Series 920

Microprocessor-Based Ramping Control

User's Manual

WATLOW

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W920-MA60-9302
January, 1993
Supersedes:
W920-MC5A-8944

$10.00
Made in the U.S.A.

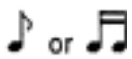
Printed on Recycled Paper

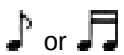
Use The Manual

First...	***This manual will make*** your job ***easier.*** Reading it and applying the **information is a** good way to become familiar with the Series 920. Here's an overview:
Starting Out	Introduction, Chapter 1.
Front Panel	Keys and Displays, Chapter 2.
Running a Program	Sample Program, Chapter 3.
Install/Wire	Installation and Wiring, Chapter 4.
Tune	How to Tune, Chapter 5.
Programming	How to Program, Chapter 6.
Alarms	How to Use Alarms, Chapter 7.
Appendix	Specifications Glossary Calibration Warranty
Quick Reference	Series 920 error codes and prompts, inside and outside back covers.

Notes

The user's manual contains informational notes to alert you to important details. When you see a note icon, look for an explanation in the margin.





NOTE:

Details of a "Note" appear here, in the narrow box on the outside **of each page.**

Safety Information

Boldface safety information protects both you and your equipment. Please be attentive to them. Here are explanations:

The CAUTION symbol (exclamation point) in the **wide text column alerts you to a 'CAUTION", a** safety or functional hazard which could affect your equipment or its **performance. A** full explanation is **in the narrow column on the outside of the page.**

CAUTION:

Details of a "Caution" appear here, **in the narrow box on the outside of each page.**

WARNING:

Details of a "Warning" appear here, **in the narrow box on the** outside of **each page.**

The WARNING symbol (lightning bolt) in the wide text column alerts you to a 'WARNING", a safety hazard which could affect you and the equipment. A full explanation is in the narrow column **on the outside of the page.**

Your comments or suggestions on this manual are welcome, please send them to Technical Writer, Watlow **Controls, 1241 Bundy Blvd.,** P.0. Box **5580,** Winona, MN 55987-5580, or phone **507/454-5300. The Watlow Series 920 User's Manual and integral software are copyrighted by Watlow Winona, Inc.,© 1987 with all rights reserved.**

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Starting out with the Watlow Series 920:
A Microprocessor-Based Control

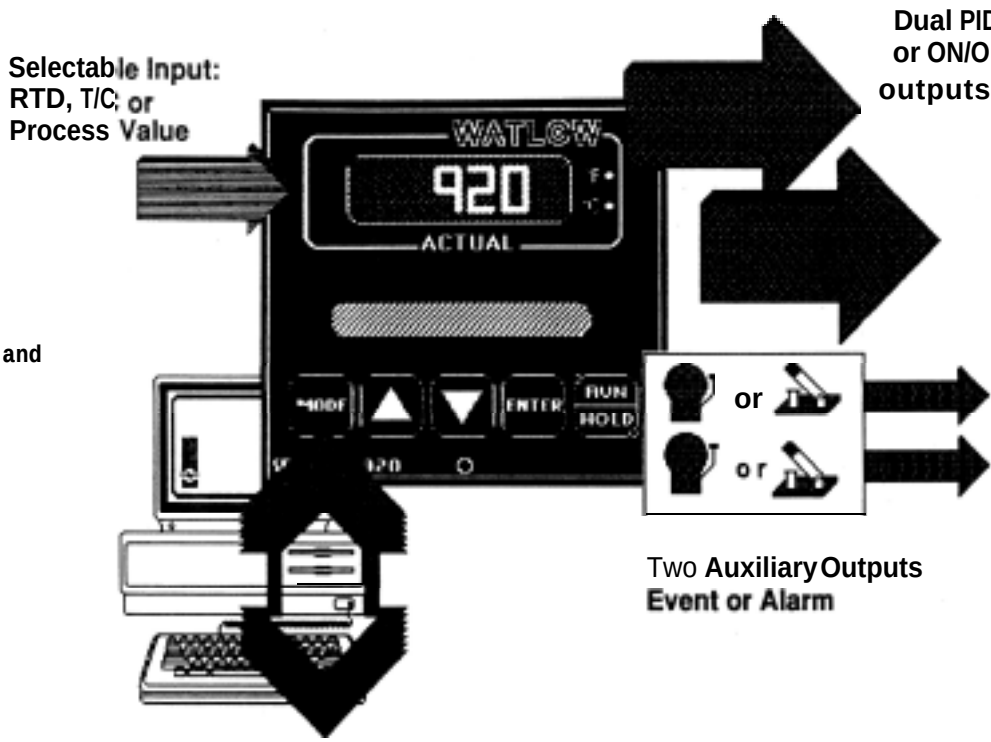


Figure 1-1 Series 920 Input and output Overview

General Description

Congratulations, you're about to become a fully-qualified user of the Watlow Series 920! This versatile microprocessor-based ramping control is powerful, yet simple to learn. A ramp progresses from one set point to another set point over a period of time. In this chapter of the user's manual, you'll get an overview of the 920 and its operation.

Figure 1 is a simplified view of the Series 920's capabilities. It is a dual output, microprocessor-based, 1/4 DIN-sized ramping temperature control. The 920 accepts a single, front panel-selectable input. This includes Type J, K, T, R, S, or B thermocouple input, a 1° or 0.1° RTD input, or one of two process inputs. It has a full control temperature range, offset calibration, and a front panel lock-out feature.

The Series 920 is a PID controller. You may input two complete sets of PID parameters on the front panel for heat/cool applications. This includes rate, reset, proportional band and cycle time. By setting the proportional band(s) to zero, the Series 920 becomes a simple ON/OFFcontrol with a 3°F or 1.7°C switching differential.

The 920s auxiliary outputs may be alarms or events. An event is an ON/OFF auxiliary output relay signal. You can use events, based on time, temperature, or other process variables, to trigger peripheral equipment or processes.

Operator-friendly features include automatic entry codes or "prompts" to aid in setup. When there's a power outage, the Watlow Series 920 stores all information in a non-volatile memory.

When you first apply power, the unit will "come up" with default values for set points, alarm points and control parameter. These default values provide minimum operating information for the control until you program in the desired data. The default values are listed in the Master Step Menus and Charts, pp. 41-50.

Remove the Series 920 carefully from its shipping container. Be sure to set this literature aside where it will not be discarded.

Packing List

Included with your Watlow Series 920 are two mounting brackets with integral screws, and this manual. If your unit has communications, the "How to Use Data Communications with the Watlow Series 922" manual is also included.

Put Your Control to Work-Three Steps

Once your control is installed and wired, getting the Series 920 "up and running" is a three-part process:

- First, match the control's "personality", to your system in what we call the SETUP menu; input type, units of measure, range, calibration offset, output action, alarm type, lock-out.
- Second, tune the control making final PID entries.
- Third, enter up to ten separate profiles in the PROGRAM menu.

How to Open the 920

Before going further, open the Series 920 and pull the control chassis from its case. Here's how:

The control chassis fastens to the case with a single screw located on the lower front panel. See Figure **2.** Turn the screw counterclockwise to loosen it. Three or four strip connector plugs, in the rear of the control chassis, feed power and signals through the back of the casing to the triple terminal strip. These plugs will let go as you pull.

CAUTION:

The front panel screw turns 90° only. Do not apply excessive force or turn the screw more than 90°.

When removing the Series 920 control from its case, pull firmly but gently. When returning the control to the case, be sure you have the top up to match the plugs with the case. The 920 will not fit in to the case upside down. Always check to see that it is oriented correctly. Press the unit in firmly, then turn the front panel screw clockwise to secure it.

Figure 2 - How to Open the Series 920.

How to Set the DIP Switches

The Watlow Series 920 has a Dual In-line Package (DIP) switch inside the control on circuit board AOO7-1699. The locations of the board and switch appear in Figure 3. The switches are clearly numbered from left to right. You will use DIP switches #1 and 3 - 8; #2 is not used. Table 1 on the next page shows the DIP switch selections.

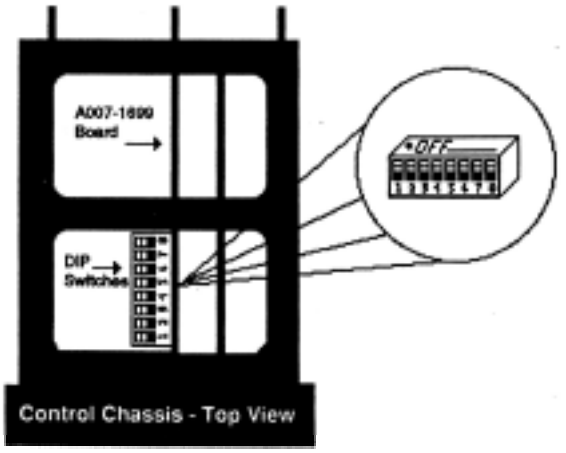


Figure 3 - DIP Switch Location and Orientation.

DIP SW#	Function		Normal Operating Position
	ON	**OFF**	
1	Cold Start	Warm Start	OFF
2	Not Used	Not Used	OFF
3	Tenths of units displayed	No decimal displayed	Choose
4	0-5VDC/0-20mA input	l-5VDC/4-20mA input	Choose
5	Primary output is 4-20mA	Primary output is not 4-20	Model # Dep,
6	LEDs are load indicators	LEDs are °F or °C	Choose
7	Selected SPCLFUNC promts	All SPCLFUNC prompts	Choose
8	Factory Test/Calibrate	Normal Operation	OFF

Table 1 - DIP Switch Selection.

NOTE:
For units with process input only. If your unit does not have process input, DIP Switch #3 should be in the OFF position.

- DIP switch #1 determines a warm or cold start. A **"warm"** start saves all programmed information in the 920s memory back-up protection. A **"cold"** start is a "clean" startup condition; all user-programmed information is lost. The Series 920 leaves the factory programmed for a warm start.
- DIP switch #2 is not used.
- DIP switch #3 determines if the decimal point is displayed in tenths of units for process inputs.
- DIP switch #4 is for 0-5VDC/0-20mA input or l-5VDC/4-20mA input selection.
- DIP switch #5 is for units with 4-20mA output. If your unit has 4-20mA output, set switch #5 ON for the Primary output.
- DIP switch #6 determines the function of the front panel LEDs to the right of the actual display. When ON, these LEDs can be used as a diagnostic tool for tuning or system troubleshooting, see Page 12 and 33.
- DIP switch #7 is OFF, all SPCLFUNC prompts are displayed, when ON, only factory selected prompts appear. See Page 42. DIP switch #8 is a factory test/calibrate switch.

WARNING:
Doing a cold start will cause all setup parameters and files to be lost. DO NOT put DIP switch #1 in the ON position unless all user-programmed information is to be cleared.

Changing the Position of a Switch

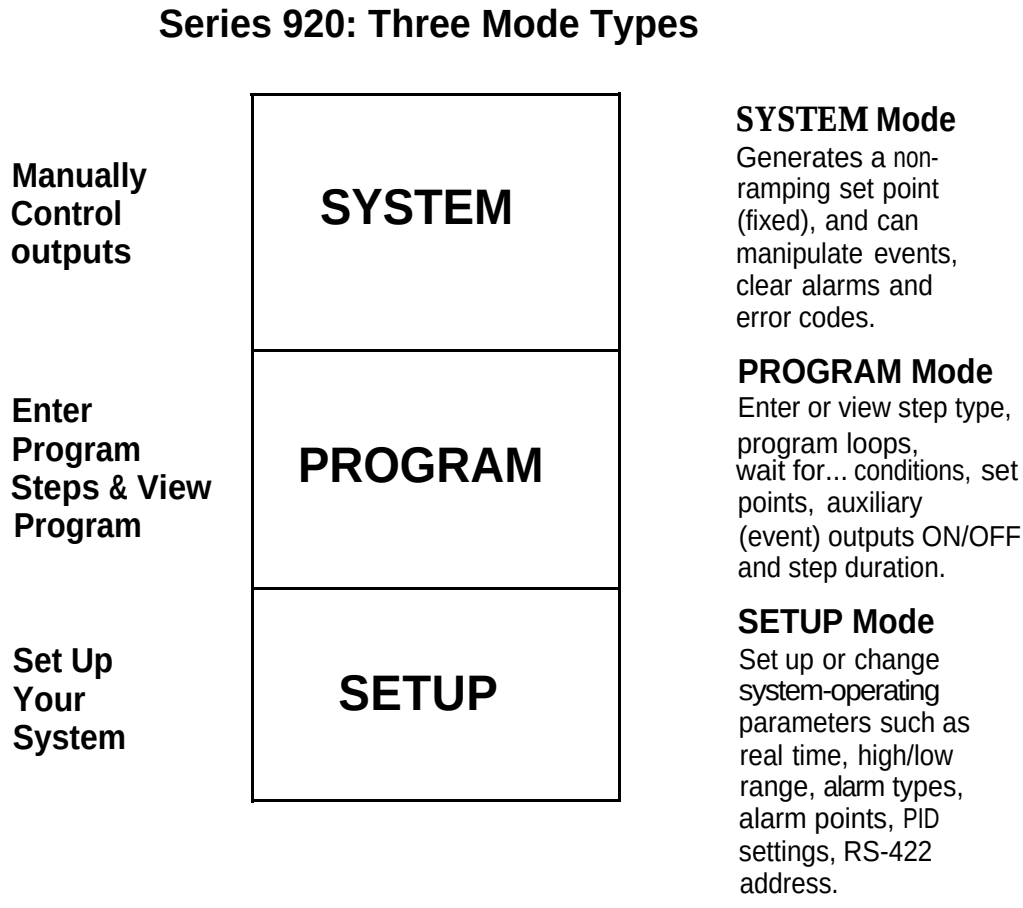
Whenever you change the position of a DIP switch, follow this procedure:

1. Remove power from the 920. Turn the front panel screw 90°counterclockwise.
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.
5. Secure the front panel screw and re-apply power to the 920.

Overview of the Three Operating Modes

Before getting into the details of the Series 920s keys and displays, take a look at Figure 4 showing the three different modes. After you feel comfortable with the names of the modes and their functions, go ahead to learn the keys and displays.

Figure 4 - **Overview of the Series 920** Operating Modes.



Where To Go From Here:..

You are now ready to find out more about the Series 920s keys and displays. Continue to Chapter 2.

Chapter **2**

How to Use the Keys and Displays

This chapter will show you the Series 920 front panel, and the function of each display, key and LED. Figures 6 and 7 explain the 920 front panel.

Display, Key and LED-Location and Explanation

The Watlow Series 920 Ramping Control has two main displays, the process ACTUAL display at the top of the unit, and the smaller alphanumeric display below. You set up the Series 920s characteristics in the alphanumeric display window. On the right of the ACTUAL display there is a red °F LED and a red °C LED, indicating the temperature scale ACTUAL is displaying. If neither of these **LEDs** are showing, the ACTUAL display is showing Process Variable Units (PVU's).

The 920 has five touch-membrane keys along the bottom edge of the front panel: (from left to right) a MODE key, an UP key, a DOWN key, an ENTER key, and a RUN/HOLD key.

The MODE key steps the processor through the entry prompts.

The UP and DOWN keys increase and decrease or change values in the alphanumeric display. A single touch to either of these keys will change the least significant digit by one. Continuous pressure will change the value in the alphanumeric display at an increased rate. The ENTER key places the value, in the alphanumeric display, into the processor's memory.

An alphanumeric display value will flash (when changed with the UP or DOWN keys) until you press ENTER, placing the value in the processormemory.

The RUN/HOLD key will execute or halt a program.

Front Panel Information

Use Figures 6 and 7 to assist you in learning the locations and functions of the front panel components.

Keys / Displays

Use the following figures to learn the nature and function of the Series 920s keys and displays.

Figure 5 - Series 920 Front Panel Information.

Actual and Alphanumeric Display Area

ACTUAL **Display**
Shows the actual value of the process variable up to four digits.

°F LED
When DIP switch #6 is OFF, it indicates the value in the ACTUAL display is temperature in degrees Fahrenheit. When DIP switch #6 is ON, it indicates Output 1 is energized.

When DIP switch #6 is OFF, both °F and °C LEDs are OFF. The 920 is displaying Process Variable Units (PVUs).

°C LED
When DIP switch #6 is OFF, it indicates the value in the ACTUAL display is temperature in degrees Celsius. When DIP switch #6 is ON, this LED indicates Output **2** is energized.

Figure 6 - Actual and Alphanumeric Display Front Panel Information.

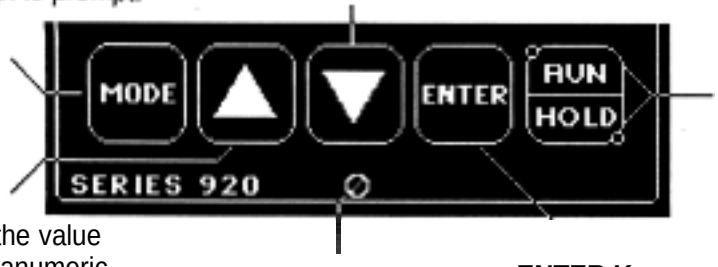
Alphanumeric Display
Shows entry prompts and the parameter values in alphanumerics.

Keyboard Area

Figure 7 - Keyboard Front Panel Information.

DOWN Key
Acts opposite the UP key. Decreases the value in the alpha-numeric display. A light touch decreases the value by one digit. Hold the key down to decrease the displayed value at a rapid rate.

MODE Key
This key steps the Series 920 in sequence from prompt to prompt.



RUN/HOLD Key
Executes or holds a program from the SYSTEM menu.

Run/Hold LEDs
When the HOLD LED is ON steady, the 920 is in a HOLD condition. When the HOLD LED flashes, the unit is holding for a WAITFOR condition, or a guaranteed soak condition. When the RUN LED is ON the 920 is in the RUN condition.

UP Key
Increases the value in the alphanumeric display. A light touch increases the value by one digit. Hold the key down to increase the displayed value at a rapid rate.

90° Front Panel Screw
Secures the control chassis in its case with a 1/4 turn clockwise or releases the chassis with a 1/4 turn counter-clockwise.

ENTER Key
Enters selected (flashing) data into the microprocessor memory, or will mask an error code or latched alarm for 1 minute.

Where To Go From Here

Now that you have a good idea where everything is on the faceplate of the Series 920, continue to Chapter 3 for the Sample Program. If you skip the sample program, do not forget to check the position of DIP switch#1 before you begin programming your control after installation. With DIP switch #1 OFF, the 920 saves your program whenever power is removed (warm start). With DIP switch #1 ON, the 920 will clear its memory of all programmed information whenever power is removed, substituting default values (cold start).

Chapter 3

Learning the Series 920 - A Sample Program in Action

This chapter will guide you through an easy sample program for the Series 920. You can quickly grasp the necessary terms and concepts by entering and observing this exercise.

If you feel that your knowledge of profiling controllers does not require a sample program to learn the Series 920, skip this chapter.

A Brief Overview

This sample program will teach you the fundamentals of creating a ramping profile, along with ways to expand that profile to its greatest versatility.

WARNING: Doing a cold start will cause all setup parameters and files to be lost. DO NOT put DIP switch #1 in the ON position unless all user-programmed information is to be cleared.

The program example will start with a simple ramp and soak profile. A ramp progresses from one set point to another set point over a period of time, or ramp rate, expressed in degrees/time. Soaking then controls the length of time the temperature is held at this level.

We will, then expand it to multiple ramp and soaks, add JUMPLOOP functions, perform an AUTOSTART, LINK to another profile, and finally perform a WAITFOR step.

At this point make copies of your Master Step Chart on Page 53. It is a good practice to keep track of your program as you go. It is also a good idea to sit down and define exactly what you want your program to do.

Enter Real Time of Day

First, set the Series 920s "real time-of-day, 24-hour clock." Remember the MODE key is used to progress through the menus. The UP/DOWN keys are used to select parameters and values, and remain flashing until you press the ENTER key.

1. Press the MODE key until the SETUP menu appears. Press the ENTER key.

2. At ACCESS, enter (0) with the UP/DOWN keys; press ENTER. This is your calibration (CALIB) menu.

3. Press the MODE key until HOUR appears in the alphanumeric display and press ENTER. Note that hours are in a 24 hour format.

4. Use the UP/DOWN keys to place hours into the display. The display will flash until you press ENTER.

5. Press MODE to continue to the MIN parameter and press ENTER. Enter the correct value for minutes and press ENTER.

6. Press the MODE key several times to return to the top of the ACCESS (0) menu. At the top of the ACCESS (0), which is the CALIB menu, you will see the Real Time (TI) displayed.

7. Continue to press MODE until you reach RETURN. Press ENTER to return to SYSTEM.

NOTE:
When either the hours or minutes are entered, internal seconds are set to 0.

Before Entering Your Program

Before we begin to program your Series920, there are a few other initial SETUP parameters to enter. Verify that DIP switch #7 is OFF. If you have not tried any programming since your cold start, the C/F/U (Celsius/Fahrenheit/Units) and GS (Guaranteed Soak) parameters are set to their appropriate values. Refer to the glossary for a more detailed definition. If you have already tried stepping through the parameters and entering values, it might be agood idea to go back and double check to see that the values are correct.

NOTE:
DIP switch #7 must be OFF to access all SPCLFUNC parameters.

1. Press the MODE key until SETUP appears. Press ENTER. Once again you see the ACCESS parameter. Use the UP/DOWN keys to enter (5) and press ENTER; this is the Special Function (SPCLFUNC) menu.

2. Press MODE again until you see the C/F/U parameter. This parameter will defautt to F. Use the UP/DOWN keys to enter degrees F (Fahrenheit). Press ENTER..

3. Continue through the SPCLFUNC menuuntil you see GS (Guaranteed Soak). Enter a value of (0); press ENTER. This parameter has a default of0.

4. Press the MODE key to move to the RETURN parameter. Press ENTER to return to SYSTEM.

5. Good job! You have completed the initial setup, and are ready to program the 920.

Programming. File 1

Our first step in programming will be to make a short ramp and soak program. Step1 initializes the set point to a known starting point for the ramp, Step 2 is a short ramp, Step 3 is a soak step, which holds the programmed set point constant for the programmed time. Step 4 will be a STOP step which signals the end of a file.

1. From the SYSTEM menu, press MODE until you see the PROGRAM menu. Press ENTER.

2. The Series 920 asks you for a FILE?. Your 920 should already say (I), but if you have entered any values, it may be different. Make sure it says (1). Press ENTER.

3. Press the MODE key and you are asked for a STEP. ENTER (1) if it is not already there.

4. Press the MODE key. Use the UP/DOWN keys to select the step type and values.

5. Use Table 2 to enter the corresponding parameters and values. The parameters appear from left to right on the table. Remember that the MODE key is used to progress through the menus. After the step # is selected, use the UP/DOWN keys to select a step type. Press ENTER. Use the UP/DOWN keys to select parameters and values, they remain flashing until you press the ENTER key.

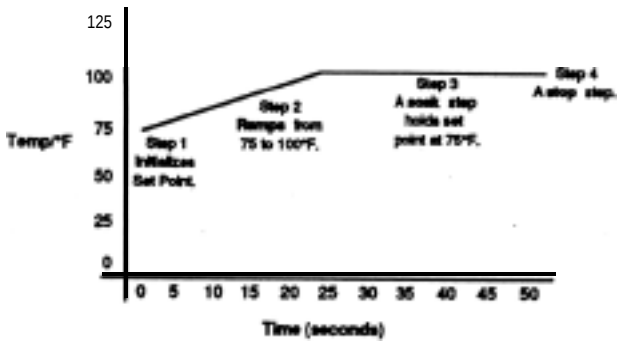
At the end of each menu, rather than pressing ENTER to go back to SYSTEM, press MODE for the STEP prompt. The 920 automatically increments to the next step number, with the step number flashing. Press ENTER.

Table 2 - Series 920 Ramp and Soak Program.

FILE?	STEP #	STEP TYPE	SP1	HOUR	MIN	SEC	EV1	EV2
1	1	SETPOINT	75	0	0	1	OFF	OFF
1	2	SETPOINT	100	0	0	25	ON	OFF
1	3	SETPOINT	100	0	0	25	ON	OFF
1	4	STOP						

NOTE:

Step 4 must be entered as a step even though it defaults to a STOP step.



Running Your Program

1. Return to SYSTEM using the ENTER key at the RETURN prompt. **Press** the **RUN/HOLD key.**

2. The Series 920 now asks you what FILE? you would like to run. Enter (1) if it is not already entered.

3. **Press the MODE** key. The 920 asks you what step you would like to start on. Again, press (1) if it is not already there, and press ENTER.

The Series 920 quickly shows you the SP (Set Point) and jumps to Step1. The RUN LED is now lit. After each step is completed, the next step that the Series 920 performs will appear.

You may step through the parameters to see what the step-type is and what the parameters are set at. The Time Remaining is also displayed at the end of the menu. Once the Time Remaining reaches 00:00:00, it will show you what step it has progressed to. Refer to the Run menu on Page 19.

Editing Your Program

Let's try editing the program by expanding it with another ramp and soakstep and adding a jump loop. We'll jump to Step 1 and repeat Steps 1 - 6 two more times. This is accomplished by programming a Jump Step (JS)= 1 and Jump Count (JC) = 2. When your 920 goes through the program and reaches Step 6, it jumps back to Step 1 and repeats the program two more times.

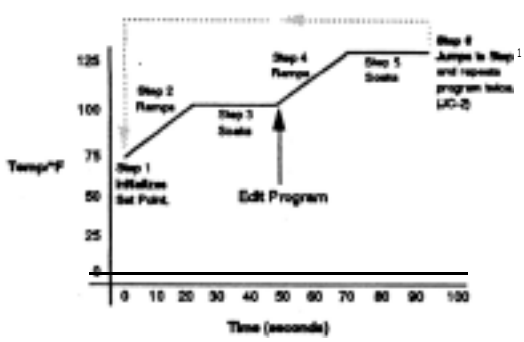
By this time you should understand the basic concept of the Series 920 and be able to get around on your own. Remember that the MODE key takes you through the menus. Use the UP/DOWN keys to select parameters and values, and press ENTER.

1. Return to the PROGRAM menu.
2. Enter FILE? (1), Step (4). We are going to change this step type from a STOP step to a SETPOINT step. This will be our second ramp. Use Table 3 to enter values into the corresponding parameters.

FILE?	STEP #	STEP TYPE	SP	HOUR	MIN	SEC	EV1	EV2	JS	JC
1	4	SETPOINT	125	0	0	25	OFF	ON	-	-
1	5	SETPOINT	125	0	0	25	OFF	ON	-	-
1	6	JUMPLOOP	-	-	-	-	-	-	1	2
1	7	STOP								

Table 3 - Editing Your Program, Steps 4-7.

3. Once you have edited your program, run it again and watch its progress.



Adding an AUTOSTART Step Type

The Series 920 can also automatically start your program, or a step, on a specified day and time. When you use AUTOSTART, it stops your program, and waits for the day and time you entered under the AUTOSTART step type. The Series 920 then executes the next sequential step. AUTOSTART allows you to wait up to seven days in the future; **day 0 is always the** current **day. The** days accumulated increases by 1 every time the Real Time clock goes from **2359** to 00:00. If 0 is programmed for DAY, and the Real Time clock is greater than the programmed AUTOSTART time, the AUTOSTART waits 6 days along with the programmed time. If day is left blank, the program begins each day at the real time programmed, regardless of the day.

Go to the PROGRAM menu. Edit Step 7 from a STOP step to an AUTOSTART step. Follow the table below for input values. This step will wait for approximately five minutes in the future.

FILE	STEP#	STEP TYPE	DAY	HOUR	MIN
1	7	AUTOSTART	**0**	Current Hours	Current Minutes + 5
1	8	STOP			

Table 4 - Adding the AUTOSTART Step.

Run this file starting at Step 7 and observe. The Series 920 will now wait until the real time of day matches the programmed value.

LINKing Files

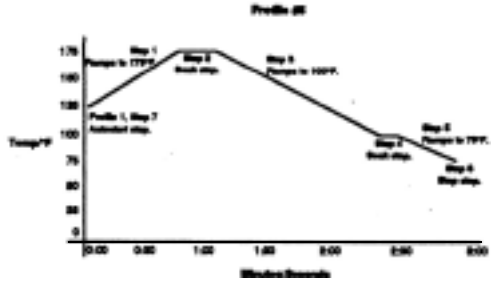
The Series 920 enables you to link **files** together. The LINK step allows you to link the last step of a profile to the first step of another profile.

Lets edit the program again by adding a LINK step at the end of the profile. But first, lets create another file. If you run your program with a LINK going to a non-existing file, you'll receive ER2 0036, the "no file found" error. Follow Table 5 to add a LINK and a new FILE to your program.

Table 5 - LINKing to Another File.

FILE?	STEP #	STEP TYPE	SP	HOUR	MIN	SEC	EVI	EV2	FILE?
1	8	LINK							5
5	1	SETPOINT	175	0	0	50	ON	ON	
5	2	SETPOINT	175	0	0	20	ON	ON	
5	3	SETPOINT	100	0	1	15	ON	OFF	
5	4	SETPOINT	100	0	0	10	ON	OFF	
5	5	SETPOINT	75	0	0	25	OFF	OFF	
5	6	STOP							

Run your program again beginning at FILE 1, STEP 8. Step through the menu to see the step type you're on, and time remaining. See what happens at the end of File 1.



The WAITFOR Step

Table 6 - The WAITFOR Step.

FILE	STEP #	STEP NPE	WPV	WHR	WMN
5	6	WAITFOR	75		-
5	7	STOP			

The last step type we will work with is the WAITFOR step. This is a test step. It compares a specified temperature with the process temperature, before continuing the program. It also waits for programmed time to elapse before continuing with the program. After the test is successful, the program continues to the next sequential step.

Return to PROGRAM and enter FILE? (5). Add a WAITFOR step to the end of that file.

WHR and WMN are unprogrammed. To program a WAITFOR time, enter your values for WHR and WMN. The programmed WAITFOR time waits that time duration. Both WAITFOR process variable (WPV), and time (WHR,WMN) can be programmed simultaneously. Once a WAITFOR condition is satisfied, it won't have to be performed again.

Run your program from FILE 5, STEP 1. If you don't want to go through the entire program, START your program at any STEP in FILE 1 or 5. When the program reaches FILE 5, STEP 6, the HOLD LED begins flashing. This means the program is still running, but is HOLDing, to WAITFOR the ACTUAL temperature to equal the

WAITFOR Process Variable (WPV). When equal, the HOLD LED stops flashing. Your program then continues to the last step, a STOP step, and HOLDs again.

To change a programmed step, return to the PROGRAM menu, and enter the FILE and STEP number to change. Use the UP/DOWN keys to select another step type and press ENTER. Under a step type, to clear all parameters of the current values, return to that step type and press ENTER. All parameters will return to their defaults.

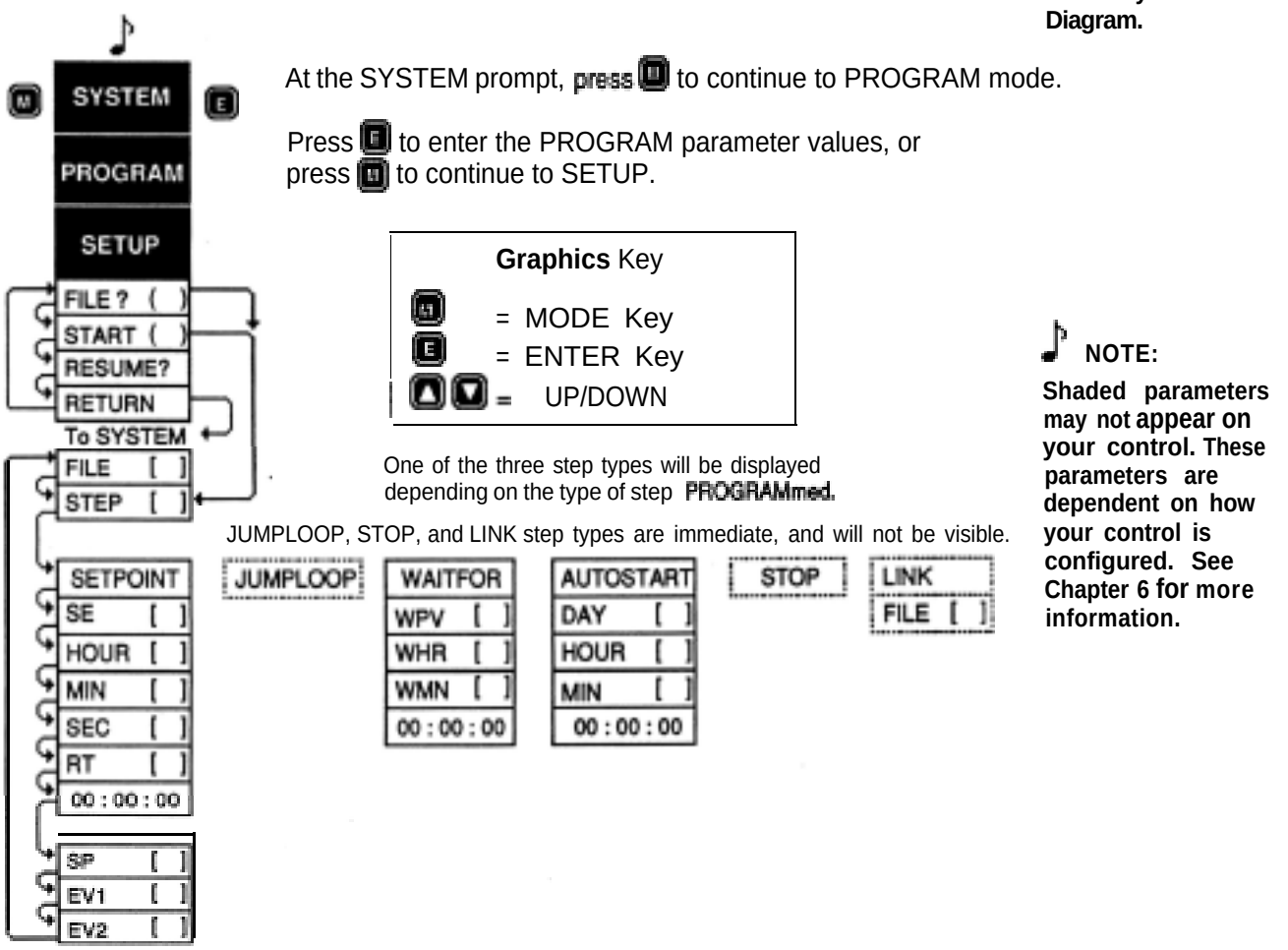
Running Your Series 920

To run the Series 920, you must be at one of the three main level operating parameter menus, SYSTEM, PROGRAM, or SETUP. Press the RUN/HOLD key. The Series 920 asks you what file you'd like to run, and asks what step to begin with. After entering the file and step number, the program begins and the RUN LED is lit. While in the RUN mode, you can only view the current file and step.

To change your program, you must be in the HOLD mode. To stop your program at any time, press HOLD. When returning to your program, the Series 920 asks if you'd like to RESUME? on the step you left off on. Trying to RESUME on a file that has been changed, generates an "ER2 0040"; this is a "Change File Error." Advance to the START prompt and begin the program again.

When in the PROGRAM menu, SP is programmed to the steps ending set point. When in the RUN mode it shows the current set point. In the RUN mode, SE shows the steps ending set point. Refer to Pages 51 - 52 for definitions of other prompts.

Figure 8 - RUN Key Flow Diagram.



NOTE:

Shaded parameters may not appear on your control. These parameters are dependent on how your control is configured. See Chapter 6 for more information.

Chapter 4

How to Install and Wire the Series 920

This chapter tells you how to install the Series 920. All mounting and wiring information is right here. Because Watlow controls are thoroughly tested, and "burned in" before leaving the factory, the Series 920 is ready to install when you receive it.

But before you begin working or cutting holes in panels, read through this chapter to gain an understanding of the entire installation. Consider sensor installation carefully. You'll need to look at the noise reduction guidelines before making your panel cutout.

Sensor Installation Guidelines

We suggest that you mount the sensor at a location in your process or system where it reads an average temperature. Put the sensor as near as Possible to the material or space that you want to control. Air flow past this sensor should be moderate. The sensor should be thermally insulated from the sensor mounting.

Excessive lead length **in a two-wire RTD sensor can create indication errors. To combat this, use** a three wire sensor in long lead applications.

Input Power Wiring

Microprocessors are in a way like trout...

They require a clean environment to be successful and to prosper. A clean environment means on one level an environment that is free of excessive dust, moisture and other airborne pollutants. But primarily it means a "clean" source of input power from which to base all its operations. What is "clean power"?

Clean power is simply a steady, noise-free line voltage source that meets the rating specifications of the hardware using it. Wiihout clean power to the integrated circuitry, any microprocessor chipisdoomed to failure.

Just as the water you get from a tap nowadays may not be acceptable to drink in some locales, so the line voltage coming into your facility may not be acceptable for your microprocessor devices. You may have to fitter or "clean" the water or the power. In industrial environments, the potential for pollutants increases, especially electrical noise due to high level power consumption occurring in one place.

The recommendations we are providing for you are ways to achieve a minimum level of clean input power protection. In almost all cases these guidelines remove the potential for input power problems. If you've applied these measures and still do not get results, please feel free to call us at the factory. We are here to see that our control products work well and do the job they were designed to do.

Definitions

Ground Loop - A condition created when two or more paths for electricity are created in a ground line, or when one or more paths are created in a shield.

Earth Ground - The starting point for safety and computer grounds. It is usually a copper rod driven into the earth.

Safety **Ground** - **A** ground line run with electrical power wiring to protect personnel.

Computer Ground - A ground line for the ground connections to computers or microprocessor-based systems. This line is isolated from safety ground.

Common Mode Line Filter - A device to filter noise signals present on both power line legs with respect to ground.

Differential Mode Line Filter - A device to filter noise signals present between the two power lines themselves.

The Dos and Don'ts of Clean Input Power

Do keep line filters as close to the control as possible to minimize the area for interference pick up.

Do use twisted pair wire and possibly shielded wire from line filters to the control to keep the line "clean".

Do keep low power control wires physically separated as far as possible from line voltage wires. Also keep all controller wiring separate from other nearby wiring. Physical separation is extremely effective. A 12 inch (304.8mm) minimum separation is usually effective.

Do use common mode, differential mode or a combination of the two filters wherever power may have electrical interferences.

Do *cross* other wiring at 90° angles whenever crossing lines is unavoidable.

Do have a computer ground line separate from all other ground lines. This computer ground line should terminate at the ground rod where the electrical service is grounded.

Don't connect computer ground to safety ground or any other ground points in the electrical system, except at the ground rod.

Don't mount relays or switching devices close to a microprocessor control.

Don't run wires carrying line voltage with signal wires (sensor, communications or other low power lines) going to the control.

Don't use conduit for computer ground.

Don't have phase angle-fired devices in the same electrical enclosure or on the same power line with the control.

Don't connect ground to the control case if the control is mounted in a grounded enclosure (prevent ground loops).

Don't fasten common mode line filters or filters with metal cases to metal that is at ground potential. This prevents ground loops and maintains filter effectiveness.

How to Check for Ground Loops

To check for ground loops, disconnect the ground wire at the ground termination. Measure the resistance from the wire to the point where it was connected- The ohmmeter should read a high ohm value.If you have a low ohm value across this gap, that means there is at least one ground loop present in your system.

Also, check for continuity; your reading should be "open". If you do find continuity, you must now begin looking for the ground loops. Begin disconnecting grounds in the system one at a time, checking for continuity after each disconnection. When continuity reads "open" you have eliminated the ground loop(s). Also as you reconnect grounds, keep making the continuity test. It is possible to reconnect a ground loop.

Noise Suppression Devices Available from Watlow

Watlow Controls stocks a few key noise suppression parts. You may order these by calling your local Watlow distributor.

Table 7 - Noise Suppression Device Ratings.

Item	Electrical Ratings	Part Number
Common Mode Line Filter	250V, 3 Amp	0804-0196-0000
Metal Oxide Varistor	15OV, 80 Joule	0802-0273-0000
MOV	130V, 38 Joule	0802-0304-0000
MOV	275V, 75 Joule	0802-0266-0000
MOV	275V, 140 Joule	0802-0405-0000

Line Filtering Configurations For Controls

These three diagrams show you filter configurations for removing input power noise. Choose the one best suited for your system if you are unsure which one to use.

NOTE:

For very "dirty" or critical applications, use micro-computer-regulated power supply of Uninterruptable Power Supply (U.P.S.)

♪1 Keep filters 12 inches (304.8mm) or less from the control. Minimize the line distance where noise can be w-introduced to the control.

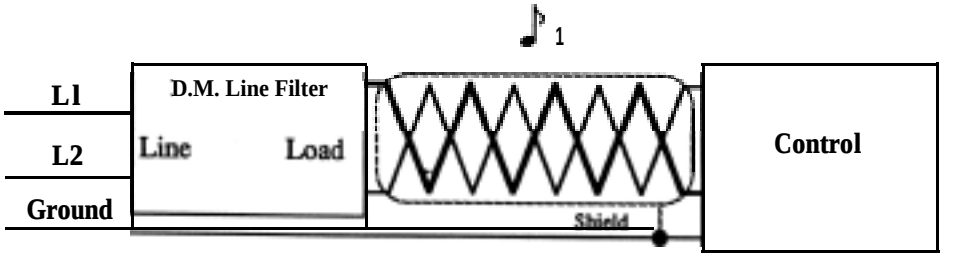


Figure 9 - Differential Mode Filter Diagram.

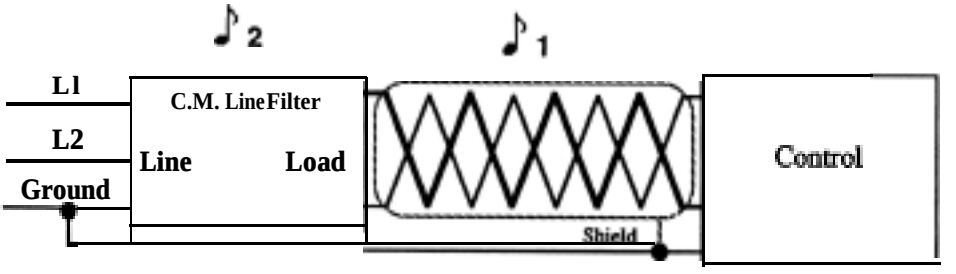


Figure 10 - Common Mode Filter Diagram.

♪2 To prevent ground loops, do not fasten common mode line filters or filters with metal cases to metal that is at ground potential. Doing so will reduce filter effectiveness.

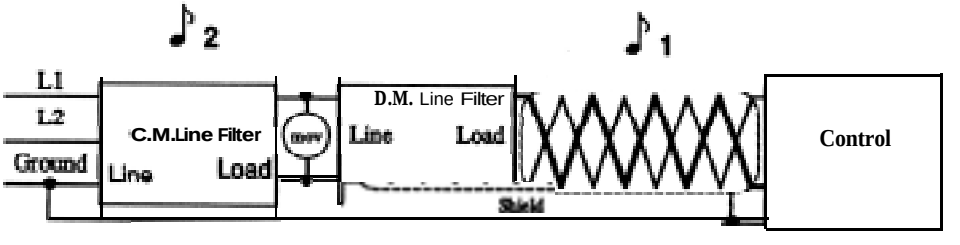


Figure 11 - Combination Differential-Common Mode Filter Diagram.

Installation Information

The Series 920 mounts in a panel cutout with two brackets. These brackets hold the case against the front panel. The Series 920 behind-panel dimensions are 3.56 in. (90.42mm) high by 3.56 in. (90.42mm) wide by 6.0 in. (152.4mm) deep. If your unit has a triac output, add another 2.5 in (63.5mm) to the depth. Figure 12 shows the dimensions of the front panel bezel. The 920 weighs 2.75 lbs. (1.25Kg).

For unit dimensional and mounting information, including the location of mounting brackets and size of the front panel cutout, see Figures 13 and 14. Your panel's thickness can be from 0.06 (1.5mm) to 0.25 in. (6.3mm).

Installation Procedure

Follow this procedure to mount the Watlow Series 920 Temperature Control:

1. Make a panel cutout per the dimensions in Figure 14.
2. Remove the 920 from its case by turning the front panel screw 90° counterclockwise (CCW). Grip the bezel firmly and pull the control chassis out of the case.

CAUTION:

The front panel screw turns 90° only. Do not apply excessive force or turn the screw more than 90°.

3. Place the case in the cutout you just made.
4. Attach the mounting brackets either to the top and bottom, or to both sides of the unit.
5. Tighten the mounting brackets securely against your panel.
6. Insert the control chassis into its case and press the bezel to seat it. Turn the front panel screw 90° clockwise (CW) to lock the control in place. The hardware installation is complete. Go on to the wiring section from here.

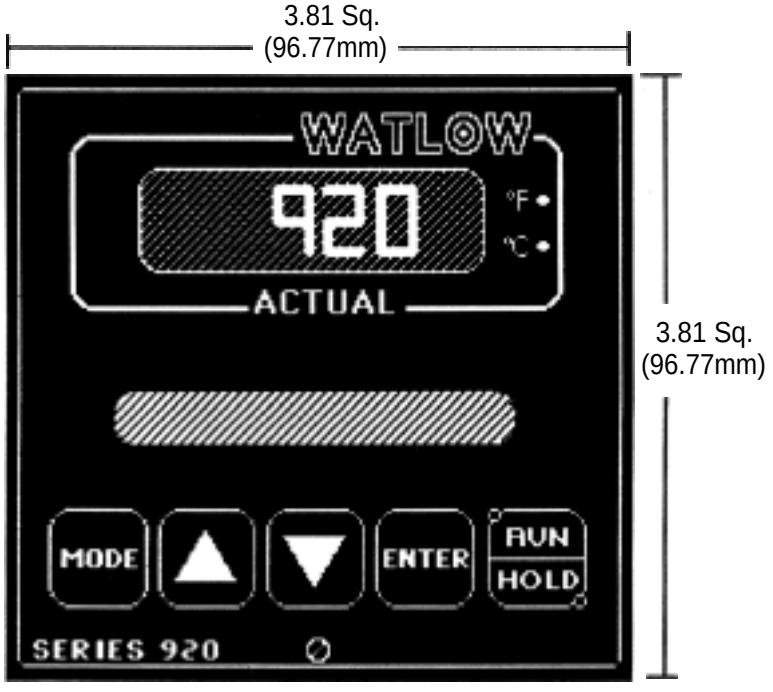


Figure 12 - Series 920 Faceplate Dimensions.

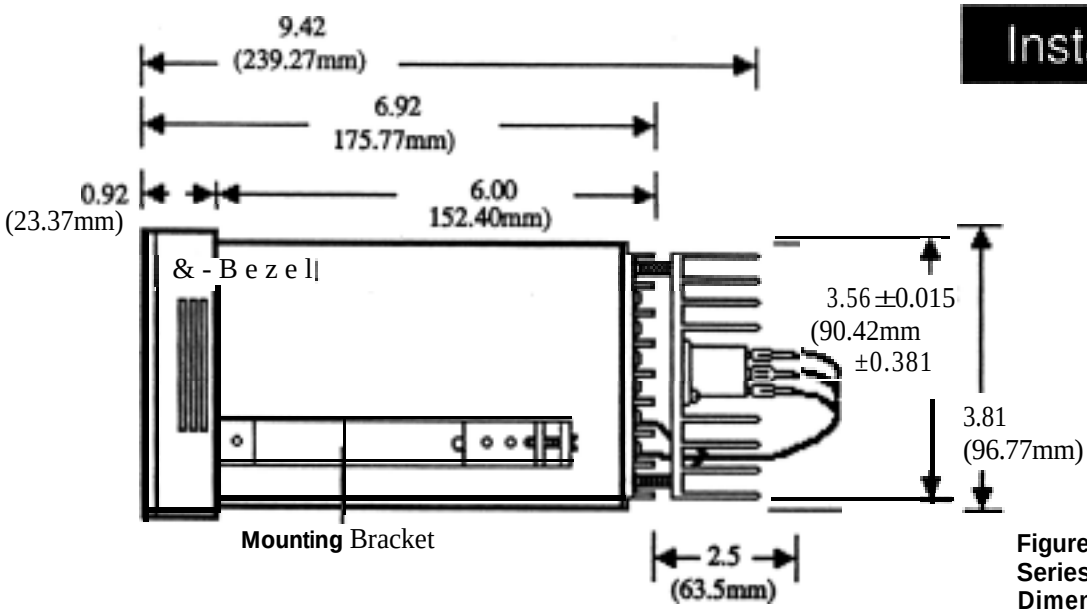


Figure 13 - Series 920 Dimensions. (side view)

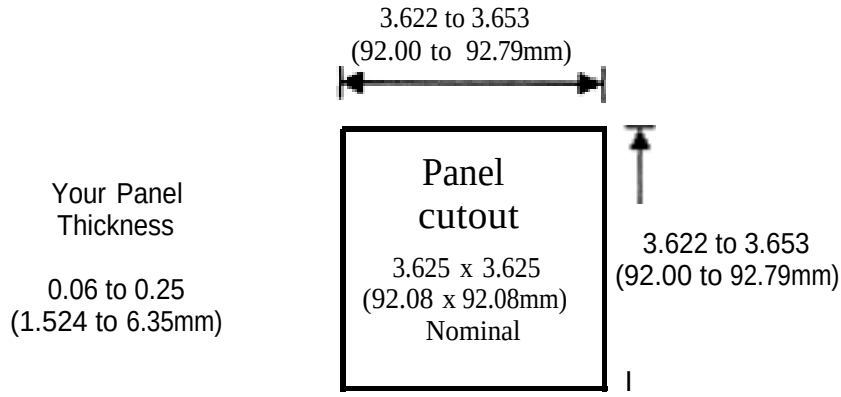


Figure 14 - Series 920 Panel Cutout Dimensions.

How to Wire the Series 920

This section has all the information you need to complete a good wiring job on the Series 920 and your system. Please read the Safety Information in the narrow column on the outside of each page. You will find internal circuits on the left in the following diagrams, and external circuits on the right. In addition, output options are listed by model number. Refer to the unit sticker on your control to be sure that you are wiring from the corresponding diagram. We suggest that you read through the entire section before beginning your hookup. Then proceed, starting with the sensor inputs, auxiliary outputs, then control outputs, data communications, and finally, power wiring.

It is very important to enter a system set point in the Series 920 before applying power to the load circuitry.

In all wiring diagrams, internal circuits are on the left and external circuits are on the right.

WARNING:

To avoid electric shock, make all connections on the back of the control before connecting power to the control. Also, disconnect power before opening the Series 920. Do not apply load power to the output circuits until you have entered a system set point

Power Wiring

1 WARNING:
To avoid potential electric shock, use National Electric Code safety practices when wiring and connecting this unit to a power source and to electrical sensors or peripheral devices.

2 WARNING:
To avoid electric shock, connect the chassis ground terminal to "Earth Ground."

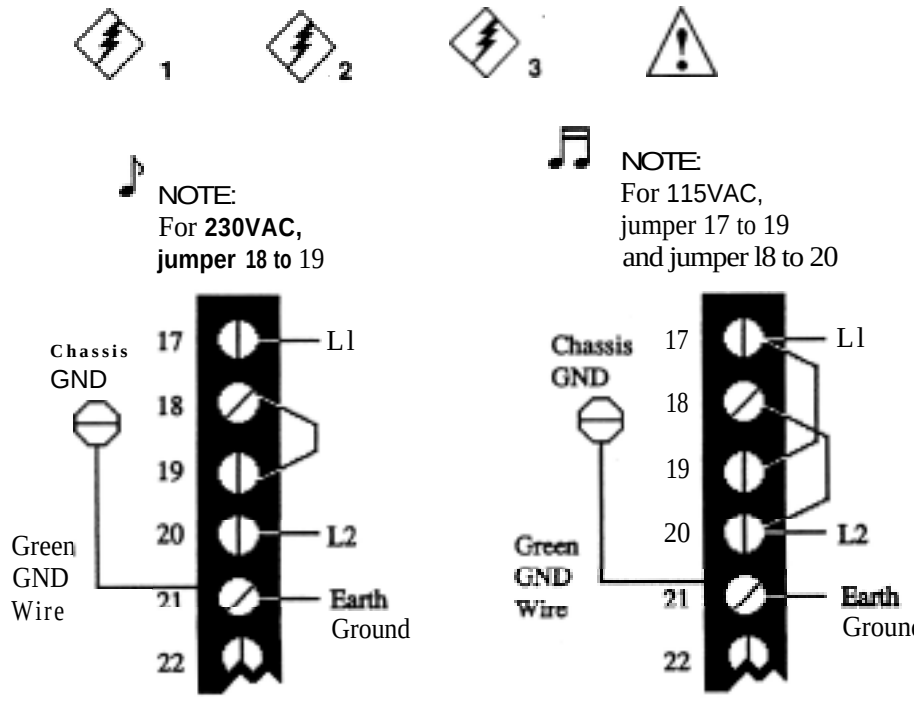


Figure 15 - Series 920 Power Wiring.

3 WARNING:

Disconnecting the green ground jumperwire could allow A.C. voltages to be present on the metal case.

CAUTION:

Remove **the short green ground jumper on the back of the 920 (T-21) if your control is mounted in a metal panel connected to safety (chassis) ground. Removing the jumper will prevent ground loops. OR Leave the short green ground jumper in place if the Series 920 case is not connected to safety (chassis) ground.**

Connect the AC power lines and the jumper wires to the power supply terminal strip of the Series 920. Study the strip connections carefully before beginning. Be sure to use these jumpers on the power supply terminal strip. For 230VAC, jumper 18 to 19. For 115VAC, jumper 17 to 19 and jumper 18 to 20.

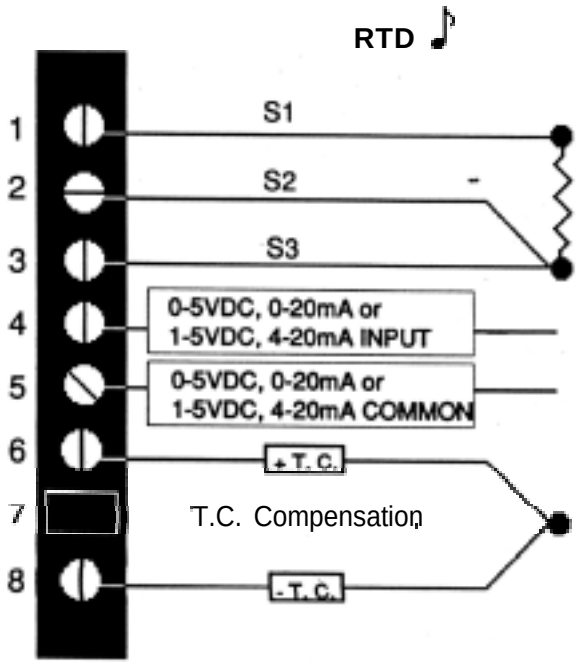
All wiring and fusing should conform to the National Electric Code and to any locally applicable codes also.

When you apply power without sensor inputs on the Signal Conditioner terminal strip, the Series 920 alternately flashes from SYSTEM to ERl 00XX. This is an error code indicating an open sensor. These are normal displays for a unit without sensors.

Before applying power, open the Series 920 and set DIP Switch #1 "ON" for a Cold Start. Replace the control chassis in the enclosure and apply power to the unit. (This clears all previously entered information from the 920; it is a "clean" or "cold" start.)

Now remove power again, open the unit, and set the Switch #1 to OFF, (This will make the next start a "warm" one, retaining all subsequently entered information in the processor's memory.) Close the 920.

Input Options: Terminals 1- 8 Apply One Input Only



For RTD input, use Terminals 1,2 and 3.

For 0-5VDC, 0-20mA or 1-5VDC, 4-20mA input, use Terminals 4 and 5.

For T/C input, use Terminals 6 and 8.

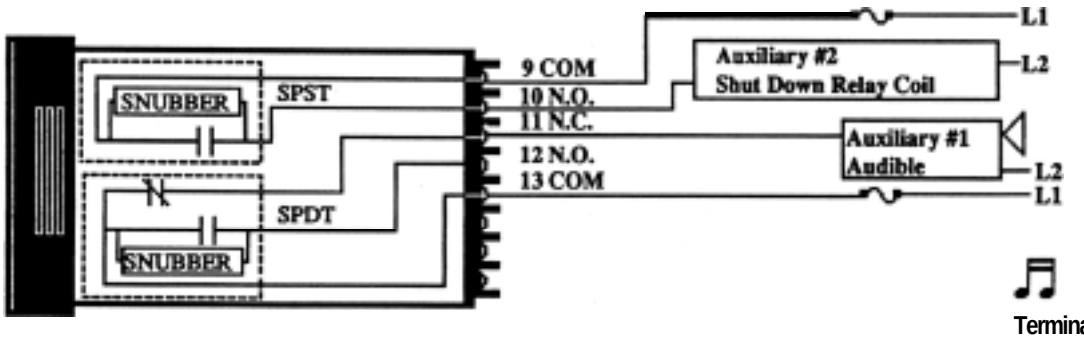
NOTE:
For a two-wire RTD, use Terminals 1 and 2 for the RTD, and jumper Terminal 2 to Terminal 3.

Figure 16 - input Options Wiring Diagram.

See model number information, p. 61, for the input option that applies to your unit.

Front-Panel Input Selection Also Required

Auxiliary Output: Terminals 9 - 13



NOTE:
Auxiliary outputs go to a de-energized state when in an alarm condition.

Figure 17 - Auxiliary Wiring Diagram.

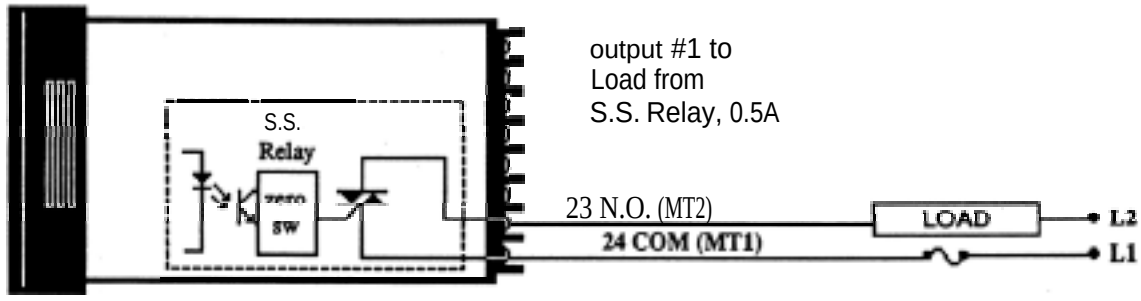
See model number information, p. 61, for the alarm output option that applies to your unit.

NOTE:
Terminals 9 & 10 are Auxiliary Output #2. Terminals 11, 12, & 13 are Auxiliary Output #1.

Output #1 Option B, Terminals 22 - 24

Model#920A-_ **B** _ _-_**000**

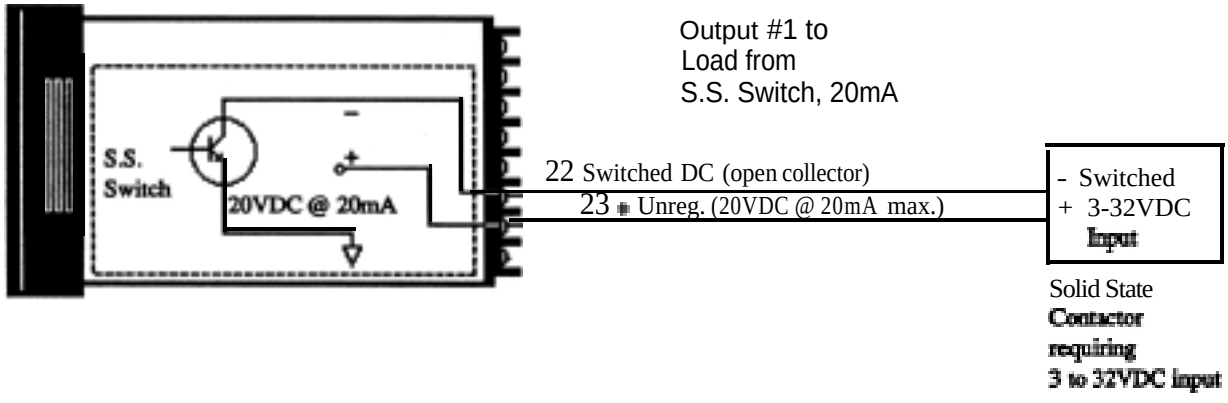
Figure 18 - Output 1, S.S. Relay, Option "B", Wiring Diagram.



Output #1 Option C, Terminals 22 - 24

Model #92OA-_ **C** _ _-_**000**

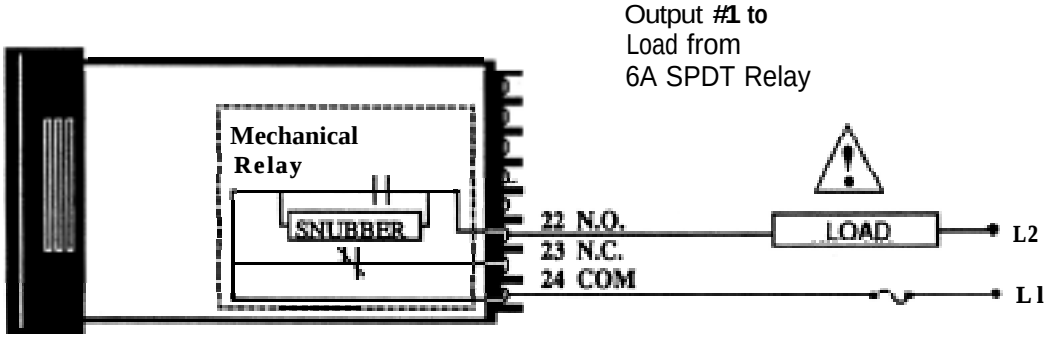
Figure 19 - Output 1 S.S. Switch, Option "C", **Wiring Diagram**



Output #1 Option D, Terminals 22 - 24

Model #92OA-_ D_ _-_000

Figure 20 - Output 1 Mech. Relay, Option "D", Wiring Diagram.



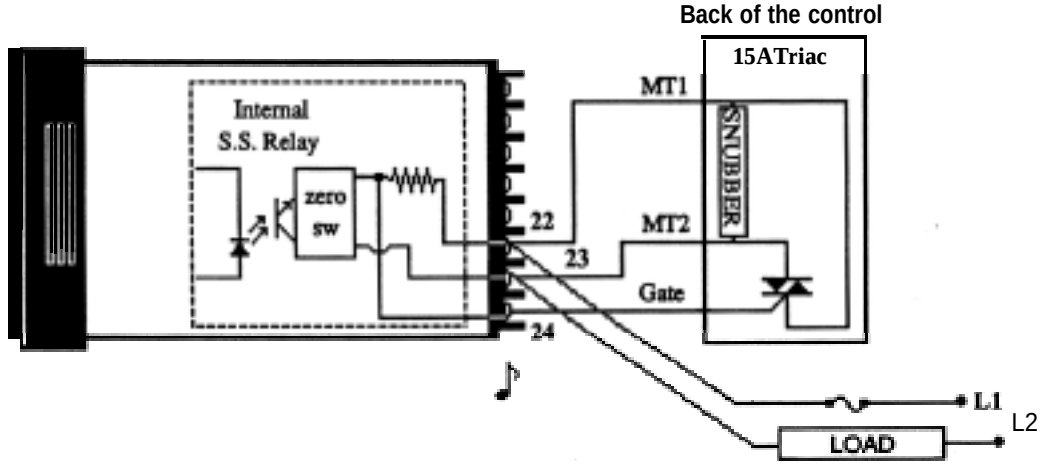
CAUTION:

If you use normally closed contacts of the mechanical relay, you may need to add an external snubber (Watlow Part # 0804-0147-0000) across the normally closed contacts to avoid RF noise and potential malfunction. Normally open contacts are protected internally.

Output #1 Option E, Terminals 22 - 24

Model #92OA-_ E_ _-_000

Figure 21- Output 1, Trlac, Option "E", Wiring Diagram.



NOTE:

Terminal #24 should not have load wires connected to it. It is used only for the gate of the triac located on the back of the control.

Output, #l Option F, Terminals 22 - 24

Model #920A-_ F_ _-_000

♪ **NOTE:**
Current for the 4-20mA loop is sourced internal to the control.

Use ungrounded sensors only.

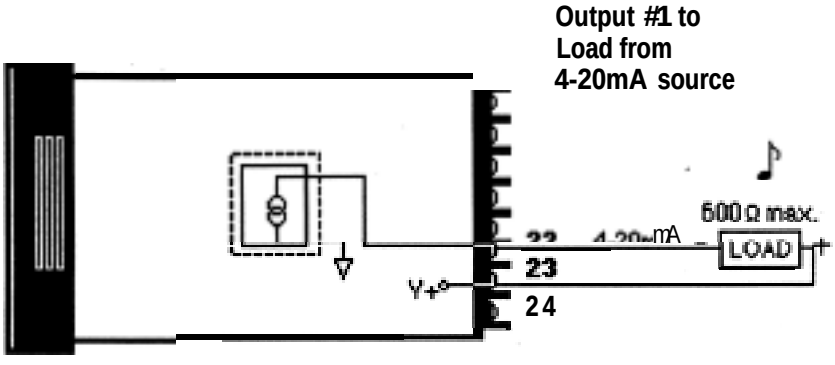


Figure 22 - output 1,4-20mA Option "F", Wiring Diagram.

Output #2 Option A, Terminals 14 - 16

Model #92OA- - A_-_000

Figure 23 - No Output 2.

Output #2 Option B, Terminals 14- 16

Model #920A- - B_-_000

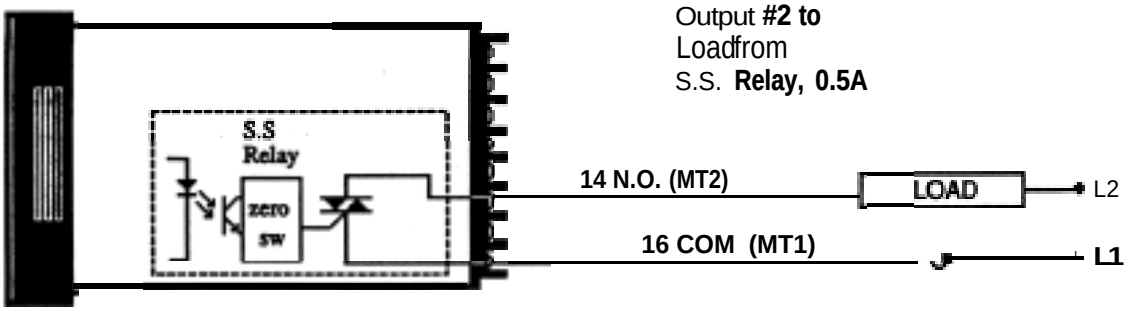
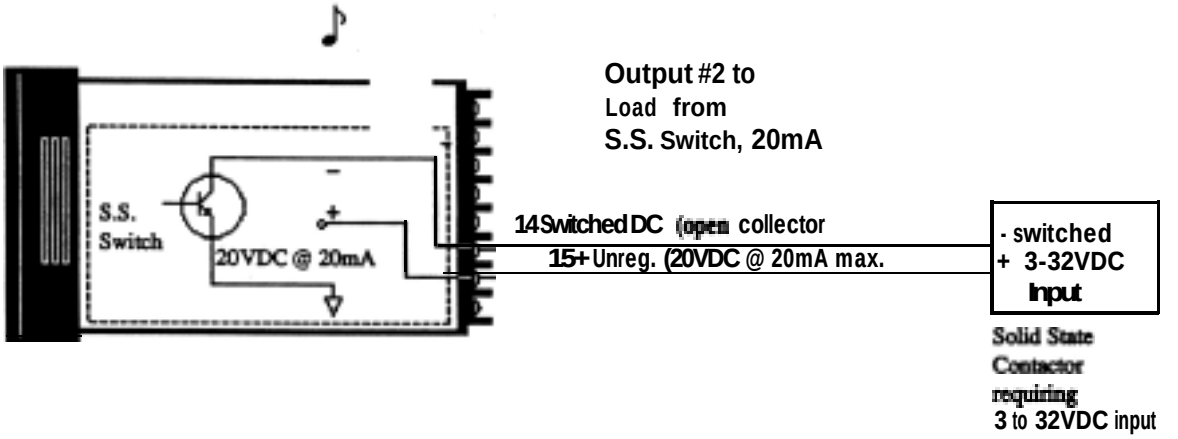


Figure 24 - output 2 S.S. Relay, Option "B", Wiring Diagram.

Output #2 Option C, Terminals 14 - 16

Model #920A- _ _ C - _ 000

Figure 25 - Output 2 S.S. Switch, Option "C", Wiring Diagram.



Output #2 Option D, Terminals 14 - 16

Model #92OA- _ _D_-_000

CAUTION:

If you use normally closed contacts of the mechanical relay, you may need to add an external snubber (Watlow Part # 0804-01479 0000) across the normally closed contacts to avoid RF noise and potential malfunction. Normally open contacts are protected internally.

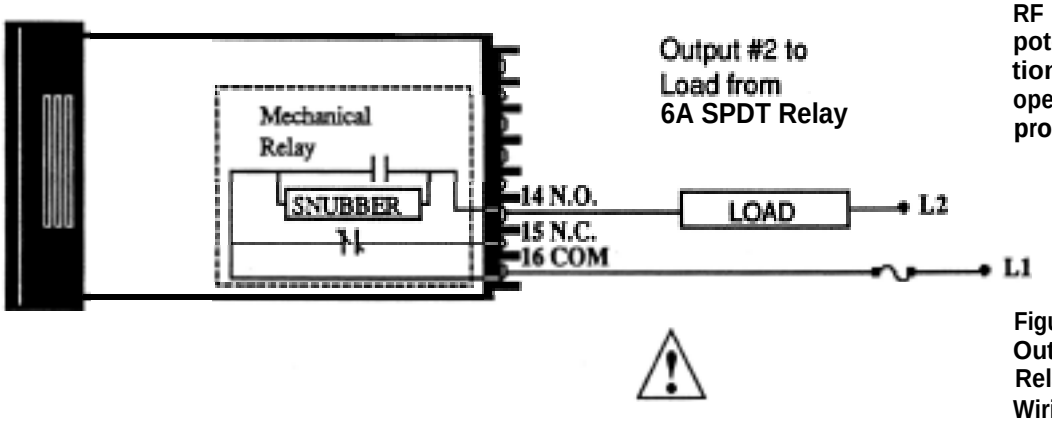
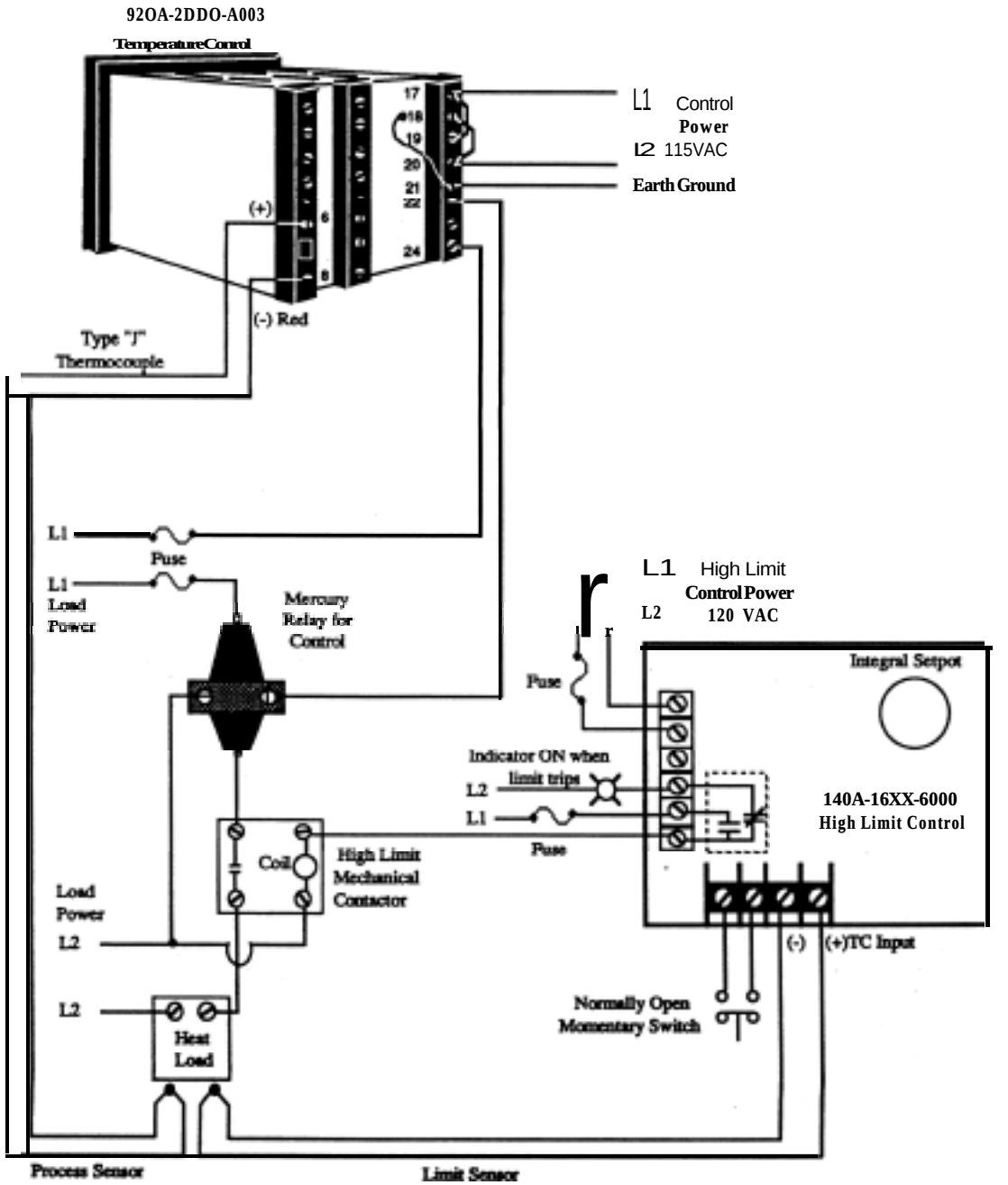


Figure 26 - Output 2 Mech. Relay, Option "D", Wiring Diagram.

System Wiring Example

This example shows a typical Series 920 wiring scheme. it represents only one of many output configurations.

Figure 27 - System Wiring Example.



Chapter 5

How to Tune the Series 920

This chapter will explain tuning the Series 920 to the system it controls.

Recommended Tuning Reference

There are a number of quality references on the art of tuning electronic controllers to the systems they control. If you are not an instrument technician qualified to tune thermal systems, we suggest that you obtain and become familiar with the reference below before attempting to tune your system. Remember that the time you spend tuning your system is relative to the quality of control you need.

Process Control Instrumentation Technology - Third Edition -
by Curtis D. Johnson hard cover, 1982,497 pp.
ISBN: **0-471-05789-4** approx. **$37.00**

"Its overall objective is to provide instructional material for a general understanding of process control characteristics such as elements, modes, and stability along with detailed knowledge of measurement technique, control mode implementation, and final control element functions." Johnson

Using A Chart Recorder

The tuning procedure will be greatly simplified if you use a chart recorder to assist in tuning the Series 920. While the Series 920 itself will not drive a chart recorder, there are several Watlow controls and indicators which will. Your Watlow sales engineer or distributor can help you select one. Place the chart drive sensor near the Series 920 sensor so that the recorder is reading the same system response.

If you don't have a chart recorder available, you can still plot the time vs. temperature system response. Record the 920's ACTUAL display readings on graph paper with an x, y axis to accomplish the same thing.

Load LEDs

The °F/°C LEDs also function as load indicators. When tuning your control set DIP Switch #6 to the ON position for load indication. The °F LED now functions as an LED for Load 1 and the °C LED functions as an LED for Load 2. These LEDs help you determine when the system has stabilized by cycling at a constant rate. When used in a heat/cool application, these LEDs help determine the interaction between heating and cooling.

Tuning

For optimum control performance, tune the 920 to a thermal system. The tuning settings here are meant for a broad spectrum of applications; your system may have somewhat different requirements. Refer to the key flow charts and diagrams and definitions on Pages 41,45 - 47 for prompt location and description.

NOTE:

When tuning in the Heat mode, use PID prompts followed by H. Set the set point above ambient.
When tuning in the Cool mode, use PID prompts followed by C. Set the set point below ambient.

1. **Apply power to the Series 920** and enter a set point in the SYSTEM menu. Next, go into the SETUP mode, and enter ACCESS (1), the PID parameter Using the MODE, UP/DOWN, and ENTER keys, set the Operating Parameters initially: (Proportional Band) PB H (C)= 0, (Reset) RS H (C) = 0.00, (Rate) RT H (C) = 0.00, (Cycle Time) CT H (C) = 5, (Rate band) RBH (C) = 2. Under ACCESS (0) enter CAL = 0.

   Allow actual process temperature to stabilize at or near Set Point (SP). The ACTUAL display will indicate when the load is stabilized near set point.

2. **Proportional Band Adjustment:** Gradually increase PB until the ACTUAL display temperature stabilizes to a constant value. The temperature will not be right on set point because the initial reset value is 0.00 repeats per minute. When tuning in the heat mode, the ACTUAL temperature will stabilize below the desired set point. When tuning in the cooling mode, the ACTUAL temperature stabilizes above set point. (When PB = 0, RS, RT, and CT are inoperative, and the 920 functions as a simple ON/OFF control with a 3°F or 1.7°C switching differential.)

3. **Reset Adjustment:** Gradually increase RS until the ACTUAL display temperature begins to oscillate or "hunt". Then slowly decrease RS until the ACTUAL display stabilizes again near set point NOTE: This is a slow procedure, taking from minutes to hours to obtain optimum value.

4. **Cycle Time Adjustment:** Set CT as required. Optimum system control is always achieved with faster cycle times. However, if a mechanical contactor or solenoid is switching power to the load, a longer cycle time may be desirable to minimize wear on the mechanical components. Experiment until the cycle time is consistent with the quality of control you want.

5. **Rate Adjustment:** Increase RT to 1.00 min. Then raise SP by 20° to

30°F, or 11° to 17°C. Observe the system's approach to SP. If the load temperature overshoots SP, increase RT to 2.00 minutes.

Then raise SP by 20 to 30°F, or 11 to 17°C and watch the approach to the new set point. If RT is advanced too far, approach to the set point will be very sluggish. Repeat as necessary until the system rises to the new set point without overshooting or approaching the set point too slowly.

6. **Calibration Offset Adjustment: You** may want your system to control to a temperature other than the value coming from the input sensor. If so, measure the difference (as much as ±90°F or ±50°C) between that temperature, perhaps at another point in the system, and the process value showing in the alphanumeric display. Then enter the amount of CAL offset you want. Calibration offset adds or subtracts degrees from the value of the input signal.

The LOPWR and HIPWR Parameters

The LOPWR and HIPWR parameters allow you to limit the duty cycle of the beat output to minimum and maximum values. The LOPWR parameter is used to generate a minimum duty cycle regardless of the duty cycle calculated by **the PID circuit.**

LOPWR Example: LOPWR = 20%

The PID circuit calls for a duty cycle of 10%. The LOPWR parameter overrides the PID circuit and outputs a duty cycle of 20%.

For the HIPWR parameter, a maximum duty cycle is generated regardless of the duty cycle calculated by the PID circuit.

HIPWR Example: HIPWR = 80%

The PID circuit calls for a duty cycle of 100%. The HIPWR parameter overrides the PID circuit and outputs a duty cycle of 80%. These two parameters help insure that an "idle" duty cycle is always applied, or that the heaters cannot apply full power to the thermal system.

Where To Go From Here

Once you have tuned your Series 920, continue to Chapter 6 to learn how to program your Series 920 for your system.

Chapter 6
How To Program The Series 920

This chapter will enable you to set up the Series 920 quickly and easily. It will explain why it's a good idea to write out your parameter values. Chapter 6 also shows you flow diagrams of the programming process.

Write Out Your Program

The Watlow Series 920 controls temperature for a specific heating and/or cooling process. Your setup parameter values, when they're entered, give the Series 920 orders for the work you want it to perform.

Since the amount of information in the setup is extensive, we suggest that you write the value on a **copy** of the Master Step Chart on Page 53. This will enable you to set up the Series 920 quickly and without mistakes. The chart makes a good record of your values.

Programming in General

Programming the Series 920 is easy as 1- 2 - 3:

1. Use the MODE key to select the alphanumeric display prompt you want.
2. Use the UP/DOWN keys to select data or prompts in the alphanumeric display.
3. Press ENTER.

Select the Proper DIP Switch Settings

Prior to programming and operating the Series 920, you must set the DIP Switches.

DIP Switch #1 sets a "warm" or "cold" start following power removal from the 920. With the DIP switch in the OFF position for a "Warm Start", the micro-processor uses previously programmed information as if power had not been removed. A Cold Start starts "clean" or completely cleared of all user-programmed information when the DIP switch is in the ON position. All parameters will be empty or set to the default limits.

DIP switch #2 is not used. Set it to the OFF position.

DIP switch #3 selects tenths of units displayed for process inputs.

DIP switch #4 is ON for 0-5VDC/0-20mA input & OFF for 1-5VDC/4-20mA input.

DIP switch #5 is for units with 4-20mA output. If you have this unit, set #5 to the ON position.

DIP switch #6 determines whether the front panel LED's to the right of the actual display are load indicators or °F/°C indicators. When OFF, the LEDs are °F/°C indicators.

DIP switch #7, when OFF, displays all SPCLFUNC parameters. When ON, only factory selected parameters are displayed.

DIP switch #8 is for factory test and calibration, it must be OFF.

Event Outputs

Another feature of the Series **920** is its capability for two event outputs. An "event output" is simply a pre-programmed ON/OFF event per program step. The event may turn any number of peripheral devices ON or OFF to assist you in controlling your process, system or environment.

For instance, in an environmental chamber, you might wish to circulate air at a given time in your program for one or more steps. You might want to turn lights ON or OFF, or signals, or lock out your humidifier, or you could activate a video recorder.

EV1 and EV2 will not be visible under the SYSTEM menu until you SETUP AUX1 and AUX2 as events (EV).

Enter the SETUP menu, and enter ACCESS (5). This is the SPCLFUNK (Special Function) parameter. Press the MODE key until you reach the AUX1 parameter and press ENTER. The default for AUX1 and AUX2 is AL (Alarms). Change the value to EV (Events) if it hasn't already been done.

If you return to the SYSTEM menu, EV1 and EV2 will be visible, and can be turned ON or OFF from here. EV1 and EV2 can also be viewed under the SETPOINT parameter in the PROGRAM menu.

If the events are programmed for one step and left unprogrammed for the next step, the events will maintain the last programmed status.

These event outputs are mechanical relays rated at 6 amps up to 240VAC

Guaranteed Soak

The Series 920 Guaranteed Soak (GS) feature insures that the process temperature tracks a programmed ramp. The Guaranteed Soak acts as a deviation alarm. The program clock halts if the ACTUAL temperature exceeds the Guaranteed Soak value. At this time the HOLD LED flashesand the clock starts once the process variable is within the GS deviation value. Programmed in degrees or process units, GS is in the SETUP menu under ACCESS (5). Entering a value of **(0)** disables the Guaranteed Soak function. Figure 28 is an example of the Guaranteed Soak function.

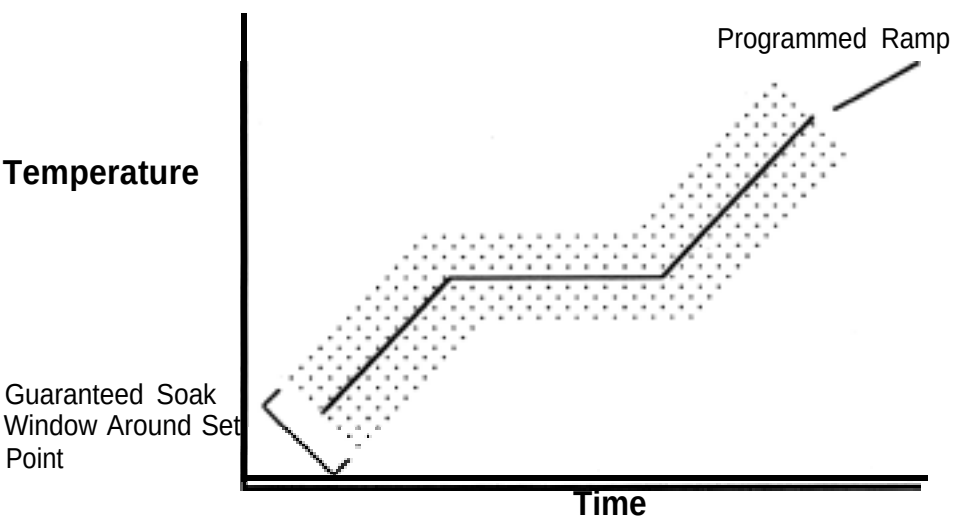


Figure 28 - **Guaranteed Soak (GS) Example**

NOTE:

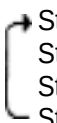
If the program is put in the HOLD mode while holding for a guaranteed soak and restarted at another step, the GS has to be met for the previous step, before the program can continue.

The Four JUMPLOOP Types

The Series 920 gives you the capability to perform four basicjumploop types in your programming. The backward jump, foward jump, nested loops, and intertwining loops. **These are only definitions of the four loops.** The Series 920 has very few rules concerning loops in your program.

Backward Jump

The **Backward** jump is the most common jump. A backward jump will force you to a step already performed. The Jump Step (JS) must be less than the current step. You cannot JUMPLOOP to the step that you are on.



Step 2	SETPOINT		
Step 3	SETPOINT		
Step 4	SETPOINT		
Step 5	JUMPLOOP	JS - 02	JC-01
Step 6	STOP		

The steps in sequence will be: 2,3,4,5,2,3,4,5,6.

Your Jump Count (JC) can be anything from 0- 100. If you enter 0, this will be an infinite looping and will never progress to Step 6.

Forward Jump

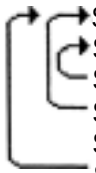
The next loop type is a **Forward** jump. By definition you can jump forward. The Jump Step must be greater than this step.

Step 1	SETPOINT		
Step 2	SETPOINT		
Step 3	JUMPLOOP	JS - 05	JC-01
Step 4	SETPOINT		
Step 5	STOP		

The steps in sequence will be: 1,2,3,5.

Nested LOOP

A **"Nested"** loop is a jump loop within a loop. You will be forced to a step either forwards or backwards from your present location. When nested loops are performed, they cannot break across other loops. Your JC can be from 0 - 100 with 0 being an infinite looping.

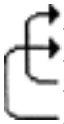


Step 1	SETPOINT		
Step 2	SETPOINT		
Step 3	JUMPLOOP	JS - 02	JC-01
Step 4	JUMPLOOP	JS - 01	JC-01
Step 5	SETPOINT		
Step 6	JUMPLOOP	JS - 01	JC-01
Step 7	STOP		

The steps in sequence will be: 1,2, 3,2,3,4,1, 2, 3,2,3,4,5,6,1,2,3,2,3, 4,1,2,3,2,3,4,5,6, 7.

Intertwined LOOP

An **"Intertwined"** loop can break across other loops.



Step 1	SETPOINT		
Step 2	SETPOINT		
Step 3	JUMPLOOP	JS - 01	JC-01
Step 4	JUMPLOOP	JS - 02	JC-01
Step 5	STOP		

Rules to Follow

The one basic rule that you must follow is that you can only have a maximum of three consecutive jump loops.

Step 1	SETPOINT		
Step 2	JUMPLOOP	JS-01	JC-01
Step 3	JUMPLOOP	JS-01	JC-01
Step 4	JUMPLOOP	JS-01	JC-01
Step 5	JUMPLOOP	JS-01	JC-01
Step 6	STOP		

Your program will run until it reaches Step 5, and you will receive an ER2 0039. This is the infinite looping error, and means that you have too many consecutive loops.

Another rule to follow is that you cannot JUMPLOOP to a step that you are on. You will receive an ER2 0039. Clear the error in the ER2 parameter under the SYSTEM menu and retransmit your data.

Use simple loops in your program!

The next pages will show you each of the Series 920 menus and their prompts and values. Each section, SYSTEM, SETUP, and PROGRAM, has a menu graphic with a table of values, followed by prompt definitions. Don't write in the tables and charts here, but make copies to document your control.

Prompt definitions are also listed in the glossary.

SYSTEM Menu

The SYSTEM mode shows the status of the SYSTEM set point, event outputs, and error prompts for clearing errors. Step through the SYSTEM menu using the key flow diagram below, and table on the following page. Note that several parameters are only visible when they are entered under SETUP, or when errors exist.

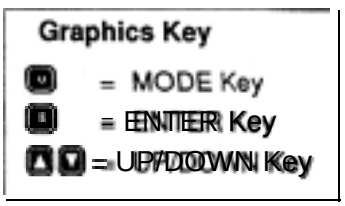
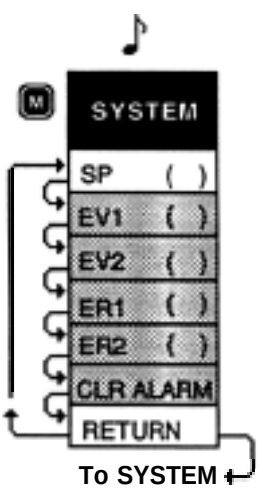


Figure 29 - SYSTEM Key Flow

NOTE:

Shaded parameters may not appear on your control. These parameters are dependent on how your control is configured. See Page 41 for more information.



Press E to enter SYSTEM menu.

After entering a value, continue to the next parameter by pressing M.

At any RETURN, you can press E to return to SYSTEM, or press M to return to the first parameter.

Table 8 - SYSTEM Prompts and Description. Make photocopies, keep original clean:

SYSTEM				
Prompt	**Description**	**Range**	**Default**	**Your Settings**
SP	Monitor/Enter the Fixed Set Point value.	RAL and RAH	73°F	
EV1	Monitor/Enter the Event Output 1 status. Dependent on AUX1 = EV.	OFF or ON	OFF	
EV2	Monitor/Enter the Event Output 2 status. Dependent on AUX2 = EV.	OFF or ON	OFF	
ER1	Displays/Clears the most recent fatal error.	0 - 50	--	
ER2	Displays the most recent non-fatal error.	0 - 50	--	
CLR ALARM	Displays the current alarm.	1-2		
RETURN	Press the ENTER key to returnto SYSTEM prompt Press the MODE key to return to the SP prompt.			

SYSTEM

One of three main level operating menus. From the SYSTEM menu, you can generate a non-ramp set point (fixed), manipulate Events 1 and 2 ON or OFF, clear system errors, and clear latching alarms.

SP ( )

Represents the current set point.
Range: RAL and RAH **Default: 73°F**

EV1 ( )

This auxiliary output can be an alarm or event. Events may be turned ON or OFF in the HOLD mode. EV1 will only appear when AUX1 = EV, under the SPCLFUNC menu.
Range: OFF or ON **Default:** OFF

EV2 ( )

This auxiliary output can be an alarm or event. Events may be turned ON or OFF in the HOLD mode. EV2 will only appear when AUX2 = EV, under the SPCLFUNC menu.
Range: OFF or ON **Default:** OFF

ER1 ( )

ER1 is considered a fatal error; your system will shut down. When the Serles 920 shuts down, all outputs are turned off, and your program stops running. When an error occurs, ER1 00XX alternately flashes with the SYSTEM parameter. When in either the RUN or HOLD mode, press the ENTER key to stop ER1 from flashing for 5 minutes. This will not clear the error condition. To clear an error, ENTER the SYSTEM mode, and scroll to the ER1 parameter. Press ENTER; this clears the error unless it is a re-occuring error and has not been resolved.
Range: 0 - 50

ER2 ( )

ER2 is considered non-fatal. if you are in the **RUN mode,** your program continues running unless it is a program error. **ER2 00XX** appears, and flashes alternately along withthe parameter you are presently on. When in either the RUN or HOLD mode, pressing the ENTER key steps ER2 from flashing for 5 minutes. This will not clear the error condition. Clear an ER2 by pressing the ENTER key while in the RUN mode, or return to the ER2 parameter under the SYSTEM mode. Press ENTER. If the error persists, refer to the Error Code list at the end of the manual to clear.
Range: 0 - 50

CLR ALARM

Alarms 1 and 2 are considered non-fatal. If you are in the RUN mode, your program will continue to run. ALMX XX appears and flashes alternately with the parameter you are presently on. When in either the RUN or HOLD mode, press the ENTER key to stop ER1 from flashing for 5 minutes. This will not clear the alarm condition. ENTER the CLRALARM parameter to clear a latching alarm. A non-latching alarm clears itself once it fails within the alarm limits.
Range: 1 - 2

RETURN

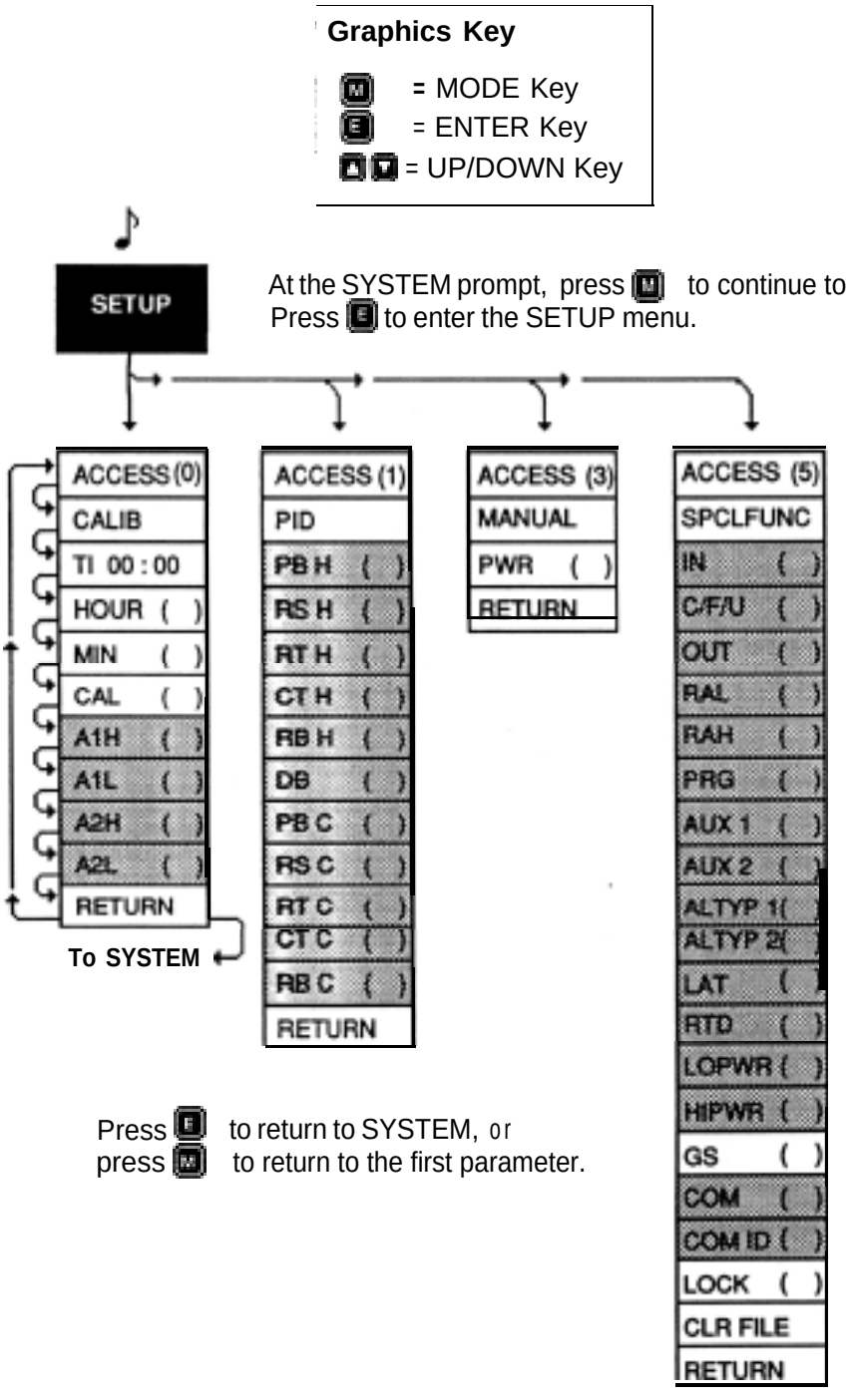
From any RETURN, you can go back to SYSTEM prompt.

SETUP Menu

While in the HOLD mode, press the MODE key until you see SETUP, press ENTER. These parameters are to setup the personality of your Series 920. Using the MODE to progress through the prompts, use the UP/DOWN keys to select parameters and values and press ENTER.

Select **each** ACCESS number. Follow that parameter sequence to enter values. You must return to SYSTEM before you can continue to the next ACCESS number.

Figure 30 - SETUP Key Flow



NOTE:

Shaded parameters may not appear on your control. These parameters are dependent on how your control is configured. See Pages 43 - 48 for more information.

NOTE:

Changing certain parameter values will default other parameters and clear all programmed files. See Page 44 and 47 for details.

Table 9 -
SETUP Prompts and Description. Make photocopies, keep original clean.

SETUP Menu

Prompt	Description	Range	Default	Your Settings
ACCESS = (0) CALIB				
To enter CALIB parameters, use ACCESS (0) and ENTER.				
TI XX:XX	Read only. Displays the Real Time.			
HOUR	Enter the hours to display the system time-of-day clock.	0-23 hours	0	
MIN	Enter the minutes to display the system time-of-day clock.	0-59 minutes	0	
CAL	Enter the Calibration Offset value	-90 to 90°F, -50 to 50°C	0	
A1H	Enter the Alarm 1 High value. Displayed if AUX1 = AL	J		
Al L	Enter the Alarm 1 Low value. Displayed if AUX1 = AL	See Below.	RAL	
A2H	Enter the Alarm 2High value. Displayed if AUX2 = AL	See Below.	**RAH**	
A2L	Enter the Alarm 2 Low value. Displayed if AUX2 = AL	See Below.	RAL	
RETURN	Press the ENTER key to returnto the SYSTEM prompt Press the MODE key to return to the CALIB prompt			

	Range	Process Default & High Slew Limit	Deviation Default & High Slew Limit
AXH	**J**	1 382°F/750°C	999°F/555°C/U
	K	2282°F/1250°C	999°F/555°C/U
	T	662°F/350°C	999°F/555°C/U
	RTD Whole	1112°F/600°C	999°F/555°C/U
	RTD Tenths	392.0°F/200.0°C	999°F/555°C/U
	0 - 5 Whole	1985°F/1985°C	999°F/555°C/U
	0 - 5 Tenths	198.5°F/198.5°C	999°F/555°C/U
	4 - 20 Whole	1985°F/1985°C	999°F/555°C/U
	4 - 20 Tenths	198.5°F/198.5°C	999°F/555°C/U
	R	2642°F/1450°C	999°F/555°C/U
	S	2642°F/1450°C	999°F/555°C/U
	B	3092°F/1700°C	999°F/555°C/U

	Range	Process Default & Low Slew Limit	Devlation Default & Low Slew Limit
AXL	J	32°F/O°C	**-999°F/-555°C/U**
	K	-328°F/-200°C	-999°F/-555°C/U
	T	-328°F/-200°C	-999°F/-555°C/U
	RTD Whole	-328°F/-200°C	-999°F/-555°C/U
	RTD Tenths	-99.9°F/-99.9°C	-999°F/-555°C/U
	0 - 5 Whole	-117°F/-117°C	-999°F/-555°C/U
	0 - 5 Tenths	-11.7°F/-11.7°C	-999°F/-555°C/U
	4 - 20 Whole	-285°F/-285°C	-999°F/-555°C/U
	4 - 20 Tenths	-28.5°F/-28.5°C	-999°F/-555°C/U
	R	30°F/-1°C	-999°F/-555°C/U
	S	30°F/-1°C	-999°F/-555°C/U
	B	390°F/199°C	-999°F/-555°C/U

Prompt	Description	Range	Default	Your Settings
ACCESS = (1) PID				
To enter PID parameters, use ACCESS (1) and press ENTER.				
PB H	Enter the Proportional Band value, Heating. Not displayed if OUT = CL.	0 - 900°F/0 - 500°C	45°F/7.22°C	
RS H	Enter the Reset value, Heating. Not displayed if OUT = CL, and PB H = 0.	0.00 - 5.00 repeats/minute	0.00	
RT H	Enter the Rate value, Heating. Not displayed if OUT = CL, and PB H = 0.	0.00 - 5.00 minutes	0.00	
CT H	Enter the Cycle Time value, Heating. Not displayed if PB H=O. Dependent on output & OUT. OUT = HT or HT/CL, and PB H = 0.	1 - 60 seconds	5	
RB H	Enter the Rate Band value, Heating. Not displayed if OUT = CL, and PB H = 0. **0 denotes rate is always functional.**	0 - 7 times PB H	0	
DB	Enter the Current Dead Band value. Not displayed if OUT = HT or CL	-20 to 20° F or C, Units	0	
PBC	Enter the Proportional Bandvalue, Cooling. Not displayed if OUT = HT.	0 - 900°F/0 - 500°C	45°F/7.22°C	
RSC	Enter the Resetvalue, Coollng. Not dlsplayed if OUT= HT, and PB C =0.	0.00 - 5.00 repeats/minute	0.00	
RTC	Enter the Rate value, Cooling. Not displayed if OUT = HT, and PB C = 0.	0.00 - 5.00 minute	0.00	
CTC	Enter the CycleTime value, Coding. Not dlsplayed if **PB H = 0. Dependent on output & OUT.**	1 - 60 seconds	5	
RBC	Enter the Rate Band value, cooling Not displayed if OUT =CL, and PB C =0. **0 denotes rate is always functional.**	0 - 7 times PB C	0	
RETURN	**Press the ENTER key to return to the SYSTEM prompt** Press the MODE key to return tothe PID prompt.			

Prompt	Description	Range	Default	Your Settings
ACCESS = (3) MANUAL				
To enter MANUAL parameters, use ACCESS (3) and press ENTER.				
PWR	Enter the manual power output. -100 = Cool on 100% 0 = Heat/Cool OFF 100 = Heat on 100%	-100 to 100	% of pwr output when MANUAL is entered	

SETUP Menu

1 NOTE:

Changing these parameter values will default other parameters and clear all programmed files. See Page 47 for details.

Prompt	Description	Range	Default	Your Settings
	ACCESS = (5) SPCLFUNC To enter SPCLFUNC parameters, use ACCESS (5) and press ENTER.			
IN	Input type codes Model number - 920A-2XX0-X000 IN J 32 to 1382°F 0 to 750°C IN K -328 to 2282°F -200 to 1250°C IN T -328 to 662°F -200 to 350°C IN RTD1 -328 to 1112°F -200 to 600°C In 0 - 5 -99 to 1800 Units Not displayed if DIP switch #7 is ON.		J	
IN	Model number - 920A-3XX0-X000 IN J 32 to 1382°F 0 to 750°C IN K -328 to 2282°F -200 to 1250°C IN T -328 to 662°F -200 to 350°C IN RTD.1 -99.9 to 392.0°F -99.9 to 200.0°C IN 4-20 -99 to 1800 Units Not displayed if DIP switch #7 is ON.		J	
IN	Model number - 920A-4XX0-X000 IN R 32 to 2642°F 0 to 1450°C IN S 32 to 2642°F 0 to 1450°C IN B 392 to 3092°F 200 to 1700°C Not displayed if DIP switch #7 is ON.		R	
C/F/U	Enter the unit of measure code. (Celsius/Fahrenheit/Units) Not displayed if DIP switch #7 is ON.	C/F/U	F	
OUT	Enter the control output OUT HT Heat PID OUT CL Cool PID OUT HTCL Heat PID/Cool PID OUT CLHT Cool PID/Heat PID Not displayed if DIP switch #7 is ON.	HT CL HT/CL CL/HT	HT HT HT HT	
RAL	Enter the Range Low value. Not displayed if DIP switch #7 is ON.	Input selection dependent		
RAH	Enter the Range High value. Not displayed if DIP switch #7 is ON.	Input selection dependent		
PRG	Enter ramp rate in Degrees/Minute or Time Duration. PRG TIME Time Duration PRG RATE Degrees/Minute Not displayed if DIP switch #7 is ON.	TIME RATE	TIME	
AUX1	Enter the Auxiliary Output 1. AUX1 AL AUX1 EV Not displayed if DIP switch #7 is ON.	Alarm output Event output	AL	
AUX2	Enter the Auxiliary Output 2. AUX2 AL AUX2 EV	Alarm output Event output	AL	
ALTYP1	Enter Alarm Type 1. ALTYP1 P ALTYP1 D Not displayed if DIP switch #7 is ON.	Process alarm Deviation alarm	P P	
ALTYP2	Enter Alarm Type 2. ALTYP2 P ALTYP2 D Not displayed if DIP switch #7 is ON.	Process alarm Deviation alarm	P P	
LAT	Enter the Alarm function type. Not displayed if DIP switch #7 is ON.	LAT or NLAT	NLAT	
RTD	Enter input gain of RTD input channels for different curves. Not displayed if DIP switch #7 is ON. Also dependent on input type being RTD whole or tenths.	JIS or DIN	JIS	
LOPWR	Enter the Low Power. Not displayed if DIP switch #7 is ON.	0 - 100%	0	
HIPWR	Enter the High Power. Not displayed if DIP switch #7 is ON.	0 - 100%	100	
GS	Enter the Guaranteed Soak value.	0 - 90°F/0 - 50°C	0°	
COM	Selects between XON/XOFF or STX/ETX protocol. Dependent on communications capability.	STX or XON	STX	
COM ID	Enter the Communications protocol identification Dependent on communications capability and COM = STX.	0 - 9	0	
LOCK	Enter the Front panel Lock code.	0 - 2	0	
CLR FILE	Press ENTER to display FILE?. Enter a file number to clear.	1 - 10	1	
RETURN	Press the ENTER key to return to the SYSTEM prompt. Press the MODE key to return to the SPCLFUNC prompt.			

SETUP

One of three main level operating menus. From the SETUP menu, you can setup or change system-operating parameters such as real time, high/low range, alarm types, alarm points, PID settings and communications. You must select each ACCESS number to create the personality of your Series 920.

ACCESS (0)

ACCESS number (0) must be selected to enter the personality of your Series 920 into the CALIB parameters.

CALIB

In the Series 920, when ACCESS (0) is entered under the SETUP menu, the CALIB parameters appear. These parameters set up the Real Time clock, alarms, and the calibration offset of the process variable.

TI 00:00

Represents the current Real Time hours and minutes of the Series 920s System. Midnight = 0 hours and 0 minutes. A Read Only parameter.

HOUR ( )

Represents the SYSTEM 24 hour time-ofday clock for hours. Midnight = 0 hours.
Range: 0 - 23 hours Default: 0

MIN ( )

The SYSTEM 24 hour time-of-day clock setting for minutes.
Range: 0 - 59 minutes **Default: 0**

CAL ( )

An offset of the process variable. This number is added to the value that the system derives. The final result is used for the control point.
Range: -50 to 50°C/-90 to 90°F **Default: 0**

A1H ( )

The Series 920 will display this parameter representing the high process alarm or high deviation alarm for Alarm 1. Displayed only when AUX 1 = AL. See Page 43.

A1L ( )

This parameter represents the low process alarm or low deviation alarm for Alarm 1 of the Series 920. Displayed only when AUX1 = AL See Page 43.

A2H ( )

Represents the high process alarm or high deviation alarm for Alarm 2 of the Series 920. Displayed only when AUX2 = AL. See Page 43.

A2L ( )

The low process alarm or low deviation alarm for Alarm 2 of the Series 920. Displayed only when AUX2 =AL. See Page 43.

RETURN

From RETURN, you can go back to the SYSTEM prompt by pressing the ENTER key, or return to ACCESS (0) menu by pressing the MODE key.

ACCESS (1)

In the SETUP menu, ACCESS (1) must be selected to enter the PID parameters.

PID

When ACCESS (1) is entered under the SETUP menu of the Series 920, the PID parameters will appear. These parameters consist of Proportional, Integral (auto reset), and Derivative (rate) actions.

PB H ( )

A proportional temperature band expressed in degrees within which a temperature controller proportioning function is active for heating. Expressed in degrees. This parameter will not appear if OUT =CL.
Range: 0 to 900°F/0 to 500°C **Default:** 45°F/25°C

RS H ( )

A reset (integral) heating control action that automatically eliminates offset, **or** "droop", between set point and actual process temperature in a proportional control. Expressed by repeats per minute. This parameter isn't displayed if OUT =CL, or **PB H** is set to 0.
Range: 0.00 to 5.00 repeats/minute Default: 0.00

RT H ( )

The rate (derivative) heating function of the Series 920. The rate is determined by how fast the error being corrected is increasing. Expressed in minutes. This parameter will not appear if OUT=CL, or PBH=0.
Range: 0.00 to 5.00 minutes **Default: 0.00**

SETUP Menu

The heating cycle time usually expressed in seconds for a controller to complete one ON/OFF cycle. Time between successive turn ons. This parameter will not appear if: OUT= CL, or PB H =0 or if your Series 920 has a 4-20mA output and OUT = HT or HT/CL.
Range: 1 to **60** seconds **Default: 5**

A thermal control band for heating, that defines where the rate (derivative) function begins. This band is in multiples of the heat proportional band. This parameter will not appear if OUT=CL, or PB H=0.
Range: 0 to 7 times PB H **Default: 0**

The area where no heating or cooling takes place in a heat/cool proportional control. Not displayed if OUT = HT or CL.
Range: -20 to 20°F, C or Units **Default: 0**

A temperature band expressed in degrees within which a temperature controller proportioning function is active for cooling. This parameter will not appear if OUT = HT.
Range: 0 to 900°F/0 to 500°C **Default: 45°F/25°C**

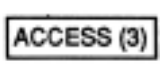
Reset (integral) cooling control action that automatically eliminates offset, or "droop", between set point and actual process temperature in a proportional control. Expressed in repeats per minute. This parameter will not appear if OUT = HT, of PB C = 0.
Range: 0.00 to 5.00 repeats/minute **Default 0.00**

The rate (derivative) cooling function of the Series 920. The rate is determined by how fast the error being corrected is increasing. Expressed in minutes. This parameter will not appear if OUT=HT, or PB C=O.
Range: 0.00 to 5.00 minutes **Default: 0.00**

The cooling cycle time expressed in seconds for a controller to complete one ON/OFF cycle. Time between successive turn ons. This parameter will not appear if: OUT=HT. or PB C =0. Your Series 920 has a 4-20mA output and OUT = CL or CL/HT.
Range: 1 to **60** seconds **Default: 5**

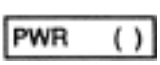
A thermal control band for cooling that defines where the rate (derivative) function begins. Use the same as RB H. This band is in multiples of the cool proportional band. This parameter will not **appear if OUT** = CL, or PB C = 0.
Range: 0 to **7** times PB C **Default: 0**

From RETURN, you can go back to the SYSTEM prompt by pressing the ENTER key, or return to PID by pressing the MODE key.



In the SETUP menu, ACCESS (3) must be selected to enter the MANUAL parameters. Here you can manually adjust percent power.

When ACCESS (3) is selected under the SETUP mode of the Series 920, the MANUAL parameters appear. The outputs revert to manual percent power control at the percent of power that they happen to be currently at.



Allows the operator to manually adjust the percent power output. The default value displayed and controlling at, is the value the PID calculated when the MANUAL parameter menu was entered. -100 to 100 represents full cool to full heat, respectively This parameter will take priority over the LOPWR and HIPWR parameters.
Range: -100 to 100 **Default: % of** power output when MANUAL is entered

RETURN

From RETURN, you can go back to the SYSTEM prompt by pressing the ENTER key, or return to ACCESS (3) menu by pressing the MODE key.

ACCESS (5)

In the SETUP menu, ACCESS (5) must be selected to enter the SPCLFUNC parameters.

SPCLFUNC

When ACCESS (5) is selected under the SETUP mode of the Series 920, the Special Function parameters appear. Here you can select the input type, degrees, output type, auxiliary, and alarm types among others.

IN ( )

Selects the type of sensor used as an input to the Series 920. This parameter will not appear if DIP switch #7 is ON. Changlng this **parameter defaults parameters SP, A1L, A1H, and clears all programmed files.**
Range: Dependent on model number. Default: Dependent on input type.

C/F/U ( )

Accepts the sensor input and scales it to degrees Celsius, Fahrenheit, or Units of measure. This parameter will not appear if DIP switch #7 is ON.
Range: C, F, or U **Default: F**

OUT ( )

Select an output type. Action in response to the difference between set point and process variable. This parameter will not appear if DIP switch #7 is ON.
Range:

Heat PID	HT	Cool PID	CL
HeatPID/Cool PID	HT/CL	Cool PID/Heat PID	CL/HT

Default: HT

RAL ( )

Represents a low limit to set point. The default values are also the low limits of your input type. This parameter will not appear if DIP switch#7 is ON. Changing **this parameter clears all files.**
Range: Input selection dependent.

RAH ( )

Represents a high limit to set point. The default values are also the high limits of your input type. This parameter will not appear if DIP switch #7 is ON. **Changing this parameter clears all files.**
Range: Input selection dependent.

PRG ( )

Allows a selection of program steps to run a ramp rate in either degrees/minute or time duration. This parameter will not appear if DIP switch #7 is ON.
Range: Time or Rate Default: Time

AUX 1 ( )

This parameter determines whether Auxiliary Output 1 will be an alarm or event output for the Series 920. This parameter will not appear if DIP switch #7 is ON.
Range:

Alpha Display	Auxiliary Outout 1's Function
AUX1 AL	Alarm Output defined for AUX 1
AUX1 EV	Event Output defined for AUX 1

Default: AL

AUX 2 ( )

This parameter determines whether Auxiliary Output 2 will be an alarm or event output for the Series 920. This parameter will not appear if DIP switch #7 is ON.
Range:

Alpha Display	Auxiliary Output 1's Function
AUX2 AL	Alarm Output defined for AUX 2
AUX2 EV	Event Output defined for AUX 2

Default: AL

SETUP Menu

ALTYP 1 ( )

Determines whether the alarm type for Auxiliary Output 1 will be **a** process alarm or a deviation alarm for the Series 920. This parameter will not appear if AUX1 = AL, or DIP switch #7 **is ON.**

Range:

Alpha Display	Alarm Type	**Default: P**
ALTYP1 P	Process Alarm	
ALTYP1 D	Deviation Alarm	

ALTYP 2 ( )

Determines whether the alarm type for Auxiliary Output 2 will be a process alarm or deviation alarm. This parameter will not appear if AUX2 =AL, or DIP switch #7 is ON.

Range:

Alpha Display	Alarm Type	**Default: P**
ALTYP2 P	**Process Alarm**	
ALTYP2 D	**Deviation** Alarm	

LAT ( )

Selects alarms as latching or non-latching. Latching remains energized until you manually clear it. This parameter will not appear if DIP switch #7 is ON.

Range: LAT or NLAT **Default:** NLAT

RTD ( )

Allows the operator to change the input gain of the RTD Input for diierent curves. This parameter will not appear if the input type is not RTD whole or RTD tenths, or DIP switch#7 is ON.

Range: JIS or DIN Default: JIS

LOPWR ( )

Selects the minimum percent of power that the Series 920 will output. This parameter will not appear if **DIP** switch #7 is ON,

Range: 0 to 100% **Default: 0**

HIPWR ( )

Selects the maximum percent of power that the Series 920 will output. This parameter will not appear if DIP **switch #7 is ON.**

Range: 0 to 100% **Default: 100**

GS ( )

The Guaranteed Soak parameter guarantees the actual temperature is being controlled within a window around set point. If exceeded, the step time clock stops and the HOLD LED flashes until the actual temperature is within the soak window.

Range: 0 to 90°F/ to 50°C Default: 0

COM ( )

Represents the selection of the protocol type for serial communications. This selectsXON/XOFF protocol or ANSI X3.28 communication protocol. This parameter **will** not appear if your Series 920 does not have communications.

Range: STX or XON **Default: STX**

COM ID ( )

Represents the device identification number as required for the ANSI X3.28 communications protocol for the Series 920. This parameter will not appear if COM has been selected as XON, or if your Series 920 does not have communications. Refer to the 920 Data Communications Manual.

Range: 0 to 9 **Default: 0**

LOCK ( )

Allows for specific groups of parameters to be unaffected by the UP/DOWN and ENTER keys, preventing these parameters from being changed accidentally.

0 = No lock, full access of all parameters.

1 = Prevents user from editing all parameters except the SYSTEM parameter group, the LOCK parameter, the STEP and FILE parameter in the PROGRAM and pre-RUN groups.

2 -Prevents user from editing all parameters except **ER1 ,** ER2, & ALRM in the SYSTEM menu, and the **LOCK, STEP** and FILE parameter are in the PROGRAM and pre-RUN menus.

Range: 0 - 2 Default: 0

CLR FILE

Allows the operator to clear a file of the Series 920.Press ENTER, and choose the FILE? to clear.

Range: 1 - 10 **Default:** 1

RETURN

From RETURN, you can go back to the SYSTEM prompt by pressing the ENTER key, or return to SPCLFUNC by pressing the MODE key.

PROGRAM Menu

From the Program menu, you can create your files. There can be up to ten profiles; consisting of a total of 99 steps. You can only choose one step type per step.

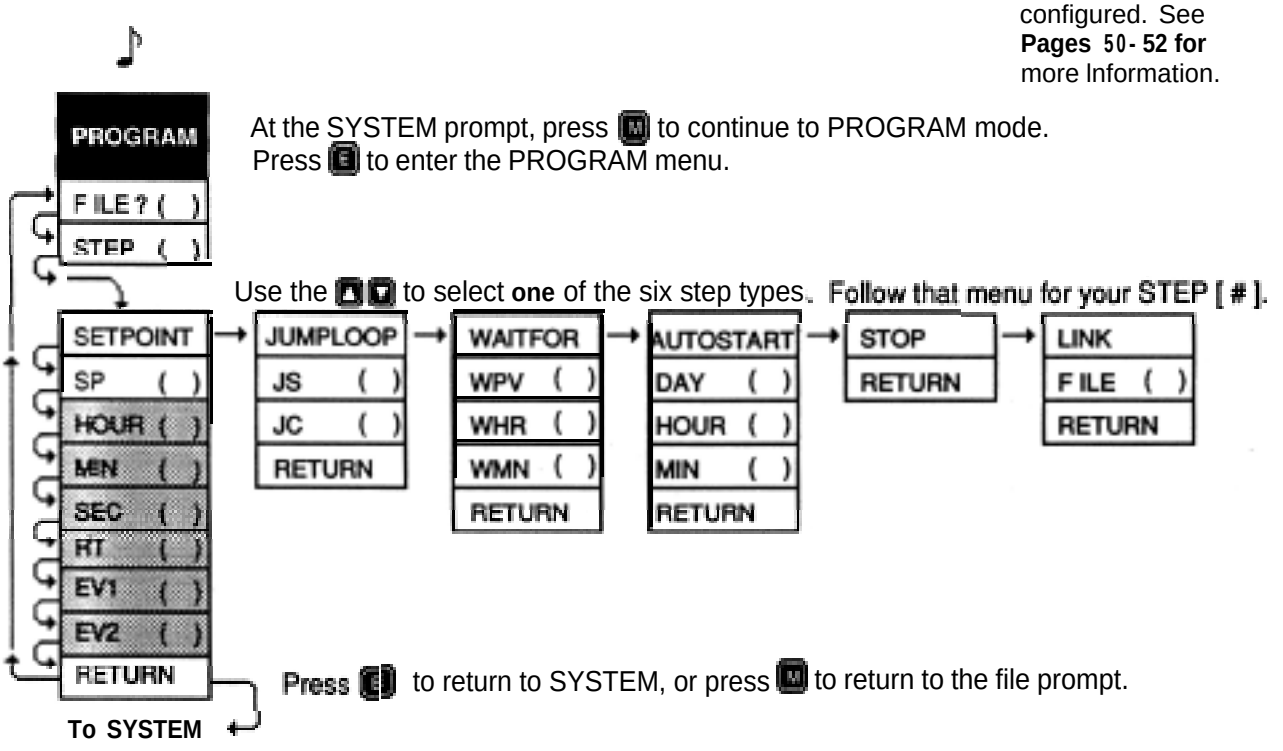
Figure 31 - PROGRAM Key Flow

Graphics **Key**

- = MODE Key
- = ENTER Key
- = UP/DOWN Key

NOTE:

Shaded parameters may not appear on your control. These parameters are dependent on how your control is configured. See **Pages 50- 52 for** more Information.



PROGRAM Menu

NOTES:

The Series 920 leaves the factory programmed for a warm start. STOP steps appear as a defautt until you program your 920.

Table 10 - PROGRAM Prompts and Description.

Make photocopies, keep original clean.

PROGRAM				
Prompt	**Description**	**Range**	**Default**	**Your Settings**
FILE?	Current system file to edit.	1-10	1	
STEP	Select step number to view or edit. Press MODE for step-type prompt. To change steptype use the increment/decrement key and press ENTER.	1-99	1	
SETPOINT - Step-Type				
SP	Enter the temperature to achieve for the step's ending set point according to the HOUR, MIN, SEC parameters.	RAL to RAH	---	
HOUR	Enter the hours programmed for this step. Displayed if PRG = TIME.	0 - 23 hours	0	
MIN	Enter the minutes programmed for this step. Displayed if PRG = TIME.	0 - 59 minutes	0	
SEC	Enter the seconds programmed for this step. Displayed if PRG = TIME.	0 - 59 seconds	0	
RT	Enter the rate that the set point changes.	0.0-360.0°F/ 0.0-200.0°C	---	
EV1	Enter the Event Output 1 status.	Off or ON	- -	
Ev2	Enter the Event Output 2 status.	OFF or ON	- -	
RETURN	Press the **ENTER** key to return to the SYSTEM prompt. Press the MODE key to return to the STEP prompt.			
JUMPLOOP - StepType				
JS	Enter the step number the 920 will jump to.	1-99	1	
JC	Enter number of times the 920 will jump to the step indicated by JS.	0-100	0	
RETURN	Press the ENTER key to return to the SYSTEM prompt Press the MODE key to return to the STEP prompt.			
WAITFOR - Step-Type				
WPV	Enter a process variable to compare with the actual temperature.	RAL to RAH	- -	
WHR	Enter the hours the 920 will wait relative to the beginning of the step.	0 - 23 hours	—	
WMN	Enter the minutes the 920 will wait relative to the beglnnlng of the step.	0 - 59 minutes	—	
RETURN	Press the ENTER key to return to the SYSTEM prompt Press the MODE key to return to the STEP prompt.			
AUTOSTART - Step-Type				
DAY	Enter the number of days for the 920 to wait until AUTOSTART takes place.	0- 6days	---	
HOUR	Enter the number of hours for the 920 to wait for the time-of-day dock before AUTOSTART takes place.	0 - 23 hours	- -	
MIN	Enter the number of minutes for the 920 to wait for time-of-day clock before AUTOSTART takes place.	0 - 59 minutes	—	
RETURN	Press the ENTER key to return to the SYSTEM prompt. Press the MODE key to return to the STEP prompt.			
STOP - Step-Type				
STOP	Press ENTER to display the last step of the program.			
RETURN	Press the ENTER key to return to the SYSTEM prompt. Press the MODE key to return to the STEP prompt.			
LINK - StepType				
FILE?	The current system file will always link to Step 1 in the file specified.	1-10	1	
RETURN	Press the ENTER key to return to the SYSTEM prompt. Press the MODE key to return to the STEP prompt			

PROGRAM Menu

PROGRAM — One of three main level operating menus. From the PROGRAM menu, you can enter or view step type, program loops, wait for conditions, set points, auxiliary (event) outputs ON/OFF, and step duration.

FILE? ( ) — Represents the current SYSTEM file of the Series 920 to be edited or reviewed.
Range: 1 to 10 files Default: 1

STEP ( ) — Represents the current step of a file of the Series 920 to be edited or reviewed.
Range: 1 to 99 steps Default: 1

SETPOINT — One of six step types under the PROGRAM menu of the Series 920. Can be programmed as a file or a step to achieve or maintain a set point.

SP ( ) — Represents the temperature that the system will try to achieve in the amount of time given. This will be done linearly, producing a ramp from a beginning set point to an end set point. In the RUN mode the SE prompt will appear. This represents the set endpoint that the Series 920 is to achieve.
Range: RAL to RAH Default: Unprogrammed

HOUR ( ) — The number of hours, in combination with the MIN and SEC parameters, that equal the total step time to achieve the temperature under the SETPOINT step-type. This parameter only appears if PRG - TIME under the SPCLFUNC menu.
Range: 0 to 23 hours Default: Unprogrammed

MIN ( ) — The number of minutes that equal total step time to achieve the temperature of the Series 920. Under the SETPOINT step-type. This parameter only appears if PRG TIME under the SPCLFUNC menu.
Range: 0 to 59 minutes Default: Unprogrammed

SEC ( ) — The number of seconds that equal total step time to achieve the temperature of the Series 920. Under the SEtPOINT steptype. This parameter only appears if PRG-TIME under the SPCLFUNC menu.
Range: 0 to 59 seconds Default: Unprogrammed

RT ( ) — Represents the rate at which the set point changes in a given time. This parameter only appears if PRG = RATE.
Range: 0.0 - 360.0°F10.0 - 200.0°C minimum per minute Default: Unprogrammed

EV1 ( ) — This auxiliary output oan be an alarm or event. EV1 only appears when AUX1 =EV. Auxiliary outputs can be alarms or events.
Range: OFF or ON Default: Unprogrammed

EV2 ( ) — This auxiliary output can be an alarm or event.EV2 only appears when AUX2 =EV. Auxiliary outputs can be alarms or events.
Range: OFF or ON Default: Unprogrammed

RETURN — From RETURN, you can go back to SYSTEM prompt by pressing the ENTER key, or return to FILE? by pressing the MODE key.

JUMPLOOP — One of six step types under the PROGRAM menu of the Series 920 that can be programmed as a step or file. You can jump from one step to anothr within a file.

JS ( ) — The Series 920 will jump step to any step within your current file. You cannot jump loop to another step in another file.
Range: 1 to 99 Default 1

PROGRAM Menu

JC ( ) — The number **of** times that the Series 920 will jump to the step that was specified by the JS step. 0 – Infinite number of jumps.
Range: 0 to 100 Default: 0

RETURN — From RETURN, you can go back to the SYSTEM prompt **by** pressing the ENTER key, or return to FILE? by pressing the MODE key.

WAITFOR — One of six step types under the PROGRAM menu of the Series 920 that can be programmed to wait for a specific amount of time, or for a desired set point.

WPV ( ) — Temperature that the system compares against the process variable, and wait for, before proceeding to the next step of the program.
Range: RAL to RAH **Default:** Unprogrammed

WHR ( ) — The hours that the system will wait for relative to when the step began. This is not a measure of time-of-day.
Range: 0 to 23 hours Default: Unprogrammed

WMN ( ) — Represents the minutes that the syste will wait for, relative to when the step began. This is not a measure of time-of-day.
Range: 0 to 59 minutes Default: Unprogrammed

RETURN — From RETURN, you **can go back to the SYSTEM** prompt **by** pressing the ENTER key, or return to FILE? by pressing the MODE key.

AUTOSTART — One of six step types under the PROGRAM menu of the Series 920 that can be programmed to automatically start at a certain time, depending on the DAY, HOUR, and MIN parameter **settings.**

DAY ( ) — **Represents the number of days that the 920 waits until AUTOSTART takes place. Each time 00:00 is achieved, one day has gone by.**
Range: 0 to **6** days Default: Unprogrammed

HOUR ( ) — Stands for **the hour that the 920 waits for the time-of-day clock before AUTOSTART takes place. Under the AUTOSTART steptype.**
Range: 0 to 23 hours Default: Unprogrammed

MIN ( ) — **This parameter represents the minutes that the 920 will wait for on the time-of-day clock** before AUTOSTART takes **place. Under the AUTOSTART steptype.**
Range: 0 to 59 minutes Default: Unprogrammed

RETURN — **From RETURN, you can go back to the** SYSTEM **promptly pressing** the ENTER key, or retum to FlLE? by pressing the MODE key.

STOP — One of six step types under the PROGRAM menu of the Series 920, that will indicate the end of any file.

RETURN — From RETURN, you can go back to the SYSTEM prompt by pressing the ENTER key, or retum to FILE? by pressing th8 MODE key.

LINK — One of six step types under the PROGRAM menu allowing you to link on8 file to another.

FILE ( ) — **Enter the number of the file that you want to link to from here.**
Range: 1 to 10 **Default: 1**

[RETURN — **From RETURN, you can go back to the SYSTEM prompt by pressing the** ENTER **key,** or **return to** FlLE? by pressing the MODE key.

Chart I - **Master** Step **Chart** Make photocopies, keep original clean.

Step #	√◊ Step Type	Values		Time			Events ON or OFF	
	☐ SETPOINT	SP		HR	MN	SEC	EV1	Ev2
				RATE				
	☐ JUMPLOOP	J S	JC					
	☐ WAITFOR	WPV		WHR	WMN			
	☐ AUTOSTART			DAY	HR	MIN		
	☐ STOP							
	☐ LINK	ToFILE?						

Step #	√ Step Type	Values		Time			Events ON or OFF	
	☐ SETPOINT	SP		HR	MIN	SEC	EV1	EV2
				RATE				
	☐ JUMPLOOP	JS	JC					
	☐ WAITFOR	WPV		WHR	WMN			
	☐ AUTOSTART			DAY	HR	MIN		
	☐ STOP							
	☐ LINK	To FILE?						

Step #	√ Step Type	Values		Time			Events ON or OFF	
	☐ SETPOINT	SP		HR	MIN	SEC	EV1	EV2
				RATE				
	☐ JUMPLOOP	JS	JC					
	☐ WAITFOR	WPV		WHR	WMN			
	☐ AUTOSTART			DAY	HR	MIN		
	☐ STOP							
	☐ LINK	To FILE?						

Step #	√ Step Type	Values		Time			Events ON or OFF	
	☐ SETPOINT	SP		HR	MIN	SEC	EV1	EV2
				RATE				
	☐ JUMPLOOP	JS	JC					
	☐ WAITFOR	WPV		WHR	WMN			
	☐ AUTOSTART			DAY	HR	MIN		
	☐ STOP							
	☐ LINK	To FILE?						

Step #	√ Step Type	Values		Time			Events ON or OFF	
	☐ SETPOINT	SP		HR	MIN	SEC	EV1	EV2
				RATE				
	☐ JUMPLOOP	JS	JC					
	☐ WAITFOR	WPV		WHR	WMN			
	☐ AUTOSTART			DAY	HR	MIN		
	☐ STOP							
	☐ LINK	To FILE?						

Step #	√ Step Type	Values		Time			Events ON or Off	
	☐ SETPOINT	SP		HR	MIN	SEC	Evl	Ev2
				RATE				
	☐ JUMPLOOP	JS	JC					
	☐ WAITFOR	WPV		WHR	WMN			
	☐ AUTOSTART			DAY	HR	MIN		
	☐							
	☐ :ir	ToFILE?						

Chapter 7

How To Use the Series 920 Alarms

One of the most versatile features of the Watlow Series 920 is its capability for alarms. The alarms can be automatic signals for process error or temperature related event-type actions in your system.

To use the alarms to their fullest extent, you need to understand what they are and what they will do. Here's an overview of the different alarm parameters again. Although you may already be aware of the alarms, notice how these parameters interact.

Alarm Relay Configuration

Series 920 alarm relays are configured to de-energize when the ACTUAL value is beyond the alarm limits. Normally open contacts are thus closed when temperatures are "OK." That way alarm conditions exist if power is lost from the control.

Number Of Alarms

There are two alarms in the Series 920, ALARM 1 and ALARM 2. They indicate an alarm condition, or a de-energized alarm relay with a flashing "ALMX - XX" in the alphanumeric display. By retaining the indication of a previous alarm condition, an operator absent from the control panel can be aware that an alarm occurred. We'll look more closely at that later in this chapter.

Alarm Types

There are three Alarm Types for each alarm. ALTYPl and ALTYP2 are the prompts for Alarm 1 and Alarm 2, respectively. The choices are: Process alarm (P), or Deviation alarm (D).

For review, a **"process"** type alarm is one that is set at a fixed degree distance, either positive or negative, from the mean 0°F or 0°C. A **"deviation"** type alarm is always a fixed degree distance, positive or negative, from Set Point (SP).

If we change SP, a process type alarm remains where it was originally set, while a deviation type alarm will shift with SP the same number of degrees as its value. The examples illustrate a plot of each alarm type.

Here we've added a process alarm function to the basic graph.

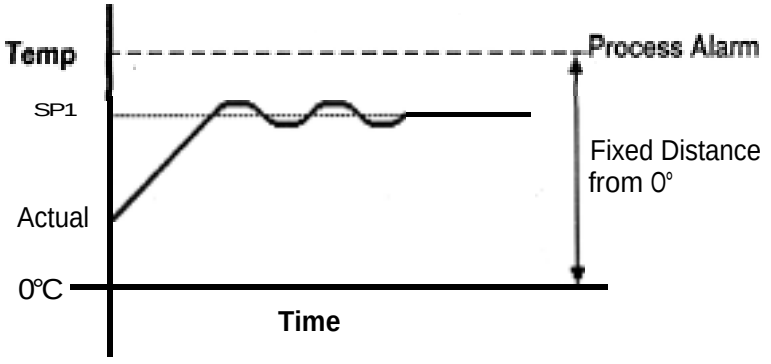


Figure 32 - **Alarm Type for Alarm 1 is "process" alarm (ALTYP =P)**

This graph shows a deviation alarm setting, and how it shifts with a change in SP.

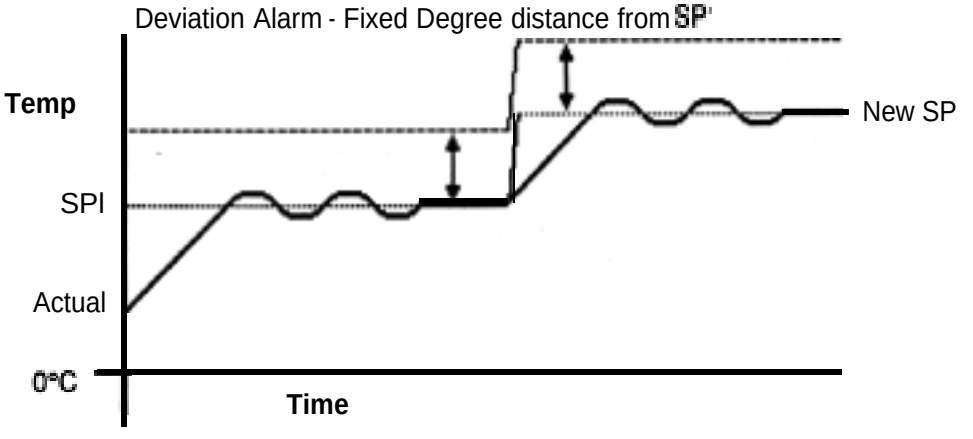


Figure 33 - Alarm **Type for Alarm 1 is a "deviation" alarm (ALTYP=D).**

The Operating Band

Now we need to set the alarm limits. In doing so, you'll define an "operating band" where you want system temperature (or your controlled variable) to be "OK" and alarm-free.

By selecting an alarm type (ALTYP), and then the alarm limits (AXL, AXH), you define the Operating Band. The extreme limits of the Operating Band are defined by the 920s high and low ranges, see the table below.

The following limits are enabled when RAL and RAH are at their maximum default values. If RAL or RAH are changed, the corresponding process alarm value will also change to the RAL/RAH value. If the input type is 0-5VDC or 4-20mA, the process alarm value will change to their default value.

If RAL or RAH are changed, the deviation alarm value will change to its default value.

Table 11 - **Operating Band Limits and Ranges.**

	Range	Process Default & High Slew Limit	Deviation Default		Range	Process Default & Low Slew Limit	Deviation Default
AXH	J	1382°F/750°C	999°F/555°C/U	AXL	J	32°F/0°C	-999°F/-555°C/U
	K	2282°F/1250°C	999°F/555°C/U		K	-328°F/-200°C	-999°F/-555°C/U
	T	662°F/350°C	999°F/555°C/U		T	-328°F/-200°C	-999°F/-555°C/U
	RTD Whole	1112°F/600°C	999°F/555°C/U		RTD Whole	-328°F/-200°C	-999°F/-555°C/U
	RTD Tenths	392.0°F/200.0°C	999°F/555°C/U		RTD Tenths	-99.9°F/-99.9°C	-999°F/-555°C/U
	0 - 5 Whole	1985°F/1985°C	999°F/555°C/U		0 - 5 Whole	-117°F/-117°C	-999°F/-555°C/U
	0 - 5 Tenths	198.5°F/198.5°C	999°F/555°C/U		0 - 5 Tenths	-11.7°F/-11.7°C	-999°F/-555°C/U
	4 - 20 Whole	1985°F/1985°C	999°F/555°C/U		4 - 20 Whole	-285°F/-285°C	-999°F/-555°C/U
	4 - 20 Tenths	198.5°F/198.5°C	999°F/555°C/U		4 - 20 Tenths	-28.5°F/-28.5°C	-999°F/-555°C/U
	R	2642°F/1450°C	999°F/555°C/U		R	30°F/-1°C	-999°F/-555°C/U
	S	2642°F/1450°C	999°F/555°C/U		S	30°F/-1°C	-999°F/-555°C/U
	B	3092°F/1700°C	999°F/555°C/U		B	390°F/199°C	-999°F/-555°C/U

Alarm Limits

You can set up alarm bands with the two available alarms. Each of the two alarms has a high and a low limit point, indicated by the "L" or "H" designation. You specify in the Operating Data where you want Al L, Al H, A2L, and A2H.

The first two examples below show one band inside the other. However, you could use Al L-Al H as a band below both set point, and A2L-A2H.

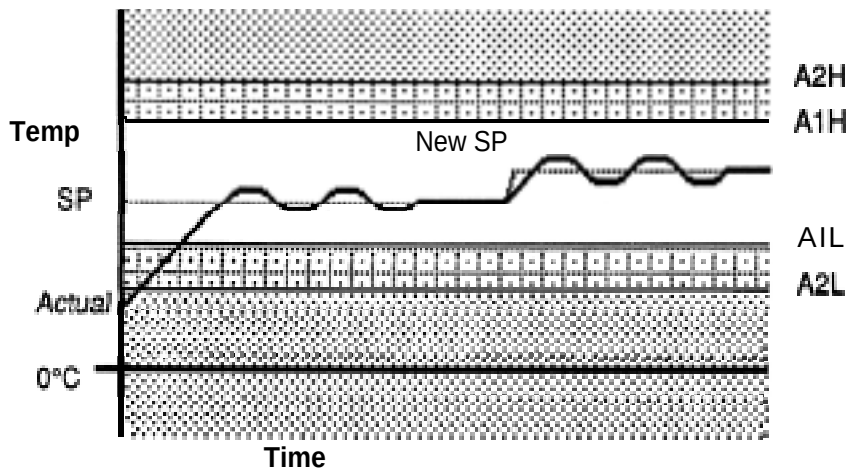


Figure 34 - Alarm limits for Alarms 1 and 2 with "process" type alarm. (ALTYP1=P, ALTYP2=P)

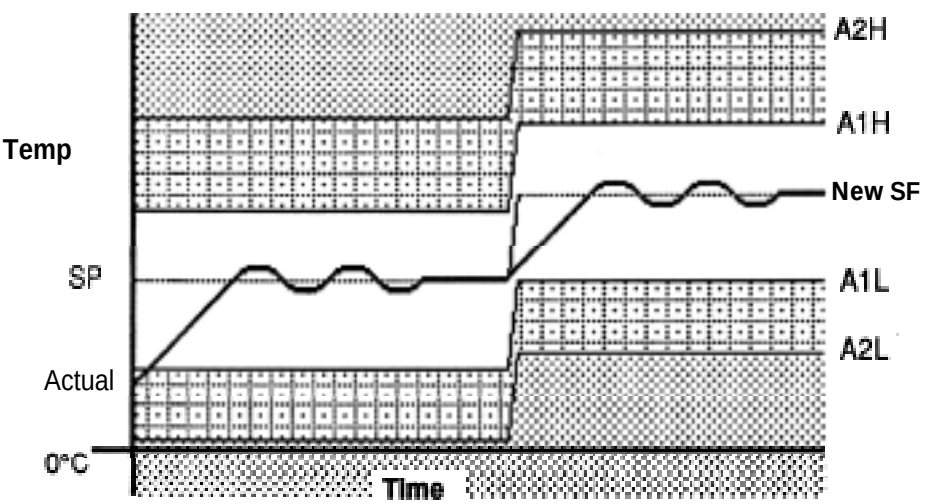


Figure 35 - Alarm limits for Alarms 1 and 2 with "deviation" type alarm. (ALTYP=D, ALTYP=D)

Alarm Function, Latching or Non-Latching

Alarm function is either “latching” or “non-latching.” Latching is a means of “saving” indication of an alarm event for the operator to clear manually. A latching alarm requires the operator to manually clear it with the ENTER key when ACTUAL returns to within the limits. A non-latching alarm clears itself automatically when ACTUAL returns to within the limits. It’s your choice.

Here again is the "LAT" information from the Operating Parameters:

LAT Defines **AlarmFunction:**
NLAT = Non latching. Alarm relays are automatically energized when ACTUAL temperature returns to within the operating band (as defined by ALTYP X, AXL and AXH).

LAT = Latching. Requires the ENTER key to manually energize alarm relays after ACTUAL temperature returns to within the operating band (as defined by ALTYP X.AXL and AXH).

Alarms have a 3°F/1.7°C switching differential.

Clearing An Alarm Message

When a latched alarm condition occurs, the ACTUAL display will flash an alarm code. You can clear the latched alarm when the ACTUAL display value returns to within the operating band.

While in either the RUN or HOLD mode, press the ENTER key to stop the alarm code from flashing for 5 minutes. This will not clear the alarm. The alarm must be cleared in the SYSTEM menu within the 5 minutes, or the alarm code will flash in the display again.

To clear an alarm, return to the SYSTEM prompt. Press ENTER; SP XXXX will be displayed. Press the MODE key until the CLR ALRM parameter is displayed. Press ENTER to clear the alarm.

A non-latching alarm cannot be cleared. A non-latching alarm clears itself when the ACTUAL display value returns to within the operating band.

An Alarm And The State Of The Alarm Relay

Simply stated, a flashing alarm on the 920 alphanumeric display indicates the state of the alarm relay contacts. A flashing alarm means when an alarm condition is present (ACTUAL beyond an alarm limit), then the alarm relay is de-energized.

Appendix

Series 920 Specifications

Control Mode

- Microprocessor-based, user selectable modes.
- Single input, dual control outputs, dual auxiliary outputs.
- 99 step programmer with up to 10 profiles.
- Control outputs: User selectable as: Heat, Heat/Cool, Cool, Cool/Heat.
  - Outputs independent, or related via dead band.
  - ON/OFF: 3°F (1.7°C) switching hysteresis.
  - PID parameters.
    - Proportional band: 0 to 900°F (0 to 500°C), or 0 to 500 units, 0.0 to 90.0°F (0.0 to 50.0°C) for 0.I° RTD inputs.
    - Reset: 0.00 to 5.00 repeats per minute.
    - Rate: 0.00 to 5.00 minutes.
    - Rate band: 0 to 7 times proportional band.
    - Cycle time: 1 to 60 seconds.
  - Deadband: ±36°F ±20° C), ± 20 units.
- Auxiliary outputs: User selectable as:
  - Event per step or alarm.
  - Process or deviation value per output.
  - Latching or non-latching.
  - Separate high and low values per output.

Operator interface

- Membrane front panel.
- Four digit 1/2" (13 mm) LEDs display actual process input value.
- LED indication of °F,°C, or process variable units.
- MODE, ENTER, UP, DOWN, and RUN/HOLD keys.
- Eight character alphanumeric display of operating data.

Input

- Thermocouple, RTD and electrical process input.
- Lead resistance effect for "J" type thermocouple input: 200hm of lead resistance will cause less than 1°F error. Refer to the lead wire manufacturer's specification on ohms per double foot for the type and gauge of wire used.
- Automatic cold junction compensation for thermocouple.
- RTD input 2 or 3 wire, platinum, 100 ohms @ 0°C, calibrated to JIS curve #3916 (0.003916 ohms/ohms/°C or DIN curve #3850 (0.003850 ohms/ohms/°C Selectable in the RTD parameter under the SPCLFUNC menu
- Sensor break protection de-energizes control outputs to protect system.
- Isolated or grounded sensor. Isolated sensors must be used with process inputs or outputs.
- 100K ohms input impedance for 0-5 volt input.
- 250 ohms input impedance-for 4 - 20mA input.
- Operating ranges user selectable.

J t/c:	32 to 1382°F or 0 to 750°C
K t/c:	-328 to 2282°F or -200 to 1250°C
T t/c:	-328 to 662°F or -200 to 350°C
R tic:	32 to 2642°F or 0 to 1450°C
S t/c:	32 to 2642°F or 0 to 1450°C
B t/c:	392 to 3092°F or 200 to 1700°C
1° RTD:	-328 to 1112°F or -200 to 600°C
0.1° RTD:	-99.9 to 392.0°F or -99.9 to 200.0°C
0-5VDC:	-99 to 1800 units
4-20mA:	-99 to 1800 units

Specifications

- Offset of input signal, ±90°F (±50°C), ±50 PVU's, front panel adjustable ±9.0°F (±5.0°C) for 0.1° RTD units
- °F, °C, or process variable units are user selectable

Output - Control (Single or Dual)

- Output #2 user selectable as cool action
- Solid state relay, Form A, 0.5A @ 24VAC minimum, 264VAC maximum, 10mA minimum load, opto isolated, zero cross switching. OFF state impedance is 20K ohms minimum
- Open collector, switched DC signal provides a minimum turn ON voltage of 3VDC into a minimum 500 ohm load; maximum ON voltage not greater than 32VDC into an infinite load
- Electromechanical relay, Form C, SPDT; 6A @ 115/230VAC, 6A @ 28VDC, 1/8 hp @ 115VAC, 125VA pilot duty @ 115VAC. OFF state impedance is ohms minimum
- Triac 15A, resistive @ 230VAC, 100mA minimum load, mounted external on rear of case
- Process, 4-20mA, non-isolated, load impedance 600 ohms maximum

Output - Auxiliary

- Electromechanical relay, 2 ea; #1 Form C; #2 Form A, 6A. SPDT: 6A @ 115/230VAC, 6A @ 28VDC 1/8 hp @ 115VAC, 125VA pilot duty @ 115VAC. OFF state impedance is 20K ohms minimum

Accuracy

- Calibration Accuracy: ±0.15% of span, ± digit at 77°F ±°F (25°C ±3°) ambient & rated line voltage ± 10%
- Accuracy Span: 1000°F (540°C) minimum
- Temperature Stability: ± 2uV°F (3.6uV/°C ambient referred to the input
- Voltage Stability: ±0.01% of span / % of rated line voltage

Agency Approvals

- UL recognized, UL873, File #E43684

Terminals

- #6 compression type, universal bead screw terminals

Communications

- Serial data communications
- RS-422A or RS-423A (RS-232C compatible)
- All operator indication and controls
- ANSI X3.28 protocol, or XON/XOFF protocol
- Isolated
- DB-15 female receptacle

Power

- 120/240VAC ±10%, 50/60Hz ±5%.
- 18VA power consumption
- Data retention upon power failure via nonvolatile memory.

Operating Environment

- 30 to 130°F (0 to 55°C)
- 0 to 90% RH, noncondensing

Model No.

Series 920 Model Number Breakdown

Control Series

920 = Single channel, microprocessor based, dual output, ramping controller, 99 steps, 1/4 **DIN.**

Input

2 = Type J, K, T thermocouple, **0-5VDC,** 1° RTD
3 = Type J, K, T thermocouple, **4-20mA, 0.1° RTD**
4 = Type R, S, B thermocouple

#1 output

B = Solid state relay, Form A, **0.5A,** RC Suppression
c = Switched DC, open collector, non-isolated
D = Electromechanical relay, Form C, 6A (Warranted to 100,000 cycles only)
E = Triac, 15A, resistive, external
F = Process, 4-20mA, non-isolated

#2 **output**

A = None
B = Solid state relay, **Form A,** 0.5A, RC suppression
c = Switched DC, open collector, non-isolated
D = Electromechanical relay, Form C, 6A (Warranted to 100,000 cycles only)

Communications

A = None
B = Isolated **RS-422/RS-423**

J, K, & T Thermocouple Field Calibration Procedure

Equipment Required

- T/C calibrator set at 0°C/32°F OR
  Type "J", "K", or "T" Reference Compensator with reference junction at 0°C/32°F.
- Type "J", "K", or "T" T/C extension wire.
- 4-1/2 digit Digital Voltmeter (DVM).

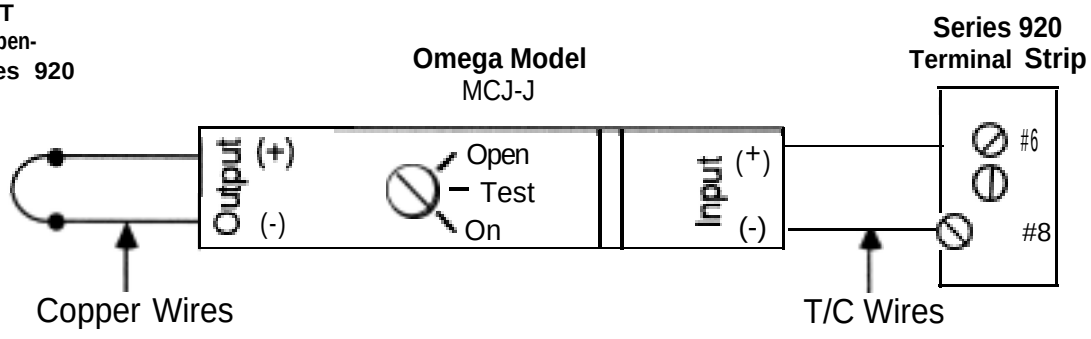
Setup and Calibration

NOTE:

Before calibration on an installed control, make sure all data and parameters are documented.

1. Connect the input side of the thermocouple reference compensator, or output of the T/C calibrator to #6 Positive and #8 Negative on the Series 920 terminal strip. Short the output side of the compensator and turn on the compensator. See Figure 36.

Figure 36 - Type J, K, or T Reference Compensator-to-Series 920 Connection Diagram.



2. Connect AC line voltage, L1 to #17, L2 to #20, ground to #21.
3. Set DIP switch #8 to ON. Apply power to the unit and allow it to warm up for **15** minutes. The unit should be in the TEST mode.
4. Using the MODE key, advance until the IN X parameter appears on the alphanumeric display. Using the UP/DOWN keys, advance to the thermocouple input type. Press the ENTER key.
5. Connect DVM common to TP84 and DVM positive to TP36 on the A007-**1703** circuit board, (right most board) located on the top side behind the center chassis support. DVM should be set up for DC volts, and in a range capable of displaying 32.00 & 10mV.
6. Press the MODE key until HOF XXXX appears on the alphanumeric display. (The decimal will not appear on the display of your control.) Use the UP/DOWN keys to adjust the alphanumeric display to match the reading on the DVM. Once the two readings match, press ENTER.
7. Press the MODE key until parameter CJO XXXX appears. Press ENTER. The unit is now calibrated for Type J, K, and T themocouple inputs. Allow 10 seconds for the unit to stabilize. The process reading on the ACTUAL display should be 32°F (0°C).
8. Remove power from the Series 920. Remove thermocouple wires from #6 and #8. Turn off the compensator. Set DIP Switch #8 to the OFF position.

R, S, & B Thermocouple Field Calibration Procedure

Equipment Required

- Type "R" Reference Compensator with reference junction at 0°C/32° F OR
  T/C calibrator.
- Type "R" T/C Extension Wire.
- Copper wire.
- Precision Millivolt Source.

Setup and Calibration

NOTE:

Before calibration on an installed control, make sure all data and parameters are documented.

1. Connect the precision millivolt source to Terminals #6 and #8. See the figure below.

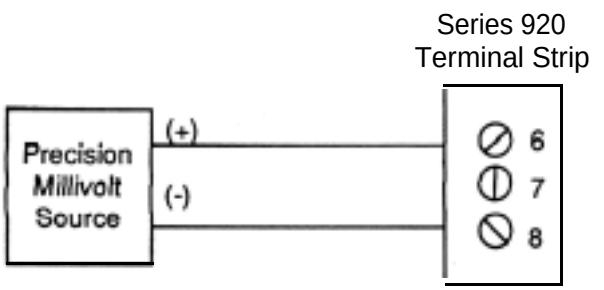


Figure 37 - Type "R" Reference Compensator-to-Series 920 Connection Diagram.

2. Connect AC line voltage, L1 to #17, L2 to #20, ground to #21.
3. Set DIP switch #8 to ON. Apply power to the unit and allow it to warm up for 15 minutes. The unit should be in the TEST mode.
4. Using the MODE key, advance until the IN X parameter appears on the alphanumeric display. Using the UP/DOWN keys, advance to the "R" thermocouple input type. Press the ENTER key.
5. Press the MODE key until the ATZ prompt will appear.
6. Set the precision millivolt source for an output of 0.000 millivolts, (32°F/0°C). Allow 10 seconds for the control to stabilize, and press ENTER.
7. Press the MODE key, the ATG prompt appears in the alphanumeric display.
8. Set the precision millivolt source for an output of 16.035 millivolts, (2552°F/1400°C). Allow 10 seconds for the control to stabilize and press ENTER. Disconnect the millivolt source and connect the input side of the thermocouple reference compensator, or output of the T/C calibrator, to #6 Positive and #8 Negative on the Series 920 terminal strip.
9. Connect the reference compensator to the 920. See Page 62, Figure 37.
10. Turn the compensator ON. Allow 10 seconds for the control to stabilize. Press the MODE key, advance until the CJ prompt appears in the display, press ENTER. The unit is now calibrated for R, S, and B T/C units.
11. Remove power from the Series 920. Remove the T/C wires from #6 and #8. Turn off the compensator. Set DIP switch #8 to the OFF position.

RTD Field Calibration Procedure

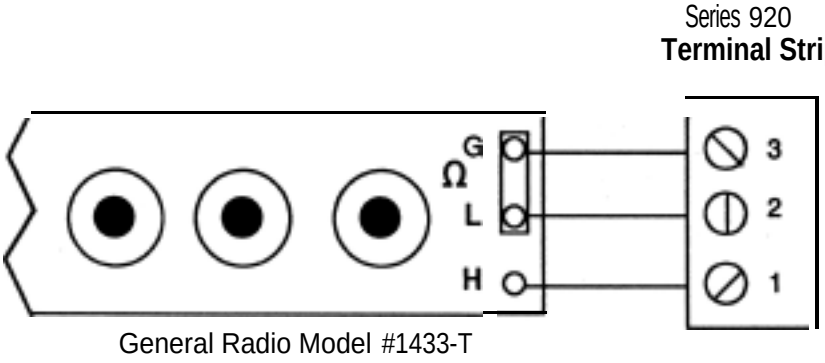
Equipment Required

- 100 ohm precision decade resistance box with 0.00 ohms resolution.
- 4-1/2 digit, digital voltmeter (DVM).

Setup and Calibration

NOTE:
Before calibration on an installed control, make sure all data and parameters are documented.

1. Connect the precision decade box to #1 , #2, and #3 of the Series 920 terminal strip as shown in the figure below.



General Radio Model #1433-T

Figure 38 - **Decade Resistance Box-to-Series 920 Connection Diagram**

2. Connect AC line voltage, L1 to #17, L2 to #20, ground to #21.
3. Set DIP switch #8 ON. Apply power to the Series 920 and allow it to warm up for 15 minutes. The unit should be in the TEST mode.
4. Using the MODE key, advance until the IN X parameter appears in the alphanumeric display. Using the UP/DOWN keys, advance to your correct RTD input type. Press the ENTER key.
5. Connect DVM common to TP84 and DVM positive to TP36 on the A007-1703 circuit board. Located on the top side behind the center chassis support. DVM should be set up for DC volts, and in a range capable of displaying 32.00 millivolts ± 10mV.

6. Press the MODE key until the HOF XX.XX parameter appears on the alphanumeric display. (The decimal point will not appear on the display of your control.) Use the UP/DOWN keys to adjust the alphanumeric display on the 920 to match the reading on the DVM. Once the two readings match, press the ENTER key.

7. Press the MODE key until ATZ XXXX appears on the alphanumeric display. Set the precision decade box to the correct LOW setting from Table 12 that corresponds to the type of 920 unit you have. Allow 10 seconds for the unit to stabilize and then press the ENTER key.

8. Press the MODE key until ATG XXXX appears on the lower display. Set the precision decade box to the correct HIGH setting from Table 12 that corresponds to the type of 920 that you have. Allow 10 seconds to stabilize and then press the ENTER key. The unit is now calibrated for RTD.

9. Remove power from the Series 920. Remove wires from #1, #2, and #3. Set DIP Switch #8 to the OFF position.

NOTE:

For a DIN curve RTD, enter the SPCLFUNC menu and use the MODE key to advance to the RTD parameter. Select DIN.

Calibration	Low	High
1° JIS	17.31	317.33
0.1° JIS	59.57	158.30

Table 12 - RTD Calibration Settings for JIS

Process Field Calibration Procedure

Equipment Required

- 4-1/2 digit, digital voltmeter (DVM).
- Precision voltage/current source.

Set-up and Calibration

NOTE:

Before calibration on an installed control, make sure all data and parameters are documented.

1. Connect the voltage/current source to #4 Positive and #5 Negative on the Series 920 terminal strip. See the figure below.

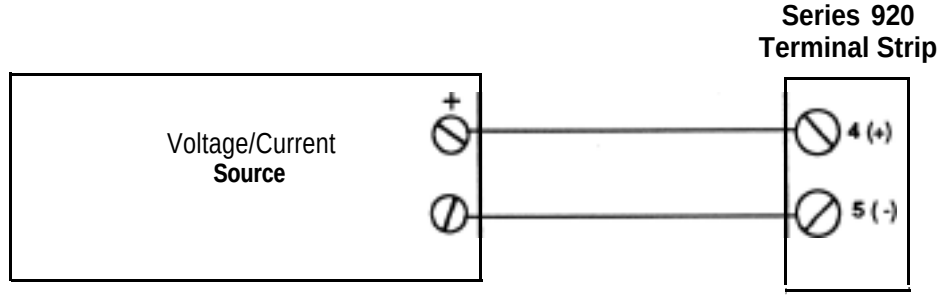


Figure 39 - Voltage/Current Source to Series 920 Connection **Diagram**

2. Connect AC line voltage, L1 to #17, L2 to **#20,** ground to #21 on the Series 920 terminal strip.
3. Set DIP switch #8 ON. Apply power to the 920 and allow it to warm up for 15 minutes. The unit should be in the TEST mode.
4. Using the MODE key, advance until the IN X parameter appears on the alphanumeric display. Using the UP/DOWN keys, advance to the correct input type. Press the ENTER key.
5. Connect DVM common to TP84 and DVM positive to TP36 on the A007-1703 circuit board. Located on the top side behind the center chassis support. DVM should be set up for DC volts, and in a range capable of displaying 32.00 ± 10mv.
6. Press the MODE key until HOF XX.XX appears on the alphanumeric display. (The decimal point will not appear on the display of your control.) Use the UP/DOWN keys to adjust the alphanumeric display on the 920 to match the reading on the DVM. Once the two readings match, press the ENTER key.
7. Press the MODE key until MA2 XXXX appears. Input 0 volts for a 0-5 volt input type, or 4mA for a 4-20mA input type. Press the ENTER key. **Allow** 10 seconds for the unit to stabilize.
8. Press the MODE key until MAG XXXX appears. Inpuy 5 volts for a 0-5 volt input type, or 20mA for a 4-20mA input type. Press the ENTER key. The unit is now calibrated for process inputs. Allow 10 seconds to stabilize. The process reading on the ACTUAL display should be sitting at the RAH setting.
9. Remove power for the Series 920. Remove wires from #4 and #5. Set DIP Switch #8 to the OFF position.

Glossary

This glossary includes general thermal systemcontrol terms.

ACCESS( ): In the SETUP menu of the Series 920, an ACCESS number **(0, 1, 3,5)** must be selected to enter the personality of your Series 920 into the CALIB, PID, MANUAL, **and** SPCLFUNC parameters.

Actual display data: Displayed information which gives the operator/programmer real or "actual" data, i.e., actual process temperature. See "Programmed display data."

Alarm: A condition generated by the Series 920, indicating that the process has exceeded or fallen below the limit point.

ALTYP1: Present only when AUX1 = AL and DIP switch #7 is ON. Determines whether the alarm type for Auxiliary Output 1 will be a process alarm or a deviation alarm.

ALTYP2: Present only when AUX2 =AL and DIP switch #7 is ON. Determines whether the alarm type for Auxiliary Output 2 will be a Process alarm or deviation alarm.

Antireset: Control feature that inhibits automatic reset action outside of the proportional band.

Automatic Prompts: Data entry points where a microprocessor-based control "prompts" or asks the operator/programmer for information input.

AUTOSTART One of six step types under the PROGRAM menu of the Series 920 that can be programmed to automatically start at a certain time, depending on the DAY, HOUR, and MIN parameter settings.

AUX1: This parameter detemines whether Auxiliary Output 1 will be an alarm or event output for the Series 920. Not displayed if DIP switch #7 is ON.

AUX2: This parameter detemines whether Auxiliary Output 2 will be an alarm or event output for the Series 920. Not displayed if DIP switch #7 is ON.

A1H: When AUX1 = AL, the Series 920 will display this parameter representing the high process alarm or high deviation alarm for Alarm 1.

AIL: This parameter represents the low process alarm or low deviation alarm for Alarm 1 of the Series 920. Displayed only when AUX1 = AL.

A2H: Represents the high process alarm or high deviation alarm for Alarm 2 of the Series 920. Displayed only when AUX2 = AL.

A2L: The low processalarm or low deviation alarm for Alarm 2 of the Series 920. Displayed only when AUX2 ■ AL.

CAL: An offset of the process variable. This number is added to the value that the system derives. The final result is used for the set point as well as a front panel indication.

Glossary, C - D

CALIB: When ACCESS (0) is entered under the SETUP menu, the CALIB parameters appear. These parameters setup the Real Time and the calibration offset of the process variable.

C/F/U: Accepts the sensor input and scales it to degrees Celsius, Fahrenheit, or Units of measure. This parameter will not appear if DIP switch #7 is ON.

Closed loop: Control **system with** a sensing device for process variable feedback.

CLR FILE: Allows the operator to clear a file of the Series 920.

Cold junction: Point of connection between thermocouple metals and the electronic instrument.

Cold junction compensation: Electronic means used to compensate for the effect of the temperature at the cold junction.

Cold start: A "Clean", or completely cleared-of-user-program-information, start-up condition. (Factory settings.)

COM: This parameter determines whether the communications protocol will be STX/ETX or XON/XOFF. This parameter can be found in the SPCLFUNC menu. This parameter will not **appear if you do not have communications.**

COM ID: **Represents the device identification number** as required for the ANSI X3.28 **communications protocol for the Series** 920. This **parameter will not appear if you do not have communications.**

CT C: The Cooling Cycle Time expressed in seconds for a controller to complete one ON/OFF cycle. The time between successive turn ons. This parameter **will not appear if: 1.** OUT = HT, or PB C = 0, 2. Your Series 920 has a 4-20mA output and OUT = CL or CL/HT.

CT H: The Heating Cycle Time usually expressed in seconds for a controller to complete one ON/OFF cycle. Time between successive turn ons. This parameter will not appear if: 1. **OUT =** CL, or PB H = 0, 2. Your Series 920 has a 4-20mA output and OUT = HT or HT/CL.

Cycle time: The time necessary to complete a full ON-through-OFF period in a time proportioning control system.

DAY: Represents the number of days that the 920 waits until AUTO-START takes place. Each time 00:00 is achieved, one day has gone by.

DB: The Dead Band parameter representing the area where no heating or cooling takes place in a heat/cool proportional control. This parameter will not appear if OUT = HT or CL.

Dead band: A temperature band between heating and cooling functions.

Derivative: Anticipatory action that senses the rate of change of temperature, and compensates to minimize overshoot and undershoot. Also "rate."

Deviation: The difference between the value of the controlled variable and the value at which it is being controlled.

Default parameters: The parameters, or programmed instructions, which are permanently stored in microprocessor software to provide a data base.

DIP switch: A Dual In-line Package switch.

DIN: Deutsche Industrial Norms, a widely-recognized German standard for engineering units.

Display capability: In a digital indicating instrument, the entire span that can be indicated if fully utilized.

Droop: The difference in temperature between set point and stabilized process temperature.

Duty cycle: Percentage of "load ON time" relative to total cycle time.

ER1: ER1 (Error 1) is considered a fatal error; your system will shut down. When the Series 920 shuts down, all events turn off, and your program stops running. When an error occurs, ER1 OOXX alternately flashes with the parameter you are presently on. While in either the RUN or HOLD mode, press ENTER to stop the display from flashing the error code. This will not clear the error, but stops the error code from flashing for 5 minutes. To clear an error, return to the **SYSTEM** mode and ENTER the ER1 parameter. This clears your error unless it is a reoccuring error and has not been resolved.

ER2: ER2 (Error 2) is considered non-fatal. If you are in the RUN mode, your program continues running unless it is a program error. ER2 00XX appears, and alternately flashes along with the parameter that you are presently on. While in either the RUN or HOLD mode, press ENTER to stop the display from flashing the error code. This will not clear the error, but stops the error code from flashing for 5 minutes. Clear an ER2 parameter under the SYSTEM mode. If the error persists, refer to the Error Code list on Page 78 to clear.

Events: An event is an ON/OFF auxiliary output relay signal. You can use events, based on time, temperature, or other process variables, to trigger peripheral equipment or process.

EV1 & **EV2:** These auxiliary outputs can be alarms or events. EV1 and EV2 only appear when AUX1 and AUX2 = EV respectively. You can change the state of the events only in the HOLD mode. Auxiliary outputs can be alarms or events.

FILE: Represents the current SYSTEM file of the Series 920 to be edited or reviewed. Under the LINK parameter, FILE? stands for the file that you want to link to.

GS: The Guaranteed Soak parameter guarantees that the actual temperature is being controlled within a window around set point. If exceeded, the step time clock will stop until the actual temperature is within the soak window.

HIPWR: Selects the maximum percent of power the Series 920 will output. Will not appear if DIP switch #7 is ON.

Glossary, H - L

HOUR: **The HOUR** parameter has three meanings, depending **upon** which menu you are in.

PROGRAM menu - **The** number **of hours, in combination with the MIN and SEC parameters, that equal the total step time to achieve the temperature.**

Under the AUTOSTART step type, the hours that the 920 will wait for the time-of-day clock before AUTOSTART takes place.

SETUP menu - Represents the SYSTEM 24 hour time-of-day clock. Midnight = 0 hours.

Hysteresis: In ON/OFF control, the temperature change necessary to change the output from full ON to full OFF.

Hunting: Oscillation or fluctuation of process temperatures between set point and process variable.

IN: Represents the input parameter. Selects the type of sensor used as an input. Will not appear if DIP switch #7 is ON.

Input: Process variable information being supplied to the instrument.

Integral: Control action that automatically eliminates offset, or "droop", between set point and actual process temperature. Also "reset".

Isolation: Electrical separation of sensor from high voltage circuitry. Allows for application of grounded or ungrounded sensing element.

JC: The Jump Count parameter represents the number of times that the Series 920 will jump to a specified step.

JS: The Jump Step parameter of the Series 920 will jump to any step within your current file. You cannot Jump Step to another step in another file.

JUMPLOOP: One of six step types under the PROGRAM menu of the Series 920, that can be programmed as a step or a file. You can jump from one step to another within a file.

L A T : Latches your alarm outputs when the Series 920 has an alarm condition. Remain energized until you manually **clear any alarms.** Will not appear if DIP switch #7 is ON.

LINK: One of six step types under the PROGRAM menu of the Series 920, that allows you to link one file to another.

LOCK: Allows for specific groups of parameters to be unaffected by the UP/DOWN and ENTER keys, preventing these parameters from being changed accidentally. 0 = No lock, full access of all parameters. 1 = Prevents user from editing all parameters except the SYSTEM parameter group, the LOCK parameter, and the STEP parameter in the PROGRAM group. 2 = Prevents user from editing all parameters except **ER1 , ER2,** ALRM in the SYSTEM menu, the LOCK parameter, and the STEP parameter in the PROGRAM menu.

LOPWR: Selects the minimum percent of power that the Series 920 will output.

MANUAL: When ACCESS (3) is selected under the SETUP mode of the Series 920, the MANUAL parameter appears.

MN: The MIN parameter has three meanings depending upon which parameter you are in.

PROGRAM menu - The number of minutes that equal total step time to achieve the temperature of the Series 920.

Under the AUTOSTART step type in the PROGRAM menu, it represents the minutes that the 920 will wait for on the time-of-day clock before AUTOSTART takes place.

SETUP menu - The SYSTEM 24 hour time-of-day clock setting.

Offset: Adjustment to actual input temperature and to the temperature values the Series 929 uses for display and control.

ON/OFF control: Control of temperature about a set point by turning the output full ON below set point and full OFF above set point in the heat mode.

Open loop: Control system with no sensory feedback The 920 uses a closed loop.

Operating band: The area around set point in the Series 920 where ACTUAL temperature is deemed safe, or "OK". The band is defined under ACCESS (5), SPCLFUNC, under the SETUP menu by Alarm types (ALTYP1 and ALTYP2) and under ACCESS(0), CALIB, by Alarm High and Low Limit Points (A1H, A1L and A2H, A2L.)

OUT: Select an output type. Action in response to the difference between set point and process variable. This parameter will not appear if DIP switch#7 is ON.

Output: Action in response to difference between set point and process variable.

Overshoot: Condition whereby temperature exceeds set point due to initial power up or process changes.

PB C: A temperature band expressed in degrees within which a temperature controller proportioning function is active for cooling. This parameter will not appear if OUT = HT.

PB H: A proportional temperature band expressed in degrees within which a temperature controller proportioning function is active for heating. Expressed in degrees. This parameter will not appear if OUT = CL.

P control: Proportioning control.

Parameter: A physical property whose value determines the response of an electronic control to given inputs.

PD control: Proportioning control with rate action.

PI control: Proportioning control with **auto-reset.**

Glossary, P - R

PID: When ACCESS (1) is entered in the Series 920, the PID parameters will appear. These parameters consist of Proportional, Integral (auto reset), and Derivative (rate) actions.

PID control: Proportioning control with auto-reset and rate.

PRG: This parameter determines whether the set point steps will ramp as a function of time or ramp rate.

Process Variable: Thermal system element to be regulated, such as time temperature, relative humidity, etc.

Programmed display data: Displayed information which gives the operator/programmer the "programmed" or intended process information, i.e., intended set point, intended aiarm limit, etc. See "Actual displayed data".

Proportional band: The span of temperature about the set point where time proportional control action takes place.

Proportioning control: See Time proportioning control.

PWR: Allows the operator to control the outputs manually. Full cool is -100, 0 is cool and heat off, and 100 is full heat. This parameter takes priority over the LOPWR and HIPWR parameters.

RAH: Represents a high limit to set point. The default values are also the high limits of your input type. This parameter will not appear if DIP switch #7 is ON.

RAL: Represents a low limit to set point. The default values are also the low limits of your input type. This parameter will not appear if DIP switch #7 is ON.

Rate: Anticipatory action that senses the rate of change of temperature and compensates to minimize overshoot. Also "derivative".

Rate Band: A thermal control band that defines where the rate (derivative) function begins. A Watlow rate band occurs centered on set point at one or more times the width of the proportional band.

RB C: The thermal control band for cooling that defines where the rate (derivative) function begins. This parameter will not appear if OUT = CL or PBC = 0.

RB H: A thermal control band for heating that defines where the rate (derivative) function begins. This parameter will not appear if OUT = CL or PBH = 0.

RS C: Reset (integral) cooling control action that automatically eliminates offset, or "droop", between set point and actual process temperature in a proportional control. Expressed in repeats per minute. This parameter will not appear if OUT = HT or PBC = 0.

RS H: A reset (integral) heating control action that automatically eliminates offset, or “droop”, between set point and actual process temperature in a proportional control. Expressed in minutes. This parameter will not appear if OUT = CL or PB H is set to 0.

RT: Represents the rate at which the set point changes in a given time.

RT C: The Rate (derivative) Cooling function detemined by how fast the error being corrected is increasing. Expressed in minutes. This parameter will not appear if OUT = HT, or PB C = 0.

RTD: (parameter) Allows the operator to change the input gain of the RTD input for different curves. This parameter will not appear if the input type is not RTD whole or RTD tenths, or DIP switch #7 is ON

RT H: The Rate (derivative) for the Heating function that is determined by how fast the error being corrected is increasing. Expressed in minutes. This parameter will not appear if OUT = CL or PBH = 0.

Reference junction: Synonymous with cold junction. See “Cold junction.”

Reset: Control action that automatically eliminates offset, or “droop,” between set point and actual process temperature. Also “integral.”

Reset windup inhibit: Synonymous with anti-reset. See “Anti-reset.”

RETURN: From any RETURN parameter, you can go back to SYSTEM.

RTD: Resistance Temperature Detector. Resistive sensing device displaying resistance versus temperature characteristics. Displays positive temperature coefficient.

SE: Represents the set endpoint that the Series 920 will try to achieve in the amount of time given. This will be done linearly, producing a ramp from a beginning set point to an end set point. Seen only in the RUN mode.

SEC: The number of seconds that equal total step time to achieve the temperature of the Series 920.

Set point: Intended value of the process variable.

SETPOINT: One of six step types under the PROGRAM menu of the Series 920. Can be programmed as a file or a step to achieve or maintain a set point.

SP: Represents the current Set Point. Its primary function is as the control point of the closed loop.

SPCLFUNC When ACCESS (5) is selected under the SETUP mode of the Series 920, the Special Function parameters appear. Here you can select the input type, degrees, output type, auxiliary and alarm types among others.

STEP: Represents the current SYSTEM file step of the Series 920 to be edited or reviewed.

STOP: One of six step types under the PROGRAM menu of the Series 920, that will indicate the end of any file.

Glossary, S - Z

SYSTEM: One of three main level operating parameters. From the SYSTEM menu, you can generate a non-ramping set point (fixed), manipulate Events 1 and 2, clear error codes and latching alarms.

Switching sensitivity: In ON/OFF controls, the temperature change necessary to change the output from full ON to full OFF (3°F or 1.7°C in the Series 929).

Thermal **System:** A regulated environment consisting of a heat source, heat transfer medium, sensing device and a process variable control instrument.

Thermocouple: Temperature sensing device that is constructed of two dissimilar metals wherein a measureable, predictable voltage is generated corresponding to temperature.

Thermocouple break protection: Fail-safe operation that assures output shutdown upon an open thermocouple condition.

Three mode control: Proportioning control with reset and rate.

TI Represents the **Real Time hours and minutes of the Series** 920's system.

Time proportioning control: Action which varies the amount of ON and OFF time when "close" to the set point, i.e., in the proportional band. This variance is proportional to the diierence between the set point and the actual process temperature. In other words, the amount of time the output relay is energized depends on the system temperature.

Triac: Solid state switching device.

WAITFOR: One of six step types under the PROGRAM menu of the Series 920 that can be programmed to wait for a specific amount of time, or a process value.

Warm start: Start-up condition where all program Information is remembered by the instrument's memory backup protection.

WHR: The hour that the system will wait for relative to when the step began. This is not ameasure of time-of-day.

WMN: Represents the minutes that the system will wait for **relative to when the step began. This** is not a measure of time-ofday.

WPV: Temperature that the system will compare **against the process variable,** and wait for, before proceeding to the next step.

Zero switching: Action which provides output switching only at the zero voltage crossing points of the AC line.

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Warranty Information

The Watlow Series 920 is warranted to be free of defects in material and workmanship for 36 months after delivery to the first purchaser for use, providing that the units have not been misapplied.

Since Watlow has no control over their use, and sometimes misuse, we cannot guarantee against failure. Watlow's obligations hereunder, at Watlow's option, are limited to replacement; repair or refund of purchase price, any parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse or abuse.

Returning Merchandise

The following procedure applies for any products returned to the factory:

1. You must call Watlow Customer Service, 507/454-5300, for a Return Material Authorization (RMA) number before returning any item for repair. We need this information:
   - Ship to address
   - Bill to address
   - Contact name
   - Phone number
   - Ship via
   - Your P.0. number
   - Symptoms and/or special instructions
   - Name and phone number of person returning the material.

   We will not accept a return without an RMA number. The RMA number must appear on the outside of the carton and on all paperwork. Cartons without RMA numbers will be returned. Ship on a freight prepaid basis.
2. You need prior approval and an RMA number from the Customer Service Department when you are returning an unused product for credit. Also, we must apply a 20 percent restocking charge for all returned stock controls and accessories.
3. After we receive your return, we will enter a repair order, replacement order, or issue credit for material.
4. In cases of manufacturing defect, we will return it to you with a letter of explanation. Repair costs will not exceed 50 percent of the original cost.

Shipping Claims

When you receive your Watlow control, examine the package for any signs of external damage it may have sustained enroute. If there is apparent damage either outside the box or to its contents, make a daim with the shipper immediately. Save the original shipping carton and the packing material.

Series 920 Error Codes/Alarms

ER1 Error Codes and Actions

1 Internal RAM failure; consult factory.
2 External RAM failure; consult factory.
3 Bad battery error; consult factory.
5 A/D conversion error, or input sensor error. For the input type selected, verify that the corresponding sensor input is OK, (TC, RTD, 0-5VDC or 4-20mA). If sensor is OK, consult factory.
9 High reference out of limit. Check calibration procedure. If not OK, consult factory.
10 Cold junction offset out of limit. Check calibration procedure. If not OK, consult factory.
11 RTD gain out of limit. Check calibration procedure. If not OK, consult factory.
12 RTD zero out of limit. Check calibration procedure. If not OK, consult factory.
13 0-5V/4-20mA out of limit. Check calibration procedure. If not OK, consult factory.
14 Interpolation/overrange. Check specification for sensor input range.
15 Ambient temperature overrange. Check specification for ambient temperature range.
16 0-5VDC/4-20mA offset out of limit.
20 Frequency/Voltage offset out of limit. Clear in the SYSTEM menu.
21 Frequency/Voltage gain out of limit. Clear in the SYSTEM menu.
22 Stack overflow error; consult factory.

ER2 Error Codes and Actions

1 920 transmit buffer overflow.
2 920 receiver buffer overflow. Protocol or syntax violation, retransmit.
3 Framing/overrun error. Check baud rate, parity, stop bits.
5 Parity error. Check baud rate, parity, stop bits.
6 Talking out of turn. Protocol violation, retransmit.
7 Invalid reply error. Figure out communications, retransmit.
20 Command not found. Check your program.
21 Parameter not found. Check your program.
22 Incomplete command line. Syntax error, retransmit.
23 Invalid character. Syntax error, retransmit.
24 Number of characters overflow. Numeric syntax error, retransmit.
25 Input out of limit. Transmitted value too large or small, retransmit.
26 Read only command. Cannot input a value for that parameter, retransmit.
28 Write only error. Attempted to read a parameter that can only be written to.
30 Request to run invalid. Verify a run condition.
31 Request to hold invalid. Verify a hold condition.
32 Command invalid in run mode. Cannot enter values in run mode, retransmit.
33 Self test mode not active. Check to see that DIP switch #8 is ON.
35 Number of steps stored is > 99. Enter steps only to 99.
36 No file found. Check your program, retransmit.
37 No step found. Check your program, retransmit.
38 No asterisk input allowed. Follow proper format for entering asterisks.
39 Infinite loop error. Check the number of consecutive loops, retransmit.
40 File change error. An attempt to resume a changed file has occurred.

Rules for Error Codes and Alarms

1. **The priority for displaying errors is ER1, ER2,** ALM. If an ER1, ER2, and an ALM condition occur simultaneously, the ER1 code will flash on the ACTUAL display. When the ER1 code is cleared, the ER2 code will flash **in** the ACTUAL display. When the ER2 code is cleared, the ALM message will flash.

2. The **lowest alarm code will take priority in an ALM condition.** If two alarm codes are occurring, the code with the lowest value will flash. Once the alarm code is corrected in the SYSTEM menu, all alarm codes will be cleared. When two alarm codes occur simultaneously, the alarm with the highest code will never be displayed.

3. It **is possible to read multiple alarms via communications.** For example, if "ALM1 HI" and "ALM2 LO" are occurring, "ALM1 HI" flashes on the front panel since it has an alarm code of 1. But if the alarms are queried via communications, the result will be 9, which is ALM1 HI and ALM2 LO.

4. The most **recent error received will be displayed** for an ER1 **or ER2 condition.** For Example: If an ER2 20 occurs and is not cleared, then an ER2 20 will be overwritten by ER2 21.

5 **If** an ER1, **ER2, or ALM condition** occur, **the** indication **will flash on the ACTUAL display.** In either the RUN or HOLD mode, press the ENTER key. This stops the display from flashing for 5 minutes. The error, or alarm must be cleared in the SYSTEM menu within five minutes or the condition will continue to flash.

Series 920 Response to Error Codes

ER1 Codes Shut Down Outputs
The Series 920 will shut down its outputs whenever an ER1 code occurs. An ER1 code usually represents a Series 920 malfunction.

Check These Items First
Anytime you see an ER1 error code, check for these four items first, then follow the recommended action listed by the code:
a) Low line voltage
b) Noisy environment, noise event
c) Vibration
d) Temperature or moisture over specification

ER2 Codes Do Not Shut Down Outputs
ER2 error codes are data communication system related, or file programming related.

Alarm Messages	Alarm Code
ALM1___HI occurring	1
ALM1_LO occurring	2
ALM2_HI occurring	4
ALM2_LO occurring	8

Clearing an Error Code

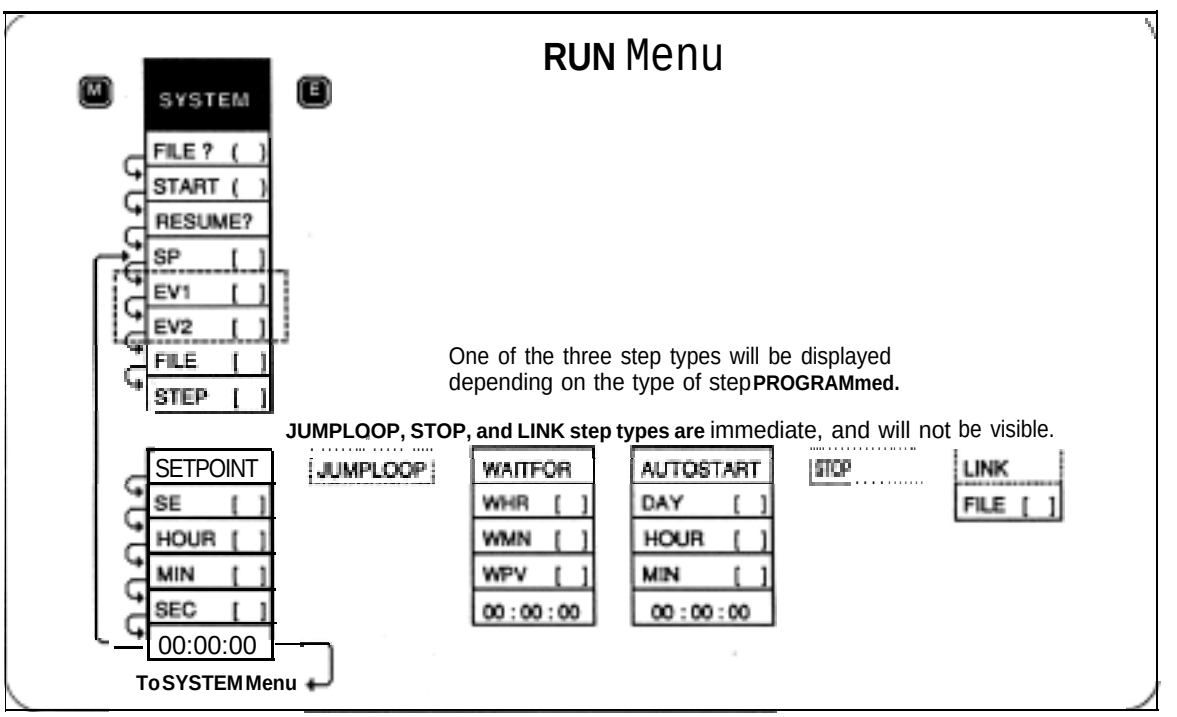
To clear an Error Code from the alphanumeric display, first correct the problem, then return to the SYSTEM menu. Use the MODE keys to reach the ER1 or ER2 parameter and press ENTER. Press ENTER or transmit a 0. If the code returns, or if the 920 replies to a data communicated "? ER1" or "? ER2" query with the same code, the problem still exists. Refer to the Series 920 manual or the Series 920 Data Communications Manual.

ER1, ER2, and ALM can only be cleared when in the SYSTEM menu.

How to Clear an Alarm Code

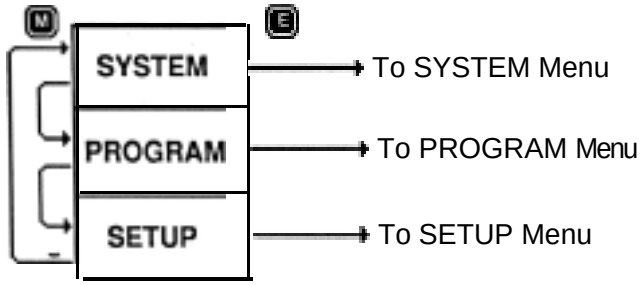
An alarm code will alternately flash with the parameter that you are presently on. If the LAT alarm value is NLAT, your alarms are non-latching and will clear automatically when the ACTUAL display value returns to within the normal operating band. If LAT= LAT, the alarms are latching.

First correct the alarm condition and return to the SYSTEM menu. Press the MODE key until you see the CLR ALARM parameter. Press ENTER to clear latching alarms that are no longer in an alarm condition.

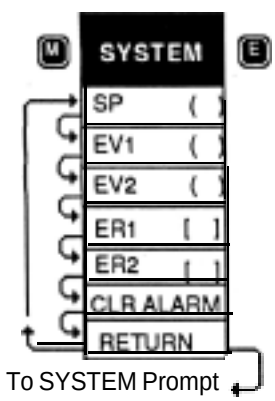


Series 920 Quick Reference

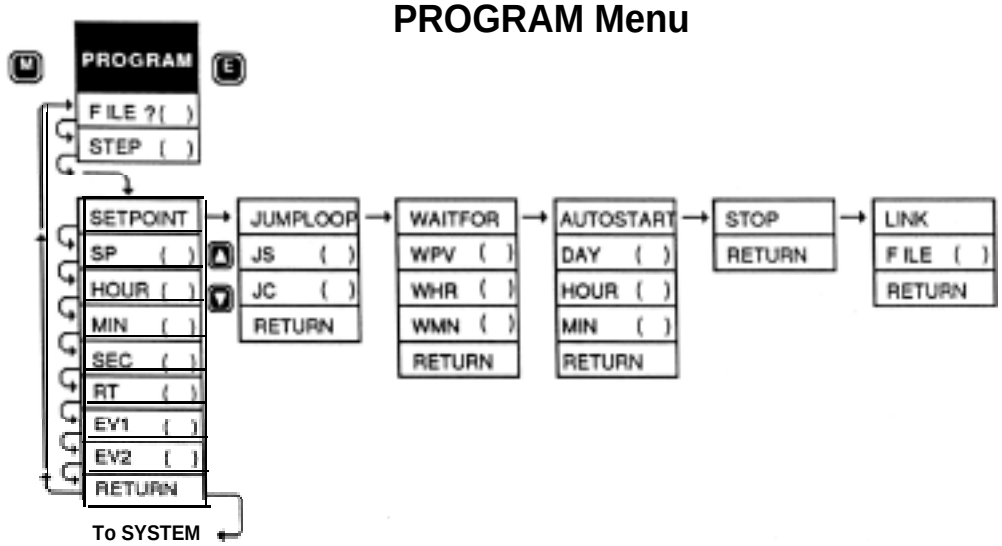
Main Menu



SYSTEM Menu



PROGRAM Menu



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