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Application

SLATE™ brings configurable safety and programmable logic together into one single platform. The platform can easily be customized for almost any requirement or application—offering virtually limitless development opportunities with far less complexity.

The R8001C6001 Fuel Air Ratio module uses the latest technology to control up to 4 SLATE actuators and/or 2 Variable Frequency Drives. The Fuel Air Ratio Control module controls the relationship between fuel, airflow and flue gas recirculation on a power burner.

Features

Within the SLATE system, the fuel air ratio module provides:

- Air-fuel ratio control for up to 4 actuators
- Drive 2 Variable Frequency Drives (VFDs)
- RS-485 Modbus communications to communicate to the actuators and receive feedback
- SLATE actuator torque sizes:
 - 50 in/lb (NEMA 1 and NEMA 4)
 - 150 in/lb (NEMA 1 and NEMA 4)
 - 300 in/lb (NEMA 4)
 - 900 in/lb (NEMA 4)
- Up to 24 points
- Field configurable
- Automated actuator endpoint seeking process
- UL Recognized and NFPA acceptable
- Password protected
- Fault information
- Status of four actuator channels
- Unused VFD terminals (Analog Cells) available for general purpose I/O configuration
- Flue Gas Recirculation (FGR)
- Trim
- Dual Fuel

Safety Features

- Class C operating software system
- Fail-safe feedback
- Curve verification algorithms
- Password protected
- Built in self test
- No slope constraints that would limit the steepness of the curve
- Component anti-swap protection
- Off curve checking algorithm

Specifications

Electrical Ratings

Voltage and Frequency: See Tables 1–5.

Environmental Ratings:

Ambient Temperature:

Operating: -20°F to +150°F (-29°C to +66°C).

Shipping: -40°F to +150°F (-40°C to +66°C).

Humidity: 95% continuous, noncondensing.

Vibration: 0.5G environment

Dimensions: See Fig. 1.

Weight: 2 lb 1 oz (0.94 Kg)

Approvals

Underwriters Laboratories Inc. Listed, File: MP268

Factory Mutual

IRI Acceptable

Federal Communications Commission: Part 15, Class A

Must be mounted inside a grounded metal enclosure.

Mounting: DIN Rail (See Fig. 2)

Required Components

R8001A1001 SLATE Base Module

R8001S9001 Sub-Base Module

R8001B2001 SLATE Burner Control Module

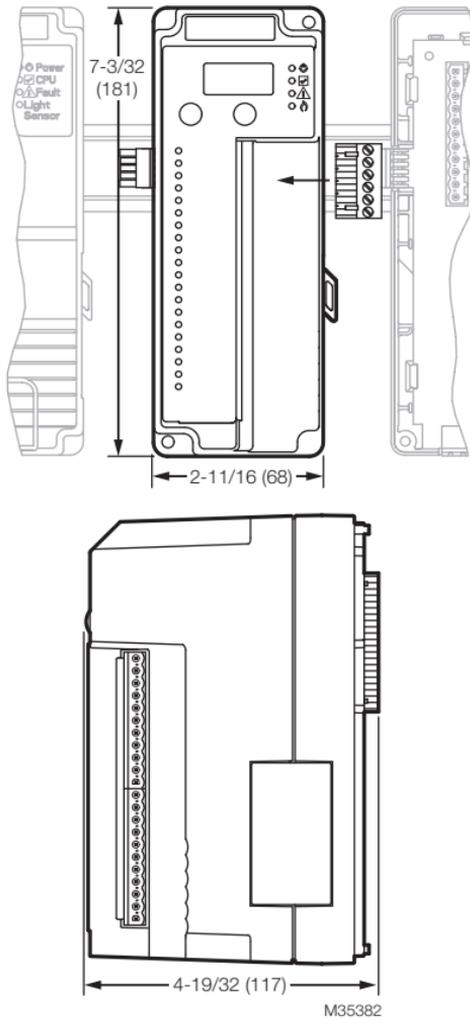


Fig. 1. Dimensions in in. (mm).

Principal Technical Features

The R8001C6001 fuel air ratio module monitors and controls the air-fuel ratio for combustion applications.

LED Array

There are three LEDs on the front of the Fuel Air Ratio module that provide quick identification of the system status and any problems that might occur. The status is broadcast to other modules on the platform bus in case they are affected by the inoperable modules. See Table 1 for descriptions.

LED	Color	Description
 Power	No light	System does not have power
	Green	System has power
 CPU	Red	No Wiresheet (SLATE) loaded
	Green	Running
 Fault	Red	Fault
	No light	No fault

Table 1. LED Descriptions.

LED Display

The SLATE system modules have three-character LED displays used for indicating the module number of the SLATE system. They also have three-position LED colors to indicate terminal states as shown in Table 2.

Color	Description
Green	Terminal is on or normal
Red	Fault
No light	Off, not in use, or in power-saving mode

Table 2. Terminal LED Meanings.

Select and Reset Buttons

The SLATE system modules have Select and Reset buttons located on the front of the module and beneath the segment display. The Reset button is used to clear a lockout and reset the module. The Select button is used to scroll through the segment display information.

Installation



WARNING

Fire or Explosion Hazard

Can cause severe injury, death, or property damage.

Verification of safety requirements must be performed each time a control is installed on a burner to prevent possible hazardous burner operation.

When Installing This Product

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. After installation is complete, check out the product operation as provided in these instructions.
4. The SLATE module must be mounted in an electrical enclosure with adequate clearance for servicing, installation and removal of modules.

Wiring

WARNING

Electrical Shock Hazard.

Can cause severe injury, death or equipment damage.

1. Disconnect the power supply before beginning installation to prevent electrical shock and equipment damage. More than one power supply disconnect can be involved.

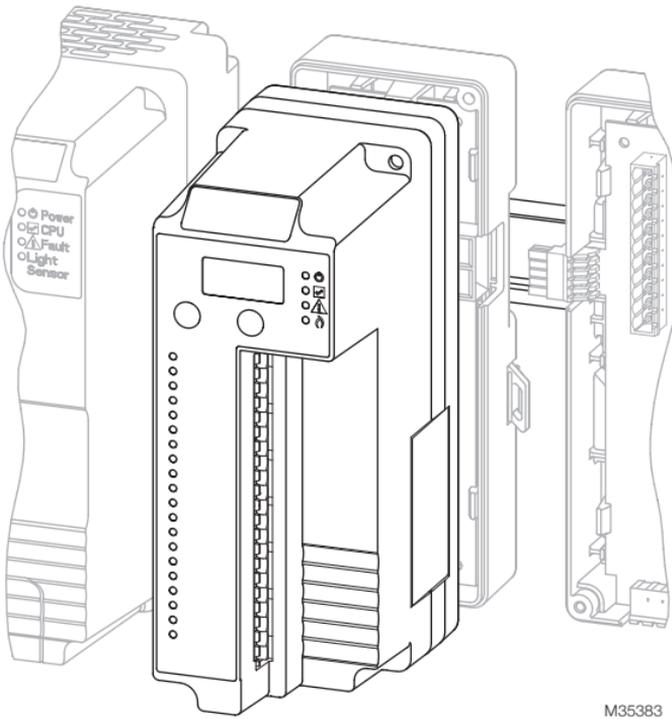


Fig. 2. Installing the Fuel Air Ratio Module on the Sub-Base Module.

2. Wiring must comply with all applicable codes, ordinances and regulations.
3. Wiring must comply with NEC Class 1 (Line Voltage) wiring.

IMPORTANT

1. *This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with these instructions, may cause interference for radio communications. It has been tested and found to comply with the limits of a Class A computing device of part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference; in which case, the user, at their own expense, may be required to take whatever measures are required to correct this interference.*
2. *This digital apparatus does not exceed the Class A limits for radio noise, set out in the Radio Interference Regulations of the Canadian Department of Communications.*
3. *Cable shield must be terminated to ground at both ends. If shielded cable is NOT used, use three-wire twisted cable.*

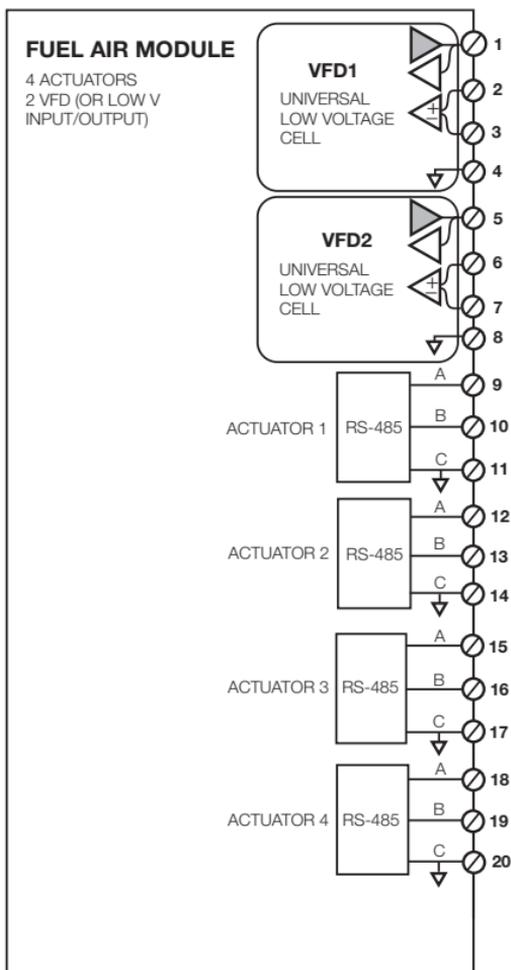


WARNING

Fire or Explosion Hazard

Can cause severe injury, death, or property damage.

Disconnect the power supply from the main disconnect before beginning installation to prevent electrical shock and equipment damage. More than one disconnect can be required.



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Fig. 3. Wiring diagram for Fuel Air Ratio Module.

Terminal	Description	Rating
1	VFD1 - Cell A (TF1)	See Tables 2-5 for configuration options
2	VFD1 - Cell A (TF2)	See Tables 2-5 for configuration options

Terminal	Description	Rating
3	VFD1 - Cell A (TF3)	See Tables 2-5 for configuration options
4	VFD1 - Cell A (TF4)	See Tables 2-5 for configuration options
5	VFD2 - Cell B (TF1)	See Tables 2-5 for configuration options
6	VFD2 - Cell B (TF2)	See Tables 2-5 for configuration options
7	VFD2 - Cell B (TF3)	See Tables 2-5 for configuration options
8	VFD2 - Cell B (TF4)	See Tables 2-5 for configuration options
9	A1 - A (RS485)	---
10	A1 - B (RS485)	---
11	A1 - C (GND)	---
12	A2 - A (RS485)	---
13	A2 - B (RS485)	---
14	A2 - C (GND)	---
15	A3 - A (RS485)	---
16	A3 - B (RS485)	---
17	A3 - C (GND)	---
18	A4 - A (RS485)	---
19	A4 - B (RS485)	---
20	A4 - C (GND)	---
21	Unused	---
22	Unused	---

Table 3. Terminal Ratings.

Terminal Functions			Min	Typical	Max	Units		
TF1	Voltage	In	Range	0.0	-	15.0	VDC	
			Resolution	-	2.43	-	mV DC	
			Null	-25.0	-	25.0	mV DC	
			Accuracy	-25.0	-	25.0	mV DC	Whichever is greater
			-1.0	-	1.0	%		
		Out	Range	0.0	-	15.0	VDC	
			Resolution	-	4.0	-	mV DC	
			Null	100.0	-	100.0	mV DC	
	Accuracy		-50.0	-	50.0	mV DC	Whichever is greater	
		-1.5	-	1.5	%			
	Current	In	Range	0.0	-	25.0	mA DC	a
			Resolution	-	7.4	-	µA DC	
			Null	-0.5	-	0.5	mA DC	
			Accuracy	-1.5	-	1.5	%	0 to 25 mA
Out ^b		Range	0.0	-	25.0	mA DC	Max Load = 500 Ω	
		Resolution	-	4.0	-	mA Ω		
		Null	-0.5	-	0.5	mA DC		
		Accuracy	-300.0	-	300.0	µA DC	0 to 25 mA	
	-50	-	50	µA DC	4 to 20 mA			
TF2	Voltage	In	Amplitude	0.0	-	15.0	VDC	
			Trip Point	-	3.0	-	VDC	Comparator Only
			Hysteresis	-	0.25	-	VDC	
			Resolution	-	0.37	-	mV DC	
			Null	-25.0	-	25.0	mV DC	
			Accuracy	-25.0	-	25.0	mV DC	
TF3	Voltage	In	Range	0.0	-	15.0	VDC	
			Resolution	-	0.37	-	mV DC	
			Null	-25.0	-	25.0	mV DC	
			Accuracy	-25.0	-	25.0	mV DC	
	Current	In	Range	0.2	-	25.0	mA DC	
			Resolution	-	3.7	-	µA DC	
			Null	-0.5	-	0.5	mA DC	
Accuracy	-1.5	-	1.5	%	0 to 25 mA			

^a TF1 input terminal is held at constant 2.5VDC over allowable current range.

^b Accuracy specification given is for 100 Ω load. Resolution specification can be converted to mA by dividing out load.

Table 4. Specifications for Basic Cell Functions.

Specifications based on worst case over ambient temperatures.

	Complex Functions	Min	Typical	Max	Units		
Thermocouple							
TF2 & TF3	Type J	Range	-200.0		1025.0	°C	
		Resolution	-	0.1	-	°C	
		Accuracy	-5.0	-	5.0	°C	
	Type K	Range	-150.0	-	1000.0	°C	
		Resolution	-	0.1	-	°C	
		Accuracy	-5.0	-	5.0	°C	
RTD							
TF3 & TF4	Type PT100 ^a	Range	-135.0	-	250.0	°C	3 wire, 100 Ω
		Resolution	-	0.5	-	°C	
		Accuracy	-2.0	-	2.0	°C	
	Type PT1000	Range	-135.0	-	250.0	°C	3 wire, 1000 Ω
		Resolution		0.5		°C	
		Accuracy	-2.0	-	2.0	°C	
NTC							
TF3 & TF4	Type 10K	Range	-40.0 ^b	-	175.0	°C	T4 rated to 0 °C
		Resolution	-	0.1	-	°C	
		Accuracy ^c	-2.0	-	2.0	°C	-40 °C to 25 °C
			-1.0	-	1.0	°C	25 °C to 125 °C
			-1.5	-	1.5	%	
			-3.0	-	3.0	°C	125 °C to 175 °C

^a Shielded cable required for reliable operation in noisy environment.

^b NTC on terminal TF4 is rated down to 0 °C.

^c Temperatures refer to sense range.

Table 5. Specifications Cell Complex Functions.

	Frequency / PWM Functions	Min	Typical	Max	Units		
PWM Out							
TF1	Amplitude	5.0	-	10.0	VDC	Low output state = 0V	
	Frequency	100.0	-	1000.0	Hz		
	Duty Cycle	2.0	-	98.0	%DC	Allowable output %DC	
	Resolution	-	1.0	-	%		
	Accuracy	-0.5	-	0.5	%DC	10V amplitude	
Frequency In							
TF2	Amplitude	5.0	10.0	15.0	VDC		
	Range	2.0	-	1000.0	Hz		
	Min. "on" pulse width (low %DC)	-	50.0	-	usec	10V amplitude	
	Min. "off" pulse width (high %DC)	-	130.0	-	usec	10V amplitude	
	Duty Cycle	2 – 100 Hz	2.0	-	98.0	%DC	10V amplitude
		1000 Hz	5.0	-	85.0	%DC	10V amplitude
	Resolution	-	1.0	-	Hz		
	Accuracy		-5.0	-	0.0	%	Whichever is greater
		-1.0	-	0.0	Hz		
PWM In							
TF2	Amplitude	5.0	10.0	15.0	VDC		
	Frequency	125.0	-	500.0	Hz		
	Min. "on" pulse width (low %DC)	-	50.0	-	usec	10V amplitude	
	Min. "off" pulse width (high %DC)	-	130.0	-	usec	10V amplitude	
	Duty Cycle	125 – 500 Hz	5.0	-	90.0	%DC	10V amplitude
	Resolution		-	1.0	%DC		
	Accuracy	125 Hz	-1.5	-	1.5	%DC	10V amplitude
500 Hz		-7.5	-	7.5	%DC	10V amplitude	

Table 6. Specifications for Cell Frequency Functions.

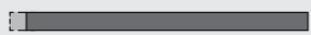
Configuration	Min	Optimum Range for Performance	Max	
Thermocouple	J	-50°C		1025°C ± 4 °C
	K	-50°C		1000°C ± 4 °C
RTD	-135°C		250°C	± 2 °C
NTC	25°C		125°C	± 1°C
Current Out	4 mA		20 mA	± .05 mA
Voltage: In / Out	2 V		10 V	0.3 %, typical

Table 7. Suggested Sensor Selection Based on Application.

Application	Recommended Wire Size	Recommended Part Numbers
Communication Lines	22 AWG two-wire twisted pair with ground, or five-wire.	Belden 8723 shielded cable or equivalent.
Other terminals	18 AWG wire insulated for voltages and temperatures for given application.	TTW60C, THW75C, THHN90C

Table 8. Recommended Wire Sizes and Part Numbers.

Recommended Grounding Practices

Use an Earth ground or a signal ground as described below.

Earth ground (Base, Rectification Flame Amp Module, other modules optional)

1. Use to provide a connection between the base and the control panel of the equipment. Earth ground must be capable of conducting enough current to blow the breaker in the event of an internal short circuit.
2. Use wide straps or brackets to provide minimum length, maximum surface area ground conductors. If a leadwire is required, use 14 AWG copper wire.
3. Make sure that mechanically tightened joints along the ground

path are free of nonconductive coatings and protected against corrosion on mating surfaces.

Signal ground

Note the 18V system ground is not electrically connected to earth ground. Follow local codes and appliance recommendations to determine if this should be connected to earth ground.

Recommended wire routing of leadwires

Do not run high voltage ignition transformer wires in the same conduit with the flame detector or data lines.

Be sure loads do not exceed the terminal ratings. Refer to the labels or terminal ratings in Table 3.

The SLATE system must be mounted in an electrical enclosure. When mounting in an electrical enclosure, provide adequate clearance for servicing, installation and removal of SLATE modules.

Maximum wire length:

- The maximum leadwire length is 300 feet to terminal inputs (Control, Running/Lockout Interlock)
- For Remote Bus data lines, maximum cable length depends on the number of modules connected, the noise conditions and the cable used. The maximum of all interconnecting wires is 4000 feet.



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For more information and detailed instructions on the R8001C6001 and the entire SLATE system please refer to the SLATE User Guide located on our website at <http://combustion.honeywell.com/SLATE>

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