Hays Cleveland
Division of UniControl Inc.

MODEL C-05810

Micro IV™ Lead-Lag Sequencer

TYPICAL 3-BOILER MICRO IV™

FEATURES & BENEFITS

- **Maintains facility main header temperature or pressure** for efficient production and heating: eliminates variable energy supply and meets demand!
- **Universal applications:** controls any model burner or boiler.
- **Sequencing with modulation** for 2 to 12 steam or hot water boilers and auxiliary boiler plant equipment.
- **On-Off, Low-High-Off or Full-modulation.**
- **Time-based main header temperature or pressure control:** fully factory-configured before shipment.
- **Fully Automatic** control & burner interface.
- **Building Management (EMS)** interface with **ASCII-II** and **RS-485 Modbus** ports for remote control, data acquisition and **SCADA** systems.
- **Master set point tracking.**
- **Bright Vacuum Fluorescent Display:** 2 easy-to-read lines using engineering units.
- **Real-time data acquisition** including efficiency, boiler ON times, pressures and temperatures.
- **Industrial heavy-duty enclosure:** cabinet has easy access for field wiring.
- **Front panel operator interfaces** include boiler ON lights, engineering unit displays of all boiler combustion functions, manual/auto/off switches, dedicated display of header temperature or pressure, and auxiliary manual/auto stations.
- **Five lead-boiler rotation modes**: manual selection (via keypad entry); automatic rotation on a weekly basis; automatic rotation based on lead-boiler run time; or remote select with Modbus or switched inputs.
- **Night set-back/weekend skip**: real-time clock for automatic set point reduction during lighter load periods.
- **Packaged systems ready for installation!** Include engineering services for submittals, wiring schematics, and field sensors.

STANDARD IN FULL- MODULATION MODELS

- **Automatic control transfer upon CPU failure**: returns operating control to the individual boiler controls.
- **Selectable series or parallel modulation modes. Series** modulation varies the firing rate of only the last boiler brought on-line, while holding other online boilers at their throttle-back setting. **Parallel** modulation varies all on-line boilers at the same firing rate.
- **Throttle-back base-loading** is used in the series modulation mode. On-line boilers automatically throttle back to a selectable firing rate as an additional lag boiler is brought online.

APPLICATIONS

Hays Cleveland, the company dedicated to providing efficient boiler plant operation since 1901, introduces **Micro IV™**, a fourth generation lead lag sequencer with modern control features designed to provide efficient operation for today's boiler plants.

The boiler plants of today generally use ***more*** and ***smaller*** boilers than the plants of the past. These small boilers cost less to install and operate. When properly controlled by the **Micro IV™**, they provide flexibility and efficiency to the production process. First and foremost, the **Micro IV™** provides the rate and desired pressure or temperature to meet changing facility demands not achievable with individual boiler controls.

Micro IV™ facilitates **safe and efficient** steam or hot water plant operation today, just as **Hays Cleveland** large boiler control systems have been doing for a century. **Micro IV™** sequence control enables boilers to work **together**, under any and all operating conditions, eliminating costly unnecessary boiler cycling.

Micro IV™ is not limited to boiler control: it can be factory-configured for tank level, air-compressor loading, or air dryer control.

TECHNOLOGY

The Microprocessor-based controller automatically responds to changing plant conditions. Advanced-technology sensors **monitor and display** steam pressure or water temperature continuously, independent of the **programming keypad and alphanumeric display**. Operator controls include plainly labeled **boiler status lights** (to identify which boilers are currently on-line) and **manual/off/auto mode switches**. **Auxiliary loop and monitor displays** are available as options.

On-Off, **Low-High-Off** and **Full-modulating** models are available to provide the appropriate control strategy for any plant. On-off cycling is achieved with output relays. Full-modulation is available with choice of **0–135 Ω**, **1–5 VDC**, **4–20 mADC**, or **optional 117 VAC switched output** to interface with any type of actuator.

MODEL SUFFIX CODES

C-05810-*O-___- ___- _____- [__]- [__]

A - B - (C,D,E,F) - [G] - [H]

(C,D,E,F): Choose just one.
[G] - [H]: Choose as many as needed.
* = current revision designation.

A_ _ _ _ Enclosure Size & Processor I/O Capability

The "yy" portion of the suffix code is the I/O capability. It is assigned by Hays Cleveland, and varies for the specific options selected. The enclosure will be selected from the following:

-A01yy: 24"H x 24"W x 8"D Hot Water
-A02yy: 24"H x 24"W x 8"D Steam
-A03yy: 36"H x 30"W x 12"D Hot Water
-A04yy: 36"H x 30"W x 12"D Steam
-A05yy: 48"H x 36"W x 12"D Hot Water
-A06yy: 48"H x 36"W x 12"D Steam

B_ _Process Element

-B01: RTD Assembly for use with hot water service. Platinum 3-wire RTD with ½" stainless steel thermowell. The "U" insertion dimension is 2". Temperature range is +40 to +240F, or as specified.

-B02: RTD Assembly, same as **-B01**, but with 4" "U" insertion.

-B24: Steam Pressure Transducer (stainless steel body) with steam syphon pigtail for steam pressures of 0 to 30 psig; specify set point.

-B25: Steam Pressure Transducer, same as **-B24** but with range of 0 to 100 psig; specify set point.

-B26: Steam Pressure Transducer, same as **-B24** but with range of 0 to 300 psig; specify set point.
(Higher pressures available. Consult Factory.)

C_ _, D_ _, E_ _, F._ _Control Output & Quantity of Boilers:

Select only one output option. Then fill in the number of boilers in the "xx" value.

Non-Modulating Outputs:

-Cxx: ON-OFF relays only. Use for boilers equipped with their own modulating control systems, or to turn pumps on and off.

-Dxx: LOW-HIGH-LOW. Use for boilers that do not modulate, but have only minimum and maximum actuator positions that use relay output switching.
Includes **ON-OFF** relays.

Modulating Outputs

(Control selections **-Exx** & **-Fxx** include the standard modulation features (see above) that are unavailable with non-modulating models.)

-Exx: ON-OFF with 4–20 mADC output MODULATION. Boilers may or may not be equipped with control systems. Includes one relay and one isolated 4–20 mA (24 VDC) output per boiler.

-Fxx: ON-OFF with 135Ω MODULATION. Boilers may or may not be equipped with control systems. One relay and one 135Ω isolated output per boiler. Use without isolators with modern low current 135Ω control input motors that have low fire position switches. For interface with other 135Ω actuators or 135Ω firing rate controllers, isolators are recommended. Refer to option **-H04xx.**

G. Common Option Selections:

For all control selections (C, D, E & F). Note: Purchase one per system, or one per boiler, as appropriate. Multiple selections are allowed. Options **G16 through G2**1 are for Hot Water Generators and Boilers only.

-G0100: Outside Air Temperature Reset. Includes RTD Assembly for through-wall mounting and a cabinet located indicating transmitter. One per system.

-G0200: Normal-Manual Night Set-Back Switch. A door-mounted override of the standard keypad-operated night set-back feature. One per system.

-G0300: Dual Set Point Switch. A door-mounted switch to select either of two operating temperatures or pressures. One per system.

-G0400: Remote Set Point. User supplies a 4–20 mADC isolated input of temperature or pressure set point. Processor defaults to local set point if input is less than 4 mADC. One per system.

-G05xx: Remote Lead Boiler Select. User supplies a multiple-contact switch input to select the lead boiler. Defaults to local lead boiler select if inputs are not switched. One per boiler.

-G06xx: Assured Low-Fire Warm-Up. Boiler is not released from low-fire until temperature or pressure switch input is open. Sensing switch by others. One per boiler.

-G07xx: Assured Low-Fire Warm-Up with one Warm Stand-By Boiler. Same as **-G06xx**, plus keeps one boiler warm for immediate use. Uses additional (two) isolated switch inputs, by others. The next available boiler is started by the "lower" switch temperature or pressure and kept at low fire until the "upper" input switch contacts open. The boiler is either released to modulation, or turned off (if the boiler is not needed). One per boiler.
Note: **Hays Cleveland** can supply the hardware needed to incorporate this option if it is not available from the boiler supplier. Equipment includes RTD assembly (P/N 1198-138) with panel-mounted controller Model M3-3000.

-G08xx: Assured Low-Fire Shut-Down. Ensures that the boiler is not taken off-line until a switch input signals that the linkage is in the low-fire position. One per boiler.

-G09xx: Auto Sequencing with Boiler Failure. Boiler fail relay input and limit-string failures cause the next lag boiler to replace the current lead or lag boiler. One per boiler. (Standard Feature.)

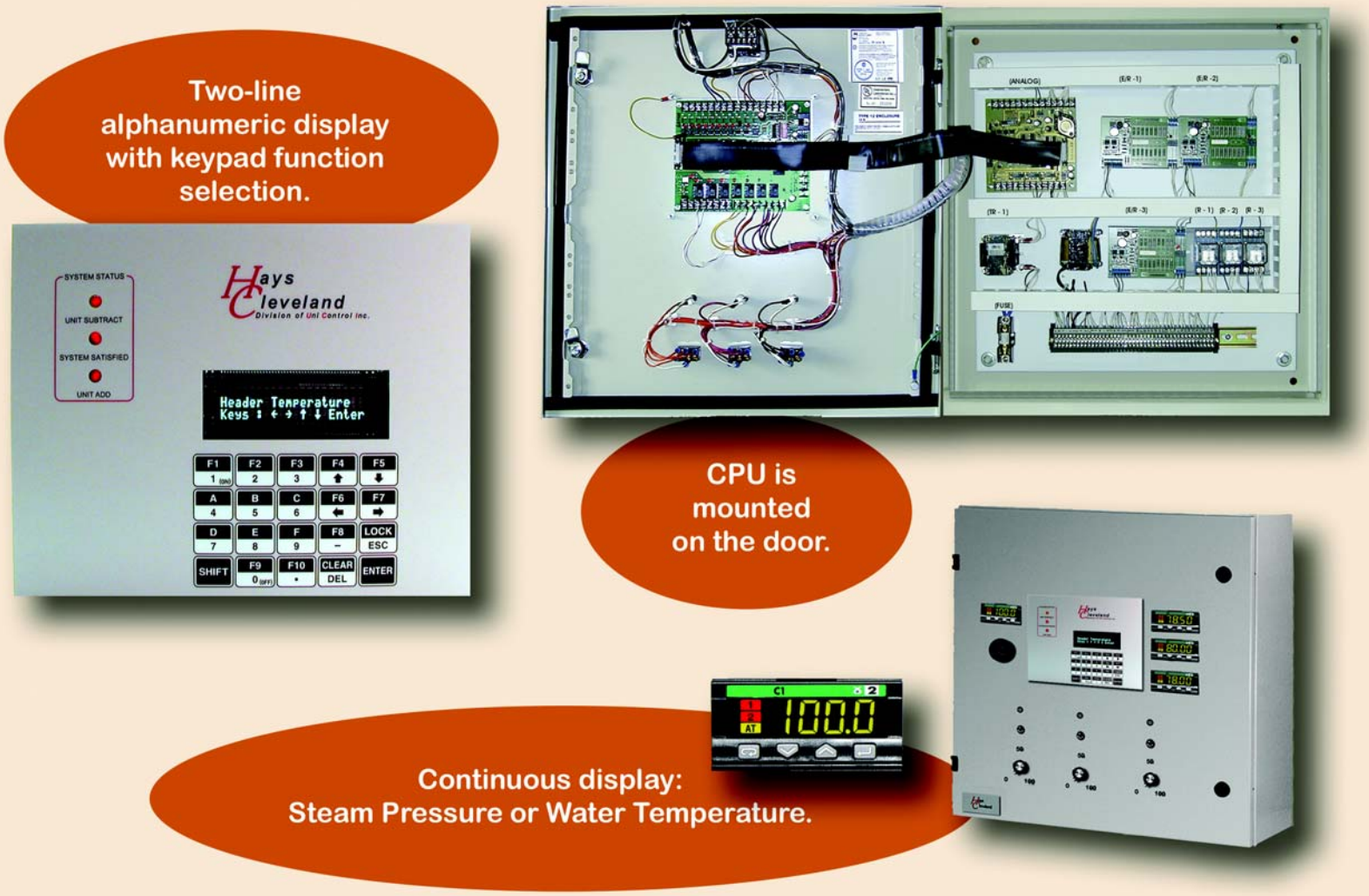
-G1000: Micro IV™ CPU Alarms. Adds cabinet-located horn and silence button to the standard processor alarm relay feature. One per system.

-G11xx: Make-Up Air Damper Control. Relay output to open boiler room air inlet damper(s). Proof-of-open input from the damper(s) is required before boilers are brought on-line. One or more of this option can be provided per facility. One per output.

-G12xx: Flue Gas Temperature Indication. Includes 12-inch RTD assembly for high temperature flue gas duct mounting and a cabinet-located indicating transmitter. One per boiler.

-G13xx: Flue Gas Temperature Indication. Includes 18-inch RTD assembly for high temperature flue gas duct mounting and a cabinet-located indicating transmitter. One per boiler.

-G14xx: Combustion Efficiency with Flue Gas Temperature Indication. Same as **-G12xx**, plus the Micro IV™ computes relative efficiency for display. Includes 12-inch RTD assembly. One per boiler.



-G15xx: Combustion Efficiency with Flue Gas Temperature Indication. Same as **-G13xx**, plus the Micro IV™ computes relative efficiency for display. One per boiler.

-G16xx: Water Return Temperature Indication. Includes RTD and SS thermowell with a 2.0 inch (U-dimension insertion) pipe and a cabinet-located indicating transmitter with 4–20 mADC output. One per system.

-G17xx: Water Return Temperature Indication. Same as **-G16xx** above, but with a 4.0-inch insertion RTD & thermowell. One per system.

-G18xx: Water Supply Temperature Indication. Same as **-G16xx** above, for 2.0-inch insertion, but for each boiler's outlet temperature. One per boiler.

-G19xx: Water Supply Temperature Indication. Same as **-G18xx** above, for 4.0-inch insertion, for each boiler's outlet temperature. One per boiler.

-G20xx: Boiler Pump ON with Time Delay OFF. Relay output to turn on boiler's circulation pump with it's boiler. Adjustable time delay OFF after boiler is taken off-line. One per pump.

-G21xx: Boiler Pump ON with Lead Pump Always ON. Sequences boiler pumps which are used as system circulation pumps. The lead-boiler's pump is always ON, with adjustable time delay OFF for lag boiler pumps. One per pump.

-G2200: Password Menu Protection. Prevents unauthorized keyboard entry. The keypad control display is blanked until the proper code is entered to gain access. One per system.

-G2300: Modbus Communications Port. Supplements RS-232/485 ports. Two-way communications from a SCADA system **(Standard Feature)**.

-G2400: Auxiliary Digital I/O Expansion Module: 8 inputs, 6 outputs. One or more will be included at order entry if needed to accommodate system I/O requirements.

-G2500: Second Auxiliary Digital I/O Expansion Module: 8 inputs, 6 outputs. One or more will be included at order entry if needed to accommodate system I/O requirements.

H. Hardware Options:

-H01xx: Manual Potentiometer (Fxx only). 135Ω firing rate pot enables the boiler firing rate to be adjusted when the MAN/OFF/AUTO switch is in the manual position. One per boiler.

-H02xx: Manual Potentiometer (Exx only). 4–20 mADC output enables boiler firing rate to be adjusted when the Manual/Off/Auto switch is in the manual position. One per boiler.

-H03xx: Firing Rate Indicator. Provides a front-panel digital display of boiler firing rate. One per boiler.

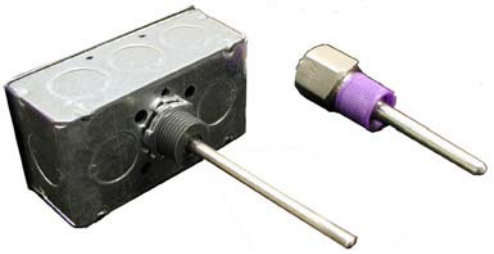
-H04xx: 135Ω Signal Isolators. Depending on the type of actuators or firing rate controls for interface with the **Micro IV™**, there may be a need to provide an isolated signal for each boiler with option **-Fxx**. One per boiler.

SPECIFICATIONS

Line Power: 117 vac, 50/60 Hz.
Ambient Temperature: 32 to 122 F, 0 to 50 C.
Cabinet Dimensions:
Per Model Suffix "A"
(as required for number of units and options):
24" x 24" x 8"
36" x 30" x 12"
48" x 36" x 12"
Cabinet Rating: NEMA 1, with door lock.
Cabinet Mounting:
Surface-mounted via lugs (included).
Process Display (C1): ½" high characters; displays process variable: Temperature (F) or Pressure (psig).
Processor-CPU Display:
2-line vacuum fluorescent display; alphanumeric with 20 characters per line;
system status LED indicators.
Processor Keypad: 20 keys (membrane).
Output Displays: RUN lamp, one per boiler.
Horn Output (optional: G1000):
2900 Hz, 68-80 dB.
Boiler Service Switch:
MANUAL/OFF/AUTO, one per boiler.
Processor-CPU:
Motorola 68HC11.
Memory Size:
22K RAM, 52K EPROM.
Memory Type/Retention:
CMOS RAM w/ battery.
Comm Ports: RS485 Modbus 9600 baud, and RS232 ASCI-II.
Inputs, digital (standard):
11; optically isolated.
Inputs, Analog (standard):
Eight; 0–5 VDC or 4–20 mADC into 250 Ω shunt.
Outputs, Digital (standard):
Seven; 10A@117 vac, noninductive, 10A@12 VDC.
Outputs, Analog (standard):
Two (up to Eight, opt), 135Ω or 4–20 mADC @24 VDC
Expansion Module (digital):
Eight DI, Six DO relays.
Approvals:
Dept. Environmental Protection, NYC DEP;
Underwriters Laboratory and CUL pending.
System Interface Requirements:

- Interface only with printed circuit board style firing rate actuators. Honeywell Series 90 electronic models or equivalent.
- Firing rate actuators must have low fire auxiliary switch available.
- 4 - 20 mADC input signals must be isolated.

STEAM PRESSURE SENSOR.



TYPICAL RTD SENSOR WITH WELL FOR WATER TEMPERATURE.

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