RWL11X2 GREENHOUSE CONTROLLER
Operation Manual

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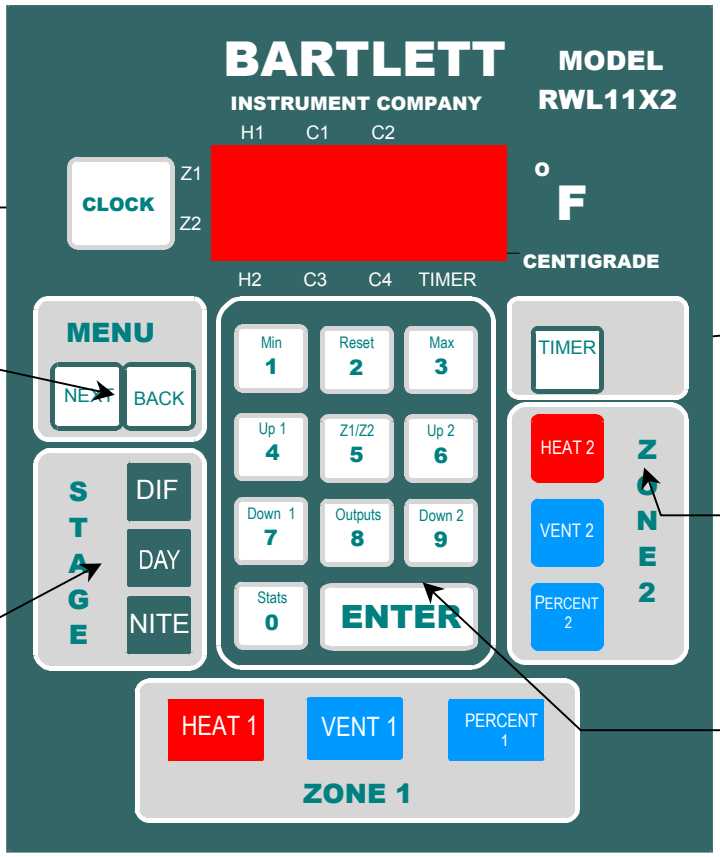
Front Panel Description

MENU INCLUDES:
rSEt – Reset changes all "ON" outputs to "AUTO"
CHFC – Select °F or °C
Id – Select ID# for CIS (COMPUTER INTERFACE SYSTEM)
OtOA – Set time to reset "ON" outputs back to "AUTO"
dELA – Delay sets time delay between the transition from heat to cool or from cool to heat
dEFt – Defaults resets DIF, DAY, and NITE back to default settings
HYSt – Hysteresis settings for tightness of control
ALAr – Enter temperatures for High and Low alarm
1Or2 – Select 1 or 2-zone mode
FAIL – Selects if thermistor failure triggers heat cycling or outputs off.
FULL – Selects the full open time length for proportional outputs.

Set time on 24-hour clock

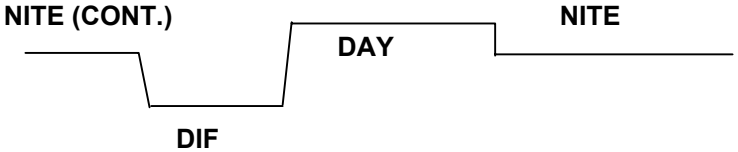


Timer for Mister operations and Timer operations

Set ZONE 2 steps to ON, OFF, or Auto and change step size and percents.

Set ZONE 1 steps to ON, OFF, or Auto and change step size and percents.

Set START TIME AND TARGET TEMPERATURE for each STAGE



Introductory Notes and Definitions

Notes

- The controller uses a 24-hour clock format.
- Programs are not stored until all information has been entered. If programming is started, and no key is pressed for 15 seconds the controller will go back to normal operation and any changes that had been made will be lost.
- The DIF stage must start before the DAY stage.
- The DAY stage must start before the NITE stage.
- Minimum allowable target temperature of 32°F.
- Maximum allowable target temperature of 131°F.
- Temperature step size minimum of 0°F.
- Temperature step size maximum of 15°F.

Definitions

First we need to define and understand some terms.

TERM	MANUAL DEFINITION AND DESCRIPTION
Output	OUTPUT is a relay that corresponds to HEAT 1, OPEN 1, & CLOSE 1 for ZONE 1; and HEAT 2, OPEN 2, & CLOSE 2 for ZONE 2.
Target Temperature	The base temperature set for each stage (DIF, DAY and NITE). Usually the temperature for the first HEAT to come on.
Step Size	The STEP SIZE is the amount of change required in temperature before the controller will transition to a new percentage.
Output Temperature	This is the TARGET TEMPERATURE with the STEP applied.
Hysteresis	This is the separation between output temperature and trip point. It is variable from 1° to 3°F
Trip Point	The temperature at which an output (relay)turns on or off.
Appliances	APPLIANCES are the heating and cooling connected to the controller.

Controller Operations

Overview

The RWL11X2 controller manages the environment of your greenhouse. It has independent temperature settings for DIF, DAY and NITE stages to assist in plant height control. It collects 7 days of statistics for graphical tracking and tracks the minimum and maximum temperatures. The RWL11X2 series has two independent temperature sensors so it can be set to single zone mode to control a larger gutter connected house or set to two zone mode to control two independent smaller houses. The RWL11X2 has two HEAT outputs and two PROPORTIONAL outputs. These outputs can be divided up to control two separate zones each having one HEAT and one PROPORTIONAL or used to control one larger zone that utilizes both HEATS and both PROPORTIONALS. In the two zone mode, each zone works independently having its own control temperature and statistics.

The RWL11X2 also has a TIMER output and an ALARM output. The timer output can be configured as a timer or a mister. In the TIMER mode, the output will come on at a programmed time of day and remain on for a programmed duration. In MISTER mode, the output will come on for a programmed number of seconds ("ON" time) and will repeat the "ON" time after a programmed number of minutes has passed (cycle time). Each stage (DIF, DAY, and NITE) has separate MISTER settings.

Stages – DIF, DAY, NITE

The RWL11X2 has three operating stages (DIF, DAY, NITE). The DIF stage allows you to adjust the temperature a few hours before sunrise to help control crop height. The DAY stage allows you to take advantage of solar energy to increase the daytime temperature so you can maintain the correct average temperature and control crop maturity. The NITE stage allows you to lower the temperature at night to save on heating. As shown in figure 1, each stage has a programmable start time and target temperature. The time of day determines the current operating stage.

Target Temperature

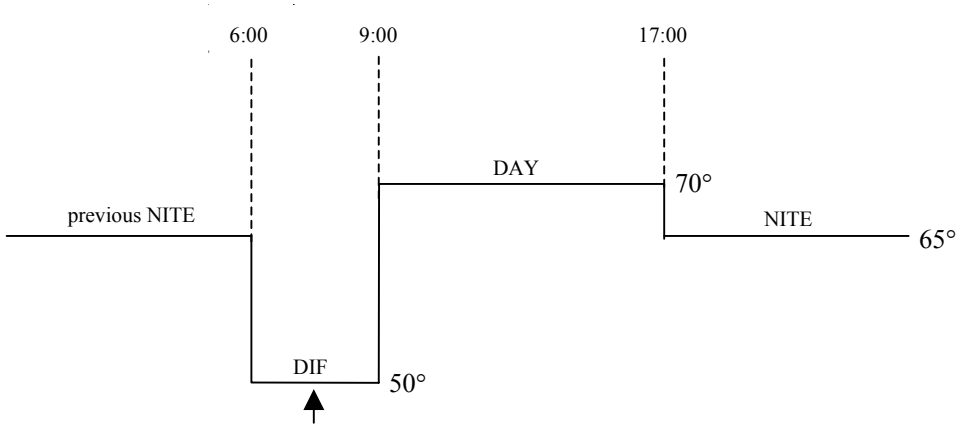


Fig. 1

Figure 1 shows we have programmed the DIF stage to start at 6:00am, the DAY stage at 9:00am and the NITE stage for 17:00 (5:00pm). We also have the target temperatures set as follows, for the DIF stage 50° F, the DAY stage at 70°F, and the NITE stage for 65°F. As indicated by the arrow, at 8:00am you are in the DIF stage and the target temperature is 50°F.

Output Steps

The target temperature is the base line for determining when each output comes on. Each output has a step temperature to be added to (cools)or subtracted from (heats)the target temperature to determine that output's activation temperature. Therefore as the target temperature changes with the operating stage, the activation temperature for each output changes. Figure 2 shows the activation temperatures with respect to the target temperature for each output.

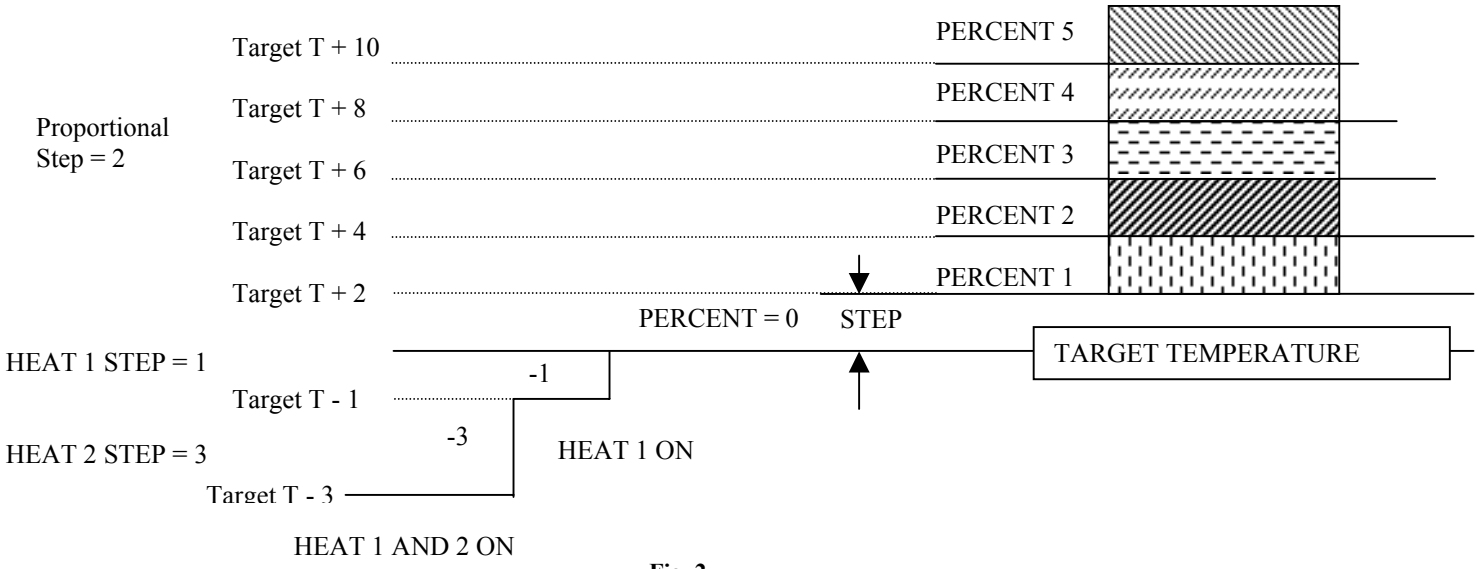


Fig. 2

Output Temperature

Using the information in figures 1 and 2, if the time is 8:00 AM the operating stage is DIF and the target temperature is 50°F. The output temperatures for each output are as follows:

	Target Temperature	Step	Output Temperature
STEP 5	50° F	+ 10 =	60
STEP 4	50° F	+ 8 =	59°
STEP 3	50° F	+ 6 =	57°
STEP 2	50° F	+ 4 =	55°
STEP 1	50° F	+ 2 =	53°
HEAT 1	50° F	- 1 =	49°
HEAT 2	50° F	- 3 =	47°

Table 1

Output ON/OFF Transitions For Heats

The trip point for an output is the temperature at which the output actually turns on or off. The ON and OFF points for an output should be separated slightly to prevent rapid cycling of appliances. This separation above and below the output temperature is called hysteresis (figure 3). Larger hysteresis will give more efficient cycling of appliances but will also give a wider swing in temperature. The hysteresis can be set to values of 1, 2 or 3 through the menu options. For the proportional output the hysteresis is fixed at a value of 1.

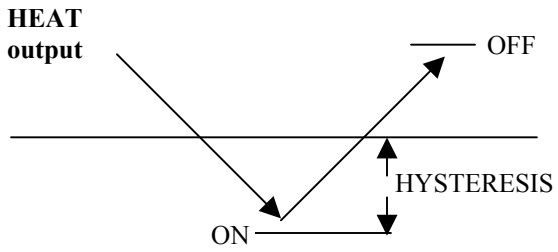


Fig. 3

Using the output temperatures from Table 1 and a hysteresis setting of 2, the trip points for each output will be as follows (all temperatures are in °F):

	Output Temperature	Hysteresis	ON	OFF
HEAT 1	49°	2	47	51
HEAT 2	47°	2	45	49

Table 2

Proportional outputs do not have hysteresis but require the temperature to be above or below the next output temperature for a minimum amount of time before making the change. Once this time threshold has been exceeded, the output will move to the next step. Threshold is programmed through the menu options.

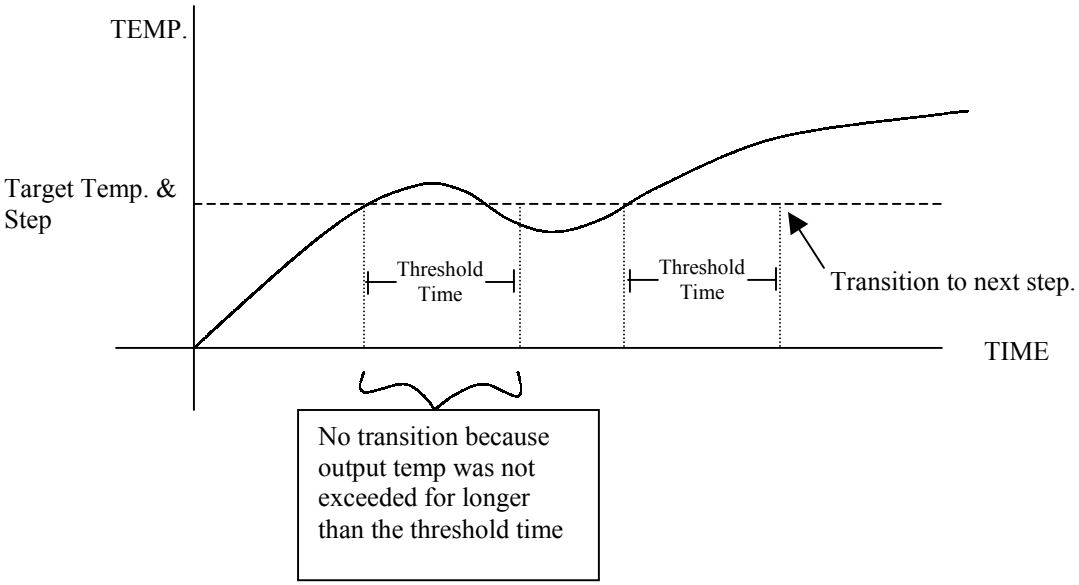


Figure 4 shows the information of Table 2 graphically.

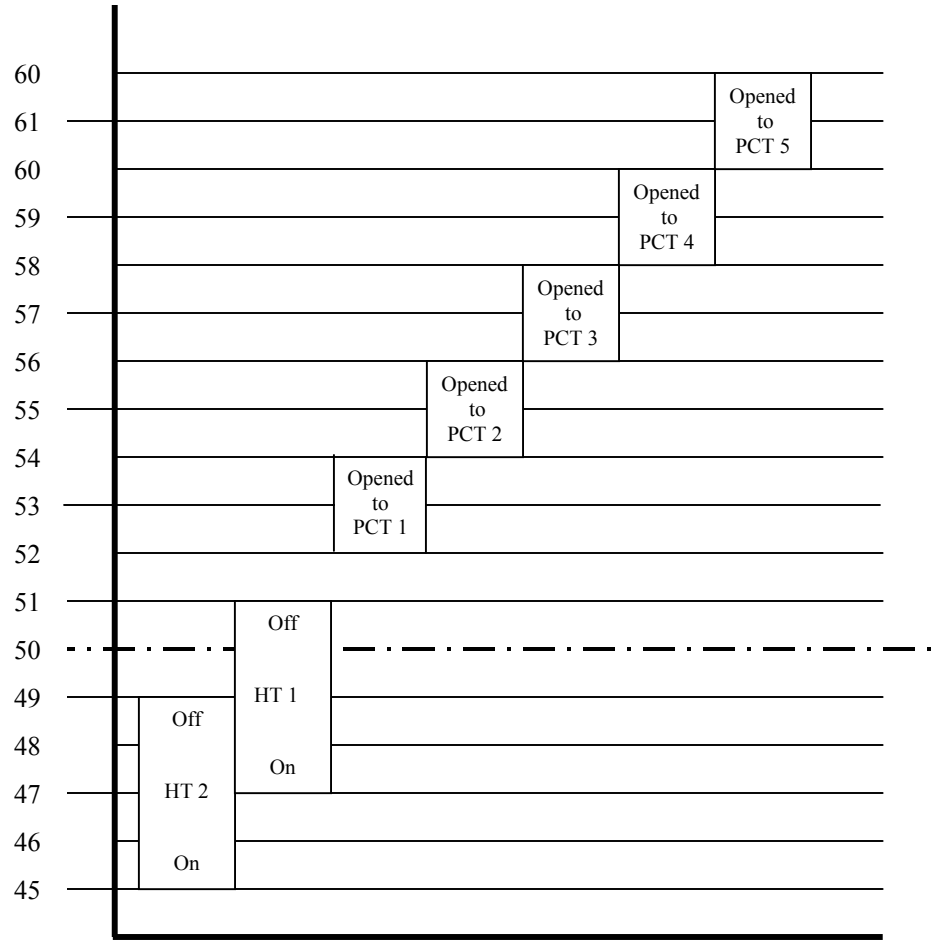


Fig. 4

Programming

The Quick Start Guide in Appendix E is the programming guide with limited explanation. The next pages will give you more detail on programming each step.

Notes

- The RWL11x2 utilizes a 24-hour clock
- All information for a program sequence must be entered before the program is saved.
- Once data is entered it remains until modified, even after a power failure.
- The display flashes at a 1/2-second rate when in a programming mode.
- After 15 seconds without a key-press the RWL11x2 returns to normal operation without saving.
- Entering invalid data will cause a beep and display of the old information (DIF, DAY, NITE)

Stage - DIF, DAY, NITE

Programming of each stage (DIF, DAY, NITE) will require a start time and a target temperature for each zone. If the MISTER option is enabled, you will have to also enter an "ON" time in seconds and a "CYCLE" time in minutes for each stage. See **TIMER** section for details.

Press the DIF, DAY, or NITE key to start programming stage information. The stage name and the currently programmed start time will be displayed alternately. Use the number keys to type in the start time for that stage. Remember the start time for DIF must be earlier than the start time for DAY and DAY must start before NITE. Press "ENTER" when the desired time is displayed. The controller will beep and flash the stage name and old start time if an invalid time was entered. All times are in 24hr clock format. Next, °F 1 will be alternately displayed with the currently programmed target temperature for Zone 1. Use the number keys to change the target temperature and press "ENTER" to continue. If °F 2 alternates with a second target temperature, the RWL11X2 is set for 2 zones. Again, use the number keys to change the target temperature and press “ENTER” to continue.

Programming is complete if the MISTER is disabled. When programming is complete the display will flash the current stage and temperature.

If the MISTER is enabled, the display will alternately show ‘ON t’ and the current number of seconds the output will be on per cycle. Type in the desired “ON” time in seconds and press "ENTER" to continue. The display will show ‘CYCL’ and the cycle length in minutes. Type in the desired cycle time in minutes and press "ENTER". All information is stored and the current stage and temperature will flash at a 1-second rate.

Programming Example

To program the following DIF setting, follow the steps in the example below.

STAGE	START TIME	°F1	°F2
DIF	5:00 AM	60	60

°F1 = Zone 1 Target Temp.

°F2 = Zone 2 Target Temp.

And we want the MISTER enabled with the following

On Time (seconds)	Cycle Time (minutes)
30	30

Since the default setting for the MISTER is off, in order to produce a program with the MISTER enabled we must first check that the TIMER option is set to MISTER. To perform this press the TIMER key until ‘MIS’ appears in the display and then press "ENTER".

Programming Example Instructions

STEP	KEY PRESS	DISPLAY	COMMENTS
1	DIF	DiFF/XX.XX	‘diFF’ and start time will flash at 1/2 second interval
2	5,0,0	05.00	New start time of 5 AM
3	ENTER	°F 1/xx	‘°F1’ and current target temperature for Zone 1. Will flash at ½ second interval
4	6,0	_ _6 0	New Zone 1 target temperature for DIF.
5	ENTER	°F 2/xx	‘°F2’ and current target temperature for Zone 2. Will flash at ½ second interval
6	6,0	_ _6 0	New Zone 2 target temperature for DIF.

7	ENTER (while in MISTER mode)	Operating display On t/xx	If TIMER is off or in TIMER mode. All information for program is saved. 'On t' and current number of seconds MISTER will be on each cycle will flash at 1/2 second rate.

If in single zone mode, steps 5 and 6 are skipped.
With MISTER operation enabled the following is also required

8	3,0	_ _3 0	30-second mister on time each cycle.
9	ENTER	CYCl/xx	'CYCL' and current cycle length in minutes flash at a 1/2 second rate
10	3,0	_ _3 0	Cycle time of 30 minutes for MISTER in DIF stage.
11	ENTER	Operating display	All information saved.

Programming Heat Outputs (HEAT 1, HEAT 2)

Each heat output has three different settings. These settings are Auto, On and Off. In Auto the controller will regulate the temperature to correspond with the target temperature. This is accomplished in the manner described under **Controller Operations**. In the "ON" mode the output is turned on. Any appliance connected to this output is turned on regardless of the temperature. In the "Off" mode the output is turned off. Any appliance connected to this output is also turned off. In either on or off mode the temperature is not regulated by this output.

To change the outputs setting (ON, OFF, or AUTO), press the appropriate output key (Heat 1 or Heat 2). This will cause either 'AutO', 'On', or 'OFF' to appear in the display. Press the output key again until the desired setting is displayed. Then press "ENTER". For the Auto mode you will additionally be asked to enter the step size in degrees for this output. Refer to **Controller Operations** for more on step temperatures.

Programming Proportional Outputs

There are 4 steps in programming the proportional outputs. Entering the Full Open time, selecting Auto & Step Size, setting the percent open for each step, and setting the threshold time for each output.

The first step is entering the time in seconds that is required for the curtain or vent to transition from closed to full open. Press the menu "BACK" key. 'Full' will be displayed, press "ENTER". "SEC1" will flash with the current full open time for the first proportional output (default setting is 0 maximum is 255). Type the new time in seconds. Press "ENTER" and the display will show "SEC2". Type the new time for the second proportional output. Press "ENTER" and the full open time is saved.

The second step in programming the proportional outputs is setting it to Auto and entering the step size. Press "VENT 1". 'Auto', 'on', or 'off' is displayed. Press the "VENT 1" key to toggle to the desired setting. Press "ENTER". If 'auto' was selected, "step"/xxxx will be displayed. Then type in the new step size (0 –15). Press "ENTER". Repeat for Vent 2. Vent 1 and Vent 2 can have different Step sizes.

The third step is to set the percent open for each of the 5 steps. Press "PERCENT 1". 'Pct1'/xx will be displayed. Type in the new percent 1 setting. Press "ENTER". Continue this through all 5 percentages. Repeat for "PERCENT 2".

The fourth step is programming the threshold time for each output. Press the menu "NEXT" key 2 times. THRS will be displayed. Press "ENTER". THR1 will flash the current threshold time in minutes for output 1. Type in the new time and press "ENTER". THR2 will flash with output 2's threshold time. Type in the new threshold time for output 2 and press "ENTER".

NOTE: Valid percentages are 0 – 99. 99% is full open. Percentages do **not** have to increase with increasing steps.

To synchronize the controller and appliance, set the curtain/vent to ‘off’ and wait for the curtain or vent to close completely and then set the controller to the ‘auto’ mode.

Programming Proportional Example

	STEP	KEY PRESS	DISPLAY	COMMENTS
Full Open Time Prgrm	1	BACK		Press “BACK” until ‘FULL’ is displayed
	2	ENTER	SEC1/xxx	Displays previous Full open time for the first proportional output
	3	# keys	xxx	Enter the Full open time for the first proportional output
	4	ENTER	SEC2/xxx	Goes to the entry for the second proportional output Full open time
	5	# keys	xxx	Enter the Full open time for the second proportional output
	6	ENTER	Operation Display	Stores the Full open times
Set to Auto and Step size	7	VENT 1	Vnt 1 or Auto/man/off	Keep pressing “VENT 1” until the display is Auto
	8	ENTER	Vnt1/xx	This is the step size
	9	# keys	xx	Enter the desired step size
	10	ENTER	Operation Display	Stores the entered step size
Enter % open for output one	11	PCT 1	PCT1/xx	This begins the sequence for programming the percentages for the first proportional output
	12	# keys	xx	This is the percent for the first step
	13	ENTER	PCT2/xx	This is the second percentage.
	14	# keys	xx	This is the percent for the second step
	15	ENTER	PCT3/xx	This is the third percentage
	16	# keys	xx	This is the percent for the third step
	17	ENTER	PCT4/xx	This is the forth percentage.
	18	# keys	xx	This is the percent for the forth step
	19	ENTER	PCT5/xx	This is the fifth and final percentage.
	20	# keys	xx	This is the percent for the fifth step
	21	ENTER	Operation Display	This stores the entered percents for the first proportional output
Enter % open for Output Two	22	PCT 2	PCT1/xx	This begins the sequence for programming the percentages for the second proportional output
	23	# keys	xx	This is the percent for the first step
	24	ENTER	PCT2/xx	This is the second percentage.
	25	# keys	xx	This is the percent for the second step
	26	ENTER	PCT3/xx	This is the third percentage
	27	# keys	xx	This is the percent for the third step
	28	ENTER	PCT4/xx	This is the forth percentage.

	29	# keys	xx	This is the percent for the forth step
	30	ENTER	PCT5/xx	This is the fifth and final percentage.
	31	# keys	xx	This is the percent for the fifth step
	32	ENTER	Operation Display	This stores the entered percents for the second proportional output
Enter threshold time for Output 1	33	NEXT	THRS	Press “NEXT” until THRS is displayed
	34	ENTER	THR1/xx	This is the current threshold time for output 1
	35	# keys	xx	This is the new threshold time for output 1
Enter threshold time for Output 2	36	ENTER	THR2/xx	This is the current threshold time for output 2
	37	# keys	xx	This is the new threshold time for output 2
	38	Enter	Operation Display	

OUTPUT STATUS

Once the stage information and outputs are programmed, you can check the output status by pressing the “8” key. When the “8” key is pressed, the current % open for output 1 is shown. Then the % open for output 2. Next, if HT1, HT2, or timer are ON bar will be displayed by the appropriate label.

Programming Clock

It is important to remember that the RWL11X2 uses a 24-hour clock. The middle decimal point in the time settings designates the hours and minutes division. See **figure 5** for an example of the clock. For morning times the clock setting will be from 00.00 until 11.59 and the afternoon settings are from 12.00 until 23.59.

Press “CLOCK”. The current time will appear. The middle decimal point will be illuminated indicating a time is being displayed. If the time is correct, press the clock button again or wait 15 seconds and the display will return to the normal operating mode. If the time is incorrect, use the number keys to type the new time and press "ENTER" to store it.

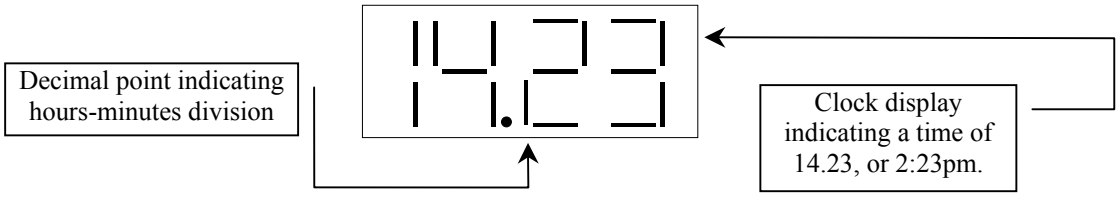


Fig. 5

TIMER Option

The RWL11X2 has a TIMER output that is not used for temperature control but can be used to turn on lights at a certain time or to run mist type irrigation. The TIMER option has three modes of operation; TIMER, MISTER and OFF. In the Off position the timer relay will not turn on. In TIMER mode the timer relay will turn on at a designated time of day and run for a set length. The MISTER mode causes the timer appliance to enter an on-off cycle. In this on-off cycle the timer is on for a programmed number of seconds repeating after the set number of minutes has expired.

TIMER Mode

Timer mode is designated by 'tMr' in the display window when the TIMER option key is pressed. The following example describes programming the Timer to operate with the following information. A timer cycle may be manually started at any time by pressing "TIMER" and then when 'tMr' is in the display press "CLOCK".

TIMER Example

To program a Timer cycle, to occur daily, with the following settings follow the programming example below.

START TIME	HOLD LENGTH	REPEAT
1:15	15 minutes	ON

TIMER Programming

KEY PRESS	DISPLAY	COMMENTS
TIMER	MIS or OFF or tMr	Press until 'tMr' is displayed.
ENTER	tMr/XX.XX	'tMr' and previous start time. Will flash at 1/2-second interval.
1,3,1,5	13.15	New start time of 1:15 PM.
ENTER	HOLd/00.00	New hold time in hours.minutes. Maximum hours setting is 23 and the maximum minute setting is 59.
1,5	00.15	Hold time of 15 minutes.
ENTER	REPt/OFF REPt/On	Repeat timer cycle on or off. Toggle with TIMER key. 'rEPt' on is repeated daily 'rEPt' off is performed once.
ENTER	Operating display	All information saved.

MISTER Mode

'MIS' designates MISTER mode in the display window when the TIMER options key is pressed. MISTER programming occurs during Stage programming. To program a MISTER first select the MISTER option using the TIMER key until 'MIS' appears in the display window. Then follow the information provided under **Programming**.

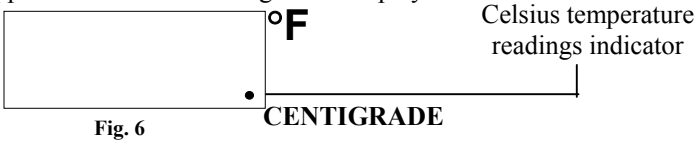
Menu Options

This section will explain the menu options.

The menu key allows access to the menu functions of the RWL11X2. There are 10 different menu functions of the controller: 'rSEt', 'CHFC', 'Id', 'OtOA', 'dELA', 'dEFt', 'HYSt', 'ALAr', '1Or2', and 'FAIL'. Also included under the menu are the following status conditions of the controller: 'ALAr', 'FL 1', or 'FL 2'. When the conditions for a status are indicated the status condition replaces the reset function of the controller. More will be explained on these conditions later in this section.

To navigate through the menu options press "MENU ►" to advance to the next option. Press "MENU ◄" to navigate backwards. When the desired option is displayed, press "ENTER".

MENU OPTION	DISPLAY	COMMENTS
Reset	rSEt	Returns all outputs to auto. The offsets return to the previously stored values. Under the special status conditions the reset option is replaced by the status indication message. To reset press "ENTER" when 'rSEt' is displayed. (** See **Status Conditions** after Menu table)

Proportional output Threshold time	tHrS	This is the amount of time the temperature must be above or below the target temperature or next step before the output will change. Valid times are 1-9 minutes. See page 7 for explanation and page 12 steps 33-38 for programming.
Fahrenheit to Celsius	CHFC	Allows change of the temperature scale (°F or °C). **Appendix C** contains information about any changes to the settings that occur under the Celsius setting. To indicate the controller is reading in the centigrade scale a decimal appears in the ones reading of the display.  **Fig. 6** To change temperature scale press "ENTER" when 'CHFC' is displayed. Press "MENU" to toggle between temperature scales. Press "ENTER" when the desired scale is displayed. Default = °F.
Identification	Id	Controller Software Identity. Identification indicates the software identity of the controller for CIS (Computer Interface System). Default = 1
On to Auto	OtOA	Sets duration time in minutes for when all manually on outputs return to auto. For more comfortable working conditions or if an emergency situation develops, any output may be turned on manually. On to Auto will return any output that is set in the on position after a certain length of time has expired. Default = 15
Delay	DELA	Sets the delay duration time in minutes between transitions from cooling to heating. Default = 15
Defaults	dEFt	Returns the controller to default settings. Also will clear all statistics. For default settings see **Appendix B**.
Hysteresis	HYSt	Sets the hysteresis value used for temperature regulation. 1, 2 or 3 are valid for the hysteresis. Default = 2
Alarm	ALAr	Sets temperatures for high and low alarm values. The alarm is meant for use in conjunction with a SensaPhone, auto dialer, or similar piece of equipment. ALARM could also be utilized to set off a buzzer when the conditions are met. Default low = 32, high = 131
1 or 2 zones	1Or2	Sets the number of zones being monitored. Under one zone operation both thermistor connections are averaged to determine the temperature. Default = 2
Thermistor Fail Mode	FAIL	Sets the operation if thermistor fail is detected. The off condition causes all outputs to terminate during a fail condition for the failed zone. The heat condition causes the controller to enter 50 percent on 50 percent off heating duty cycle. The 50/50 heating duty cycle is designed for use during colder weather or in colder climates to help prevent loss of greenhouse crops. Default = heat
Full Proportional output opening time	FULL	Sets the time to fully open both proportional outputs. This value is in seconds and has a valid range of 0 through 255. Default = 0.

**Status Conditions

Under normal operation when the menu key is pressed ‘rSEt’ appears in the display. However when certain status conditions are present this display changes for notification of this status. The status condition displays are ‘CLOC’, ‘HI’, ‘Lo’, ‘FL 1’, and ‘FL 2’. ‘CLOC’ indicates that there is a clock error or a problem with the clock circuitry. ‘HI’ and ‘Lo’ indicate alarm conditions. ‘FL 1’ and ‘FL 2’ indicate thermistor fail conditions.

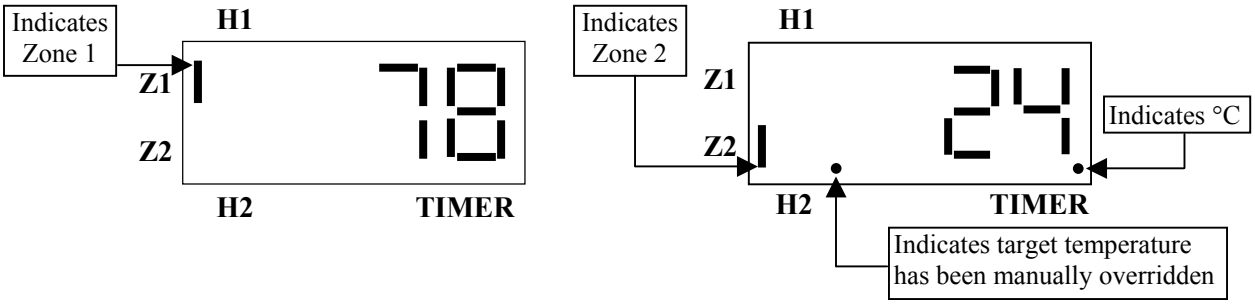
When an alarm condition is met, by the temperature either going below the low temperature setting or above the high temperature setting, the display changes to indicate this change. Pressing menu will show the user what type of alarm caused the condition, with either ‘Lo’ indicating a low temperature or ‘HI’ indicating a high temperature. Pressing the “ENTER” key while either ‘Lo’ or ‘HI’ is displayed will cause the alarm to reset and return to normal operation. Resetting the alarm condition makes no other changes.

When thermistor fail is indicated pressing menu will bring either ‘FL 1’ for fail on thermistor one or ‘FL 2’ for fail on thermistor two. Pressing menu will indicate which thermistor has failed. When a fail condition is encountered the corresponding zone enters the FAIL mode setting. Pressing the “ENTER” key while either ‘FL 1’ or ‘FL 2’ is present in the display will reset the fail monitor and return the controller to normal operating mode.

Controller Status

Operating Display

The main operating display will tell you the current stage and temperature, one or two zones operation, the temperature scale (°F/°C), and if the target temperature has been overridden. During normal operation, current stage (DIF, DAY, NITE)and the current temperature will be alternately shown at 1-second rate. A vertical LED bar on the left of the display when the temperature is displayed indicates two-zone operation. The bar positioned at the upper left of the display indicates Zone 1 temperature is displayed. If the bar is at the lower left, the temperature displayed is for Zone 2.



Two decimal points are used to give status information also. °C operation is indicated if the decimal point to the right of the ones digit is illuminated (See **Menu Options** for setting). Override of the target temperature is indicated if the decimal point to the right of the 1000s digit is illuminated (See **Appendix A: Hot Keys** for this function)

Output Conditions (Hot Key 8)

Many times, especially for troubleshooting, you will want to know which outputs the RWL11X2 has on. Pressing the “8” key changes from the normal operating display to the output status display. For the RWL11X2 two numbers will be displayed followed by the current status bar for the heats and the timer. The first number is the percentage for VENT 1 and the second number is the percentage for VENT 2. each will be displayed for 1 second. See **figure 7** for an example of the status bars.

The current open percentages will precede the status bars.

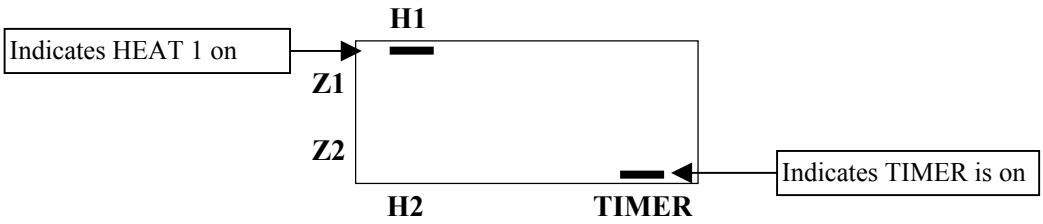


Fig. 7

Target Temperature Viewing and Override

The hot keys for overriding the target temperature can be used to view the current setting. The target temperature for Zone 1 can be viewed by pressing, from the main operating display, the "4" or "6" key once and for Zone 2 by pressing "7" or "9" key once. To leave the temperature unchanged, simply wait 15 seconds to return to the main operation display or press "ENTER". Continue pressing the up (4, 6)or down (7, 9)keys for that zone to temporarily override the current target temperature. The next stage transition will reset the target temperature to the programmed value.

Error Status Displays

Various error conditions will open the contacts of the alarm relay. The error signal will persist until manually cleared even if the fault corrects itself. Press “MENU” to see the fault (CLOC, FL 1, FL 2, Hi, Lo)then press “ENTER” to clear the error. If the fault has not been corrected it will latch again and must be cleared again after correcting the offending condition.

Failed Thermistor

A vertical zone indicator on the left side of the display with the letters ‘FL’ indicates the thermistor for that zone is faulty or disconnected. A controller set for single zone operation will continue to control if one thermistor fails. If both thermistors in single zone, or one thermistor in two-zone mode fail, the controller will either shut all outputs off or go into a heat cycle of 15 minutes on and 15 minutes off as specified under Menu Options “FAIL”.

ALARM Condition (High, Low Temperature)

‘ALAr’ will flash alternately with the current temperature if the high or low alarm conditions were exceeded. Use the Min and Max hot keys to see the temperature extremes. The ALARM relay will open indicating an alarm condition. Press "MENU" an "ENTER" to reset the alarm status.

Memory Failure

‘ErrE’ will be displayed alternately with the temperature if the backup memory has had an error. The controller restores the factory default table and continues to function. The controller can be programmed but will restore defaults if power is lost and then restored. If the fault continues the controller should be returned to the factory for repair.

Clock Failure

If the real-time clock fails, the stage will remain in DAY and ‘CLOC’ will be displayed. When “MENU” is pressed, ‘CLOC’ will be displayed. Press “ENTER” to clear the error. The clock failure can be caused by excessive moisture in the case, faulty clock circuitry or a discharged battery. If this condition persists factory service will most likely be required.

Faulty Keypad

‘StUC’ will be displayed if the keypad has a stuck key. Factory service will most likely be required.

Statistics

The RWL11X2 was designed to be a growing tool as well as a temperature control device. The RWL11X2 not only has a DIF feature to help control plant height through temperature control but also collects and stores averages for 7 days. Each day it stores the average temperature for each operating stage (DIF, DAY, NITE)and the average for the 24 hours from the start of DIF until the end of NITE.
Note: When in the two-zone mode, set the zone indicator with the "5" key to the zone of interest before viewing averages or minimum and maximum temperatures.

The hot key “0” (stats)is used to view the averages. Press “0” once and day 1 will be displayed. ‘dAY 1’ is the current 24-hour period. ‘dAY 2’ is yesterday, ‘dAY 3’ the day before that through ‘dAY 7’. Continue to press “0” until the day to be reviewed is displayed and press “ENTER”. The average temperature for that day’s DIF period will be displayed. Continue to press “ENTER” to see the average temperature for DAY, NITE, and 24-hour periods.

Besides averages, the RWL11X2 tracks minimum and maximum temperatures. You can see the minimum and maximum temperature since the last hot key reset (“2”)by pressing “1” or “3”. Pressing the “2” key to reset the stored minimum and maximum.

Overrides

Not only is the RWL11X2 easily programmed for automatic operation but it can also give the grower temporary overrides of the target temperature, manual start of the TIMER and VENT option and on/off control of each output.

Target Temperature Override

The target temperature can be temporarily moved up (4, 6)or down (7, 9)with hot keys without altering the program. This is for times when you want to change the growing temperature because it is too uncomfortable to work in but want to revert back to the program after you have completed your task.

Use the appropriate hot key (“4” or “7” for Zone 1, “6” or “9” for Zone 2)to move the target temperature up or down. The first time you press one of these keys you will see the current target temperature. Continue to press “UP” or “DOWN” until the desired temperature is displayed and then press “ENTER”. The 1000’s decimal point will be illuminated indicating an override.
Remember if you were in a cooling situation and the new target temperature moves you into a heating situation the delay between HEAT to COOL or COOL to HEAT must time out before the output will activate. Delay is a menu option and can be varied from 1 to 30 minutes.

TIMER Manual Start

Pressing “TIMER” and then “CLOCK” can manually start the TIMER cycle. Repeating the key press sequence will end the manual start. TIMER can be manually started even if set to off. This allows you to program a cycle, set it to off and run it only on a manual cycle.

Outputs Manual Settings

Each HEAT or PROPORTIONAL output can be set manually to on or off. Manual settings will override the safety checks and you may have instances where the HEATS and PROPORTIONALS run at the same time. The menu function ‘rSEt’ will set all outputs to Auto. The menu function On-to-Auto will set any output, from ‘ON’ back to ‘AutO’ after the programmed time. On-to-Auto does not affect an output set to off.

To manually set a heat output press one of the “HEAT” keys until “on” or “off” is displayed. Press “ENTER” to accept the override. “On” will turn the output on without regard to temperature. An “on” setting will return to Auto after the “on-to-auto” timer has elapsed.

The proportional outputs can be manually set to a desired percent or to off. To close and disable the output, press Vent1 or Vent2 until off is displayed. Press “ENTER” to accept.

To manually set the output to a given percent, press Vent1 or Vent2 until “man” is displayed. Press “ENTER” and the display will flash between “Pct” and the current setting. Use the number keys to adjust the percentage and press enter. The “on-to-auto”timer will set a manually set percentage back to Auto after the timer has elapsed.

An “off” setting will leave the output off regardless of the temperature. The “on-to-auto” timer does not affect an output set to “off”.

The RWL11X2 has a special feature in its menu options called “On-to-Auto”. This is used in conjunction with manually setting an output to “ON” to ensure the output is not left on indefinitely. The “On-to-Auto” time can be set from 1 minute to 23 hours and 59 minutes. “On-to-Auto” time disables the function. The “on” mode or manual open setting will be maintained until changed by the operator.

Appendix A: Hot Keys

The number keys function as hot keys in the normal operating mode to give instant access to special functions.

KEYPAD NUMBER	HOT KEY	COMMENTS
1	Min	Displays the Lowest temperature since the last reset of Min and Max. To clear the display press “ENTER” or wait 15 seconds.
2	Reset	Resets the Minimum and Maximum temperatures.
3	Max	Displays the Highest temperature since the last reset of Min and Max. To clear the display press “ENTER” or wait 15 seconds.
4	Up 1	Temporarily increases the Zone 1 target temperature. This increase will be canceled at the next stage transition. A decimal will appear in the display to indicate a temporary change. See **figure A.1** for an example.
5	Z1/Z2	Toggle between which zone temperature is displayed. The zone indicator will change to indicate this. (See **Operating Display** page 13)

6	Up 2	Temporarily increases the Zone 2 target temperature. This increase will be cancelled at the next stage transition. A decimal will appear in the display to indicate a temporary change. See **figure A.1** for an example.
7	Down 1	Temporarily decreases the Zone 1 target temperature. This increase will be cancelled at the next stage transition. A decimal will appear in the display to indicate a temporary change. See **figure A.1** for an example.
8	Outputs	Changes the display to the output indication. **Figure A.2** is an example read-out of the display as output indication. (See **Outputs** page 9)
9	Down 2	Temporarily decreases the Zone 2 target temperature. This increase will be canceled at the next stage transition. A decimal will appear in the display to indicate a temporary change. See **figure A.1** for an example.
0	Stats	Displays the average temperatures for the selected day. The averages maintained are for DIF, DAY, NITE, and 24-hour period. (See **Statistics** page 15)

Fig. A.1

Decimal indicator in the 1000s location shows a target temperature has been modified using the hot keys.

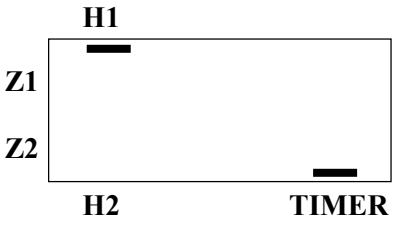


Fig. A.2

Figure A.2 indicates that in Zone 1 Heat 1 is active and the Timer is active.

Appendix B: Default Settings

See the following charts for default settings of the RWL11X2.

Stage Temperature Settings

STAGE	START TIME	°F1	°F2
DIF	6:00	65	65
DAY	8:00	65	65
NITE	17:00	65	65

Options Settings

OPTIONS KEY	DEFAULT SETTING
TIMER	TMr

Timer Programming Defaults

OPTION	SETTING
START TIME	12.00
HOLd	00.00
rEPt	OFF

Output Settings

OUTPUT	MODE	OFFSET or STEP
HEAT 1 and HEAT 2	AUtO	0
VENT 1	AUtO	0
VENT 2	AUtO	0
TIMER	tMr	N/A

Menu Settings

MENU FUNCTION	SETTING
CHFC	°F
Id	01
OtOA	10
DELA	15
HYSt	2
ALAr	Lo – 32 °F HI – 131 °F
1Or2	2
FAIL	HEAT
FULL	SEC1 – 0 SEC2 – 0

Appendix C: Celsius Settings Conversions

When operating in Celsius mode the controller settings are different from in the Fahrenheit. The following table will illustrate the differences between the temperature settings. Remember that the default setting for the controller is Fahrenheit.

SETTING	CONTROLLER DEFAULT	COMMENTS
DIF target temperature	18	Maximum setting of 55. Minimum setting of 1.
DAY target temperature	18	Maximum setting of 55. Minimum setting of 1.
NITE target temperature	18	Maximum setting of 55. Minimum setting of 1.
HYSt setting	2	Only values of 1,2 ,or 3 accepted.
ALAr setting Lo HI	 0 55	Values of 1 through 55 accepted.

Converting the Fahrenheit settings to Celsius temperatures generates the values in this table. Although the default setting for ALAr Lo is 0 only values of 1 or higher are acceptable for entry. This is due to the internal conversion that the controller performs.

Appendix D: Display Messages

Numbers

This section will contain examples of all the numbers on the RWL11X2. The numbers shown will be in the following order: 1,2,3,4,5,6,7,8,9,0. There will be three numbers to a display, with the last display showing only zero.

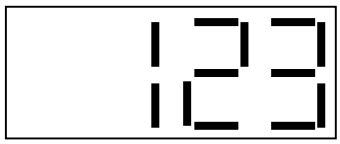


Fig. D1 -- numbers 1 2 3

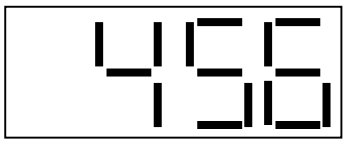


Fig. D2 – numbers 4 5 6

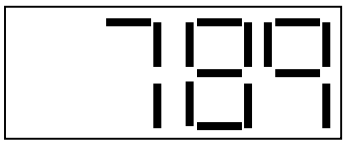


Fig. D3 – numbers 7 8 9

Fig. D4 – number 0

Wording Displays

This section shows displays of all the words that can appear on the display. Each figure number includes the full name of the display word. Note that diFF, dAY and nItE will also appear when running statistic comparisons.

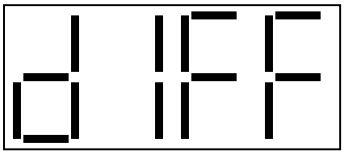


Fig. D5 – Running Mode Diff

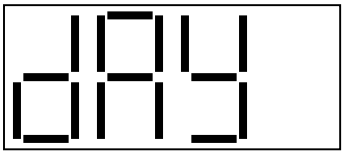


Fig. D6 – Running Mode Day

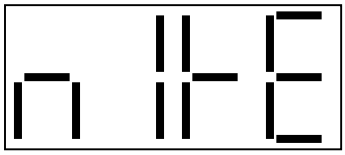


Fig. D7 – Running Mode Nite

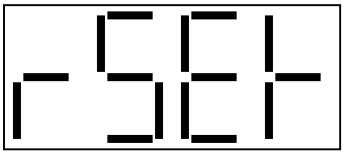


Fig. D8 – Menu Function Reset

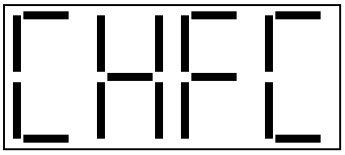


Fig. D9 – Menu Function Change Change Fahrenheit to Celsius

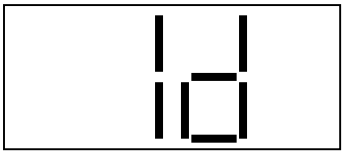


Fig. D10 – Menu Function Change CIS Identity

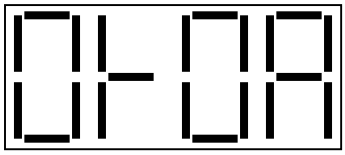


Fig. D11 – Menu Function On to Auto delay

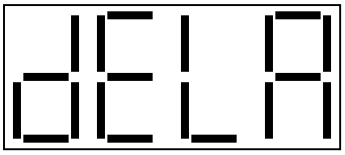


Fig. D12 – Menu Function Transition Delay

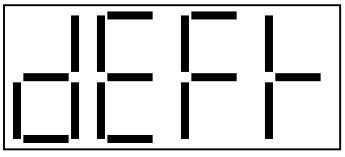


Fig. D13 – Menu Function Defaults

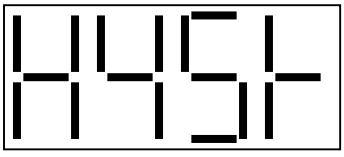


Fig. D14 – Menu Function Hysteresis

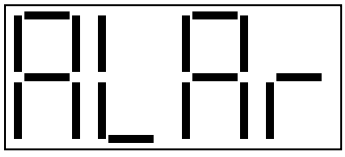


Fig. D15 – Menu Function Set Alarm

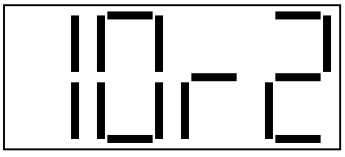


Fig. D16 – Menu Function Number of Zones

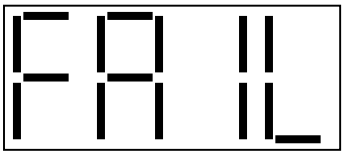


Fig. D17 – Menu Function Set Fail Condition

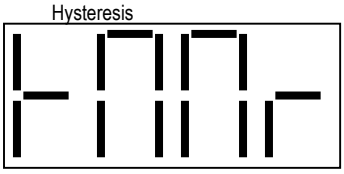


Fig. D18 – Programming Mode Timer or Timer Mode Active

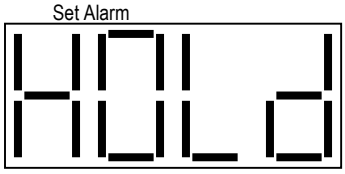


Fig. D19 – TIMER Programming Timer Hold Length

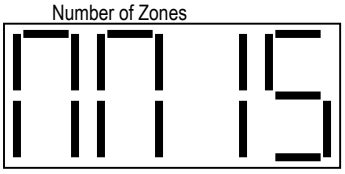


Fig. D20 – Programming Mode MISTER or MISTER Mode Active

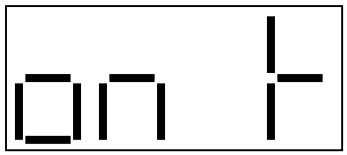


Fig. D21 – MISTER Programming
MISTER on time

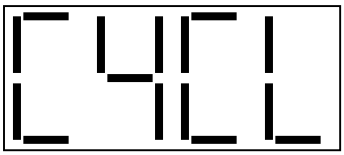


Fig. D22 – MISTER Programming
MISTER Cycle Length

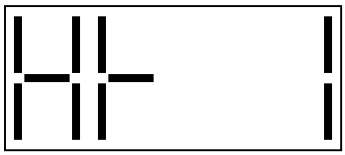


Fig. D23 – Programming Mode
HEAT 1 Output

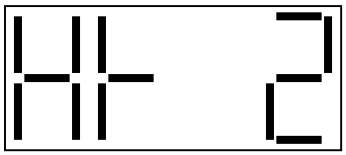


Fig. D24 – Programming Mode
HEAT 2 Output

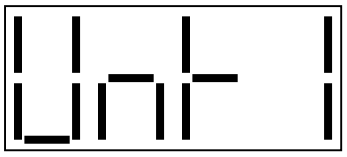


Fig. D25 – Programming Mode
PROPORTIONAL 1 Output

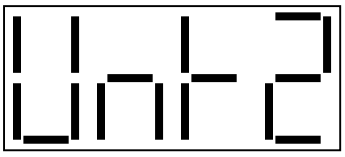


Fig. D26 – Programming Mode
PROPORTIONAL 2 Output

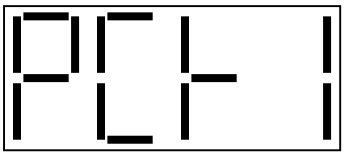


Fig. D27 – Programming Mode
PROPORTIONAL Percent 1

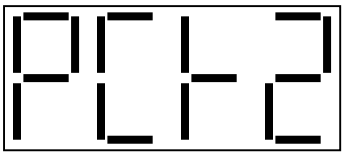


Fig. D28 – Programming Mode
PROPORTIONAL Percent 2

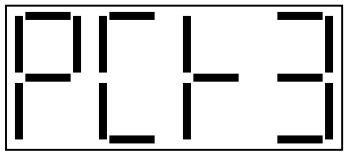


Fig. D29 – Programming Mode
PROPORTIONAL Percent 3

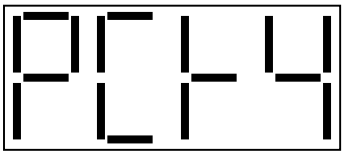


Fig. D30 – Programming Mode
PROPORTIONAL Percent 4

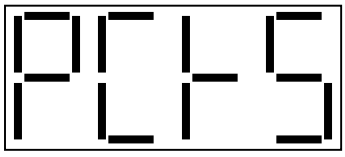


Fig. D31 – Programming Mode
PROPORTIONAL Percent 5

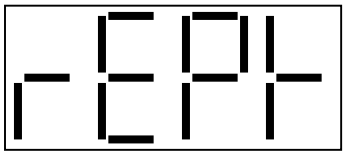


Fig. D32 – Programming Condition
Repeat Programming

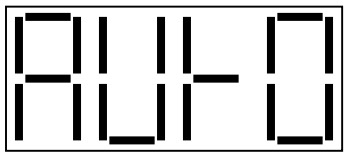


Fig. D33 – Programming Condition
Outputs Automatic Regulation

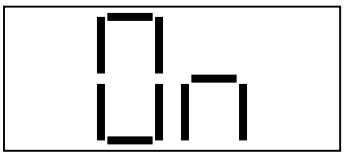


Fig. D34 – Programming Condition
Output or Option On

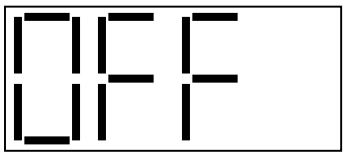


Fig. D35 – Programming Condition
Output or Option Off

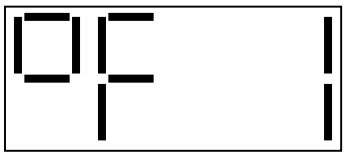


Fig. D36 – Programming Condition
Zone 1 Targeet (Fahrenheit)

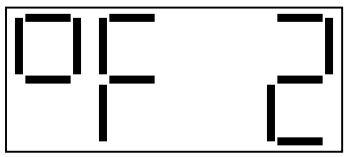


Fig. D37 – Programming Condition
Zone 2 Target (Fahrenheit)

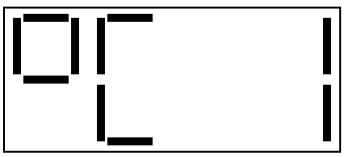


Fig. D38 – Programming Condition
Zone 1 Target (Celsius)

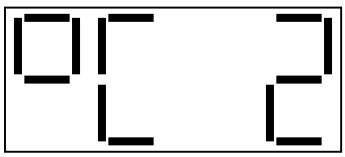


Fig. D39 – Programming Condition
Zone 2 Target (Celsius)

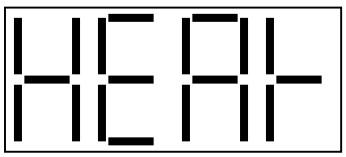


Fig. D40 – Programming Condition
HEAT Cycling On

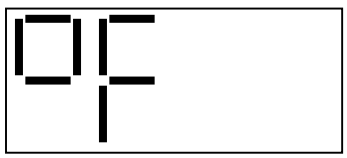


Fig. D41 – Programming Condition
Change to Fahrenheit

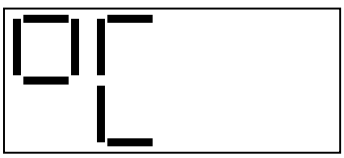


Fig. D42 – Programming Condition
Change to Celsius

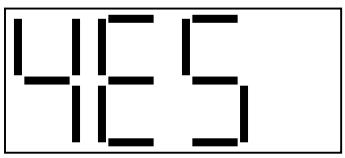


Fig. D43 – Programming Condition
Selection Confirmation

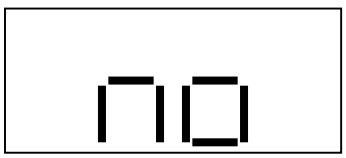


Fig. D44 – Programming Conditin
Selection Negation

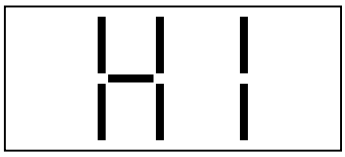


Fig. D45 – Progamming Condition
ALARM High setting

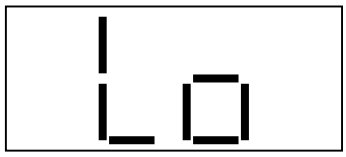


Fig. D46 – Programming Condition
ALARM Lo setting

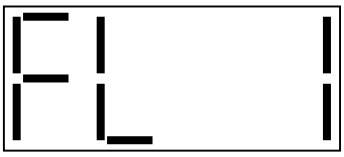


Fig. D47 – Fail Condition
Failure Themistor One

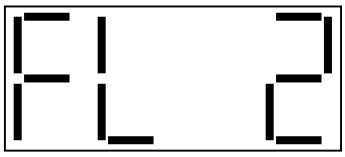


Fig. D48 – Fail Condition
Failure Thermistor Two

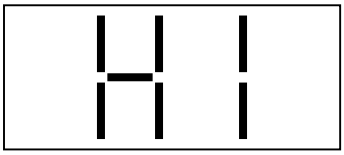


Fig. D49 – ALARM Condition
ALARM from High temperature

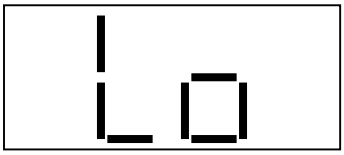


Fig. D50 – ALARM Condition
ALARM from Low temperatuer

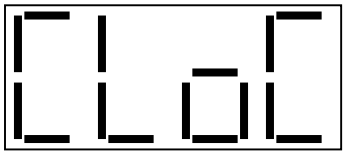


Fig. D51 – FAILURE Condition
CLOCK Circuitry failure

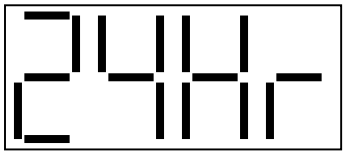


Fig. D52 – Statistics Mode
24-hour Average Temperature

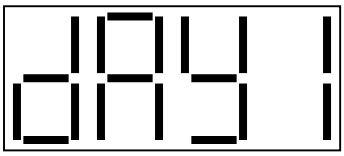


Fig. D53 – Statistics Mode
View Day 1 Statistics

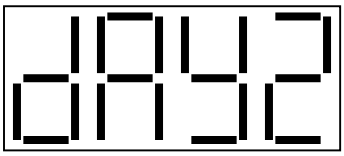


Fig. D54 – Statistics Mode
View Day 2 Statistics

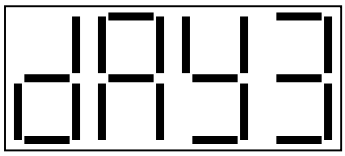


Fig. D56 – Statistics Mode
View Day 3 Statistics

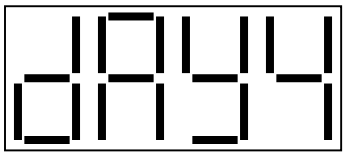


Fig. D57 – Statistics Mode
View Day 4 Statistics

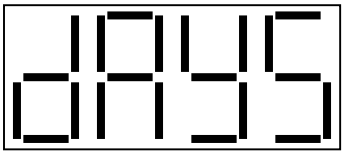


Fig. D58 – Statistics Mode
View Day 5 Statistics

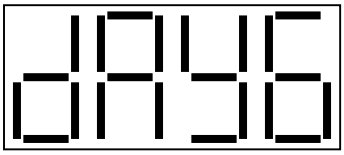


Fig. D59 – Statistics Mode
View Day 6 Statistics

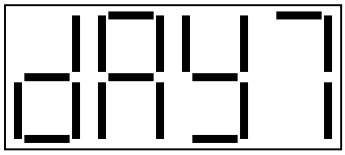


Fig. D60 – Statistics Mode
View Day 7 Statistics

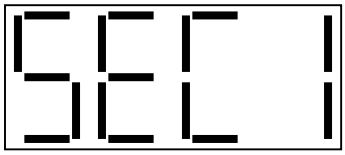


Fig. D61 – Programming Condition
Full Open Length PROPORTIONAL 1

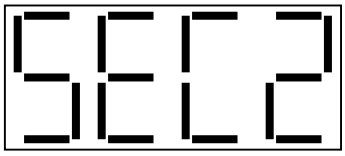


Fig. D62 – Programming Condition
Full Open Length PROPORTIONAL 2

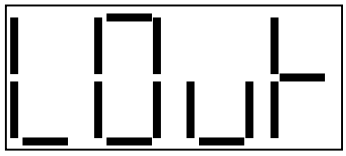


Fig. D63 – Security Option
Keypad Lockout

Fig. D64 – Error Condition
Hardware Error

Fig. D65 – Error Condition
Memory Error

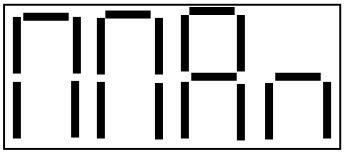


Fig. D66 – Manual Change of Percentage

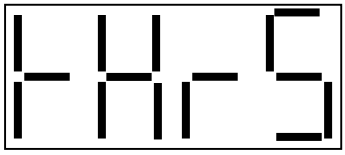


Fig. D67 – Menu Item Threshold

Output Displays

This section will illustrate the output displays of the RWL11X2. Although already covered in Operation Information section, this portion of the appendix will show each in more detail.

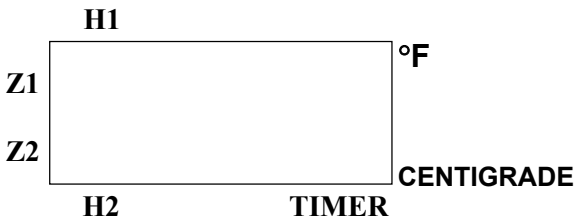


Fig. D60 – Controller Display

Output Indentifiers

Around the outside edge of the display are the output identifiers.

The following table explains what each describes.

Output Identifier	Explanation
Z1	Bar to the left of Z1 identifies Zone one is being viewed.
Z2	Bar to the right of Z2 identifies Zone two is being viewed.
H1	Bar below H1 identifies Heat one on.
H2	Bar above H2 identifies Heat two on.
TIMER	Bar above TIMER indentifies Timer on.
°F	Default temperature of Fahrenheit. Reminder to user temperature readings.
CENTIGRADE	Decimal in lower right corner identifies in Centigrade temperatures.

If there is no bar to the right of Z1 or Z2 then the controller is set for single-zone use.