The Sixth Sense AI-100

1/32 DIN Fuzzy Logic controller



User's Manual

sixth sense

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INTRODUCTION

General Description

The AI-100 is a fully programmable, microprocessor-based temperature/process controller. It offers superior control with 200 msec sampling rate and by using fuzzy logic to enhance its P, I and D parameters. The 4-digit 0.4" red LED display offers excellent visibility on a unit that is 1/32 DIN in size.

The AI-100 is available with either 20-32V AC/DC or 90-264V AC power supply. This is a single universal input unit that will accept 8 different thermocouple types, Pt100 RTDs, and a variety of linear mA and VDC signals. The wide range of options for the two available outputs include relays, SSR drives, 4-20mA, 0-20mA, or 0-10VDC. Output #1 can be used in either a direct or reverse action control situation with a programmable ramp rate. Output #2 can be used as a control output, as an alarm, or as a dwell timer.

Optional features include 2-wire RS-485 serial communications with Windows 95™-based software, and Analog Retransmission of process variable, setpoint variable or the percentage of control output, as a 0-20 mA/4-20 mA DC signal.

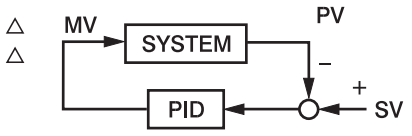
The communications software package, COMM 4851, offers excellent graphics, bar and trend displays, and supports easy-to-use database control and back-up capability.

FUZZY LOGIC

The function of Fuzzy Logic is to adjust the PID parameters internally in order to make the control output more flexible and adaptive to the process. One of the best analogies would compare Fuzzy Logic to the abilities of a good driver. The driver is

able to control a car well at a variety of speeds and under varying circumstances by using knowledge gained through previous experience.

Fuzzy Logic combined with PID control has been proven to be an efficient method to improve control stability. This is illustrated in figure 3.



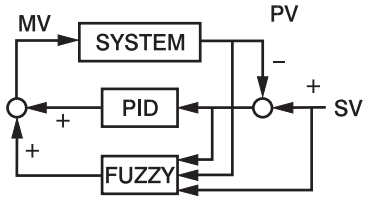


Figure 2. *PID with fuzzy logic*

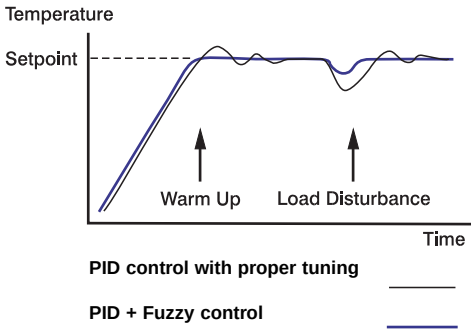


Figure 3. *PID vs. PID and fuzzy logic*

SPECIFICATIONS

INPUT

Thermocouple(T/C):	Type J,K,T,E,B,R,S,N
RTD:	Pt100 ohm RTD (DIN or JIS)
Linear:	Scalable. Refer to table on p.5
Accuracy:	Refer to table on p.5
External Resistance:	100 ohm max.(for thermocouple)
Normal Mode Rejection:	60dB
Common Mode Rejection:	120dB
Sample Rate:	5 times/sec

CONTROL

Proportional Band:	0-360°F, 0-200°C, 0-3600 Process Units
Reset (Integral):	0-3600 seconds
Rate (derivative):	0-1000 seconds
Ramp rate:	0-55.55°C/min, 0-99.99°F/min, 0-99.99 Process Units(P.U.)/min
Dwell:	0-9999 minutes
Hysteresis:	0.1-11.0°C, 0.1-19.9°F, 0.1-199 P.U.
Cycle Time:	0-99 seconds
Control Action:	Direct (cooling) and reverse(heating)

OUTPUT

Relay:	SPST, 3A/240 VAC (resistive)
DC pulse:	24 VDC/20 mA max.
4 to 20 mA:	Linear, max. load 500 ohms
0 to 20 mA:	Linear, max. load 500 ohms
0 to 10 V:	Linear, min. input impedance 500K ohms

ALARM

Relay:	SPST, 3A/240 VAC (resistive)

INDICATION

Process Display:	0.4" red LED, 4 digits
Status Indicator:	Control output and alarm

POWER

Rating:	90-264VAC, 50/60Hz or 20-32V AC/DC
Consumption:	Less than 5VA

ENVIRONMENTAL & PHYSICAL

Safety:	CE, UL & CSA Approved
Protection:	NEMA 4X, IP66 (front panel)
Operating Temperature:	-10 to 50°C (14 to 122°F)
Humidity:	0 to 90%RH (non-condensing)
Insulation:	20 Mohm min. (500 VDC)
Breakdown:	AC2000V, 50/60Hz, 1 minute
Vibration:	10-55Hz, amplitude 1mm
Shock:	200 m/s^2 (20G)
Weight:	110 grams (3.87 oz.)
Dimension:	24(H) x 48(W) x 99mm (depth behind panel)
Panel cutout:	22.2mm(H) (+.3/-0) 45 mm(W) (+.5/-0)
Warranty:	2 years

RANGE AND ACCURACY OF INPUTS

SENSOR	INPUT TYPE	RANGE (°F)	RANGE (°C)	ACCURACY
J	Iron-Constantan	-58 to 1830	-50 to 999	±3.6°F/±2°C
K	Chromel-Alumel	-58 to 2500	-50 to 1370	±3.6°F/±2°C
T	Copper-Constantan	-454 to 752	-270 to 400	±3.6°F/±2°C
E	Chromel-Constantan	-58 to 1382	-50 to 750	±3.6°F/±2°C
B	Pt30%Rh/Pt6%Rh	572 to 3272	300 to 1800	±3.6°F/±2°C
R	Pt13%Rh/Pt	32 to 3182	0 to 1750	±3.6°F/±2°C
S	Pt10%Rh/Pt	32 to 3182	0 to 1750	±3.6°F/±2°C
N	Nicrosil-Nisil	-58 to 2372	-50 to 1300	±3.6°F/±2°C
RTD	Pt100 ohm (DIN)	-328 to 842	-200 to 450	±0.72°F/±0.4°C
RTD	Pt100ohm (JIS)	-328 to 842	-200 to 450	±0.72°F/±0.4°C

LINEAR INPUTS (All scalable)

Input type	Range	Accuracy
4-20 mA, 0-20 mA, 0-1V, 0-5V, 1-5V, 0-10V	-1400 to 9400	±0.05% FS

MODEL CONFIGURATION

A I 1 0 0 - [ ] [ ] [ ] [ ] [ ]

POWER INPUT
- 4 90-264VAC
- 5 20-32V AC/DC

INPUT SIGNAL
- 0 J - Iron-Constantan
- 1 K - Chromel-Alumel
- 2 T - Copper-Constantan
- 3 E - Chromel-Constantan
- 4 B - Pt30%Rh/Pt6%Rh
- 5 R - Pt13%Rh/Pt
- 6 S - Pt10%Rh/Pt
- 7 N - NICROSIL-NISIL
- 8 RTD - Pt100 (DIN)
- 9 RTD - Pt100 (JIS)
- A 4-20mA
- B 0-20mA
- C 0-10V
- D 1-5V
- E 0-5V
- F 0-1V

OUTPUT #1 OPTIONS
- 0 None
- 1 Relay
- 2 SSR Drive
- 3 4-20mA
- 4 0-20mA
- 5 0-10V

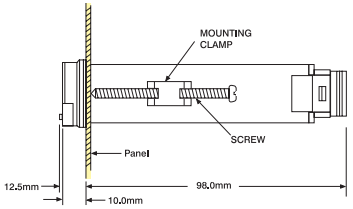
ALARM/OUTPUT #2 OPTIONS
- 0 None
- 1 Relay
- 2 SSR Drive
- 3 4-20mA
- 4 0-20mA
- 5 0-10V

AUXILIARY OPTIONS
- 0 None
- 1 RS-485 Communications
- 2 Retransmission 4-20mA/0-20mA

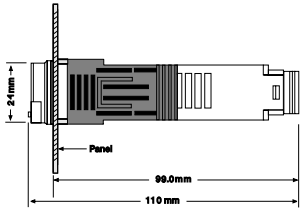
INSTALLATION

MOUNTING

Install mounting clamp(s). Gently tighten clamp until the controller fits snugly against the front panel.



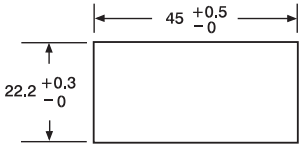
NEMA brackets



Mounting collar (non-NEMA)

Make panel cutout as shown in figure

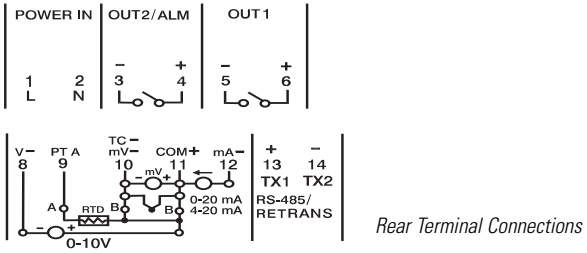
1.772"(W) X 0.874"(H)



Units: mm

WIRING

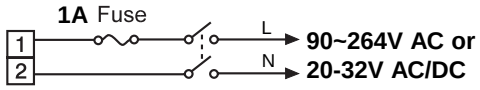
The following connections for outputs and inputs are provided on the wiring diagram located at the rear of the housing:



Rear Terminal Connections

POWER SUPPLY

The controller is supplied to operate on either 90-264V AC or 20-32V AC/DC. Check that the supply voltage corresponds to that indicated on the product label before connecting power to the controllers.

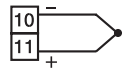


Power Supply Connections

This equipment is designed for installation in an enclosure which provides adequate protection against electric shock. The enclosure must be connected to earth ground.

THERMOCOUPLE INPUT

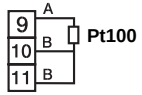
Thermocouple input connections are shown in the illustration below. The thermocouple extension wire must be of proper type and gauge, and should be run in a conduit, separate from any power wiring. The resistance of the entire run should not exceed 100Ω.



Thermocouple Input Connections

Pt100 Ohm RTD INPUT

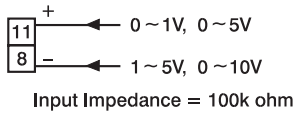
RTD connections are shown in the illustration below with the compensating lead connected to terminal 11. For two-wire RTD inputs, terminals 10 and 11 should be linked.



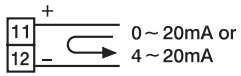
RTD input Connections

DC LINEAR INPUT

DC linear voltage and current input connections are shown below.



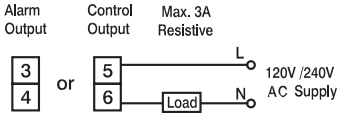
VDC



mADC

RELAY OUTPUT DIRECT DRIVE

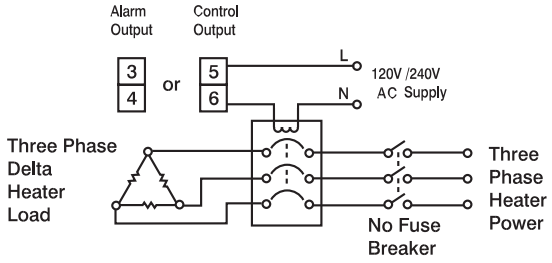
The illustration below shows connections for using the internal relay to drive a small load. The current should not exceed 3 amps.



Relay Direct Drive Connections

RELAY OUTPUT CONTACTOR DRIVE

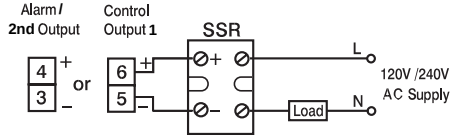
The illustration below shows connections for using an external relay to drive heavier loads.



Relay Contactor Drive Connections

DC PULSE (SOLID-STATE RELAY DRIVE) OUTPUT

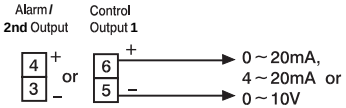
Controllers fitted with the DC pulse output produce a time-proportional non-isolated pulse voltage (0-24V nominal, output impedance 660Ω). The connections are shown in the illustration below.



Pulsed DC output Connections

DC LINEAR OUTPUT

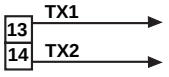
There are three types of linear output modules that can be selected for the output. The connections are shown in the illustration below.



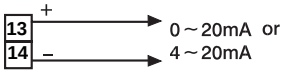
Linear DC output Connections

RS-485 COMMUNICATIONS/ANALOG RETRANSMISSION

RS-485 serial communications or Analog retransmission of process variable, setpoint, or manipulated variable can be selected as an optional feature. The connections are shown in the illustration below.



RS-485 Communications



Analog retransmission

NEGOTIATING THE MENU

When the controller is powered up, it automatically displays the Process Variable (PV).

From the Process Variable (PV) display you can easily:

Press either the ⌃⌃ or ⌄⌄ key momentarily to view set-point.
or
Press the ↻ key momentarily to enter the Primary Program Menu.
or
Press the ↻ key and the ⌄⌄ key simultaneously to enter the Tool Program Menu.



TOUCH KEYS	FUNCTION	DESCRIPTION
⌃⌃	Up key	Press to select digit to change. Press and hold to increase value for parameter
⌄⌄	Down key	Press to select digit to change. Press and hold to decrease value for parameter
↻	Scroll key	Press to select parameter in direct sequence or to select tool program parameters
↻ press for 3.2 seconds	Long scroll/ Enter key	Use to select protected parameters in higher security level or to actuate selected tool program
↻ & ⌃⌃	Reverse scroll/ Calibration Verification	Use to select parameter in reverse sequence or to verify display accuracy for input types during calibration
↻ & ⌃⌃ press for 3.2 seconds	Lock key	Use to disable keypad operation to protect parameters
↻ & ⌄⌄	Tool program key	Press to select tool program in sequence
⌃⌃ & ⌄⌄	Reset/Exit key	Press to unlock keypad operation, to reset display, to exit tool program, or to end autotune and manual control execution.
⌃⌃ & ⌄⌄ press for 3.2 seconds	Autotune key	Hold both keys for 3.2 seconds then release to start autotune.

LEARNING THE PARAMETERS

SV

SV - Setpoint
This parameter is the target value for the process. It can be adjusted throughout the range defined by the Low Scale Value LoSC and High Scale Value hiSC. Set in degrees/engineering units.

ASP1

ASP1 - Alarm 1 Setpoint or Dwell Time
If output #2 is configured as an alarm this parameter sets the point that the alarm will be activated. If output #2 is configured as a Dwell Timer this parameter sets the amount of time to be counted. Set in degrees/engineering units for alarms or minutes for timer.

rAmP

Ramp - Ramp Rate
This determines the rate at which your process will approach set-point. Setting this parameter to 0 will cause your system to approach setpoint at maximum speed. Set in degrees/minute.

oFSt

OFST - Offset Value for Manual Reset
For systems using proportional control only (Ti set to 0) this parameter will be adjusted to compensate for any deviation between setpoint and process. Set 0-100% of Pb.

Shif

SHIF - Shift Process Value
This value will be added to the process value to correct for errors or to synchronize a number of different units. Set in degrees/engineering units.

Pb

PB - Proportional Band
The proportional band is that area around main setpoint where the control output is neither full on nor full off.

HySt

HYST - Hysteresis for ON/OFF Control
The hysteresis for output #1 is the area around the main setpoint where the output does not change condition. It is intended to eliminate relay chatter at setpoint for ON/OFF control applications.

TI - Integral Time

The integral time is the speed at which a corrective increase or decrease in output is made to compensate for offset which usually accompanies proportional only processes. The more the integral time entered, the slower the action. The less the integral time entered, the faster the action. Enter a value that would eliminate offset without overcompensation, resulting in process oscillation.

TD - Derivative Time

The derivative time is that time used in calculating rate of change and thermal lag in helping eliminate overshoot which results in response to process upsets. This overshoot usually accompanies proportional only and proportional integral processes. The derivative action dampens proportional and integral action as it anticipates where the process should be. The more the derivative time entered, the more the damping action. The less the derivative time entered, the less damping action. Enter as much derivative time as necessary to eliminate overshoot without overdamping the process resulting in process oscillation.

ADDR - Address of unit for serial communications/ Retransmission

This unit can be assigned a numerical address to identify it as one of 191 stations on an RS-485 serial communications loop (set from 1-191) or for 4-20mA/0-20mA retransmission (set from 192-199).

Code for "Addr"	Retransmission
192	4~20mA, PV
193	4~20mA, SV
194	4~20mA, MV1 (Output 1)
195	4~20mA, MV2 (Output 2)
196	0~20mA, PV
197	0~20mA, SV
198	0~20mA, MV1 (Output 1)
199	0~20mA, MV2 (Output 2)

LOSC/HISC - Low/High Scale Range

If a thermocouple or RTD is being used these parameters will establish the allowable range for the setpoint. If an analog input is being used these parameters will establish the scaling range for the process signal and the allowable range for the setpoint. Set in temperature/engineering units.

PL1/PL2 - Power Limit for Heating and Cooling Outputs

These parameters limit the maximum percentage of power for the control outputs. These are used on systems that cannot tolerate 100% power. Set from 0-100%.

INPT - Input Type Selection

Used to indicate what type of sensor input will be connected. See Range and Accuracy of Inputs on page 5 for available input types.

UNIT - Process Unit

Used to select the correct engineering units for the process. (PU for Analog inputs, C or F for temperature applications).

RESO - Decimal Point Resolution

This parameter defines the position of the decimal point for the process value and setpoint value. Set to 0,1 or 2 positions right of the decimal point. (2 positions is reserved for linear inputs only.)

CONA - Control Action of Output #1

Determines whether the output will be reverse acting, as in a heating application, or direct, as in a cooling application. See programmable control action on page 33.

A1MD - Alarm Mode Selection for Alarm #1

Refer to page 22 for the various alarm types available.

A 1SF

A1SF - Alarm #1 Special Function
Selects a hold function or latch function for alarm #1. Also, used to reconfigure alarm #1 as a dwell timer. Refer to page 22 for more information. Set to CooL for cooling action on output #2.

CYC
C.CYC

CYC/CCYC - Proportional Cycle Time for Outputs #1 & #2
These parameters determine the duration of the duty cycle for time proportioned outputs. Set from 0-99 seconds. Set to 0 for linear outputs.

C.Pb
d-b

CPB/DB - Cooling Proportional Band/Dead Band
Used only when output #2 is configured for cooling applications. Refer to page 34 for a more detailed explanation.

PRIMARY PROGRAM MENU

Press the key momentarily to enter the Primary Program Menu.

Press the key momentarily to scroll through the Primary Program Menu.

Pause momentarily on a parameter to be changed. After 3.2 sec the display will begin to toggle between the parameter and its current value.

Press either the or key momentarily to highlight the numerical position to be changed.

Press and hold either the or key to increment or decrement the desired position.

Press the key momentarily to continue scrolling through the Primary Program Menu.

When you've reached the last parameter in a given level, press and hold the key until that parameter stops flashing. This will advance you to the next level of the Primary Program Menu.

CHANGING SETPOINT (SV)

Press either the ⌃⌃ or ⌄⌄ key momentarily to view set-point

Press either the ⌃⌃ or ⌄⌄ key momentarily to highlight the numerical position to be changed.

Press and hold either the ⌃⌃ or ⌄⌄ key to increment or decrement the desired position.

After approximately 10 seconds the unit will automatically return to reading the Process Variable (PV).

BEGIN CONTROLLING

1. Insure that the controller is properly wired for your application. As soon as the unit is powered up it will begin trying to control at the current setpoint.

2. Check the display of the controller. Make sure that it is reading the actual temperature/engineering units.

3. If everything looks correct set the desired setpoint, go to the auto-tune procedure (page 20) and initiate it. When autotune is complete your system will be ready.

4. If you experience problems go to the troubleshooting section (p.38).

AUTO-TUNING

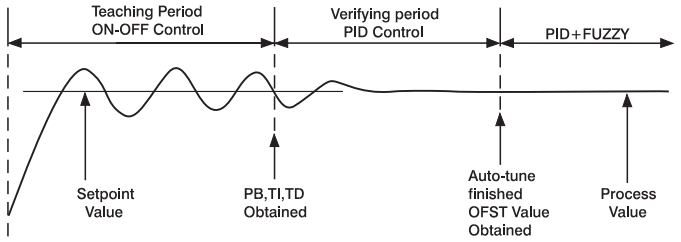
Auto-tune is a procedure that will oscillate your process around setpoint twice, testing the dynamics of your system and automatically setting the P, I, and D parameters.

You should auto-tune your system:
- during initial set-up.
- if setpoint is changed by a large amount.
- if sensor or output is changed.

TO COMPLETE THE AUTO-TUNE PROCEDURE;

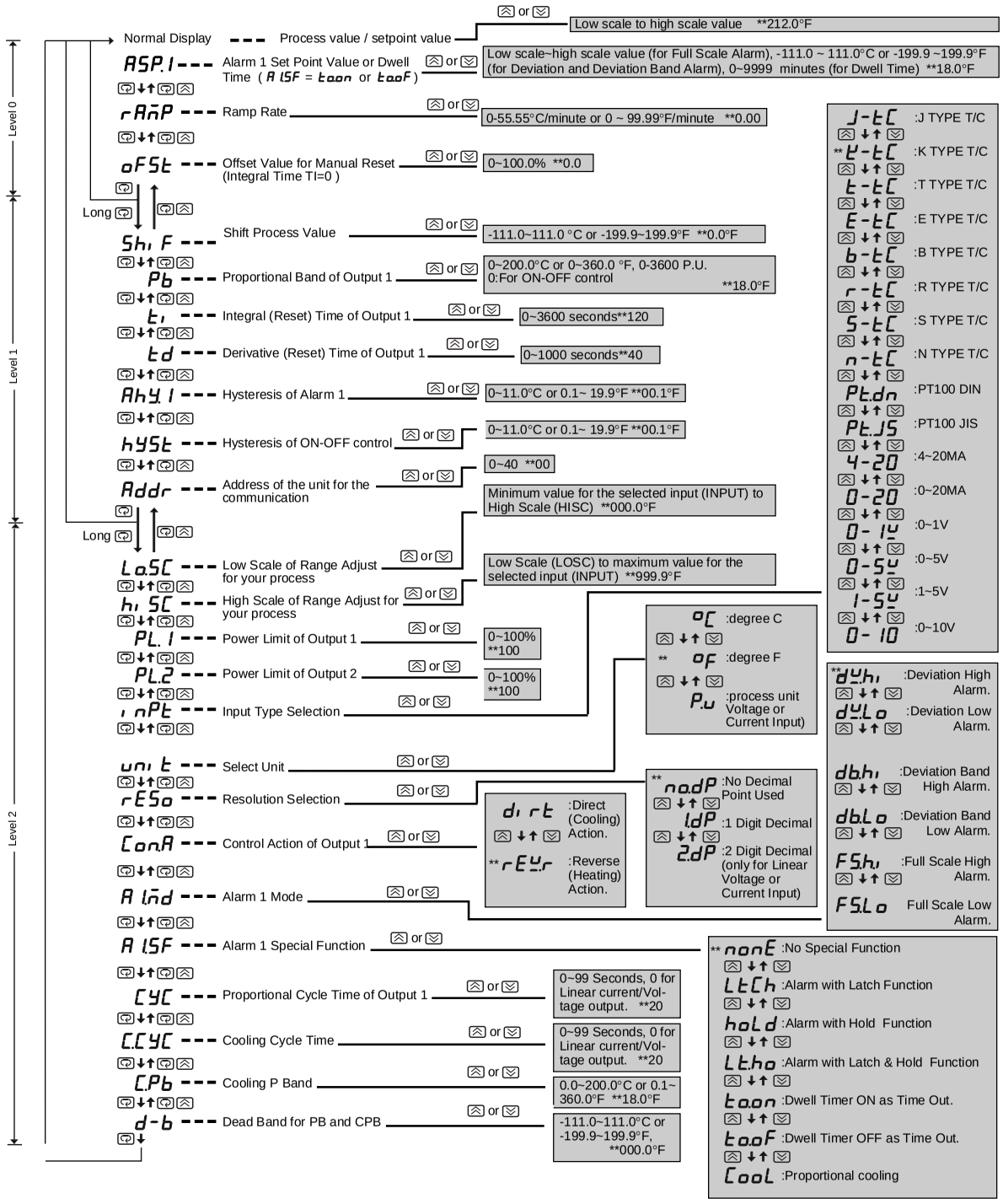
1. Make sure all parameters are configured correctly.
2. Have system under normal load conditions.
3. Make sure Pb(Proportional band) is not 0.
4. Set the setpoint to the normal operating temperature.
   Note: If system overshoot is likely to cause damage, reduce the setpoint during autotune.
5. Press and hold the ⌃⌃ and ⌄⌄ keys for 3.2 seconds and then release. The display will begin flashing and will continue to flash throughout the auto-tune process.

Note: To abort the autotune process, press and release the ⌃⌃ and ⌄⌄ keys during the first oscillation of the process.



FLOW CHART OF PARAMETERS

The following chart shows a typical (default) access sequence of parameters.



Note: Using the Tool Program the display sequence and the security level for any parameter are configurable. Also, any unused parameter can be removed from the display sequence to simplify the operation.

**: Denotes the default setting

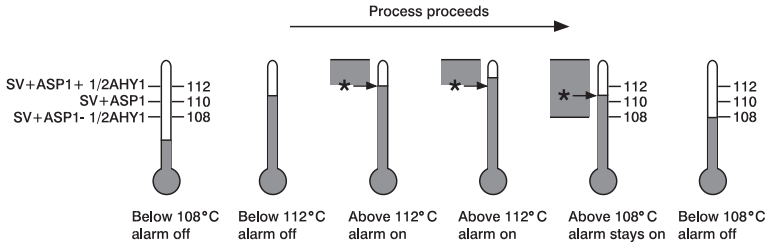
Long : Press and hold for at least 3.2 seconds

ALARMS

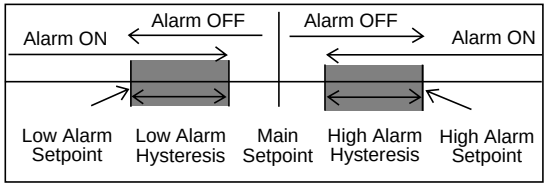
This controller is available with a second output that can be configured for a variety of alarm types. The following parameters in the Primary Program Menu are used to configure the alarms;

ASP.1 **Alarm 1 setpoint** - This parameter determines the point that alarm 1 will be activated.

Example: Deviation high alarm with no special function
SV= 100°C, ASP1= 10°C, AHY1= 4°C



AHY.1 **Alarm 1 Hysteresis** - This parameter establishes an area around Alarm 1 setpoint where the alarm relay will not change states.

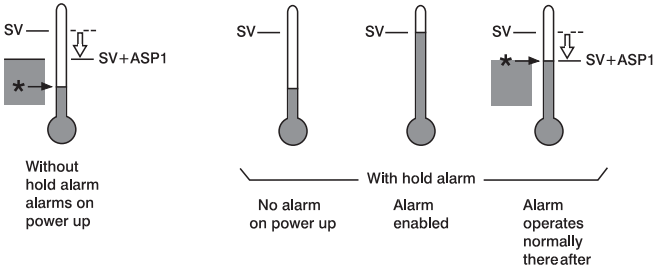


A1nd **Alarm 1 mode** - This parameter determines the alarm type that is to be used, such as a deviation alarm, a band alarm, or an absolute alarm.

Code	Type		
1	Full scale high	FSh1	PV; Alarm Set point
2	Full scale low	FSLo	PV; Alarm Set point
3	Deviation high	dUh1	Alarm Set point; PV; Set point
4	Deviation low	dULo	Alarm Set point; PV; Set point
7	Deviation band high	dbh1	Alarm Set point; PV; Set point
8	Deviation band low	dbLo	PV; Set point

A1SF **Alarm 1 Spec. Func.-** This parameter assigns special functions to Alarm 1 such as a **holding** feature **hold** that prevents an alarm during start up or a **latch** function **LtCh** that prevents the alarm from clearing unless power is interrupted.

Example: Deviation low alarm with Hold function.



SETTING ALARMS

To set an alarm:

Press the key momentarily to enter the Primary Program Menu.

Press the key momentarily to scroll through the Primary Program Menu until you come to A1nd .

Pause momentarily. After 3.2 sec the display will begin to toggle between A1nd and its current setting.

Press and hold either the or key to select the desired alarm type.

Press the key momentarily to continue scrolling through the Primary Program Menu until you come to A1SF .

Pause momentarily. After 3.2 sec the display will begin to toggle between A1SF and its current setting.

Press and hold either the or key to select the desired alarm special function.

Press the key momentarily to continue scrolling through the Primary Program Menu until you come to A5P.1 .

Pause momentarily. After 3.2 sec the display will begin to toggle between A5P.1 and its current setting.

Press either the or key momentarily to highlight the numerical position to be changed.
Press and hold either the or key to select the desired alarm set point.

Press the key momentarily to continue scrolling through the Primary Program Menu until you come to Ah4.1 .

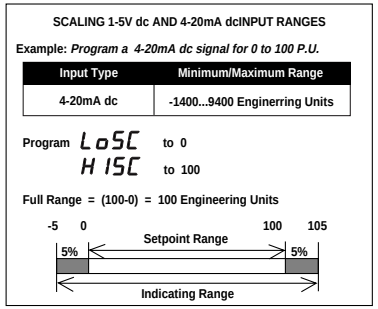
Pause momentarily. After 3.2 sec the display will begin to toggle between Ah4.1 and its current setting.

Press either the or key momentarily to highlight the numerical position to be changed.

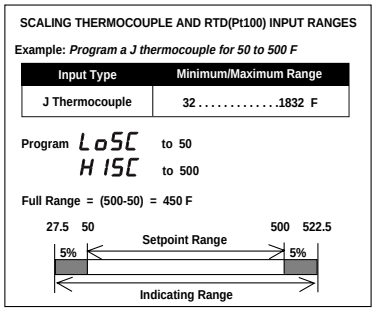
Press and hold either the or key to select the desired amount of alarm hysteresis.

SCALING ANALOG INPUTS / SETTING SETPOINT LIMITS

When an analog input such as 4-20 mA signal is applied to this unit it is necessary to tell the unit how this signal is to be scaled.



When a thermocouple or RTD is applied to this controller it may be necessary to establish limits that the setpoint can be set within in order to protect the system from over/ under-temperature situations.



Parameters LoSC (zero point/lower setpoint limit) and hi.SC (span point/upper setpoint limit) are used to scale analog inputs or to establish setpoint limits.

TO SET THESE PARAMETERS;

Press the key momentarily to enter the Primary Program Menu.

Press the key momentarily to scroll through the Primary Program Menu until you come to LoSC / hi.SC .

Pause momentarily. After 3.2 sec the display will begin to toggle between LoSC / hi.SC and its current setting.

Press either the or key momentarily to highlight the numerical position to be changed.

Press and hold either the or key to enter the desired value.

RAMP FUNCTION

If the ramp function is enabled the process will increase or decrease, during initial power up and setpoint changes, at a rate determined by the parameter rAnP which can be adjusted in units/minute. This function will be disabled when rAnP is set to zero.

TO SET A RAMP RATE;

Press the key momentarily to enter the Primary Program Menu.

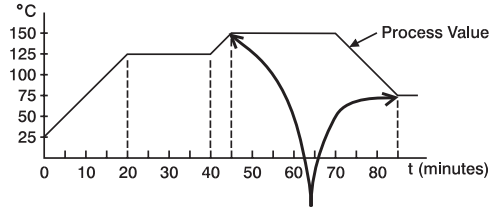
Press the key momentarily to scroll through the Primary Program Menu until you come to rAnP .

Pause momentarily. After 3.2 sec the display will begin to toggle between rAnP and its current value.

Press either the or key momentarily to highlight the numerical position to be changed.

Press and hold either the or key to increment or decrement the desired position.

Press the key momentarily to continue scrolling through the Primary Program Menu.



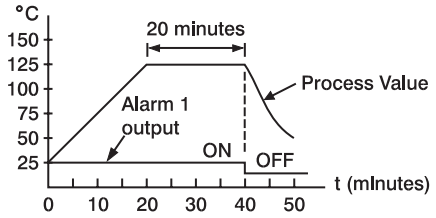
Change of Setpoint

RAMP & SOAK/DWELL FUNCTION

A dwell timer has been incorporated into this controller.
Alarm #1 can be configured by setting [A1SF] = [t.on] or [t.oF] to provide either a dwell function or a soak function to be used in conjunction with the ramp function.

The ramp and soak function will allow the system to be programmed to approach setpoint at a specific ramp rate, hold the setpoint temperature for a set amount of time and then shut off the alarm relay. When the output is wired in series with the alarm relay, the output will turn off when the alarm relay shuts off. This will end the soak cycle and return the process to ambient conditions until the controller is reset.

TO SET A SOAK/DWELL TIME



Follow the procedure outlined in Ramp Function to set a ramp rate.

While in the Primary Program Menu continue to scroll until you come to parameter [A1SF].

Pause momentarily. After 3.2 sec the display will begin to toggle between [A1SF] and its current value.

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Press and hold either the ⌃⌃ or ⌄⌄ key to increment or decrement to the desired position, [t.on] to turn the relay on after the amount of time defined by [ASP.1] or [t.oF] to turn the relay off after the amount of time defined by [ASP.1].

Press the ↻ key momentarily to continue scrolling through the Primary Program Menu until you come to parameter [ASP.1].

Pause momentarily. After 3.2 sec the display will begin to toggle between [ASP.1] and its current value.

Press either the ⌃⌃ or ⌄⌄ key momentarily to highlight the numerical position to be changed.

Press and hold either the ⌃⌃ or ⌄⌄ key to increment or decrement the desired time setting.

TOOL PROGRAM MENU

Press the key and the key simultaneously to enter the Tool Program Menu.

Press the key and the key simultaneously to scroll through the main headings of the Tool Program Menu.

Press the key to access the parameters under each main heading within the Tool Program Menu.

Pause momentarily on a parameter to be changed. After 3.2 sec the display will begin to toggle between the parameter and its current value.

Press either the or key momentarily to highlight the numerical position to be changed.

Press and hold either the or key to increment or decrement the desired position.

Press the key momentarily to continue scrolling through the parameters within that heading,

or

Press the key and the key simultaneously to continue scrolling through the main headings of the Tool Program Menu.

MANUAL CONTROL

The outputs of this controller can be used in a manual mode. This enables the operator to apply a specific percentage of power to the system.

To use this unit in manual mode:

Enter the Tool Program Menu by pressing the and the key simultaneously.

The display will toggle between hAnd and Cont .

Press the key momentarily.

The display will toggle between the process variable and the current output percentage h___ .

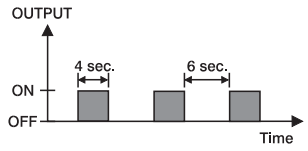
To change output #1 skip this step, to change output #2 press the key momentarily to display the output percentage for the cooling output C___ .

Press and hold the key for 3.2 seconds.

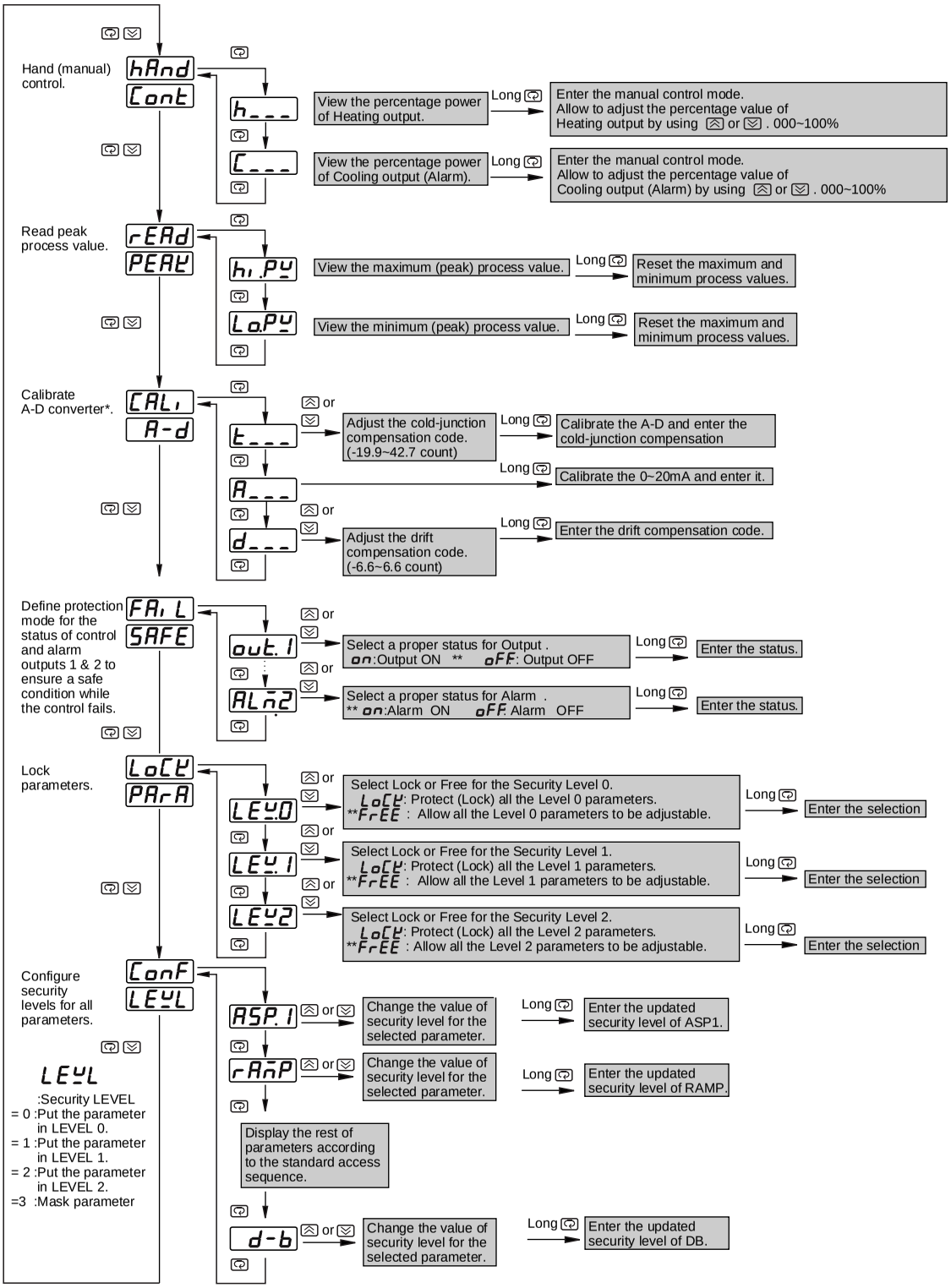
The display will begin flashing as it toggles between the process variable and h___ .

Use the and keys to highlight and change the display h___ to the desired output percentage.

Example:
H 40 is viewed with cycle time CYC =10 sec.
The output 1 will act as shown:



Flow Chart of Tool Programs



* Do not proceed through this section unless there is a definite need to re-calibrate the controller.
All previous calibration data will be lost.

PROGRAMMABLE CONTROL ACTION

Output #1 can be used in a reverse action configuration (heating applications) or in a direct action configuration (cooling applications) by adjusting parameter conA .

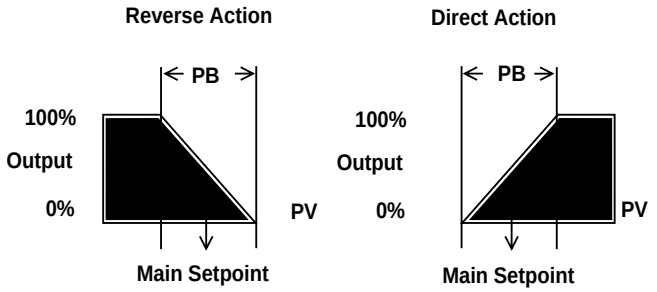
To adjust the control action of output #1;

Press the key momentarily to enter the Primary Program Menu.

Press the key momentarily to scroll through the Primary Program Menu until you come to conA .

Pause momentarily. After 3.2 sec the display will begin to toggle between conA and its current setting.

Press and hold either the or key to select the desired control action (dirt = direct / rEvr = reverse).



Note: PB = Proportional Band

COOLING CONTROL

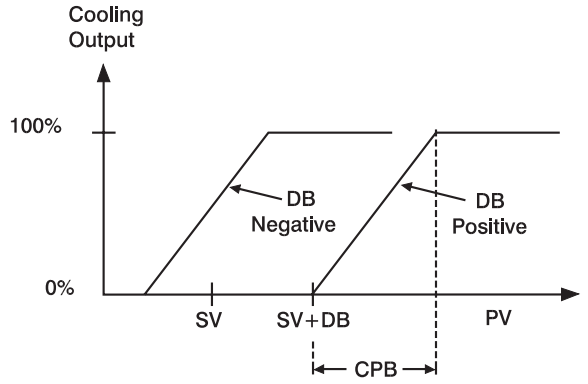
This controller has the option of being configured as a single or a dual output controller.

The alarm output can be used as a control output by setting parameter A1SF in the Primary Program Menu to CooL. Once this is done the following parameters are used as output #2 control parameters;

CPB: Cooling Proportional Band

DB: Dead Band

CCYC: Cooling Cycle Time



CONFIGURABLE MENUS

This controller gives you the flexibility to configure the menus in a way that is most convenient for your application. There are four menu levels that parameters in the primary program menu can be assigned to.

LEV0 - This is the first group of parameters within the Primary Program Menu. Locate parameters here that need to be changed frequently or that need to be accessed easily.

LEV1 - This is the second group of parameters within the Primary Program Menu. Locate parameters here that need to be accessed but not frequently.

LEV2 - This is the third group of parameters within the Primary Program Menu. Locate parameters here that are specific to your application but are not going to be changed.

LEV3 - This is a level used to mask parameters that are not used for your application or parameters that are not to be accessed by the operator.

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TO ASSIGN PARAMETERS TO A SPECIFIC LEVEL

Press the key and the key simultaneously to enter the Tool Program Menu.

Press the key and the key simultaneously to scroll through the Tool Program Menu until you come to CONF .

Pause momentarily. After 3.2 sec the display will begin to toggle between CONF and LEVL .
Press the key to access the parameters under this, contained within the primary program menu and their current menu level.

Pause momentarily on a parameter to be changed. After 3.2 sec the display will begin to toggle between the parameter and the level it is currently assigned to.

Press and hold either the or key to increment or decrement to the menu level desired.

Press and hold the key for 3.2 sec to register the selection.

LOCKING MENUS

The various menu levels within the Primary Program menu can be left free so that information can be viewed as well as changed, or any of the levels can be locked so that the information can only be viewed but not changed.

TO LOCK A MENU LEVEL WITHIN THE PRIMARY PROGRAM MENU

Press the key and the key simultaneously to enter the Tool Program Menu.

Press the key and the key simultaneously to scroll through the Tool Program Menu until you come to LoCt .

Pause momentarily. After 3.2 sec the display will begin to toggle between LoCt and PArA .

Press the key to access the parameters LEv0 - LEv2 .

Pause momentarily on a menu level to be changed. After 3.2 sec the display will begin to toggle between the parameter and the lock setting it is currently set to.

Press and hold either the or key to increment or decrement to the lock level desired (LoCt = locked, FrEE = accessible).

Press and hold the key for 3.2 sec to register the selection.

ERROR MESSAGES

Symptom	Probable Cause(s)	Solution
Process display shows: 	- Sensor break	- Replace RTD or sensor - Use manual mode operation
Process display shows: 	- Input signal beyond the low range, sensor fails	- Replace sensor - Check sensor or thermocouple type, correct input selection
Process display shows: 	- Input signal beyond the high range, sensor fails	- Replace sensor - Check sensor or thermocouple type, correct input selection
Process display shows: 	- A to D module damage	- Replace module - Check for outside source of damage such as transient voltage spikes
Process display shows: 	- Incorrect operation of auto tune procedure - Manual mode is not allowed for an ON-OFF control system	- Repeat procedure. Increase Prop. band to a number larger than 0.
Process display shows: 	- Check-sum error, values in memory may have changed accidentally.	- Check and reconfigure control parameters
Process display shows: 	- Fail to enter data into EEPROM	- Replace EEPROM
Process display shows: 	- Overflow error, data out of range during execution of program	- Check if there is noise coming in. - Replace EEPROM.
Process Display shows: 	- Attempt to change a locked parameter	- UNLOCK procedure stated in the flow chart of tool programs.