

AC³

MULTI-LOOP PROGRAMMABLE CONTROLLER

C-07000-AC STATION REPLACEMENT

STANDARD FEATURES

- Pre-programmed 4.3 inch TFT color LCD touch screen HMI with 16:9 ratio.
- Multiple bar graph, trend, & alphanumeric display panels.
- Process variables displayed in engineering units.
- Multiple alarm display panels.
- Multiple programmable loops.
- On-screen manual/auto station for each loop.
- 3 installation modes: compact, split, remote.
- Ethernet with Modbus TCP Server protocol.
- 8 analog inputs & 4 analog outputs.
- 8 digital inputs 8 digital outputs.
- Expansion unit for up to 16 additional digital inputs
- PID with auto tuning.
- Specific "function block" library dedicated to graphic pages.
- Set point programmer function blocks and data trending.
- External transmitter power supply available.
- Auto-tune, natural frequency type.
- Extensive computation ability, e.g., BTU meter.
- Boiler and combustion efficiency; mass flow computation & totalization possible.
- Password & access control.

AC³ MULTIPLE LOOP CONTROLLER

The AC³ Compact Multifunction Programmable Controller is a complete multi-loop control system suitable for new installations or replacement/upgrade of other multi-loop control technologies. Designed specifically to replace AC-Station controllers, it provides an economical alternative to any programmable logic controller and digital control system. It is a particularly valuable resource when older multiple loop microprocessor-based controllers must be maintained or replaced. Often, outright replacement with AC³ is less expensive than maintaining the out of date technology. In addition, AC³ provides superior control capability and greatly enhanced performance compared to older units.

AC³ has optional controller and interface features that enhance suitability to a wide variety of applications. Typical applications include industrial kilns, autoclaves, steam generators, cold storage rooms for produce, spray booths, climatic chambers, chillers, cooling towers, boiler control loops (such as oxygen trim, pump sequencing, drum level control, DA tank level control, etc.), economizer monitoring and control, BTU meters, boiler efficiency computers and general purpose process applications such as vulcanizers, plating tanks and oven zone control.



The platform is based on **programmable automation controller (PAC)** technology, which is known to provide the most responsive PID control possible. The programming software is OpenPCS, the user-friendly IEEE-61131 language suite.

Standard components include the CPU unit with 8 analog inputs or 6 analog inputs and 2 universal inputs (see Nomenclature), 4 analog outputs, 8 digital inputs and 8 digital outputs; Operator Panel with 4.3 inch TFT touch screen and cable to connect the CPU to the HMI. Available options include CPU expansion modules that increase the number of inputs and outputs, Operator Panel features such as mounting plates and different lengths of connecting cable to allow for flexible mounting options (see below), enhanced communications options (see below) and power supplies. Please consult Hays Cleveland Sales Dept. for quotation of competitively priced custom-engineered applications and software.

AC³ Mounting Options: For convenience, AC³ can be installed one of three different ways:

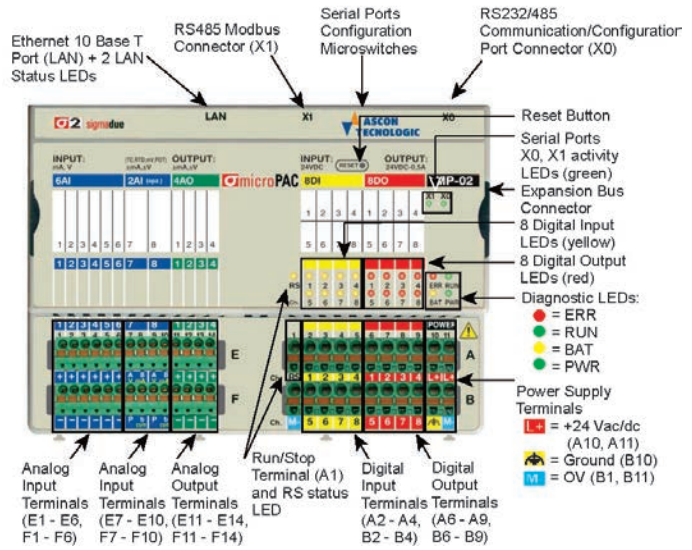
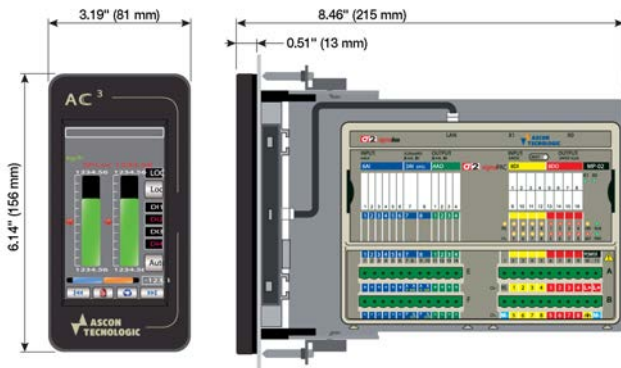
- Compact panel face installation: entire unit is inserted into front panel cutout for 72 x 144 mm process controller such as AC-Station.
- Split architecture panel mounting: display is mounted on panel front while other components are rail-mounted inside the panel.
- Remote surface mounting: the display panel is mounted far away from the CPU and relies on Ethernet communication with it.



Integrated I/Os

The AC3 MP-02 system base unit has up to 28 I/O ports:

- 6AI** 6 analog inputs configurable for mA or V;
- 2 AI** 2 optional universal or high level isolated analog inputs configurable for:
 - Thermocouples (L, J, T, K, S, R, B, N, E, W3, W5);
 - RTD (PT100, PT1000);
 - ±mA, ±V linear inputs;
 - Potentiometers.
- 4 AO** 4 optional high level analog outputs;
- RS** RUNSTOP program functionality;
- 8 DI** General purpose digital inputs;
- 8 DO** Isolated general purpose digital outputs.



Dimensions

Specifications

Operator Panel

Display Characteristics

LCD type: TFT display
Screen Dimension: 4.3"
Screen Format: 16/9
Touch Screen: Resistive
Resolution: 480 x 272
Number of Colors: 262K
Back Light: LED

Storage Characteristics

RAM: 128 mb
Flash: 128 mb (Operating system + Program + 16 mb user space)
Memory Card: MicroSD (max. capacity 8 GB) (future)
USB: 2.0 full speed (max. distance <3m.) (future)

Communication Characteristics

Ethernet: 10/100mb/s (max. distance <3m.)
RS485: Not available

Electrical Characteristics

Power Supply: 24 V AC/DC $\pm 10\%$
Current Consumption: 300 mA @ 24 V dc
Internal Fuse: Not available

Mechanical Characteristics

Dimensions (H x L x W), inches (mm):
3.27" (83) x 6.26" (159) x 1.10" (28)
Cutout, inches (mm): 2.68" (68) x 5.43" (138) (with front panel mounting adapter) 2.68" (68) x 5.00" (127) (panel only)
Shipping Weight (without other components): <.5 lbs (200 g)

Environmental Characteristics

Operating temperature range: 32 °F to 131 °F (0 °C to 55 °C)
Storage temperature range: -4 °F to 140 °F (-20 °C to 60 °C)
Relative Humidity: 0-85%, non-condensing
Protection Degree: Front Panel: IP65, Rear side: IP20
CE standards: EN61151-3, 61000-3-3: 1995+A1:2001+A2:2005

MP-02 CPU

CPU Specifications

Processor: 32-bit ARM
Program memory: 2 mb flash
Dynamic memory: 16 mb RAM
Retentive memory: 64 kB redundant (32 kB + 32 kB)
Memory data retention: 10 years (with replaceable battery)
Real time clock: Available
Timer resolution: 1 ms maximum
Computing speed: 70 mips
Minimum cycle time: ≥ 5 ms (typical 10 ms)
Minimum response time: Inputs Acquisition + cycles execution time
Communications port: Ethernet 10 mb base T
Communications ports: 1RS232/485 selectable
Front LEDs: For digital I/Os, communication ports and CPU diagnostic

General and Environmental Specifications

Power supply voltage: 24 Vdc (-15 - +25%)
Power consumption: 10 W (+5 W with both expansions)
Reverse polarity protection: Standard
Isolation class: II (50 Vrms), EN61010-1
Vibration resistance: 10 - 57 Hz., 0.0375 mm, 47 - 150 Hz, 0.5 g (3 axis)
Shock resistance: 15 g
Operating temperature: 0 °C- 55 °C (32 °F- 131 °F ; humidity: 5 - 95%)
Storage temperature: -40 °C- 70 °C (-40 °F- 158 °F)
Protection: IP20

High Level Analog Inputs

6 configurable: 0- 10 V, 0/1 - 5 V, 0 - 1 V - 0/4 - 20 mA
2 optional configurable: ± 10 V, ± 5 V, ± 1 V, 0/4 - 20 mA
Acquisition time: Standard inputs: 179 ms, optional inputs: 40 ms
Resolution: 16 bit
Accuracy: 0.1%
Input impedance: >100 k Ω (V); 300 Ω (mA)

Universal Analog Inputs

2 optional configurable: ± 50 mV, ± 100 mV, ± 300 mV, ± 1.25 V high impedance, TX (L, J, T, K, S, R, B, N, E, W3, W5), Pt100 (3-wire), Pt1000 and potentiometer (0.1 - 10 k Ω)
Acquisition time: 60 ms
Resolution: 16 bit
Accuracy: 0.1%
Input impedance: 10 M Ω (V)
Cold junction compensation isolation: ≤ 1 °C/20 °C ambient temperature
800 V between power supply and logics Vpp between the two channels (differential inputs)

Analog Outputs

0/2/4 optional configurable: ± 10 V (± 25 mA maximum), 0/4 - 20 mA
Update time: 35 ms
Resolution: 13 bit
Accuracy: 0.1%
Output impedance: 4-20 mA into 0-250 Ω , non-isolated

Digital Inputs

8 - 40 with expansions: 24 V dc (On: 5 - 30 V, Off: 0-3 V)
Maximum input frequency: 80 Hz.
Type: Sink
Protection: Reverse polarity and overvoltage
Compliance: IEC/EN 61131-2 (type 2)

Digital Outputs

8 - 40 with expansions: 24 V dc, 0.5 A
Type: Source (PNP)
Protection: overvoltage and short circuit

Installation Kit (hardware for front panel installation)

Includes:

- Front panel adapter
- 2 Allen screws to install the P04 touch screen display in the front panel adapter
- Mounting plate with DIN rail for installation of the MP-02 CPU
- 4 conical head Allen screws to assemble the mounting plate to the front panel adapter
- 2 clamps to affix the structure to the front panel

Mechanical Characteristics

Dimensions (H x L x W): 6.14" x 3.19" x 8.46"
(156 mm x 81 mm x 215 mm)
Cutout: 2.68" x 5.43" (68 mm x 138 mm)
(P04 with front panel mounting adapter)

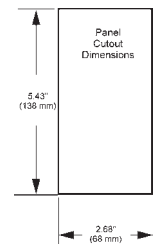
Weight: varies with options.

Terminal Specifications

Flexible cable section:
0.00031 in²-0.0039 in² (0.2 mm²- 2.5 mm²) (AWG24 - AWG12);
0.00012 in²-0.0023 in² (0.08 mm²- 1.5 mm²) (AWG28 - AWG16)

Stripped wire:

Screw: 0.28"(7 mm); Spring 0.39" (10 mm)
Screw: 0.28"(7 mm); Spring 0.39" (10 mm)
Flat blade screwdriver: 0.02" x 0.14" (0.6 x 3.5 mm);
0.02" x 0.1" (0.4 x 2.5 mm)
Tightening torque: 0.37 ft lbs - 0.44 ft lbs (0.5 - 0.6 Nm);
0.30 - 0.37 ft lbs (0.4 - 0.5 Nm)



OTHER PAC TECHNOLOGIES FROM HAYS CLEVELAND

- **UPAC™ Plant Wide System** is a powerful solution for a wide range of industrial applications. Capabilities include full metering control, parallel positioning, O₂ trim, feed water control, draft control, DA and condensate tank control, and plant master functions with nearly unlimited analog and digital I/O. Request Bulletin **LT-UPAC-xx**.

- **AC-PAC™ Programmable Automation Controller** is a low-cost solution for projects ranging from complete new systems to individual controller replacements. When older multiple loop controllers must be maintained or replaced, outright replacement with AC-PAC™ is often less expensive than maintaining the out of date technology. Applications include chillers, cooling towers, standard boiler control loops, economizers, BTU meters, boiler efficiency computers, vulcanizers, plating tanks, and autoclaves. Request Bulletin **LT-AC-PAC-xx**.

- **UPAC LT™ Prepackaged Combustion Control System** combines the power of the AC-PAC™ and the HMI of the UPAC™ to provide a system that is pre-programmed for the industrial or institutional boiler combustion control application. Control loops include boiler master selection, parallel positioning with fuel (two fuels), air, O₂ trim and VFD with optional feed water control. Request Bulletin **LT-UPAC-xx**.



UPAC™ Plant Wide System



AC-PAC™ Programmable
Automation Controller



UPAC LT™ Prepackaged
Combustion Control System



Nomenclature

AC3 Multi-Loop Controller

C-07015-00-Axx-Bxx-Cxxxx-Dxx-Exx-Fxxxx

A CPU Selection for Analog Inputs

A01 CPU with (8) analog inputs (V dc or mA dc), (4) analog outputs (V dc, mA dc), (8) digital inputs (V dc), (8) digital outputs (V DC).

A02 CPU with (6) analog inputs (V dc or mA dc), (2) universal inputs (mV dc, T/C, or RTD temperature sensors), (4) analog outputs (V dc, mA dc), (8) digital inputs (V dc), (8) digital inputs and (8) digital outputs (V DC).

A03 Custom CPU selection.

B Application Options

B00 Without expansion module.

B01 Expansion Module for CPU with (8) Digital Inputs (V dc) and (8) Digital Outputs (V dc).

B02 Expansion Module for CPU with (8) Digital Inputs (V dc) and (8) Relay Outputs (NO 2A, 120/240 V ac).

B03 Expansion Module for CPU with (16) Digital Inputs (V dc) and (16) Digital Outputs (V dc).

B04 Expansion Module for CPU with (8) Digital Inputs (120 V ac) and (8) Relay Outputs (NO 2A, 120/240 V ac).

C Operator Panel

C0100 Operator Panel with LCD touch screen 4-loop display. 4.3" HMI, 480 x 272 pixel resolution, NEMA4/IP65 front panel mounting. With auxiliary USB port for uploading strategies to the display & LAN port connection to the CPU. Includes AC Station cutout adaptor mounting bracket on panel front: 6.260" H x 3.268" W overall. Requires LAN cable to CPU.

C0101 Operator Panel for remote mounting from CPU, with 1m long interconnecting LAN cable.

C0102 Operator Panel for remote mounting from CPU, with 2m long interconnecting LAN cable.

C0103 Operator Panel for remote mounting from CPU, with 3m long interconnecting LAN cable.

C0201 Operator Panel as described for -C0100 with added short plate to mount the CPU (-Axx selection) to the back of the Operator Panel. Includes a short LAN cable between the CPU & Operator Panel.

D Communications

Note: Modbus access is through a TCP IP gateway. One per cabinet required (for 1 to 16 AC3 units). BacNet and LonWorks modules connect to the gateway. The LAN uses other ports not available to general use.

D00 Standard Modbus TCP. FJ45 LAN port can be accessed when a network switch (P/N 42107) and Ethernet jumper cables are added, and is also used when the following optional gateways are selected.

D03 Modbus TCP to Modbus RTU gateway communications. PN 899, B&B MESR901 with switch (P/N 42107), Ethernet jumpers and engineering configuration.

D04 Modbus TCP to BACnet IP gateway communications. PN 42090, BB2-7010 with switch (P/N 42107), Ethernet jumpers and engineering configuration.

D05 Modbus TCP to BACnet MS/TP gateway communications. PN 899, BB2-3060 with switch (P/N 42107), Ethernet jumpers and engineering configuration.

D06 Modbus TCP to LonWorks TP/FP10 gateway communications. PN 899, BB2-6020-MB with switch (P/N 42107), Ethernet jumpers and engineering configuration.

E Power Supply

E00 Without 24 V dc power supply; 24 V dc power by others.

E01 Power Supply, 24 V dc 60W (2.5A) output power for CPU, Operator Panel, with optional expansion module & communications gateway. 100/240 V ac line power. DIN rail mounting and loop power.

F Engineering & Software

F0000 Without Engineering & Software.

Fxxxx Control programming is available for control strategies with one, two, three or four loops (maximum). Typical applications include pressure control (steam, water, draft), boiler water level control (one, two and three element), tank level (makeup and emergency fill). Includes input/output channel designation lists. Consult applications engineering for fuel-air control and for systems requiring UL approval.

F9999 OPEN PCS Programming software for system integrators to use to develop custom system designs.

- PN 42030, OPEN PCS Software

- PN 42031, ASCON Function block libraries, including AC3 functionality.