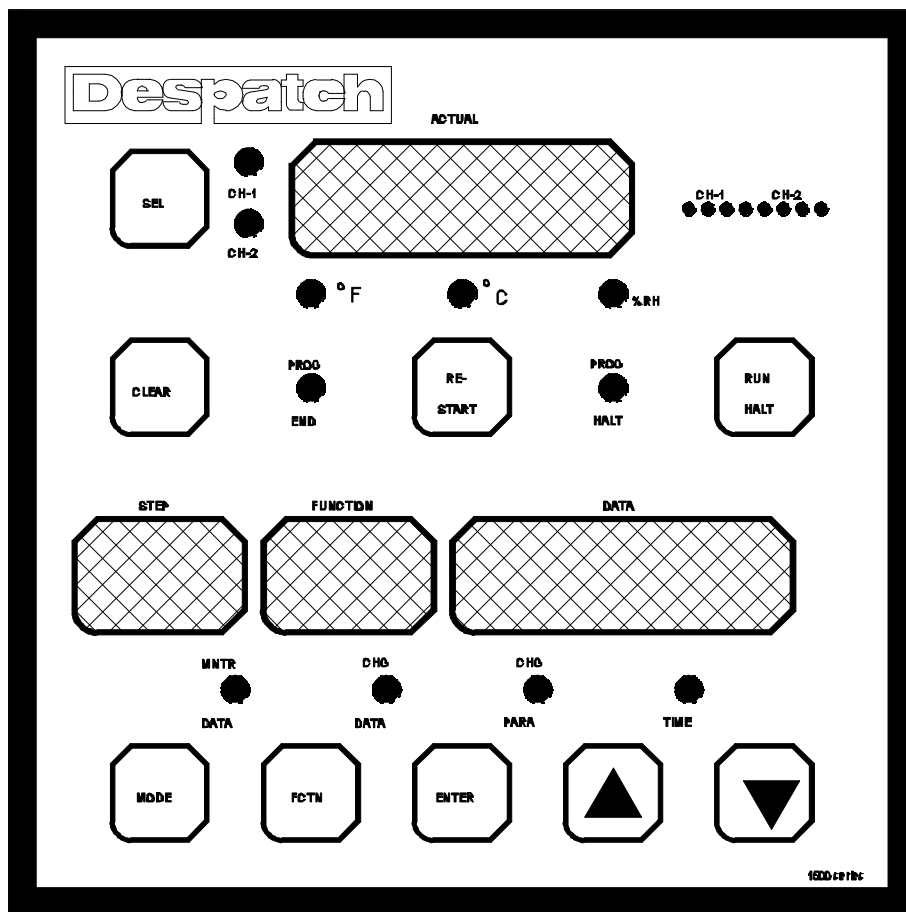# Instruction Manual for the Despatch/Watlow 1500 Control

Notice

Users of this equipment must comply with operating procedures and training of operation personnel as required by the Occupational Safety and Health Act (OSHA) of 1970, Section 6 and relevant safety standards, as well as other safety rules and regulations of state and local governments. Refer to the relevant safety standards in OSHA and National Fire Protection Association (NFPA), section 86 of 1990.

Caution

Setup and maintenance of the equipment should be performed by qualified personnel who are experienced in handling all facets of this type of system. Improper setup and operation of this equipment could cause an explosion that may result in equipment damage, personal injury or possible death.

Dear Customer,

Thank you for choosing Despatch Industries. We appreciate the opportunity to work with you and to meet your heat processing needs. We believe that you have selected the finest equipment available in the heat processing industry.

At Despatch, our service does not end after the purchase and delivery of our equipment. For this reason we have created the Service Products Division within Despatch. The Service Products Division features our Response Center for customer service. The Response Center will direct and track your service call to ensure satisfaction.

Whenever you need service or replacement parts, contact the Response Center at 1-800-473-7373: FAX 612-781-5353.

Thank you for choosing Despatch.

Sincerely,

Despatch Industries

PREFACE

This manual is your guide to the Watlow 1500 control. It is organized to give you the information you need quickly and easily.

The INTRODUCTION section provides an overview of the control.

The THEORY OF OPERATION section details the function and operation of the control.

The INSTRUCTIONS section provides directions on unpacking, installing, operating and maintaining the control.

The APPENDIX section contains Special Instructions for operating the control instrument and a Troubleshooting Table.

An efficient way to learn about the control would be to read the manual while working with the control. This will give you practical hands-on experience with information in the manual and the control.

While reading this manual, if a term or section of information is not fully understood, look up that item in the appropriate section to familiarize yourself with that item. Then go back and reread that section again. Information skipped, not understood or misunderstood could create the possibility of operating the equipment in an unsafe manner. This can cause damage to the oven or personnel, or reduce the efficiency of the equipment.

NOTE:
Read the entire INTRODUCTION and THEORY OF OPERATION before operating the control.

WARNING:
Failure to head warnings in this instruction manual and on the oven could result in death, personal injury or property damage.

Despatch/Watlow 1500 Control Instruction Manual

Table of Contents

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INTRODUCTION

This INTRODUCTION section provides an overview of the Watlow 1500 controller. The microprocessor based controller is capable of measuring, displaying and controlling temperature and humidity from a variety of inputs.

The controller is easy to use. Control functions, alarm settings and other parameters are easily entered through the front keypad. Limited data can be protected from unauthorized changes with its guarded access mode security system. Battery back-up protects against data loss during AC power outages.

In this application the controller has been factory configured to control temperature and humidity conditions in your Despatch chamber. Under normal conditions, you should <u>not</u> have to reprogram this controller. We have, however, included reprogramming instructions in this manual to help guide you through that process if it should become necessary.

NOTE:
Your control has already been configured at Despatch. Use this manual as a guide to typical settings.

CAUTION:
Before making changes to your control, consult with Despatch Industries Product Service at 1-800-473-7373.

INSTRUCTIONS

Operating

To start the controller, start the oven fans. When you start the fans the following sequence will automatically take place.

1. The controller will power up.

2. The controller **MNTR DATA** LED will light up and the alarm indicator A1 will be flashing in the **FUNCTION** display. Alarm A1 is an indication of power loss.

3. Clear the alarm by pressing the clear button on the Watlow 1500.

4. The actual temperature and humidity will be shown in the **ACTUAL** display located at the top of the control. Press the **SEL** key to toggle between temperature and humidity. Temperature will be displayed on Channel 1. Humidity will be displayed on Channel 2.

NOTE:
Your control has already been configured at Despatch. Use this manual as a guide to typical settings.

CAUTION:
Before making changes to your control, consult with Despatch Industries Product Service at 1-800-473-7373.

Watlow 1500 Control

The Watlow Series 1500 is a versatile microprocessor-based control; powerful, yet simple to learn.
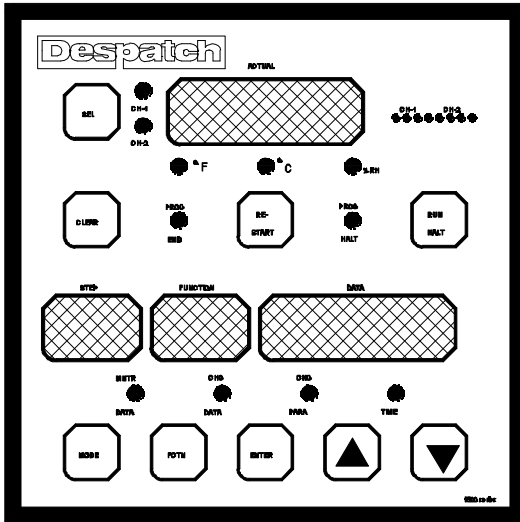
Figure 1 illustrates the Watlow 1500 installed on the Series 16000 environmental chamber control panel.

Table 1 Watlow 1500 Displays

Display	Description
Actual	Shows the actual process conditions (dry bulb temp if CH-1 LED is on, RH% if CH-2 is on.
Event	Shows current status of all events. Lowest significant event is left justified [instead of right justified as when events are shown in data display].
Step	Shows which step the programmer is currently pointed to.
Function	Describes the function or type of data being displayed in the data display.
Data	Shows current value for the function being viewed. This display is effected by the scroll up and down keys.

Watlow 1500 Control (Cont.)

Table 2 Watlow 1500 Keys

Key	Description
CH SEL	Selects either channel 1 or channel 2 for the **ACTUAL** display.
CLEAR	Clears alarm codes from the **FUNCTION** display in the monitor data mode. Clears the step in the **STEP** display in the change data mode when the unit is in the halt condition. Clears all 51 programmed steps when the unit is in the halt condition, and in the guarded access area of the change parameter mode.
RE-START	Returns the controller to the initial program step only in the program halt condition.
RUN/HALT	Starts or stops the program. The processor will resume a program where it was interrupted, unless the **RESTART** key was pressed, or the step number or set point data at the current step was changed during the halt condition.
MODE	Selects either the monitor data, change data or change parameter mode.
FCTN	The **FUNCTION** key steps through the prompts in each of the three modes.
ENTER	Enters the selected data or next step operations in the change data and change parameter modes.
▲ ▼	Increases and decreases the value in the **DATA** display. A light touch changes the value by one. Holding the key down causes the **DATA** display to increase rapidly.

Table 3 Watlow 1500 LEDs

LED	Description
CH-1 CH-2	Indicates the channel in the **ACTUAL** display.
ℇF	Indicates the value in the **ACTUAL** display is temperature in ℇF.
ℇC	Indicates the value in the **ACTUAL** display is temperature in ℇC.
%RH	Indicates the value in the **ACTUAL** display is per cent relative humidity.
PROG END	Indicates that the processor has reached the end of the program.
PROG HALT	Indicates that the processor is in the halt condition. This may be caused by pressing the **RUN/HALT** key or by a blank step in the program. Flashing indicates that the processor is in remote-hold condition.
MNTR DATA	Indicates the processor is in the monitor data mode. While in this mode the Watlow 1500 is used as a set point controller or a process profiler.
CHG DATA	Indicates the processor is in the change data mode.
CHG PARA	Indicates the processor is in the change parameter mode.
TIME	Indicates that the **FUNCTION** and **DATA** displays are showing time.

Manual Set Point Controller

Use the following procedure to enter a dry bulb temperature, RH%, or change auxiliary event status when the **MNTR DATA** LED is on.

1. Press the **RUN/HALT** key so the **PROG HALT** LED lights up.

2. Press the **RESTART** key.

3. Enter the dry bulb temperature.

    a. Press the **FCTN** key until C1 is signaled in the **FUNCTION** display.

    b. Update the dry bulb temperature by using up/down arrow keys.

    c. Press enter when the desired set point is signaled in the data display.

    Your set point is now in effect.

    If the set point shown in the **DATA** display is higher than the value shown in the **ACTUAL** display for CH-1, then the heat LED near the Watlow 1500 should be on.

    If the set point in the **DATA** display is lower than the value in the **ACTUAL** display for CH-1, then the cool LED should be on.

Manual Set Point Controller (Cont.)

4. Enter the %RH. The humidity event must be off when outside of the range 4ᴇC to 98ᴇC. Humidity beyond these extremes can result in equipment damage. If a dry air system and an electronic humidity sensor are installed in lieu of a wet bulb sensor, the optional dry air event may be outside the range of 4ᴇC to 98ᴇC.

    NOTE:
    In the **DATA** display the right most character for Event 11 is shown as 0001.

    a. Press the **FCTN** key. C2 is shown.

    b. Update the %RH temperature by using the up/down keys.

    c. Press enter when **DATA** display shows your desired set point.

5. Change the auxiliary events.

    a. Press the **FCTN** key. E1 is displayed.

    b. Turn the auxiliary event on or off.

        1 = on
        0 = off

Try varying set points and events and watch how each effects the output LEDs.

Guarded Access Programming

The Guarded Access parameters control the process limits. the three GA parameter loops are restricted to operators by special codes. The Guarded Access codes prevent inexperienced or unauthorized operators from changing the parameters.

You must select one of the following:

      GA = 0000   To set CH-1 and CH-2 alarm limits

      GA = 0001*   To set CH-1 PID tune parameters

      GA = 0002*   To set CH-2 PID tune parameters

      GA = 0006   To set set point scroll limits, optional lockout and option recycle

    *If GA = 0001 and 0002 will not work, try GA code 0005 for both channel parameters.

Use the following sequence to alter the GA prompts:

1.   Follow the steps for "SETTING THE CLOCK."

2.   Select a **GA** code with the > key and the ? key.

3.   Press **ENTER**. The prompt appears in the **DATA** display.

4.   Press the **FCTN** key. The next prompt in the loop appears in the **DATA** display.

Setting the Clock

1. Press the **MODE** key to select the Change Parameter (CHG PARA) mode. The **TIME** LED will be ON. The **FUNCTION** and **DATA** displays will show the real time of day.

2. Press **FCTN** to produce the time prompt, **HR**, in the **FUNCTION** display.

3. Enter the real time of day, beginning with hours. The **CHG PARA** programming prompts are listed below in the order they appear.

    a. Enter the real time of day (24 hour basis) by selecting the hour with the › key and the ? key.

    b. Press **ENTER** to enter the hour into the program. The prompt **MN** will appear when you press **ENTER**.

    c. Select correct minutes and seconds.

After setting the real time the **FUNCTION** prompt should display a **GA**. This is guarded access.

GA0001 and 0002 PID Tuning

Prompts appear for CH-1 with Code 0001, and then repeat
for CH-2 with Code 0002. Except for CA, these parameters
pertain directly to tuning your control to the system.

Table 4 GA0001 and 0002 PID Tuning Parameters

Parameter	FUNCTION Display	Description
Proportional Band	Pb	
Reset	RS	
Rate	RT	
Rate Band	Rb	Rate band defines where the rate function will occur. The rate band will occur at one to seven times the proportional band. With a 0 entry, rate is always in effect.
Cycle Time	CT	
Dead Band	db	The dead band defines an area on either side of set point where no switching action will occur.
Calibration Offset	CA	Calibration offset enables you to offset the input value from -10E to 10EC or EF.

GA0000 Alarms

Prompts appear for CH-1, then repeat for CH-2. Refer to
the Watlow User's Manual for details.

Table 5 GA0000 Alarms

Parameters	FUNCTION Display	Description
Upper Process Type Alarm	UP	If you do not want this alarm, set to highest value.
Lower Process Type Alarm	LP	If you do not want this alarm, set to lowest value.
Upper Deviation Type Alarm	Ud	If you do not want this alarm, set to highest value.
Lower Deviation Type Alarm	ID	If you do not want this alarm, set to lowest value.

Sequence repeats for Channel 2 and then leaves the
guarded area, returning to real time.

GA0006 Setting Options

These parameters are high and low display and scroll limits, and for some units, two channel control type and device address.

Table 6 Setting Options

Parameter	FUNCTION Display	Description
CH-1 Upper Set Point Limit	U1	
CH-1 Lower Set Point Limit	L1	
CH-2 Upper Set Point Limit	U2	
CH-2 Low Set Point Limit	L2	
Front Panel Keyboard Lockout	LC	Enter: ᴄ 1 to lock the entire front panel, ᴄ 0 to unlock it.
Recycle	RC	Select: ᴄ 1 to activate the recycle option (begin again at Step #1 after completing a profile), ᴄ 0 to deactivate the recycle option.
Temp-Temp, 2-channel temperature control	TT	This prompt will not appear on thermocouple units. Select: ᴄ 0000 for Temp-RH control ᴄ 0001 or Temp-Temp control.
RS-422 Address for the 1500	Ad	This prompt appears only on units with data communications. It applies only for an RS-422 interface. Each device on the network must have its own address.

Sequence then leaves the guarded area, returning to real time.

ECOSPHERE/16000 Series Guarded Access Chart

Make a copy of this chart to document the Series 1500
Guarded Access for each program you use.

Program #_____ System _____   Programmer _____   Date_____

GA Code	Ch	Pmpt	Parameter	Typical ECOSPHERE Setting	Your Settings
0000	C1	UP	Ch-1 Upper Process Alarm	180	
	C1	LP	Ch-1 Lower Process Alarm	-75	
	C1	Ud	Ch-1 Upper Deviation Alarm	538	
	C1	Ld	Ch-1 Lower Deviation Alarm	-538	
	C2	UP	Ch-2 Upper Process Alarm	101	
	C2	LP	Ch-2 Lower Process Alarm	-001	
	C2	Ud	Ch-2 Upper Deviation Alarm	101	
	C2	Ld	Ch-2 Lower Deviation Alarm	-101	
0001	1	Pb	Ch-1 Prop. Band	0009	
	1	RS	Ch-1 Reset	0010	
	1	RT	Ch-1 Rate	0000	
	1	Rb	Ch-1 Rate Band	0001	
	1	CT	Ch-1 Cycle Time	0003	
	1	db	Ch-1 Dead Band	0001	
	1	CA	Ch-1 Calibration Adjust.	0000	
Dual PID	1C	Pb	Ch-1 Prop. Band	0009	
	1C	RS	Ch-1 Reset	0002	
	1C	RT	Ch-1 Rate	0001	
	1C	Rb	Ch-1 Rate Band	0001	
	1C	CT	Ch-1 Cycle Time	0007	
0002	2	Pb	Ch-2 Prop. Band	0020	
	2	RS	Ch-2 Reset	0010	
	2	RT	Ch-2 Rate	0050	
	2	Rb	Ch-2 Rate Band	0003	
	2	CT	Ch-2 Cycle Time	0002	
	2	db	Ch-2 Dead Band	-0001	
	2	CA	Ch-2 Calibration Adjust.	0000	
Dual PID	2C	Pb	Ch-2 Prop. Band	0020	
	2C	RS	Ch-2 Reset	0006	
	2C	RT	Ch-2 Rate	0001	
	2C	Rb	Ch-2 Rate Band	-0001	
	2C	CT	Ch-2 Cycle Time	0005	
0006		U1	Ch-1 Upper Set Point Limit	177	
		L1	Ch-1 Lower Set Point Limit	-73	
		U2	Ch-2 Upper Set Point Limit	100	
		L2	Ch-2 Lower Set Point Limit	000	
		RC	Recycle: ON = 1, OFF = 0	0	
		TT	T-RH = 0000, T-T = 0001	0	
		Ad	Address number RS-422	0	
		LC	Keyboard Lock	0	

LPB Series Guarded Access Chart

Make a copy of this chart to document the Series 1500
Guarded Access for each program you use.

Program #_____   System _____   Programmer _____   Date_____

GA Code	Ch	Pmpt	Parameter	Typical HASP Settings	Your Settings
0000	C1	UP	Ch-1 Upper Process Alarm	170	
	C1	LP	Ch-1 Lower Process Alarm	0	
	C1	Ud	Ch-1 Upper Deviation Alarm	538	
	C1	Ld	Ch-1 Lower Deviation Alarm	-538	
	C2	UP	Ch-2 Upper Process Alarm	101	
	C2	LP	Ch-2 Lower Process Alarm	-001	
	C2	Ud	Ch-2 Upper Deviation Alarm	101	
	C2	Ld	Ch-2 Lower Deviation Alarm	-101	
0005		RC	Recycle	0000	
	C1	Pb	Ch-1 Prop. Band	0003	
	C1	RS	Ch-1 Reset	0005	
	C1	RT	Ch-1 Rate	0001	
	C1	Rb	Ch-1 Rate Band	0001	
	C1	CT	Ch-1 Cycle Time	0001	
	C1	db	Ch-1 Dead Band	0000	
	C1	CA	Ch-1 Calibration Adjust.	0000	
	C2	Pb	Ch-2 Prop. Band	0005	
	C2	RS	Ch-2 Reset	0002	
	C2	RT	Ch-2 Rate	0005	
	C2	Rb	Ch-2 Rate Band	0001	
	C2	CT	Ch-2 Cycle Time	0001	
	C2	db	Ch-2 Dead Band	0000	
	C2	CA	Ch-2 Calibration Adjust.	0000	
0006		U1	Ch-1 Upper Set Point Limit	166	
		L1	Ch-1 Lower Set Point Limit	0	
		U2	Ch-2 Upper Set Point Limit	100	
		L2	Ch-2 Lower Set Point Limit	000	
		RC	Recycle: ON = 1, OFF = 0	0	
		TT	T-RH = 0000, T-T = 0001	0	
		Ad	Address number RS-422	0	

Profile Mode

This section of the manual provides details on programming the Watlow 1500 in the Change Data (**CHG DATA**) mode, the Change Parameters (**CHG PARA**) mode and Guarded Access. Refer to the Watlow 1500 manual for more details.

Change Data Mode

When the Watlow **CHG DATA** LED is lit, the processor is in the change data mode. While in this mode, the programming steps can be entered into the processor.

There are three step types:

- Set Point (SP)
- Jump Loop (JL)
- Wait (WT)

Halt Conditions

The Watlow 1500 can HALT in three ways, when the:

- processor encounters a Blank Step in the program,

- **RUN/HALT** key is pressed while the program is running,

- remote hold input is shorted.

While in the HALT condition, the Watlow 1500 actively maintains set points and event output conditions which existed at the time the processor was halted.

If you do not want the hot or humid conditions to be retained at the end of a programmed halt, add a step just before the Blank Step [End of Program] to establish stand-by set points near ambient with all Event Outputs OFF.

Blank Step

Any unprogrammed step is first a Blank Step before information entered makes it a Set Point, Jump Loop or Wait Step.

In normal programming, only the last step in the program remains a Blank Step. A Blank Step halts the processor. If, however, the RECYCLE option was selected in the CHG PARA mode, the program will return to Step #01 and repeat.

When programming a HAST chamber, a Blank Step is not used. A Jump Step is used to jump over blank steps to ensure the program will not stop until reaching steps 47-51 required for cooldown and shutdown.

Set Point Step

The existing start conditions for each step depend upon the programmed step previously performed by the Watlow 1500. The desired end conditions for each step are also programmed.

During any set point step, the Watlow 1500 follows a linear path between the existing start conditions and the desired end conditions. When programming set points in the Watlow 1500, it is important to keep track of the ramping conditions at the start of a step and at the end of a step.

To clear a step:

1. Place the controller in halt by pressing the **RUN/HALT** key until **RUN/HALT** LED is lit.

2. Place the controller in the desired step to be cleared.

3. Press the **CLEAR** pushbutton.

Creating Files/Profiles

See sections on "SAMPLE HAST PROFILE" and
"PROCEDURE FOR PROGRAMMING HAST PROFILE" for
LPB chambers.

1. Press the **MODE** key to select the CHANGE DATA
    mode. The **FUNCTION** display will indicate one of three
    submodes:

    - SP-Set Point,
    - JL-Jump Loop,
    - WT-Wait.

2. Press the **FCTN** key until **SP** appears in the function
    display.

3. Press the **ENTER** key. S1 will appear in the
    FUNCTION display and **0000** will appear in the **DATA**
    display.

4. Use the **FCTN** key to select the variable to edit. See
    the example on Table 7, Channel 1 (S1).

5. Enter a set point for the channel selected in step 4.

    a. Use the > key and the ? key to change the value in
        the **DATA** display.

        OR

        Use the **FCTN** key to advance to the next prompt
        without entering a value.

    b. Press the **ENTER** key to enter the value in the DATA
        display as the new set point.

Creating Files/Profiles (Cont.)

6. Enter set points for the JL (Jump Loop) submode.

    a. Use the > key and the ? key to enter the JS-Jump
        Step parameter.

        OR

        Use the **FCTN** key to advance to the next prompt
        without entering a value.

    b. Press the **ENTER** key.

    c. Use the > key and the ? key to enter the JC-Jump
        Count parameter.

        OR

        Use the **FCTN** key to advance to the next prompt
        without entering a value.

    d. Press the **ENTER** key. **WT** appears in the
        FUNCTION display.

Creating Files/Profiles (Cont.)

7. Enter the wait condition values for the WT (Wait) submode.

    a. Use the **ENTER** KEY. **W1** appears in the **FUNCTION** window, indicating that a wait condition for the CH-1 set point can be entered.

    b. Use the > key and the ? key to enter the wait condition.

        OR

        Use the **FCTN** key to advance to the next prompt without entering a value.

    c. Press the **ENTER** key. W2 appears requesting a wait for CH-2 set point.

    d. Repeat steps 3b and 3c for:

        • WE (Wait for Event)

        • WH (Wit for Real Hours)

        • WM (Wait for Real Minutes)

        • WS (Wait for Real Seconds)

    Select actual time-of-day values for each.

Creating Files/Profiles (Cont.)

Table 7 Set Point Step Programming Detail

Step	FUNCTION Display	Programming Procedure
Channel 1 Set Point	S1	1. Select the Channel 1 set point. 2. Press **ENTER** (or **FCTN** to leave blank).
Channel 2 Set Point	S2	1. Select the Channel 2 set point. 2. Press **ENTER** (or **FCTN** to leave blank).
Channel 1 Event Outputs	E1	1. Select a 1 or a 0 for each of the four available events (1 = ON, 0 = OFF). The **DATA** display shows the 1 or 0 entry for Events 4* through 1, from left to right. 2. Press **ENTER** (or **FCTN** to leave blank).
Channel 2 Event Outputs	E2	1. Select a 1 or a 0 for each of the four available events (1 = ON, 0 = OFF). The **DATA** display shows the 1 or 0 entry for Events 4* through 1, from left to right. 2. Press **ENTER**. NOTE: If you've set DIP Switch #1 ON, then there are only three events available for each channel. In that case each Event 4 is an alarm.
Step Duration	HR	1. Select hours. 2. Press **ENTER**. The prompt MN will appear. 3. Select minutes, press **ENTER**. The prompt **SC** will appear. 4. Select seconds. 5. Press **ENTER**. The step duration in hours, minutes and seconds will appear in the **FUNCTION** and **DATA** displays. The **TIME** LED will be ON. 6. Press **FCTN** to proceed to the next prompt, **NX**.
Next Step	NX	To display the next prompt in sequence, press **ENTER**. To display a different step: 1. Enter that step number with the ˃ and ? keys. 2. Press **ENTER**. The Watlow 1500 will return to the SP, JL, WT, NX loop. The process begins over again.

Wait Steps

The Wait (WT) submode allows the Watlow 1500 to wait for:

- Channel 1 and/or Channel 2 actual process inputs,

- the real time of day (not elapsed time as in set point steps).

You can wait for one or two of these conditions, or all of them. If you don't need one wait condition, just press the FCTN key and the next Wait prompt will appear. By doing this the particular wait function will remain blank and be ignored.

Table 8 Wait Steps

Wait Condition	FUNCTION Display	Description
Channel 1 Actual	W1	
Channel 2 Actual	W2	
Wait for Event	WE	1 = wait for a closed switch condition. 0 = wait for an open switch condition at the Event input. Enter 0 by pressing the **ENTER** key when the Data Display is blank, or when a 0 is in the display.
Real Time of Day	WH, WM, WS	When waiting for Time, program all three units (HR-MN-SC). If you program only 53 for minutes, but enter nothing for Hours or Seconds, the programmed time will be 53 minutes after midnight, 00 53 00. If you press **ENTER** when WH, WM or WS is shown, you could end up waiting for midnight when you wanted wait for time ignored.2

A Wait Step maintains the same set points and event output conditions that existed at the end of the previous step. To establish new set point values, place a short (1 second) step containing the conditions you wish to achieve immediately before the Wait Step.

Wait Steps (Cont.)

The Wait Step does not allow the linear ramping path to reach the new conditions, as a Set Point Step does. To optimize control (reduce the overshoot and undershoot), a Wait Step uses the PID Parameters to satisfy the wait condition. In other words, select the step type which best matches your needs.

Next Step

The Next step (NX) step is used to select the program step. After the final prompt in each of the step types (SP, JL or WT), pressing **ENTER** advances the processor to NX. At the same time the STEP display will advance by one.

Pressing **ENTER** again will bring up SP, JL or WT if the next step has no programmed information. If there is data in the subsequent step, the processor will move to the first prompt in that submode.

If you want a different step from NX, select the number of the step you want in the **DATA** display with the > key and ? key, then press **ENTER**. Again, the processor will move to one of the three step types if the step is blank, or to the first prompt in the step type loop: S1, JS or W1.

Pressing **FCTN** at **NX** instead of **ENTER** will send the processor back to the initial prompt in the current step.

Recycle Option

You may request that your program repeat indefinitely by selecting RC=1 in the GA=5 area of the **CHG PARA** mode.

With the Recycle option active, you may expect to see continuous activity as the program sequence repeats. However, if your Step #1 is programmed as a Wait Step, the processor will be waiting for a time or actual condition and no action will be taking place.

Write Your Program

The number of steps in the program may be as many as 51. We suggest that you write it out on copies of the charts in this section. This will enable you to program the Series 1500 quickly and without mistakes. This Programming Chart will provide you with a back-up copy of your entire program.

WORKSHEETS

Programming Work Sheet

Name _____ Date _____

Step No.	Set Point CH-1 εC or εF S1	Set Point CH-2 % or ε S2	Events 1 = ON E1 4321	Events 0 = OFF E2 4321	Duration HR	Duration MN	Duration SC	Comments
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
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45								

Sample HAST Profile for LPB Chambers

Name _____ SAMPLE JEDEC PROGRAM _____ Date_____

Step No.	Set Point CH-1 ᴇC or ᴇF S1	Set Point CH-2 % or ᴇ S2	Events 1 = ON E1 4321	Events 0 = OFF E2 4321	Duration HR	Duration MN	Duration SC	Comments
1	20	70	0000	0001	00	00	05	Turn on "STANDBY" OR "AUTOFILL."
2	W3(0001)		--	--	--	--	--	Checking for proper water level & holds until satisfied.
3	115	58	--	0010	--	40	00	May be modified for special applications (ie 85/85).
4	--	--	--	--	--	--	01	Not used—reserved for special applications (ie 85/85).
5	120	58	--	0010	--	--	05	EV22 turns on fans and heaters.
6	W4(99.5)		--	--	--	--	--	Wait for near boiling condition.
7	120	58	--	--	--	10	--	Purge air by boiling for 10 minutes.
8	120	59	--	0110	00	00	01	EV23 closes the vent solenoid.
9	JS10	JC01						Jump to step 10 or other for different setpoint process.
10	120	85	--	--	00	31	00	Change to 85% RH condition.
11	--	W2(84)	--	--	--	--	--	Waits for RH% to reach near setpoint.
12	--	--	0000	--	00	30	--	Hold for 30 minutes.
13	--	--	0011	--	00	30	00	Hold for 30 min w/Devices powered and cool fans.
14	JS12	JC01						Repeat Device power off/on cycle to step #12 once.
15	JS47	JC01						JS to 47 for ramp down w/o rapid decompression.
16	--	--						Blank step.
17								
18								
19								
20	130	--	--	--	--	10	--	Ramp C1 to 130ᴇC @ 1ᴇC/min first, not RH%.
21	--	85	--	--	--	--	05	Ram RH% after temperature has been reached.
22	--	W2(84)	--	--	--	--	--	Wait for near set conditions.
23	--	--	0000	--	00	30	--	Hold for 30 min w/Devices not powered (EV1.1).
24	--	--	0011	--	00	30	--	Hold for 30 min w/Devices powered and cool fans.
25	JS23	JC01						Repeat Devices powered on/off cycle to step #23.
26	JS47	JC01						Jump to 47 for shutdown w/o rapid depressurization.
27								Blank step.
28								
29								
30	140	--	--	--	--	20	--	Ramp temperature first to 140ᴇC @ 1ᴇC/min.
31	--	85	--	--	--	--	05	Begin RH% ramp after temperature is reached.
32	--	W2(84)	--	--	--	--	--	Wait for near setpoints RH% condition.
33	--	--	0000	--	00	30	--	Hold for 30 min w/Devices not powered (EV1.1).
34	--	--	0011	--	00	30	--	Hold for 30 min w/Devices powered and cool fans.
35	JS33	JC01						Repeat Devices powered on/off cycle to step #33.
36	JS47	JC01						Jump to 47 for shutdown w/o rapid depressurization.
37								Blank step.
38								
39								
40								
41								
42								
43								
44								
45								
46								
47	00	60	0010	--	--	--	05	Cool EV12 on. Ramp down but maintain 60% RH.
48	W4(102)		--	--	--	--	--	Wait for liquid temperature of 102ᴇC.
49	00	00	0010	1000	--	--	--	Open the drain and vent to purge old water.
50	W1(40)		--	--	--	--	--	Waits for typical safe unloading temperature.
51	00	00	0000	0000	00	00	05	Test complete light on (all EV's off).

Note: --'s in above sample indicate parameter is left blank. <u>Blank is not the same as zero.</u>

Procedure for Programming HAST Profile

1. If power on, check HALT LED. If off, press RUN/HALT.

2. Press RESTART.

3. Press MODE until CHG PARA LED is lit.

4. Press FCTN until FUNCTION display reads GA.

5. Press UP arrow until DATA display stops at 2000.

6. Press DOWN arrow until display reads 1995, press
   enter key.

7. At Step 1 the display will read 01 SP (if Step 1 is clear),
   press enter.

   S1 is displayed, use arrow keys to 20, press enter
   S2 is displayed, use arrow keys to 70, press enter
   E1 is displayed, use arrow keys to 0000, press enter
   E2 is displayed, use arrow keys to 0001, press enter
   HR is displayed, use arrow keys to 00, press enter
   MN is displayed, use arrow keys to 00, press enter
   SC is displayed, use arrow keys to 05, press enter
   TIME is displayed (this displays the HR MN SC for
       what was just programmed)
   NX is displayed, use arrow keys to 0002, press enter

8. At Step 2 the display will read 02 SP, press FCTN until
   WT appears (if S1 is displayed, press "CLEAR" and it
   will read SP), press enter.

   Press FCTN until W3 is displayed, use arrow keys to
       0001, press enter
   Press FCTN until NX is displayed, use arrow keys to
       0003, press enter

Procedure for Programming HAST Profile (Cont.)

9. At Step 3 the display will read 03 SP, press enter.

    S1 is displayed, use arrow keys to 115, press enter
    S2 is displayed, use arrow keys to 58, press enter
    E1 is displayed, press FCTN
    E2 is displayed, use arrow keys to 0010, press enter
    HR is displayed, press FCTN
    MN is displayed, use arrow keys to 40, press enter
    SC is displayed, use arrow keys to 00, press enter
    TIME is displayed
    NX is displayed, use arrow keys to 0004, press enter

10. At Step 4 the display will read 04 SP, press enter.

    Press FCTN until SC is displayed, use arrow keys to
        01, press enter
    TIME is displayed
    NX is displayed, use arrow keys to 0005, press enter

11. At Step 5 the display will read 05 SP, press enter.

    S1 is displayed, use arrow keys to 120, press enter
    S2 is displayed, use arrow keys to 58, press enter
    E1 is displayed, press FCTN
    E2 is displayed, use arrow keys to 0010, press enter
    HR is displayed, use arrow keys to 00, press enter
    MN is displayed, use arrow keys to 00, press enter
    SC is displayed, use arrow keys to 05, press enter
    TIME is displayed
    NX is displayed, use arrow keys to 0006, press enter

12. At Step 6 the display will read 06 SP, press FCTN until
    WT appears, press enter.

    Press FCTN until W4 is displayed, use arrow keys to
        099.5, press enter
    Press FCTN until NX is displayed, use arrow keys to
        0007, press enter

Procedure for Programming HAST Profile (Cont.)

13. At Step 7 the display will read 07 SP, press enter.

       S1 is displayed, use arrow keys to 120, press enter
       S2 is displayed, use arrow keys to 58, press enter
       E1 is displayed, press FCTN
       E2 is displayed, press FCTN
       HR is displayed, press FCTN
       MN is displayed, use arrow keys to 10, press enter
       SC is displayed, use arrow keys to 00, press enter
       TIME is displayed
       NX is displayed, use arrow keys to 0008, press enter

14. At Step 8 the display will read 08 SP, press enter.

       S1 is displayed, use arrow keys to 120, press enter
       S2 is displayed, use arrow keys to 59, press enter
       E1 is displayed, press FCTN
       E2 is displayed, use arrow keys to 0110, press enter
       HR is displayed, use arrow keys to 00, press enter
       MN is displayed, use arrow keys to 00, press enter
       SC is displayed, use arrow keys to 01, press enter
       TIME is displayed
       NX is displayed, use arrow keys to 0009, press enter

15. At Step 9, the display will read 09 SP. Press FCTN until
    JL appears, press enter.

       JS is displayed, use arrow keys to 0010, press enter
       JC is displayed, use arrow key to 0001, press enter
       Press FCTN until NX is displayed, use arrow key to
          0010, press enter

Procedure for Programming HAST Profile (Cont.)

16. At Step 10 the display will read 10 SP, press enter.

    S1 is displayed, use arrow keys to 120, press enter
    S2 is displayed, use arrow keys to 85, press enter
    E1 is displayed, press FCTN
    E2 is displayed, press FCTN
    HR is displayed, press FCTN
    MN is displayed, use arrow keys to 31, press enter
    SC is displayed, use arrow keys to 00, press enter
    TIME is displayed
    NX is displayed, use arrow keys to 0011, press enter

17. At Step 11 the display will read 11 SP, press FCTN until
    WT appears, press enter.

    Press FCTN until W2 is displayed, use arrow keys to
        0084, press enter
    Press FCTN until NX is displayed, use arrow keys to
        0012, press enter

18. At Step 12 the display will read 12 SP, press enter.

    S1 is displayed, press FCTN
    S2 is displayed, press FCTN
    E1 is displayed, press FCTN
    E2 is displayed, press FCTN
    HR is displayed, press FCTN
    MN is displayed, use arrow keys to 30, press enter
    SC is displayed, use arrow keys to 00, press enter
    TIME is displayed
    NX is displayed, use arrow keys to 0013, press enter

Procedure for Programming HAST Profile (Cont.)

19. At Step 13 the display will read 13 SP, press enter.

> S1 is displayed, press FCTN
> S2 is displayed, press FCTN
> E1 is displayed, use arrow keys to 0011, press enter
> E2 is displayed, press FCTN
> HR is displayed, use arrow keys to 00, press enter
> MN is displayed, use arrow keys to 30, press enter
> SC is displayed, use arrow keys to 00, press enter
> TIME is displayed
> NX is displayed, use arrow keys to 0014, press enter

20. At Step 14 the display will read 14 SP. Press FCTN
    until JL appears, press enter.

> JS is displayed, use arrow keys to 0012, press enter
> JC is displayed, use arrow keys to 0001, press enter
> Press FCTN until NX is displayed, use arrow keys to
>   0015, press enter

21. At Step 15 the display will read 15 SP. Press FCTN
    until JL appears, press enter.

> JS is displayed, use arrow keys to 0047, press enter
> JC is displayed, use arrow keys to 0001, press enter
> Press FCTN until NX is displayed, use arrow keys to
>   0047, press enter

22. At Step 47 the display will read 47 SP, press enter.

> S1 is displayed, use arrow keys to 00, press enter
> S2 is displayed, use arrow keys to 60, press enter
> E1 is displayed, use arrow keys to 0010, press enter
> E2 is displayed, press FCTN
> HR is displayed, use arrow keys to 00, press enter
> MN is displayed, use arrow keys to 00, press enter
> SC is displayed, use arrow keys to 05, press enter
> TIME is displayed
> NX is displayed, use arrow keys to 0048, press enter

Procedure for Programming HAST Profile (Cont.)

23. At Step 48 the display will read 48 SP, press FCTN until WT appears, press enter.

    Press FCTN until W4 is displayed, use arrow keys to 0102, press enter
    Press FCTN until NX is displayed, use arrow keys to 0049, press enter

24. At Step 49 the display will read 49 SP, press enter.

    S1 is displayed, use arrow keys to 00, press enter
    S2 is displayed, use arrow keys to 00, press enter
    E1 is displayed, use arrow keys to 0010, press enter
    E2 is displayed, use arrow keys to 1000, press enter
    HR is displayed, press FCTN
    MN is displayed, press FCTN
    SC is displayed, use arrow keys to 01, press enter
    TIME is displayed
    NX is displayed, use arrow keys to 0050, press enter

25. At Step 50 the display will read 50 SP, press FCTN until WT appears, press enter.

    Press FCTN until W1 is displayed, use arrow keys to 40, press enter
    Press FCTN until NX is displayed, use arrow keys to 51, press enter

26. At Step 51 the display will read 51 SP, press enter.

    S1 is displayed, use arrow keys to 00, press enter
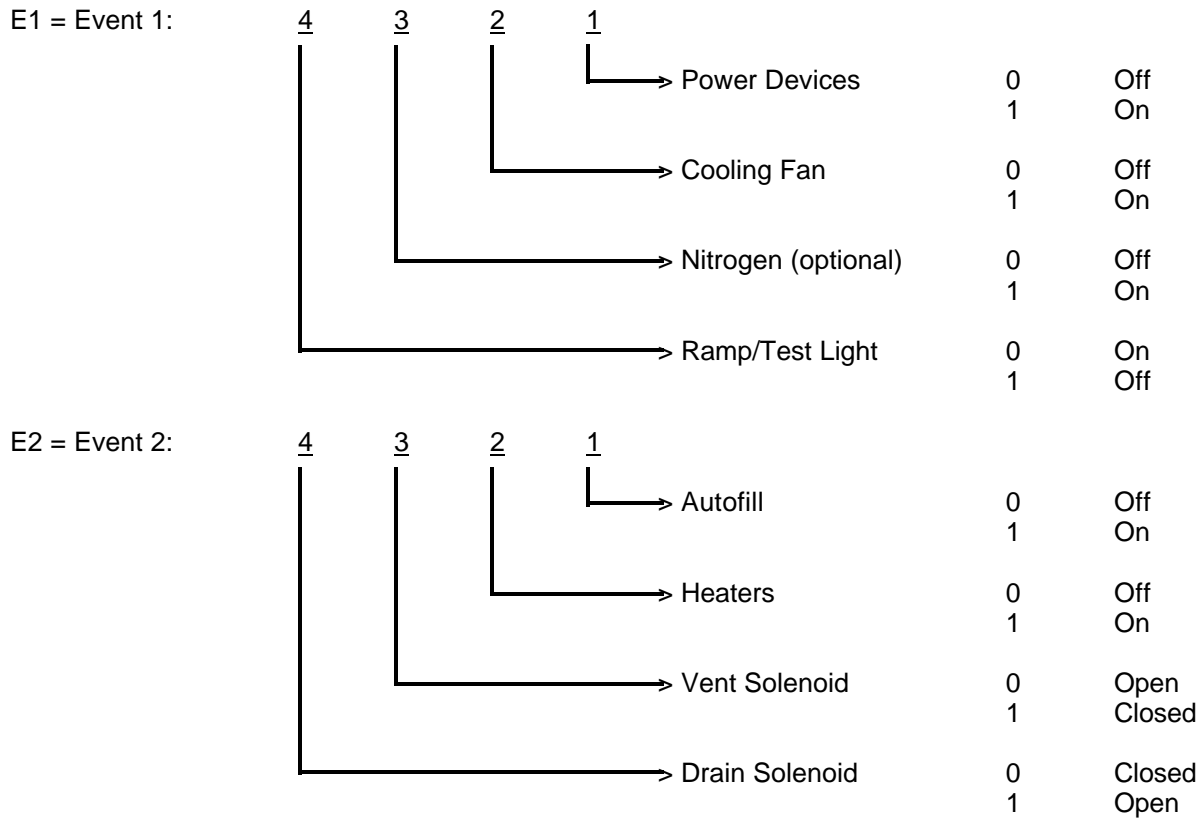   S2 is displayed, use arrow keys to 00, press enter
    E1 is displayed, use arrow keys to 0000, press enter
    E2 is displayed, use arrow keys to 0000, press enter
    HR is displayed, press FCTN
    MN is displayed, press FCTN
    SC is displayed, use arrow keys to 05, press enter
    TIME is displayed
    NX is displayed, use arrow keys to 0001, press enter

27. Press mode key to jump out of guarded access.

HAST Chamber Programming Instructions and Definitions

C1 = Channel 1, Temperature (εC)
C2 = Channel 2, Relative Humidity (%RH)

SP = Set Points
S1 = Set Temperature
S2 = Set Relative Humidity

E1 = Event 1:   4   3   2   1

→ Power Devices	0	Off
	1	On
→ Cooling Fan	0	Off
	1	On
→ Nitrogen (optional)	0	Off
	1	On
→ Ramp/Test Light	0	On
	1	Off

E2 = Event 2:   4   3   2   1

→ Autofill	0	Off
	1	On
→ Heaters	0	Off
	1	On
→ Vent Solenoid	0	Open
	1	Closed
→ Drain Solenoid	0	Closed
	1	Open

WT = Wait Loop
WE = Wait Event: 1 = Wait for Temperature
                   2 = Wait for Relative Humidity
                   3 = Wait for Water Level
                   4 = Wait for Water Temperature

JL = Jump Loop
JS = Jump to Step
JC = Number of Times to Perform Jump

NX = Next Programming Step

Ecosphere Sample Program

The sample program on the following page is provided to
demonstrate the function of the unit. It is pre-programmed in
the factory and available for you to run upon installation of
your chamber. If the program has been cleared somehow,
you may wish to re-enter it as programming practice.

Table 9 Despatch Sample Program

Step	Description
1	Set points of 25ᴇC and 95% RH entered for S1 and S2. Event 1.1 is on. This enables the humidity control system. This step is held for 10 minutes so that the humidity system has sufficient time to fill up with water.
2	S1 is changed to 40ᴇC. S2, E1 and E2 are left blank by pressing the **FCTN** key when those functions are displayed. In a set point step, blank data defaults to previous settings, so S2 = 95, E1 = 0001, and E2 = 0000. Since Step #1 was the previous step, by doing this if you wished to change S2 to 85% throughout the program you only have to change it on Step #1. The step duration is 30 minutes. Since the previous set point was 25ᴇ, the process set point will be ramped continuously from 25ᴇ to 40ᴇ over the 30 minute span.
3	No change in set points (S1 or S2) or events (E1 or E2). Therefore, control will act to hold 40ᴇC and 95% for 30 minutes.
4	S1 is set back to 25ᴇC. It is ramped from 40ᴇC over 30 minute period.
5	Again, a hold for 30 minutes.
6	S1 is changed to -10ᴇC. This is ramped over a 1 second period so it is essentially a step change. Note Event 1.1 is turned off. To protect the equipment, humidity control generally needs to be disabled when below freezing.
7	The control is set to wait for the CH-1 process to reach -8. All other waits are blank so they will be ignored. Do not type zeros into wait functions that are to be ignored. This is caused by pressing the **ENTER** key instead of the **FCTN** key when you scroll past the function you wish to ignore. The above is the most typical problem encountered in a wait-for-step.
8	Another hold for 30 minutes.
9	This is a jump to Step #2. Steps 2-8 will be repeated.
10	Set points are changed to 25ᴇC and 60%, a normal condition, before program is ended.
11	Is a blank step (SP when viewed in **CHG DATA** mode). Program execution will end here.

Despatch/Watlow 1500 Control Instruction Manual

Ecosphere Sample Profile Worksheet

Program Name _____ Date _____

Step No.	Set Point CH-1 ᴇC or ᴇF S1	Set Point CH-2 % or ᴇ S2	Events 1 = ON E1 4321	Events 0 = OFF E2 4321	Duration HR	Duration MN	Duration SC	Comments
1	25	95	0001	0000	00	10	00	Initialize system at ambient.
2	40	--	0001	--	00	30	00	Ramp to 40ᴇC in 30 minutes.
3	--	--	--	--	00	30	00	Hold for 30 minutes.
4	25	--	--	--	00	30	00	Ramp to 25ᴇC in 30 minutes.
5	--	--	--	--	00	30	00	Hold 25ᴇC for 30 minutes.
6	10	--	0001	--	00	00	01	Step Ramp to -10. Humid event OFF.
7	W1 (-8)	--			--	--	--	Wait for -8ᴇC. ALL OTHER W'S BLANK.
8	--	--	--	--	00	30	00	Hold -10 for 30 minutes.
9	JS02	JC01						Jump to step 2. Repeat once.
10	25	40	0001	--	00	00	01	Return to ambient with low humidity.
11	SP							SP = Blank step. End of program.
12								
13								NOTE:
14								--'s indicate blanks, which are not the same as 00's. To get
15								blank in data display, press the FCTN key instead of the
16								ENTER key.
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
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42								
43								
44								
45								

Clearing a Program

To clear an entire program, perform the following steps:

1. Press **MODE** key until **CHG PARA** LED lights.

2. Press **FCTN** key until **GA** shows in **FUNCTION** display.

3. Press the > key until **DATA** display shows **0006**.

4. Press **ENTER** key.

5. Press the **CLEAR** key.

6. Press the **RESTART** key.

Tuning/Programming Worksheet

Guarded Access Chart

Make a copy of this chart to document the Series 1500
Guarded Access for each program you use.

Program #_____   System _____   Programmer _____   Date_____

GA Code	Ch	Pmpt	Parameter	Your Settings
0000	C1	UP	Ch-1 Upper Process Alarm	
	C1	LP	Ch-1 Lower Process Alarm	
	C1	Ud	Ch-1 Upper Deviation Alarm	
	C1	Ld	Ch-1 Lower Deviation Alarm	
	C2	UP	Ch-2 Upper Process Alarm	
	C2	LP	Ch-2 Lower Process Alarm	
	C2	Ud	Ch-2 Upper Deviation Alarm	
	C2	Ld	Ch-2 Lower Deviation Alarm	
0001	1H	Pb	Ch-1 Prop. Band	
	1H	RS	Ch-1 Reset	
	1H	RT	Ch-1 Rate	
	1H	Rb	Ch-1 Rate Band	
	1H	CT	Ch-1 Cycle Time	
	1	db	Ch-1 Dead Band	
	1	CA	Ch-1 Calibration Adjust.	
Dual PID	1C	Pb	Ch-1 Prop. Band	
	1C	RS	Ch-1 Reset	
	1C	RT	Ch-1 Rate	
	1C	Rb	Ch-1 Rate Band	
	1C	CT	Ch-1 Cycle Time	
0002	2H	Pb	Ch-2 Prop. Band	
	2H	RS	Ch-2 Reset	
	2H	RT	Ch-2 Rate	
	2H	Rb	Ch-2 Rate Band	
	2H	CT	Ch-2 Cycle Time	
	2	db	Ch-2 Dead Band	
	2	CA	Ch-2 Calibration Adjust.	
Dual PID	2C	Pb	Ch-2 Prop. Band	
	2C	RS	Ch-2 Reset	
	2C	RT	Ch-2 Rate	
	2C	Rb	Ch-2 Rate Band	
	2C	CT	Ch-2 Cycle Time	
0006		U1	Ch-1 Upper Set Point Limit	
		L1	Ch-1 Lower Set Point Limit	
		U2	Ch-2 Upper Set Point Limit	
		L2	Ch-2 Lower Set Point Limit	
		RC	Recycle: ON = 1, OFF = 0	
		TT	T-RH = 0000, T-T = 0001	
		Ad	Address number RS-422	
		LC	Keyboard Lock	

Warm/Cold Start

1. A "Warm" start will save all programmed information in the memory.

2. A "Cold" start is a "Clean" startup condition. All **MEMORY IS DELETED** and the controller will return to default settings.

3. Upon completion of "Cold" start, return the control to "Warm" start, otherwise the control will return to the default settings after each power loss.

4. DIP Switch #6 determines a warm or cold start. Your controller leaves the factory programmed for a warm start.
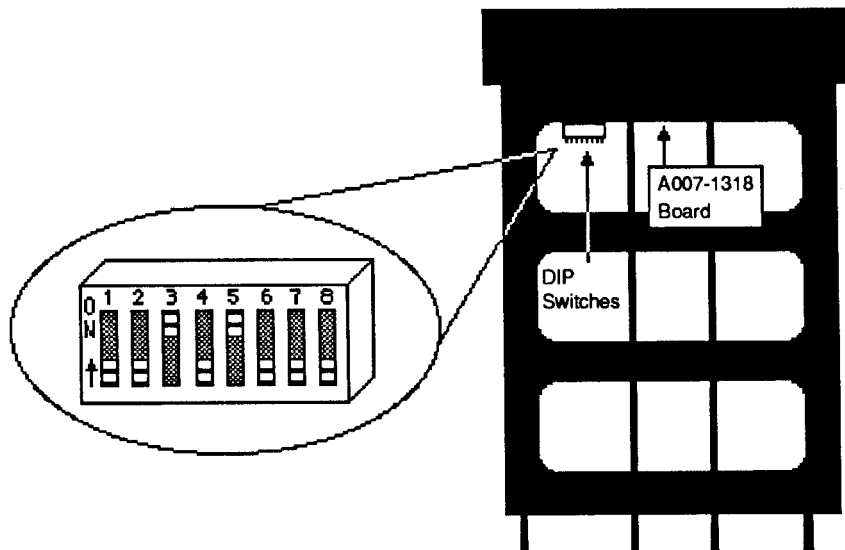

Figure 2 DIP Switch Location and Orientation

Warm/Cold Start (Cont.)

Table 10 DIP Switch Selection

DIP Switch No.	FUNCTION	
	ON	OFF
1	Auxiliary (Event) Output #4 for both Ch-1 and Ch-2 are alarm outputs.	Auxiliary (Event) Output #4 for both Ch-1 and Ch-2 are event outputs.
2	Alarms are latching (displayed until cleared manually).	Alarms are non-latching (displayed only as long as the alarm condition exists).
3	RTD Unit Only The Ch-2 sensor is an RTD sensor. Jumpers W151 and W153 on the signal conditioner board (A007-1316) must be installed. T/C Unit Only Not used. Set in the ON position.	The Ch-2 sensor is an RTD sensor. Jumpers W151 and W153 on the signal conditioner board (A007-1316) must be installed.
4	Dual PID per channel.	Single PID per channel.
5	Factory use only. Must be in the ON position.	
6	Cold start on power-up. (Memory cleared, parameters set to default values.)*	Warm start on power-up. (Programmed values are retained for all parameters.)*
7	EC function after a cold start.	EF function after a cold start.
8		Not used. Set in the OFF position.

Changing the Position of a Switch

Whenever you change the position of a DIP switch, follow this procedure.

1. Remove power from the 1500. Turn the front panel to loosen the controller from the case.

2. Grip the front panel bezel and pull it straight out from the control case. The control chassis will come out of the case as you pull the bezel.

3. Set the DIP switch to the position you want.

4. Return the control chassis to the case. Be sure you have it oriented correctly. It will not fit in upside down, but check just the same. Press firmly, but gently, to seat the chassis.