	Blocked condensate sensor reads less then 7kΩ for more than 5 minutes.
Blocked Flue	Blocked flue input has been enabled for 3 minutes or more.
Flame Relay Wiring	Received a gas valve feedback within 500ms of activating the flame relay output.
Flame Failure	Gas valve feedback has no power after 1 minute of enabling the Flame relay output.
Gas Valve out of range	When ball valve is enabled this alarm occurs if the gas actuator feedback is greater or less then the demand by 10% for more than 90 seconds.

G-XM

The DG heating module will control all burner aspects of the DG HT line of indirect fired heaters. The same burner is used on DJX200 and DJX300 models of heaters.

Basic operation:

On a call for heating the combustion blower will be enabled and the air actuator will open to the prepurge setpoint to purge the heat exchanger. Once the prepurge time has elapsed the gas and air actuators will move to ignition position and then enable the ignition control to start and prove pilot flame, then open the main safety valve (SSOV). Once the pilot flame has proven and the main flame is established, the G-XM will then disable the pilot valve. The burner is allowed to operate to maintain the requested discharge air temperature from the CenCon by modulating the gas and air actuators. If heating is not required the burner will be disabled and the combustion blower will enter a post purge time, and then shut down.

Alarm List:

Gas Valve out of range	Gas valve actuator feedback is greater or less then the demand . Tolerances and timing depending vary on mode of operation.
Air Actuator Out of range	Air Actuator Feedback Is greater or less then the demand. Tolerances and timing vary depending on mode of operation.
Shorted Air Proving	Combustion blower air switch input has power for 10 seconds before the combustion blower has been commanded on.
Open Air Proving	Combustion blower air switch input has no power for 60 seconds after commanding the combustion blower on / Combustion blower air switch input has no power for 2 seconds during main flame
Plugged Condensate	Blocked condensate sensor reads less than 7kohms for more than 5 minutes.
Blocked Flue	Blocked flue input has been enabled for 1 minute or more.
Flame Relay Wiring	Received a gas valve feedback within 500ms of activating the Flame relay output.
Flame Failure	Gas valve feedback has no power after 1 minute of enabling the Flame relay output.
Gas Valve Wiring	Gas valve feedback has power before the FR and SR contact are energized.

M-XM

The M-XM heating module will control all burner aspects of the HE line of direct fired heaters.

Basic operation:

On a call for heating the ignition control will be enabled to start and prove pilot flame, then open the main safety valve (SSOV). Once the pilot flame has proven and the main flame is established, the M-XM will then disable the pilot valve. The burner is allowed to operate to maintain the requested discharge air temperature from the CenCon by modulating the control valve. If heating is not required the burner will be disabled.

Alarm List:

Flame Failure	Gas valve feedback has no power after 1 minute of enabling the Flame relay output.
Gas Valve Wiring	Gas valve feedback has power before the FR and SR contact are energized.
Flame Relay Wiring	Received a gas valve feedback within 500ms of activating the Flame relay output.
Gas Valve out of range	When ball valve is enabled this alarm occurs if the gas actuator feedback is greater or less then the demand by 10% for more then 60 (Default is currently variable) seconds.
Low Velocity Air Switch	Occurs if the pressure drops below the low pressure setpoint during modulation for more than 40 seconds
High Velocity Air Switch	Occurs if the pressure goes above the High pressure setpoint during modulation for more than 90 seconds
Air Tube	Unexpected sensing. Typically reversed sensor location.
Low Pressure	Alarm occurs if the pressure is less than the low pressure setpoint plus 0.05" wc after the damper is opened and the blower has been commanded to start for a minute. This alarm will not be triggered if we have already passed the purge status and have lit. See Low velocity air Switch alarm
Low Pressure Sensor	If the pressure is greater than the Very low pressure setpoint before the damper is opened for more than 1 minute

Very Low Pressure	Occurs if the pressure drops below the very low pressure setpoint after the purge has been completed.
Far Sensor Flame Failure	Occurs if a secondary flame rod is enabled and we lose flame sensing in less than 20 seconds after the pilot valve drops out on consecutive attempts.

CD-XM

A slave to the DJ heating module, this will control the combustion motor speed on DJ indirect fired heaters. A 3 wire feedback signal is returned to the module to confirm the blower speed.

P-XM

The flow module may be used for a variety of functions. Primarily, it will measure, control, and maintain the required variable flow in an HE direct fired heater. An analog and digital output is also available.

TERMINAL DESIGNATIONS

CenCon

H N		Power Supply
GND		Ground
LmA B		Modbus
BmA,B		BACnet
SmA,B		Modbus
MCW	AO	Modulating cooling
MEc	AO	Modulating economizer
MHW	AO	Modulating heating
MSp	AO	VFD command speed
RPM	AI	VFD feedback speed
DPr	AI	Supply duct pressure
IAQ	AI	CO2 or IAQ sensor
HuO	AI	Outside humidity
CM		Relay common
FbD	AI	Damper feedback
OLF	DI	VFD fault
FbB	DI	Air proving switch
DES	DI	Damper end switch
AL	DO	Alarm
SA	DO	Supply air
DM	DO	Damper actuator enable
OCC	DI	Occupied / unoccupied mode
TCB	DI	Time clock bypass
EnF	DI	Enable Fan
ALi	DI	Secondary Bacnet alarm
Y+-	AI	Modulating cooling thermostat
MA1,2	AI	Mixed air temperature
DA1,2	AI	Discharge temperature
AA1,2	AI	Ambient air temperature
RA1,2	AI	Return / room temperature
W+-	AI	Modulating heating thermostat
ASP	AI	Remote VFD setpoint
Hr+-	AI	Modulating humidity
DX1,2	AI	DX temperature
DhC	DI	Dehumidification.
Byp	DI	VFD Bypass
RmA,B		Modbus Room

J-XM

H N		24Vac Power Supply
GND		Ground
LmAB		Internal Modbus
FbG	AI	Gas actuator feedback
FbA	AI	Air actuator feedback
MBV	AO	Gas actuator demand
CAS	DI	Combustion air switch
BFS	DI	Blocked flue switch
EnH	DI	Enable heat
PV1,2	DO	Pilot valve enable
SR1,2	DO	Safety relay
FR1,2	DO	Flame relay
FbV	AI	SSOV feedback hot
VN		SSOV feedback neutral
HL	DI	High limit
CP	AI	Condensate probe
MX1,2	AO	Maxitrol valve

G-XM

H N		24Vac Power Supply
GND		Ground
LmAB		Internal Modbus
FbG	AI	Gas actuator feedback
FbA	AI	Air actuator feedback
MBV	AO	Gas actuator demand
MCA	AO	Air actuator demand
CAS	DI	Combustion air switch
BFS	DI	Blocked flue switch
EnH	DI	Enable heat
CB1,2	DO	Combustion blower enable
PV1,2	DO	Pilot valve enable
SR1,2	DO	Safety relay
FR1,2	DO	Flame relay
FbV	DI	SSOV feedback hot
VN		SSOV feedback neutral
HL	DI	High limit

M-XM

H N		24Vac Power Supply
GND		Ground
LmA B		Modbus
FbG	AI	Feedback Gas
MBV	AO	Modulating ball valve
MPP	AO	Profile pressure
HiE	DI	High Speed Enable
EnH	DI	Enable heat
CM	COM	Relay Common
HiS	DO	High Speed
Exl	DO	Exhaust fan low
DFR	DO	Dual Flame Rod
WPu	DO	Water Pump

PV1,2	DO	Pilot valve
SR1,2	DO	Safety relay
FR1,2	DO	Flame relay
FbV	AI	Feedback valve
VN		Valve neutral
HL	DI	High limit
MX1, MX2	AO	Maxitrol Valve

C-XM

H N		24Vac Power Supply
GND		Ground
LmAB		Internal Modbus
MCp	AO	Modulating compressor output
MF1	AO	Modulating condenser 1 fan output
MF2	AO	Modulating condenser 2 fan output
MRh	AO	Modulating reheat output
HP1	AI	High pressure transducer stage 1
HP2	AI	High pressure transducer stage 2
HP3	AI	High pressure transducer stage 3
HP4	AI	High pressure transducer stage 4
+5V		+5Vdc output
CMa		Relay set ‘a’ common
C1a	DO	Cooling stage 1
C2a	DO	Cooling stage 2
C3A	DO	Cooling stage 3
C4a	DO	Cooling stage 4
C5a	DO	Cooling stage 5
F1b	DO	Condenser fan 1
F2b	DO	Condenser fan 2
C6a	DO	Cooling stage 6 output
R1b	DO	Stepped reheat stage 1
R2b	DO	Stepped reheat stage 2
CMb		Relay set ‘b’ common
SSR		Solid state relay output
HP5	AI	High pressure transducer stage 5
LP1	AI	Low pressure transducer stage 1
LP2	AI	Low pressure transducer stage 2
LP3	AI	Low pressure transducer stage 3
LP4	AI	Low pressure transducer stage 4
LP5	AI	Low pressure transducer stage 5
+5V		+5Vdc output
GC		DC common
DS+-	AI	Dehumidity Setpoint
EnH	DI	Enable reheat
EnC	DI	Enable mechanical cooling

CD-XM

H N		24Vac Power Supply
GND		Ground
LmAB		Internal Modbus
OS	AI	Tachometer +
YS	AI	Tachometer -
GS	AI	Tachometer reference
CB	AO	TRIAC output
120		120Vac input
SR1,2	DO	Safety relay

P-XM

H N		24Vac Power Supply
GND		Ground
LmAB		Internal Modbus
CM		Relay common
PSw	DO	Pressure switch
PrS	AO	Pressure sensor