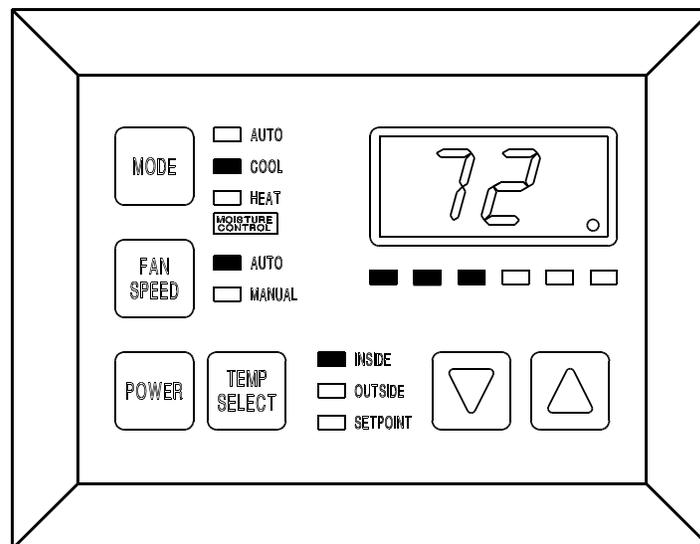# AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

**Aqua-Air Tempwise 2001
Direct Expansion Digital Thermostat**

Operating Manual

Aqua-Air Manufacturing
division of the James D. Nall Co., Inc.

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Tempwise 2001 Direct Expansion Digital Thermostat

Aqua-Air Manufacturing
1050 East 9th Street
Hialeah, Florida 33010 U.S.A.

Contents

The **Tempwise 2001** Control is designed for use with **Aqua-Air** Direct Expansion, reverse cycle Air Conditioning Systems. The **Tempwise 2001** has a universal power supply that operates on 115V or 230V, 50 or 60 Hz AC power. The **Tempwise 2001** includes the following standard and optional features:

Standard Features

User friendly 6 button display panel

Five volt logic and micro controller located in the display

3-digit 7-segment display indicates ⁄F or ⁄C

Paintable Face Plate Cover with recess for matching wall covering insert

Automatic fan speed reduction as set point is approached

Six (6) programmable manual fan speeds

16 programmable parameters for custom installations

AC voltmeter to protect valuable electrical components

High and Low Refrigerant pressure sensor inputs

Moisture Mode for controlling relative humidity

De-Icing cycle to prevent evaporator coil icing

Programmable multiple compressor staging delays

Universal AC power supply

Nonvolatile memory retains settings without batteries

Programmable display brightness control for night use

Optional Features

The following optional items can be added by plugging the device into the appropriate jack and making the necessary programming changes:

> **Outside Air Temperature Sensor - No programming necessary**
>
> **Alternate Air Temperature Sensor - No programming necessary**
>
> **Custom painted display panels**
>
> **Pump Guard water sensor**

This manual is intended to provide information necessary to insure proper installation and operation of the **Tempwise 2001**. Poor installation and/or <u>MISUNDERSTOOD</u> operating parameters will result in unsatisfactory performance and premature failure of the **Tempwise 2001**.

Read This Manual Completely Before Proceeding!

If you require assistance prior to or during the installation of the **Tempwise 2001** call **Aqua-Air** at (305) 884-8363 or Fax your questions to **Aqua-Air** at (305) 883-8549. The **Tempwise 2001** is covered under existing **Aqua-Air Manufacturing** Warranty Policy. Incorrect installation, neglect and system abuse are not covered under **Aqua-Air**'s warranty policy.

> **NOTE**: In order to continually improve the **Tempwise 2001** Control, **Aqua-Air** reserves the right to change this product's basic operation, specifications and design criteria without prior notice.

BASIC OPERATION

The **Tempwise 2001** is a user friendly, easy to operate, programmable temperature control.

• Press the **Power** button once to engage the system. The display indicates room temperature when the system is on and the display is blank when the system is off.

• Press and release the Mode Button until the desired Mode LED is illuminated.

• Set the room temperature by pressing the up or down button. The set point can be viewed by momentarily pressing and releasing the up or down button.

Fan speed operation is automatic. The fan speed decreases as set point temperature is approached. The fan will operate at low speed when set point is satisfied. Manual fan speeds can be selected by pressing the Fan Speed Button and selecting the desired

fan speed. The fan will operate at the speed selected and will not change speeds with room temperature.

The fan can be programmed to cycle on and off with the Heating and Cooling demand. Normally the automatic fan speed operation is reversed in the heating mode, however, the fan speeds can be programmed to operate the same as in the cooling mode.

NORMAL HEATING OR COOLING CYCLE

Select Cool only and cooling only will be supplied. The cabin temperature will be maintained within 2⁄F of the set point. Select Heat only and only heating will be supplied. The cabin temperature will be maintained within 2⁄F of the set point.

Select Automatic and both heating and cooling will be supplied as required. While in the automatic Mode Tempwise 2001 will maintain a two degrees Fahrenheit (2⁄F) temperature variation. A four degree swing is required to cause the unit to shift to the opposite mode. Once in a given mode, heating or cooling, Tempwise 2001 will maintain a two degree differential.

When the Heating or Cooling demand is satisfied, the compressor cycles off and the Automatic Fan returns to low speed. The fan speed will remain constant if Manual Fan Speed has been programmed.

REVERSING VALVE OPERATION

The reversing valve is toggled to the opposite mode when heating or cooling is required to reduce the compressor starting surge. The valve will only toggle to the opposite mode when a cooling or heating cycle is called for and if the system has been off for less than seventy-five (75) seconds. The valve will also toggle if a cycle is interrupted from the display panel by pressing the power button ON/OFF, or changing the set point. Unnecessary valve toggling has been limited to reduce reversing valve noise. Valve toggling can be totally eliminated by programming the minimum compressor staging delay at seventy-five seconds (75) or greater.

Power on reset, which occurs when the system is powered up, will always initiate a valve toggle.

MOISTURE MODE

While in the **On** mode, press the Mode Button until the Moisture Control LED is lit. Every four (4) hours, the fan is started and air circulated for thirty (30) minutes. During this time the air temperature is sampled and entered into memory. The cooling cycle is started and continues until the temperature is lowered 2/F. The system is allowed a maximum of one hour running time to reach the desired temperature. Four (4) hours after the temperature is satisfied or the Cooling Mode times out, the cycle is repeated. During the humidity cycle the water valve LED is lit while the system is cooling.

MEMORY

The **Tempwise 2001** has nonvolatile memory which requires no batteries or any form of backup power. When power is lost the operating parameters are retained indefinitely. When power is restored, the control resumes operating as last programmed. All operating and programming parameters are entered into nonvolatile memory instantly and are retained indefinitely.

OPERATOR CONTROLS AND DISPLAY PANEL

Refer to **Figure 1** for the buttons locations and display functions listed on the following pages.

1. **POWER BUTTON** - The power button is used to toggle between the **On** and **Off** modes. Press the power button once to toggle the unit to the **On** mode. Press the power button again to toggle to the **Off** mode.

2. **FAN SPEED BUTTON** - Press and release the **Fan Button** to advance from auto fan to manual fan. Press and release the fan speed button to advance the manual fan speeds, 1 through 6. Press and release again to return to the automatic fan mode. The selected fan mode is indicated by the auto and manual fan LED's.

3. **UP BUTTON** - Momentarily press the **up button** and the set point will appear in the temperature display. Press and release the up button to increase the set point one degree. The set point Is increased by one degree each time the up button is pressed and released. The highest set point allowed is 85/F. The up button is used with the down button to display the Water In temperature when the control is on. The up button is also used to increase program values in the program mode.

4. **DOWN BUTTON** - Momentarily press and release the **down button** to display the set point. Press and release the down button to decrease the set point. The set point is decreased one degree each time the down button is pressed and released. The lowest set point allowed is 55/F. The down button is used in conjunction with the up button to display Water In temperature when the control is on. The down button is also used to reduce program values in the program mode.

Tempwise 2001 Display Panel
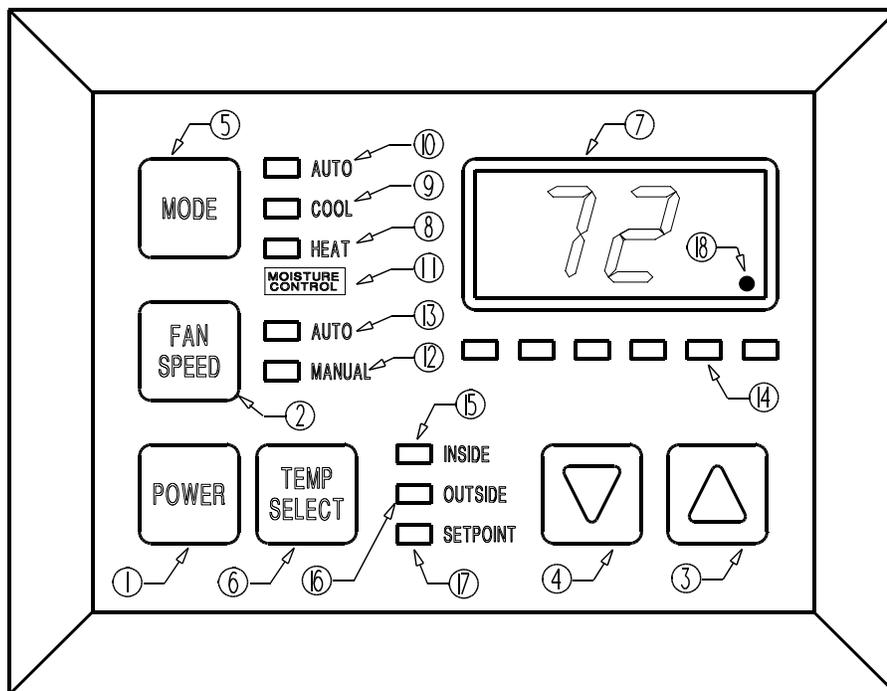
Figure 1: Tempwise 2001 Control Buttons and Indicator Displays

5. **MODE BUTTON** - The mode button is used to select one of the four operating modes. Press and release the mode button and the **Tempwise 2001** will advance to the next mode. Continue to press and release the Mode button until the desired operating mode is reached. The mode selected is indicated by the Mode LED, i.e., Cool, Heat, Automatic or Moisture Mode.

6. **TEMP SELECT BUTTON** - Press and release the Temp Mode Button to view inside air temperature, outside air temperature (optional) or the set point. The appropriate LED, Inside, Outside or Set Point will be lit indicating which temperature is being displayed. If no outside air sensor is installed three (3) dashes will appear in the Three Digit Display.

7. **THREE DIGIT SEVEN SEGMENT DISPLAY** - The inside air temperature is displayed in the window whenever the control is turned on. The three digit 7 segment display provides a readout of the return air temperature. The display also indicates program information, fault codes and outside air temperature when the optional outside air sensor is installed. The display momentarily indicates the set point when the up or down button is pressed. When the control resumes operation after a power interruption all the display LEDs will turn on for one second. This is a normal operating condition and is referred to as "Power On Reset".

8. **HEAT MODE LED** - The heat mode LED will be lit when the Heat Mode has been selected. The heat mode LED is also lit when the optional electric heat is installed and the beat mode is selected. Electric heater status, on or off, is indicated by the right side decimal point (18).

9. **COOL MODE LED** - The cool mode LED will be lit when the Cooling Mode has been selected.

10. **AUTO LED** - The auto LED is lit when the automatic heating or cooling mode has been selected. The control will automatically switch to heating or cooling when this mode is selected.

11. **MOISTURE CONTROL LED** - The moisture mode LED is lit when the Moisture Control has been selected. This mode is used to control humidity during periods when the vessel is unoccupied.

12. **MANUAL FAN LED** - The manual fan LED will be lit when one of six manual fan speeds has been selected.

13. **AUTO FAN LED** - The auto fan LED is illuminated when automatic fan speed operation has been selected.

14. **FAN SPEED BAR GRAPH** - There are six (6) individual fan speed LED's in the Fan Speed Bar Graph. Each LED represents one (1) fan speed. Low fan speed (1) is indicated by illuminating the first LED. High fan speed is indicated by illuminating all six (6) LED's. Any of the six (6) fan speeds available are displayed by illuminating the appropriate LED's.

15. **INSIDE LED** - The inside LED is lit when the inside air temperature is being displayed.

16. **OUTSIDE LED** - The outside LED is turned on when the outside temperature is displayed (optional).

17. **SET POINT LED** - The set point LED is turned on when the set point is displayed.

18. **VALVE LED** - The water valve operating status (Open or Closed) is indicated by turning on the right most decimal point in the 3 Digit Display.

DUAL BUTTON FUNCTIONS

Up & Down Buttons....Press the Up and Down buttons together and the outside air temperature will be displayed, provided the OPTIONAL OUTSIDE AIR TEMPERATURE SENSOR has been installed. No programming is required.

Press the UP & Down Buttons simultaneously, while in the program mode, to set new custom programming defaults.

Power and Down buttons.... Simultaneously press the power and down buttons while viewing the Service Fault History Log clears the Fault History Log.

SPECIAL BUTTON FUNCTIONS

Special button functions are implemented by pressing and holding a particular button while the controls' AC power is turned on.

1. **Service History Log**... View the service history log by pressing and holding the Mode Button while turning on the AC power. Exit the service history log by pressing the power button once. Clear the service history log by simultaneously pressing the power

and down buttons.

2. **Self Test Mode**... Press and hold the power button while AC power is applied to enter the self test mode, The self test is used to diagnose problems and test the air conditioning system. For complete details see page 14 of this manual.

3. **View Hour Meter**... To view the compressor hour meter, press and hold the down button while applying AC power. Maximum recorded time is 10,000 hours. The hour meter stops at maximum (10,000 hrs) and can only be reset by Aqua-Air Manufacturing. The hour meter functions are described fully on page 16 of this manual.

MODES OF OPERATION

Off Mode

When the **Tempwise 2001** is in the **Off** mode, all control outputs are turned off. Program parameters and user settings are saved in nonvolatile memory. The program mode can only be accessed from the **Off** mode.

On Mode

When the control is in the **On** mode, power will be supplied to the appropriate control outputs and the display will indicate the current state of operation. The operating and program parameters resume based on those stored the last time the unit was operating.

Cool Only Mode

When "**Cool**" LED is on, only the cooling systems are selected and operated as required. When the temperature drops below the set point, the system will not automatically switch to the heating mode. Cooling only is available for customers that do not want automatic cooling and heating operation. Systems without reverse cycle heating can have an optional electric heater installed should heating be required.

Heating Only Mode

When the "**Heat**" LED is on, only the heating systems are selected and operated as required. Should the temperature rise above the set point, the system will not automatically switch to the cooling mode. Heating only is supplied for customers that require the system to not automatically switch from the heating to the cooling mode.

Automatic Mode

When the "**Automatic**" LED is on, both heating and cooling are supplied as required. The **heat** and **cool LED's** will be lit according to the mode required. When the system requires compressor operation for heating or cooling, theright most decimal point (18) will turn on when the compressor is On.

Temperature in a given mode will be maintained within two degrees Fahrenheit (2⁄F) of the set point temperature, however, a four degree difference is required to allow the control to change modes. Once in a new mode, the temperature will remain within two degrees Fahrenheit (2⁄F) of the set point.

Moisture Mode

While in the "**On**" mode, press the **Mode** Button until the Moisture Mode LED is illuminated. Every four (4) hours, the fan is started and air circulated for thirty (30) minutes. During this time the air temperature is sampled and entered into memory. The cooling cycle is started and continues until the temperature is lowered 2⁄F. The system is allowed maximum of one hour running time to reach the desired temperature. Four (4) hours after the temperature is satisfied or the one hour timer runs out the cycle is repeated. During the humidity cycle the water valve LED is lit while the water valve is turned on and the system is cooling.

**Automatic Fan Speeds**

Tempwise 2001 has six automatic fan speeds available. Speed six is high, three is medium and one is low or the slowest speed. Automatic fan mode allows the **Tempwise 2001** to determine the required fan speed based on room temperature. The closer the room temperature is to the set point, the slower the fan will run. This permits a balance between the most efficient temperature control and slower, quieter fan speeds. Automatic fan operation is the **factory default**, however, manual fan speed control is available.
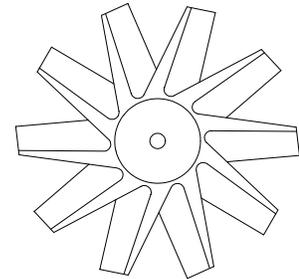
Manual Fan Speeds

Six (6) is the fastest and one (1) represents the slowest fan speed. Manual fan mode allows the user to select and maintain the desired fan speed manually. When a manual fan speed has been selected, the fan speed bar graph will indicate the speed selected by the number of LED's lit. Select speed 3, for Fan Speeds example, and the first 3 LEDs in the fan bar graph will turn on. Manual Fan Mode is sometimes preferred when room temperature is constantly changing due to varying heat loads.
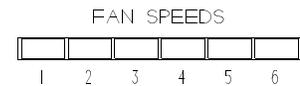
Program Mode Overview

The program mode is used to adjust the systems operating parameters to suit the particular needs of individual users. The program mode is also used to tailor the air-conditioning system for the most efficient operation within an installation. Installation variables such as, ducting, sensor location and system layout affect the perceived operation of the overall system. The program mode allows the system to operate as efficiently as possible under all conditions. The **Tempwise 2001** is shipped with factory programmable default settings which are stored in permanent memory and can be recalled at any time.

Warning

Severe electrical disturbances can sometimes upset the **Tempwise 2001** operating sequences. Operator confusion related to program parameters can also cause what may seem to be operational problems. Whenever there is any doubt as to the proper operation of the controller, Factory Default Parameters should be re-initialized.
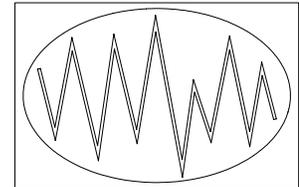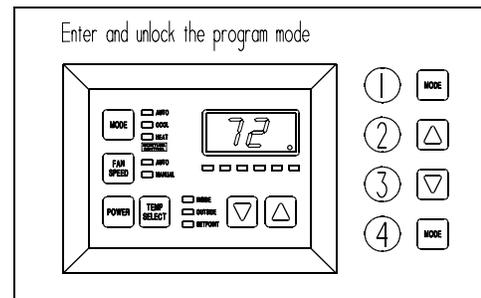
Entering Program Mode

The program mode can only be entered from the off mode. From the off mode and in the following order, press the **Select**, **Up**, **Down** and the **Select** buttons. These buttons have to be pressed and released in the order given. The letter "**P**" appears in the display. The buttons have to be pressed in the sequence described. Remember **"SUDS"**... It's the key to enter and unlock the program mode. The characters "**P**" then "**P1**" followed by the parameter setting, appear in the display. The **Tempwise 2001** control is now in the program mode. Exit the program mode, to the off mode, by pressing and releasing the power button.

NOTE: The control will exit the program mode and return to the "**off**" mode if no programming is attempted for one (1) minute.

Restore Memorized Default Settings

IMPORTANT! The memorized default settings can be restored by entering the software ID program mode and setting P-16 to **rSt**. Exit the program mode and the software version number appears in the display. The memorized default settings are restored and the **Tempwise 2001** control returns to the **off** mode. The software version number is always displayed when you exit the program mode.

Increment from one program parameter to the next by pressing the **Mode Button** while in the program mode. Press and release the Mode Button to advance to the desired parameter. Use the up and down buttons to change the program parameter values. The programmable parameters range from P-1 through P-16.

Up and Down Buttons

The up and down buttons are used to select the data or set the desired limits for the parameter being programmed. This method is followed throughout the **program** mode, however, special instructions are included for individual functions as required.

Exiting the Program Mode

There are two methods to exit the **Program** mode. Press the power button and the **Tempwise 2001** control will return to the **Off** mode. Not pressing any buttons or attempting any program changes for sixty (60) seconds will allow the control to exit the **Program** mode to the **Off** mode. Any programming changes that were made while in the **Program** mode will be memorized and put into operation when the **Program** mode is exited and the control is returned to the **On** mode.

Software Identification

The software version of the control is identified for one (1) second prior to the exit from the program mode. The software identification number, i.e. **"A10"** will appear in the display for one second, then the control will return to the off mode.

Should there be any reason to contact Aqua-Air Manufacturing about the system or programming the Tempwise 2001 be sure to have the software identification number available.

Programmable Parameters

There are eighteen (18) programmable parameter locations with their Factory Default Settings listed in this section. The table below indicates what these parameters are, along with the permitted values and the original Factory Default Settings.

Program Number	Description	Default	Range
P-1	High Fan Speed Limit (arbitrary units)	85	56 - 85
P-2	Low Fan Speed Limit (arbitrary units)	50	30 - 55
P-3	Compressor Staging Time Delay	15	5-135 seconds
P-4	Temperature Sensor Calibration	0	Ambient ± 10⁄F
P-5	Failsafe Modes and Mnemonic High Freon Pressure - - - HPF Low Freon Pressure - - - LPF Low AC line voltage - - - LAC	4 = 4 failures With 90 Second Re-start Delay Manual reset is required	Off 1= Continuous No Display 2= Continuous W/ Display 3 = 4 Failure Reset Required
P-6	Low AC Voltage Cut-Off	85 VAC (115V) 185 VAC (230V)	Off - 75 to 100 (115V Unit) Off - 175 to 200 (230V Unit)
P-7	De-Icing Cycle	0	0 = Off 1 - 3 Minutes
P-8	Pump Sentry ... Protects Pump and Compressor From Loss of Seawater	Off	Off On = Select 100⁄F to 150⁄F
P-9	Display Brightness Control	13 = Maximum	4 = Low 13 = Maximum
P-10	Display ⁄F or ⁄C	⁄F	⁄F = Fahrenheit Displayed ⁄C = Celsius Displayed
P-11	Cycle Pump With Compressor or Continuous Pump Operation	OFF = Cycle with Compressor	OFF = Cycle with Comp. On = Continuous Operation
P-12	Reverse Fan Speeds in Heating Mode	rEF = Reversed	nor = Normal Fan Operation rEF = Reversed in Heating
P-13	Continuous Fan or Cycle Fan on Demand	con = Continuous Fan Operation	CYC = Cycle On Demand con = Continuous
P-14	Reverse Cycle Heating or Electric Heat Only Option Installed (cooling only units)	nor = Reverse Cycle Heat	nor = Reverse Cycle Heat ELE = Elect. Heat Installed
P-15	Fan Motor Type	SP = Shaded Pole	SP = Shaded Pole SC = Split Capacitor
P-16	Reset Memorized Programming Defaults	nor = Normal	nor = Normal rest = Reset Defaults

Should any programming problems or confusion occur, reset the memorized default settings by entering the program mode and setting P-16 to rest.

P-1: High Fan Limit

The upper fan speed limit can be tailored to suit various motors and operating conditions. The high fan limit is adjusted with the system installed and operational. The range of values are 56 through 85 and represent arbitrary units. Setting a higher number, results in a higher fan speed, setting lower numbers, lowers the high fan speed limit. Use the up and down buttons to select the desired high fan speed limit. The factory default setting is eighty-five (85).

P-2: Low Fan Limit

The low fan limit determines the lowest output allowed for the low fan speed. The range of values for the low fan speeds are 30 through 55, in arbitrary units. Use the up and down buttons to select the desired low fan speed limit. Setting a higher number, results in a higher fan speed, setting lower numbers, lowers the low fan speed limit. The factory default setting is 50.

IMPORTANT! Once the high and low fan speed limits are set, the unit will automatically readjust the remaining fan speeds to produce six (6) equally spaced in both the automatic and manual fan speeds modes.

P-3: Compressor Staging Time Delay

The compressor staging delay is provided for installations where more than one system is being operated from the same power source. Setting the staging delays at different intervals allows only one compressor to start at a time. The units should be staged at least five (5) seconds apart. The minimum delay is five (5) seconds and the maximum is one hundred thirty-five (135) seconds. The factory default setting is 15 seconds.

P-4: Temperature Calibration

Use this feature to calibrate the air sensor within a range of $\pm$ ten (10) /F. Enter the program mode and the ambient temperature appears in the display. Use the up and down keys to select the desired offset. The temperature in the display will increase or decrease according to the offset programmed. The factory default setting is zero.

P-5: Fail-safe Level

The system can be configured for one of four fail-safe levels. Selecting **OFF** turns off all

fail-safe protection and mnemonic display codes. Level one (1) shuts down the system, allows the system to restart after a 90 second delay and displays no failure code. Level two (2) shuts down the system allows continual restarts after the 90 second delay and displays the appropriate mnemonic failure code. Level three (3) operates the same as level two with the addition of a system shutdown after four (4) consecutive failures... Manual reset is required to restart the system.

P-6: Low AC Voltage Cut-Off

Tempwise 2001 can be programmed to protect the system against sustained low AC line voltage conditions. The compressor will be shut down and "LAC" flashed in the display if the line voltage goes below the programmed value for more than ten (10) minutes. Programmable values are 75 VAC to 100 VAC for 120 volt units and 175 VAC to 200 VAC for 220 volt systems. The factory default is 85 VAC for 120 volt units and 185 VAC for 220 volt systems. NOTE: Low Voltage Protection can be turned off by programming Off instead of selecting a voltage value.

P-7: De-Icing Cycle

The **Tempwise 2001** is equipped with a De-Icing Cycle to prevent ice build up on the evaporator coil during extended periods of cooling operation. Installation variables such as grille sizes, length of ducting, insulation R factors and ambient temperatures determine the cooling run time required to achieve set point. Customer usage may substantially increase run times by operating the system with the hatches and doors open. Programming unrealistic set point [55' F] and leaving the salon door open will usually cause the evaporator to ice up on warm muggy days.

De-Icing is accomplished by switching the reversing valve into the Heat Mode while the system is cooling. The valve will remain energized for the programmed cycle time. The cycle is programmable from OFF through a period of 3 minutes. The factory default setting is Off.

P-8: Optional Pump Sentry

The **Tempwise 2001** can be equipped with an optional temperature sensor that is used to monitor the condenser coil temperature. The sensor is plugged into the outside air sensor jack and parameter P-8 programmed for a temperature between 100/ and 150/ F depending on sea water temperature and the system type. When the coil temperature rises above the programmed value the pump and compressor are shut down and "PPP"

is flashed in the display. The factory default is Off, no pump sentry installed.

P-9: Display Brightness Control

The display brightness can be adjusted to suit ambient cabin lighting conditions. The allowed settings are four (4) to thirteen (13), with four (4) being the dimmest and thirteen (13) the brightest. Typically a dark cabin will require a setting of four or five. A very bright cabin will require a setting of twelve or thirteen. The factory default setting is thirteen (13).

P-10: Fahrenheit or Celsius Selection

The unit can be programmed to display either Fahrenheit or Celsius. Programming ∕F selects degrees Fahrenheit and programming ∕C displays degrees Celsius. The factory default setting is ∕F, Fahrenheit. When degrees Celsius (∕C) is selected the readings are displayed in tenths, i.e. 22.2∕.

P-11: Cycle Pump With Compressor

To increase pump life and conserve electricity the pump can be programmed to cycle on and off with the compressor. The pump can also be programmed to operate continuously whenever the system is on. To program the pump for continuous operation turn P-11 On. The factory default is **Off**, which cycles the pump with the compressor.

P-12: Reverse Automatic Fan Speeds During Heating

The automatic fan speeds can be reversed during the heating mode to improve personal comfort in cooler climates. The fan speed is decreased as the temperature spread increases. The fan will speed up as the set point is approached. Lowering the fan speed when the cabin is cold raises the supply air temperature. The fan switches to low speed when the set point is satisfied and the water valve cycles off. The fan can be programmed to operate the same as in cooling by programming P12 **nor** which represents normal fan operation during the heating cycle.   The factory default is **rEF**, which reverses the automatic fan speeds during heating.

P-13: Cycle Fan with Compressor

The fan can be programmed to run continuously when the system is on or can be allowed to cycle with the compressor. When cycled with the compressor, the fan will operate only when heating or cooling is called for. To cycle the fan with the compressor select **CYC**

which stands for cycle the fan with the compressor. To operate the fan continuously select **con** which represents continuous fan operation. The factory default is [con] continuous fan operation when the system is on.

P-14: Reverse Cycle or Electric Heat

Units not equipped with reverse cycle heat may have an electric heater added. Electric heat requires the compressor be turned off when heating is called for. The reversing valve output is used to control the optional electric heating element contactor. The valve output relay can only carry 6 amps, therefore, a heavy duty contactor must be installed to carry the heater current. Program parameter **ELE** for the electric heat option. The factory default is **nor** which is normal reverse cycle heating.

P-15: Fan Motor Selection

There are two basic fan motor types, shaded pole (SP) and split capacitor (SC). Each motor reacts differently to speed control and each motor requires different timing for optimum fan speed variation. The default setting is "**SP**" which selects the shaded pole motor type, however, "**SC**" should be selected if a split capacitor type of fan motor is used. **Aqua-Air Manufacturing** supplies shaded pole type fan motors, therefore, the factory default selection is "**SP**".

P-16: Reset Memorized Defaults

The default programming parameters can be reset by entering the program mode and selecting "**rest**". This will restore the programmable parameters to the values selected when the system was shipped. The program parameters listed on page nine may be altered by **Aqua-Air Manufacturing**, the installing dealer or the end user. Once new defaults are entered (see page 7, dual button functions) and memorized the new defaults will be reset. The original factory programmable parameters as listed on page nine (9) will have to be restored manually.

Why Memorize New Defaults?

Once the desired programming changes have been made and the system tests satisfactorily, your work can be saved as the new factory defaults. Your new defaults are initiated by simultaneously pressing and releasing the up and down buttons prior to exiting the program mode. New defaults can be initialized at any time by entering the program

mode and following the above instructions. Once new defaults have been initialized the control will revert back to the new defaults whenever factory defaults are restored as described on page 10 of this manual.

FAIL-SAFE AND FAULT HANDLING CODES

When a fault is detected **Tempwise 2001** will display one of the following Mnemonic fault codes:

HPF...Indicates high Freon pressure. Fifteen (15) second Delay... Ignored in Heat Mode.
LPF...Indicates low Freon pressure. Ten (10) minute charge time delay.
LAC...Indicates low AC line power
AAA...Indicates failed air sensor. Unit will not run until repaired.
PPP...Indicates the sea water pump has failed.

Fail-Safe

There are four levels of fail-safe protection including the fail-safe **off mode.** Level one monitors the sensors, takes appropriate action and allows continuous restarts after a 90 second delay... **Does not display the fault code.** Level two works the same as level one, however, the appropriate fault code mnemonic is displayed during the time-out between restarts. Level three is identical to level two with the inclusion of a three successive failures lockout routine. After four (4) consecutive failures the system is shut down and a manual reset is required.

Lockout

Lockout occurs if P-5 is programmed for level 3 and four consecutive faults are detected within a heating or cooling cycle. Lockout causes the system to shut down and flash the mnemonic fault code. Lockout can only be cleared by turning the unit **off**, then **on** using the **Power** button.

Fault Display

When a fault occurs the appropriate mnemonic code is flashed in the display. The flashing mnemonic can be removed from the display by <u>pressing and releasing</u> the **power button** to reset the control. <u>Resetting the control does not solve the problem that caused the fault!</u>

Failsafe Level	Action	Description of Action Taken
OFF	All Protection Turned Off	FAILSAFE PROTECTION LEVELS TURNED OFF: Air Sensor Fault: Heating/Cooling Immediately Suspended; Normal Operation Not Resumed Until Fault is Cleared. Air Sensor Fault Code "Flashing Display" NO OTHER FAILSAFE PROTECTION PROVIDED.
1	No Mnemonic Fault Code Displayed Continuous 90 Sec. Re-starts Allowed	MINIMUM PROTECTION LEVEL: All Actions Taken in Failsafe Protection Level "0" PLUS: In Addition, Continuous 90 Second Compressor Restarts Allowed. FAULT Mnemonic CODE NOT DISPLAYED NO OTHER FAILSAFE PROTECTION PROVIDED.
2	Display Fault and Shutdown Compressor with continuous 90 Second Delay Between Restarts	INTERMEDIATE PROTECTION LEVEL: All Actions Taken in Failsafe Protection Level "0" & Level "1 " Plus: In Addition the FAULT MNEMONIC CODE Message Will Be Displayed With Continuous 90 Second Compressor Restarts Allowed. NO OTHER FAILSAFE PROTECTION PROVIDED.
3	Display Fault & Require Manual reset after 4 failures	MAXIMUM PROTECTION LEVEL: FAULT CODE MESSAGES ARE DISPLAYED and the Appropriate Action is Taken According to The Problem Encountered. After 4 Consecutive Failures Manual Reset is Required.

AUTOMATED FACTORY-SELF TEST PROGRAM

Self-Test Mode

The **Tempwise 2001** software contains a self-test program to facilitate factory testing of the entire air-conditioning system. Once the self-test mode is activated, the test cycle will continue until the AC power is interrupted or the on/off button is pressed once which returns the system to the off mode.

Activate the self-test by pressing and holding the on/off button while turning on the AC power. Be sure to continue to hold the button until the power on reset is completed. The **Tempwise 2001** is now in the self-test mode.

Once activated the self-test software will continuously execute the following procedure:

  1- Turn on in the heat mode and supply heating for ten (10) minutes.

  2 - Stop heating and run the fan only for five (5) minutes.

  3 - Switch to cooling and continue cooling for ten (10) minutes.

  4 - Stop cooling and run the fan only for five (5) minutes.

  5 - Return to step one (1) and continue until interrupted.

The test mode will continue until the power is interrupted or the test is halted by pressing the on/ off button once.

Service Tools

Hour Meter
Total compressor cycle time is saved in EEPROM every 6 minutes of continuous compressor running time. Cycles less than 6 minutes will be discarded to conserve memory and allow the most flexible hour-meter possible.

To view the hour meter turn off the power at the AC breaker and hold the down button depressed. While depressing the down button, restore AC power. After the Power-On reset routine is complete, the following will appear in the display:

1. The hour meter mnemonic [Hr] is displayed for one (1) second.

2. The display blanks out for one second and then displays the THOUSANDS units for three (3) seconds.

3. The display blanks out for one (1) second and then displays the hours for three (3) seconds.

4. The unit returns to the last operating state before power was removed.

Maximum recorded time is 10,000 hours. The hour meter stops at maximum (10,000 hrs) and can only be reset by Aqua Air Manufacturing.

Service History

Tempwise 2001 will record and remember the last eight (8) service problems or service faults detected. Each time a fault is detected, a one hour timer is started. During that hour the same recurring fault will not be recorded. Should a different fault be detected during that hour, it will be entered into the service history log.

The following events are entered into the service history log:

1. High Freon Pressure
2. Low Freon Pressure
3. Air Sensor Fault
4. Low AC Voltage
5. Pump or Loss of Sea Water Fault

To view the service log turn off the AC power and depress the **Mode** Button. With the **Mode** Button depressed turn on the AC power. Once Power-On reset is completed, the display will flash the most recent mnemonic for the fault detected, followed by the event number. To view the other events detected press either the up or down buttons.

To exit the service history log press the power or the Mode Button or wait 30 seconds without pressing any buttons.

The service log can be cleared by simultaneously pressing the power and down buttons while you are viewing the service log mode.

SPECIAL HARDWARE INSTRUCTIONS

Outside Air Sensor Option

When this option is installed, the outside air sensor is plugged into the **outside air sensor jack** (32) and the feature is ready for use. The outside air temperature can be viewed, during normal operation, by simultaneously pressing the up and down buttons or selecting the Outside LED with the Temp Select Button. No special programming is required for installation of the Optional Outside Air Sensor.

Pump Sentry Option

Tempwise 2001 can be equipped with an optional temperature sensor that is used to monitor condenser coil temperature. The sensor is plugged into the outside air sensor jack and parameter P-8 programmed for a temperature between 100 and 150∕F, depending on the seawater temperature and the system type. When the coil temperature rises above the programmed value the pump and compressor shut down and **"PPP"** is flashed in the display. The Pump Sentry follows the programmed fail-safe protocol as described on page 13 of this manual. The factory default is **Off**, no pump sentry installed.

IMPORTANT! When the Optional Pump Sentry is installed the outside air sensor option is NOT available.

High and Low Freon Pressure Inputs

A three pin Molex jack **JP5** is supplied on the main board for high and low Freon Pressure Inputs. Jumper **JP6** is used to emulate the Low Freon Pressure Switch when it is not installed. Cutting **JP6** when the **Low Freon Pressure Switch** is installed automatically configures the system to monitor the low pressure input.

Bimini Jumpers

The **Tempwise 2001** is equipped with four (4) emergency operation jumpers... Fan, Water Valve, Auxiliary Fan and Heater. Should any of these outputs fall, the output can be forced On by moving the jumper to the position indicated below.

CAUTION! Allowing the **Tempwise 2001** to operate with any or all of the outputs forced **On** while unattended can cause serious damage to the air conditioning system and/or vessel.

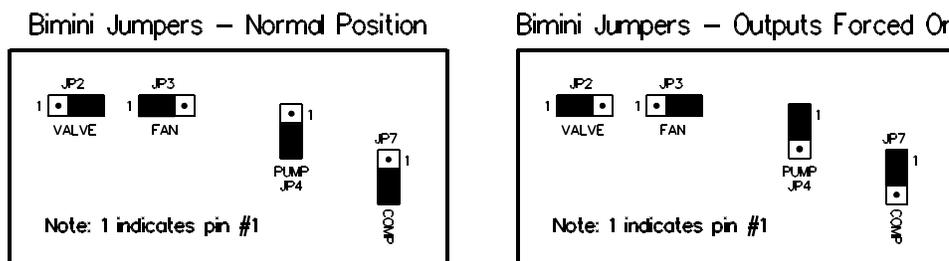*Do not leave the cabin unattended while any of the outputs are forced On.*

Figure 4: Bimini Jumpers Settings

Specifications

```
SET POINT RANGE . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 55/F - 85/F
TEMPERATURE RANGE DISPLAYED  . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0/F - 150/F
SENSOR ACCURACY . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ±2/F @ 77/F
LOW VOLTAGE LIMIT - 115V UNITS  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 75VAC
LOW VOLTAGE LIMIT - 230V UNITS  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 175VAC
LOW VOLTAGE PROCESSOR RESET . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 65VAC
LINE VOLTAGE  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 115 - 230VAC
FREQUENCY . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 50-60 Hz
FAN CIRCUIT RATING  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 6A @ 230V
VALVE CIRCUIT RATING  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1/4A @ 230V
PUMP CIRCUIT RATING . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 6A @ 230V
HEATER CIRCUIT RATING . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 20A @230V
MINIMUM OPERATING TEMPERATURE . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0/F
MAXIMUM OPERATING TEMPERATURE  . . . . . . . . . . . . . . . . . . . . . . . . . . 180/F
MAXIMUM RH CONDITIONS . . . . . . . . . . . . . . . . . . . . . . . . . . 99% non-condensing
POWER CONSUMPTION  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Less than 5 Watts
```

Operating Temperatures

Set Point	55 to 85/F	15.6 to 29.4/C
Display Range	0 to 150/F	-17.8 to 65.6/C
Air Sensor Temperature	0 to 150/F	-17.8 to 65.6/C

Dimensions

Display Panel	5.13"W x 4.125"H
Panel Cut Out	4.56"W x 3.375"H

Cable Lengths[1]

Display	15' std. Optional to 50'
Air Sensor	7' std. Optional to 50'
Water Sensor	7' std. Optional to 50'

System Inputs

Inside Air Temperature Sensor
Water Inlet Temperature Sensor

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[1]**NOTE**: Maximum length of display cable is fifty (50) feet. Sensor cable lengths should be limited to 50 feet. The outside air sensor is an optional item not available on all models and is not included with the standard control package.

Basic System Start-up Problems

PROBLEM	PROBABLE CAUSE	SOLUTIONS
• No lights in the display and the system does not heat or cool. Power on reset does not occur when AC power is applied.	• AC breaker is not turned on or AC power is not available. • Display cable or jacks broken or dirty. • Display cable is improperly assembled. • AC input is less than 75 VAC.	• Check for AC power at circuit breaker. • Check for AC power at module inputs. • Clean all jacks and plugs. • Try another known good display cable. • Check for proper AC and system wiring.
• The system operates but there is no compressor and no heat or cool lights.	• The set point is satisfied.	• Raise or lower the set point to allow the unit to cycle.
• The display toggles between **AAA** and zero (**0**), and the system will not run.	• The air sensor is shorted or the display cable has been shorted or damaged. • The air sensor is open or the display cable is broken.	• Clean all plugs and jacks. • Try an alternate air sensor. • Try a known good display cable. • Check the existing display cable for screws, staples and other damage.
• System displays room temperature but there is no fan or compressor operation.	• Set point is satisfied and P-13 is programmed to cycle the fan on demand. • See page 12 of this manual.	• Raise or lower the set-point temperature to allow the system to cycle on... Check P-13.

• The system runs but there is no cooling or heating, the compressor cycles on and off and eventually the AC breaker trips.	• The seawater valve is closed. • The seawater strainer is clogged. • The seawater pump is air-bound. • The seawater pump is inoperable.	• Open the seawater valve. • Clean the strainer. • Bleed the air from the system. • Check wiring, replace pump if necessary.
• The system operates but the fan does not operate. • The fan runs but only in high speed, lower speeds are not available. • The fan runs very slow and is noisy.	• The fan wiring is incorrect. • Ducting is restricted or fan is miswired or triac has failed in closed mode. • Fan triac has failed or motor is defective.	• Check and correct fan motor wiring. • Check for proper duct sizes, correct any duct restrictions and check wiring. Return the module for fan output triac replacement. • Check fan motor and replace triac or return module for repair or call for service.

Advanced Tempwise 2001 System Problems

PROBLEM	PROBABLE CAUSE	SOLUTIONS
• System runs continuously and is not able to achieve set-point.	• Set-point temperature set too low. • Low Refrigerant charge. • Outside air sensor plugged into the alternate air sensor jack.	• Raise the set point to the 68∥72∕F range. • Add refrigerant as required. • Check the module board and plug the outside air sensor into the proper jack.
• System short cycles and display indicates low temperatures.	• Supply air vent is blowing directly on display face plate.	• Re-direct the air guide vanes, relocate the display or install an alternate air sensor.
• Evaporator coil is icing up during the cooling cycle.	• Duct is restricted. • Set-point temperature is set too low. • Low fan speed is programmed too low... P-2.	• Check and repair ducting • Raise the set point to the 68/72∕F range. • Raise the low fan speed parameter... P-2.
• All eights (888) appear in the display on start-up and the system operates normally.	• Power on reset indicating all LED's are OK and the system is functional.	• This is the normal boot-up routine and occurs when the AC power is first applied.

• The AC breaker trips when switching from shore to ships power. Applies to vessels with two or more staged chillers modules on board.	• Multiple stage chiller compressor time delays are not set, or are all set at he same value.	• Enter the programming mode and set the staging delay at least 5 seconds apart.
• Pump cycles on and off with compressor.	• Normal... The pump is programmed to cycle with compressor. P-11 is programmed Off.	• None required. Normal operation.
• Unit rips the AC breaker during heating but runs fine in cooling mode.	• The compressor is overloaded. This is usually caused by high temperature seawater, low fan speed settings, duct restrictions or a combination of these.	• Raise the low fan speed setting to 49. • Reverse fan speed during heating... P-14 (reF) • Check for proper sizing of grills, duct work.

Tempwise 2001 Stuck Button Chart

Stuck Button	Display Behavior
POWER	Display will indicate "888" on Power-Up and operate in the Self Test Mode from Both the On and Off Modes.
SELECT	The display will enter the trouble log... VIEW HISTORY MODE. The last fault logged will be displayed, whether you are in the On or Off mode. The system will not operate and continue to display the last fault logged.
UP	From the **Off** Mode, the control will reset ("888") and the display will go blank. From the **On** Mode, the display will not reset, ambient temperature is displayed, all outputs work but no buttons work.
DOWN	From the On mode, Displays Compressor Run Time, enters normal operation, all outputs function but no buttons work. From the Off mode, indicates the Compressor Run Time, the Display goes blank and no buttons work.

Tempwise 2001 Display Cable Troubleshooting Guide

Display Problem	Possible Causes
No display and the buttons will not work.	- The cable is assembled backwards. - Pin 1 is open - Pin 3 is open
No buttons, no display but the fan is running.	- Pin 5 is open - Check Bimini jumper for proper location
No relays turning on, display is on, buttons operate and fan is running.	- Pin 2 is open - Pin 1 and Pin 2 are shorted - Pin 4 is open
No fan output.	- Pin 6 is open
All the relays are on, no fan operation and no display.	- Pin 2 and Pin 3 are shorted

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