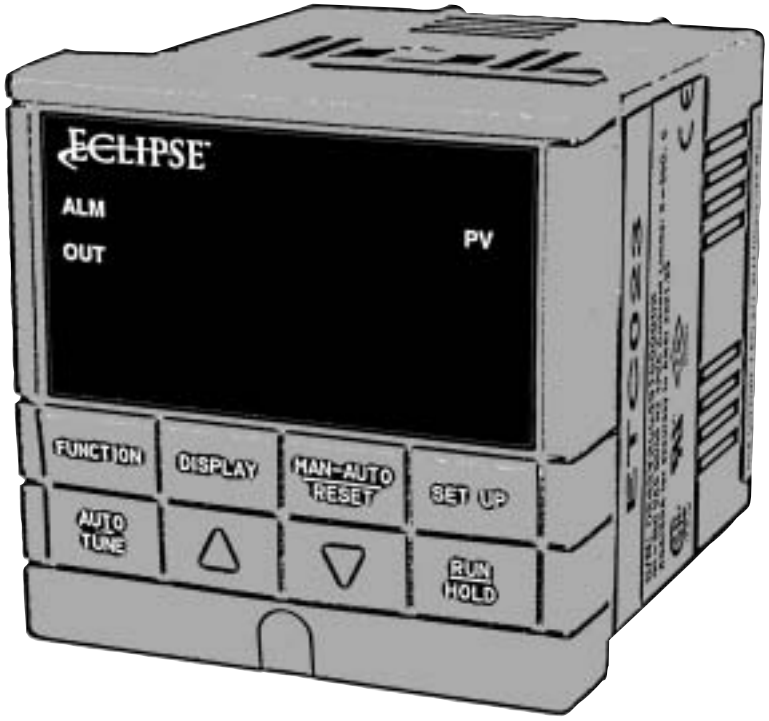
Instruction Manual
No. 909 8/02

Eclipse Combustion

Universal Temperature Controller

Model ETC023



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Innovative Thermal Solutions

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About this manual

AUDIENCE

This manual has been written for the people who select and install the product and the technicians who work on it. They are expected to have previous experience with this kind of equipment.

SCOPE

This manual contains essential information for the proper installation and operation of the Eclipse Universal Temperature Controller.

Following the instructions in this manual should assure trouble free installation and operation. Read this manual carefully. Make sure that you understand its structure and contents. Obey all the safety instructions.

Do not deviate from any instructions or applications limits in the manual without written consent from Eclipse Combustions.

If you do not understand any part of the information in this manual, do not continue. Contact your Eclipse sales office or Eclipse Combustion, Rockford, Illinois.

If you need help, you can contact your local Eclipse Combustion sales office.

HOW TO GET HELP

Power Equipment Company
2011 Williamsburg Road
Richmond, Virginia 23231 U.S.A.
Phone: 804-236-3800 Fax: 804-236-3882
http://www.peconet.com

Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	This CAUTION symbol on the equipment refers the user to the Product Manual for additional information. This symbol appears next to required information in the manual.
	**WARNING** **PERSONAL INJURY:** Risk of electrical shock. This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible. **Failure to comply with these instructions could result in death or serious injury.**
	ATTENTION, Electrostatic Discharge (ESD) hazards. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal. Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to protective earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

Table of contents

Tables

Figures

1 Introduction

1.1 Overview

The ETC023 is a microprocessor-based advanced multi-functional controller. It combines reliability and operating simplicity in a cost-effective 1/4-DIN size controller.

The ETC023 monitors and controls temperatures and other variables in applications such as furnaces, ovens, environmental chambers, and other process machinery.

Its features include:

- *Universal AC Power Supply,*
- *Input/Output Isolation,*
- *Isolated Auxiliary Current Output / Digital Input,*
- *Timer,*
- *Accutune II Tuning with Fuzzy Logic Overshoot Suppression,*
- *Setpoint Ramp/Rate,*
- *Three Position Step Control,*
- *Duplex (Heat/Cool).*

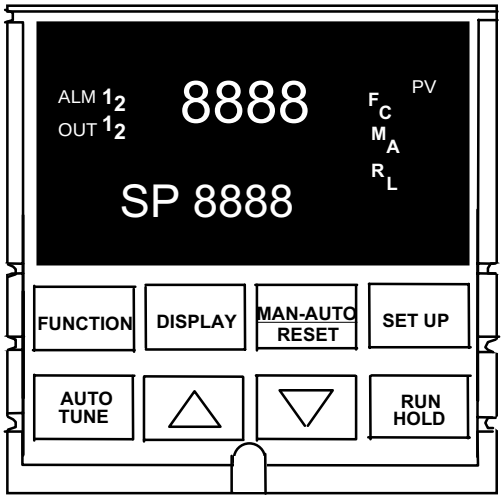


Figure 1-1ETC023 Operator Interface

1.2 CE Conformity (Europe)

This product is in conformity with the protection requirements of the following European Council Directives: **73/23/EEC**, the Low Voltage Directive, and **89/336/EEC**, the EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.

Product Classification: Class I: Permanently connected, panel-mounted Industrial Control Equipment with protective earthing (grounding). (EN61010-1).

Enclosure Rating: Panel-mounted equipment, IP 00. This controller must be panel-mounted. Terminals must be enclosed within the panel. Front panel IP 65 (IEC 529).

Installation Category (Overvoltage Category): Category II: Energy-consuming equipment supplied from the fixed installation, local level appliances, and Industrial Control Equipment. (EN61010-1)

Pollution Degree: Pollution Degree 2: Normally non-conductive pollution with occasional conductivity caused by condensation. (Ref. IEC 664-1)

EMC Classification: Group 1, Class A, ISM Equipment (EN55011, emissions), Industrial Equipment (EN50082-2, immunity)

Method of EMC Assessment: Technical File (TF)

Declaration of Conformity: 51309602-000

Deviation from the installation conditions specified in this manual, and the special conditions for CE conformity in Section 2.5, may invalidate this product's conformity with the Low Voltage and EMC Directives.

2 Installation

2.1 Overview

Introduction

Installation of the ETC023 consists of mounting and wiring the controller according to the instructions given in this section.

2.2 Preliminary Checks

Introduction

Before you install the controller, remove the chassis and make any preliminary checks necessary as listed in Table 2-1. Figure 2-1 shows the locations for jumper placements.

Table 2-1 Preliminary Checks

Check Number	Preliminary Check	Description
1	Input I Jumper Placement	Check the internal jumper for INPUT 1 to make sure it is set for the correct input type. The jumper is located at position S101 on the printed wiring board. Figure 2-1 shows the location of the jumper and position selections. The jumper is factory shipped set to position 1 for thermocouples.
2	Control Relay 1	Check the internal jumper (W101) for CONTROL. The relay is shipped as N.O. (Normally Open). Figure 2-1 shows the location of the jumper and position selections. See Table 2-2 for Control Relay contact information.

Check Number	Preliminary Check	Description
3	Control Relay 2 and Alarm Relay Action.	The controller has been shipped with ALARM relays configured for N.C. (Normally Closed). If you want to change to N.O. refer to Figure 2-1, Jumper positions W201 and W202: W201 is the ALARM RELAY 1 jumper. W202 is for CONTROL RELAY #2 for Duplex Output or 3 position step control and an ALARM RELAY 2 for all others. 3 position Step and Time Duplex must have Output 2-jumper (W202) set to N.O. (Normally Open). W202 is factory set for N.O. See Table 2-2 for Control Relay contact information, and Table 2-3 for Alarm Relay contact information. See Alarm Relay Attention Note, Section 2.3.

Jumper Placements

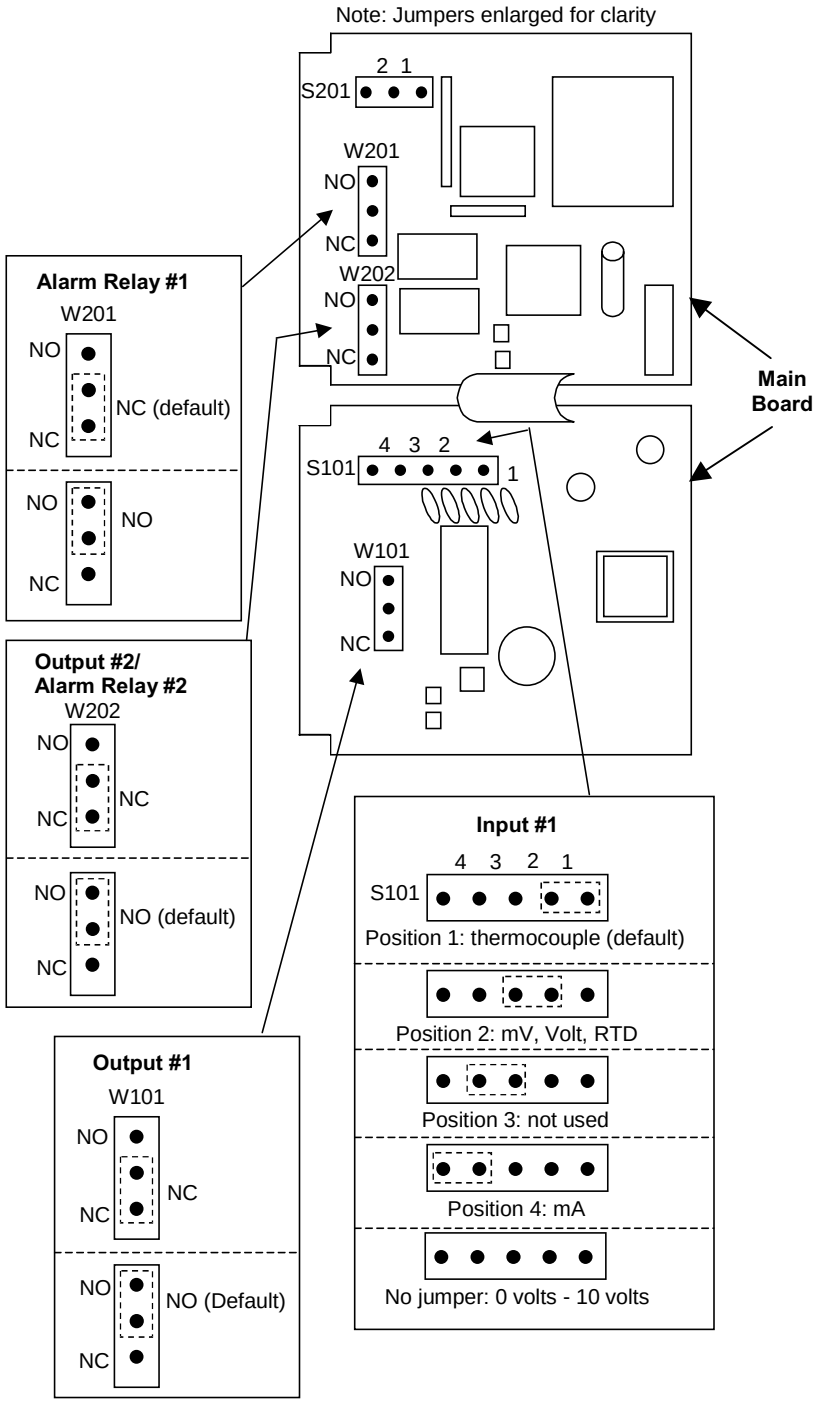


Figure 2-1Jumper Placements

2.3 Control and Alarm Relay Contact Information

Control Relays


ATTENTION

Control relays operate in the standard control mode (that is, energized when output state is on).

Table 2-2 Control Relay Contact Information

Unit Power	Control Relay Wiring	Control Relay Contact	#1 or #2 Output Indicator Status
Off	N.O.	Open	**Off**
	N.C.	Closed	
On	N.O.	Open Closed	**Off** **On**
	N.C.	Closed Open	**Off** **On**

Alarm Relays


ATTENTION

Alarm relays are designed to operate in a Failsafe mode (that is, de-energized during alarm state). This results in alarm actuation when power is OFF or when initially applied, until the unit completes self-diagnostics. If power is lost to the unit, the alarms will function.

Table 2-3 Alarm Relay Contact Information

Unit Power	Alarm Relay Wiring	Variable NOT in Alarm State		Variable in Alarm State	
		Relay Contact	Indicators	Relay Contact	Indicators
Off	N.O.	Open	**Off**	Open	**Off**
	N.C.	Closed		Closed	
On	N.O.	Closed	**Off**	Open	**On**
	N.C.	Open		Closed	

2.4 Mounting

Physical Considerations

The controller can be mounted on either a vertical or tilted panel using the mounting kit supplied. Adequate access space must be available at the back of the panel for installation and servicing activities.

- The controller's mounting enclosure must be grounded according to CSA standard C22.2 No. 0.4 or Factory Mutual Class No. 3820 paragraph 6.1.5.
- The front panel is moisture rated NEMA 3/IP65 (IEC) when properly installed with panel gasket.

Overall Dimensions

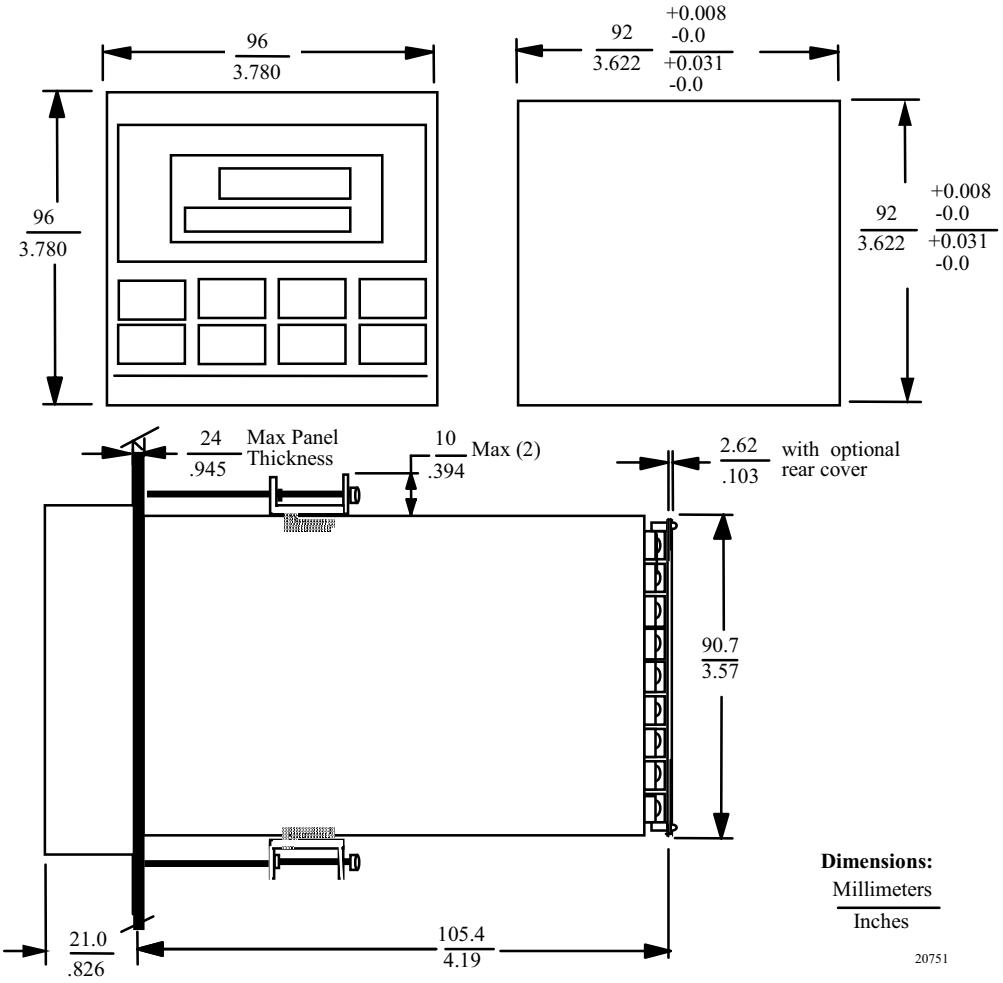


Figure 2-2Mounting Dimensions (not to scale)

Mounting Method

Before mounting the controller, refer to the nameplate on the outside of the case and make a note of the model number. It will help later when selecting the proper wiring configuration.

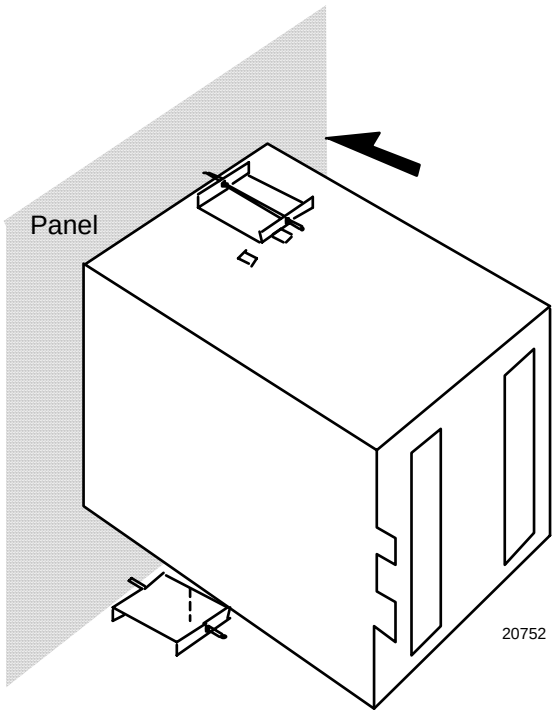


Figure 2-3Mounting Method

Table 2-4 Mounting Procedure

Step	Action
1	Mark and cut out the controller hole in the panel according to the dimension information in Figure 2-2.
2	Remove the screw cover and loosen the screw on the front of the controller. Pull the chassis out of the case.
3	Orient the case properly and slide it through the panel hole from the front.
4	Remove the mounting kit from the shipping container and install the kit as follows: • Install the screws into the threaded holes of the clips. • Insert the prongs of the clips into the two holes in the top and bottom of the case. • Tighten both screws to secure the case against the panel. • Carefully slide the chassis assembly into the case, press to close, and tighten the screw. Replace the screw cover.

2.5 Wiring

Electrical Considerations

The controller is considered “rack and panel mounted equipment” per EN61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements. Conformity with 72/23/EEC, the Low Voltage Directive requires the user to provide adequate protection against a shock hazard. The user shall install this controller in an enclosure that limits OPERATOR access to the rear terminals.

Mains Power Supply

This equipment is suitable for connection to 90 Vac to 264 Vac, 50/60 Hz, power supply mains. It is the user’s responsibility to provide a switch and non-time delay (North America), quick-acting, high breaking capacity, Type F (Europe), 1/2A, 250V fuse(s), or circuit-breaker, as part of the installation. The switch or circuit breaker shall be located in close proximity to the controller, within easy reach of the OPERATOR. The switch or circuit breaker shall be marked as the disconnecting device for the controller.

Controller Grounding

PROTECTIVE BONDING (grounding) of this controller and the enclosure in which it is installed shall be in accordance with National and Local electrical codes. To minimize electrical noise and transients that may adversely affect the system, supplementary bonding of the controller enclosure to a local ground, using a No. 12 (4 mm^2) copper conductor, is recommended.

Control/Alarm Circuit Wiring

The insulation of wires connected to the Control/Alarm terminals shall be rated for the highest voltage involved. Extra Low Voltage (ELV) wiring (input, current output, and low voltage Control/Alarm circuits) shall be separated from HAZARDOUS LIVE (>30 Vac, 42.4 Vpeak, or 60 Vdc) wiring per Permissible Wiring Bundling, Table 2-5.

Electrical Noise Precautions

Electrical noise is composed of unabated electrical signals, which produce undesirable effects in measurements and control circuits.

Digital equipment is especially sensitive to the effects of electrical noise. Your controller has built-in circuits to reduce the effect of electrical noise from various sources. If there is a need to further reduce these effects:

- *Separate External Wiring*—Separate connecting wires into bundles (See Permissible Wiring Bundling - Table 2-5) and route the individual bundles through separate conduit metal trays.

- *Use Suppression Devices* - For additional noise protection, you may want to add suppression devices at the external source. Appropriate suppression devices are commercially available.

Permissible Wiring Bundling

Table 2-5 Permissible Wiring Bundling

Bundle No.	Wire Functions
1	• Line power wiring • Earth ground wiring • Control relay output wiring • Line voltage alarm wiring
2	***Analog signal wire***, such as: • Input signal wire (thermocouple, 4 mA to 20 mA, etc.) • 4-20 mA output signal wiring ***Digital input signals***
3	• Low voltage alarm relay output wiring • Low voltage wiring to solid state type control circuits

Universal Output Functionality and Restrictions

Table 2-6 Universal Output Functionality and Restrictions

Output Type (OUTALG)	Output Position			
	Relay #1 (4 - 5)	Relay #2 (9 - 10)	Relay #3 (11 - 12)	Current Output (13 - 14)
Time Simplex 1 (RLY)	Output 1	Alarm 2	Alarm 1	Optional Use
Time Simplex 2 (RLY2)	N/A	Output 1	Alarm 1	Optional Use
Current Simplex (CUR)	Remove	Alarm 2	Alarm 1	Output
Time Duplex (RLYD)	Output 1	Output 2	Alarm 1	Optional Use
3 Position Step (TPSC)	Output 1	Output 2	Alarm 1	Optional Use *1
Current Dup. (CURD)	Remove	Alarm 2	Alarm 1	Output *2
Current/Time (CURT)	Remove	Output 1	Alarm 1	Output
Timer/Current (TCUR)	Remove	Output 1	Alarm 1	Output

N/A = The output form or the individual output is Not Available or is not used for this output form.

Optional Use = Auxiliary Output is not needed to provide the desired output function and can be used for another purpose. Auxiliary Output could also be used as a substitute for current Output 1.

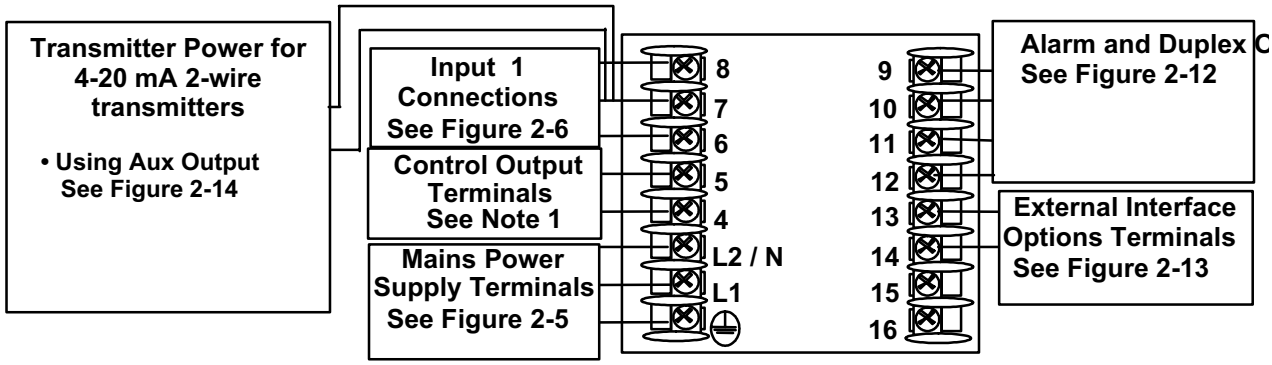
Remove = Relay #1 must be removed to prevent rapid cycling (chattering) of the contacts.

*1 On TPSC: setting AUXOUT to OUT or IN2 will not function and will remain at the 0% value.

*2 Do not use the Current Duplex setting, select CURT or TCUR.

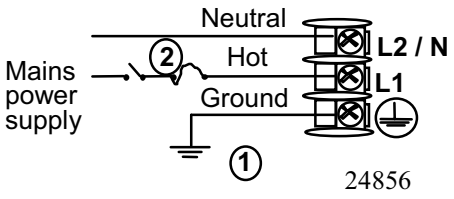
2.6 Wiring the Controller

Using the information contained in the model number, select the appropriate wiring diagrams from the composite wiring diagram below. Refer to the individual diagrams listed to wire the controller according to your requirements.



NOTE 1: Electromechanical Relay Output – See Figure 2-7
Current Output Connections – See Figure 2-8
Three Position Step Control Output – See Figures 2-9, 2-10, 2-11

Figure 2-4 Composite Wiring Diagram



①PROTECTIVE BONDING (grounding) of this controller and the enclosure in which it is installed, shall be in accordance with National and Local electrical codes. To minimize electrical noise and transients that may adversely affect the system, supplementary bonding of the controller enclosure to a local ground, using a No. 12 (4 mm^2) copper conductor, is recommended. **Before powering the controller, see "Preliminary Checks" in this section of the user manual for switch and jumper settings.**

②Provide a switch and non-time delay (North America), quick-acting, high breaking capacity, type F (Europe), 1/2 A, 250 V fuse(s), or circuit-breaker as part of the installation.

Figure 2-5 Mains Power Supply

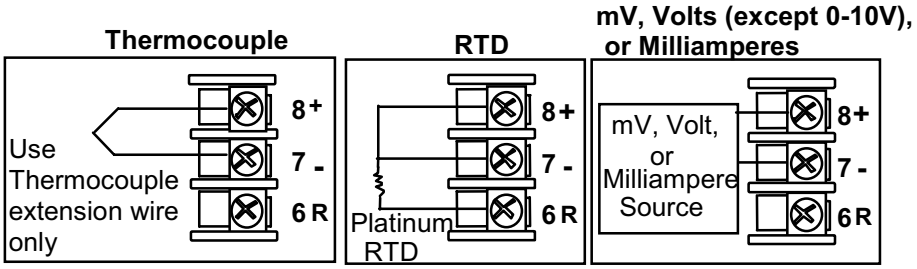
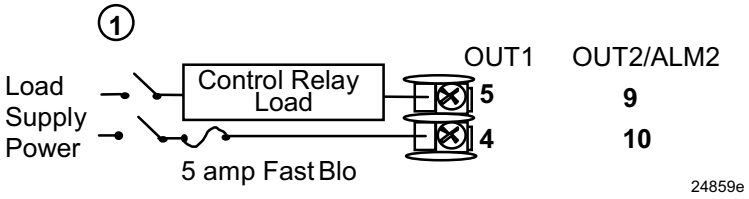


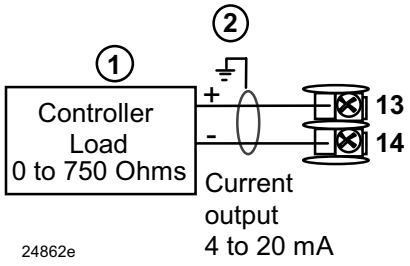
Figure 2-6 Input 1 Connections



(1) Control relays are configured N.O. as shipped. Alarm relays are configured N.C. as shipped. N.O. or N.C. configurations are selectable by jumpers on the main printed wiring boards.
See "Preliminary Checks" for details.
Each SPST relay is rated at 5 A, for 120 Vac and 30 Vdc, and 2.5 A for 240 Vac.
User-provided fuses should be sized accordingly.

See Figure 2-12 Alarm and Duplex Output Connections.
See Table 2-2 and Table 2-3 for Control Relay Contact Information.

Figure 2-7 Electromechanical Relay Output



(1) **CAUTION** Installing a current output instrument into a case wired for relay outputs will damage the instrument.

(2) Connect shield to ground at one end only.

See Figure 2-12 Alarm and Duplex Output Connections.
See Table 2-2 and Table 2-3 for Control Relay Contact Information

Figure 2-8 Current Output Connections

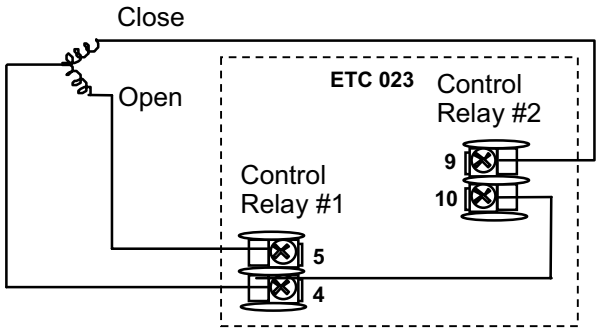


Figure 2-9 3-Position Step Control Connections for Internally Powered Motors

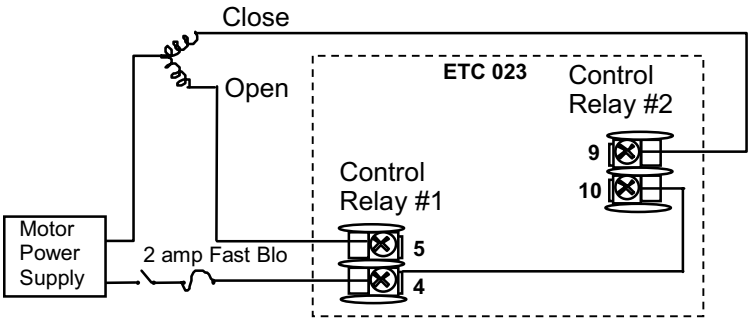


Figure 2-10 3-Position Step Control Connections for Externally Powered Motors

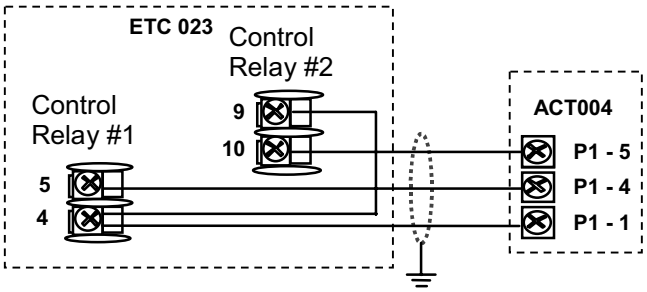
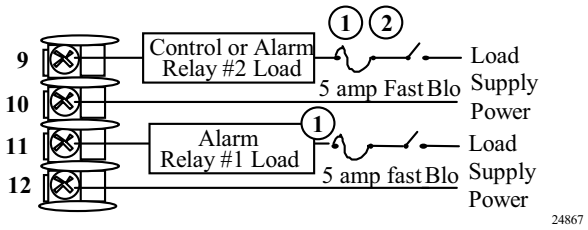


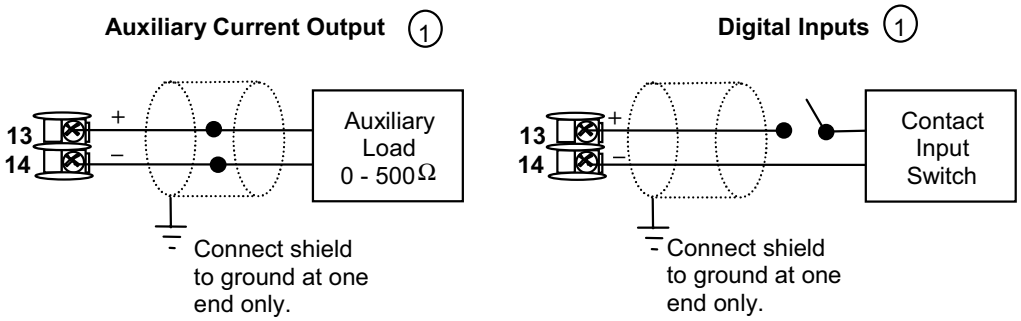
Figure 2-11 3-Position Step Connections for Eclipse Rotary Actuator



(1) Control relays 1 and 2 are configured N.O. as shipped. Alarm relay 1 is configured N.C. as shipped. The N.O. or N.C. configurations are selectable by jumpers on main printed wiring boards. See "Preliminary Checks" in this section of the User Manual for details. Each SPST relay is rated at 5 A, 120 Vac and 30 Vdc, 2.5 A, 240 Vac.

(2) Alarm #2 not available for Time Proportional Duplex or Three Position Step Control.

Figure 2-12 Alarm and Duplex Output Connections



(1) AuxOut and digital input are mutually exclusive.

Figure 2-13 External Interface Option Connections

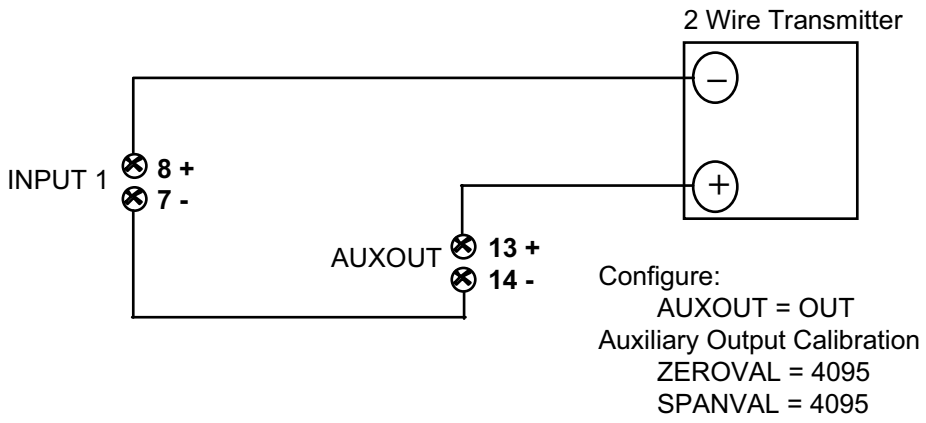


Figure 2-14 Transmitter Power for 4-20 mA - 2 Wire Transmitter Using Auxiliary Output

3 Configuration

3.1 Overview

Introduction

Configuration is a dedicated operation where you use straightforward keystroke sequences to select and establish (configure) pertinent control data best suited for your application.

To assist you in the configuration process, there are prompts that appear in the upper and lower displays. These prompts let you know what group of configuration data (Set Up prompts) you are working with and also, the specific parameters (Function prompts) associated with each group.

Figure 3-1 shows you an overview of the prompt hierarchy as they appear in the controller.

As you will see, the configuration data is divided into 11 main Set Up groups. The status group has no adjustments but shows the continuous background tests that are being performed. Also when enabled prompts for calibration will show within the Set Up Groups.

3.2 Configuration Procedure

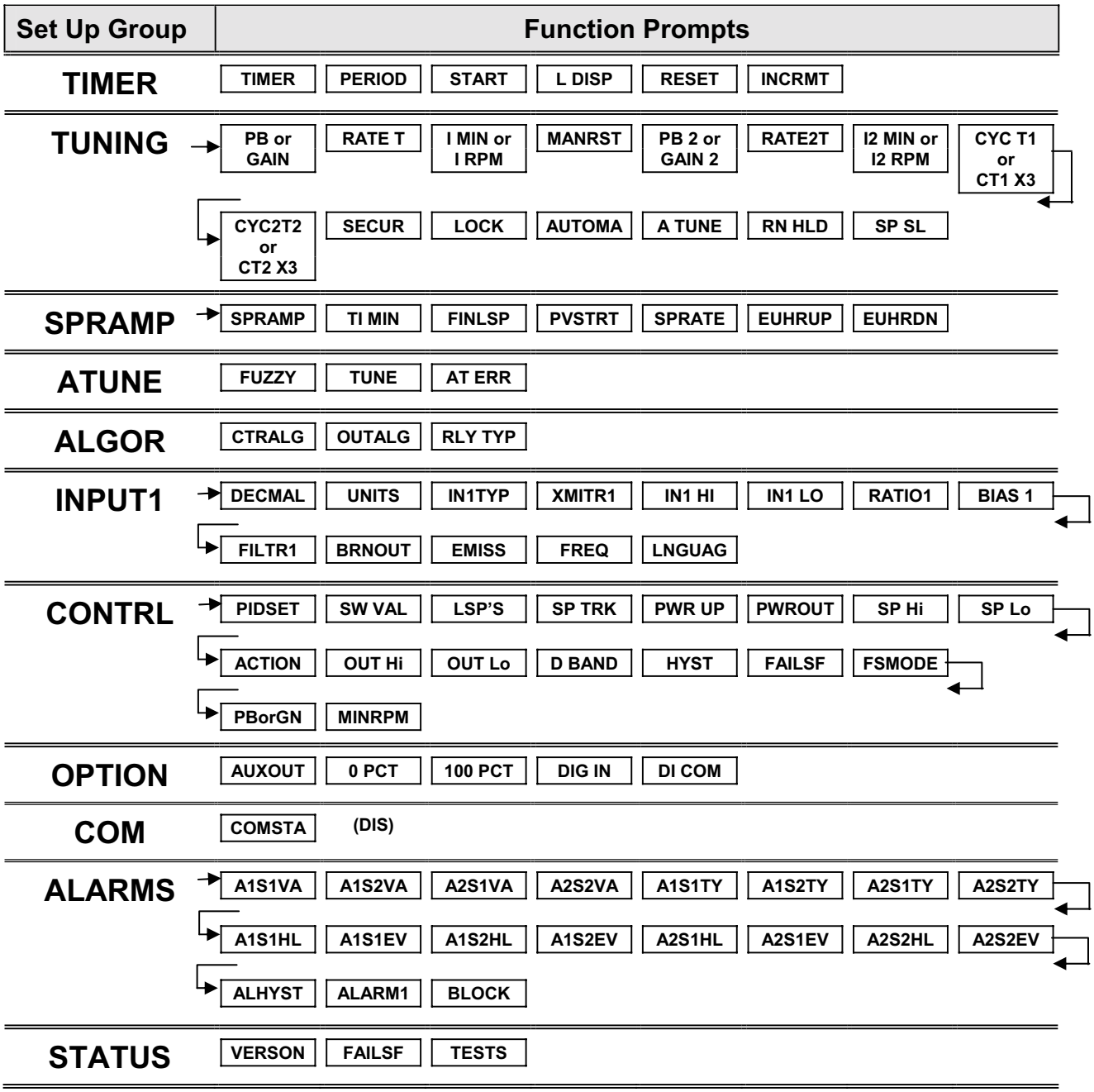
Introduction

Each of the Set Up groups and their functions are pre-configured at the factory with default settings. The factory settings are shown in Table 6-1 through Table 6-10 in Section 6 Appendix B and in Section 7 Appendix C.

If you want to change any of these selections or values, follow the procedure in Table 3-1Configuration Procedure. This procedure tells you the keys to press to get to any Set Up group and any associated Function parameter prompt.

Record your selections on the Configuration Record Sheet found in Section 7 – Appendix C.

Figure 3-1Prompt Hierarchy



Procedure

ATTENTION

The prompting scrolls at a rate of 2/3 seconds when the **SET UP** or **FUNCTION** key is held in. Also, [▲] [▼] keys will move group prompts forward or backward at a rate twice as fast.

Table 3-1 Configuration Procedure

Step	Operation	Press	Result
1	Enter Set Up Mode	**SET UP**	*Upper Display* = SET *Lower Display* = TIMER (This is the first Set Up Group title)
2	Select any Set Up Group	**SET UP**	Sequentially displays the other Set Up group titles. You can also use the [▲] [▼] keys to scan the Set Up groups in both directions. Stop at the Set Up group title that describes the group of parameters you want to configure. Then proceed to the next step.
3	Select a Function Parameter	**FUNCTION**	*Upper Display* = the current value or selection for the first function prompt of the selected Set Up group. *Lower Display* = the first Function prompt within that Set Up group. Sequentially displays the other function prompts of the Set Up group you have selected. Stop at the function prompt that you want to change, then proceed to the next step.
4	Change the Value or Selection	[▲] [▼]	Increments or decrements the value or selection that appears for the selected function prompt. If you change the value or selection of a parameter while in Set Up mode then decide not to enter it, press [MAN-AUTO/RESET] once—the original value or selection is recalled.
5	Enter the Value or Selection	**FUNCTION**	Enters value or selection made into memory after another key is pressed.
6	Exit Configuration	**DISPLAY**	Exits configuration mode and returns controller to the same state it was in immediately preceding entry into the Set Up mode. It stores any changes you have made. If you do not press any keys for 30 seconds, the controller times out and reverts to the mode and display used prior to entry into Set Up mode.

3.3 Steps to Configure a 4 mA to 20mA Output Controller

Step	Operation	Press	Result
1	Enter Set Up Mode and Select ALGOR Set Up Group	**SET UP**	*Upper Display* = SET ; press sequentially until *Lower Display* = ALGOR Note: you can also use the [▲] [▼] keys to scan the Set Up groups in both directions.
2	Select CTRALG Function Parameter	**FUNCTION**	*Upper Display* = the current value *Lower Display* = CTRALG
3	Set to Proportional Control Mode	[▲] [▼]	*Upper Display* = PIDA (PIDB & PDMR are valid also) *Lower Display* = CTRALG
4	Select OUTALG Function Parameter	**FUNCTION**	*Upper Display* = the current value *Lower Display* = OUTALG
5	Set to Relay Output Type	[▲] [▼]	*Upper Display* = RLY *Lower Display* = OUTALG Note: current output is configured in the OPTIONS group below.
6	Select Relay Type	**FUNCTION**	*Upper Display* = the current value *Lower Display* = RLYTYP
7	Set to Mechanical Relay type	[▲] [▼]	*Upper Display* = MECH *Lower Display* = RLYTYP
8	Select OPTION Set Up Group	**SET UP**	Press sequentially until *Lower Display* = OPTION
9	Set to Auxiliary Output	**FUNCTION**	*Upper Display* = DIS *Lower Display* = AUXOUT Note: if the Lower Display shows DIG IN instead of AUXOUT, press the Up/Down keys until the Upper Display shows NONE.
10	Set Auxiliary Output to follow the Output Value	[▲] [▼]	*Upper Display* = OUT *Lower Display* = AUXOUT
11	Verify 0 percent	**FUNCTION**	*Upper Display* = 0.0 *Lower Display* = 0 PCT

Step	Operation	Press	Result
			Note: use the Up/Down keys to adjust if necessary
12	Verify 100 percent	**FUNCTION**	*Upper Display* =100.0 *Lower Display* = 100PCT Note: use the Up/Down keys to adjust if necessary
13	Exit Configuration	**DISPLAY**	Exits configuration mode and returns controller to the same state it was in immediately preceding entry into the Set Up mode. It stores any changes you have made.

3.4 Steps to Configure ON-OFF or HIGH-LOW Control

Step	Operation	Press	Result
1	Enter Set Up Mode and Select ALGOR Set Up Group	**SET UP**	*Upper Display* = SET ; press sequentially until *Lower Display* = ALGOR Note: you can also use the [▲] [▼] keys to scan the Set Up groups in both directions.
2	Select CTRALG Function Parameter	**FUNCTION**	*Upper Display* = the current value *Lower Display* = CTRALG
3	Set to On-Off Control Mode	[▲] [▼]	*Upper Display* = ONOF *Lower Display* = CTRALG
4	Select OUTALG Function Parameter	**FUNCTION**	*Upper Display* = the current value *Lower Display* = OUTALG
5	Set to Relay Output Type	[▲] [▼]	*Upper Display* = RLY *Lower Display* = OUTALG
6	Select Relay Type	**FUNCTION**	*Upper Display* = the current value *Lower Display* = RLYTYP
7	Set to Mechanical Relay type	[▲] [▼]	*Upper Display* = MECH *Lower Display* = RLYTYP
8	Exit Configuration	**DISPLAY**	Exits configuration mode and returns controller to the same state it was in immediately preceding entry into the Set Up mode. It stores any changes you have made.

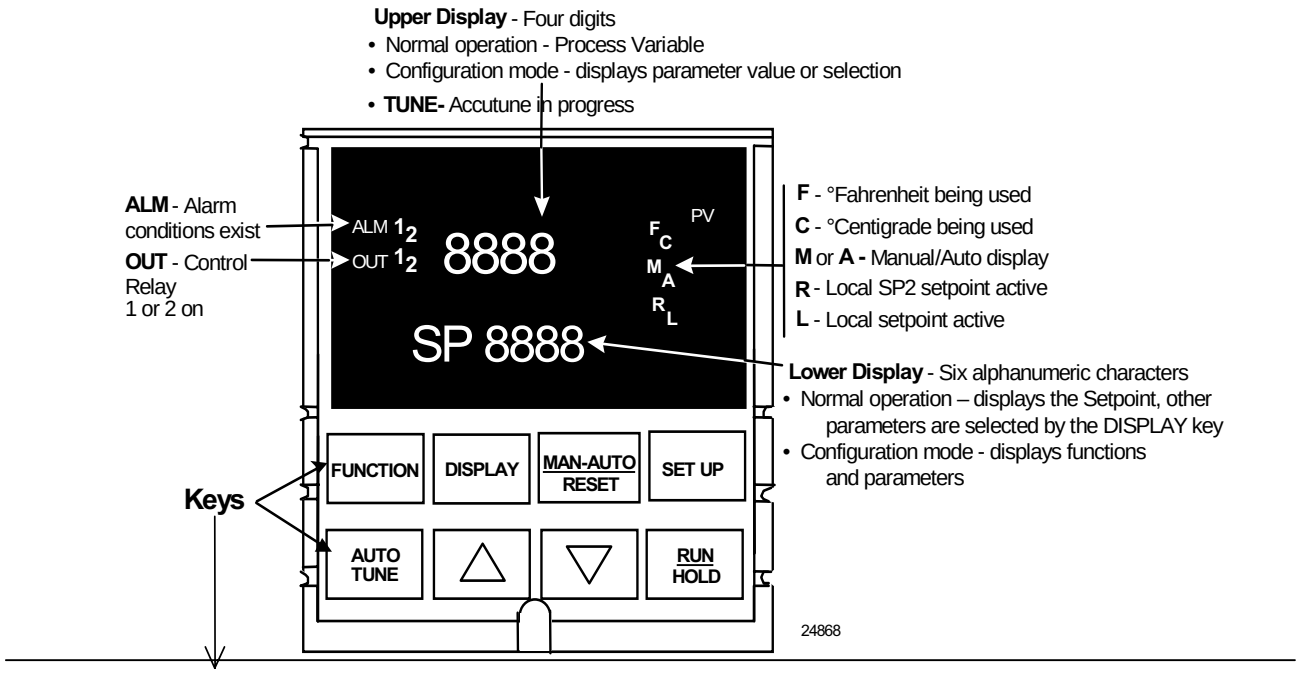
3.5 Steps to Configure Three-Position-Step-Control

Step	Operation	Press	Result
1	Enter Set Up Mode and Select ALGOR Set Up Group	**SET UP**	*Upper Display* = SET ; press sequentially until *Lower Display* = ALGOR Note: you can also use the [▲] [▼] keys to scan the Set Up groups in both directions.
2	Select CTRALG Function Parameter	**FUNCTION**	*Upper Display* = the current value *Lower Display* = CTRALG
3	Set to 3-Position-Step Control Mode	[▲] [▼]	*Upper Display* = TPSC *Lower Display* = CTRALG
4	Verify OUTALG Function Parameter	**FUNCTION**	*Upper Display* = TPSC *Lower Display* = OUTALG
5	Select TUNING Set Up Group	**SET UP**	*Upper Display* = SET ; press sequentially until *Lower Display* = TUNING
6	Select LOCK Function Parameter	**FUNCTION**	*Upper Display* = the current value *Lower Display* = LOCK
7	Enable Calibration Menu	[▲] [▼]	*Upper Display* = NONE *Lower Display* = LOCK
8	Select CAL TPSC Set Up Group	**SET UP**	*Upper Display* = CAL ; press sequentially until *Lower Display* = TPSC
9	Select Motor Time Function Parameter	**FUNCTION**	*Upper Display* = the current value *Lower Display* = MTR TI
10	Set Actuator Motor Travel Time	[▲] [▼]	*Upper Display* = set value in seconds *Lower Display* = MTR TI
11	Select TUNING Set Up Group	**SET UP**	*Upper Display* = SET ; press sequentially until *Lower Display* = TUNING
12	Select LOCK Function Parameter	**FUNCTION**	*Upper Display* = NONE (the current value) *Lower Display* = LOCK

Step	Operation	Press	Result
13	Disable Calibration Menu	[▲] [▼]	*Upper Display* = CAL *Lower Display* = LOCK Note: any other selection besides NONE will prevent access to instrument calibration settings.
14	Exit Configuration	**DISPLAY**	Exits configuration mode and returns controller to the same state it was in immediately preceding entry into the Set Up mode. It stores any changes you have made.

4 Operation

4.1 Operator Interface and Key Functions



FUNCTION	Selects functions within each configuration group. Selects 2nd Setpoint.
DISPLAY	Returns Controller to normal display from Set Up mode. Toggles various operating parameters for display.
MAN-AUTO RESET	Selects Manual or Auto mode. Resets the latching Limit Controller relay. In Set Up mode, used to restore original value or selection.
SET UP	Scrolls through the configuration Setup groups.
AUTO TUNE	Initiates tuning (Accutune).
▲	Increases setpoint or output value. Increases the configuration values or changes functions in Configuration mode groups.
▼	Decreases setpoint or output value. Decreases the configuration values or changes functions in Configuration mode groups.
RUN HOLD	Enables Run/Hold of the SP Ramp plus Timer start.

Figure 4-1 Operator Interface and Key Functions

Key Error Message

When a key is pressed and the prompt KEYERR appears in the lower display, it will be for one of the following reasons:

- parameter is not available,
- not in Set Up mode, press **SET UP** key first,
- key malfunction.

4.2 Powering Up the Controller

Apply Power

When power is applied, the controller will run three diagnostic tests. After these tests are completed, “TEST DONE” is displayed.

Test Failures

If one or more of these tests fail, the controller will go to the Failsafe Manual Mode, and FAILSF will flash in the lower display and a message indicating which test failed will appear in the lower display. Then, “DONE” will appear in the lower display.

4.3 Monitoring Your Controller

Annunciators

The following annunciator functions have been provided to help monitor the controller:

Table 4-1 Annunciators

Annunciator	Indication
ALM 1 2	*A visual indication of each alarm*
	Blinking 1 indicates alarm latched and needs to be acknowledged before extinguishing when the alarm condition ends
OUT 1 2	*A visual indication of the control relays*
A or M	*A visual indication of the mode of the controller*
	A—Automatic Mode M—Manual Mode
F or C	*A visual indication of the temperature units*
	F—Degrees Fahrenheit C—Degrees Celsius
L or R	*A visual indication of setpoint being used*
	L— Local Setpoint is active R—LSP 2 is active
	The upper display is used to show other annunciator functions **TUNE**—Accutuning in progress

Viewing the operating parameters

Press the **DISPLAY** key to scroll through the operating parameters listed in Table 4-2. The lower display will show only those parameters and their values that apply to your specific settings.

Table 4-2 Lower Display Key Parameter Prompts

Lower Display	Description
OT	OUTPUT—Output value is percent; for Three Position Step control, this is an estimated motor position.
SP	LOCAL SETPOINT #1—Also current setpoint when using SP Ramp.
2L	LOCAL SETPOINT #2
DE	DEVIATION—Maximum negative display is –999.9.
PIDSX	TUNING PARAMETER SELECTED SET—where X is either 1 or 2.
↓□ □.□□	TIME REMAINING—Time that remains on timer in Hours:Minutes
↑□ □.□□	ELAPSED TIME—Time that has elapsed on timer in Hours:Minutes.
RPXXXM	SETPOINT RAMP TIME—Time remaining in the setpoint ramp in minutes.
AX	AUXILIARY OUTPUT—Same as OT for standard 4-20mA output
Sn	SP RATE SETPOINT—Current setpoint for setpoint rate applications
BI	BIAS—Displays the manual reset value for algorithm PD+MR.

Diagnostic Error Messages

The ETC023 performs background tests to verify data and memory integrity. If there is a malfunction, an error message will be displayed. In the case of more than one simultaneous malfunction, the messages will be displayed sequentially on the lower display.

Table 4-3 Error Messages

Prompt	Description
EE FAIL	Unable to write to nonvolatile memory.
IN1FL	Two consecutive failures of input 1 integration.
CFGERR	Configuration Errors—Low limit greater than high limit for PV, SP, Reset, or Output.
IN1RNG	Input 1 Out-of-Range
PV LIM	PV Out-of-Range PV = (PV source x PV source ratio) + PV source bias
FAILSF	Failsafe—Check inputs or configuration.
LOCK	The Lockout feature has been enabled to prevent unauthorized changes of certain functions or parameters.

4.4 Start Up Procedure for Operation

Table 4-4 Procedure for Starting Up the Controller

Step	Operation	Press	Result
1	Select Manual Mode	**MAN/AUTO RESET**	Until "M" indicator is ON. The controller is in manual mode.
2	Adjust the Output	[▲] [▼]	To adjust the output value and ensure that the final control element is functioning correctly.
			Upper Display = **PV Value**
			Lower Display = **OT and the output value in %**
3	Tune the Controller	**SET UP**	Make sure the controller has been configured properly and all the values and selections have been recorded on the Configuration Record Sheet.
			Refer to Tuning Set Up group to ensure that the selections for PB or GAIN, RATE T, and I MIN, or I RPM have been entered.
			Use Accutune to tune the controller; see the procedure in this section.
4	Enter the Local Setpoint	**DISPLAY**	*Upper Display* = **Pv Value**
			Lower Display = **SP and the Local Setpoint Value**
		[▲] [▼]	to adjust the local setpoint to the value at which you want the process variable maintained.
			The local setpoint cannot be changed if the Setpoint Ramp function is running.
5	Select Automatic Mode	**MAN/AUTO RESET**	Until "**A**" indicator is ON. The controller is in Automatic mode.
			The controller will automatically adjust the output to maintain the process variable at setpoint.

4.5 Setpoints

Introduction

You can configure the following setpoints for the ETC023 controller.

- A Single Local Setpoint (SP)
- 2 Local Setpoints (L, R)

Switching between setpoints

You can switch between two Local setpoints when configured.

Table 4-5 Procedure for Switching Between Setpoints

Step	Operation	Press	Result
1	Select the Setpoint	**FUNCTION**	To switch between the 2 Local Setpoints (L and R) ATTENTION "KEY ERROR" will appear in the lower display, if: • the 2nd local setpoint is not configured as a setpoint source • you attempt to change the setpoint while a setpoint ramp is enabled, or • if you attempt to change the setpoint with the setpoint select function key disabled.

4.6 Timer

Introduction

The Timer provides a configurable Time-out period of from 0 to 99 hours:59 minutes or 0 to 99 minutes:99 seconds.

Timer “Start” is selectable as either the **RUN/HOLD** key or Alarm 2.

The Timer display can be either “Time Remaining” or “Elapsed Time”.

Configuration check

Make sure:

- TIMER is enabled
- A TIMEOUT period has been selected (in hours and minutes or minutes and seconds)
- A TIMER FUNCTION START has been selected (KEY or AL2)
- A TIMER display has been selected (Time remaining or Elapsed time)
- A timer increment selected
- Timer reset selected

Refer to Section 6.1 for details.

Viewing Times

The times are viewed on the lower display as follows:

TIME REMAINING	will show as a *decreasing* Hrs:Min value (HH:MM) or Min:Sec value (MM:SS) plus a ***counterclockwise*** rotating clock face.
ELAPSED TIME	will show as an *increasing* Hrs:Min value(HH:MM) or Min:Sec value (MM:SS) plus a ***clockwise*** rotating clock face.

Operation

When the Timer is enabled (**RUN/HOLD** key or ALARM 2), it has exclusive control of Alarm 1 relay.

At “TIME-OUT”:

- Alarm 1 is active
- The clock character has stopped moving
- The Time display shows either 00:00 or the time-out period depending on the configuration selection
- The Timer is ready to be reset.

At “RESET”:

- Alarm 1 relay is inactive
- The time display shows the time-out period
- The time-out period can be changed at this time using the ▲ or ▼ keys.
- The Timer is ready to be activated.

4.7 Accutune II

Operation

"TUNE" (Accutune II) algorithm provides foolproof, trouble-free on-demand tuning in the ETC023 controller. No knowledge of the process is required at start-up. The operator simply initiates the tuning while in the automatic mode.

The ETC023 controller immediately starts controlling to the setpoint while it identifies the process, calculates the tuning constants and enters them into the Tuning group, and begins PID control with the correct tuning parameters. This works with any process, including integrating type processes, and allows retuning at a fixed setpoint.

The tuning sequence will cycle the controller's output two full cycles between 0% and 100% (or low and high output limits) while allowing only a very small Process Variable change above and below the SP during each cycle. "TUNE" flashes in the upper display until tuning is completed.

After "TUNE" has been enabled:

- Start Tuning by pushing the **AUTOTUNE** key while in Automatic control mode.

To abort Accutune and return to the last previous operation (SP or output level), press **MAN-AUTO/RESET** key to abort the Accutune process.

Completing Accutune

When Accutune is complete, the calculated tuning parameters are stored in their proper memory location in the controller, and the controller will control at the local setpoint using the newly calculated tuning constants.

4.8 Fuzzy Overshoot Suppression

Introduction

Fuzzy Overshoot Suppression minimizes Process Variable overshoot following a setpoint change or a process disturbance. This is especially useful in processes which experience load changes or where even a small overshoot beyond the setpoint may result in damage or lost product.

Configuration

To configure this item, refer to Section 3 – Configuration and Section 6.4 – Set Up Group "**ATUNE**"
Function Prompt "**FUZZY**"
Select "**ENAB**"(enable) or "**DIS**" (disable) Use ▲ or ▼.

4.9 Using Two Sets of Tuning Constants

Introduction

You can use two sets of tuning constants for single output types and choose the way they are to be switched (Does not apply for Duplex control). See Table 4-6.

Table 4-6 Set Up Procedure

Step	Operation	Press	Action
1	Select Tuning Set Up Group	**SET UP**	until you see TUNING in the Lower Display
2	Select the tuning constants	**FUNCTION**	to successively display the available constants in the Lower Display. The value is displayed in the Upper Display
3		[▲] [▼]	To change the value of any of the above listed prompts in the lower display.

Switch between two sets via keyboard (without automatic switch-over)

Table 4-7 Procedure for Switching PID SETS from the Keyboard

Step	Operation	Press	Result
1	Select Control Set-up Group	**DISPLAY**	Until you see: *Upper Display* = **(the PV value)** *Lower Display* = **PIDS X(X= 1 or 2)**
2		[▲] [▼]	To change PID SET 1 to PID SET2 or Vice Versa. You can use Accutune on each set.

4.10 Alarms

Introduction

An alarm consists of a relay contact and an operator interface indication. The alarm relay is de-energized if setpoint 1 or setpoint 2 is exceeded.

The alarm relay is energized when the monitored value goes into the allowed region by more than the hysteresis (ALHYST).

The relay contacts can be wired for normally open (NO) energized or normally closed (NC) de-energized using internal jumper placement. See Table 2-3 Alarm Relay Contact Information.

There are four alarm setpoints, two for each alarm. The alarm type and state (High or Low) is selected during configuration. There are several alarm types that can be selected for each alarm setpoint.

Alarm Setpoints Display

Table 4-8 Procedure for Displaying Alarm Setpoints

Step	Operation	Press	Action
1	Access the Alarm Set Up group	**SET UP**	until you see ALARMS in the Lower Display.
2	Access the Alarm Setpoint Values	**FUNCTION**	to successively display the alarm setpoints and their values.
		[▲] [▼]	to change any alarm setpoint value you select in the upper display.
3	Return to normal operation	**DISPLAY**	

4.11 Three Position Step Control Algorithm

Introduction

The Three Position Step Control algorithm allows the control of a valve (or other actuator) with an electric motor driven by two controller output relays; one to move the motor upscale, the other to move it downscale, without a feedback slidewire linked to the motor shaft.

Estimated Motor Position

The Three-Position Step control algorithm provides an output display ("OT") which is an estimated motor position since the motor is not using any feedback.

- although this output indication is only accurate to a few percent, it is corrected each time the controller drives the motor to one of its stops (0% or 100%).
- it avoids all the control problems associated with the feedback slidewire (wear, dirt, and noise).
- when operating in this algorithm, the estimated "OT" display is shown to the nearest percent (that is, no decimal).

Motor Position Display

Table 4-9 Procedure for Displaying 3Pstep Motor Position

Step	Operation	Press	Result
1	Access the Displays	**DISPLAY**	Until you see: *Upper Display* = **PV** *Lower Display* = **OT (The estimated motor position in %)**

4.12 Setting a Failsafe Output Value for Restart After a Power Loss

Introduction

If the power to the controller fails and power is reapplied, the controller goes through the power up tests, then goes to a user configured FAILSAFE OUTPUT VALUE.

Set a Failsafe Value

Table 4-10 Procedure for Setting a Failsafe Value

Step	Operation	Press	Result
1	Select Control Set-up Group	**SET UP**	Until you see: *Upper Display* = **SET** *Lower Display* = **CONTRL**
2	Select Failsafe Function Prompt	**FUNCTION**	You will see: *Upper Display* = **(range)** *within the range of the Output 0 to 100 for all output types except 3 Position Step* *3 Position Step* *0 = motor goes to closed position* *100 = motor goes to open position* *Lower Display* = **FAILSF**
3	Select a value	[▲] [▼]	To select a Failsafe output value in the upper display
4	Return to Normal Display	**DISPLAY**	At power up, the output will go to the value set.

4.13 Setting Failsafe Mode

Introduction

You can set the Failsafe Mode to be Latching or Non-Latching.

Set Failsafe Mode

Table 4-11 Procedure for Setting a Failsafe Mode

Step	Operation	Press	Result
1	Select Control Set-up Group	**SET UP**	Until you see: *Upper Display* = **SET** *Lower Display* = **CONTRL**
2	Select Failsafe Function Prompt	**FUNCTION**	You will see: *Upper Display* = **LACH** (Controller goes to manual and output goes to Failsafe value) **NO L** (controller mode does not change and output goes to Failsafe value) *Lower Display* = **FSMODE**
3	Select a value	[▲] [▼]	To select a Failsafe mode in the upper display.
4	Return to Normal Display	**DISPLAY**	At power up, the output will go to the value set.

4.14 Entering a Security Code

The level of keyboard lockout may be changed in the Set Up mode. However, knowledge of a security code number (0 to 4095) may be required to change from one level of lockout to another. When a controller leaves the factory, it has a security code of 0, which permits changing from one lockout level to another without entering any other code number.

If you require the use of a security code, select a number from 0001 to 4095 and enter it when the lockout level is configured as NONE. Thereafter, that selected number must be used to change the lockout level from something other than NONE.

CAUTION Write the number on the Configuration Record Sheet in Section 7 - Appendix C so you will have a permanent record.

Table 4-12 Procedure to Enter a Security Code

Step	Operation	Press	Result
1	Enter Set Up Mode	**SET UP**	*Upper Display* = **SET UP** *Lower Display* = **TUNING**
2	Select any Set Up Group	**FUNCTION**	*Upper Display* = **0** *Lower Display* = **SECUR**
3	Security Code Entry	[▲] [▼]	To enter a four digit number in the upper display (0001 to 4095) This will be your security code.

4.15 Lockout Feature

Introduction

The lockout feature in the ETC023 is used to inhibit changes (via keyboard) of certain functions or parameters by unauthorized personnel.

Lockout levels

There are different levels of Lockout depending on the level of security required. These levels are:

- NONE No Lockout.
- CAL Calibration prompts are locked out.
- CONF Timer, Tuning, SP Ramp, and Accutune are Read/Write. All other Setup groups are Read only. Calibration Group is not available.
- VIEW Timer, Tuning, and SP Ramp are Read/Write. No other parameters are available.
- ALL Timer, Tuning, and SP Ramp are Read only. No other parameters are viewable.

Security Code (See previous section)

Individual key lockout

There are four keys that can be disabled to prevent unauthorized changes to the parameters associated with these keys. *First set the "Lock" prompt to NONE.*

These keys are:

AUTOTUNE Key - you can disable the Autotune key at configuration Set up, group prompt Tuning", function prompt "A TUNE"

RUN/HOLD Key - you can disable the Run/Hold key for Set Point Programming at configuration Set Up group prompt "Tuning," function prompt "RN HLD"

AUTO/MAN Key - you can disable the Auto/Manual key at configuration Set Up, group prompt "Tuning", function prompt "AUTOMA"

FUNCTION Key - you can disable the Set Point Select function key at configuration Set Up group prompt "Tuning," function prompt "SP SEL"

See *section 6.2- Tuning Parameters Set Up Group* prompts to enable or disable these keys.

4.16 Background Tests

Introduction

The ETC023 performs ongoing background tests to verify data and memory integrity. If there is a malfunction, an error message will be displayed (blinking) in the lower display. In the case of simultaneous malfunctions, the messages will appear in sequence in the lower display. Table 4-13 lists these background tests, the reason for their failure, and how to correct the problem.

Table 4-13 Background Tests

Lower Display	Reason for Failure	How to Correct the Problem
E FAIL	Unable to write to non-volatile memory. Anytime you change a parameter and it is not accepted, you will see E FAIL.	1. Check the accuracy of the parameter and re-enter. 2. Try to change something in configuration. 3. Run through Read STATUS tests to re-write to EEPROM.
FAILSF	This error message shows whenever the controller goes into a failsafe mode of operation. This will happen if: • RAM test failed • Configuration test failed • Calibration test failed • Burnout configured for none and the input failed.	1. Run through STATUS check to determine the reason for the failure. 2. Press the **SET UP** key until STATUS appears in the lower display. 3. Press the **FUNCTION** key to see whether the tests pass or fail, then run through the STATUS codes a second time to see if the error cleared.
IN1RNG	Input 1 out of range. The process input is outside the range limits.	1. Make sure the range and actuation are configured properly. 2. Check the input source (wiring, EMI). 3. Restore the factory calibration *(see Section 4.17)* or field calibrate.
IN1_FL	Two consecutive failures of input 1 integration. i.e., cannot make analog to digital conversion. This will happen if: • Upscale or Downscale burnout is selected • Input not configured correctly	1. Make sure the actuation is configured correctly. *See Section 7.6.* 2. Make sure the input is correct. 3. Check for gross over-ranging. Check S101 jumper position. See Figure 2-1 Jumper Placements 4. Restore factory calibration. See *Section 4.17*
CNFERR	• PV low limit is > PV high limit • SP low limit is > SP high limit • Output low limit > Output high limit	1. Check the configuration for each item and reconfigure if necessary.

Lower Display	Reason for Failure	How to Correct the Problem
PV LIM	PV out of range. PV = INP1 x RATIO1+ INP1 BIAS	1. Make sure the input signal is correct. Recheck the calibration. 2. Make sure the Ratio and Bias settings are correct. Use Bias of 0.0

4.17 Restore Factory Calibration

Introduction

The factory calibration constants for all the input actuation types that can be used with the controller are stored in its nonvolatile memory. Thus, you can quickly restore the "Factory Calibration" for a given input actuation type by simply changing the actuation type to another type and then changing it back to the original type. Refer to Table 4-14 for procedure.

ATTENTION

A restored factory calibration overwrites any previous field calibration done for the input and may change the High and Low Range Limits.
Be sure to protect any field calibration from accidental overwrites by configuring the appropriate LOCKOUT selection after calibration.
See Section 4.15 for specific instructions to set the lockout.

Table 4-14 Restore Factory Calibration

Step	Operation	Press	Result
1	Set LOCKOUT to NONE	SET UP	until you see*:* *Upper Display* = **SET UP** *Lower Display* = **TUNING**
		FUNCTION	Until you see: *Upper Display* = **one of the following:** **NONE** – all parameters are read/write **CAL** – all parameters are read/write except Calibration **CONF** – configuration parameters are Read Only; no writes permitted **VIEW** – Tuning and Setpoint Ramp parameters are read/write. No other parameters can be viewed. **ALL** – Tuning and Setpoint Ramp parameters are available for read only. No other parameters can be viewed. *Lower Display* = **LOCK**
		[▲] [▼]	Until **NONE** is in the upper display

Step	Operation	Press	Result
2	Enter INPUT 1 Setup Group	SET UP	until you see*:* *Upper Display* = **SET UP** *Lower Display* = **INPUT 1**
		FUNCTION	until you see*:* *Upper Display* = the current selection *Lower Display* = **INxTYP**
		[▲] [▼]	to change the current selection to another selection
3	Scroll through Functions	FUNCTION	until the lower display rolls through the rest of the functions and returns to: *Upper Display* = the new selection *Lower Display* = **INxTYP**
		[▲] [▼]	until you change the input selection in the upper display back to the proper selection. You will see: *Upper Display* = Original Input Selection that matches your type of sensor. *Lower Display* = **INxTYP**
4	Return to Normal Operation	DISPLAY	to return to Normal operating mode.

4.18 Setpoint Rate

Introduction

When you have configured a SETPOINT RATE, it will apply immediately to local setpoint change.

Configuration check

Make sure:

- SPRATE is enabled
- SPRAMP is disabled
- A Rate Up (EUHRUP) or Rate Down (EUHRDN) value has been configured in Engineering units per hour.

ATTENTION: A value of 0 will imply an immediate change in setpoint, that is, NO RATE applies. See Subsection 6.3 – Configuration group “SPRAMP” for details.)

Operation

When a change to local setpoint is made, this controller will ramp from the original setpoint to the “target” setpoint at the rate specified.

The current setpoint value can be viewed at Sn on the lower display.

Power outages

If power is lost before the “target” setpoint is reached, upon power recovery, the controller powers up with Sn = Current PV value and it automatically “Restarts” from Sn = current PV value up to the original “target” setpoint.

4.19 Setpoint Ramp

Introduction

When you have configured a SETPOINT RAMP, the ramp will occur between the current local setpoint and a final local setpoint over a time interval of from 1 to 255 minutes. You can RUN or HOLD the ramp at any time.

Configuration Check

Make sure

- SPRAMP is enabled
- SP RATE is disabled
- A Ramp Time (TIMIN) in minutes has been configured
- A final setpoint value (FINLSP) has been configured. See section 6.3 – Configuration group “SPRAMP” for details.

Operation

Running a Setpoint Ramp includes starting, holding, viewing the ramp, ending the ramp and disabling it. See Table 4-15.

Table 4-15 Running A Setpoint Ramp

Step	Operation	Press	Result
1	Select Automatic Mode	**MAN/AUTO**	“A” indicator is on. *Upper Display* = Hold and PV value *Lower Display* = SP and Present value
2	Set Start Setpoint	**DISPLAY**	Until start SP value is in lower display *Upper Display* = Hold and PV value *Lower Display* = SP and start SP value

Step	Operation	Press	Result
3	Start the Ramp	**RUN/HOLD**	You will see *Upper Display* = Run and a changing PV value *Lower Display* = SP and a changing SP value increasing or decreasing toward a final SP value
4	Hold/Run the Ramp	**RUN/HOLD**	This holds the ramp at the current setpoint value. Press again to continue.
5	View the remaining ramp time	**DISPLAY**	Until you see *Upper Display* = RUN or HOLD and the PV value *Lower Display* = RP xx HH.MM (time remaining)
6	End the Ramp		When the final setpoint is reached, “RUN” changes to “HOLD” in the upper display and the controller operates at the new final setpoint.
7	Disable SPRAMP		See Section 6.3 – Configuration group “SPRAMP” for details.

Power Outage

If power is lost during a ramp, upon power-up the controller will be in HOLD and the setpoint value will be the setpoint value prior to the beginning of the setpoint ramp. The ramp is placed in hold at the beginning.

Configure the mode at Set up Group “CONTROL”, function prompt “PWRUP”. See Table 6-7 CONTRL Group (Numeric Code 800) Function Prompts in Section 6.7– Control Set Up Group.

PV Start

This function determines whether LSP1 or PV is used as the setpoint when the controller is initially changed from HOLD to RUN.

The selections are:

DISABL = When initially changed from HOLD to RUN the present LSP1 value is captured as the default setpoint. If the program is terminated or the power cycled before the program has completed, the LSP1 is used as the control setpoint. The beginning uses this value as the initial ramp setpoint.

ENABL = When initially changed from HOLD to RUN the present PV value is captured and used as the beginning setpoint value for the ramp. If the program is terminated before completion, the setpoint value will revert back to the PV value captured at the initial HOLD to RUN transition. If the power is cycled before program completion, upon power-up the setpoint is set to the PV value at power-up and when the ramp is restarted that setpoint value is used initially.

5 Appendix A - Environmental and Operating Conditions

Operating Limits	**Ambient Temperature:** 32 °F to 131 °F (0 °C to 55 °C) **Relative Humidity:** 5% to 90% RH up to 104 °F (40 °C) **Vibration:** *Frequency:* 0 Hz to 200 Hz *Acceleration:* 0.6g **Mechanical Shock:** *Acceleration:* 5 g *Duration:* 30 ms **Power:** 90 Vac to 264 Vac, 50/60 Hz (CSA models rated to 250 Vac maximum) **Power Consumption:** 12 VA maximum
Accuracy	± 0.25% of span typical ± 1 digit for display 15-bit resolution typical
CE Conformity Special Conditions (Europe)	Shielded twisted-pair cables are required for all analog I/O, process variable, RTD, thermocouple, dc Millivolts, low level signal, 4-20 mA, digital I/O, and computer interface circuits.

6 Appendix B – Parameter Configurations

6.1 Timer Set Up Group

Introduction

The Timer Set Up group allows you to configure a time-out period and to select the timer start by either the keyboard (**RUN/HOLD** key) or Alarm 2. The optional digital input can also be configured to start the timer. The timer display is selectable as either “time remaining” *(TREM)* or “elapsed time” *(ET).*

Alarm 1 is activated at the end of the time-out period. When the timer is enabled, it has exclusive control of the alarm 1 relay—any previous alarm 1 configuration is ignored. At time-out, the timer is ready to be activated again by whatever action has been configured.

Function Prompts

Table 6-1 TIMER Group (Numeric Code 100) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
TIMER	101	Enable or Disable Timer	0 1	DIS ENAB	DIS
PERIOD	102	Time-out Period		0:00 to 99:59 Select length of time in Hours and Minutes, or Minutes and Seconds.	0:01
START	103	Timer Function Start	0 1	KEY (Run/Hold key) AL2 (Alarm 2)	KEY
L DISP	104	Timer Display	0 1	TREM (time remaining) ET (elapsed time)	TREM
RESET	105	Timer Reset Control	0 1	KEY (Run/Hold key) AL1 (Alarm 1 or Key)	KEY
INCRMT	106	Timer Count Increment	0 1	MIN (Counts HR/MIN) SEC (Counts MIN/SEC)	MIN

6.2 Tuning Set Up Group

Introduction

Tuning consists of establishing the appropriate values for the tuning constants you are using so that your controller responds correctly to changes in process variable and setpoint. You can start with predetermined values but you will have to watch the system to see how to modify them. **The Accutune feature automatically selects Gain, Rate, and Reset on demand.**

 ATTENTION

Because this group contains functions that have to do with security and lockout, we recommend that you configure this group last, after all other configuration data has been loaded.

Function Prompts

Table 6-2 TUNING Group (Numeric Code 200) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
PB or GAIN	201	Proportional Band or Gain		PB = 0.1% to 1000% Gain = 0.01 to 1000	10.00 -
RATE T	202	Rate in Minutes		0.00 to 10.00 minutes 0.08 or less = OFF	0.00
I MIN **or** **I RPM**	203	Reset in minutes/repeat Reset in repeats/minute		0.02 to 50.00 0.02 to 50.00	- 1.20
MANRST	204	Manual Reset		-100% to 100% Output	0
PB 2 or GAIN 2	205	Proportional Band 2 or Gain 2		PB = 0.1% to 1000% Gain = 0.01 to 1000	5.00
RATE2T	206	Rate 2 in Minutes		0.00 to 10.00 minutes 0.08 or less = OFF	0.20
I2 MIN **or** **I2 RPM**	207	Reset in minutes/repeat Reset in repeats/minute		0.02 to 50.00 0.02 to 50.00	- 1.30

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
CYC T1 or CT1X3	208	Cycle Time (Heat) *Cycle times are in either second or 1/3 second increments depending upon the configuration of RLY TYP in the "Algorithm" Set Up group.*		1 to 120	10
CYC2T2 or CT2 X3	209	Cycle Time (Cool) *Cycle times are in either second or 1/3 second increments depending upon the configuration of RLY TYP in the "Algorithm" Set Up group.*		1 to 120	10
SECUR	210	Security Code		0 to 4095	0
LOCK	211	Lockout	0 1 2 3 4	NONE CAL CONF VIEW ALL	CAL
AUTOMA	212	Auto/Manual Key Lockout	0 1	DIS ENAB	ENAB
A TUNE	213	Autotune Key Lockout	0 1	DIS ENAB	ENAB
RN HLD	214	Run/Hold Key Lockout	0 1	DIS ENAB	ENAB
SP SEL	215	Setpoint Select Function Lockout	0 1	DIS ENAB	ENAB

6.3 SP Ramp Set Up Group

Introduction

A *single setpoint ramp* [**SPRAMP**] can be configured to occur between the current local setpoint and a final local setpoint over a time interval of from 1 to 255 minutes.

SPRATE lets you configure a *specific rate of change* for any local setpoint change.

You can also configure a 12-segment program from a *Ramp/Soak profile*.

You can start and stop the ramp/program using the **RUN/HOLD** key.

PV Hot Start is standard and means that at power up, the setpoint is set to the current PV value and the Ramp or Rate or Program then starts from this value.

Function Prompts

Table 6-3 SPRAMP Group (Numeric Code 300) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
SP RAMP	301	Single Setpoint Ramp *Rate and Program must be disabled*	0 1	DIS ENAB	DIS
TI MIN	301	Single Setpoint Ramp Time		0 to 255 Minutes	3
FINLSP	302	Setpoint Ramp Final Setpoint		Enter a value within the setpoint limits	1000
PVSTRT	316	Program starts at PV value	0 1	DIS ENAB	ENAB
SPRATE	304	Setpoint Rate *Ramp and Program must be disabled*	0 1	DIS ENAB	DIS
EUHRUP	305	Rate Up		0 to 9999 in Engineering units per hour	0
EUHRDN	306	Rate Down		0 to 9999 in Engineering units per hour	0

6.4 Accutune Set Up Group

Introduction

Accutune II automatically calculates GAIN, RATE, and RESET TIME (PID) tuning constants for your control loop. When initiated on demand, the Accutune algorithm measures a process step response and automatically generates the PID tuning constants needed for no overshoot on your process.

Fuzzy Overshoot Suppression, when enabled, will suppress or eliminate any overshoot that may occur as a result of the existing tuning parameters, as the PV approaches the setpoint.

Function Prompts

Table 6-4 ATUNE Group (Numeric Code 400) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
FUZZY	401	Fuzzy Overshoot Suppression	0 1	DIS ENAB	DIS
TUNE	402	Demand Tuning	0 1	DIS TUNE	TUNE
AT ERR	403	Accutune Error Codes (Read Only)	0 3 4 5	NONE IDFL ABRT RUN	- - -

6.5 Algorithm Set Up Group

Introduction

This data deals with various algorithms in the controller: Control algorithm, Output algorithm, Current Duplex Range, and Relay Cycle Time Increment.

Function Prompts

Table 6-5 ALGOR Group (Numeric Code 500) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
CTRALG	501	Control Algorithm	0 1 2 3 4	ONOF PIDA PIDB PDMR TPSC (3 position step)	PIDA
OUTALG	502	Output Algorithm	0 1 2 3 4 5 6 7	RLY (Time simplex Relay 1) RLY2 (Time simplex Relay 2) CUR (Current simplex) TPSC (3 Position step) RLYD (Time duplex) CURD (Current duplex) CURT (Current/time duplex) TCUR (Time/current duplex)	RLY
RLYTYP	504	Relay Cycle Time Increment	0 1	MECH (one sec. increments) S S (1/3 sec increments)	MECH

6.6 Input 1 Set Up Group

Function Prompts

Table 6-6 INPUT1 Group (Numeric Code 600) Function Prompts

Prompt		Description	Selection or Range of Setting				Factory Setting
English	Numeric Code		Numeric Code	English			
DECMAL	601	Decimal Point Selection	0 1 2	8888 (none) 888.8 88.88			8888
UNITS	602	Temperature Units	1 2 0	F C NONE			F
			Numeric	**English**	**Numeric**	**English**	
IN1TYP	603	Input 1 Actuation Type	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	B E H E L J H J L K H K L NNMH NNML N90H N90L NIC R S T H T L	17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 33	W H W L 100H 100L 200 500 RADH RADI 0-20 4-20 10m 50m 0-5 1-5 0-10 100m	K H
			Numeric	**English**	**Numeric**	**English**	
XMITR1	604	Transmitter Characterization	0 1 2 3 4 5 6 7 8 9 10 11 12	B E H E L J H J L K H K L NNMH NNML N90H N90L NIC R	13 14 15 16 17 18 19 20 21 22 23 24 25	S T H T L W H W L 100H 100L 200 500 RADH RADI LIN SrT	LIN

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
IN1 HI	605	Input 1 High Range Value		–999 to 9999 floating in engineering units	2400
IN1 LO	606	Input 1 Low Range Value		–999 to 9999 floating in engineering units	0.00
RATIO1	607	Ratio on Input 1		-20.0 to 20.0	1.0
BIAS 1	608	Bias on Input 1		-999 to 9999	0.0
FILTR1	609	Filter for Input 1		0 to 120 seconds 0 = No Filter	1
BRNOUT	610	Burnout Protection (Sensor Break)	0 1 2 3	NONE UP (Upscale) DOWN (Downscale) NOFS (No Failsafe)	UP
EMISS	611	Emissivity		0.01 to 1.00 (RADH & RADI only)	1.0
FREQ	612	Power Line Frequency	0 1	60 50	60
LNGUAG	614	Language Selection	0 1 2 3 4 5	ENGL FREN GERM SPAN ITAL NUMB (Numeric)	ENGL

6.7 Control Set Up Group

Introduction

The functions listed in this group deal with how the controller will control the process including: Number of Tuning Parameter Sets, Setpoint Source, Tracking, Power-up Recall, Setpoint Limits, Output Direction and Limits, Deadband, and Hysteresis.

Function Prompts

Table 6-7 CONTRL Group (Numeric Code 800) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
PIDSET	801	Number of Tuning Parameter Sets	0 1 2 3	ONE 2KBD (Keyboard) 2 PR (PV switch) 2 SP (SP switch)	ONE
SW VAL	802	Automatic Switchover Value		Value in engineering units within PV or SP range limits	0.00
LSP'S	803	Local Setpoint Source	0 1	ONE TWO	ONE
SP TRK	805	Setpoint Tracking	0 1 2	NONE PROC (LSP tracks PV–manual) RSP (N/A-do not use)	NONE
PWR UP	806	Power Up Controller Mode Recall	0 1 2 3 4	MAN (Manual/LSP/Failsafe) ALSP (Auto/last LSP) ARSP (N/A-Auto/last RSP) AMSP (Last mode/last SP) AMLS (Last mode/last LSP)	AMLS
PWROUT	807	TPSC (Three Position Step Control) Output Start-up Mode	0 1	LAST (Last output) FSAF (Failsafe output)	LAST
SP Hi	808	Setpoint High Limit		0 to 100 % of the PV range	2400
SP Lo	809	Setpoint Low Limit		0 to 100 % of the PV range	0.00
ACTION	810	Control Output Direction	0 1	DIR REV	REV

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
OUT Hi	811	High Output Limit		-5 to 105 % of Output (Current)	100.0
				0.0 to 100.0 % of Output (Relay)	
OUT Lo	812	Low Output Limit		-5 to 105 % of Output (Current)	0.0
				0.0 to 100.0 % of Output (Relay)	
D BAND	813	Deadband		-5 to 25.0 % (Time Duplex)	2.0
				0.5 to 5.0 % (3 position step)	
HYST	814	Hysteresis (Output Relay Only)		0.0 to 100.0 % of PV	0.5
FAILSF	815	Failsafe Output Value		0 to 100 %	0.0
	816			*For 3 Position Step*	
			0	0 (Closed position)	
			1	100 (Open position)	
FSMODE	817	Failsafe Mode	0	**No L** (Mode does not clear once unit goes to FS Output)	NO L
			1	**LACH** (Unit goes to manual and FS output)	
PBorGN	818	Proportional Band Units	0	GAIN	PB
			1	PB	
MINRPM	819	Reset Units	0	MIN	RPM
			1	RPM	

6.8 Options Set Up Group

Function Prompts

Table 6-8 Options Group (Numeric Code 900) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
AUXOUT	901	Auxiliary Output	0 1 2 3 4 5 6 7	DIS Disabled IN1 Input 1 IN2 Input 2 PROC Process Variable DEV Deviation OUT Output SP Setpoint LSP1 Local Setpoint 1	OUT
0 PCT	902	Auxiliary Output Low Scaling Factor		Value in Engineering Units	0.0
100 PCT	903	Auxiliary Output High Scaling Factor		Value in Engineering Units	100.0
DIG IN	904	Digital Input	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	None MAN To Manual LSP To Local SP 1 SP2 To Local SP 2 DIR Direct Control HOLD Hold SPP/SP Ramp PID2 PID Set 2 RUN Start a stopped SPP/SP Ramp Begn SPP Reset NO I Inhibit Integral MNFS Manual, Failsafe Output LOCK Keyboard Disable TIMR Start Timer TUNE Start Tune INIT Init SP to PV RSP Remote SP MNLT Latching Manual TRAK Output tracks Input 2	NONE
DI COM	905	Digital Input Combinations	0 1 2 3 4 5	DIS Disabled + PD2 PID Set 2 + DIR Direct + SP2 Set Point 2 + SP1 Set Point 1 + RUN Start SPP	DIS

6.9 Communications Set Up Group

Function Prompts

Table 6-9 Communications Group (Numeric Code 1000)

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
COMSTA	1001	Communications State	0 1 2	DIS Disabled R422 (N/A do not use) MODB (N/A do not use)	DIS

6.10 Alarms Set Up Group

Function Prompts

Table 6-10 ALARMS Group (Numeric Code 1100) Function Prompts

Prompt		Description	Selection or Range of Setting		Factory Setting
English	Numeric Code		Numeric Code	English	
AxSxVA **A1S1** **A1S2** **A2S1** **A2S2**	 1101 1102 1103 1104	Alarm Setpointx Value X = 1 or 2		within the range of the selected parameter or of the PV Span for Deviation configurations	90
AxSxTY **A1S1** **A1S2** **A2S1** **A2S2**	 1105 1106 1107 1108	Alarmx Setpointx Type X = 1 or 2	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	NONE No Alarm IN 1 Input 1 IN 2 Input 2 (do not use) PROC Process Variable DE Deviation OUT Output SHED Shed Com (do not use) E-ON Event ON (do not use) E-OF Event OFF (do not use) MAN Alarm on Manual RSP Remote (do not use) FSAF Failsafe P_RT PV Rate of Change DI Alarm on Digital Input DE II DEV Alarm SP2 based BRAK Loop break alarm	NONE
AxSxHL **A1S1** **A1S2** **A2S1** **A2S2**	 1109 1110 1111 1112	Alarmx Setpoint State X = 1 or 2	0 1	LOW Low Alarm HIGH High Alarm	HIGH
ALHYST	1113	Alarm Hysteresis		0.0 to 100.0 % of span or full output as appropriate	0.1
ALARM1	1114	Latching Alarm Output	0 1	NO L LACH	NO L
BLOCK	1115	Alarm Blocking	0 1 2 3	DIS Disable Blocking BK1 Block Alarm 1 only BK2 Block Alarm 2 only BK12 Blocks both Alarms	DIS

7 Appendix C - Configuration Record Sheet

Enter the value or selection for each prompt on this sheet so you will have a record of how your controller was configured.

Group Prompt	Function Prompt	Value or Selection	Factory Setting	Group Prompt	Function Prompt	Value or Selection	Factory Setting
TIMER	TIMER	_____	DIS	**ATUNE**	FUZZY	_____	DIS
	PERIOD	_____	0:01		TUNE	_____	TUNE
	START	_____	KEY		AT ERR	_____	---
	L DISP	_____	TREM				
	RESET	_____	KEY				
	INCRMT	_____	MIN				
TUNING	PB or GAIN	_____	10.00	**ALGOR**	CTRALG	_____	PIDA
	RATE T	_____	0.00		OUTALG	_____	RLY
	I MIN or I RPM	_____	1.20		RLYTYP	_____	MECH
	MANRST	_____	0				
	PB2 or GAIN 2	_____	5.00				
	RATE2T	_____	0.20				
	I2 MIN or I2 RPM	_____	1.30				
	CYCT1 or CT1X3	_____	10				
	CYC2T2orCT2X3	_____	10				
	SECUR	_____	0				
	LOCK	_____	CAL				
	AUTOMA	_____	ENAB				
	A TUNE	_____	ENAB				
	RN HLD	_____	ENAB				
	SP SEL	_____	ENAB				
SPRAMP	SPRAMP	_____	DIS	**INPUT1**	DECIMAL	_____	8888
	TI MIN	_____	3		UNITS	_____	F
	FINLSP	_____	1000		IN1TYP	_____	K H
	PVSTRT	_____	ENAB		XMITR1	_____	LIN
	SPRATE	_____	DIS		IN1 HI	_____	2400
	EUHRUP	_____	0		IN1 LO	_____	0.00
	EUHRDN	_____	0		RATIO1	_____	1.0
					BIAS 1	_____	0.0
					FILTR1	_____	1
					BRNOUT	_____	UP
					EMIS	_____	1.0
					FREQ	_____	60
					LNGUAG	_____	ENGL

Group Prompt	Function Prompt	Value or Selection	Factory Setting	Group Prompt	Function Prompt	Value or Selection	Factory Setting
CONTRL	PIDSET	_____	ONE	**COM**	ComSTA	_____	Disabl e
	SW VAL	_____	0.00				
	LSP'S	_____	ONE				
	SP TRK	_____	NONE				
	PWR UP	_____	AMLS				
	PWROUT	_____	LAST				
	SP Hi	_____	2400				
	SP Lo	_____	0.00				
	ACTION	_____	REV				
	OUT Hi	_____	100.0				
	OUT Lo	_____	0.0				
	D BAND	_____	2.0				
	HYST	_____	0.5				
	FAILSF	_____	0.0				
	FSMODE	_____	NO L				
	PBorGN	_____	PB				
	MINRPM	_____	RPM				
OPTIONS	AUXOUT	_____	OUT	**ALARMS**	A1S1VA	_____	90
	0 PCT	_____	0.0		A1S2VA	_____	90
	100 PCT	_____	100.0		A2S1VA	_____	90
	DIG IN	_____	NONE		A2S2VA	_____	90
	DIG COM	_____	DIS		A1S1TY	_____	NONE
					A1S1TY	_____	NONE
					A2S1TY	_____	NONE
					A2S2TY	_____	NONE
					A1S1HL	_____	HIGH
					A1S2HL	_____	HIGH
					A2S1HL	_____	HIGH
					A2S2HL	_____	HIGH
					ALHYST	_____	0.1
					ALARM1	_____	NO L
					BLOCK	_____	DIS

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