CEC Condensing Economizer Control System

Model CEC20x

Installation, Operation, and Service Manual

Manual Part No. 750-300
Revised May 2010

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CHAPTER 1

GENERAL DESCRIPTION AND PRINCIPLE OF OPERATION

A. Introduction

Congratulations, and thank you for choosing the Cleaver-Brooks Condensing Economizer Control System. This system has been designed with the user in mind, and should provide many years of dependable, safe, and efficient operation. To ensure continued trouble-free operation, please be sure to follow all instructions in this manual regarding proper installation, set-up, operation, and maintenance.

B. How to Use this Manual

This manual is arranged to provide a straightforward, step-by-step process from installation through operation and maintenance of your system.

Chapter 1 describes the system, components, and principles of operation, and explains how to identify what type of system and components you should have.

Chapter 2 details the installation procedures, including mounting, piping, wiring, and utility requirements, and the proper sequence to perform these procedures.

Chapter 3 explains how to set up the system with your boiler/burner, and then place the system in operation.

Chapter 4 provides information on routine maintenance, troubleshooting, replacement parts, and warranty policy.

C. System Description - General

The C-B Condensing Economizer Control (CEC) System is a PLC based control system intended for use on condensing economizers installed on multiple boiler applications. Single boiler applications without a Hawk ICS Advanced control system will also require a Condensing Economizer control system. On single boiler applications with the Hawk ICS Advanced Package, the condensing economizer is controlled by the Hawk ICS system—the CEC system is not required.

There are two control platforms available for the CEC system. They are functionally identical, but differ in the type of operator interface. The CEC 10x series uses a 128x64 monochrome LCD display. The CEC 20x series uses a 5.7” color touchscreen display. This manual is intended for use with the CEC20x series systems.

The complete system consists of temperature and firing rate sensors, a control panel which houses the PLC, and valves to control water flow through the upper coil of the economizer(s).

The system provides visual indication of water and flue gas temperatures for each boiler. Firing rate and valve positions are also displayed.

D. Principle of Operation

The system monitors the temperature of the upper coil and acts to prevent a steaming condition. When a near steaming condition is sensed, Valve 3 is activated to route condensate through the upper coil. If the near steaming condition continues, the makeup water bypass valve is opened to route cold water through the upper coil. Once the near steaming condition has cleared, the makeup water bypass valve is stepped closed on a timed basis. Once the bypass valve is closed, and the temperature is not near steaming, the condensate routing valve is closed after a time delay.

E. System Components

1. Temperature Sensor

Temperature sensors are installed in the boiler flue before and after the economizer. Temperature sensors are also installed in the water lines to and from both economizer coils. They provide a 4-20mA signal to the control system.

2. Firing Rate Position Sensor

The firing rate position sensor is an enclosed rotary potentiometer installed on the front of the boiler. Its shaft is connected via linkage to the modulating jackshaft. It provides a signal to the PLC that is relative to the burner firing rate.

3. PLC/HMI

The system is controlled by an integrated HMI/Programmable Logic Controller (PLC). I/O modules allow the PLC to interface with all the field equipment (valves, temperature sensors, and firing rate sensor). The PLC communicates with the I/O via Modbus RTU protocol.

CHAPTER 2

INSTALLATION

A. System Requirements

1. Electrical

120 VAC, 60 Hz, or 110 VAC 50 Hz 10 Amp
3-wire grounded system.

2. Environmental

Temperature:
Control Panel 32-122 °F
Firing Rate Sensor 0-180 °F

B. Determining Locations

The following items are general instructions for determining locations:

The interconnecting signal cables between the CEC panel and field devices should be located as far as possible from high voltage wiring and large electrical equipment. Items like the ignition cable and combustion air fan motor can introduce voltage spikes which could upset the operation of the PLC. The signal cables should be run at right angles to any power wiring and must not be routed with any boiler wiring.

C. Control Panel

The Control Panel may be mounted on its own (optional) pedestal, a wall, or a convenient post. To avoid excessive heat or vibration, it should not be mounted directly on the boiler. Also, it must be located away from large or high voltage equipment such as power distribution panels, motors, ignition transformers, etc. If pedestal mounted, the base must be securely anchored. A location in the vicinity of the front of the boiler is usually most convenient since it will allow the operator, when working on the controls, to directly see the effects of their actions. This is particularly useful when adjusting a fuel cam.

D. Firing Rate Sensor

The firing rate sensor enclosure contains a potentiometer which translates the jackshaft position into a voltage signal that can be read by the PLC. It is screw mounted to the front head of the boiler or windbox of the burner.

E. Wiring

The control panel requires 120 VAC, 10 amp. All wiring must conform to the National Electrical Code (NEC), and all applicable local codes.

Both the firing rate sensor and the probe are connected to the control panel with cables. It is recommended that these cables be kept away from large electrical equipment such as the combustion air fan motor and the ignition transformer. Do not route these signal lines along conduit runs.

CHAPTER 3

SYSTEM SETUP AND CONFIGURATION

A. PLC Overview

The system monitors the temperature of the upper coil and acts to prevent a steaming condition. When a near steaming condition is sensed, Valve 3 is activated to route condensate through the upper coil. If the near steaming condition continues, the makeup water bypass valve is opened to route cold water through the upper coil. Once the near steaming condition has cleared, the makeup water bypass valve is stepped closed on a timed basis. Once the bypass valve is closed, and the temperature is not near steaming, the condensate routing valve is closed after a time delay.

B. Data Logging

The PLC can log data to a micro SD memory card. When Data Logging is enabled, data for the temperatures, firing rate, and valve positions are written once per second to a CSV file on the memory card. A new data log file is created every hour with a time and date coded filename: MMDDHH.CSV. The data logging can be enabled or disabled via push button at the HMI. The used capacity of the memory card is also displayed at the HMI.

*To install a Micro SD card***:** Align its 8-pin gold edge connector down, facing the front of the HMI. Carefully push it all the way into the Memory slot. Ensure that it clicks into place.

*To remove the Micro SD card***:** Push down on the top of the card gently to release the spring.
The card pops up for removal.

C. Remote Monitoring

The PLC provides data via Modbus RTU serial protocol. See Appendix A for addressing and communications parameters.

D. HMI Screens

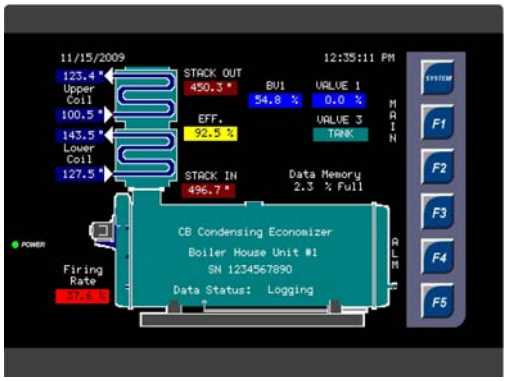
The HMI displays all the information related to the CEC system. There are several screens that are used to view and/or change the system parameters.

1. Main Menu Screen

This screen allows access to all the other screens. Pressing the F1 key will display the Overview screen. The F2 key displays the fuel curve configuration menu screen. The F3 key displays the PID menu screen. The F4 key displays the system setup screen. The F5 key displays the alarm screen. Pressing the F1 key while on any other screen will display the main menu screen.

2. Boiler Overview Screen(s)

This screen displays all the pertinent data for each boiler, including valve positions and firing rate.



3. System Configuration Menu Screens

This screen allows the operator to access the Analog I/O scaling screens, the Digital I/O screen, the System Setup screen, and the I/O Module Configuration screen.

4. Analog Input Scaling Screens

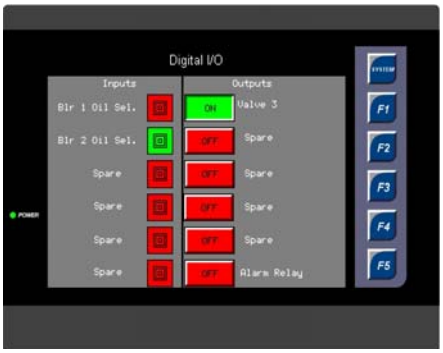
The screen allows the operator to adjust the raw input and scaled values for each analog input point. Normal raw values for voltage inputs are 1000 counts per volt of input signal. 4-20 mA signals are treated as 2-10 VDC voltage signals. Normal raw values for current inputs are 0-32000 counts for the local inputs range. The scaled values should correspond to the engineering unit range of the transmitter that is wired to the analog channel.

5. Analog Output Scaling Screens

The screen allows the operator to adjust the raw input and scaled values for each analog output point. **Note: When this screen is displayed, the normal control values for the analog points are overridden by the values displayed on this screen. Analog output adjustments should not be done while the system is in operation.** Normal raw values are 1000 counts per volt of output signal (typically 0-10 VDC). The scaled values should correspond to the engineering unit range of the device that is wired to the analog channel.

6. Digital I/O Screen

The screen allows the operator to view the status for each digital input point. When an input signal is on, the corresponding indicator for that point is displayed in green. When the input signal is off, the indicator is red. The operator can also view the current status of the output points. The operator is able to ‘force’ each output to an on state by pressing the button corresponding to the digital output point. **Note: When this screen is displayed, the normal control values for the digital output points may be overridden by operator input. Changes should not be made while the system is in operation.**

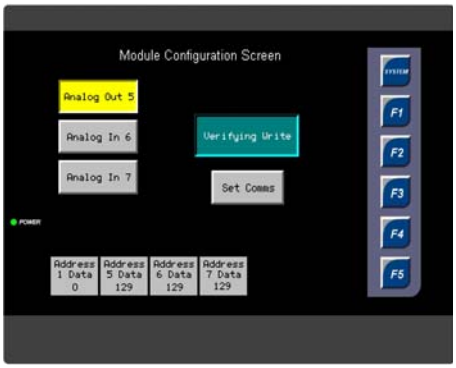


7. System Setup Screens

These screens are used to set the general operating configuration of the system. The parameters include setpoints for control of the condensate and bypass valves.

8. I/O Module Configuration Screen

The screen allows the operator to configure the communications parameters for a new I/O module.



9. Alarm Summary Screen

The screen displays the current alarm status of the system. Conditions in Alarm are displayed in red. Conditions that are in alarm and have been acknowledged are displayed in blue. Conditions that are out of alarm, but have not been acknowledged are displayed in green. The alarms are displayed with the date and time of their occurrence.

10. Alarm History Screen
The screen displays the alarm history of the system. The alarms are displayed with the date and time of their occurrence.

E. Control Panel

1. HMI Display – The PLC has a built-in screen display. It shows all the information pertaining to the CEC system and is the means for operator interface to the PLC. All operating parameters are entered and/or adjusted via this interface.

2. I/O Modules – The field mounted devices are controlled by the PLC via I/O modules. The I/O modules consist of two different types--Analog Input and Analog Output. The analog input module accepts analog signals from field devices such as the temperature transmitters and firing rate sensor. The analog output module transmits analog control signals to the bypass and balancing valves.

3. Power Supplies – The 24 VDC power supply mounted on the back panel provides power to all the components in the control panel. The 12 VDC power supply provides power for the Firing Rate Potentiometer signal to the PLC.

4. Relays – The relays provide signal isolation from the 120 VAC signals from the boiler fuel selection switch and the discrete inputs.

5. Circuit Breaker/Fuse Blocks – These provide protection from electrical shorts caused by improper wiring or damaged electrical equipment.

6. Transformer(s) – This device is used on installations that require 24 VAC power to operate the valves. The transformer steps down the 120 VAC panel power to 24 VAC for use by the actuator.

F. Placing System into Operation

It is suggested the following sequence be used when the CEC System is started for the first time.

If, at any time, the expected result is not obtained, see the troubleshooting chapter.

Before applying power to the unit inspect all wiring.

1. Supplying Power to the System

Check that the supplied voltage is 120 VAC (+/- 10%). Turn on the main power breaker. The PLC will power up.

2. System Configuration

The system needs to be configured to reflect the various options that have been selected for the installation.

1) Go to the Setup Screen Menu at the HMI by pressing the “F4” button.
2) After entering the correct password, select the “Setup 1” button to go to the setup screen.
3) Enter the boiler size and minimum and maximum positions for the balancing valves (multiple boiler applications only).
4) Select the “Setup 2” button to go to the second setup screen.
5) Enter the temperature setpoint used to determine a Near Steaming condition. This setpoint will be used by the PLC to take corrective action by actuating valves.
6) Enter the ‘V3 Open Delay’ setpoint. This is the time delay (in seconds) after a near steaming condition is sensed before Valve 3 is opened to route condensate through the upper coil of the economizer.
7) Enter the ‘V3 Close Delay’ setpoint. This is the time delay (in seconds) after a near steaming condition is cleared with the bypass valve closed before Valve 3 is closed to route condensate to the surge or DA tank.
8) Enter the ‘V1 Open Delay’ setpoint. This is the time delay (in seconds) after Valve 3 is opened to correct a near steaming condition before the bypass valve is opened to route water through the upper coil of the economizer.
9) Enter the ‘V1 Dec. Delay’ setpoint. This is the time delay (in seconds) after a near steaming condition is cleared before the bypass valve begins to modulate closed. The valve modulates closed in steps with the step size determined by the ‘V1 Decrement’ setpoint value. The time between each step is determined by the ‘V1 Dec. Delay’ setpoint.
10) Enter the ‘V1 Decrement’ setpoint. This is the amount that the valve output is decreased (in percentage) after a near steaming condition is cleared and the decrement delay time has passed.
11) Enter the ‘V1 Minimum Position’ setpoint. This is the minimum valve position allowed for the bypass valve (0% is fully closed, 100% is fully open).
12) Enter the ‘V1 Maximum Position’ setpoint. This is the maximum valve position allowed for the bypass valve (0% is fully closed, 100% is fully open).

3. Firing Rate Potentiometer Calibration

Turn the boiler off. Mount the firing rate potentiometer on the boiler front. Make sure that there is no binding. The potentiometer should be mounted so that the damper reaches the fully closed

position before the potentiometer reaches the lower limit of travel. Ideally, the firing rate signal to the PLC should be around two volts (raw input value of 2000) at the low fire position. The firing rate potentiometer signal is displayed on the Overview screen. To get to this screen go to the Main menu and press the F1 key.

Modulate mod. motor from low to high fire. The displayed firing rate value should increase. If it does not, reverse the connections of the red and black wires.

To calibrate the potentiometer, go to the analog input setup screen for the firing rate input. At low fire, the scaled value should read zero. If it does not, adjust the value of the “Raw Min Value” to match the “Raw Value” display. At high fire, the scaled value should read 100. If it does not, adjust the value of the “Raw Max Value” to match the “Raw Value” display. The “Scaled Min” and “Scaled Max” values should be set for 0 and 100 respectively.

4. Valve Output Position Setup

Adjustment of Analog Output

The valves should be set up to travel from fully closed to fully open with the application of a 0-10 VDC control signal.

1) Connect the digital multimeter to the analog output terminals.
2) Go to the HMI I/O configuration screen for the subject analog output point.
3) Set the subject analog output signal to 0%. Verify that the voltage reading for the output is 0 VDC.
4) In the same manner, set the analog output signal to 50%. Verify that the voltage reading for the output is 5 VDC.
5) Finally, set the analog output signal to 100%. Verify that the voltage reading for the output is 10 VDC.
6) Adjustments may be made by entering new “Scaled Min” or “Scaled Max” values at the Analog Output Setup screen. The “Scaled Min” value should correspond to a value that will result in a 0 VDC output signal in step 3. The “Scaled Max” value should be changed to a value that will result in a 10 VDC output signal in step 5.

Adjustment of Analog Inputs

Adjustments may be made for each analog input channel to compensate for minor changes in transmitter outputs over time.
1) Apply the minimum process signal from a standard voltage or current generator to the analog input terminal. This signal should correspond with a ‘zero’ level signal from the transmitter that is normally wired to the analog input.
2) Using the I/O data panel of the tuning panel, check the value of the subject analog input raw value. Normal values are 1000 counts per volt of input for the modular I/O and 3200 counts per volt of input for local I/O. 4-20 mA current inputs are converted to a voltage of 2-10 VDC at the analog input module.

3) In the same manner apply 10.0 VDC or 20 mA as appropriate.
4) Adjustments may be made by entering new “Raw Min” or “Raw Max” values at the Analog Input Setup screen. The “Raw Min” value should correspond to the actual value observed in step 2. The “Raw Max” value should correspond to the actual value observed in step 3.

Digital I/O Verification

The digital I/O points can be verified by going to the Digital I/O screen from the I/O Configuration menu screen.
1) Press the buttons for each of the digital outputs. The digital outputs should change state as the button is pressed and return to the previous state when the button is released. A green button indicates that the point is ‘on’; red indicates that a point is ‘off’.
2) Apply voltage to each of the digital inputs. The indicator on the screen should turn green when an input senses voltage.

CHAPTER 4

MAINTENANCE AND TROUBLESHOOTING

Very little maintenance should be required for the CEC system. Some basic troubleshooting and adjustment information is provided below.

A. Basic Troubleshooting

Problem	Possible Cause	Action
No display at HMI	Power Failure	Check supply voltage to the panel is 120 VAC +/- 10%. Check supply voltage to the HMI is 24 VDC.
	Tripped circuit breaker or blown fuse	Check circuit breaker and fuses inside the control panel. 24 VDC power supply should have a green LED to indicate power.
I/O Failure Alarms	Blown Fuse/Power Failure	I/O modules should have a green LED lit to indicate power. Check fuse.
	Communications Cable loose	Check communications cable connections.
Balancing Valve position doesn't change with firing rate	Firing rate sensor failure	Check that firing rate display changes from 0 to 100 as the burner goes from low to high fire.
	Firing rate sensor power failure	Check that the 12 VDC power supply is on. A green LED should be lit to indicate power. Check fuse.

B. I/O Module Replacement and Configuration

Should an I/O module need to be replaced, it will need to be configured with the correct Modbus address in order to function properly. The default Modbus address for a new I/O card is 1. Refer to Appendix A for information regarding I/O addressing.

1) Turn off power to the panel at the main circuit breaker.
2) Remove the terminals from the module to be replaced by pulling them out of their sockets.
3) Remove the module from the DIN rail by pulling the bottom tab down with a screwdriver. Pulling the tab should release the module from the DIN rail and allow it to be removed from the panel.
4) Install the new module on the DIN rail and connect the terminals. If multiple modules are being replaced, only one new (unconfigured) module should be connected at a time.
5) Go to the HMI Setup Menu screen and select “Module Config”.
6) Select the module that is being replaced (Analog Out 5, Analog In 6 or Analog In 7).

7) Press the ‘Set Comms’ button. A ‘Verify Write’ indicator will appear. If the configuration is successful, a ‘Write OK’ indicator will appear.
8) Verify the proper operation of the new I/O module by going to the I/O screen corresponding to the new module. Change the value of several inputs and/or outputs to/from the module and verify that it is responding correctly. Acknowledge any alarms indicating I/O module communication faults.
9) Repeat the procedure for any additional I/O modules being installed.

STANDARD WARRANTY

The standard warranty on all Cleaver-Brooks Products is as set forth in form C9-188L4, Terms and Conditions of Sale.

APPENDIX A – I/O Listing

CEC-100/CEC-200 Single Boiler

DI 24 VDC	Local I/O
%I0001	B1 Fuel Select 1=oil
%I0002	
%I0003	
%I0004	
%I0005	
%I0006	
%I0007	
%I0008	

AI 0-10 VDC	Local I/O
%AI0001	B1 Upper Coil Temp In
%AI0002	B1 Upper Coil Temp Out
%AI0003	B1 Lower Coil Temp In
%AI0004	B1 Lower Coil temp out

AO 0-10 VDC	SmartMod DAC107 Address 5
%AO0001	MUV Bypass Valve
%AO0002	

DO Relay Out	Local I/O
%Q0001	Condensate Routing Valve)
%Q0002	
%Q0003	
%Q0004	
%Q0005	
%Q0006	Alarm Contact

AI 4-20 mA	SmartMod ADC107 Address 6
%AI0010	B1 Flue Gas Temp In
%AI0011	B1 Flue Gas Temp Out
%AI0012	B1 Firing Rate
%AI0013	

CEC-102/CEC-202 Two Boiler

DI 24 VDC	Local I/O
%I0001	B1 Fuel Select 1=oil
%I0002	B2 Fuel Select 1=oil
%I0003	
%I0004	
%I0005	
%I0006	
%I0007	
%I0008	

AI 0-10 VDC	Local I/O
%AI0001	B1 Upper Coil Temp In
%AI0002	B1 Upper Coil Temp Out
%AI0003	B1 Lower Coil Temp In
%AI0004	B1 Lower Coil temp out

AO 0-10 VDC	SmartMod DAC107Address 5
%AO0001	MUV Bypass Valve
%AO0002	Valve BV1
%AO0003	Valve BV2
%AO0004	

DO Relay Out	Local I/O
%Q0001	Condensate Routing Valve
%Q0002	
%Q0003	
%Q0004	
%Q0005	
%Q0006	Alarm Contact

AI 4-20 mA	SmartMod ADC107 Address 6
%AI0010	B1 Flue Gas Temp In
%AI0011	B1 Flue Gas Temp Out
%AI0012	B1 Firing Rate
%AI0013	

AI 4-20 mA	SmartMod ADC207 Address 7
%AI0018	B2 Flue Gas Temp In
%AI0019	B2 Flue Gas Temp Out
%AI0020	B2 Firing Rate
%AI0021	B2 Upper Coil Temp In
%AI0022	B2 Upper Coil Temp Out
%AI0023	B2 Lower Coil Temp In
%AI0024	B2 Lower Coil temp out
%AI0025	

CEC-103/CEC-203 Three Boiler

DI 24 VDC	Local I/O
%I0001	B1 Fuel Select 1=oil
%I0002	B2 Fuel Select 1=oil
%I0003	B3 Fuel Select 1=oil
%I0004	
%I0005	
%I0006	
%I0007	
%I0008	

AI 0-10 VDC	Local I/O
%AI0001	B1 Upper Coil Temp In
%AI0002	B1 Upper Coil Temp Out
%AI0003	B1 Lower Coil Temp In
%AI0004	B1 Lower Coil temp out

AO 0-10VDC	SmartMod DAC107 Address 5
%AO0001	MUV Bypass Valve
%AO0002	Valve BV1
%AO0003	Valve BV2
%AO0004	Valve BV3

Note: Use 500 Ohm Resistors for 4-20 mA Transmitters wired to 0-10 VDC Inputs

DO Relay Out	Local I/O
%Q0001	Condensate Routing Valve
%Q0002	
%Q0003	
%Q0004	
%Q0005	
%Q0006	Alarm Contact

AI 4-20 mA	SmartMod ADC107 Address 6
%AI0010	B1 Flue Gas Temp In
%AI0011	B1 Flue Gas Temp Out
%AI0012	B1 Firing Rate
%AI0013	

AI 0-10 VDC	SmartMod ADC207
%AI0018	B2 Flue Gas Temp In
%AI0019	B2 Flue Gas Temp Out
%AI0020	B2 Firing Rate
%AI0021	B2 Upper Coil Temp In
%AI0022	B2 Upper Coil Temp Out
%AI0023	B2 Lower Coil Temp In
%AI0024	B2 Lower Coil temp out
%AI0025	

AI 0-10 VDC	SmartMod ADC207
%AI0026	B3 Flue Gas Temp In
%AI0027	B3 Flue Gas Temp Out
%AI0028	B3 Firing Rate
%AI0029	B3 Upper Coil Temp In
%AI0030	B3 Upper Coil Temp Out
%AI0031	B3 Lower Coil Temp In
%AI0032	B3 Lower Coil temp out
%AI0033	

CEC-104/CEC-204 Four Boiler

DI 24 VDC	Local I/O
%I0001	B1 Fuel Select 1=oil
%I0002	B2 Fuel Select 1=oil
%I0003	B3 Fuel Select 1=oil
%I0004	B4 Fuel Select 1=oil
%I0005	
%I0006	
%I0007	
%I0008	

AI 0-10 VDC	Local I/O
%AI0001	B1 Upper Coil Temp In
%AI0002	B1 Upper Coil Temp Out
%AI0003	B1 Lower Coil Temp In
%AI0004	B1 Lower Coil temp out

AO 0-10 VDC	SmartMod DAC207 Address 5
%AQ0001	MUV Bypass Valve
%AQ0002	Valve BV1
%AQ0003	Valve BV2
%AQ0004	Valve BV3
%AQ0005	Valve BV4
%AQ0006	
%AQ0007	
%AQ0008	

Note: Use 500 Ohm Resistors for 4-20 mA Transmitters wired to 0-10 VDC Inputs

DO Relay Out	Local I/O
%Q0001	Condensate Routing Valve
%Q0002	
%Q0003	
%Q0004	
%Q0005	
%Q0006	Alarm Contact

AI 0-10 VDC	SmartMod ADC207 Address 6
%AI0010	B1 Flue Gas Temp In
%AI0011	B1 Flue Gas Temp Out
%AI0012	B1 Firing Rate
%AI0013	B4 Firing Rate
%AI0014	B4 Upper Coil Temp In
%AI0015	B4 Upper Coil Temp Out
%AI0016	B4 Lower Coil Temp In
%AI0017	B4 Lower Coil temp Out

AI 0-10 VDC	SmartMod ADC207 Address 7
%AI0018	B2 Flue Gas Temp In
%AI0019	B2 Flue Gas Temp Out
%AI0020	B2 Firing Rate
%AI0021	B2 Upper Coil Temp In
%AI0022	B2 Upper Coil Temp Out
%AI0023	B2 Lower Coil Temp In
%AI0024	B2 Lower Coil temp out
%AI0025	B4 Flue Gas Temp In

AI 0-10 VDC	SmartMod ADC207 Address 8
%AI0026	B3 Flue Gas Temp In
%AI0027	B3 Flue Gas Temp Out
%AI0028	B3 Firing Rate
%AI0029	B3 Upper Coil Temp In
%AI0030	B3 Upper Coil Temp Out
%AI0031	B3 Lower Coil Temp In
%AI0032	B3 Lower Coil temp out
%AI0033	B4 Flue Gas Temp Out

APPENDIX B – Removable Media

Using Removable Media to Load and Save Applications
A special file type, with a .PGM extension, is used to store application programs on Micro SD. To load an application from Micro SD to the controller, open the Removable Media Manager in the System Menu. Find and highlight the desired .PGM file, and press the Enter key.

To prevent data loss or corruption, be sure to turn off the memory card via the HMI setup screen before installing or removing a Micro SD card.

*To install a Micro SD card***:** Align its 8-pin gold edge connector down, facing the front of the HMI. Carefully push it all the way into the Memory slot. Ensure that it clicks into place.

*To remove the Micro SD card***:** Push down on the top of the card gently to release the spring.
The card pops up for removal.

The CEC 10x/20x systems have been tested with SanDisk brand memory cards. Other brands should work, but their performance has not been verified or tested by Cleaver-Brooks.

APPENDIX C – Modbus Slave Addressing

Communications parameters: RS232, 9600 Baud, No Parity, 8 Data Bits, 1 Stop Bit

PLC Address	Description	Data Type	Modbus Register	Units	Typ Scale Factor
%AQ10	Boiler 1 Upper Coil In Temperature	16 bit Int.	40010	Deg. F	1/10
%AQ11	Boiler 1 Upper Coil Out Temperature	16 bit Int.	40011	Deg. F	1/10
%AQ12	Boiler 1 Lower Coil In Temperature	16 bit Int.	40012	Deg. F	1/10
%AQ13	Boiler 1 Lower Coil Out Temperature	16 bit Int.	40013	Deg. F	1/10
%AQ14	Boiler 1 Flue Gas In Temperature	16 bit Int.	40014	Deg. F	1/10
%AQ15	Boiler 1 Flue Gas Out Temperature	16 bit Int.	40015	Deg. F	1/10
%AQ16	Boiler 1 Firing Rate	16 bit Int.	40016	Percent	1/100
%AQ17	Boiler 1 Efficiency	16 bit Int.	40017	Percent	1/100
%AQ18		16 bit Int.	40018		
%AQ19		16 bit Int.	40019		
%AQ20	Boiler 2 Upper Coil In Temperature	16 bit Int.	40020	Deg. F	1/10
%AQ21	Boiler 2 Upper Coil Out Temperature	16 bit Int.	40021	Deg. F	1/10
%AQ22	Boiler 2 Lower Coil In Temperature	16 bit Int.	40022	Deg. F	1/10
%AQ23	Boiler 2 Lower Coil Out Temperature	16 bit Int.	40023	Deg. F	1/10
%AQ24	Boiler 2 Flue Gas In Temperature	16 bit Int.	40024	Deg. F	1/10
%AQ25	Boiler 2 Flue Gas Out Temperature	16 bit Int.	40025	Deg. F	1/10
%AQ26	Boiler 2 Firing Rate	16 bit Int.	40026	Percent	1/100
%AQ27	Boiler 2 Efficiency	16 bit Int.	40027	Percent	1/100
%AQ28		16 bit Int.	40028		
%AQ29		16 bit Int.	40029		
%AQ30	Boiler 3 Upper Coil In Temperature	16 bit Int.	40030	Deg. F	1/10
%AQ31	Boiler 3 Upper Coil Out Temperature	16 bit Int.	40031	Deg. F	1/10
%AQ32	Boiler 3 Lower Coil In Temperature	16 bit Int.	40032	Deg. F	1/10
%AQ33	Boiler 3 Lower Coil Out Temperature	16 bit Int.	40033	Deg. F	1/10
%AQ34	Boiler 3 Flue Gas In Temperature	16 bit Int.	40034	Deg. F	1/10
%AQ35	Boiler 3 Flue Gas Out Temperature	16 bit Int.	40035	Deg. F	1/10
%AQ36	Boiler 3 Firing Rate	16 bit Int.	40036	Percent	1/100
%AQ37	Boiler 3 Efficiency	16 bit Int.	40037	Percent	1/100
%AQ38		16 bit Int.	40038		
%AQ39		16 bit Int.	40039		
%AQ40	Boiler 4 Upper Coil In Temperature	16 bit Int.	40040	Deg. F	1/10
%AQ41	Boiler 4 Upper Coil Out Temperature	16 bit Int.	40041	Deg. F	1/10
%AQ42	Boiler 4 Lower Coil In Temperature	16 bit Int.	40042	Deg. F	1/10
%AQ43	Boiler 4 Lower Coil Out Temperature	16 bit Int.	40043	Deg. F	1/10
%AQ44	Boiler 4 Flue Gas In Temperature	16 bit Int.	40044	Deg. F	1/10
%AQ45	Boiler 4 Flue Gas Out Temperature	16 bit Int.	40045	Deg. F	1/10
%AQ46	Boiler 4 Firing Rate	16 bit Int.	40046	Percent	1/100
%AQ47	Boiler 4 Efficiency	16 bit Int.	40047	Percent	1/100
%AQ48		16 bit Int.	40048		
%AQ49		16 bit Int.	40049		
%AQ50	Valve 1 Position (100% = full open)	16 bit Int.	40050	Percent	1/100
%AQ51	BV1 Position (100% = full open)	16 bit Int.	40051	Percent	1/100
%AQ52	BV2 Position (100% = full open)	16 bit Int.	40052	Percent	1/100
%AQ53	BV3 Position (100% = full open)	16 bit Int.	40053	Percent	1/100
%AQ54	BV4 Position (100% = full open)	16 bit Int.	40054	Percent	1/100
%AQ55		16 bit Int.	40055		
%AQ56		16 bit Int.	40056		
%AQ57		16 bit Int.	40057		
%AQ58		16 bit Int.	40058		
%AQ59		16 bit Int.	40059		

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