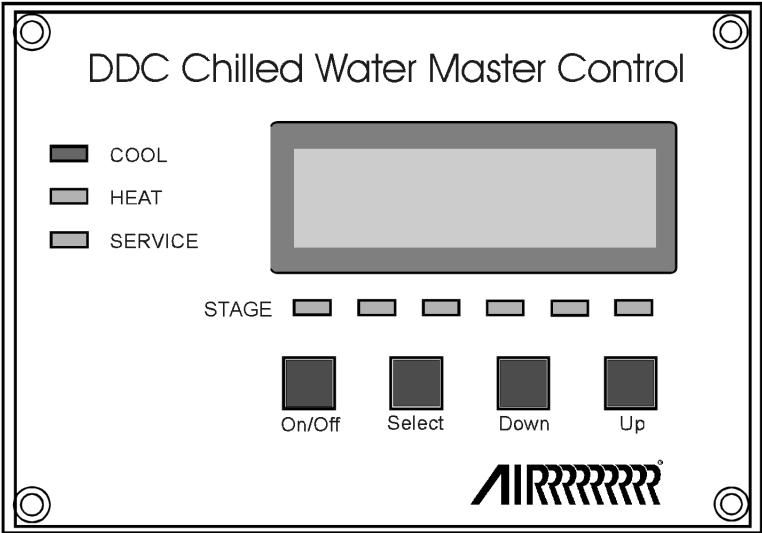


CWMC Chilled Water Master Control

Operations Manual



 **Dometic**[®]

MARINE AIR SYSTEMS[®]


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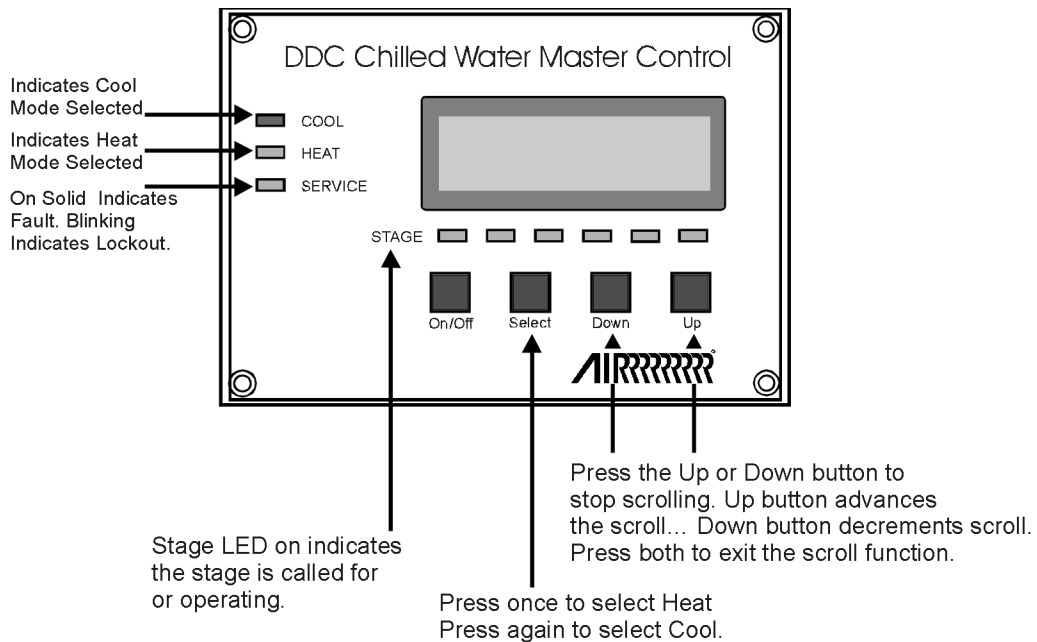
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The PCB is approximately 4 by 4 inches long with the following Input/Outputs (see last page):

1. Six RJ11 I/O jacks allowing interface with six (6) DDC Modules.
2. Two RJ11 display interface jacks supporting two (2) displays
3. Two RJ45 Network interface jacks.
4. One RS 232 serial port direct PC connection.
5. Two 3 pin Molex jacks for optional water supply and suction pressure inputs.
6. One set of alarm output dry contacts NO / NC / COM.

DISPLAY FUNCTIONS



The display is sixteen (16) character by two (2) line, back lit LCD type. The following features are included:

1. Six LED indicators, one for each DDC. Indicates DDC called for (i.e., stage 1, stage 2, etc.)
2. Four mechanical push buttons under sealed membrane.
3. Cooling Mode LED indicates the cooling mode selected
4. Heating LED indicates the heating mode has been selected.
5. Service required LED, on steady when fault is detected, blinks when DDC is locked out on fatal fault.

All error codes, programming information, temperature settings, operating mode, stage or stages in operation and history log are available at the display.

MASTER CONTROL FUNCTIONS

The interface board provides master control of up to six modular chiller assemblies equipped with DDC boards. The following operational protocols are programmed via the CWMC:

1. **BYPASSED STAGES** allows individual stages to be bypassed during normal operation
2. **HEATING STAGES** indicates how many connected modules have heating capability.
3. **HEATING SETPOINT.**
4. **COOLING SETPOINT.**
5. **HYSTERESIS** defines temperature change required to complete a Cycle.
6. **DIFFERENTIAL** temperature change required to start the next stage.
7. **COMPRESSOR** staging delays.
8. **MODE** of operation: on, off, heat, cool or electric heating.
9. **DISPLAY** Fahrenheit or Celsius.
10. **COMPRESSOR GANG STAGING** allows one or more compressors to be used as single stage
11. **SAVE AS DEFAULTS** allows user to save current settings as **NEW DEFAULTS**.
12. **RECALL DEFAULT SETTINGS** allows user to reset current values back to their original default values.
13. **VIEW HISTORY** the user can review last 16 System Faults.
14. **HEAVY LOAD STAGING**, defeats normal staging time delays and temperature settings during periods of heavy heat loads. Compressors will be brought on line with a minimum of 15 second delay when return water exceeds normal setting by 10° F (5.6° C).

BASIC OPERATING INSTRUCTIONS

If your CWMC is connected and operational, the following instructions are all that is required for normal operation.

When the system is off the display reads “SYSTEM OFF”. Press and release the **POWER BUTTON** once to turn the system on. Use the **SELECT BUTTON** to obtain heating or cooling as required. Stages called for are indicated by the stage LED.

The display panel is sixteen (16) characters by two (2) lines backlit LCD type. The back lighting is automatically activated when any button is pressed. Not pressing any buttons for sixty-seconds automatically turns the back lighting off.

When the system is on, the following screens are displayed:

Water temperature IN DDC stage one (1), Water temperature OUT DDC stage one (1).

The **HIGH** and **LOW** Freon pressures are displayed at this point if the optional Freon pressure transducers are installed.

The DDC state and run time hours is displayed next indicating DDC on, off or bypassed.

The display continues to scroll through all the installed stages displaying these same items for each stage.

If any stage is bypassed the display will indicate the STAGE 1, 2, 3, 4, 5 OR STAGE 6 BYPASSED. The stage bypassed message remains in the window for two (2) seconds. Bypassed stages are indicated in numerical sequence.

If stage 2 is bypassed, “STAGE 2 BYPASSED” will be displayed when stage 2 data would be normally displayed.

Once the individual stage data display cycle has been completed, the system WATER IN and WATER OUT temperatures are displayed.

The system’s WATER IN and WATER OUT pressures are displayed at this time if the optional water in water out pressure transducer is installed.

Stop Scroll function... Stop the display from scrolling by pressing and releasing either the up or down button once. The display will stop scrolling at the function where it’s stopped. To move forward through the scroll functions press and release the up button. This moves the display forward one scroll item.

To move backward through the scroll functions press and release the down button. This moves the display backward one scroll function.

Exit the display scroll function by simultaneously pressing the UP and DOWN buttons.

The display will automatically resume normal scroll functions if no buttons are pressed for sixty (60)seconds.

CWMC PROGRAMMING

There are eleven (11) programmable parameters. To enter the program mode turn the system off. With the word “OFF” visible in the display press and release the Select, Up, Down and Select buttons in sequence. Once in the program mode the first item, “BYPASSED STAGES”, appears in the display.

Bypass Stages are selected by pressing and releasing the Down Button. Press and release the Up Button to bypass the selected stage. The position’s dash will change to the bypassed stage number. Exit the bypass window with the desired bypassed stages appearing in the display. If you do not wish to bypass any stages exit the bypass window with no stage numbers indicated. Use the Down Button to remove bypass numbers from the display.

PROGRAMMING TABLE

PARAMETER	DEFAULT	RANGE
BYPASSED STAGES ALLOWS STAGES TO BE SKIPPED	NONE	1-6
HEATERS AVAILABLE	ALL	1-6
HEATING SETPOINT	110°F	95°F To 120°F
COOLING SETPOINT	48°F	42°F To 58°F
HYSTERESIS DEFINES TEMPERATURE CHANGE REQUIRED TO COMPLETE A STAGE'S CYCLE	2°F	1°F To 3°F
DIFFERENTIAL DEFINES TEMPERATURE CHANGE REQUIRED TO START THE NEXT STAGE.	2°F	1°F To 3°F
STAGING DELAY MINIMUM TIME ALLOWED BETWEEN COMPRESSOR STARTS	60 SECONDS	15 TO 200 SEC IN 5 SEC INCREMENTS
SEAWATER PUMP CYCLE USED TO CYCLE THE PUMP ON DEMAND OR RUN CONTINUOUS.	CONTINUOUS	CYCLE OR CONTINUOUS
SYSTEM UNITS	FAHRENHEIT	°C OR °F
COMPRESSOR GANG STAGING ALLOWS ONE OR MORE COMPRESSORS TO BE USED AS SINGLE STAGE	1,1,1,1,1,1	1, 2 OR 3
ZERO WATER PRESSURE TRANSDUCERS	PRESS AND RELEASE UP OR DOWN BUTTON ADVANCES TO NEXT ITEM WHEN COMPLETED	
LOW AC LINE VOLTAGE	OFF	70-100 or 170-200 VAC
SAVE SETTINGS AS NEW DEFAULTS	PRESS AND RELEASE THE UP BUTTON	
RECALL PREVIOUS DEFAULT SETTINGS	PRESS AND RELEASE THE UP BUTTON	
VIEW HISTORY LAST 16 SYSTEM FAULTS	USE THE UP OR DOWN BUTTONS TO SCROLL THRU LOG	

Heaters Available - Identifies how many DDC's have heating capabilities.

Heating Setpoint - Circulating water temperature at which compressor is turned off during heat mode.

Cooling Setpoint - Circulating water temperature at which compressor is turned off during cool mode.

Hysteresis - The change in return water temperature used to determine when each stage should be shut off. This is to be modified such that each stage will have a separate value. When viewing this item the values for all stages are displayed at the same time. Use DOWN button to select stage to be changed and the UP button to change the value.

Differential - The difference in return water temperature and setpoint used to determine when each stage should be started. This is to be modified such that each stage will have a separate value. When viewing this item the values for all stages will be displayed at the same time. Use DOWN button to select stage to be changed and the UP button to change the value.

Staging Delay - Minimum time between the start of two compressors.

Continuous or Cycled Seawater pump - Determines if seawater pump should shut off with compressor when setpoint is satisfied or run continuously while system is on.

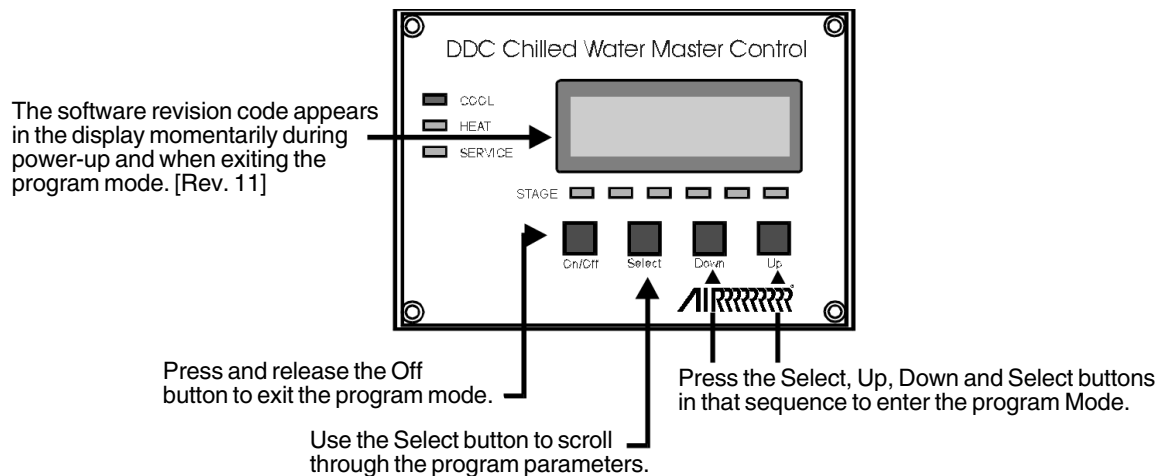
System Units - Fahrenheit/Celsius display of temperatures

COMP/Stage - Allows more than one compressor to be used as a single stage. Normal operation would call for one compressor for each temperature stage yielding six stages. This is displayed as “1 1 1 1 1 1”. As an example if desired a single compressor could be used for the first temperature stage with two compressors used for the second temperature stage and three for the third temperature stage. This would result in three temperature stages and would be displayed as: “1 2 3”. Detection of each DDC to be automatic.

Save as Defaults - Allows user to save current settings as defaults

Program Defaults - Since most chilled water installations are unique, standard factory default settings may not be applicable to all systems. New defaults may need to be programmed according to system requirements. Once the new requirements are programmed, press and release the Mode Button until “SAVE SETTINGS AS DEFAULT” appears in the display. Press the Up Button to save the current settings as the new default settings. The new defaults can be recalled at any time by entering the program mode and selecting the reset parameter.

History Log - Allows user to review last 16 system faults.



Caution! Programming should only be performed by qualified service technicians, consult your Marine Air Systems representative before attempting to make any program changes.

CWMC FAILSAFE PROTOCOL

The DDC software includes a failsafe protocol designed to protect the system while, at the same time, allowing the operational stages to continue cooling or heating. The table below lists the failsafe and the action taken when the fault occurs.

The HIGH LIMIT SENSOR and RETURN WATER SENSOR are connected to stage one. The system cannot operate properly without these sensors.

Fatal faults are defined as four (4) consecutive failures on a stage causing that stage to be locked out. The service light will flash; the display will indicate the fault and lockout condition. Fatal faults are marked with *.

The stage fault can be cleared and restarted by pressing the SELECT BUTTON. Accumulated stage faults are automatically cleared, before fourth fault, if the stage operates four hours (4) without any new faults.

High Freon pressure lockout faults are ignored in the heat mode. The compressor will shut down, the stage delay timer will start when the fault clears and the compressor will start after the stage delay times out

Low Freon pressure fault has a ten (10) minute delay allowing the compressor to come up to normal operating pressures.

<i>DDC Master Control Failsafe Protocol</i>		
<i>Fault</i>	<i>Stage</i>	<i>Action</i>
FREEZE SENSOR	ANY STAGE	COMPRESSOR SHUT-DOWN
HIGH LIMIT SENSOR	ELECTRIC HEAT ONLY STAGE 1	SHUT DOWN ALL STAGES
FLOW SWITCH	ANY STAGE	STAGE SHUT-DOWN
* HIGH PRESSURE SWITCH	ANY STAGE	STAGE SHUT-DOWN
* LOW PRESSURE SWITCH	ANY STAGE	STAGE SHUT-DOWN
* HIGH LIMIT TEMP	ANY STAGE	STAGE SHUT-DOWN
* FREEZE LIMIT	ANY STAGE	STAGE SHUT-DOWN
RETURN SENSOR	ONE REQUIRED INSTALLED ANY STAGE	SYSTEM SHUT-DOWN
STAGE 1 NOT RESPONDING	STAGE ONE	SYSTEM SHUT-DOWN
STAGES NOT RESPONDING	STAGES 2 THRU 5	COMPRESSOR SHUT-DOWN
LOW AC	ANY STAGE	STAGE SHUT-DOWN

SPECIAL INSTRUCTIONS

Since all the systems critical components are connected to stage one, the entire system is shut down when stage one fails to communicate with the CWMC.

The seawater pump, chillwater pump, inlet water and outlet water sensor must be connected to stage one DDC. Stage one (1) is defined by plugging the assigned DDC module into number one location on the CWMC board.

The water outlet temperature is acquired via the freeze-stat sensors.

Stage one compressor can be bypassed, however, stage one (1) will continue to operate the systems critical components.

Optional items are plug and play. When optional items are connected, the display immediately begins reporting the new data. For example: plug in the optional high and low Freon pressure transducers and the Freon pressure data will begin to appear in its predetermined scroll locations.

When a stage is bypassed the staging temperature and staging delay are automatically adjusted so there is neither a timing nor temperature gap. The next stage in line assumes the bypassed stage's timing and staging temperature.

After a fault, the stage on which the fault occurred will be shut down. If other compressors are available for use; the next compressor in connection order will be started. If all other compressors are already running then the compressor just shut down will be restarted after one staging delay interval has timed out. If four faults occur on the same compressor that compressor will be locked out until reactivated from the display.

Use the standard bypass method to deselect heater stages that are not installed.

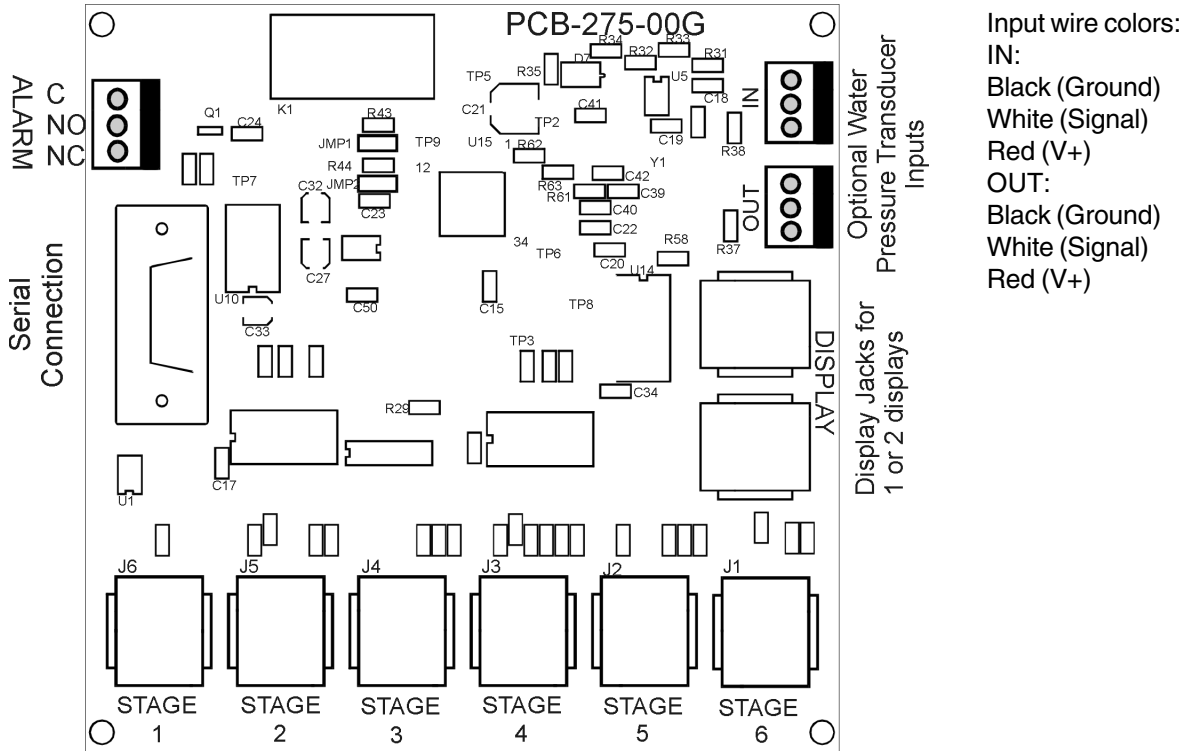
Electric heaters should be installed starting with stage one, then stage two, etc.

NOTE: All interconnecting cables are reverse connection format.

OPERATION THUMB NAIL

When the return water temperature is more than the programmed differential away from the setpoint, the number of compressors/heaters called for in the Stage Ganging parameter will be turned on at intervals controlled by the Staging Delay time. As the return water temperature approaches the selected setpoint, the hysteresis and differential will be used to determine when each stage is to be turned off. More than one compressor can be turned off at the same time based on how many compressors were in use for the last stage running and the change in return water temperature. Compressors shall be shut down in the order of longest running first.

PCB INPUT/OUTPUTS



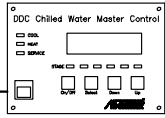
Stages 1 through 6 connect, as required, to DDC modules with 8 conductor data cable.

CWMC-OTS SYSTEM HOOK-UP DIAGRAM

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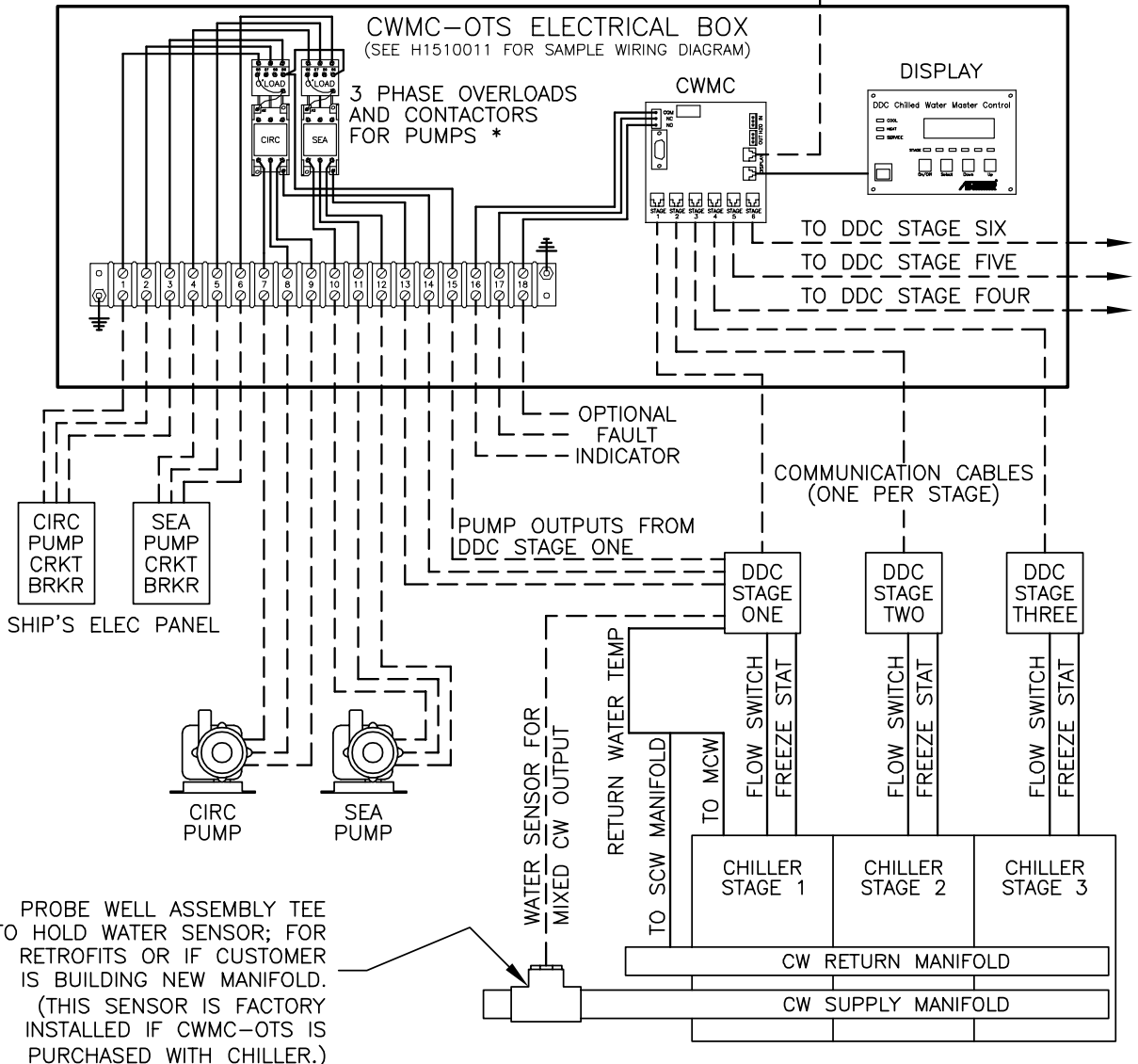
REV	DATE	REVISION DESCRIPTION	DWG	APR

OPTIONAL SECOND DISPLAY



COMMUNICATION CABLE

NOTE: THIS DIAGRAM IS MEANT AS A SAMPLE SYSTEM SCHEMATIC ONLY. SEE UNIT & SYSTEM SPECIFIC WIRING DIAGRAM(S) FOR DETAILED ELECTRICAL CONNECTIONS.



PROBE WELL ASSEMBLY TEE TO HOLD WATER SENSOR; FOR RETROFITS OR IF CUSTOMER IS BUILDING NEW MANIFOLD. (THIS SENSOR IS FACTORY INSTALLED IF CWMC-OTS IS PURCHASED WITH CHILLER.)

FIELD WIRING - - - - -

* OVERLOADS ARE FOR 3-PHASE PUMPS ONLY; SINGLE PHASE PUMPS HAVE INTERNAL OVERLOADS.

Dometic Corporation		Marine Air	
Chilled Water Master Control Off-The-Shelf			
CWMC-OTS Sample Installation Diagram			
DATE: 5-10-04	DWG BY: DKM	PART NUMBER: 0	REV: 0.1
SCALE: NTS	APR BY: JES	N/A	DWG H1580002



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