

- StepFire™ control made easy
- Simple to install and operate
- No programming
- Proven StepFire™ technology
- Superior temperature uniformity
- High turndown capability
- Sixteen burners and 2 zones of control per controller
- Two modes of control
- MODBUS option provides SCADA/OIT connectivity



Now you can realize the production, quality, and cost savings benefits of StepFire with the EasyStep Controller. Each controller directs the firing of a multi-burner furnace according to input demand requirements from a personal computer (PC), single-loop temperature controller, or programmable logic controller (PLC). It uses the well-proven StepFire technology that North American has implemented in numerous metals and ceramic applications. By embedding this solid strategy in a dedicated microprocessor, the configuration of the application becomes straightforward, and the start-up, fast. The 8377A is completely transparent with respect to the operator's view of the process control. Features include two distinct modes of operation, special actions for purge, low fire, and hold conditions and alarming.

EasyStep provides flexibility in several ways.

- It can be operated in either of two modes. In Mode 1, it serves as a smart actuator, driving the valves connected to it. A 4-20 mA signal from a PLC or external discrete controller sends its output signal to the 8377A. The unit responds by sequencing the burners to achieve the heat input required for the process. In Mode 2, the EasyStep Controller performs as both a PID control and a heat input actuator. When running under this protocol, the 8377A receives its setup parameters and setpoints via communication link from another computing device, such as a PC, SCADA, or OIT, and the controller does the rest.
- Second, the 8377A can serve one or two zones. It can operate a total of up to 16 burners or air cycling valves in one zone, or it can drive two zones independently of each other. In the two-zone configuration as many as 14 or as few as two burners can be driven in one zone while the remainder can be served by the second zone.
- Third, the operating parameters are easily set in the instrument. In Mode 1, switches dial in the few essential settings needed to operate the EasyStep Controller. In Mode 2, all configuration and operational changes (setpoint, manual, auto, output while in manual) are done through the EIA-485 communications interface (MODBUS or DDE).

Alarming takes place in both modes. A digital output reports any of a number of conditions seen by the microprocessor or occurring within the microprocessor itself. When in Mode 2, details of an alarm can be acquired by query from the host.

In tune with North American's long-standing practice, special actions of *Purge*, *Hold*, and *Low Fire* that pertain to the combustion process are initiated by an external contact input signal.

StepFire™ Background

StepFire operates in a high-fire low-fire manner. StepFire calls for the alternate firing of each burner in a zone for the period of time needed to meet the heat demand. In the case of a 2-burner system operating under a 32-second base rotation time at 50% demand, one burner is at high fire for 16 seconds, while the other is at low fire. After 16 seconds, the first burner switches to low, the second burner, to high. If the demand is 75%, the first burner goes high at the beginning of the time interval, and the second burner goes high 8 seconds after the first. The first shuts down at the 24-second point, and the second shuts down at 32 seconds (the end of the base period). Should there be more burners in a zone, other burners are raised to high fire for their 75% time intervals in equal increments within the base rotation period.

Controller Operation

Each 8377A EasyStep™ Controller has the capacity to control a single zone of up to 16 burners or two zones that are divided up in any fashion, one zone having a minimum of 2 burners.

Three special function AC inputs per zone, *Purge*, *Low Fire*, and *Hold*, are available on the 8377A. *Purge* causes a full ON condition to all burners (on-time = 100%) for maximum air flow. Gas is off at the safety shutoff valves during this evolution.

Low Fire forces all burners in the zone to go to low fire and remain there until the command is released (on-time = 0). If both *Purge* and *Low Fire* are selected, then *Purge* has precedence.

Hold causes the EasyStep Controller to continue stepping the burners at the rate just prior to *Hold* being invoked. It also causes the unit to ignore any changes in the heat demand signal, whether it be generated within the device (Mode 2) or received as a 4-20 mA input (Mode 1). This action is useful in keeping the control from upsetting the firing whenever the door to the furnace or kiln is opened. *Hold* has the lowest precedence, beneath *Purge* and *Low Fire*.

The 8377A is packaged two ways: 1) in a fiberglass NEMA 4X enclosure with a Lexan window for installation on the plant floor, or 2) in an attractive enclosure with a smoked plastic cover for mounting inside a control cabinet or in some other protected area.

Modes of Control

Mode 1

In Mode 1, the EasyStep Controller receives one or two 4-20 mA signals that represent heat demand. Usually, this signal originates at a single loop controller. The EasyStep Controller responds with the appropriate firing rate to achieve that thermal input. This signal may also come from a PC or a PLC with PID action.

The controller is configured by switches on the main board that control the number of zones, burners per zone, and minimum and maximum rotation times. This makes the setup very simple. The firing order of the burners within a zone is changed by moving an air valve solenoid connection from one terminal to another.

Mode 2

There are two options available for control of the 8377A in Mode 2. Either a Windows 9X/NT/XP utility program (Calibration and Configuration Tool, NetTool) can be used, or the 8377A can be provided with a standard MOD-BUS interface for communications with an OIT or SCADA system. Either configuration provides a means to configure the 8377A, change setpoints, and view real-time operation. **The external interface does not control the process.**

Under this discipline, the controller accepts a thermocouple input, and executes its own internal PID control loop for each zone. It receives the setpoint over the communication link instead of a demand signal by a 4-20 mA input. The host dynamically adjusts setpoints in the 8377A to accommodate product or process changes in periodic or tunnel kilns or other furnaces on a zone-by-zone basis.

Configuration information is downloaded from the host at startup into non-volatile memory. All parameters, from the number of zones to be controlled by a particular controller to thermocouple type, are part of this data.

In Mode 2 operation, tuning each PID controller is handled via the link to the host.

Of special significance, the EasyStep Controller continues to perform in the event of a loss of communication with the host. Each controller handles its respective zone at the last setpoint transmitted to it, thus maintaining a stable operation under conditions that could otherwise result in a serious process upset.

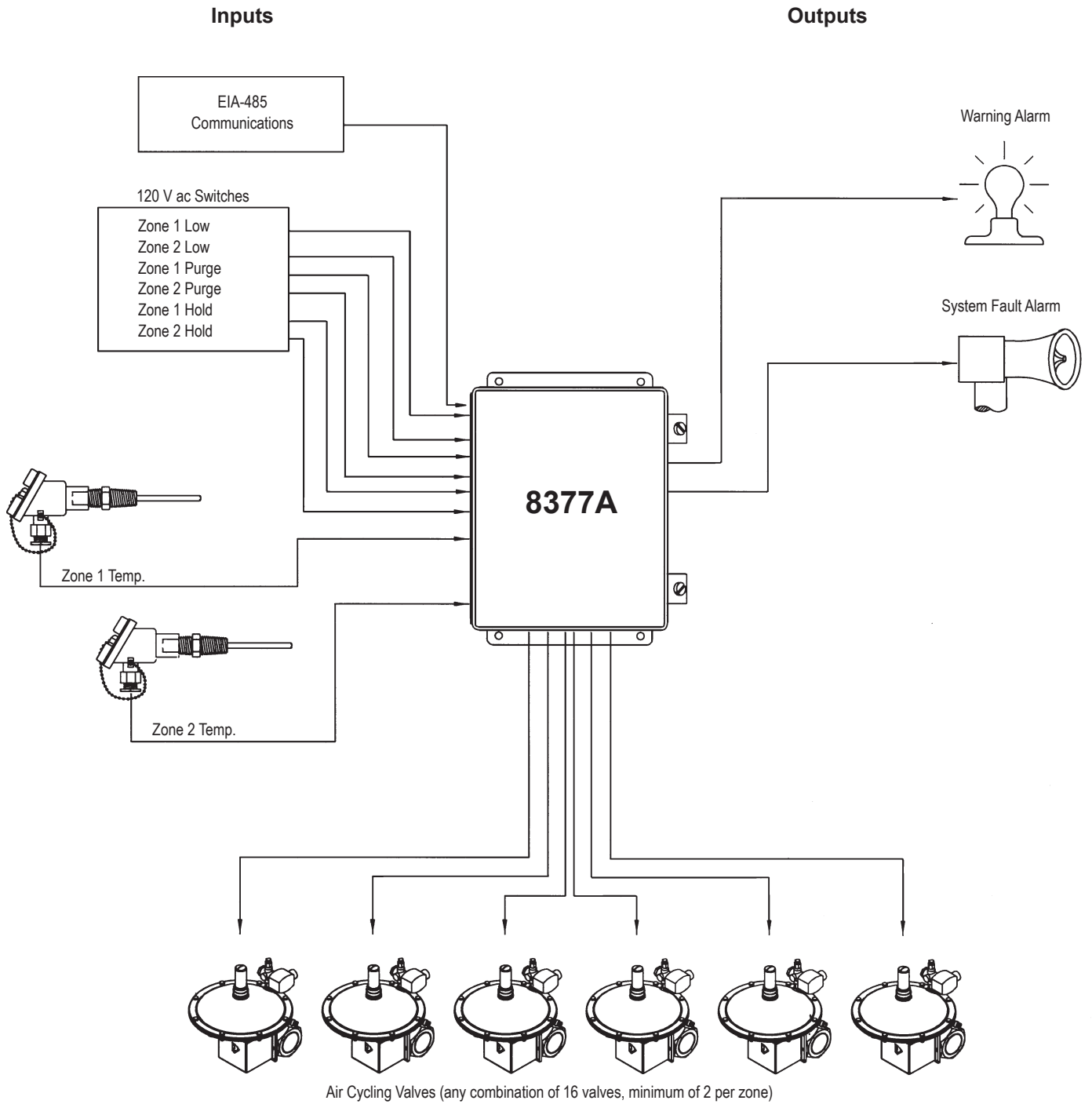
Alarms

The EasyStep Controller has two types of alarms: *System Fault*, which is fatal, and *Warning*, non-fatal. A *System Fault* results from any of several checksum errors, power supply failure, low power line, or watchdog timer trip. Each type alarm trips its own respective relay. Consideration should be given to putting the relay contact associated with *System Fault* into the flame supervision circuit.

A *Warning* alarm results from devices external to, but associated with, the operation of the controller. An example of this type alarm is a thermocouple input of Mode 2 that fails open or a 4-20 mA demand signal of Mode 1 that goes out of range.

Alarms are handled similarly no matter which mode is in use. LED's within the unit indicate alarm status. Additionally, in Mode 2 alone, a *Warning* alarm can be read by the host.

MODE 2 TYPICAL 8377A SYSTEM (2 ZONES)



SPECIFICATIONS

GENERAL

- **Operating Temperature:** 0 to 130 F (-17 to 55 C).
- **Power Source:** 120 V ac 50-60 Hz.
- **Fuse:** 0.25 A.
- **Housing:** (16"H × 14"W × 8"D). Fiberglass NEMA 4X enclosure with Lexan window for field mounting or 16³/₄"L × 14³/₄"W × 4¹/₄"H case for installation inside a panel. Order with -P for panel mount.
- **Modes of Operation:** Mode 1 – Firing rate follows a 4-20 mA heat demand signal.
Mode 2 – Internal temperature controller determines firing rate in response to setpoint transmitted via communication link.

INPUTS

Analog

- **4-20 mA (2):** Mode 1 inputs, one 4-20 mA input for each zone, 10 bit resolution. In Mode 2 these are read only, not associated with any control.
- **Thermocouple (2):** Mode 2 inputs, one isolated thermocouple input for each zone, linearized and temperature compensated. J, K, N, R, and S type thermocouples accepted. Thermocouples have upscale break.

AC digital inputs (8):

- Function select (6): *Purge*, *Low Fire*, and *Hold*, each with one discrete input per zone.
- General purpose (2): sense only in Mode 2, not associated with any control.

OUTPUTS

Analog

- **4-20 mA (2 outputs):** One 4-20 mA current sourcing output for each zone, 500 ohm load maximum, 10 bit resolution.

Discrete

- **Burner Control AC (16):** 120 V ac, 1 A using solid state relays. 16 outputs for burner control, L1 common for all AC outputs.
- **General purpose AC (2):** 120 V ac, 1 A using solid state relays, L1 common for all AC outputs.
- **System Fault Alarm:** 120 V ac, 1 A maximum. One electro-mechanical form C relay contact for fatal (system fault) alarms.
- **Non-fatal Alarm:** One contact, 120 V ac, 1 A using solid state relay.
- **Status Indicators:** (8) LEDs.
- **Communications:** One serial port for network communication, selectable baud rate (9600, 19,200), EIA-485 compliant. Communication protocol may be NAM-485 or MODBUS.

SOFTWARE/COMMUNICATIONS OPTIONS

- **Windows 9X, NT, and XP Compatible Utility:** Sets up and modifies configuration parameters and calibration, sends operational commands, and receives process variables in real time. Order with -DDE option.
- **Dynamic Link Library (DLL) and DDE Server:** Establishes compatibility with all other Windows 9X, NT, and XP programs that adhere to the DDE specifications and connect to DDE client applications. Order with -DDE option.
- **Standard MODBUS** protocol allows communications with any MODBUS master device. Order with -MODBUS option.

ORDERING OPTIONS

8377A-DDE	NEMA 4X with DDE
8377A-MODBUS	NEMA 4X with MODBUS
8377A-P-DDE	Panel mount with DDE
8377A-P-MODBUS	Panel mount with MODBUS

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