

Eclipse Combustion Universal Digital Controller

DC 2000 Series

The Eclipse Combustion DC 2000 Digital Controller is a low cost microprocessor-based digital controller. It can be used to control variables such as temperature, pressure, flow level and rotation in applications such as environmental chambers, plastic processing machines, furnaces and ovens, and packaging machinery.

The DC 2000 is a low cost alternative to more expensive controller without compromising quality or performance. It can be used to control variables such as temperature, pressure, flow, level and rotation. A limit control model is also available.

The controller has a high degree of functionality. A dedicated configuration display provides multi-language prompts providing unmatched operating simplicity. Programmed sequences of display assure quick and accurate entry of all configurable parameters. Simple key-strokes let you change the operating parameters to meet your process control needs.

Features

- **Easy Configuration**—A bright dedicated configuration display provides straightforward multi-language prompts that allow easy setup with minimum time and effort.
- **Configurable PV or SP Display**—The controller can be user-configured to provide normal display of Process Variable or Setpoint.
- **Universal Inputs**—Accepts 10 thermocouple types, RTD's, Radiamatic RH, mA, mV or voltage inputs through simple configuration.
- **Thermocouple Failsafe**—Configurable upscale or downscale burnout or failsafe output level.
- **Decimal Point Location**—Configurable for none, one or two places.
- **Moisture Resistant Front Panel**—Capable of meeting NEMA 3 and IEC IP65 (i.e. hosedown) requirements.
- **UL Recognized Component**—A standard feature for all models except limit controllers.
- **Dual Setpoints**—Simple push-button selection allows quick switchover from primary to alternate setpoint with minimal operator confusion.
- **Diagnostic/Failsafe Outputs**—Continuous diagnostic routines detect failure modes, trigger a failsafe output value and identify the failure to minimize troubleshooting time.
- **Highly Secure**—Non-volatile memory assures data integrity during loss of power. Keyboard security prevents accidental or unauthorized changes to the process.
- **High Noise Immunity**—The DC 2000 is designed for reliable, error-free performance in industrial environments that often affect highly noise-sensitive digital equipment.
- **Limit Control**—Provides a latching relay which is activated whenever the PV goes above (high limit) or below (low limit) a preset setpoint value. An alarm message will be displayed when the output is activated. Reset is through a key on the front of the controller or an optional external switch. Normal display can be configured to indicate process variable or setpoint.
- **Quality/Support**—The DC 2000 is covered by a two year warranty.



Operator Interface (Figure 1)

- **Status Indicators**—They provide the status of the alarm and control relays. There is also indication to show the temperature units and whether Remote setpoint or Local setpoint 2 is active.
- **Displays**—A four-digit, nine segment upper display is dedicated to the process variable or setpoint during normal operation, with alternate information displayed during configuration. Key selected parameters such as Setpoint 1, Setpoint 2, Process Variable, Deviation and Output are also shown, on demand, in the upper display. A normally blank six-digit, 14 segment lower display can be configured to indicate PV or SP for the normal display. It also provides guidance through prompts for the operator during configuration.

Optional Features

- **Second Input**—Isolated high level input available for remote setpoint signal or PV signal via digital inputs.
- **Auxiliary Output**—This auxiliary Process Variable output can be scaled from 1 to 5 volt or 0 to 5 volt for 0 to 100% for any range desired.
- **Remote Mode Switching**—Allows remote switch selection of:
 - local setpoint from remote setpoint
 - local setpoint 2 from local setpoint 1
 - reset of limit controller hold on SP Ramp or SP Program
 - disable keyboard

- **Alarm Selection**—None, one or two relays to activate external equipment when preset high/low setpoints are reached. There is an indicator for each alarm on the operator interface (only one alarm is available for Duplex or 3 Position Step operation).
- **Auto Tune**—When enabled, this feature will automatically calculate and enter into memory, the optimum tuning parameters required for your process. A “Short Tune” feature lets you obtain approximate tuning constants.
- **Single Setpoint Ramp/Soak Programming**—Enables you to program a single setpoint Ramp, or program and run 6 Ramp and 6 Soak segments for setpoint programming. Run or Hold of program is keyboard or remote switch selectable.
- **Solid State External Control Relay Output**—Optional output rated at 2 amps at 120/240V or 10 amps at 120/240V (minimum load 0.1 amp).

Inputs

The analog inputs are sampled three times a second. The sampled signal is amplified and then converted to a digital signal which is passed to the microprocessor. The primary output can be one of various Thermocouple, RTD, Radiamatic or Linear actuations (see Table 1 on page 6). Any range can be field selected via internal switch positions and keyboard selections. A second input provides a remote setpoint function and accepts a 4-20 mA or a 1-5 Vdc linear signal. Cold junction compensation is provided. You can select upscale or downscale sensor break protection. A configurable digital filter of 0-120 seconds provides input signal smoothing.

Figure 1—Operator Interface

There are four possible letters which can show, all located in the same vicinity:

- F = Degrees Fahrenheit being used
- C = Degrees Centigrade being used
- R = Remote or Local SP2 setpoint active
- L = Local setpoint active

- ALM = Alarm conditions exist
- OUT = Control relay on

The numbers 1 or 2 may appear after the above abbreviations, signalling which control relay is on or where alarm conditions exist.



KEY FUNCTIONS

The first five keys below enable complete configuration and operation of the controller.

- FUNCTION** = Selects function within each configurable group.
- DISPLAY** = Returns controller to PV display from Set Up mode.
- RESET** = For restoring original value or selection when in Set Up mode, or for resetting the latching limit controller relay.
- SET UP** = Scrolls through the configuration groups.
- AUTOTUNE** = Autotune key.
 - Δ = Increases the configuration values or changes functions in Set Up groups.
 - ▽ = Decreases the configuration values or changes functions in Set Up groups.
- RUN/HOLD** = Run/Hold key.

Output Types

The following output types are available per the model selection guide:

- Electromechanical relays
- Open collector output
- Current output
- Solid state relay

Output Algorithms

- **Time Proportional Duplex**—Provides On-Off or Time Proportional (Relay) Output. Relay output is standard; 2 amp or 10 amp external solid state output is optional.
- **Current Proportional**—Supplies proportional direct current output for final control elements which require a 4-20 mA signal.
- **Time Proportional Duplex (Heat/Cool)**—Depending on which control algorithm you select, this duplex output algorithm can provide On-Off Duplex, Time Proportional Duplex or 3 Position Step Control. The Time Proportional Duplex output provides independent PID tuning constants and two time proportional outputs: one for heat zone above the 50% output and one for cool zone below 50% output.

Control Algorithms

Depending on the output algorithm specified, the controller can be configured for the following control algorithms:

- **On-Off**—Whenever the controlled variable deviates a predetermined amount from the setpoint, the controller moves the final control element to either of two extreme positions.
- **PID-A**—the controller gives full response to Setpoint and Process Variable (PV) changes due to Gain (proportional), Reset (integral) and Rate (derivative) effects. There is a fixed relationship between the value of the controlled variable and the position of the final control element. The adjustable Gain, Rate and Reset Time tuning constants let you tailor the controller's response to your process requirements.
- **PD with Manual Reset**—The action is similar to the PID-A algorithm except the reset (Integral) value is entered as Manual Reset Tuning Constant instead of Reset Time. The manual reset value eliminates offset by shifting the PD calculated output upscale or downscale to return the controller variable to the setpoint.
- **Three Position Step Control**—This is an extension of the On/Off Duplex control and includes internal feedback of the state of the relays. The effect of this control action is that the On and Off times of the output relay change in proportion to the error signal and the Gain and Reset time settings. The Deadband and Hysteresis are adjustable in the same manner as the duplex output algorithm.

Configuration

You decide how the controller is to interact with the process by selecting the functions you want through simple key-strokes. Internal programs prompt the operator through the configuration process in plain English, assuring quick and accurate entry of all configurable parameters.

Control Modes

The controller can operate in one of two modes:

- **Local Automatic**—The controller can operate from one or two local setpoints that can be selected and changed via the keyboard or optional external Contact Input.
- **Remote Automatic**—The controller operates from the setpoint measured at the second input. This setpoint can have ratio and bias applied. Selection between local and remote setpoint is via the keyboard or optional Remote Mode Switching.

Alarms

Alarm output terminals are located at the rear terminal panel. One or two alarm relays are available to activate external equipment when preset alarm setpoints are reached. Each of the two alarms can be set to monitor two independent setpoints. Each alarm setpoint can be either a high or low alarm. The alarm type can be selected to be either the Process Variable, Deviation, or Setpoint Programming events.

Diagnostics

The controllers have built-in diagnostic tests to ensure reliable operation. Every time power is applied, the microprocessor initiates tests that check the integrity of the information held in various memory location, and light all the display segments for a status check. These tests also can be operator initiated through the operator interface. The controller continually checks that the inputs are being sampled, the stored constants are secure, and the measured inputs fall within the established range limits. Test failures are identified by various error indications so the source of the trouble can be easily identified.

Calibration

The DC 2000 is factory calibrated for all ranges listed in Table 1 on page 6. When desired, you can perform a field calibration by accessing the required calibration group via the SET Up key. To calibrate, you need only to enter the calibration mode, apply the reference signal and press the CAL key. The calibration is automatically established by the microprocessor, eliminating the need for any mechanical adjustment.

Specifications

Design	
Accuracy	±0.3% of span typical (± 1 digit for display) 14 bit resolution typical
Temperature Stability	±0.8% for 50°F (28°C) change
Input Signal Failure Protection	<i>Thermocouple Inputs:</i> Upscale or downscale burnout <i>Burnout Current:</i> 0.2 microamps <i>Failsafe Output Level:</i> Configurable 0-100%
Input Impedance	<i>4-20 Milliampere Input:</i> 250 Ohms <i>All Voltage Inputs:</i> 200K Ohms <i>Thermocouples:</i> 10 Megohms <i>Resistance Temperature Detector:</i> 10K Ohms
Stray Rejection	<i>Common Mode:</i> AC (50 or 60 Hz): 120db (with maximum source impedance of 100 Ohms) or ± 1 LSB (least significant bit) whichever is greater. <i>Normal Mode</i> AC (50 or 60 Hz): 60 db (with 100% span peak-to-peak maximum)
Controller Output Types	<p>Current Output Range can be set between 4 to 20 mA, and as direct or reverse action. Minimum output level is 3.2 mA dc. <i>Resolution:</i> 11 bits for 4 to 20 mA <i>Accuracy:</i> 0.5% full scale <i>Temperature Stability:</i> 0.03% / °C <i>Load Resistance:</i> 0 to 750 ohms (ungrounded)</p> <p>Electromechanical Relay SPST contacts. Normally Open or Normally Closed, selectable by jumper. Internally socketed (Control Output #1) <i>Resistive Load:</i> 5 amps @ 120 Vac, 240 Vac or 30 Vdc <i>Inductive Load:</i> 50 VA @ 120 Vac, or 240 Vac <i>Motor:</i> 1/6 H.P.</p> <p>Solid State Relay SPST solid state contact consisting of a triac N.O. output. Internally socketed <i>Resistive Load:</i> 1.0 amp @ 25 °C and 120 or 240 Vac 0.5 amp @ 55 °C and 120 or 240 Vac <i>Inductive Load:</i> 50 VA @ 120 Vac or 240 Vac</p> <p>Open Collector Outputs <i>Maximum Sink Current:</i> 20 mA <i>Overload Protection:</i> 100 mA Internally powered @ 34 Vdc Opto-isolated from all other circuits but not from each other. Socketed jumper assembly replaces relay.</p> <p>Solid State Relays (2 amps or 10 amps) Externally mounted triac N.O. output for use with open collector output.</p> <p><i>2 amp Relay</i> <i>Resistive Load:</i> 3 amps @ 25 °C and 120 or 240 Vac 2 amps @ 55 °C and 120 or 240 Vac</p> <p><i>10 amp relay</i> <i>Resistive Load:</i> 15 amps @ 25 °C and 120 or 240 Vac 10 amps @ 55 °C and 120 or 240 Vac <i>Inductive Load:</i> 50 VA @ 120 Vac or 240 Vac <i>Motor Rating:</i> 1 HP @ 25 °C or 0.75 HP @ 55 °C</p>
Alarm Output (Optional)	<p>One SPST electromechanical relay. Normally Open or Normally Closed contact is selectable by jumper.</p> <p>A second alarm is available except with Time Proportional Relay Duplex, Three Position Step and Limit Control Models. Alarm 2 can start the optional timer.</p> <p>Up to four setpoints are independently set as high or low alarm, two for each relay. Setpoint can be either Process Variable, Deviation, or Setpoint Programming Events. Timer Output: Alarm 1.</p> <p><i>Alarm Relay Contacts</i> <i>Resistive Load:</i> 5 ampere at 120 Vac, 240 Vac or 30 Vdc <i>Hysteresis:</i> Adjustable: 0 to 100% of (PV) Input Span</p>

Specifications (continued)

Design (continued)

<p>Controller Output Algorithms</p>	<p>On-Off or Time Proportional One SPST relay or open collector output. Action can be set for direct or reverse.</p> <p>On-Off Duplex, Three Position Step Control, or Time Proportional Duplex Two SPST relays. Control action can be set for direct or reverse.</p> <p>Current Proportional 4 to 20 mA dc maximum into a load of 0 to 750 ohms. Output range can be set direct or reverse action.</p> <p>Limit Control One SPST electromechanical latching relay. Control relay action Normally Open. (Normally Closed contact selectable by jumper.)</p>
<p>Auxiliary PV Output (Optional)*</p>	<p>The Process Variable Output can be scaled for any PV range from 0 to 5 Volts for 0 to 100%, with an overrange capability of 5.25 Volts at 105% output. The scale selection is configured through the operator interface.</p> <p><i>Voltage:</i> 1 to 5 Volts (can be field calibrated to 0 to 5 Volts) <i>Minimum Impedance:</i> 2500 Ohms <i>Resolution:</i> 12 bits over 0 to 5.25 Volts <i>Accuracy:</i> 0.4% Full Scale at 2500 Ohm load <i>Temperature Stability:</i> 0.06% / °C</p>
<p>Digital Input (Optional)*</p>	<p>+20 Vdc source for external dry contact or isolated solid state contact. Contact closure selects one of the following actions:</p> <ul style="list-style-type: none"> • Local setpoint 1 from Remote setpoint • Local setpoint 2 from Local setpoint 1 • Reset of Limit Controller • To Hold from Run (SP Ramp or SP Programming) • Disabled Keyboard • To Run - contact closure starts Setpoint Program or Single SP Ramp. Re-opening contact returns to Hold.
<p>Setpoint Ramp/Soak Programming (Optional)</p>	<p>Lets you configure 6 ramp and 6 soak segments to be stored for use as one program or several small programs. You designate beginning and end segments to determine where the program is to start and stop allowing several small programs. Each ramp segment can be configured to be run in Hours and Minutes or degrees per minute. Soak segments can have a guaranteed soak deviation which guarantees the time for each soak and will not start until the PV is reached.</p>
<p>Sampling Rate</p>	<p>Inputs sampled 3 times per second</p>
<p>Input Filter</p>	<p><i>Software:</i> Single pole lowpass section with selectable time constants, off to 120 seconds for each input.</p>
<p>Digital Displays</p>	<p>Vacuum fluorescent, 9 segment and 14 segment, alphanumeric. A four digit display dedicated to the process variable, setpoints, deviation or output depending upon the model number. Alternate information displayed during configuration mode. A six character display primarily provides guidance during controller configuration.</p>
<p>Status Indicators</p>	<p>Alarm Relay Status (ALM 1 or 2) Temperature Units (F or C) Remote Setpoint or Local Setpoint 2 Active (R) Control Relay Status (OUT 1 or 2)</p>
<p>Dimensions</p>	<p>See Figure 3.</p>
<p>Mounting</p>	<p>Panel-mounted, 4.2 inch depth</p>
<p>Wiring Connections</p>	<p>Screw terminals on the rear of the case (6-32)</p>
<p>Power Consumption</p>	<p>6 VA</p>
<p>Weight</p>	<p>1 kg (2.2 lbs.)</p>

* Auxiliary Output and Digital Input are mutually exclusive.

Specifications (continued)

Environmental and Operating Conditions				
Parameter	Reference	Rated	Operative Limits	Transportation and storage
Ambient Temperature	22 ± 3°C 72 ± 5°F	15 to 55°C 58 to 131°F	0 to 55°C 32 to 131°F	-40 to 66°C -40 to 151°F
Relative Humidity	10 to 55*	10 to 90*	5 to 90*	5 to 95*
Vibration				
Frequency (Hz)	0	0 to 70	0 to 200	0 to 200
Acceleration (g)	0	0.1	0.5	0.5
Mechanical Shock				
Acceleration (g)	0	1	5	20
Duration (ms)	0	30	30	30
Voltage (Vac)	120 ± 1 240 ± 2	102 to 132 204 to 264	102 to 132 204 to 264	-- --
Frequency (Hz)	50 ± 0.2 60 ± 0.2	49 to 51 59 to 61	48 to 52 58 to 62	-- --

* The maximum rating only applies up to 40°C (104°F). For higher temperatures, the RH specification is derated to maintain constant moisture content.

Table 1–Input Actuators

PV Input	Range	
	°F	°C
Thermocouples		
B	150 to 3300	66 to 1815
E	-100 to 1832	-73 to 1000
E (low)	-100 to 1100	-73 to 593
J	0 to 1600	-18 to 871
J (low)	0 to 900	-18 to 482
K	0 to 2400	-18 to 1316
K (low)	-20 to 1000	-29 to 538
Nicrosil Nisil	0 to 2372	-17.8 to 1300
NiNiMoly (N)	32 to 2500	0 to 1371
R	0 to 3100	-18 to 1704
S	0 to 3100	-18 to 1704
T	-300 to 700	-184 to 371
T (low)	-80 to 500	-63 to 260
W5W26	0 to 4200	-18 to 2316
RTD (IEC)		
100 Ohm Pt.	-300 to 900	-184 to 482
100 Ohm Pt. (low)	0 to 300	-18 to 149
Radiamatic RH	1400 to 3400	760 to 1871
Linear		<i>Linear Ranges not available on Limit Control Models</i>
Milliamps dc	4 to 20	
Millivolts dc	0 to 10	
	0 to 100	
Volts dc	0 to 1	
	0 to 5	
	1 to 5	
	0 to 10	

General Reference Data

Static Charge	<i>Susceptibility:</i> The exposed panel surface is capable of withstanding a discharge through 100 ohms from a 250 pf capacitor charged to 10 KV with no component failures and 8 KV with no incorrect outputs.
Radio Frequency Interference (RFI)	<i>Susceptibility:</i> The UDC2000 Universal Digital Controller is capable of withstanding an EMI field generated from a 5 watt transmitter operating at 151.685 and 450 MHz. and held at a distance of 1 meter from the instrument, with no malperformance.
Line Noise Effects	<i>Surge:</i> The power line terminals are capable of withstanding the IEEE Std. 473 Surge Withstanding Capability (SWC) test with no component failures, no reset and no incorrect output to 2.5 Kilovolts. The analog terminals are capable of withstanding the IEEE Surge Withstanding Capability (SWC) test in common mode with no component failures, no reset and no incorrect outputs to 1.0 Kilovolts.
Isolation	There is no isolation between inputs and outputs. The line power input and relay contact outputs can withstand a HIPOT potential of 1000Vac for one minute or 1200Vac for one second between each other and from the terminals to the case.

Figure 2–Model Selection Guide

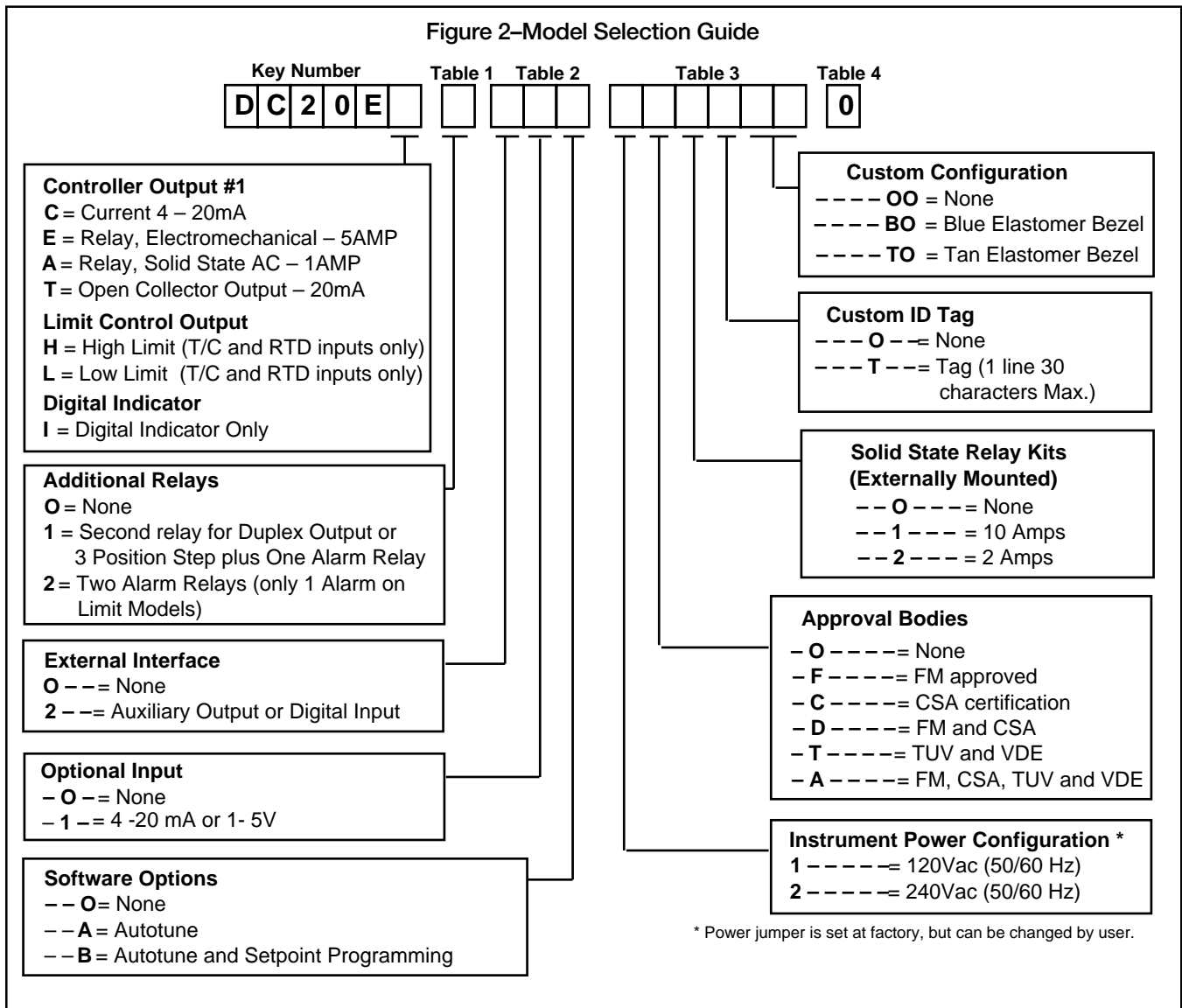
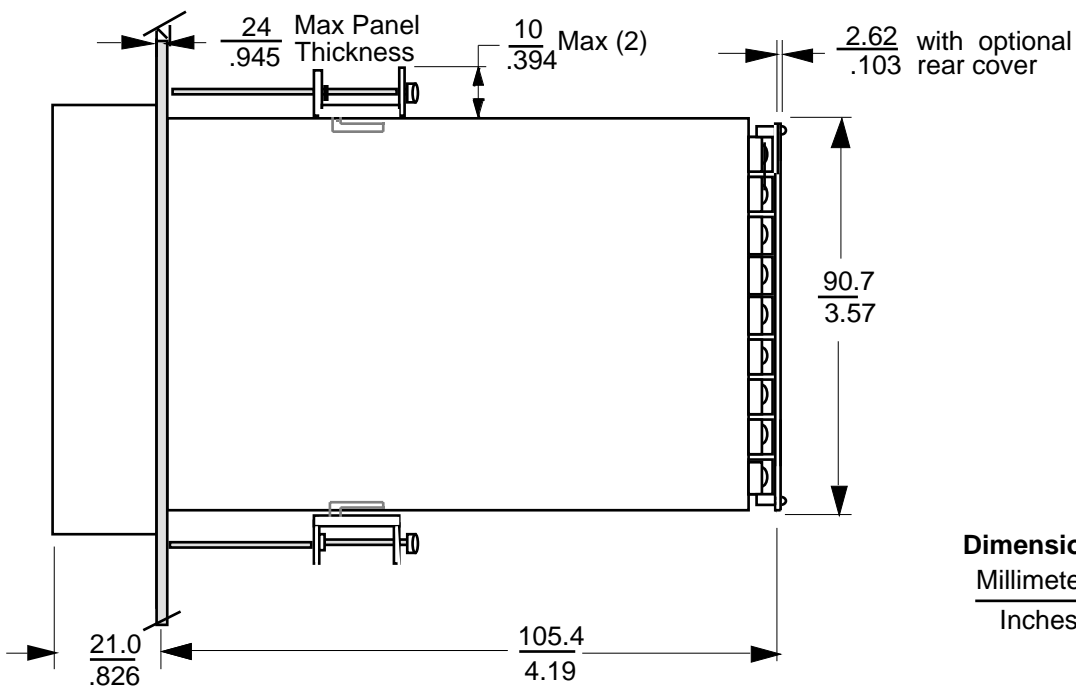
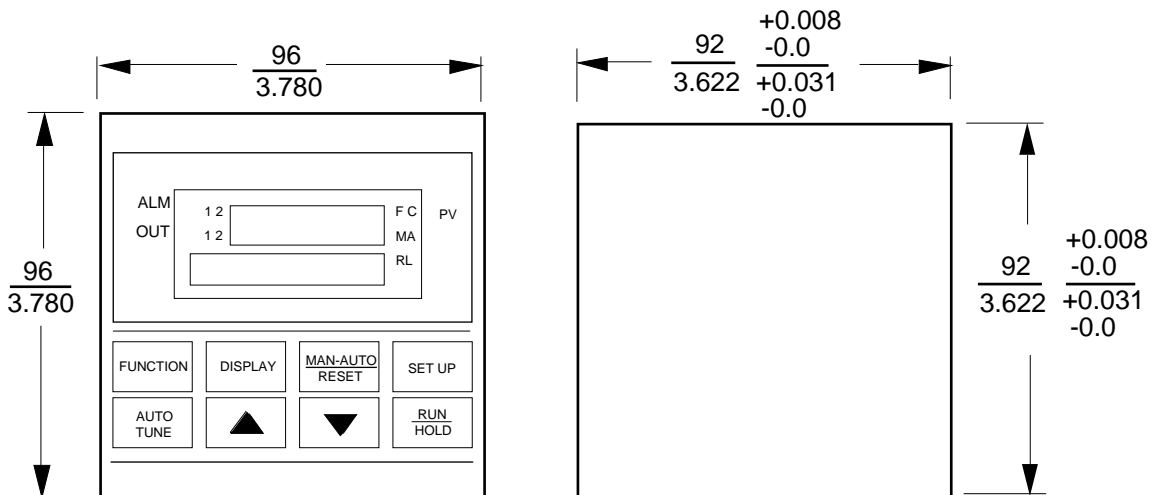


Figure 3-Dimensions (Not to Scale)



Dimensions:
Millimeters
Inches



Eclipse Combustion

ISO 9001 Registered



Offered By:

Power Equipment Company
2011 Williamsburg Road
Richmond, Virginia 23231
Phone (804) 236-3800
Fax (804) 236-3882

www.peconet.com