

UDC3300 Basic Model: DC330B User Manual

51-52-25-78

5/00

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About This Document

Abstract

This manual contains all the information that is needed to install, configure and operate the UDC3300 Universal Digital Controller. Further details on operation, troubleshooting or calibration can be found in the full UDC3300 product manual (request document number 51-52-25-55).

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

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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. |

Contents

| | |
|---|-----------|
| 1. INTRODUCTION..... | 1 |
| 1.1 Overview | 1 |
| 1.2 CE Conformity (Europe)..... | 1 |
| 1.3 Function Keys | 2 |
| 2. INSTALLATION | 3 |
| 2.1 Mounting | 3 |
| 2.2 Wiring | 4 |
| 3. CONFIGURATION | 19 |
| 3.1 Overview | 19 |
| 3.2 Configuration Procedure | 21 |
| 3.3 Loop 1 Tuning Parameters Set Up Group | 22 |
| 3.4 SP Ramp, SP Rate, or SP Programming Set Up Group..... | 24 |
| 3.5 Accutune Set Up Group | 26 |
| 3.6 Algorithm Data Set Up Group..... | 26 |
| 3.7 Output Algorithm Parameters Set Up Group | 28 |
| 3.8 Input 1 Parameters Set Up Group..... | 29 |
| 3.9 Input 2 Parameters Set Up Group..... | 30 |
| 3.10 Loop 1 Control Parameters Set Up Group | 31 |
| 3.11 Options Set Up Group..... | 33 |
| 3.12 Communications Set Up Group..... | 34 |
| 3.13 Alarms Set Up Group | 36 |
| 3.14 Display Parameters Set Up Group | 38 |
| 3.15 Calibration Group | 38 |
| 3.16 Status Group..... | 38 |
| 4. OPERATION | 39 |
| 4.1 How to Power Up the Controller | 39 |
| 4.2 Monitoring Your Controller | 39 |
| 4.3 Start-up Procedure..... | 42 |
| 4.4 Operating Modes..... | 43 |
| 4.5 Setpoints | 43 |
| 4.6 Using Two Sets of Tuning Constants | 44 |
| 4.7 Alarm Setpoints..... | 46 |

| | | |
|------------|--|-----------|
| 4.8 | Three Position Step Control Algorithm | 46 |
| 4.9 | Input Math Algorithms | 47 |
| 4.10 | Digital Input Option (Remote Switching)..... | 48 |
| 4.11 | Fuzzy Overshoot Suppression | 50 |
| 4.12 | Accutune | 50 |
| 4.13 | Entering a Security Code | 52 |
| 5. | SETPOINT RATE/RAMP/SOAK PROGRAM OPERATION | 53 |
| 5.1 | Setpoint Ramp Rate..... | 53 |
| 5.2 | Single Setpoint Ramp | 53 |
| 5.3 | Setpoint Ramp/Soak Programming Option | 55 |
| 6. | APPENDIX A – ENVIRONMENTAL AND OPERATING CONDITIONS | 63 |
| 7. | APPENDIX B – MODEL SELECTION GUIDE..... | 65 |
| 8. | APPENDIX C – CONFIGURATION RECORD SHEET | 67 |
| 9. | APPENDIX D – POSITION PROPORTIONAL CALIBRATION | 69 |
| 9.1 | Position Proportional Control Output Calibration | 69 |
| 10. | APPENDIX E – INPUT RANGES..... | 73 |

Tables

| | | |
|------------|--|----|
| Table 1-1 | Function of Keys | 2 |
| Table 2-1 | Permissible Wiring Bundling | 5 |
| Table 2-2 | Input 2 Jumper Selections | 9 |
| Table 2-3 | Control Relay Contact Information | 17 |
| Table 2-4 | Alarm Relay Contact Information | 17 |
| Table 3-1 | Configuration Procedure | 21 |
| Table 3-2 | Tuning Group Function Prompts | 22 |
| Table 3-3 | SP Ramp Function Prompts | 24 |
| Table 3-4 | Accutune Group Function Prompts | 26 |
| Table 3-5 | Algorithm Group Function Prompts | 26 |
| Table 3-6 | Output Algorithm Group Function Prompts | 28 |
| Table 3-7 | Input 1 Group Function Prompts | 29 |
| Table 3-8 | Input 2 Group Function Prompts | 30 |
| Table 3-9 | Control Group Function Prompts | 31 |
| Table 3-10 | Options Group Function Prompt | 33 |
| Table 3-11 | Communications Group Function Prompts | 34 |
| Table 3-12 | Alarms Group Function Prompts | 36 |
| Table 3-13 | Display Group Function Prompts | 38 |
| Table 4-1 | Lower Display Key Parameter Prompts | 40 |
| Table 4-2 | Error Messages | 41 |
| Table 4-3 | Procedure for Starting Up the Controller | 42 |
| Table 4-4 | Setpoint Selection Indication | 44 |
| Table 4-5 | Procedure for Selecting Two Sets of Tuning Constants | 44 |
| Table 4-6 | Procedure for Setting Switchover Values | 44 |
| Table 4-7 | Procedure for Setting Tuning Constant Values | 45 |
| Table 4-8 | Procedure for Switching PID SETS from the Keyboard | 45 |
| Table 4-9 | Procedure for Displaying or Changing the Alarm Setpoints | 46 |
| Table 4-10 | Procedure for Displaying the 3PSTEP Motor Position | 46 |
| Table 4-11 | Digital Input Option Action on Contact Closure | 48 |
| Table 4-12 | Digital Input Combinations “DIG IN1” or “DIG IN2” | 49 |
| Table 4-13 | Procedure for Starting TUNE (Demand) Tuning | 51 |
| Table 4-14 | Procedure for Using TUNE at Start-up for Duplex | 52 |
| Table 4-15 | Procedure to Enter a Security Code | 52 |
| Table 5-1 | Procedure for Running a Setpoint Ramp | 54 |
| Table 5-2 | Program Contents | 56 |
| Table 5-3 | Run/Monitor Functions | 60 |
| Table 9-1 | Calibration Procedure | 70 |

Figures

| | | |
|-------------|---|----|
| Figure 1-1 | Operator Interface Displays and Indicators | 1 |
| Figure 2-1 | Dimensions | 3 |
| Figure 2-2 | Mounting Method | 4 |
| Figure 2-3 | Composite Wiring Diagram | 6 |
| Figure 2-4 | Line Voltage Wiring | 7 |
| Figure 2-5 | Input #1/#2 Connections | 8 |
| Figure 2-6 | Electromechanical Relay Output – Model DC330X-EE-XXX | 9 |
| Figure 2-7 | Solid State (SS) Relay Output — Model DC33X-AA-XX | 10 |
| Figure 2-8 | 10-amp SS External Relay Output — Model DC330X-SS-XX | 10 |
| Figure 2-9 | Open Collector Output — Model DC330X-TT-XXX | 11 |
| Figure 2-10 | Current Output Current/Time Duplex, Time/Current Duplex, Position Proportional or Three Position Step Control | 12 |
| Figure 2-11 | Auxiliary Output and Three-Relay Output | 12 |
| Figure 2-12 | Position Proportional Output or Three Position Step—Models DC330X-EE-XXX-X2, DC330X-AA-XXX-X2 | 13 |
| Figure 2-13 | Auxiliary Output Connections— Models DC330X-XX-2XX, DC330X-XX-5XX | 14 |
| Figure 2-14 | Digital Inputs Connections—Model DC330X-XX-XX3 | 14 |
| Figure 2-15 | RS422/485/ASCII or Modbus Communications Option Connections | 15 |
| Figure 2-16 | Transmitter Power for 4-20 mA 2-wire Transmitter Using Open Collector Alarm 2 Output—Model DC330X-XT-XXX | 16 |
| Figure 2-17 | Transmitter Power for 4-20 mA 2-wire Transmitter Using Auxiliary Output—Model DC330X-XX-2XX or DC330X-XX-5XX | 16 |
| Figure 3-1 | Prompt Hierarchy | 19 |
| Figure 5-1 | Ramp/Soak Profile Example | 58 |
| Figure 5-2 | Program Record Sheet | 59 |

1. Introduction

1.1 Overview

The UDC 3300 is a microprocessor-based, stand-alone controller. It combines the highest degree of functionality and operating simplicity offered in a 1/4 DIN size controller.

With a typical accuracy of $\pm 0.20\%$ of span, the UDC 3300 is an ideal controller for regulating temperature and other process variables in numerous heating and cooling applications, in metal working, food, and pharmaceuticals, and testing and environmental work.

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.

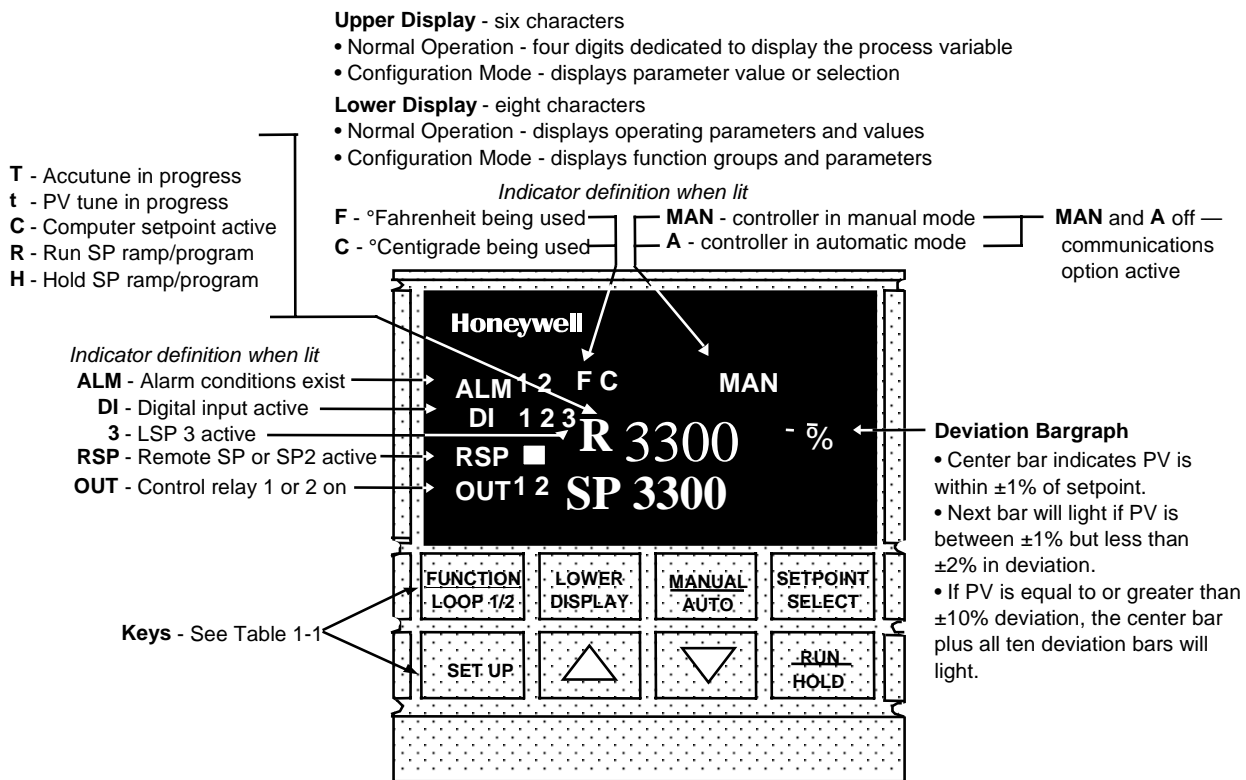


Figure 1-1 Operator Interface Displays and Indicators

1.3 Function Keys

Table 1-1 Function of Keys

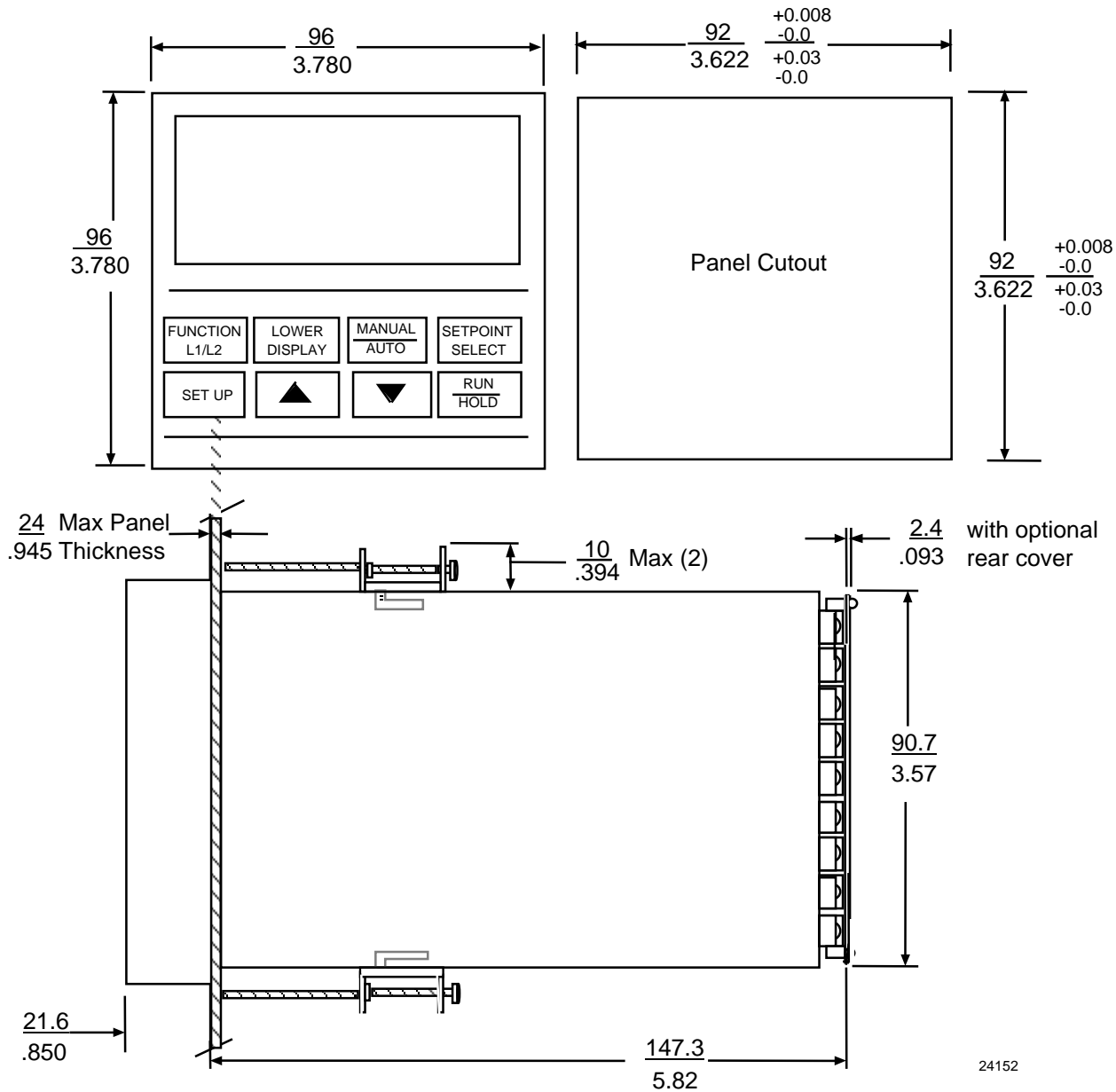
| Key | Function |
|-------------------------------------|---|
| SET UP | <ul style="list-style-type: none"> Places the controller in the Configuration Set Up group select mode. Sequentially displays Set Up groups and allows the FUNCTION key to display individual functions in each Set Up group. |
| <u>FUNCTION</u> LOOP 1/2 | Used in conjunction with the SET UP key to select the individual functions of a selected Configuration Set Up group. . |
| LOWER DISPLAY | Selects an operating parameter to be shown in the lower display. |
| <u>MANUAL</u> AUTO | Alternately selects AUTO or MAN. . |
| SETPOINT SELECT | Hold key down to cycle through configured setpoints. |
| <u>RUN</u> HOLD | <ul style="list-style-type: none"> Alternate action switch initiates or holds the Setpoint Ramp or Setpoint Program. Acknowledges a latched alarm 1. |
| ▲ | Increases the selected parameter value. |
| ▼ | Decreases the selected parameter value. |

2. Installation

2.1 Mounting

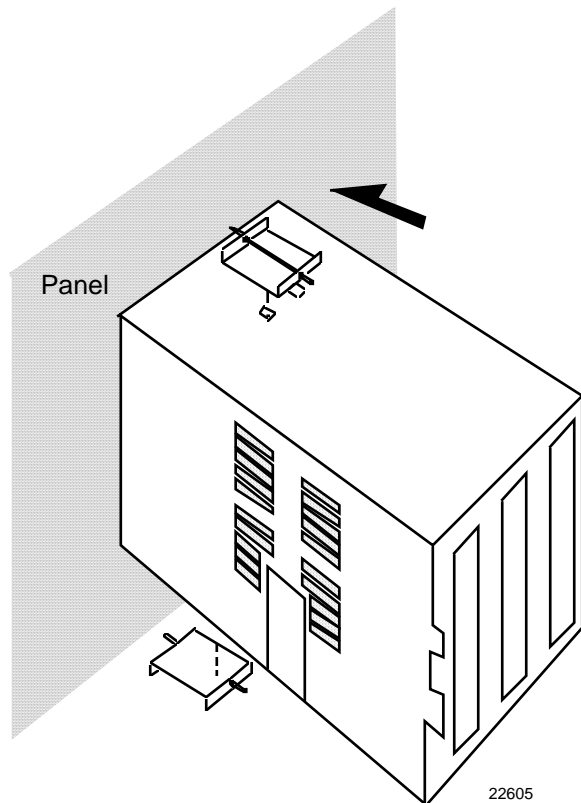
Physical Considerations

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.



Mounting Method

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



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.

Figure 2-2 Mounting Method

2.2 Wiring

Electrical Considerations/Precautions

The controller is considered “rack and panel mounted equipment” per EN 61010-1, 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.

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 mm²) copper conductor, is recommended.

Control/Alarm Circuit Wire Rating

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 Table 2-1.

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. Be sure to separate external wiring into bundles (see Table 2-1) and route the individual bundles through separate conduits or metal trays.

ATTENTION

For installation where high EMI/RFI noise cannot be avoided, we recommend you use shielded twisted pair wires for the signals in bundle 2.

Table 2-1 Permissible Wiring Bundling

| Bundle No. | Wire Functions |
|------------|---|
| 1 | <ul style="list-style-type: none"> • Line power wiring • Earth ground wiring • Control relay output wiring • Line voltage alarm wiring |
| 2 | Analog signal wire, such as: <ul style="list-style-type: none"> • Input signal wire (thermocouple, 4 to 20 mA, etc.) • 4-20 mA output signal wiring • Slidewire feedback circuit wiring • Digital input signals • Communications |
| 3 | <ul style="list-style-type: none"> • Low voltage alarm relay output wiring • Low voltage wiring to solid state type control circuits |

Composite Wiring

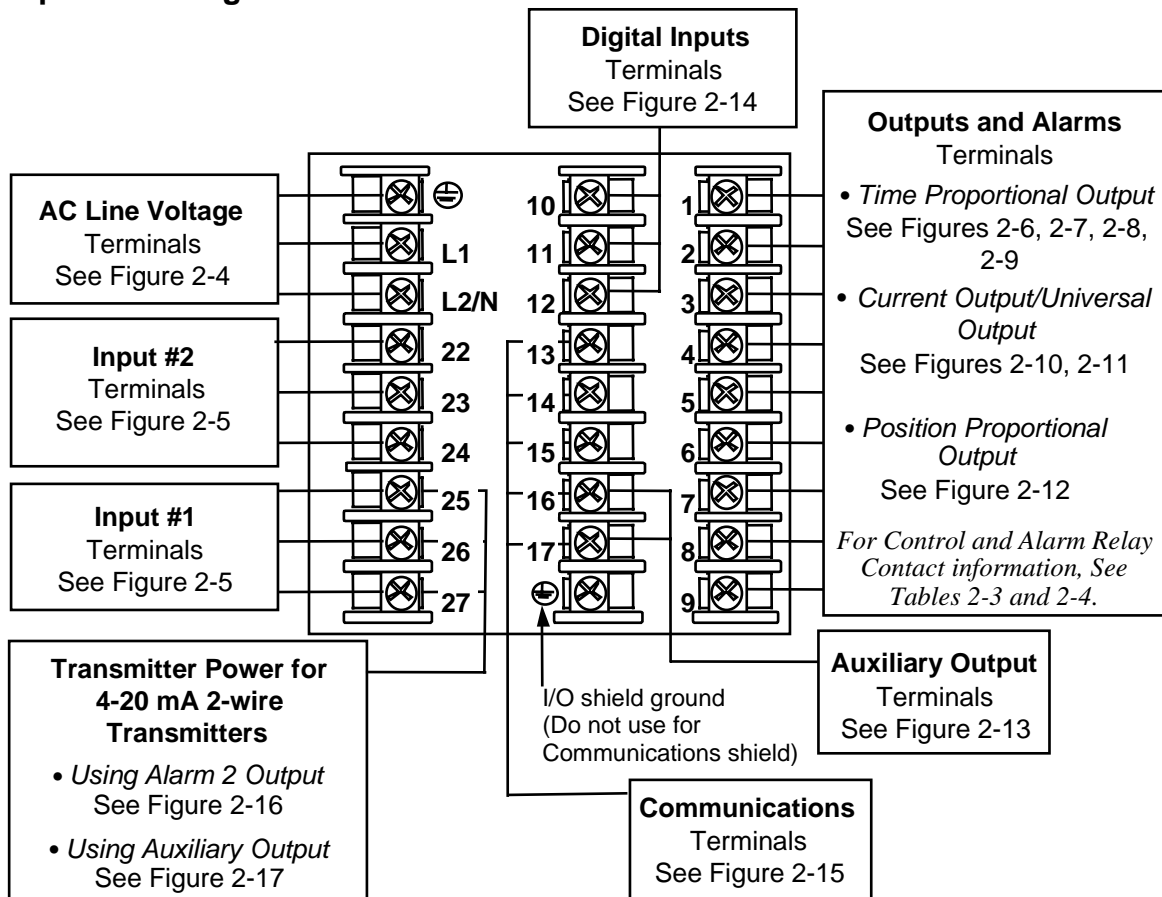


Figure 2-3 Composite Wiring Diagram

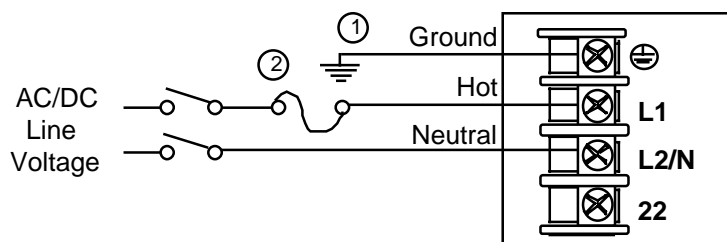
Line Voltage Wiring

This equipment is suitable for connection to 90-264 Vac or 24 Vac/dc, 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) 1/2 A, 250 V fuse(s) or circuit-breaker for 90-264 V; or 1 A, 125 V fuse or circuit breaker for 24 Vac/dc operation, as part of the installation. The switch or circuit-breaker should be located close to the controller, *within easy reach of the operator*. The switch or circuit-breaker should be marked as the disconnecting device for the controller (4 mm²).

CAUTION

Applying 90-264 Vac to a controller rated for 24 Vac/dc will severely damage the controller and is a fire and smoke hazard.

When applying power to multiple instruments, make sure that sufficient current is supplied. Otherwise, the instruments may not start up normally due to the voltage drop caused by the in-rush current.



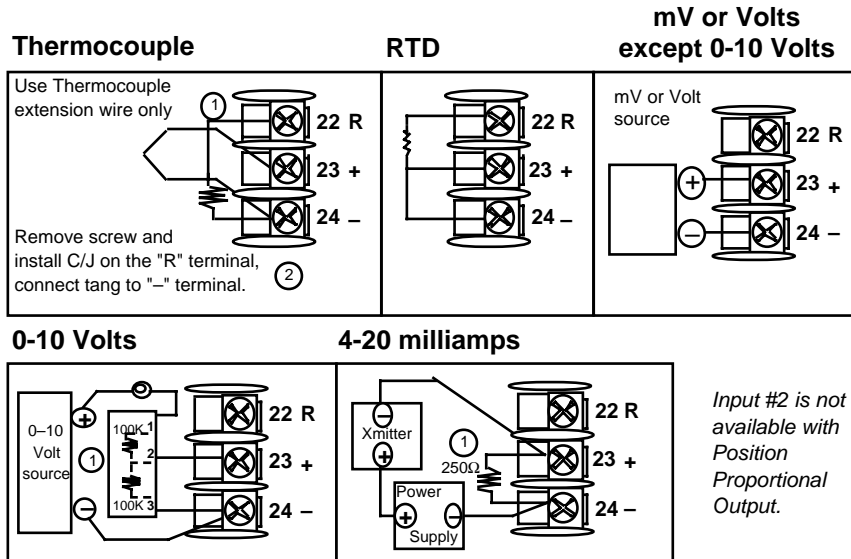
- ① PROTECTIVE BONDING (grounding) of this controller and the enclosure in which it is installed, shall be in accordance with National and local electrical codes. To minimize electrical noise and transients that may adversely affect the system, supplementary bonding of the controller enclosure to a local ground, using a No. 12 (4 mm²) copper conductor, is recommended.
- ② 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 for 90-264V; or 1A, 125V fuse or circuit breaker for 24 Vac/dc operation, as part of the installation.

Figure 2-4 Line Voltage Wiring

Input#1/Input #2

INPUT #2

Refer to Table 2-2 for Input 2 Jumper selections.



① The 250Ω load resistor for 4-20 mA or the voltage divider for 0-10 volts or the 500 ohm C/J compensation resistor is supplied with the controller when the input is specified. These items must be installed when you wire the controller before start-up.

INPUT #1 ③

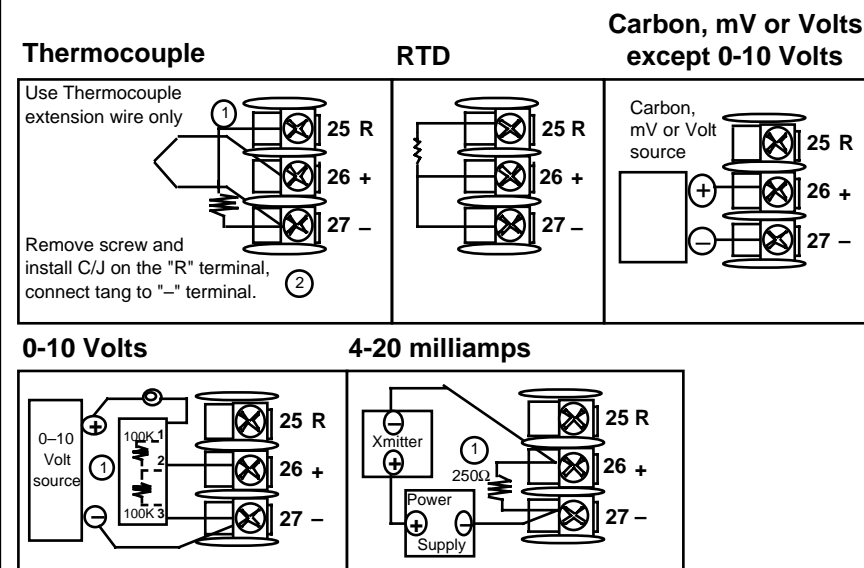


Figure 2-5 Input #1/#2 Connections

Input 2 Jumper

Table 2-2 Input 2 Jumper Selections

| | | | |
|------------------------------|-----------|---|--|
| Jumper Location | | | |
| Jumper Position | W1 | W2 | |
| Input Types Available | Slidewire | Thermocouple, RTD, mV, Radiamatic, Carbon, Oxygen, 4-20 mA, 0-20 mA, 1-5 V, 0-5 V | |

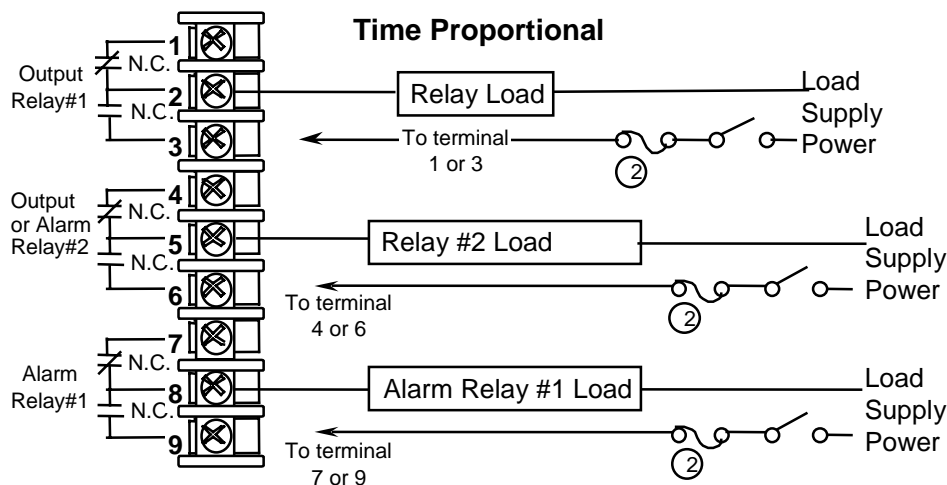
Time Proportional Output

The three types of Time Proportional outputs available on the UDC 3300 are shown in the following figures.

The Alarm wiring connections are the same for all three outputs.

For Control and Alarm Relay Contact information, see Table 2-3 and Table 2-4.

Figure 2-6 shows the Output and Alarm wiring connections for models with Electromechanical Relay Output.

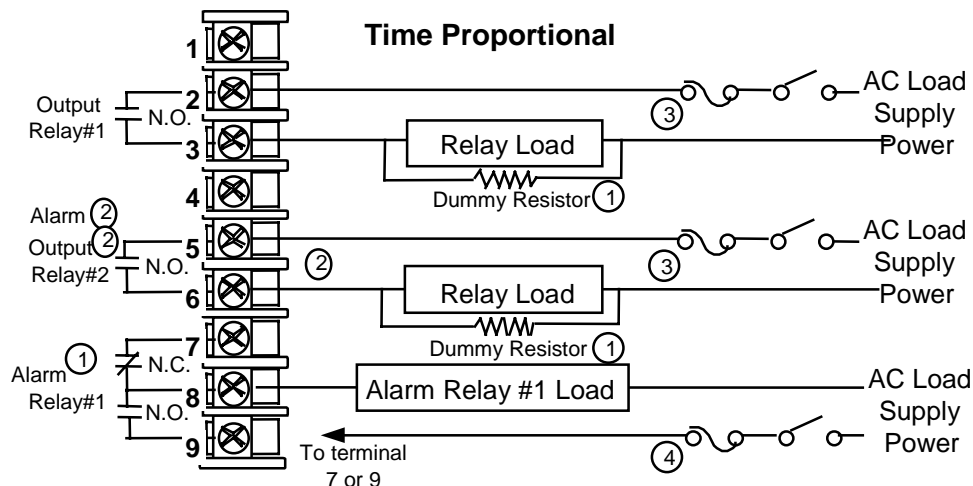


① Alarm #2 is not available with Time Proportional Duplex or Three Position Step Control or Position Proportional Control or Current/Time Duplex.

② Electromechanical relays are rated at 5 Amps @ 120Vac or 30 Vdc and 2.5 Amps at 240 Vac.

Customer should size fuses accordingly. Use FastBlo fuses only.

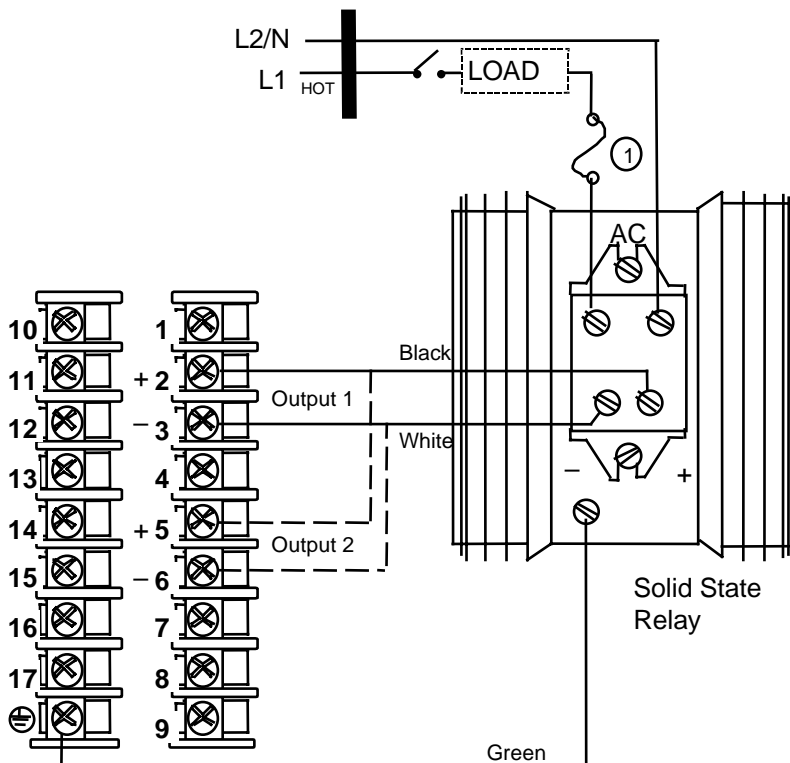
Figure 2-6 Electromechanical Relay Output – Model DC330X-EE-XXX



- ① If the load current is less than the minimum rated value of 20mA, there may be a residual voltage across both ends of the load even if the relay is turned off. Use a dummy resistor as shown to counteract this. The total current through the resistor and the load current must exceed 20mA.
- ② Alarm #2 not available with Time Proportional Duplex or Three Position Step Control or Position Proportional control.
- ③ Solid State relays are rated at 0.5 amps. Customer should size fuses accordingly. Use FastBlo fuses only.
- ④ Electromechanical relays are rated at 5 Amps @ 120 Vac or 30 Vdc and 2.5 Amps at 240 Vac. Customer should size fuses accordingly. Use Fast Blo fuses only.

WARNING: Only connect Vac to solid state relays.

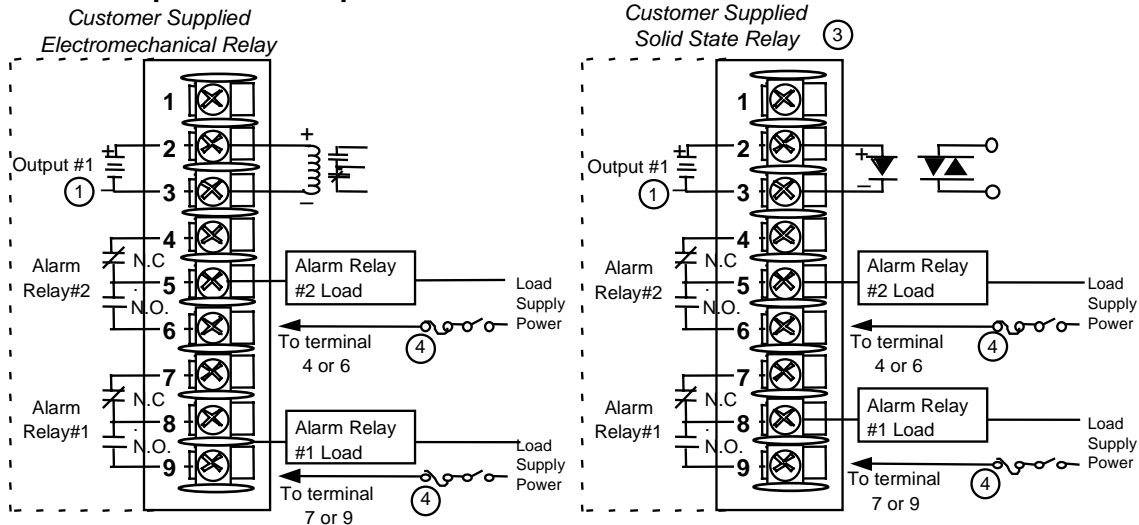
Figure 2-7 Solid State (SS) Relay Output — Model DC33X-AA-XX



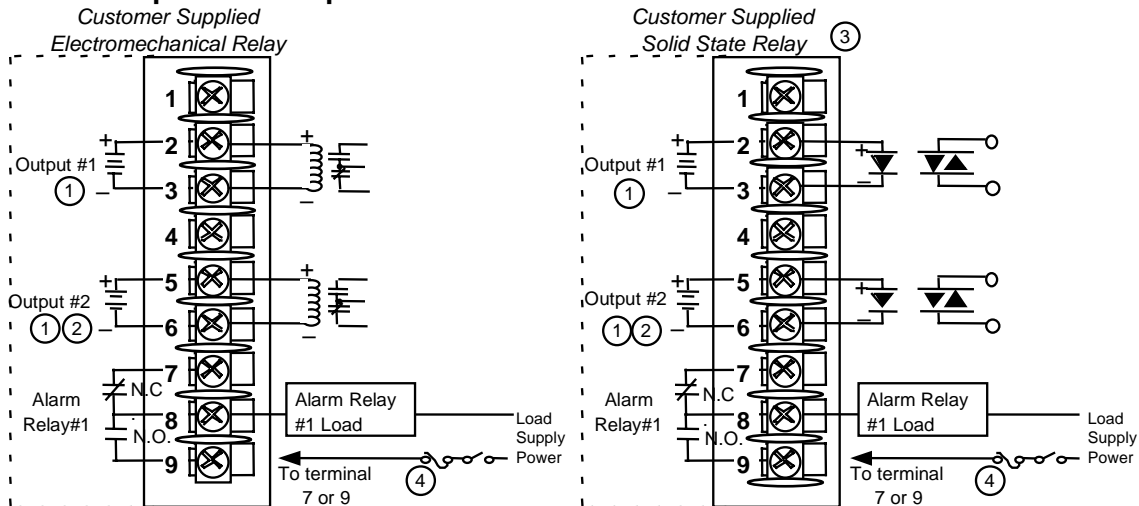
- ① External solid state relays are rated at 15 amps @ 25°C derated to 10 amps at 55°C. Customer should size fuses accordingly. Use Fast Blo fuses only.

Figure 2-8 10-amp SS External Relay Output — Model DC330X-SS-XX

Time Proportional Simplex



Time Proportional Duplex



- ① **CAUTION** Open collector outputs are internally powered. Connecting an external supply will damage the controller.
- ② Alarm #2 not available with Time Proportional Duplex or Three Position Step Control or Position Proportional control.
- ③ Can also use 10 amp solid state relay, Part Number 30756018-003
- ④ Electromechanical relays are rated at 5 Amps @ 120 Vac or 30 Vdc and 2.5 Amps at 240 Vac. Customer should size fuses accordingly. Use Fast Blo fuses only.

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Figure 2-9 Open Collector Output — Model DC330X-TT-XXX

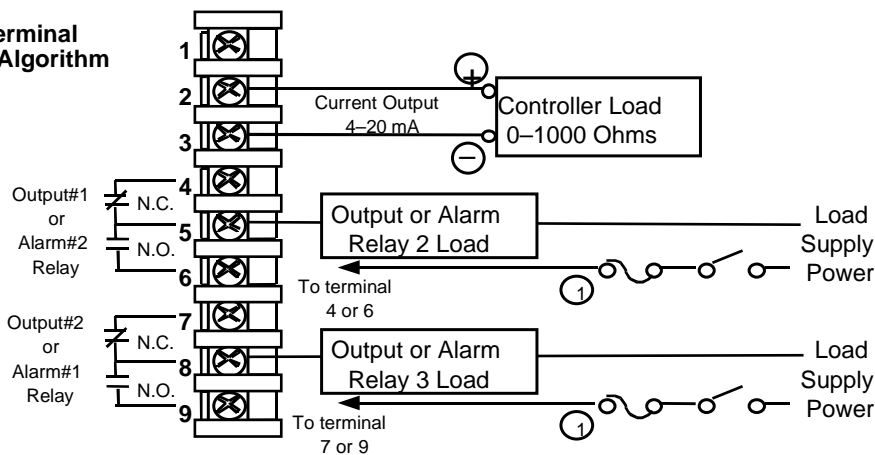
Current Output/Universal Output

Figure 2-10 shows the Output and Alarm wiring connections for models with Current Output and two-relay outputs (**Model DC330X-KE-XXX**).

See Table 2-3 for relay terminal connections for Output Algorithm selected.

For Duplex Current Output use Auxiliary Output for Output 2 (cool) (see Figure 2-14).

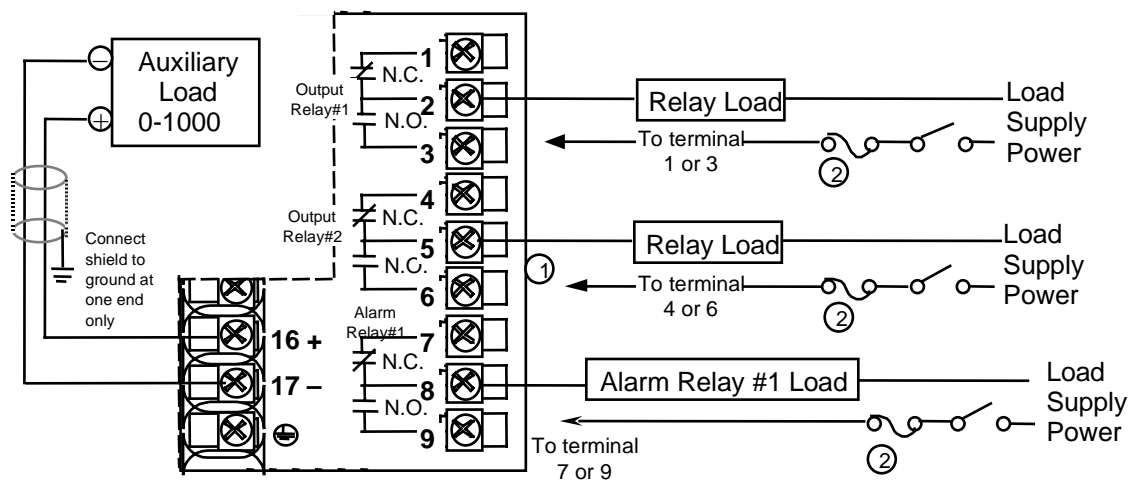
ATTENTION:
All current outputs are isolated from each other, case ground, and all inputs.



- ① Electromechanical relays are rated at 5 Amps @ 120 Vac or 2.5 Amps at 240Vac. Customer should size fuses accordingly. Use Fast Blo fuses only. Relays are NOT available on DC330X-C0-

Figure 2-10 Current Output Current/Time Duplex, Time/Current Duplex, Position Proportional or Three Position Step Control

Figure 2-11 shows the Output and Alarm wiring connections for models with a Current Output (Auxiliary Output) and three Relay Outputs (**Model DC330X-EE-2XX**).



- ① Alarm #2 is not available with Time Proportional Duplex or Three Position Step Control or Position Proportional Control.
- ② Electromechanical relays are rated at 5 Amps @ 120 Vac or 2.5 Amps at 240 Vac. Customer should size fuses accordingly. Use Fast Blo fuses only.

All current outputs are isolated from each other, case ground, and all inputs. 24160

Figure 2-11 Auxiliary Output and Three-Relay Output

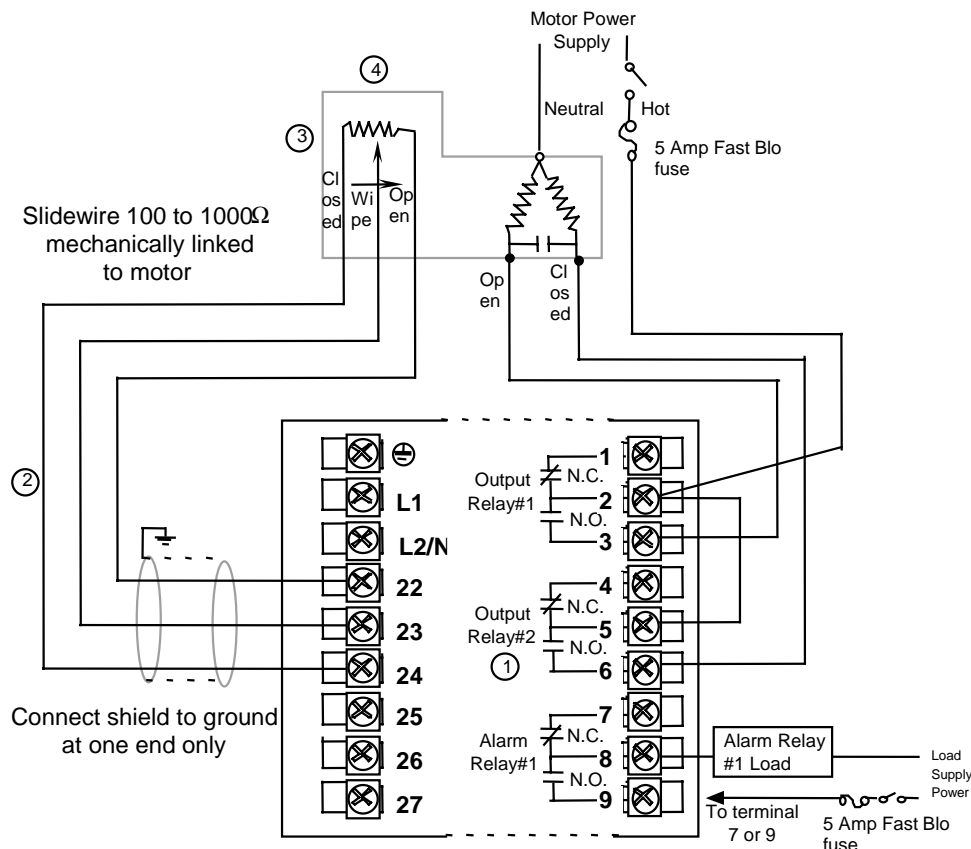
Position Proportional Output

Figure 2-12 shows models with Position Proportional Output (**Model DC330X-EE-XXX-X2**) or Three Position Step Control (**Model DC330X-AA-XXX-X2**).

Calibration

Position Proportional Output models must have the output calibrated after installation. (**See Appendix D.**)

Three Position Step models only require that the motor time be entered. Full calibration is not required.



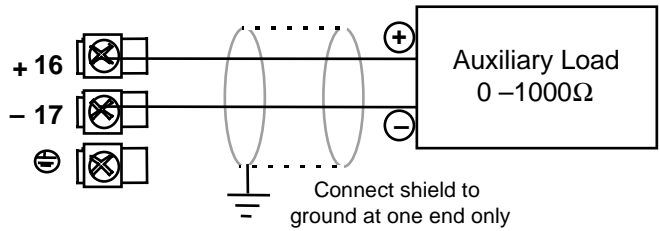
- ① Alarm #2 is not available with Position Proportional output or Three Position Step control.
- ② Do not run slidewire cable in the same conduit as AC power.
- ③ Electrical noise suppression may be required.
- ④ Slidewire input is not required for Three Position Step control but can be used for motor position indication.

**Figure 2-12 Position Proportional Output or Three Position Step—
Models DC330X-EE-XXX-X2, DC330X-AA-XXX-X2**

Auxiliary Output

For Duplex Current Output use Control Output for Output 1 (heat)

ATTENTION:
Both current outputs (control and auxiliary) are isolated from each other, case ground, and all inputs.



**Figure 2-13 Auxiliary Output Connections—
Models DC330X-XX-2XX, DC330X-XX-5XX**

Digital Inputs

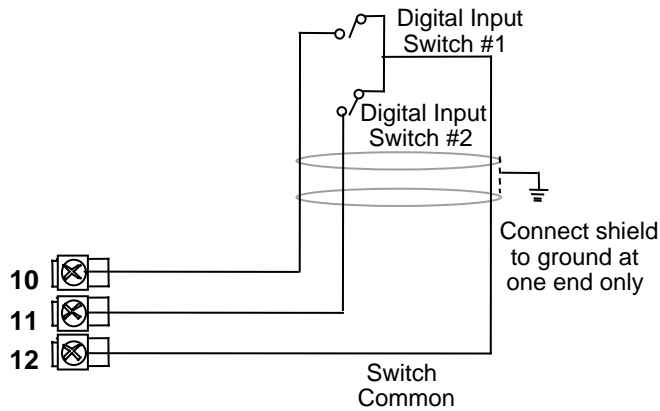


Figure 2-14 Digital Inputs Connections—Model DC330X-XX-XX3

Communications Option

The Communications option is available for RS422/485/ASCII or Modbus (**Model DC330X-XX-1XX or DC330X-XX-5XX**)—refer to Figure 2-15. Also refer to:

- Document #51-51-25-35 (RS422/485 ASCII) or
- Documents #51-52-25-66 and #51-52-25-70 (Modbus)

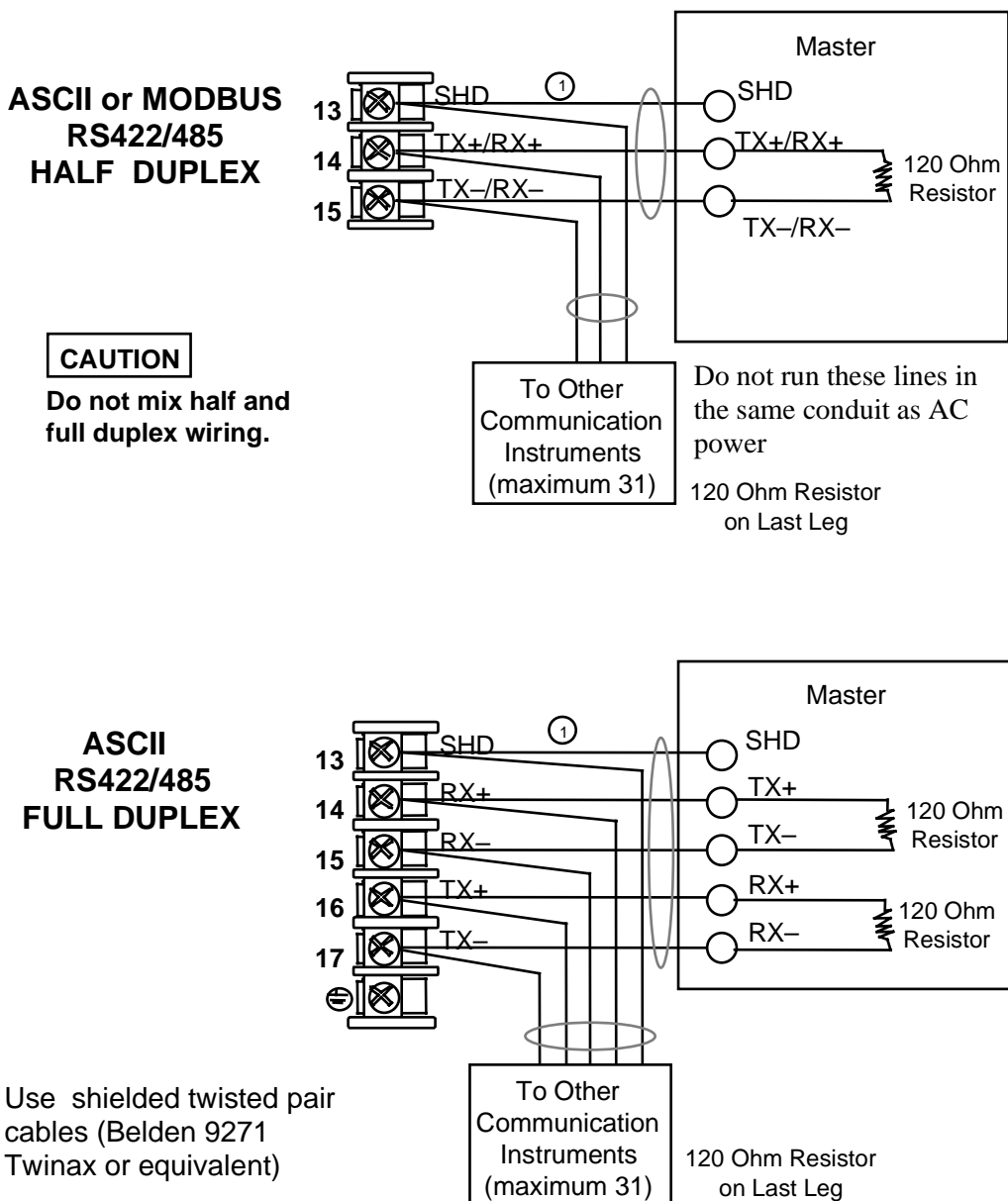


Figure 2-15 RS422/485/ASCII or Modbus Communications Option Connections

Transmitter Power for 4-20 mA 20 Wire Transmitter— Using Open Collector Alarm 2 Output

The wiring diagram example shown in Figure 2-16 (**Model DC330X-XT-XXX**) provides 30 Vdc at terminals 5 and 6 with the capability of driving up to 22 mA. If the transmitter terminal voltage must be limited to less than 30 volts, you can insert a zener diode between the positive transmitter terminal and terminal 5. For example, an IN4733A zener diode will limit the voltage at the transmitter to 25 Vdc.

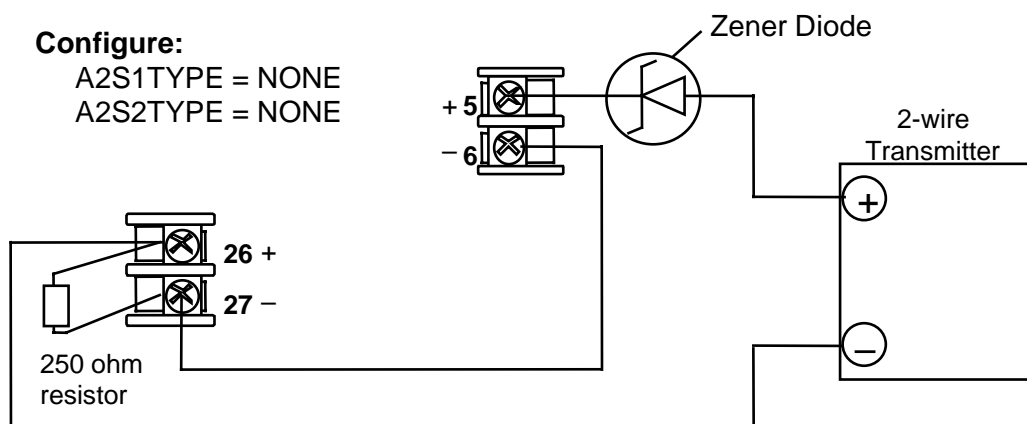


Figure 2-16 Transmitter Power for 4-20 mA 2-wire Transmitter Using Open Collector Alarm 2 Output—Model DC330X-XT-XXX

Transmitter power for 4-20 mA 20 wire Transmitter—Using Auxiliary Output

The wiring diagram example shown in Figure 2-17 (**Model DC330X-XX-2XX or DC330X-XX-5XX**) provides 30 Vdc at terminal 16 with the capability of driving up to 22 mA.

If the transmitter terminal voltage must be limited to less than 30 volts, you can insert a zener diode between the positive transmitter terminal and terminal 16. For example, an IN4733A zener diode will limit the voltage at the transmitter to 25 Vdc.

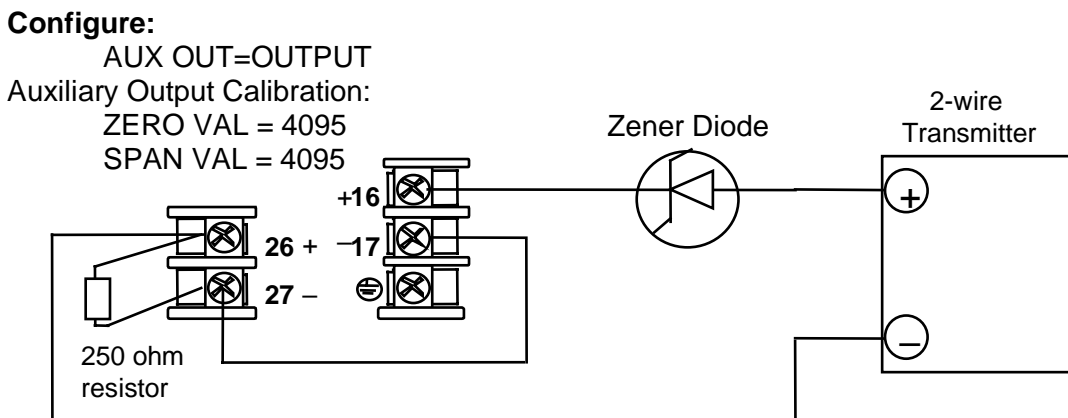


Figure 2-17 Transmitter Power for 4-20 mA 2-wire Transmitter Using Auxiliary Output—Model DC330X-XX-2XX or DC330X-XX-5XX

Control Relays

ATTENTION

Control relays operate in the standard control mode: i.e., energized when output state is on.

Table 2-3 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

Alarms relays are designed to operate in a failsafe mode; i.e., 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 the unit loses power, the alarms will function.

Table 2-4 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 | |

3. Configuration

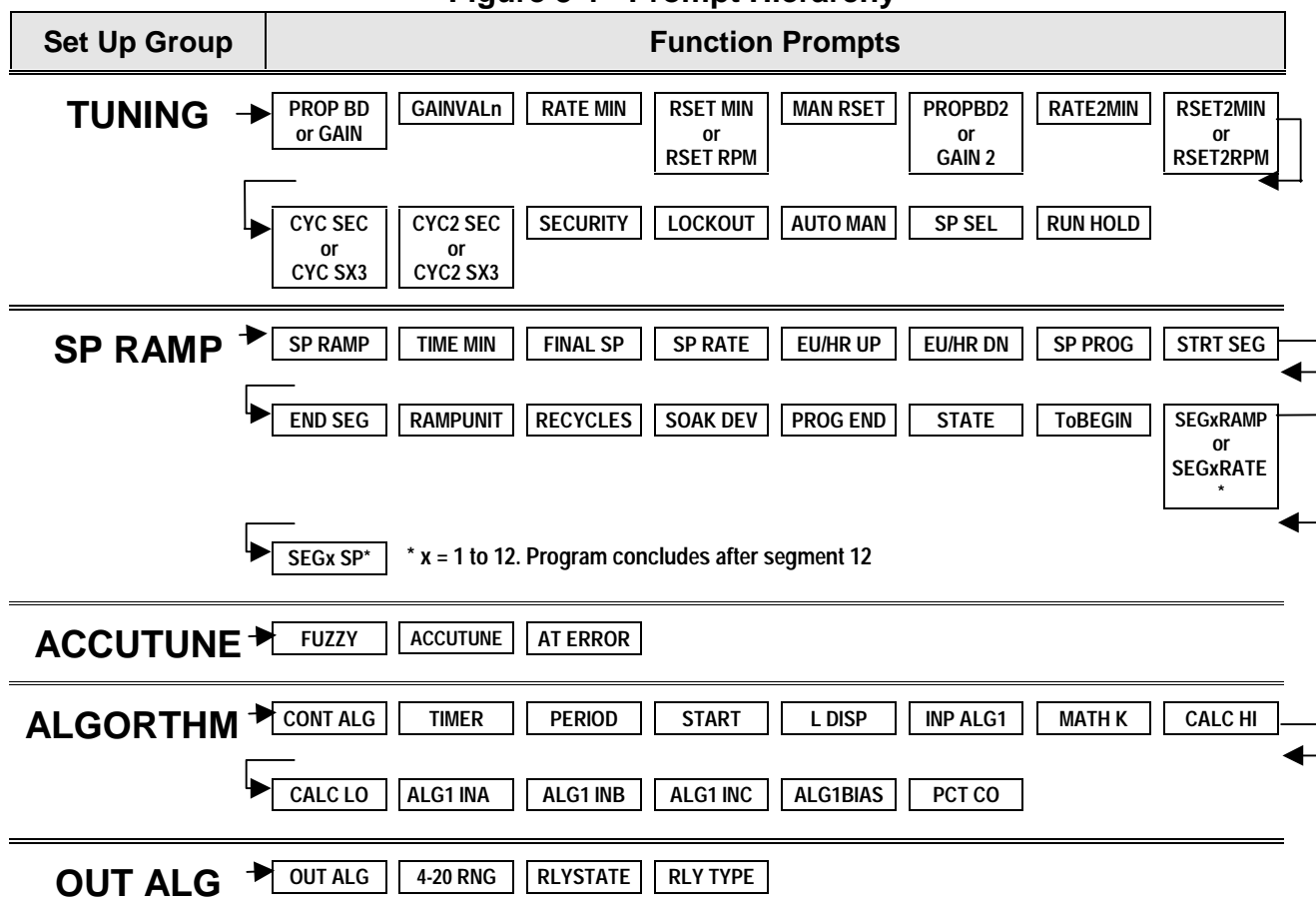
3.1 Overview

The controller is pre-configured at the factory for typical controller settings for a heating process except the input type and output algorithm must be configured to match your process. The controller must also be tuned. See subsection 4.12.

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 you will see, the configuration data is divided into 12 main Set Up groups plus prompts for calibration and prompts that show the status of the continuous background tests that are being performed.

Figure 3-1 Prompt Hierarchy



| Set Up Group | Function Prompts |
|----------------|--|
| INPUT 1 | <input type="checkbox"/> IN1 TYPE <input type="checkbox"/> XMITTER1 <input type="checkbox"/> IN1 HI <input type="checkbox"/> IN1 LO <input type="checkbox"/> RATIO 1 <input type="checkbox"/> BIAS IN1 <input type="checkbox"/> FILTER 1 <input type="checkbox"/> BURNOUT1 |
| | <input type="checkbox"/> EMISSIV1 |
| INPUT 2 | <input type="checkbox"/> IN2 TYPE <input type="checkbox"/> XMITTER2 <input type="checkbox"/> IN2 HI <input type="checkbox"/> IN2 LO <input type="checkbox"/> RATIO 2 <input type="checkbox"/> BIAS IN2 <input type="checkbox"/> FILTER 2 <input type="checkbox"/> BURNOUT2 |
| | <input type="checkbox"/> EMISSIV2 |
| CONTROL | <input type="checkbox"/> PV SOURC <input type="checkbox"/> PID SETS <input type="checkbox"/> SW VALUE <input type="checkbox"/> LSP'S <input type="checkbox"/> RSP SRC <input type="checkbox"/> AUTOBIAS <input type="checkbox"/> SP TRACK <input type="checkbox"/> PWR MODE |
| | <input type="checkbox"/> PWR OUT <input type="checkbox"/> SP HiLIM <input type="checkbox"/> SP LoLIM <input type="checkbox"/> ACTION <input type="checkbox"/> OUT RATE <input type="checkbox"/> PCT/M UP <input type="checkbox"/> PCT/M DN <input type="checkbox"/> OUTHILIM |
| | <input type="checkbox"/> OUTLoLIM <input type="checkbox"/> I Hi LIM <input type="checkbox"/> I Lo LIM <input type="checkbox"/> DROPOFF <input type="checkbox"/> DEADBAND <input type="checkbox"/> OUT HYST <input type="checkbox"/> FAILMODE <input type="checkbox"/> FAILSAFE |
| | <input type="checkbox"/> MAN OUT <input type="checkbox"/> AUTO OUT <input type="checkbox"/> PBoRGAIN <input type="checkbox"/> MINorRPM |
| OPTIONS | <input type="checkbox"/> AUX OUT <input type="checkbox"/> 4 mA VAL <input type="checkbox"/> 20mA VAL <input type="checkbox"/> DIG IN 1 <input type="checkbox"/> DIG1 COM <input type="checkbox"/> DIG IN 2 <input type="checkbox"/> DIG2 COM |
| COM | <input type="checkbox"/> ComSTATE <input type="checkbox"/> Com ADDR <input type="checkbox"/> SHEDENAB <input type="checkbox"/> SHEDTIME <input type="checkbox"/> PARITY <input type="checkbox"/> BAUD <input type="checkbox"/> DUPLEX <input type="checkbox"/> WSFLOAT |
| | <input type="checkbox"/> TXDELAY <input type="checkbox"/> SHEDMODE <input type="checkbox"/> SHEDSP <input type="checkbox"/> UNITS <input type="checkbox"/> CSP RATO <input type="checkbox"/> CSP BIAS <input type="checkbox"/> LOOPBACK |
| ALARMS | <input type="checkbox"/> A1S1 VAL <input type="checkbox"/> A1S2 VAL <input type="checkbox"/> A2S1 VAL <input type="checkbox"/> A2S2 VAL <input type="checkbox"/> A1S1TYPE <input type="checkbox"/> A1S2 TYPE <input type="checkbox"/> A2S1TYPE <input type="checkbox"/> A2S2TYPE |
| | <input type="checkbox"/> A1S1 H L <input type="checkbox"/> A1S1 EV <input type="checkbox"/> A1S2 H L <input type="checkbox"/> A1S2 EV <input type="checkbox"/> A2S1 H L <input type="checkbox"/> A2S1 EV <input type="checkbox"/> A2S2 H L <input type="checkbox"/> A2S2 EV |
| | <input type="checkbox"/> AL HYST <input type="checkbox"/> ALM OUT1 <input type="checkbox"/> BLOCK |
| DISPLAY | <input type="checkbox"/> DECIMAL <input type="checkbox"/> TEMPUNIT <input type="checkbox"/> PWR FREQ <input type="checkbox"/> RATIO 2 <input type="checkbox"/> LANGUAGE |
| CALIB | <input type="checkbox"/> USED FOR FIELD CALIBRATION |
| STATUS | <input type="checkbox"/> Verson <input type="checkbox"/> FAILSAFE <input type="checkbox"/> RAM TEST <input type="checkbox"/> CONFTEST <input type="checkbox"/> CALTEST <input type="checkbox"/> FACT CRC |

3.2 Configuration Procedure

Each of the Set Up groups and their functions are pre-configured at the factory. The factory settings are shown in Table 3-2 through Table 3-13. Follow the procedure in Table 3-1 if you want to make changes to any of these selections or values. Record your selections on the Configuration Record Sheet found in Appendix C.

Table 3-1 Configuration Procedure

| Step | Operation | Press | Result |
|------|-------------------------------|--|---|
| 1 | Select Set Up mode | SET UP | <i>Upper Display:</i> SET UP <i>Lower Display:</i> TUNING (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 | <i>Upper Display:</i> Shows the current value or selection for the first Function prompt of the selected Set Up group. <i>Lower Display:</i> Shows the first Function prompt within that Set Up group. Sequentially displays the other function prompts of the selected Set Up group. Stop at the function prompt that you want to change, then proceed to the next step. |
| 4 | Change the value or selection | ▲ or ▼ | Increments or decrements the value or selection that appears for the selected function. If the display flashes, you are trying to make an unacceptable entry. |
| 5 | Enter the value or selection | FUNCTION or SET UP | This key selects another Function prompt. This key selects another Set Up group. The value or selection you have made will be entered into memory after another key is pressed. |
| 6 | Exit Configuration | LOWER DISPLAY | Exits configuration mode and returns the controller to the same state it was in immediately preceding entry into the Set Up mode. It stores any changes you have made. |

3.3 Loop 1 Tuning Parameters Set Up Group

Table 3-2 Tuning Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|--|--|--|--------------------|
| PROP BD or GAIN | Proportional Band or Gain | 0.1 to 9999% 0.001 to 1000 | -- 1.000 |
| or GAINVALn | or Gain Value being used by Gain Scheduling when enabled | Read Only | -- |
| RATE MIN | Rate in Minutes | 0.00 to 10.00 minutes | 0.00 |
| RSET MIN or RSET RPM | Reset in minutes/repeat or Reset in repeats/minute | 0.02 to 50.00 | 1.00 -- |
| MAN RSET | Manual Reset | -100 to 100% output | 0 |
| PROPBD2 or GAIN 2 | Proportional Band 2 or Gain 2 | 0.1 to 9999% 0.001 to 1000 | -- 1.000 |
| RATE2MIN | Rate 2 in Minutes | 0.00 to 10.00 minutes | 0.00 |
| RSET2MIN or RSET2RPM | Reset 2 in minutes/repeat or Reset 2 in repeats/minute | 0.02 to 50.00 | 1.00 -- |
| CYC SEC or CYC SX3 | Cycle Time (Heat) | 1 to 120 | 20 |
| CYC2 SEC or CYC2 SX3 | Cycle Time (Cool) | 1 to 120 | 20 |
| SECURITY | Security Code | 0 to 4095 | 0 |

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|--------------------------------|---|-----------------|
| LOCKOUT | Configuration Lockout | NONE CALIB + CONF + VIEW MAX | CALIB |
| AUTO MAN | Manual/Auto Key Lockout | DISABL ENABLE | ENABLE |
| SP SEL | Setpoint Select Key Lockout | DISABL ENABLE | ENABLE |
| RUN HOLD | Run/Hold Key Lockout | DISABL ENABLE | ENABLE |

3.4 SP Ramp, SP Rate, or SP Programming Set Up Group

Table 3-3 SP Ramp Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|--|--|---|--------------------|
| <i>If SP Rate and SP Programming are disabled</i> | | | |
| SP RAMP | Single Setpoint Ramp Selection | DISABL ENABLE | DISABL |
| TIME MIN | Single Setpoint Ramp Time (SP Ramp enabled) | 0 to 255 minutes | 3 |
| FINAL SP | Single Setpoint Final Setpoint (SP Ramp enabled) | Enter a value within the setpoint limits. | 1000 |
| <i>If SP Ramp and SP Programming are disabled</i> | | | |
| SP RATE | Setpoint Rate | DISABL ENABLE | DISABL |
| EU/HR UP | Rate Up Value for Loop 1 (SP Rate enabled) | 0 to 9999 in engineering units per hour | 0 |
| EU/HR DN | Rate Down Value for Loop 1 (SP Rate enabled) | 0 to 9999 in engineering units per hour | 0 |
| <i>If SP Ramp and SP Rate are disabled</i> | | | |
| SP PROG* *requires SP Program option | Setpoint Ramp/Soak Programming | DISABL ENABLE SP PROG must be enabled to view the remaining prompts. | DISABL |
| STRT SEG | Start Segment Number | 1 to 11 (odd segment number only) | — |
| END SEG | End Segment Number | 2 to 12 Always end in a soak segment (2, 4, ... 12) | — |
| RAMPUNIT | Engineering Units for Ramp Segments | TIME (hours.minutes) EU/MIN (engineering units/minute) EU/HR (engineering units/hour) | TIME |
| RECYCLES | Number of Program Recycles | 0 to 99 recycles | — |

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|--------------------------------------|--|--|-----------------|
| SOAK DEV | Guaranteed Soak Deviation Value | 0 to 99 The number selected will be the PV value (in engineering units) above or below the setpoint outside of which the timer halts. | — |
| PROG END | Program Termination State | LASTSP (Hold at last setpoint in the program) F SAFE (Manual mode/Failsafe output) | — |
| STATE | Program State at Program End | DISABL HOLD | — |
| KEYRESET | Reset SP Program | DISABL TOBEGN RERUN | DISABL |
| HOT START | Hot Start | DISABL ENAB | DISABL |
| SEG1RAMP or SEG1RATE | Segment #1 Ramp Time or Segment #1 Ramp Rate | 0-99 hours.0-59 minutes Engineering units/minute or Engineering units/hour Select TIME, EU/MIN, or EU/HR at prompt RAMPUNIT. All ramps will use the same selection. | — |
| SEG2 SP | Segment #2 Soak Setpoint Value | Within the Setpoint limits | — |
| SEG2TIME | Segment #2 Soak Duration | 0-99 hours.0-59 minutes | — |
| SEG 3, 5, 7, 9 & 11 RAMP | Same as above | Selections are same as above. | — |
| SEG 3, 5, 7, 9, & 11 RATE | | | |
| SEG 4, 6, 8, 10 & 12 SP | | | |
| SEG 4, 6, 8, 10 & 12 TIME | | | |

3.5 Accutune Set Up Group

Table 3-4 Accutune Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|--------------------------------|---|--------------------|
| FUZZY | Fuzzy Overshoot Suppression | DISABL ENABLE | DISABL |
| ACCUTUNE | Accutune | DISABL TUNE (Demand Tuning) | DISABL |
| AT ERROR | Accutune Error Codes | Read Only RUNING (Accutune process in operation) NONE OUTLIM IDFAIL ABORT LOW PV | -- |

3.6 Algorithm Data Set Up Group

Table 3-5 Algorithm Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|-------------------------|--|--------------------|
| CONT ALG | Control Algorithm | ON-OFF PID A PID B PD+MR 3PSTEP | PID A |
| TIMER | Timer Enable/Disable | ENABLE DISABL | DISABL |
| PERIOD | Timeout Period | 00:00 to 99:59 | 00:01 |
| START | Start Initiation | KEY (Run/Hold key) ALARM2 | KEY |
| L DISP | Lower Display Selection | TI REM (time remaining) E time (elapsed time) | TI REM |

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | | Factory Setting |
|-------------------------------|--|---|---|-----------------|
| INP ALG1 | Input 1 Algorithm ATTENTION All Input Algorithms operate in engineering units except feedforward which operates in percent of output units. PV or RSP source in the Control Set Up group must be set to IN AL1. | NONE W AVG F FWRD FFWDMu CARB A CARB B | CARB C CARB D FCC DEW PT OXYGEN | NONE |
| MATH K | Weighted Average Ratio or K Constant for Math Selections | 0.001 to 1000 floating | | -- |
| CALC HI | Calculated Variable High Scaling Factor for Input Algorithm | -999. to 9999. floating (in engineering units) | | -- |
| CALC LO | Calculated Variable Low Scaling Factor for Input Algorithm | -999. to 9999. floating (in engineering units) | | -- |
| ALG1 INA | Input Algorithm 1 Input A Selection | INP 1 INP 2 LP1OUT IN AL1 | | -- |
| ALG1 INB | Input Algorithm 1 Input B Selection | INP 1 INP 2 LP1OUT IN AL1 | | -- |
| ALG1 INC | Input Algorithm 1 Input C Selection | NONE INP 1 INP 2 LP1OUT IN AL1 | | -- |
| PCT CO | Percent Carbon Monoxide | 0.020 to 0.350 (fractional percent of CO) | | 0.200 |
| ALG1BIAS | Input Algorithm 1 Bias | -999 to 9999 floating (in engineering units) | | 0.000 |

3.7 Output Algorithm Parameters Set Up Group

Table 3-6 Output Algorithm Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | | Factory Setting |
|----------------------------------|-----------------------------------|---|---|-----------------|
| OUT ALG | Loop 1 Output Algorithm | TIME CURRNT POSITN TIME D CUR D CUR TI TI CUR | Time Simplex Current Simplex Position Proportional Time Duplex Current Duplex Current /Time Duplex Time/Current Duplex | CURRNT |
| 4-20 RNG | Current Duplex Range | 100PCT 50 PCT | | 100PCT |
| RLYSTATE | Digital Output State at 0% Output | 1OF2OF 1ON2OF 1OF2ON 1ON2ON | (Output relays 1 and 2 are both de-energized) (Output relay 1 is energized, output relay 2 is de-energized) (Output relay 1 is de-energized, output relay 2 is energized) (Output relays 1 and 2 are both energized) | 1OF2ON |
| RLY TYPE | Relay Cycle Time Increments | MECHAN SOL ST | (Cycle time in one second increments) (Cycle time in 1/3 second increments: 1 = .33 seconds, 120 = 40 seconds) | MECHAN |

3.8 Input 1 Parameters Set Up Group

Table 3-7 Input 1 Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | | Factory Setting |
|----------------------------------|---|--|---------------|-----------------|
| IN1 TYPE | Input 1 Actuation Type <i>For Input Range Minimum and Maximum see Appendix E</i> | DISABL | W TC H | 0-10mV |
| | | B TC | W TC L | |
| | | E TC H | 100 PT | |
| | | E TC L | 100 LO | |
| | | J TC H | 200 PT | |
| | | J TC L | 500 PT | |
| | | K TC H | RAD RH | |
| | | K TC L | RAD RI | |
| | | NNM H | 0-20mA | |
| | | NNM L | 4-20mA | |
| | | NM90 H | 0-10mV | |
| | | NM90 L | 0-50mV | |
| | | NIC TC | 0-5 V | |
| | | R TC | 1-5 V | |
| | | S TC | 0-10 V | |
| | | T TC H | CARBON | |
| | | T TC L | OXYGEN | |
| XMITTER1 | Transmitter Characterization | B TC | S TC | LINEAR |
| | | E TC H | T TC H | |
| | | E TC L | T TC L | |
| | | J TC H | W TC H | |
| | | J TC L | W TC L | |
| | | K TC H | 100 PT | |
| | | K TC L | 100 LO | |
| | | NNM H | 200 PT | |
| | | NNM L | 500 PT | |
| | | NM90 H | RAD RH | |
| | | NM90 L | RAD RI | |
| NIC TC | LINEAR | | | |
| R TC | SQROOT | | | |
| IN1 HI | Input 1 High Range Value (Linear Inputs only) | -999. to 9999. floating (in engineering units) | | 1000 |
| IN1 LO | Input 1 Low Range Value (Linear Inputs only) | -999. to 9999. floating (in engineering units) | | 0 |
| RATIO 1 | Input 1 Ratio | -20.00 to 20.00 (floats to 3 decimal places) | | 1.000 |
| BIAS IN1 | Input 1 Bias | -999. to 9999. (in engineering units) | | 0 |
| FILTER 1 | Input 1 Filter | 0 to 120 seconds | | 1 |
| BURNOUT1 | Burnout Protection | NONE UP | DOWN NO_FS | NONE |
| EMISSIV1 | Emissivity | 0.01 to 1.00 | | 0.00 |

3.9 Input 2 Parameters Set Up Group

Table 3-8 Input 2 Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | | | Factory Setting |
|----------------------------------|---|--|---------------|--------|-----------------|
| IN2 TYPE | Input 2 Actuation Type <i>For Input Range Minimum and Maximum see Appendix E</i> | DISABL | NM90 L | 500 PT | 0-10mV |
| | | B TC | NIC TC | RAD RH | |
| | | E TC H | R TC | RAD RI | |
| | | E TC L | S TC | 0-20mA | |
| | | J TC H | T TC H | 4-20mA | |
| | | J TC L | T TC L | 0-10mV | |
| | | K TC H | W TC H | 0-50mV | |
| | | K TC L | W TC L | 0-5 V | |
| | | NNM H | 100 PT | 1-5 V | |
| | | NNM L | 100 LO | 0-10 V | |
| | | NM90 H | 200 PT | SLIDEW | |
| XMITTER2 | Transmitter Characterization | B TC | S TC | | LINEAR |
| | | E TC H | T TC H | | |
| | | E TC L | T TC L | | |
| | | J TC H | W TC H | | |
| | | J TC L | W TC L | | |
| | | K TC H | 100 PT | | |
| | | K TC L | 100 LO | | |
| | | NNM H | 200 PT | | |
| | | NNM L | 500 PT | | |
| | | NM90 H | RAD RH | | |
| | | NM90 L | RAD RI | | |
| | | NIC TC | LINEAR | | |
| | | R TC | SQROOT | | |
| IN2 HI | Input 2 High Range Value (Linear Inputs only) | -999. to 9999. floating (in engineering units) | | | 1000 |
| IN2 LO | Input 2 Low Range Value (Linear Inputs only) | -999. to 9999. floating (in engineering units) | | | 0 |
| RATIO 2 | Input 2 Ratio | -20.00 to 20.00 | | | 1.000 |
| BIAS IN2 | Input 2 Bias | -999. to 9999. (in engineering units) | | | 0 |
| FILTER 2 | Input 2 Filter | 0 to 120 seconds | | | 1 |
| BURNOUT2 | Burnout Protection | NONE UP | DOWN NO_FS | | NONE |
| EMISSIV2 | Emissivity | 0.01 to 1.00 | | | 0.00 |

3.10 Loop 1 Control Parameters Set Up Group

Table 3-9 Control Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|----------------------------|---|-----------------|
| PV SOURC | Process Variable Source | INP 1 IN AL1 INP 2 | INP 1 |
| PID SETS | Tuning Parameter Sets | 1 ONLY 2KEYBD 2PV SW 2SP SW | 1 ONLY |
| SW VALUE | Automatic Switchover Value | Value in engineering units within PV or SP range limits | 0.00 |
| LSP'S | Local Setpoint Source | 1 ONLY TWO THREE (Selection automatically disables RSP SRC) | 1 ONLY |
| RSP SRC | Remote Setpoint Source | NONE IN AL1 INP 2 | NONE |
| AUTOBIAS | Automatic Bias | ENABLE DISABL | DISABL |
| SP TRACK | Local Setpoint Tracking | NONE PV RSP | NONE |
| PWR MODE | Power Up Mode Recall | MANUAL A LSP A RSP AM SP AM LSP | MANUAL |
| PWR OUT | TPSC Output Start-up Mode | LAST F'SAFE | LAST |
| SP HiLIM | Setpoint High Limit | 0 to 100% of span input in engineering units | 1000 |
| SP LoLIM | Setpoint Low Limit | 0 to 100% of span input in engineering units | 0 |
| ACTION | Control Output Direction | DIRECT REVRSE | REVRSE |
| OUT RATE | Output Change Rate | ENABLE DISABL Does not apply to 3 Position Step Control algorithm. | DISABL |
| PCT/M UP | Output Rate Up Value | 0 to 9999% per minute | 0 |

Configuration

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|---|--|-----------------|
| PCT/M DN | Output Rate Down Value | 0 to 9999% per minute | 0 |
| OUTHILIM | High Output Limit | -5.0 to 105% of output | 100 |
| OUTLoLIM | Low Output Limit | -5.0 to 105% of output | 0.0 |
| I Hi LIM | High Reset Limit | Within the range of output limits | 100.0 |
| I Lo LIM | Low Reset Limit | Within the range of output limits | 0.0 |
| DROPOFF | Controller Dropoff Value | -5 to 105% of output | 0 |
| DEADBAND | Output Relay Deadband | <i>Time Duplex:</i> -5.0 to 25.0% <i>On/Off Duplex:</i> 0.0 to 25.0% <i>Position Prop. and 3P Step:</i> 0.5 to 5.0% | 1.0 |
| OUT HYST | Output Relay Hysteresis | 0.0 to 100.0% of PV Span for On/Off control. | 0.5 |
| FAILMODE | Failsafe Mode | NO LAT LATCH | NO LAT |
| FAILSAFE | Failsafe Output Value for all outputs except 3P Step | Set within the range of the output limits. 0 to 100% | 0.0 |
| | Failsafe Output Value for 3P Step | 0 PCT (motor goes to closed position) 100PCT (motor goes to open position) | -- |
| SW FAIL | PDMR/ Position Proportional Motor Position when Slidewire Fails | 0 PCT (motor goes to closed position) 100PCT (motor goes to open position) | -- |
| MAN OUT | Power-up Preset Output for Manual Output | Within the range of output limits | -- |
| AUTO OUT | Power-up Preset Output for Automatic Output | Within the range of output limits | -- |
| PBorGAIN | Proportional Band or Gain Units | PB PCT GAIN | GAIN |
| MINorRPM | Reset Units | RPM MIN | MIN |

3.11 Options Set Up Group

Table 3-10 Options Group Function Prompt

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | | Factory Setting |
|----------------------------------|--------------------------------------|---|---|-----------------|
| AUX OUT | Auxiliary Output One Loop Selection | DISABL INP 1 INP 2 PV DEV | OUTPUT SP LSP 1 CBOU IN AL1 | DISABL |
| 4mA VAL | Auxiliary Output Low Scaling Factor | Low scale value to represent 4 mA. Value in % for output, all others in engineering units. | | 0.0 |
| 20mA VAL | Auxiliary Output High Scaling Factor | High scale value to represent 20 mA. Value in % for output, all others in engineering units. | | 0 |
| DIG IN 1 | Digital Input 1 Selections | NONE TO MAN TO LSP TO 2SP TO 3SP TO DIR ToHOLD ToPID2 PV 2IN RERUN TO RUN ToBEGN STOP I | MAN FS ToLOCK ToAout TIMER AM STA ToTUNE SPinit TRACK1 TO RSP RST FB ToPURG LoFIRE MAN LT | NONE |
| DIG1 COM | Digital Input 1 Combinations | DISABL +PID2 +ToDIR | +ToSP2 +ToSP1 +RUN | DISABL |
| DIG IN 2 | Digital 2 Input Selections | Same as DIG IN 1 | | NONE |
| DIG2 COM | Digital Input 2 Combinations | Same as DIG1 COM | | DISABL |

3.12 Communications Set Up Group

If your controller does not have this option, the prompts will not appear.

Table 3-11 Communications Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | | Factory Setting |
|----------------------------------|--------------------------------|---|-----------------|-----------------|
| ComSTATE | Communications Option State | DISABL MB3K | MODBUS RS422 | DISABL |
| Com ADDR | Communications Station Address | 1 to 99 | | 0 |
| SHEDENAB | Shed Enable | DISABL ENABL | | DISABL |
| SHEDTIME | Shed Time | 0 to 255 sample periods (1 sample period = 0.333 seconds) 0 = No Shed | | 0 |
| PARITY | Parity | NONE ODD EVEN Fixed at NONE when ComSTATE = MODBUS | | ODD |
| BAUD | Baud Rate | 2400 4800 9600 19200 | | 2400 |
| DUPLEX | Duplex Operation | HALF FULL | | HALF |

ATTENTION

- When ComSTATE = MODBUS, this selection is fixed at HALF.
- When the RS422/485/Auxiliary output option board is installed, this selection is fixed at HALF.

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|--|---|-----------------|
| WS FLOAT | Word Swap Order | FP B Floating Point big endian FP BB Floating Point big endian with byte-swapped FP L Floating Point little endian FP LB Floating Point little endian with byte-swapped | |
| TX DELAY | Transmission Delay | 1 to 500 milliseconds | 1 |
| SHEDMODE | Shed Controller Mode and Output Level | LAST TO MAN FSAFE ToAUTO | LAST |
| SHEDSP | Shed Setpoint Recall | TO LSP TO CSP | TO LSP |
| UNITS | Communication Units | PERCNT ENG | PERCNT |
| CSP RATO | Loop 1 Computer Setpoint Ratio | -20.0 to 20.0 | 1.0 |
| CSP BIAS | Loop 1 Computer Setpoint Bias | -999. to 9999. (in engineering units) | 0 |
| LOOPBACK | Local Loop Back | DISABL ENABLE | DISABL |

3.13 Alarms Set Up Group

Table 3-12 Alarms Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|--|--|--------------------|
| A1S1 VAL | Alarm 1, Setpoint 1 Value | Value in Engineering Units | 90 |
| A1S2 VAL | Alarm 1, Setpoint 2 Value | Value in Engineering Units | 10 |
| A2S1 VAL | Alarm 2, Setpoint 1 Value | Value in Engineering Units | 95 |
| A2S2 VAL | Alarm 2, Setpoint 2 Value | Value in Engineering Units | 5 |
| A1S1TYPE | Alarm 1, Setpoint 1 Type | NONE INP 1 INP 2 PV (Process Variable) DEV (Deviation) OUTPUT SHED EV ON (Event On – SP Program) EV OFF (Event Off – SP Program) MANUAL REM SP (Remote Setpoint) F SAFE (Failsafe) PVRATE (PV Rate of Change) BREAK | NONE |
| A1S2TYPE | Alarm 1, Setpoint 2 Type | Same as A1S1TYPE | NONE |
| A2S1TYPE | Alarm 2, Setpoint 1 Type | Same as A1S1TYPE | NONE |
| A2S2TYPE | Alarm 2, Setpoint 2 Type | Same as A1S1TYPE | NONE |
| A1S1 H L | Alarm 1, Setpoint 1 State | LOW HIGH | HIGH |
| A1S1 EV | SP Programming Event Alarm State for Alarm 1, Setpoint 1 | BEGIN END | -- |
| A1S2 H L | Alarm 2, Setpoint 1 State | LOW HIGH | LOW |

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|--|--|-----------------|
| A1S2 EV | SP Programming Event Alarm State for Alarm 1, Setpoint 2 | BEGIN END | -- |
| A2S1 H L | Alarm 21, Setpoint 1 State | LOW HIGH | HIGH |
| A2S1 EV | SP Programming Event Alarm State for Alarm 2, Setpoint 1 | BEGIN END | -- |
| A2S2 H L | Alarm 2, Setpoint 2 State | LOW HIGH | LOW |
| A2S2 EV | SP Programming Event Alarm State for Alarm 2, Setpoint 2 | BEGIN END | -- |
| AL HYST | Alarm Hysteresis | 0.0 to 100.0% of output or span, as appropriate | 0.1 |
| ALM OUT1* | Latching Alarm for Output 1 | NO LAT LATCH | NO LAT |
| BLOCK | Alarm Blocking | DISABL BLOCK1 BLOCK2 BLK 12 | DISABL |

* For CE Conformity, Performance Criteria A, Select NO LAT

3.14 Display Parameters Set Up Group

Table 3-13 Display Group Function Prompts

| Function Prompt Lower Display | Function Name | Selections or Range of Setting Upper Display | Factory Setting |
|----------------------------------|--|---|-----------------|
| DECIMAL | Control Loop 1 Decimal Place | XXXX XXX.X XX.XX X.XXX ATTENTION Auto-ranging will occur to whichever decimal place has been selected. | XXXX |
| TEMPUNIT | Control Loop 1 Temperature Units | DEG F DEG C NONE | NONE |
| PWR FREQ | Power Frequency | 60 HZ 50 HZ | 60 HZ |
| RATIO 2 | Ratio for Input 2—Set from the front of the controller | DISABL ENABLE | DISABL |
| LANGUAGE | Display Language | ENGLIS FRENCH GERMAN SPANIS ITALAN | ENGLIS |

3.15 Calibration Group

The prompts used here are for field calibration purposes. Refer to *Section 7 - Calibration* in manual #51-52-25-55 for complete information and instructions.

3.16 Status Group

The prompts used here are read only. They are used to determine the reason for a controller failure. Refer to *Section 9 – Troubleshooting* in manual #51-52-25-55 for complete information.

4. Operation

4.1 How to Power Up the Controller

When the power is applied, the controller will run three diagnostic tests. All the displays will light and then the controller will go into automatic mode after 20 seconds.

If one or more of these tests fail, the controller will go to the Fail-safe Manual Mode, and “FAILSAFE” will flash in the lower display.

If the output type is Position Proportional, and AUTO-CAL has never been done, a prompt “CAL MTR” will appear suggesting that the controller be calibrated.
(See *Appendix D – Position Proportional Calibration.*)

Key Error

When a key is pressed and the prompt “KEY ERROR” 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, do keyboard test.

4.2 Monitoring Your Controller

Operator Interface

The indicators and displays on the operator interface let you see what is happening to your process and how the controller is responding. Figure 1-1 is a view of the operator interface. A description of the displays and indicators is included.

Decimal Point Position

None, one or two decimal places are indicated on configuration. When a single decimal position has been configured and values greater than 1000 are displayed, the right-most character is blank, but the decimal point will be lit.

Viewing the Operating Parameters

Press the LOWER DISPLAY key to scroll through the operating parameters listed in Table 4-1. The lower display will show only those parameters and their values that apply to your specific model and the way in which it was configured.

Table 4-1 Lower Display Key Parameter Prompts

| Indication | Description |
|------------------|---|
| OUT | OUTPUT #1—Output value is percent; for Three Position Step control, this is an estimated motor position when no slidewire exists. |
| SP | LOCAL SETPOINT #1—Also current setpoint when using SP Ramp. |
| 2SP | LOCAL SETPOINT #2 |
| 3SP | LOCAL SETPOINT #3 |
| RSP | REMOTE SETPOINT |
| 1IN | INPUT 1—Used only with combinational input algorithms. |
| 2IN | INPUT 2 |
| POS | SLIDEWIRE POSITION—Used only with TPSC. |
| CSP | COMPUTER SETPOINT—When SP is in override. |
| DEV | DEVIATION—Maximum negative display is –999.9. |
| PIDSETX | TUNING PARAMETER SET 1—Selected set for single loop or primary loop configuration where X is either 1 or 2. |
| ET XX.XX | ELAPSED TIME—Time that has elapsed on timer in Hours.Minutes. |
| TR XX.XX | TIME REMAINING—Time that remains on timer in Hours.Minutes |
| RAMPXXXM | SETPOINT RAMP TIME—Time remaining in the setpoint ramp in minutes. |
| O SK XXXX | Soak # and TIME REMAINING IN SOAK |
| AUX | AUXILIARY OUTPUT |
| SPn | SP RATE SETPOINT—Current setpoint for setpoint rate applications |
| BIA | BIAS—Displays the manual reset value for algorithm PD+MR. |
| TUNE OFF | LIMIT CYCLE TUNING NOT RUNNING—Appears when Accutune is disabled. |
| TUNE RUN | LIMIT CYCLE TUNING RUNNING—Appears when Accutune is enabled. |
| ToBEGIN | RESET SP PROGRAM TO BEGINNING OF FIRST SEGMENT |

Diagnostic Error Messages

The UDC 3300 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, only the one with the highest priority will appear on the lower display. A list of error messages is contained in Table 4-2. If any of these error messages occur, refer to *Section 9 – Troubleshooting* in manual #51-52-25-55 for information to correct the failure.

Table 4-2 Error Messages

| Prompt | Description |
|-----------------|--|
| EE FAIL | Unable to write to nonvolatile memory. |
| INP1FAIL | Two consecutive failures of input 1 integration. |
| INP2FAIL | Two consecutive failures of input 2 integration. |
| SW FAIL | Slidewire input failure. Position proportional control automatically switched to TPSC. |
| CONF ERR | Configuration Errors—Low limit greater than high limit for PV, SP, Reset, or Output. |
| SOOTING | Input Combination Errors—Percent Carbon falls outside of “sooting boundary.” |
| IN1 RNG | Input 1 Out-of-Range |
| IN2 RNG | Input 2 Out-of-Range |
| PV RNG | PV Out-of-Range $PV = (PV \text{ source} \times PV \text{ source ratio}) + PV \text{ source bias}$ |
| FAILSAFE | Failsafe Loop 1—Check inputs or configuration. |
| RV LIMIT | Remote Variable Out-of-Range $RV = (RV \text{ source} \times RV \text{ source ratio}) + RV \text{ source bias}$ |
| SEG ERR | Segment Error—SP Program starting segment number is less than ending segment number. |
| CAL MTR | Not calibrated. Perform Position Proportional calibration. |

4.3 Start-up Procedure

Table 4-3 Procedure for Starting Up the Controller

| Step | Operation | Press | Action |
|------|--------------------------|---|---|
| 1 | Select manual mode | <u>MANUAL</u> AUTO | until "MAN" indicator is ON. The controller is in manual mode. |
| 2 | Adjust the output | ▲ or ▼ | to adjust the output value and ensure that the final control element is functioning correctly. <i>Upper Display:</i> PV value <i>Lower Display:</i> OUT and the output value in % |
| 3 | Enter the local setpoint | LOWER DISPLAY ▲ or ▼ | <i>Upper Display:</i> PV Value <i>Lower Display:</i> 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. "R" appears in the upper display. |
| 4 | Select automatic mode | <u>MANUAL</u> AUTO | 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, if the controller is properly tuned. |
| 5 | Tune the controller | SET UP | Tuning will be required on the first startup. First enable "TUNE" selection in the Accutune Group. Refer to Tuning Set Up group to ensure that the proper selections for PROP BD or GAIN, RATE MIN, and RSET MIN, or RSET RPM have been entered. Use Accutune to tune the controller as follows: <ol style="list-style-type: none"> 1. Adjust setpoint to the desired value. 2. Switch to Automatic mode by pressing the MANUAL/AUTO key. 3. Initiate Tuning by: <ul style="list-style-type: none"> • Pressing the up arrow key when the lower display prompt shows TUNE-OFF, or • Pressing the LOWER DISPLAY and Up arrow keys simultaneously, or... • Using the Digital Input, if configured. If it is necessary to stop or abort the tuning process, press the MANUAL/AUTO key and the controller will return to manual mode. |

4.4 Operating Modes

The controller can operate in any of three basic modes:

- Manual
- Automatic with Local Setpoint
- Automatic with Remote Setpoint

4.5 Setpoints

You can configure the following setpoints for the UDC 3300 controller in the control group.

- A single local setpoint (SP)
- Two local setpoints (SP, 2SP)
- One local setpoint and one remote setpoint (SP, RSP)
- Three local setpoints (SP, 2SP, 3SP)
- Two local setpoints and one remote setpoint (SP, 2SP, RSP)

Changing Local Setpoint 1, 2 or 3

To scroll through the setpoint type menu, press and hold in the SETPOINT SELECT key. Release when the desired active setpoint selection is displayed.

ATTENTION

“KEY ERROR” will appear in the lower display if:

- You choose either local setpoint 2 or 3 or remote setpoint and your choice has not been configured as the setpoint source.
 - You attempt to change the setpoint while a Setpoint Ramp is enabled.
 - Setpoint Ramp rate will apply to Local SP changes, if enabled.
-

After changing a local setpoint value, if no other key is pressed, a minimum of 30 seconds time will elapse before the new value is stored in nonvolatile memory. If power is removed before this time, the new setpoint value is lost and the previous setpoint value is used at power up. If another key is pressed after changing the LSP value, then the value is stored immediately.

Setpoint Selection Indication

Table 4-4 Setpoint Selection Indication

| | Using Local Setpoint | Using Remote Setpoint | Using 2nd Local Setpoint | Using 3rd Local Setpoint |
|----------------------|---------------------------------|-------------------------------|--------------------------------------|--------------------------------------|
| | SP | RSP | 2SP | 3SP |
| Upper Display | PV and the PV value | PV and the PV value | PV and the PV value | PV and the PV value |
| Lower Display | SP and the Local Setpoint Value | RSP and Remote Setpoint Value | 2SP and the 2nd Local Setpoint Value | 3SP and the 3rd Local Setpoint Value |
| Annunciator | None | “■” lights | “■” lights | “3” lights |

4.6 Using Two Sets of Tuning Constants

Select Two Sets or Gain Scheduling

Table 4-5 Procedure for Selecting Two Sets of Tuning Constants

| Step | Operation | Press | Action |
|------|-----------------------------|--|--|
| 1 | Select Control Set Up group | SET UP | until you see SET UP in Upper Display and CONTROL in Lower Display. |
| 2 | Select PID SETS function | FUNCTION LOOP 1/2 ▲ or ▼ | until you see the function desired in the Upper Display and PID SETS in the Lower Display. to select the type of PID SET. |

Set Switchover Value

If you select 2PV SW or 2SP SW, you must set a value at which the sets will switch over. The procedure in Table 4-6 shows you how to set this value. ***This procedure assumes that you are still in the Control Set Up group from Table 4-5.***

Table 4-6 Procedure for Setting Switchover Values

| Step | Operation | Press | Action |
|------|----------------------------------|--|--|
| 1 | Select Switchover value function | FUNCTION LOOP 1/2 ▲ or ▼ | until you see the switchover value in the Upper Display and SW VALUE in the Lower Display. to select the switchover value in the upper display. |

Set Tuning Constant Values for Each Set

There are specific tuning constants that must be set for each set. The procedure below shows you how to access these constants and change their value.

Table 4-7 Procedure for Setting Tuning Constant Values

| 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 LOOP 1/2 | to successively display the available constants in the Lower Display. The value is displayed in the Upper Display. |
| | | ▲ or ▼ | To change the value of any of the above listed prompts in the lower display. |

Switch Between Two Sets via the Keyboard (Without Automatic Switchover)

This procedure is operational only if 2 PID SETS was configured at the Control Set Up group.

Table 4-8 Procedure for Switching PID SETS from the Keyboard

| Step | Operation | Press | Action |
|------|----------------------------|----------------------|---|
| 1 | Access the PID set display | LOWER DISPLAY | until you see the PV value displayed in the Upper Display and the PIDSETx in the Lower Display. |
| | | ▲ or ▼ | to change PIDSET1 to PIDSET2 or vice versa. You can use Accutune on each set. |

4.7 Alarm Setpoints

Procedure for Displaying the Alarm Setpoints

Table 4-9 Procedure for Displaying or Changing the 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 LOOP 1/2 ▲ or ▼ | 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 | LOWER DISPLAY | |

4.8 Three Position Step Control Algorithm

The Three Position Step Control algorithm (Loop 1 only) 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. Accutune **TUNE** operates with this algorithm.

Displaying the Motor Position

Table 4-10 Procedure for Displaying the 3PSTEP Motor Position

| Step | Operation | Press | Action |
|------|---------------------|----------------------|---|
| 1 | Access the displays | LOWER DISPLAY | until you see the PV Value in the Upper Display and either POS or OUT in the Lower Display. |

4.9 Input Math Algorithms

If selected via Math options, this controller has one input algorithm available. The algorithm can be configured to provide a derived (calculated) PV or a derived remote setpoint. Up to three inputs may be applied to the calculation.

Standard functionality:

- Basic models (DC330B) contain as standard: Weighted Average, Feedforward Summer, Feedforward Multiplier.

Input Algorithm Selections

Algorithm selections are made in *Section 3 – Configuration*. The following function prompt can be found in the Algorithm Set Up group:

IN ALG1

This selection includes the following algorithms:

Weighted Average
Feedforward Summer
Feedforward Multiplier
Carbon Potential (several types)
Dewpoint

Input A, Input B, and Input C selections for these formulas are found in *Section 3 – Configuration*; Set Up group ALGORITHM, under the following function prompts:


ALG1 INA
ALG1 INB
ALG1 INC

4.10 Digital Input Option (Remote Switching)

The Digital Input option detects the state of external contacts for either of two inputs. On contact closure, the controller will respond according to how each digital input is configured. Make your selection under the Option Set Up group function prompt “DIG IN1” or “DIG IN2.” See *Section 3 – Configuration* in manual #51-52-25-55.

Table 4-11 Digital Input Option Action on Contact Closure

| DIG IN1 or DIG IN2 Selections | Display Indication | Action on Contact Closure Returns (toggles) to original state when contact opens, unless otherwise noted. |
|-------------------------------|-------------------------------------|--|
| None | DI 1 2 always off* | No Digital Input selection |
| TO MAN | MAN blinks | Puts the controller into manual mode. |
| TO LSP | | Puts the controller into local setpoint 1. |
| TO 2SP | RSP annunciator blinks | Puts the controller into local setpoint 2. |
| TO 3SP | RSP annunciator blinks | Puts the controller into local setpoint 3. |
| TO DIR | | Selects direct controller action. |
| ToHOLD | H blinks | Suspends setpoint program or setpoint ramp operation. |
| ToPID2 | PIDSET2 in lower display | Selects PID set 2. |
| PV 2IN | II (II blinks) IN | Selects the PV to equal Input 2. |
| RERUN | | Resets the Setpoint Program back to the beginning of the first segment in the program and leaves the program in the same Run Or Hold mode that it was in when the DI closed. Opening the DI has no further effect. |
| TO RUN | R indicator blinks | Starts a stopped SP Program. |
| ToBEGN | | Resets the Setpoint Program back to the beginning of the first segment in the program and places the program into the Hold mode. |
| STOP I | | Disables PID Integral (I) action. |
| MAN FS | MAN blinks | Unit goes to manual mode, output goes to the failsafe value. |
| ToLOCK | LOCKED when a key is pressed | Disables all keys. |
| ToAout | | Output is forced to value set at control prompt “AUTO OUT” when controller is in automatic mode. |

| DIG IN1 or DIG IN2 Selections | Display Indication | Action on Contact Closure Returns (toggles) to original state when contact opens, unless otherwise noted. |
|-------------------------------|---|--|
| TIMER | Timer clock () and time appear in lower display. | Starts timer (momentary). Reopening switch has no effect. |
| AM STA | | Causes switch to Auto Manual Station mode. |
| ToTUNE | TUNE ON in lower display | Starts the Accutune process. |
| SPinit | | Forces the SP to initialize at the current PV value. |
| TRACK1 | O blinks | Allows Output 1 to track Input 2. |
| TO RSP | RSP annunciator blinks | Selects remote setpoint, if enabled. |
| RST FB | | Allows Input 2 to override the internal reset value, providing external reset feedback. |
| ToPURG | MAN blinks and output value shows in lower display | Forces loop to manual mode with the output values set to the Output High Limit configuration. |
| LoFIRE | MAN blinks and output value shows in lower display | Forces loop to manual mode with the output set to the Output Low Limit configuration. |
| MAN LT | | Forces loop to manual mode, latched. Opening DI has no effect on Mode. UDC remains in manual mode. |

Keyboard Operation

Front panel keys have no effect on the digital input action in the closed state.

Digital Inputs 1 and 2 Combination Selections

Table 4-12 Digital Input Combinations “DIG IN1” or “DIG IN2”

| Selections used in Combination with “DIG IN1” or “DIG IN2” | Display Indication | Action on contact closure Returns (toggles) to original state when contact opens. |
|--|----------------------------------|--|
| +PID2 | PIDSET 2 in lower display | Selects PID set 2. |
| +ToDIR | | Puts the controller into direct action. |
| +ToSP2 | RSP blinks | Selects the second local setpoint. |
| +ToSP1 | | Selects the local setpoint. |
| +RUN | R indicator blinks | Starts or restarts RUN of SP RMP/PROG. |

4.11 Fuzzy Overshoot Suppression

Fuzzy Overshoot Suppression minimizes overshoot after a setpoint change or a process disturbance. This is especially useful in processes that 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*:

- Set Up Group **ACCUTUNE**
- Function Prompt **FUZZY**
- Select **ENABLE** or **DISABL** (▲ or ▼)

4.12 Accutune

Demand Tuning is available for the UDC3300 Basic Models.

- **(TUNE) Demand Tuning**—Tuning is done on demand
 - by pressing the LOWER DISPLAY and ▲ keys simultaneously,
 - by selecting prompt “TUNE” in the lower display,
 - via digital input.

Configuration

To configure this item, refer to *Section 3 – Configuration*.

Rules and Regulations

- **TUNE** On Demand tuning will work for all control algorithms except ON/OFF. Process line out is not required.
- **TUNE** On Demand tuning works for integrating processes.
- Tuning is done in automatic mode.
- Tuning can be monitored or reconfigured using communications option.
- Tuning can be enabled via digital inputs.
- Tuning can be aborted by going to manual mode or disabling via configuration.
- When tuning is in progress, a large **T** appears in the upper display and disappears as soon as tuning is completed.
- Setpoint changes can be made during operation. The setpoint at the time tuning starts is captured and Tune runs until completion, then proceeds to the new SP value following the completion of tuning.

Starting TUNE (Demand Tuning)

After TUNE has been enabled use the following procedure to start tuning.

Table 4-13 Procedure for Starting TUNE (Demand) Tuning

| Step | Action |
|------|---|
| 1 | Set the setpoint to the desired value. |
| 2 | Switch to Automatic mode by pressing the Manual/Auto key. |
| 3 | Initiate Tuning by: <ul style="list-style-type: none"> • pressing the ▲ key when the lower display prompt = TUNE-OFF, • pressing the Lower Display and ▲ keys simultaneously, or • using the digital input, if configured. |

Aborting Tuning

If it is necessary to stop or abort the tuning process, press the MANUAL/AUTO key and the controller will return to manual mode. You can also disable TUNE in the ACCUTUNE Set Up group.

Tune for Duplex (Heat/Cool)

TUNE can be done for applications using duplex (heat/cool) control. During tuning, Accutune requires that **setpoint 1** will cause a Heating demand, and then the calculated tuning parameters will be automatically entered as PID set 1. Likewise, it requires that tuning at local **setpoint 2** will cause a Cooling demand, and then the cooling parameters will be entered as PID set 2.

The tuning sequence will cycle the controller's output two full cycles between the high output limit and 50% for HEAT or between 50% and the low output limit for COOL while allowing only a small process variable change above and below the setpoint during each cycle.

Configuring TUNE for Duplex (Heat/Cool)

To configure this item, refer to *Section 3 – Configuration*.

Using TUNE at Start-Up for Duplex (Heat/Cool)

Table 4-14 Procedure for Using TUNE at Start-up for Duplex

| Step | Action |
|----------|---|
| 1 | <p>Heat Zone:</p> <ul style="list-style-type: none"> • Adjust Local Setpoint 1 to a value within the Heat zone. • Put the controller in <i>Automatic</i> mode. • Press the Lower Display and ▲ keys simultaneously to initiate Heat tuning. <p>The output will cycle between 50% and 100% (or high output limit). A large T appears in the upper display until tuning is completed and final Heat parameters are entered for PID set 1 in the Tuning group.</p> |
| 2 | <p>Cool Zone:</p> <ul style="list-style-type: none"> • Adjust Local Setpoint 2 to a value within the Cool zone. • Put the controller in <i>Automatic</i> mode. • Press the Lower Display and ▲ keys simultaneously to initiate Cool tuning. <p>The output will cycle between 0 % and 50 % (or low output limit). A large T appears in the upper display until tuning is completed and final Cool parameters are entered for PID set 2 in the Tuning group.</p> |

4.13 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 Appendix C so you will have a permanent record.

Table 4-15 Procedure to Enter a Security Code

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

5. Setpoint Rate/Ramp/Soak Program Operation

5.1 Setpoint Ramp Rate

Introduction

When you have configured a Setpoint Ramp Rate, it will apply immediately to any local setpoint change.

Configuration Check

Make sure you:

- enable SP RATE
- disable SP RAMP and SP PROG
- set an upscale or downscale rate value

ATTENTION

A value of 0 will imply an immediate change in setpoint; that is, NO RATE applies. See *Section 3.4* for details.

Operation

When a local setpoint change is made, the controller will ramp from the original setpoint to the new one at the rate specified. This changing (current) setpoint can be viewed as SPn on the lower display.

Press the LOWER DISPLAY key until you see SPn and the setpoint value in the lower display.

5.2 Single Setpoint Ramp

Introduction

When you have configured a single setpoint ramp, it 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 you:

- enable SP RAMP
- disable SP RATE and SP PROG
- set the ramp time in minutes
- set the final setpoint value

See *Section 3.4* for details.

Operation

Running a Setpoint Ramp includes enabling, starting, holding, viewing the ramp time, and ending the ramp.

Table 5-1 Procedure for Running a Setpoint Ramp

| Step | Operation | Press | Action |
|------|--|---------------------------------------|---|
| 1 | Enable the Setpoint Ramp function | SET UP | until you see SET UP in the Upper Display and SP RAMP in the Lower Display. |
| | | <u>FUNCTION LOOP 1/2</u> | You will see DISABL or ENABLE in the Upper Display and SP RAMP in the Lower Display |
| | | ▲ | until you see ENABLE in the Upper Display. |
| 2 | Put the controller into Automatic mode | <u>MANUAL</u> AUTO | until "A" indicator is ON and you will see: H and the PV value in the Upper Display. SP and the present setpoint value in the Lower Display. |
| 3 | Set Start Setpoint | ▲ or ▼ | until the start setpoint value you desire is indicated in the lower display: |
| 4 | Start the Ramp | <u>RUN</u> HOLD | You will see R and the PV value in the Upper Display and SP and the changing setpoint value in the Lower Display. |
| 5 | Hold/Run the Ramp | <u>RUN</u> HOLD | This holds the ramp at the current setpoint value. (SP can then be changed by the ▲ and ▼ keys.) Press again to continue run. |
| | | | ATTENTION Any time the local setpoint is different from the final setpoint value and the RUN/HOLD key is pressed, the ramp will start again. |
| 6 | View the remaining ramp time | <u>LOWER</u> DISPLAY | until you see: R or H and the PV value in the Upper Display. RAMP time remaining in the Lower Display. |
| 7 | End the Ramp | | When the final setpoint is reached, the "R" changes to "H" in the upper display and the controller operates at the new setpoint. |
| 8 | Return to normal operating mode | | After the SP Ramp has completed, disable the SP RAMP function, then press the LOWER DISPLAY key. |

5.3 Setpoint Ramp/Soak Programming Option

Introduction

Setpoint Ramp/Soak Programming lets you configure six ramp and six soak segments to be stored for use as one program or several small programs. You designate the beginning and end segments to determine where the program is to start and stop.

Review Program Data and Configuration

The procedure for programming is straightforward and aided by prompts. We suggest that you read Table 5-2 which lists the program contents with an explanation of each to aid in configuration. Then refer to *Section 3.4 – SP Ramp, SP Rate, or SP Programming Set Up Group* to enable and configure the setpoint program.

ATTENTION

SP RATE and SP RAMP must be disabled to enable SP PROG (Setpoint Programming).

Fill Out the Worksheet

Referring to the example in Figure 5-1, draw a Ramp/Soak Profile on the worksheet provided in Figure 5-2 and fill in the information for each segment. This will give you a record of how the program was developed.

Operation

See Table 5-3 to run/monitor the program.

Power Outage

ATTENTION

If power is lost during a program, 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 program. The program is placed in hold at the beginning of the first segment in the program. The mode will be as configured under PWR MODE in the Control function group.

Table 5-2 Program Contents

| Contents | Definition |
|----------------------------------|--|
| Ramp Segments | <p>A ramp segment is the time it will take to change the setpoint to the next setpoint value in the program.</p> <ul style="list-style-type: none"> • Ramps are odd number segments. • Ramps are configured in either Time or Engineering Units per Minute or Engineering Units per Hour (see Ramp Unit below.) <p>NOTE: Entering "0" will imply an immediate step change in setpoint to the next soak.</p> |
| Ramp Unit | <p>The Ramp Unit selection determines the engineering data units for the ramp segments. The selections are:</p> <ul style="list-style-type: none"> • TIME = Hours:Minute (XX:XX) (<i>Range:</i> 0-99 hrs:0-59 min.) • EU/MIN = Degrees/Minute or EU/HR = Degrees/Hour (<i>Range:</i> 0 to 999) |
| Soak Segments | <p>A Soak Segment is a combination of soak setpoint (value) and a soak duration (time).</p> <ul style="list-style-type: none"> • Soaks are even number segments. • The soak setpoint range value must be within the setpoint high and low range limits in engineering units. • Soak time is the duration of the soak and is determined in: TIME – Hours.Minutes <i>Range:</i> 0-99hrs.59min. |
| Start Segment | <p>This designates the number of the first segment (Odd number). <i>Range:</i> 1 to 11</p> |
| End Segment | <p>This designates the number of the last Soak segment (Even Number). <i>Range:</i> 2 to 12</p> |
| Recycle Number | <p>This number allows the program to recycle to a specified number of times from beginning to end. <i>Range:</i> 0 to 99</p> |
| Guaranteed Soak | <p>Each soak segment can have a deviation value of from 0 to ± 99 which guarantees the value for that segment. The value is the number in engineering units, above or below the setpoint, out side of which the timer halts. <i>Range:</i> 0 to ± 99</p> <p>Soak deviation values >0 guarantee that the soak segment's process variable is within the \pm deviation for the configured soak time. Whenever the \pm deviation is exceeded, soak timing is frozen.</p> <p>The guaranteed soaks feature is disabled whenever the deviation value is configured to 0.</p> |
| Program State | <p>This selection determines whether the program is in the Hold state or Disabled after completion of the program.</p> |
| Program Termination State | <p>This function determines the status of the controller upon completion. The selections are:</p> <ul style="list-style-type: none"> • LASTSP = controls to last setpoint and last control mode • F SAFE = manual mode, failsafe output |

| Contents | Definition |
|-----------------------------------|--|
| Hot Start | <p>This function determines whether LSP1 or PV is used as the setpoint when the program is initially changed from HOLD to RUN. The selections are:</p> <ul style="list-style-type: none">• DISABL = present LSP1 is default setpoint• ENABL = present PV value is used as beginning setpoint value for the ramp segment |
| Reset Program to Beginning | <p>When enabled, this selection allows you to reset the program to the beginning or rerun it from the keyboard.</p> |

Setpoint Rate/Ramp/Soak Program Operation

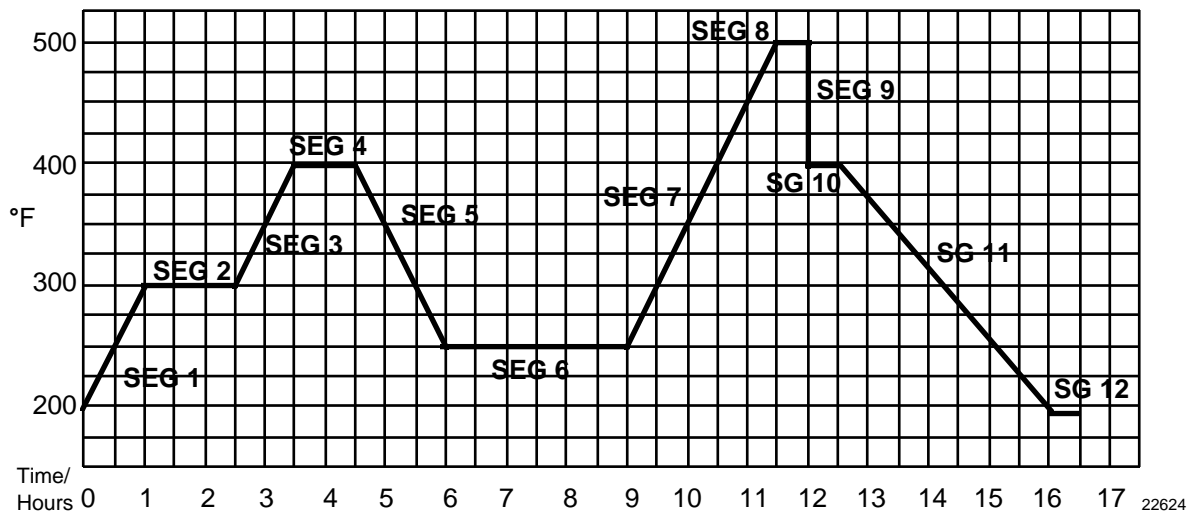
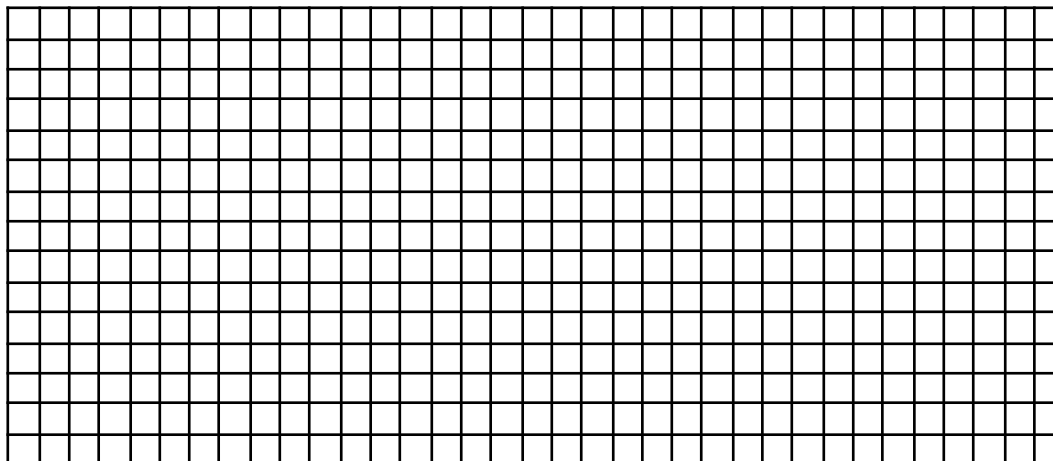


Figure 5-1 Ramp/Soak Profile Example

| Prompt | Function | Segment | Value | Prompt | Function | Segment | Value |
|-----------|--|---------|-------------|-----------|-----------|---------|-------------|
| STRT SEG | Start Seg. | | 1 | SEG4TIME | Soak Time | 4 | 1 hr. |
| END SEG | End Seg. | | 12 | SEG5RAMP | Ramp Time | 5 | 1hr.:30min. |
| RAMP UNIT | Engr. Unit for Ramp | | TIME | SEG6 SP | Soak SP | 6 | 250 |
| RECYCLES | Number of Recycles | | 2 | SEG6TIME | Soak Time | 6 | 3hr.:0min. |
| SOAK DEV | Deviation Value | | 0 | SEG7RAMP | Ramp Time | 7 | 2hr.:30min. |
| PROG END | Controller Status | | LAST SP | SEG8 SP | Soak SP | 8 | 500 |
| STATE | Controller State at end | | HOLD | SEG8TIME | Soak Time | 8 | 0hr.:30min. |
| KEYRESET | Reset SP Program | | DISABL | SEG9RAMP | Ramp Time | 9 | 0 |
| HOTSTART | PV Hot Start Program Initialization or power up in SPP | | DISABL | SG10 SP | Soak SP | 10 | 400 |
| SEG1RAMP | Ramp Time | 1 | 1 hr. | SG10 TIME | Soak Time | 10 | 0hr.:30min. |
| SEG2 SP | Soak SP | 2 | 300 | SG11RAMP | Ramp Time | 11 | 3hr.:30min. |
| SEG2TIME | Soak Time | 2 | 1hr.:30min. | SG12 SP | Soak SP | 12 | 200 |
| SEG3RAMP | Ramp Time | 3 | 1hr. | SG12TIME | Soak Time | 12 | 0hr.:30min. |
| SEG4 SP | Soak SP | 4 | 400 | | | | |

Program Record Sheet

Draw your ramp/soak profile on the record sheet shown in Figure 5-2 and fill in the associated information in the blocks provided. This will give you a permanent record your program and will assist you when entering the setpoint data.



22625

Figure 5-2 Program Record Sheet

| Prompt | Function | Segment | Value |
|-----------|--|---------|--------|
| STRT SEG | Start Seg. | | |
| END SEG | End Seg. | | |
| RAMPUNIT | Engr. Unit for Ramp | | |
| RECYCLES | Number of Recycles | | |
| SOAK DEV | Deviation Value | | |
| PROG END | Controller Status | | |
| STATE | Controller State at end | | |
| KEYRESET | Reset SP Program | | |
| HOTSTART | PV Hot Start Program Initialization or power up in SPP | | DISABL |
| SEG1RAMP | Ramp Time | 1 | |
| SEG2 SP | Soak SP | 2 | |
| SEG2TIME | Soak Time | 2 | |
| SEG3RAMP | Ramp Time | 3 | |
| SEG4 SP | Soak SP | 4 | |
| SEG4TIME | Soak Time | 4 | |
| SEG5RAMP | Ramp Time | 5 | |
| SEG6 SP | Soak SP | 6 | |
| SEG6TIME | Soak Time | 6 | |
| SEG7RAMP | Ramp Time | 7 | |
| SEG8 SP | Soak SP | 8 | |
| SEG8TIME | Soak Time | 8 | |
| SEG9RAMP | Ramp Time | 9 | |
| SG10 SP | Soak SP | 10 | |
| SG10 TIME | Soak Time | 10 | |
| SG11RAMP | Ramp Time | 11 | |
| SG12 SP | Soak SP | 12 | |
| SG12TIME | Soak Time | 12 | |

Run/Monitor Functions

Table 5-3 lists all the functions required to run and monitor the program.

Table 5-3 Run/Monitor Functions

| Function | Press | Result |
|-------------------------------------|----------------------------|--|
| Set the Local Setpoint | SETPOINT SELECT | <i>Lower Display: SP</i> |
| | ▲ or ▼ | to set the Local Setpoint value to where you want the program to start out. |
| Run State | <u>RUN</u> HOLD | Initiates the setpoint program. An "R" appears in the upper display indicating that the program is running. |
| Hold State | <u>RUN</u> HOLD | Holds the setpoint program. An "H" appears in the upper display indicating that the program is in the HOLD state. The setpoint holds at the current setpoint. |
| External Hold DI = To HOLD" | | If Remote Switching (Digital Input option) is present on your controller, contact closure places the controller in the HOLD state, if the setpoint program is running. The "H" in the upper display will blink indicating external hold is in effect. Contact reopening runs program. NOTE: The keyboard takes priority over external switch for the RUN/HOLD function. |
| Changing a Segment While in Hold | ▲ or ▼ | These keys will operate and allow you to change the segment number while in HOLD. If a different segment is selected, it will be started at the beginning when placed in RUN. If the original segment is brought back, the program will continue from the point placed in HOLD. NOTE: Changing a segment number may affect the alarms/events. |
| External Program Reset "To BEGN" | | If Remote Switching (Digital Input option) is present on your controller, contact closure resets the SP Program back to the start of the first segment. Program cycle number is not affected. Reopening the contact has no effect and places the program in HOLD mode. The setpoint is changed to what the setpoint was when the program was first started. |
| | <u>RUN</u> HOLD | restarts the Setpoint Program. |

| Function | Press | Result |
|--|--------------------------|--|
| Keyboard Reset | LOWER DISPLAY | <p>until you see <i>Lower Display:</i> ToBEGN</p> <p>Press ▲ key to reset program to beginning at Hold state.</p> |
| Viewing the Present Ramp or Soak Segment Number and Time | LOWER DISPLAY | <p>until you see <i>Upper Display:</i> "R" and the PV value <i>Lower Display:</i> Ramp segments: # RA XX.XX Soak segments: # SK XX.XX</p> <p># indicates the segment number (Ramp–odd only, Soak–even only)</p> <p>XX.XX Ramp Time – Hours.Minutes Ramp Rate – EU/MIN or EU/HR Soak Time – Hours.Minutes</p> |
| Viewing the Number of Cycles Left in the Program | LOWER DISPLAY | <p>until you see <i>Upper Display:</i> "R" and the PV value <i>Lower Display:</i> RECYC XX</p> <p>Number of cycles remaining in the setpoint program. XX = 0 to 99</p> |
| End Program | | <p>When the final segment is completed, the "R" in the upper display either changes to "H" (if configured for HOLD state) or disappears (if configured for disable of setpoint programming).</p> <p>The controller operates at the last setpoint in the program in automatic or will be in manual mode at the failsafe output.</p> |
| Disable Program | | See <i>Section 3.4</i> for details. |

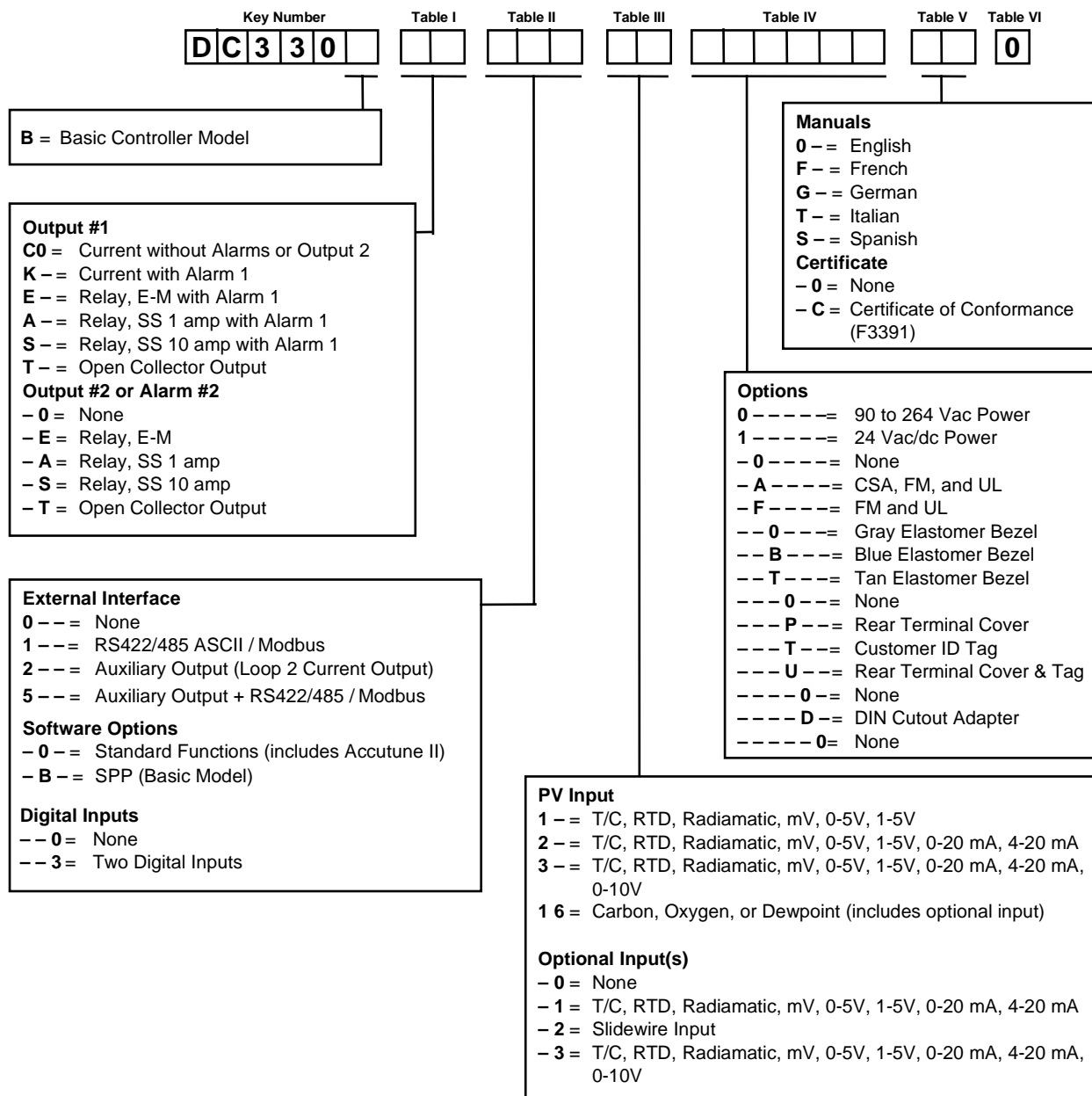
6. Appendix A – Environmental and Operating Conditions

| Parameter | Reference | Rated | Operative Limits | Transportation and Storage |
|--|---|-----------------------------------|----------------------------------|-------------------------------------|
| Ambient Temperature | 25 °C ± 3 °C 77 °F ± 5 °F | 15 °C to 55 °C 58 °F to 131 °F | 0 °C to 55 °C 32 °F to 131 °F | –40 °C to 66 °C –40 °F 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 | 0.4 | 0.6 | 0.5 |
| Mechanical Shock | | | | |
| Acceleration (g) | 0 | 1 | 5 | 20 |
| Duration (ms) | 0 | 30 | 30 | 30 |
| Voltage (Vdc) | +24 ± 1 | 20 to 27 | 20 to 27 | -- |
| Voltage (Vac) | | | | |
| 90 to 240 Vac | 120 ± 1 240 ± 2 | 90 to 240 | 90 to 264 | -- -- |
| 24 Vac | 24 ± 1 | 20 to 27 | 20 to 27 | -- |
| Frequency (Hz) | 50 ± 0.2 | 49 to 51 | 48 to 52 | -- |
| (For Vac) | 60 ± 0.2 | 59 to 61 | 58 to 62 | -- |
| Power Consumption | 18 VA maximum (90 to 264 Vac) 12 VA maximum (24 Vac/dc) | | | |
| Input Accuracy | ± 0.20 % of span typical (± 1 digit for display) Field calibratable to ± 0.05 % of span typical 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 millivolt, low level signal, 4-20 mA, digital I/O, and computer interface circuits. | | | |

Refer to 51-52-05-01, How to Apply Digital Instrumentation in Severe Electrical Noise Environments, for additional information.

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

7. Appendix B – Model Selection Guide



8. 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 | |
|--------------|-----------------|--------------------|-----------------|--------------|-----------------|--------------------|-----------------|--------|
| TUNING | PROP BD | _____ | — | ALGORITHM | CONT ALG | _____ | PID A | |
| | or GAIN | _____ | 1.000 | | TIMER | _____ | DISABL | |
| | or GAINVALn | Read Only | — | | PERIOD | _____ | 0.01 | |
| | RATE MIN | _____ | 0.00 | | START | _____ | KEY | |
| | RSET MIN | _____ | 1.00 | | L DISP | _____ | TI REM | |
| | or RSET RPM | _____ | — | | INP ALG1 | _____ | NONE | |
| | MAN RSET | _____ | 0 | | MATH K | _____ | — | |
| | PROPBD2 | _____ | — | | CALC HI | _____ | — | |
| | or GAIN 2 | _____ | 1.000 | | CALC LO | _____ | — | |
| | RATE2MIN | _____ | 0.00 | | ALG1 INA | _____ | — | |
| | RSET2MIN | _____ | 1.00 | | ALG1 INB | _____ | — | |
| | or RSET2RPM | _____ | — | | ALG1 INC | _____ | — | |
| | CYC SEC | _____ | 20 | | ALG1BIAS | _____ | — | |
| | or CYC SX3 | _____ | 20 | | PCT CO | _____ | 0.200 | |
| | CYC2 SEC | _____ | 20 | | | | | |
| | or CYC2 SX3 | _____ | 20 | | OUT ALG | OUT ALG | _____ | CURRNT |
| | SECURITY | _____ | 0 | | 4-20 RNG | _____ | 100PCT | |
| | LOCKOUT | _____ | CALIB | | RLYSTATE | _____ | 1OF2ON | |
| | AUTO MAN | _____ | ENABLE | | RLY TYPE | _____ | MECHAN | |
| | SP SEL | _____ | ENABLE | | | | | |
| RUN HOLD | _____ | ENABLE | | | | | | |
| SP RAMP | SP RAMP | _____ | DISABL | INPUT 1 | IN1 TYPE | _____ | 0-10mV | |
| | TIME MIN | _____ | 3 | | XMITTER1 | _____ | LINEAR | |
| | FINAL SP | _____ | 1000 | | IN1 HI | _____ | 1000 | |
| | PV HOT | _____ | DISABL | | IN1 LO | _____ | 0 | |
| | START | _____ | — | | RATIO 1 | _____ | 1.00 | |
| | SP RATE | _____ | DISABL | | BIAS IN1 | _____ | 0 | |
| | EU/HR UP | _____ | 0 | | FILTER 1 | _____ | 0 | |
| | EU/HR DN | _____ | 0 | | BURNOUT1 | _____ | NONE | |
| SP PROG | _____ | DISABL | EMISSIV1 | _____ | 0.00 | | | |
| ACCUTUNE | FUZZY | _____ | DISABL | INPUT 2 | IN2 TYPE | _____ | 0-10mV | |
| | ACCUTUNE | _____ | DISABL | | XMITTER2 | _____ | LINEAR | |
| | AT ERROR | Read Only | — | | IN2 HI | _____ | 1000 | |
| | | | | | IN2 LO | _____ | 0 | |
| | | | | | RATIO 2 | _____ | 1.00 | |
| | | | | | BIAS IN2 | _____ | 0 | |
| | | | | | FILTER 2 | _____ | 0 | |
| | | | | | BURNOUT2 | _____ | NONE | |
| | | | EMISSIV2 | _____ | 0.00 | | | |

Configuration Record Sheet

| Group Prompt | Function Prompt | Value or Selection | Factory Setting | Group Prompt | Function Prompt | Value or Selection | Factory Setting | |
|--------------|-----------------|--------------------|-----------------|--------------|-----------------|--------------------|-----------------|------|
| CONTROL | PV SOURC | _____ | INP 1 | COM | ComSTATE | _____ | DISABL | |
| | PID SETS | _____ | 1 ONLY | | Com ADDR | _____ | 0 | |
| | SW VALUE | _____ | 0.00 | | SHEDENAB | _____ | DISABL | |
| | LSP'S | _____ | 1 ONLY | | SHEDTIME | _____ | 0 | |
| | RSP SRC | _____ | NONE | | PARITY | _____ | ODD | |
| | AUTOBIAS | _____ | DISABL | | BAUD | _____ | 2400 | |
| | SP TRACK | _____ | NONE | | DUPLEX | _____ | HALF | |
| | PWR MODE | _____ | MANUAL | | WS FLOAT | _____ | PF b | |
| | PWR OUT | _____ | LAST | | TX DELAY | _____ | 1 | |
| | SP HiLIM | _____ | 1000 | | SHEDMODE | _____ | LAST | |
| | SP LoLIM | _____ | 0 | | SHED SP | _____ | TO LSP | |
| | ACTION | _____ | REVRSE | | UNITS | _____ | PERCNT | |
| | OUT RATE | _____ | DISABL | | CSP RATO | _____ | 1.0 | |
| | PCT/M UP | _____ | 0 | | CSP BIAS | _____ | 0 | |
| | PCT/M DN | _____ | 0 | | LOOPBACK | _____ | DISABL | |
| | OUTHILIM | _____ | 100 | | | | | |
| | OUTLoLIM | _____ | 0 | | | | | |
| | I Hi LIM | _____ | 100.0 | | ALARMS | A1S1 VAL | _____ | 90 |
| | I Lo LIM | _____ | 0.0 | | | A1S2 VAL | _____ | 10 |
| | DROPOFF | _____ | 0 | | | A2S1 VAL | _____ | 95 |
| | DEADBAND | _____ | 1.0 | | | A2S2 VAL | _____ | 5 |
| | OUT HYST | _____ | 0.5 | | | A1S1TYPE | _____ | NONE |
| | FAILMODE | _____ | NO LAT | | | A1S2TYPE | _____ | NONE |
| | FAILSAFE | _____ | 0.0 | | | A2S1TYPE | _____ | NONE |
| | MAN OUT | _____ | — | | | A2S2TYPE | _____ | NONE |
| AUTO OUT | _____ | — | A1S1 H L | _____ | | HIGH | | |
| PborGAIN | _____ | GAIN | A1S1 EV | _____ | | -- | | |
| MINorRPM | _____ | MIN | A1S2 H L | _____ | | LOW | | |
| | | | A1S2 EV | _____ | | -- | | |
| | | | A2S1 H L | _____ | | HIGH | | |
| | | | A2S1 EV | _____ | | -- | | |
| | | | A2S2 H L | _____ | | LOW | | |
| | | | A2S2 EV | _____ | -- | | | |
| | | | AL HYST | _____ | 0.1 | | | |
| | | | ALM OUT1 | _____ | NO LAT | | | |
| | | | BLOCK | _____ | DISABL | | | |
| OPTIONS | AUX OUT | _____ | DISABL | DISPLAY | DECIMAL | _____ | XXXX | |
| | 4mA VAL | _____ | 0.0 | | TEMPUNIT | _____ | NONE | |
| | 20mA VAL | _____ | 0 | | PWR FREQ | _____ | 60 HZ | |
| | DIG IN 1 | _____ | NONE | | RATIO 2 | _____ | DISABL | |
| | DIG1 COM | _____ | DISABL | | LANGUAGE | _____ | ENGLIS | |
| | DIG IN 2 | _____ | NONE | | | | | |
| | DIG2 COM | _____ | DISABL | | | | | |

9. Appendix D – Position Proportional Calibration

9.1 Position Proportional Control Output Calibration

Introduction

When the UDC 3300 controller has a Position Proportional control output, calibrate the controller so that the increase and decrease relays operate properly with respect to the position of the external feedback slidewire.

Three Position Step Control Output Models **with** Motor Position Indication
(Model Numbers DC330X-EE-XXX-X2, DC330X-AA-XXX-02)

This model must have its output calibrated per the entire procedure to ensure the displayed output (slidewire position) agrees with the final control element position.

Three Position Step Control Output Models **without** Motor Position Indication
(Model Numbers DC330X-EE-XXX-X0, DC330X-AA-XXX-X0)

This model only requires that the “Motor Time” be entered as shown in the calibration procedure. FULL CALIBRATION IS NOT REQUIRED

Procedure

Apply power and allow the controller to warm up 30 minutes before you calibrate. Leave all field wiring connected to the rear terminals.

There are two ways in which to calibrate Position Proportional or 3 Position Step control: AUTO mode or MANUAL mode.

Rules for auto mode vs manual mode

The Auto-mode selection must be done at least once before the manual mode will operate properly. Failure to use the Auto-mode procedure will prevent the controller from going into automatic control mode.

During the Auto-mode calibration procedure, the values being displayed are used only to indicate if the motor is still traveling. To view the actual calibration value, use the manual mode after the Auto-mode is completed. These values can be changed for purposes of tweaking the calibration.

Make sure LOCKOUT in Tuning Set Up group is set to NONE.

For *Three Position Step Control Output models without Motor Position Indication*, do steps 1 and 2 only.

For *Position Proportional Output and Three Position Step Control Output models with Motor Position Indication*, follow the entire calibration procedure.

ATTENTION These prompts *only* appear when position OUT ALG is selected. If motor position for 3PSTEP is desired, first configure unit for “position.” After calibration the unit can be switched to 3PSTEP.

Table 9-1 Calibration Procedure

| Step | Operation | Press | Action | | | | | | |
|------------------|--|--------------------------|---|------------------|---------|---------|--------------|--------|--------------|
| 1 | Enter Calibration Mode | SETUP | until you see <i>Upper Display: CALIB</i> <i>Lower Display: POS PROP</i> | | | | | | |
| 2 | Set Motor Traverse Time | FUNCTION LOOP 1/2 | Until you see <i>Upper Display: (A value)</i> <i>Lower Display: MTR TIME</i> NOTE: This is the time it takes the motor to travel from 0 to 100%. | | | | | | |
| 3 | | ▲ or ▼ | until the proper motor stroke time is reached (see the motor specs or measure the time) Range of setting = 5 to 1800 Seconds | | | | | | |
| 4 | Select Automatic or Manual Calibration | FUNCTION LOOP 1/2 | Until you see You can calibrate the controller output manually or let the controller calibrate the output automatically . If the slidewire has never been calibrated, you must use DO AUTO first. In the "Automatic Calibration Mode" (DO AUTO), the controller relays automatically move the motor in the proper direction. If desired, however, the motor may be manually positioned to 0% and 100% positions. Disconnect the relay wires. Use DO MAN. In the "Manual Calibration Mode" (DO MAN), the motor does not move. Instead, the existing 0% and 100% values may be changed with the ▲ or ▼ key. | | | | | | |
| 5 | | ▲ or ▼ | to select automatic or manual calibration. <i>Upper Display: DO AUTO or DO MAN</i> <i>Lower Display: POS PROP</i> | | | | | | |
| | | | <table border="1"> <thead> <tr> <th>If you select...</th> <th>Then...</th> </tr> </thead> <tbody> <tr> <td>DO AUTO</td> <td>go to Step 6</td> </tr> <tr> <td>DO MAN</td> <td>go to Step 8</td> </tr> </tbody> </table> | If you select... | Then... | DO AUTO | go to Step 6 | DO MAN | go to Step 8 |
| If you select... | Then... | | | | | | | | |
| DO AUTO | go to Step 6 | | | | | | | | |
| DO MAN | go to Step 8 | | | | | | | | |
| | | | ATTENTION When calibration is terminated, this selection reverts to DISABL. | | | | | | |
| 6 | DO AUTO Set 0% value | FUNCTION LOOP 1/2 | The decrement relay is turned on to move the motor to 0% position. <i>Upper Display: (Counts of Feedback Slidewire-0 to 3000)</i> <i>Lower Display: ZERO VAL</i> When the motor stops, the display should stop counting, then go to the next step. | | | | | | |

| Step | Operation | Press | Action |
|------|---------------------------------|---|---|
| 7 | DO AUTO Set 100 % value | FUNCTION LOOP 1/2 | The increment relay is turned on to move the motor to 100 % position. <i>Upper Display:</i> (Counts of Feedback Slidewire-0 to 3000) <i>Lower Display:</i> SPAN VAL When the motor stops, the display should stop counting, then go to step 12. |
| 8 | DO MAN Set 0 % value | FUNCTION LOOP 1/2 | You will see: <i>Upper Display:</i> (The existing zero calibration value in counts) <i>Lower Display:</i> ZERO VAL |
| 9 | | ▲ or ▼ | until the desired zero value is reached in the upper display. <i>Upper Display:</i> (The desired zero value) <i>Lower Display:</i> ZERO VAL |
| 10 | DO MAN Set 100 % value | FUNCTION LOOP 1/2 | The controller will store the 0% value and you will see: <i>Upper Display:</i> (The existing span calibration value in counts) <i>Lower Display:</i> SPAN VAL |
| 11 | | ▲ or ▼ | until the desired span value is reached in the upper display. <i>Upper Display:</i> (The desired span value) <i>Lower Display:</i> SPAN VAL For manual calibration, the motor does not move from its position prior to the start of Position Proportional calibration. |
| 12 | Exit the Calibration Mode | FUNCTION LOOP 1/2 LOWER DISPLAY or SETUP | The controller will store the 100 % value. To exit the calibration mode. |

10. Appendix E – Input Ranges

| PV Input | Range | |
|-----------------------------------|-----------------------------------|-------------------|
| | °F | °C |
| Thermocouples (Per ITS-90) | | |
| B | 0 to 3300 | -18 to 1816 |
| E | -454 to 1832 | -270 to 1000 |
| E (low) | -200 to 1100 | -129 to 593 |
| J | 0 to 1600 | -18 to 871 |
| J (low) | 20 to 770 | -7 to 410 |
| K | 0 to 2400 | -18 to 1316 |
| K (low) | -20 to 1000 | -29 to 538 |
| NiNiMoly (NNM68) | 32 to 2500 | 0 to 1371 |
| NiNiMoly (low) | 32 to 1260 | 0 to 682 |
| NiMo-NiCo (NNM90) | 32 to 2500 | 0 to 1371 |
| NiMo-NiCo (low) | 32 to 1260 | 0 to 682 |
| Nicrosil Nisil (NIC) | 0 to 2372 | -18 to 1300 |
| R | 0 to 3100 | -18 to 1704 |
| S | 0 to 3100 | -18 to 1704 |
| T | -300 to 700 | -184 to 371 |
| T (low) | -200 to 500 | -129 to 260 |
| W5W26 | 0 to 4200 | -18 to 2315 |
| W5W26 (low) | 0 to 2240 | -18 to 1227 |
| Honeywell Radiamatic | | |
| Type RH | 0 to 3400 | -18 to 1871 |
| Type RI | 0 to 9999 max.* | -18 to 9999 max.* |
| RTD IEC Alpha = 0.00385 | | |
| 100 ohms | -300 to 1200 | -184 to 649 |
| 100 ohms (low) | -300 to 300 | -184 to 149 |
| 200 ohms | -300 to 1200 | -184 to 649 |
| 500 ohms | -300 to 1200 | -184 to 649 |
| Linear | | |
| Milliamps | 4 to 20 mA 0 to 20 mA | |
| Millivolts | 0 to 10 mV 0 to 50 mV | |
| Volts | 1 to 5 V 0 to 5 V 0 to 10 V | |
| Carbon | 0 to 1250 mV | |
| Oxygen | -30 to 510 mV | |

*User enters the range manually per RI type and application

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