ARPrv Control v1.0

User Manual
doc-v1.0

Terms -- Conditions & Contact Information

CONTENTS

SAFETY

1.1 Acronyms and Abbreviations

ARP: ARP Control = ARPrv Control
GND: Ground
NC: Normally Closed Relay Contact
NO: Normally Opened Relay Contact
P/N: Part Number
RTD: ARP Control temperature sensor; Resistance temperature detector is the type of sensor used.

1.2 Hazard Information

Hazard information includes terms, symbols and instructions used in this manual or on the equipment to alert operating and service personnel to the recommended precautions in the care, use and handling of the ARP.

1.3 Work Safely

There are many ways to install the ARP. **Make safety your first priority**! The installer's knowledge, skill, and ability are important for safely installing the system. If you are unsure of your ability to do the installation, have a qualified installer do the work.

1.4 Terms & Warnings Symbols

⚠ **DANGER**	Imminent hazards which, if not avoided, will result in serious injury or death.
⚠ **WARNING**	Potential hazards which, if not avoided, could result in serious injury or death.
⚠ **CAUTION**	Potential hazards which, if not avoided, could result in minor or moderate injury.

1.5 Operation Safety

The ARP Control and 'ARPrvSafe' infer that the use and operation of this control can add a level of safety to your absorption refrigeration system in your RV. No other RV absorption refrigerator control monitors the boiler temperature, and turns off the heat source to the refrigerator before damage can be done to the internal fluids in the refrigerator cooling unit. The ARP cannot prevent RV refrigerator failure if the manufacture built the cooling unit in a manner that would result in premature failure.

1.6 ARP Control and your Refrigerator

The ARP Control is designed to work in conjunction with the manufactures safety devices that are presently on your RV refrigerator. Many of the manufactures over temperature devices have proven to turn off the refrigerator unnecessarily, rendering the refrigerator useless. Due to this common complaint, the ARP control can be turned off using the On/Off button. The end user does not need to fear a potential situation where the ARP Control keeps the refrigerator from performing its normal function. Thus, when the ARP Control is off, your refrigerator is still protected by the manufactures safety devices. It is the end user's responsibility to insure that the ARP Control is installed and functioning properly at all times, this includes the state of the control being turned on or off.

⚠ **DANGER** Never remove or bypass any manufacture safety device when installing the ARP Control. Be aware that the ARP Control can be turned off thereby preventing its function. Know and understand you RV electrical system and its integrity for proper ARP Control use. RV electrical systems integrity are complex due to the inclusion of charging systems such as solar systems, generator, inverters and 120VAC chargers just to mention a few sources of electrical disruption that can result in disruption of ARP Control function. Always consult a certified RV repair facility and/or the manufacture of your RV if you are concerned about safety issues.

INTRODUCTION

2.1 How Does the ARP Help

The ARP is a monitoring device for RV refrigerators. The ARP turns off your cooling unit heat source if refrigeration is not taking place. The ARP control will automatically attempt to restart your refrigerator.

2.2 How Does the ARP Work

RV absorption refrigerators work by boiling a fluid mixture that includes water and ammonia. The ammonia turns into a gas that rises and separates from the water mixture. It then condenses into a liquid that flows through the cooling unit tubing. As it does this, it absorbs heat thereby cooling the refrigerator. RV refrigerators are notoriously unsafe when operated off-level or in a variety of temperature and pressure conditions. If

the boiler in your RV refrigerator overheats, the cooling tubes are stressed which may lead to early failure or even a rupture that leads to a fire. The ARP monitors the actual boiler temperature of your RV refrigerator to detect conditions that can be unsafe, and in turn, turn off the boiler heat source to prevent overheating.

2.3 User – Install – Supplement Manuals

Please check the General Install Manual and the Install Supplements for various refrigerators make and model information. The user should read all manuals to fully understand the installation and use of the ARPrv Control.
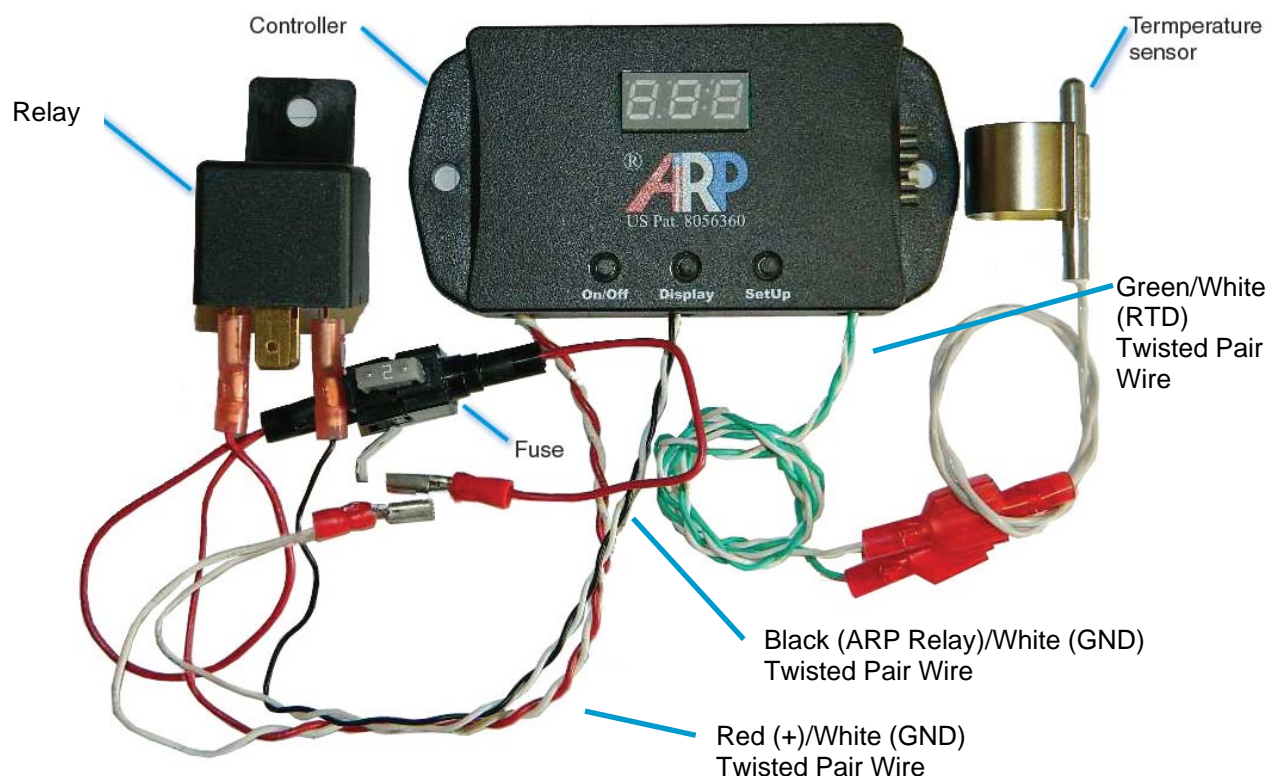
Fig. 1 ARPrv Control Kit

OPERATION
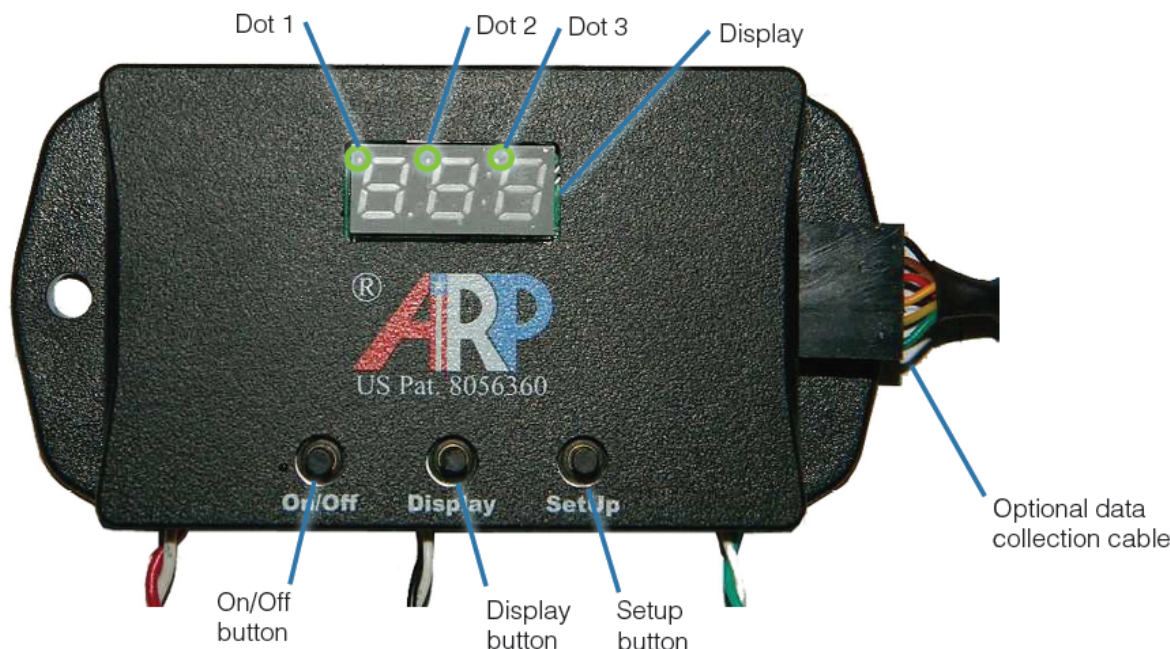
Fig. 2 ARPrv Control Panel

3.1 Initialization of the ARP Controller

You operate the ARP using the buttons on its front panel. Information is displayed using bar and dot LEDs in the display area. Once the ARP has been properly installed, you must test the wiring by activation of the relay and the RTD function as described in sections 3.8 and 3.10. Next, run the ARP Auto Tune function to set the parameters unique to your refrigerator. After setting Auto Tune, there are two set-point methods: EZ Set-Point Method (Control-High) and the operator adjustable Control-Low Set-Point Method, more on these modes in section 3.4 and 3.5.

3.2 Button Sequence & Control Functions

Referencing Fig.2, the ARP has three push buttons. The On/Off button on the left is purely a momentary push-button, where momentary means to press the button and release it immediately. The center Display, and right SetUp buttons are used as both momentary and press-hold buttons depending on the function desired. Please see section 3.12 for details of how to setup the control.

3.3 ARP Control Modes

The ARP has 4 modes of operation which perform different tasks as follows:

1. **ARP Control Mode**: This mode is initiated by momentarily pressing the On/Off button. Within this mode, there are two set-point methods described in sections 3.4 and 3.5.
2. **Recording Mode**: This mode will not activate the ARP relay if there is a boiler over heat situation. This mode is purely for diagnostics. This mode is initiated by holding down the center Display button; momentarily press the On/Off button. When the display shows **SP0**, release the Display button.
3. **Auto Tune Mode**: Defined below in section 3.6.
4. **Set-Up Mode**: This mode is for operator adjustments if the user does not want to run the controller using the EZ Set-Point

Method (Control-High), more on this in section 3.4.

3.4 EZ Set-Point Method (C-H)

After Auto Tune is complete, and the control is in the ARP Control mode, the ARP begins detecting excessive boiler temperatures using default parameters. The default is the EZ Set-Point mode which has a set-point that will prevent damage to the cooling unit and will work with most refrigerator installations, but the refrigerator may have difficulty restarting automatically in this mode. When an excessive temperature is reached, the ARP opens the relay to turn off power, stopping your refrigerator from overheating. After an appropriate cool-down period, the ARP signals the relay to close and the normal refrigerator operation resumes. As a safety measure, the ARP makes 5 consecutive attempts to resume normal operation before locking out the restoration of power to the refrigerator device. At this point you must resolve the conditions that are causing the boiler to overheat.

⚠️ **WARNING** If the ARP attempts to restore the heat source to your refrigerator and fails, the operator must determine if there is an unsafe condition present, and remedy the cause of the unsafe condition. Turning off the ARP and restarting your refrigerator should be preformed by qualified service personal that are capable of dealing with any issues that may arise.

3.5 User Adjustable Set-Point Method (C-L)

This control method is for advanced users that want to fine tune the ARP for their particular refrigerator to achieve its maximum protection. The operator must place the ARP into the Set-Up mode to activate this set-point method. Please see Fig. 3 and the Troubleshooting Guide for more on this subject.

3.6 Auto Tuning

Auto Tune must be run the first time the ARP is powered on, after confirming that the ARP

is functioning correctly. For most installations, Auto Tune will only need to be run once. Each time Auto Tune is run, the previous stored settings will revert to default settings. To Auto Tune the ARP perform the following steps:

1. Level your RV and remain parked during the Auto Tune session. Turn on your refrigerator, and make sure it is functioning properly.
2. Hold down both the Display and Setup buttons and then momentarily press the On/Off button to start the Auto Tune mode.
3. When the ARP front panel displays **At**, release all buttons, Dot1 will flash while recording.
4. Run in the Auto Tune mode for 24 hours. Half of this time the refrigerator should be placed in the LP gas operation mode, and the other half in the 120VAC operation mode.
5. When you are finished running Auto Tune, press the On/Off button. This will turn off the ARP and save all of the parameters.

⚠️ **CAUTION** After running Auto Tune we recommend placing the control in the Set-Up mode. Check the value of AtO variable. If AtO is greater than 250°C (482°F), most likely the RTD has been installed either too close to, or on the flue tube. This will destroy the RTD, please contact technical support for assistance. If the AtO value is greater than 210°C (410°F), please contact technical support for assistance, there may be a problem with your cooling unit, the ARP control can not compensate for any preexisting conditions or faults in your cooling unit. Finally, many fridge installs, such as in slide outs, require fans for proper cooling air circulation. The installer must test and confirm proper cooling air circulation in the cooling unit compartment. If your cooling unit has a factory fan, it must be working properly in order for the ARP Auto Tune process to work properly.

3.7 ARP Control Mode

After running Auto Tune, press the On/Off button again to turn on the ARP Control mode. The ARP automatically defaults to the EZ Set-Point Method after Auto Tune. At this point you are ready to use the ARP if you do not want to change the set-point method to C-L. The ARP is now monitoring the temperature at the sensor location and will open the relay if overheating is detected.

3.8 Displaying Boiler Temperature

The boiler temperature may be displayed on the LED during all modes of operation with the exception of the Set-Up mode. Press and hold the Display button to show the measured boiler temperature. Release the button to turn off the temperature display.

3.9 Displaying Circuit Temperature

When in ARP Control mode, press and hold both the Display and SetUp buttons to show the present circuit temperature. Upon releasing the buttons, the relay will activate, press the SetUp button again to resume ARP Control mode.

3.10 Relay Test

To test the ARP relay, momentarily press the SetUp button while in ARP mode. The display will read **OFF**, and the refrigerator and/or the heat source will be turned off if the control is functioning properly. Press SetUp again to resume normal operation.

3.11 Error Message

Please see the Troubleshooting Guide for ARP display error messages.

3.12 ARP Modes and Button Selection Flow Charts

Fig. 3 is a flow chart that shows the sequence of button press that the operator would use to place the ARP into a particular mode, and then select functions within the selected mode. Within this chart are letters that reference the following notes which further clarify the operation.

ARP Control Mode

(A) When the boiler overheats, the ARP turns off the heat source by activation of the relay. The display shows the present Hold Off period being counted down in minutes. The duration of the Hold Off period is a function of how many times the control has detected an overheat situation.

(B) Once the ARP turns back on the heat source, Dot1 & Dot3 will flash for the duration of the Overshoot period. If the ARP does not detect an overheat situation during the Overshoot period, the control will resume normal operation by displaying the single Dot1.

SetUp Mode

(C) Press the Display button to view the next variable.

(D) To change the value of a variable in the SetUp Mode, hold the SetUp button until the desired value is displayed.

(E) Once the desired value is shown, the value may be stored by holding the Display and SetUp buttons simultaneously, 'StO' will be displayed when the changes are stored successfully .

Button Selection & Modes

ARP Control Mode

Momentarily Press **ON/OFF** Button

LED Briefly Displays **ArP**

1

LED Display Flashes **Dot1**

2

Control Measures Boiler Temperature

Boiler Overheat ? — NO → **1**

YES

(A) Turn off Heat Source

3

Control Measures Boiler Temperature

Heat Source Hold Off Period Display Shows Hold Off Countdown Time in Minutes **010, 009, 008,..,001**

End Hold Off Period ? — NO → **4**

YES

Boiler Temp. Drops ? — NO → Display Time **000** Until Temp. Drop

YES

(B) Restart Heat Source – Over Shoot Period Starts

Over Shoot Period End ? — NO → **Dot1** + **Dot3** Flash - - Elevated Set-Point → **2**

YES → **1**

Recording Mode

Press and Hold **Display** Button + Momentarily Press **ON/OFF** Button

LED Briefly Displays **SP0** **Release All Buttons**

Control Measures Boiler Temperature LED Display Flashes **Dot1**

Auto Tune Mode

Press and Hold **Display** + **SetUp** Button + Momentarily Press **ON/OFF** Button

LED Briefly Displays **At** **Release All Buttons**

Control Measures Boiler Temperature LED Display Flashes **Dot1**

SetUp Mode

Press and Hold **SetUp** Button + Momentarily Press **ON/OFF** Button

LED Alternately Toggles Between **AtO** and the **Value** **Release All Buttons**

Push **Display** Button to Advance Next Variable for Following Sequence **(C)**

(D)

Display Toggles Between **AbS** and the **Value**

Display Toggles Between **tr** and the **Value** → Hold **SetUp** Button Till Zero Is Viewed

Display Toggles Between **SP** and the **Value**

Display Toggles Between **OS** and the **Value** → Hold **SetUp** Button Change Value From 0 - 30°C

Display Toggles Between **OFS** and the **Value**

Display Toggles Between **trP** and the **Value**

Display Toggles Between **OSP** and the **Value** → Hold **SetUp** Button Change Value From 10 – 60 Minutes

Display Toggles Between **C** or **F** and the **Value**

Display Toggles Between **C-H** or **C-L** and the **Value** → Hold **SetUp** Button until Desired Setting Displayed

Display Toggles Between **ItO** and the **Value** → Hold **SetUp** Button Change Value From 0 - 30°C

Display Toggles Between **ItP** and the **Value**

Press **On/Off** Button to Power Off Control after **AbS** has been Displayed

Store Change Press **Display** + **SetUp** Buttons Simultaneously **StO** Displays Release Buttons **(E)**

All Modes

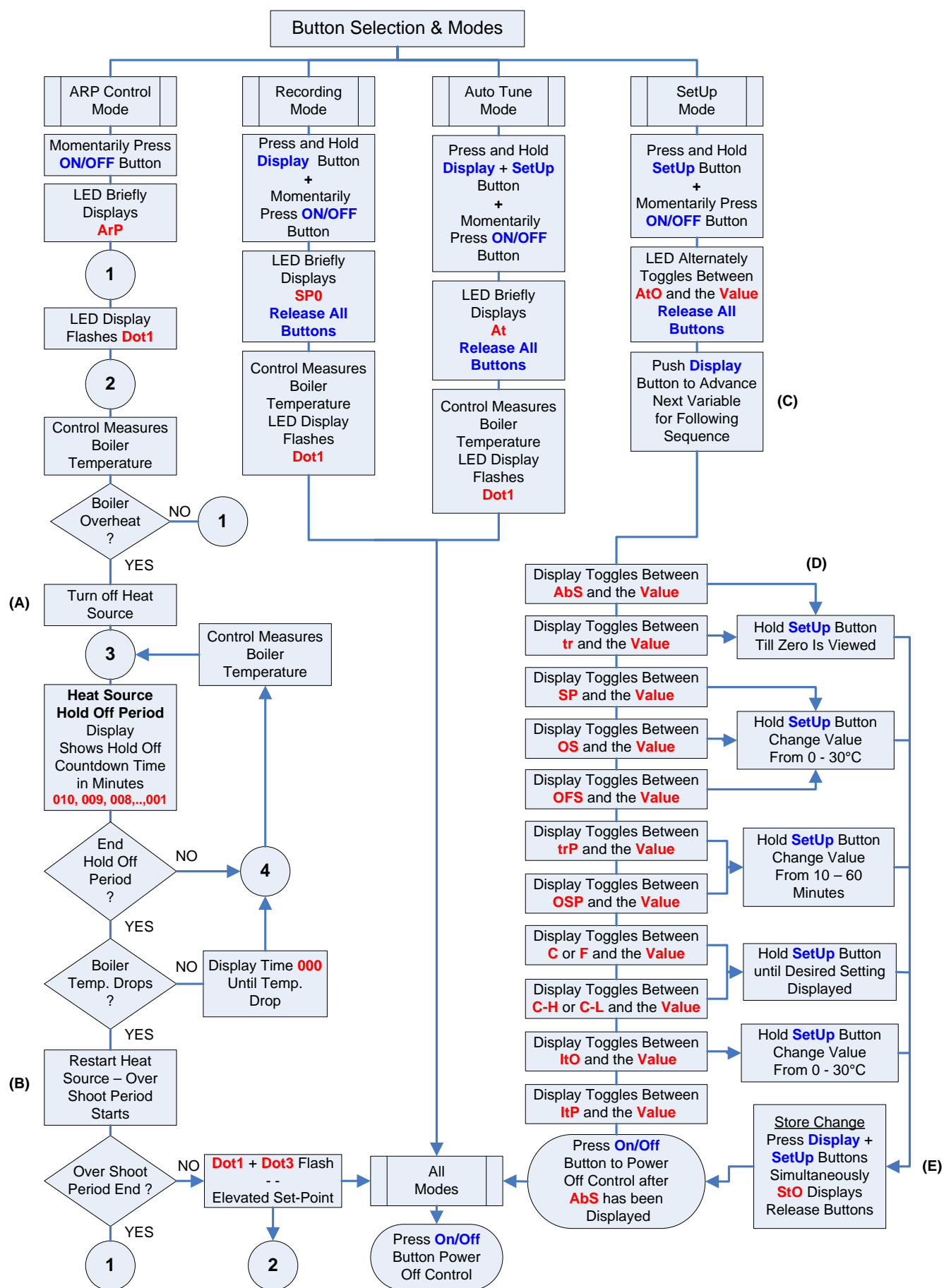Press **On/Off** Button Power Off Control

Fig. 3 ARP Button Flow Chart

3.13 Set-Up Mode Variable Definition

The following table is a quick reference for operators using the Set-Up mode for fine tuning their control. Please see Fig. 3 above for the button sequence and the Troubleshooting Guide, starting at section 6.1, for detailed variable explanations.

LED Display	Meaning	Setting
AtO	Auto Tune Value + SP	**AtO** not operator adjustable, set during Auto Tune Session.
AbS	Absolute Maximum Boiler Temp.	SetUp button resets this value to zero (LED reads **-LO**).
tr	Total Trigger Events	SetUp button resets this value to zero.
SP	Operator Raise Set-Point	SetUp button raises this value to a maximum of 30, then returns to zero.
OS	Over-Shoot Temp. Elevation	SetUp button raises this value to a maximum of 30, then returns to zero.
OFS	LED Temp. Compensation	SetUp button raises this value to a maximum of 30, then returns to zero.
trP	Initial ARP Period (min)	SetUp button changes by a value of 10 minutes to a maximum of 60 minutes, then returns to zero.
OSP	Over-Shoot Period (min)	SetUp button changes by a value of 10 minutes to a maximum of 60 minutes, then returns to zero.
C or F	Display Units - Celsius or Fahrenheit	SetUp button Toggles between Celsius and Fahrenheit.
C-H or C-L	Control High or Control Low	SetUp button Toggles between Default High Set-Point (EZ) or Low Set-Point.
ItO	Internal Temperature Offset	SetUp button raises this value to a maximum of 30, then returns to zero.
ItP	Internal Temperature ABS MAX	Not adjustable, stored and saved permanently.

CONCLUSION

The ARP monitors the absorption refrigerators boiler temperature, and automatically turns on and off the heat source to protect the refrigerator. When the ARP is installed and used properly, it will extend the life of your refrigerator and save energy while improving fire safety.