

## FEATURES & BENEFITS

- Saves fuel and improves safety
- Small initial investment
- Menu-driven setup
- Field configurable for positive or negative pressures and sequences
- Electronic draft gauge
- Draft range transmitter
- Integral low draft/high pressure cutoff switch option
- Available flue gas temperature indicator/transmitter
- ISA Sequence "M" FGT (flue gas temperature) alarm
- Modbus serial communications standard
- BACnet™ & LonWorks™ available
- Processor diagnostic LED's
- Replaces earlier controllers: Series 7710, DCR & others
- DEP, CUL & UL Approvals

## INTRODUCTION

The Hays Cleveland Series C-07720-C0 Solid State Micro-processor Draft Control System provides an economical means of controlling draft with burner management system sequencing. This state of the art system provides an immediate, measurable improvement in fuel economy attributable to greater efficiency. The solid state design simplifies routine maintenance and greatly reduces repair expenses when compared to traditional draft controllers with mechanical switching mechanisms. The complete system includes an electronic sensor with logic panel to provide floating proportional control, draft/pressure gauge, optional flue gas temperature indicator transmitter, and optional low draft or high pressure cutout switch. Modbus communications for interface with SCADA or building management systems is standard.

## STANDARD PACKAGE

The standard C-07720 DCS provides accurate draft control with a simple operator interface. The operator can field-



configure the controller by using the front panel pushbuttons (**ENTER, INCREASE, DECREASE, RESET**) and changing jumper positions on the processor's printed circuit board. Included draft control logic functions are non-sequencing modulation, and sequencing modulation with one or more of the following features: adjustable start, pre-purge and full open damper post-purge. The bright, two-line, vacuum-fluorescent display shows the control parameters, alarms and sensor values in engineering units.

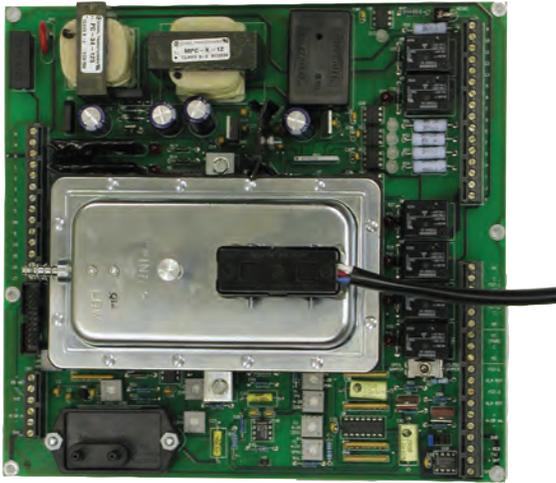
Since draft pressure is displayed on the front of the draft controller, there is no need for a separate mechanical gauge and its associated piping. The transmitted 4-20 mA DC draft signal is directly proportional to the draft range: 4 ma = -2.0" w.c. and 20 ma = +2.0" w.c. OR 4 ma = -4.75" w.c. and 20 ma = +4.75" w.c. The 3-mode selector switch (**CLOSE/AUTO/OPEN**) permits manual damper positioning.

The integral draft sensor is a piezoresistive, silicon element capable of measuring positive or negative pressure directly. The sensor is temperature-compensated and produces an electrical signal directly proportional to the pressure in the boiler. The controller output through zero-crossover switching relays is selectable for bi-directional, switched 120v AC or 24v AC to operate the damper actuator. Adjustable dead band and damping circuits filter out process noise to help eliminate cycling.

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### WHY DRAFT CONTROL?

Draft control is essential to both fire tube and water tube boiler applications. Boilers with stack heights of 25–30 feet (and even boilers with stub stacks) benefit from proper draft control and monitoring: it improves heat transfer and combustion efficiency, reduces room heat loss, improves flame stability, reduces pilot light failure and improves flame retention. Efficiency improves dramatically when a **Hays Cleveland C-07720 Draft Control System** is applied!



*Optional integral Low Draft/High Pressure switch mounted on C-07720 Printed circuit Board Assembly.*

The **C-07720 Draft Control System** interfaces with any burner management system. The 10 amp burner interface relays ensure reliable service.

Processor diagnostic LED displays provide for troubleshooting, alarms and operations. The LED's indicate status functions such as processor running, increase/decrease control action, modulation mode, alarms, and status with the burner management system.

## CONTROL FUNCTIONS

The standard **C-07720 Draft Control System** package provides draft control for any fire tube or industrial water tube boiler. The **C-07720 Draft Control System** is factory-configured to one of four logic operations (see Nomenclature section, page 4, Model designation "A: Draft Control Logic Operations"), but can be completely reconfigured onsite if necessary. To do so, simply reposition the jumpers on the processor printed circuit board to select the appropriate sequence of operation for the burner management system interface and damper actuator operation. The four available logic configurations are as follows.

**Model C-07720-C0-1- Non-Sequencing operation:** This configuration modulates the damper when used with Hays Cleveland F-09140-010-1 Linear Actuator or equal. It does not interface with a burner management system. Model C-07720-C0-1 replaces Hays Cleveland 7711 & DCP-E units.

**Model C-07720-C0-2- Sequencing operation with Adjustable Start positioning:** This configuration interfaces with the burner management system to open and close the damper. It also permits "light-off" with the damper open to a pre-selected, adjustable start position when a **Hays Cleveland Model F-09140-010-1 Linear Actuator** equipped with adjustable start position switches is used. Once the safe flame has been established with the damper partially open, the actuator modulates the damper over its complete range to maintain set point. **Model C-07720-C0-2** is also used for stoker applications. It replaces obsolete **Hays Cleveland 7712-41 & DCR-AS-G units.**

**Model C-07720-C0-3- Sequencing with Adjustable Start & Post-Purge:** This configuration functions the same as the **C-07720-C0-2** with the addition of post-purge capability when used with the **Hays Cleveland F-09140-010-1 Linear Actuator** or equal. When the damper opens to its adjustable start position during boiler startup, the post-purge timer is energized. Upon boiler shutdown, the damper remains open for 20 seconds and then closes. Model **C-07720-C0-3** replaces obsolete **Hays Cleveland 7713-43 & DCR-AS-PP-G units.**

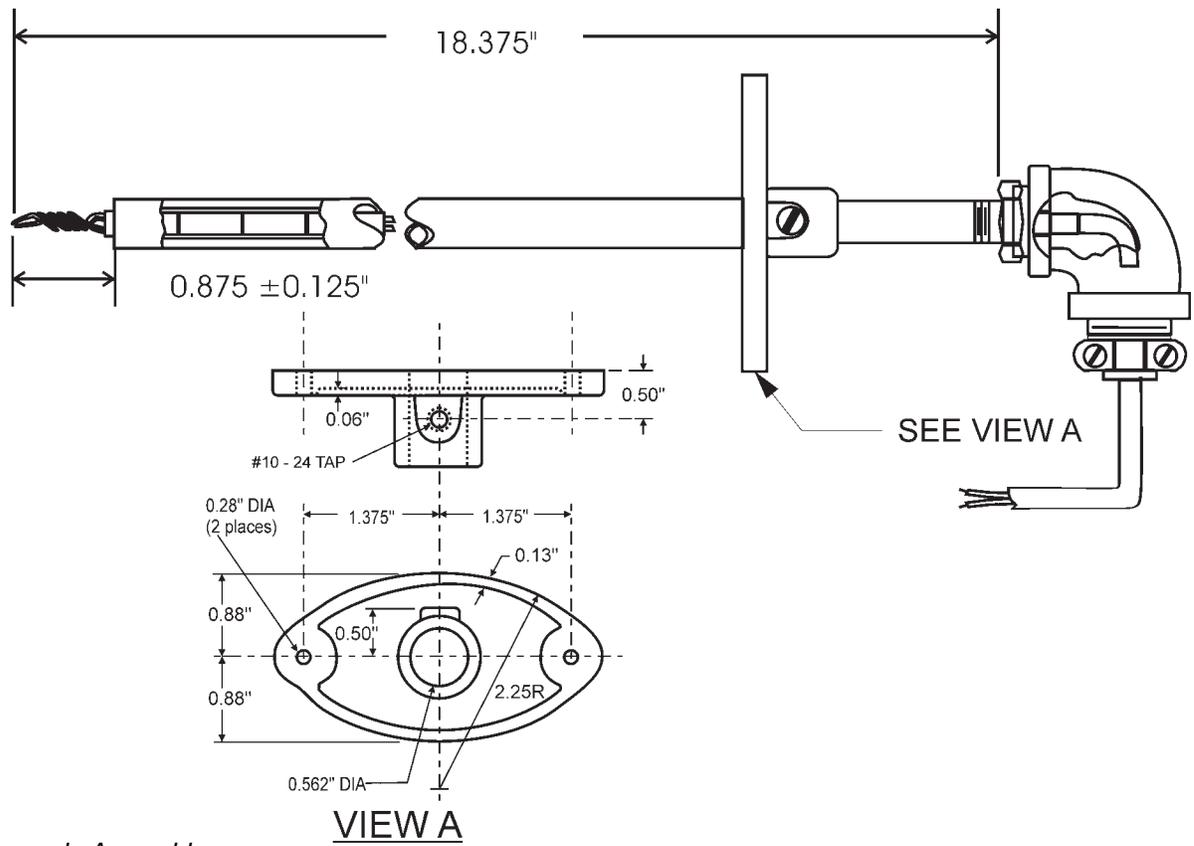
**Model C-07720-C0-4- Sequencing With Adjustable Start, Post Purge & Pre-Purge:** This configuration functions the same as the **C-07720-C0-3** but with the addition of pre-purge damper positioning, adjustable 20 to 120 seconds, and post-purge damper positioning, adjustable 0 to 120 seconds, when used with the Hays Cleveland F-09140-010-1 Linear Actuator or equal. When the boiler is starting up through the burner management system limits, the damper is opened completely and the pre-purge timer starts. When the pre-purge time expires, the actuator closes it to the adjustable start position. Upon boiler shutdown the post-purge function commences as set with the adjustable timer. Model **C-07720-C0-4** replaces obsolete **Hays Cleveland 7714-20-A & DCR-111 units.**

## INTEGRAL INSTRUMENTATION OPTIONS

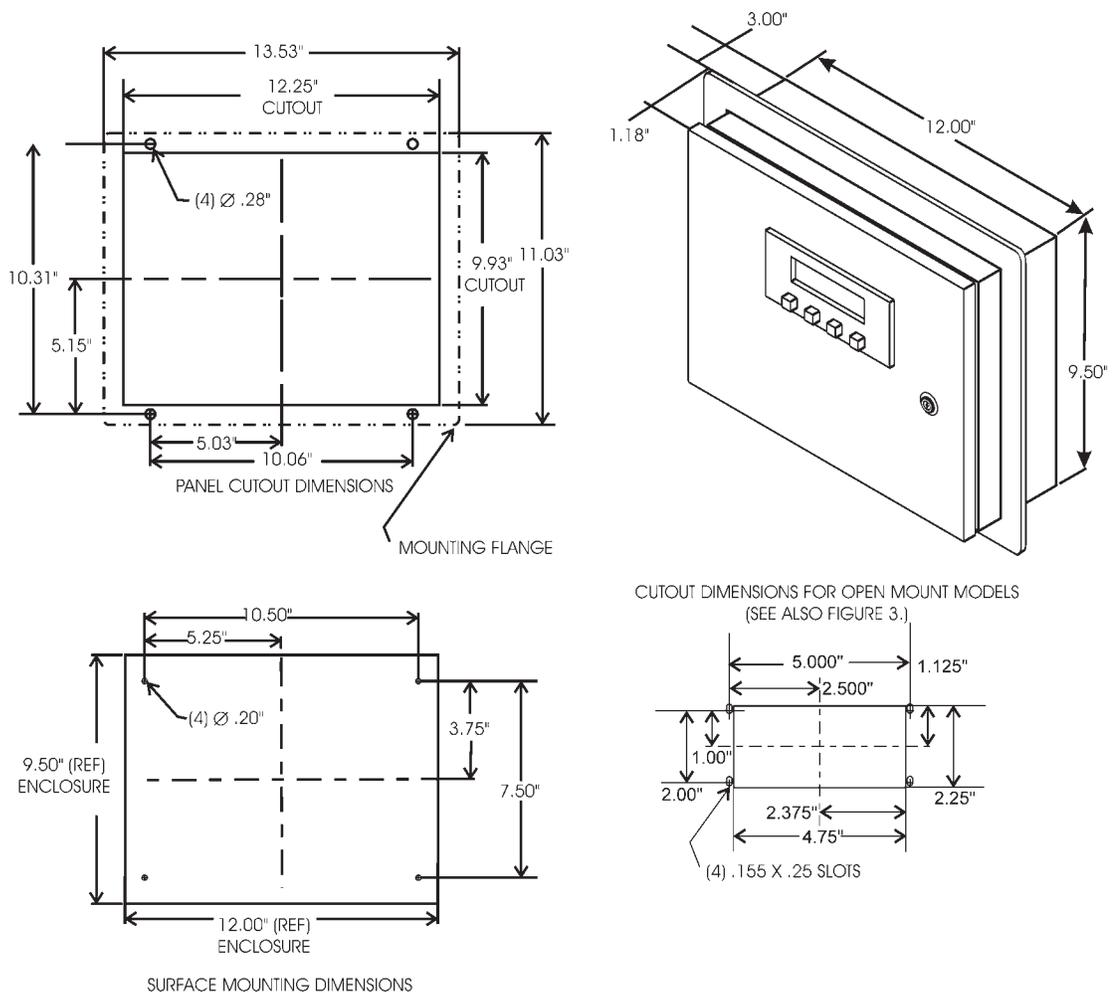
Optional features add the functions of several instruments to the basic **C-07720 Draft Control System** without increasing the panel space required. Compared to using separate instruments, installation is much simpler, and the panel connections are centralized for further convenience.

**Low Draft/High Pressure Cutoff Switch:** traditional installations required a separate safety switch (such as the **Cleveland Controls AFS-952**) with separate piping. The **C-07720 Draft Control System** has an optional UL-approved, integral switch that prevents firing of the boiler when draft (whether natural or induced) is insufficient. On balanced draft systems, the switch cuts off firing when the draft falls below a selected minimum draft set point. On pressure-fired systems, the switch cuts off firing when the pressure rises above a selected maximum pressure set point. In either case, nuisance shut-downs due to momentary "puffs" or fluctuations are avoided by means of an 8±3 second delay relay. The switch set point is field-adjustable, .05±.02" to 12.0" w.c.

**Flue Gas Temperature (FGT) Alarm & Indicator/Transmitter:** traditional installations required a separate instrument (such as the **Hays Cleveland Model D-06111 FGT Meter**) with separate wiring. The **C-07720 Draft Control System** has an optional integral FGT that meets ISA Sequence M requirements for monitoring flue gas temperature and causing an alarm to occur when the flue gas exceeds safe limits. A Type J thermocouple (with temperature range 32 - 999 °F or 0 - 537 °C, selectable) is provided with this option. Flue gas temperature is displayed on the front panel, and a proportional 4-20 mADC signal is transmitted. Dual alarm outputs are standard, providing for visual alarm (Lo/Hi) and burner shut-down (Hi/Hi). Alarm set points are adjustable. The Lo/Hi alarm resets automatically. For the Hi/Hi alarm, there is a choice of local manual reset, remote manual reset, or automatic reset. Thermocouple fault displays on the front panel, and results in maximum output with alarms.



Thermocouple Assembly



Dimensions

## SPECIFICATIONS

### General

- Power requirements:** 120 V AC  $\pm$  10%, 50/60 Hz.  
**Ambient temperature range:** 32–130 °F (0–54 °C)  
**Fuse:** One, @ 1 amp.  
**Housing:** NEMA 1 (for enclosed models)  
**Relative Humidity:** 0–90%, non-condensing  
**Shipping Weight:** Varies with options.  
• For enclosed models, 7.5–8.5 lbs.  
• For open-mounted models, 6.5–8.0 lbs.  
• Add 3–4 lbs. for thermocouple assembly, if ordered  
**Approvals:** DEP, UL & CUL

### Draft Controller

- Set Point:** for adjustable ranges, see Nomenclature "C: Working Range Options".  
**Damping:** adjustable, 0.0 to 15 seconds in 1.5 second increments  
**Proportioning Band:** adjustable, 0.03" to 0.2" w.c.  
**Period:** fixed, 0.2 seconds  
**Deadband:** adjustable +/- 0.01" to 0.08" w.c.  
**Pressure media:** dry clean gases that will not degrade polyester, vinyl, silicone or silicone-based adhesive  
**Voltage output:** switched; selectable by applying the voltage to the input terminal with an external voltage source

### Draft Gauge

- Display range:** -2.00" to +2.00" w.c. (fixed), or -4.75" to +4.75" w.c. (fixed)  
**Transmit:** 4–20 mA DC directly proportional to the draft range, where 4 ma = -2.00" w.c. and 20 ma = 2.00" w.c. or 4 ma = -4.75" w.c. and 20 ma = 4.75" w.c. 750 $\Omega$  maximum. Output is grounded and not isolated.

### Flue Gas Temperature Display & Alarm Option

- Thermocouple:** Type J, Iron & Constantan, is standard; suitable for use in oxidizing or reducing environments  
**Thermocouple cable length:** 50' or 100'  
**Probe insertion:** up to 18"  
**Units:** selectable, °F or °C  
**Range:** 32–999 °F or 0–537 °C  
**Transmit:** 4–20 mA DC, directly proportional to the flue gas temperature, where 32 °F (0 °C) = 4 mA DC and 999 °F (537 °C) = 20 mA DC. 750  $\Omega$  maximum. Accuracy =  $\pm$ 5 °F. Output is grounded and not isolated.  
**Alarm:**  
• **Settings:** 2 alarms, Lo/Hi and Hi/Hi, independently adjustable, 32–999 °F or 0–537 °C.  
• **Contact rating:** 10 amps, 120v AC, SPDT, non-inductive.  
• **Reset:** Alarm 1: automatic. Alarm 2 manual or automatic.  
**Indication:**  
• **Visual display indicator for Alarm 1 and Alarm 2.**  
• **Open thermocouple indication:** upon thermocouple failure, the over range reading is displayed on the meter

### Low Draft/High Pressure Cutoff Switch Option

- Range:** .05–12" w.c. (draft or pressure, determined by port selection)

### Modbus Communication

- RTU Protocol with RS485 communications  
9600 or 19200 Baud rate (field selectable from the menu)  
N/8/1 (no parity, 8 data bits, 1 stop bit).

## NOMENCLATURE

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### A Draft Control Logic Operations

- A=1 Non-Sequencing Modulation (Replaces Series 7711 and DCP-E models).  
A=2 Sequencing Modulation with Adjustable Start Positioning Capability (Replaces Series 7712 and DCR-AS-G models).  
A=3 Same as A=2, but in addition, Post Purge Capability (Replaces Series 7713 and DCR-AS-PP-G models).  
A=4 As above but includes Full Open Damper Pre-Purge Capability (Replaces Series 7714 and DCR-111 models).

### B Application Options

- B=0 Non-Sequencing Modulation (only with Code A=1)  
B=1 Gas/Oil Application (only with Code A= 2, 3, or 4)  
B=2 Stoker Application (only with Code A=2)

### C Working Range Options

- C=1 Positive Control: 0 to +2.00" w.c.  
C=2 Negative Control: 0 to -2.00" w.c.  
C=3 Positive Control: 0 to +4.75" w.c.  
C=4 Negative Control: 0 to -4.75" w.c.

### D Safety Draft/Pressure Cutout Options

- D=0 No Air Switch.  
D=1 High Pressure/Low Draft Switch (9 $\pm$ 3-sec. timer).

### E Flue Gas Temperature (FGT) Indicator/Transmitter Options

- E=0 No FGT selected.  
E=1 FGT Monitoring with adjustable length "J" Type Thermocouple with 50' cable.  
E=2 FGT Monitoring with adjustable length J Type Thermocouple with 100' cable.  
E=3 FGT Monitoring with special Thermocouple Length.  
E=4 FGT Monitoring with customer-supplied Type J Thermocouple.

### F Flue Gas Temperature (FGT) Hi/Hi Alarm Selection

- F=0 No FGT selected  
F=1 Local Manual Reset of FGT Hi/Hi Alarm.  
F=2 Remote Manual Reset of FGT Hi/Hi Alarm.  
F=3 Auto Reset of FGT Hi/Hi Alarm.

### G Mounting Options

- G=1 Surface Mounted NEMA 1 enclosure.  
G=2 Panel Mounted NEMA 1 enclosure.  
G=3 Open Mount Package.

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