AQUAIR

MARINE AIR CONDITIONING SYSTEMS

INSTALLATION
OPERATION
MAINTENANCE

NAVALEX
GPA 330 55MT TOWBOAT
FOR ACP
18 TON CHILLWATER SYSTEM (UNRACKED)
09101901

Chillwater Equipment

AQUA-AIR MANUFACTURING JAMES D. NALL CO.,INC.

EQUIPMENT LISTING 09101901

COMPANY: NAVALEX DATE: 09/13/10

YACHT DESCRIPTION: GPA 330 55MT TOWBOAT FOR ACP

NOTES: CHILLER POWER INPUT 460/3/60 FAN COILS 115/1/60

REV 3: 4-28-10

PILOTHOUSE	1

3.0	BTW-36	HORIZONTAL//VERTICAL FAN COIL CHILLWATER 1200 CFM 115/1/60
3.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

CAPTAIN	2

1.0	AQOCW-16	FAN COIL 16000 BTUH 115-1-60
1.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

ENGINEER	3

2.0	AQOCW-12	FAN COIL 12000 BTUH 115-1-60
2.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

CONFERENCE ROOM	4

1.0	AQOCW-18	FAN COIL 18000 BTUH 115-1-60
1.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

FLEET D'HEAD//LOBBY	5

1.0	AQOCW-18	FAN COIL 18000 BTUH 115-1-60
1.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

PORT HEAD//MESS	6

2.0	AQOCW-18	FAN COIL 18000 BTUH 115-1-60
2.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

GALLEY	7

1.0	AQOCW-16	FAN COIL 16000 BTUH 115-1-60
1.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

CREW CHANGE ROOM	8

3.0	AQOCW-18	FAN COIL 18000 BTUH 115-1-60

COMPANY: NAVALEX DATE: 09/13/10 Page 2

YACHT DESCRIPTION: GPA 330 55MT TOWBOAT FOR ACP

CREW CHANGE ROOM	8

3.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

EOS	9

1.0	AQOW-10	FAN COIL 10000 BTUH 115-1-60
1.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

WORKSHOP	10

1.0	BTW-24	FAN COIL 24000 BTUH 115-1-60
1.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

CHILLER	11

1.0	221416-08	FLOW SWITCH BRASS/SS 1/2" NPT
3.0	A6GE-115	ALPHA CHILLER 6 TON COOL ONLY w/R407C 115V CC 460/3/60
1.0	AQCWP-03	REMOTE PANEL 3 UNIT CL 115V
1.0	AQP6RE-115	PUMP RELAY 6 STATION 380-460/3 w/115V CONTROL CIRCUIT
2.0	CD100B-49-15F	PUMP 1-1/2 HP 230-460/3/60 220-380/3/50
1.0	PR-103	PUMP RELAY 3P 30A MAX. 115V CC
2.0	STN-100	THERMOMETER W/BRASS WELL 30-180 deg F.
1.0	WMK-1	CHILLWATER MAKE UP KIT UP TO 20 TONS

RESERVE THERMOSTATS	12

13.0	TSVW	SAPPHIRE DIGITAL TSTAT KIT-CW

AQUA AIR MANUFACTURING — JAMES D. NALL CO., INC.

AMPERAGE DRAW REPORT 09101901

COMPANY: NAVALEX — DATE: 09/10/10

AREA	UNIT	QTY	AMPERAGE	WATTS	TOTAL AMPS 460-3	TOTAL AMPS 115-1	TOTAL WATTS THIS ITEM
01	BTW-36	3	5.2	622		15.6	1866
02	AQOCW-16	1	4.0	460		4.0	460
03	AQOCW-12	2	2.7	311		5.4	622
04	AQOCW-18	1	6.7	771		6.7	771
05	AQOCW-18	1	6.7	771		6.7	771
06	AQOCW-18	2	6.7	771		13.4	1542
07	AQOCW-16	1	4.0	460		4.0	460
08	AQOCW-18	3	6.7	771		20.1	2313
09	AQOW-10	1	3.0	345		3.0	345
10	BTW-24	1	5.4	622		5.4	622
11	A6GE-115	3	6.6	4220	19.8		12660
11	CD100B-49-15F	2	2.9	1334	5.8		2668

UNIT	LOAD TYPE
FAN COILS	COOLING & HEATING
DUCT HEATERS	HEATING ONLY
BLOWER HEATERS	HEATING ONLY
CHILLER UNITS:	
COOLING ONLY	COOLING ONLY
REVERSE CYCLE	COOLING & HEATING
PUMPS:	
CHILLWATER	COOLING & HEATING
SEAWATER	WHEN CHILLERS ARE ON
IMMERSION HEATERS	HEATING ONLY

AQUA-AIR MANUFACTURING JAMES D. NALL CO., INC.

SYSTEM WEIGHT REPORT 09101901

COMPANY: NAVALEX DATE: 09/13/10

AREA	PART NUMBER	QTY	DESCRIPTION	WEIGHT LBS	WEIGHT KGS
01	BTW-36	3	HORIZONTAL//VERTICAL FAN COIL CHILLWATER 1200 CFM 115/1/60	96.56	43.89
	TSVW	3	SAPPHIRE DIGITAL TSTAT KIT-CW	12.62	5.74
02	AQOCW-16	1	FAN COIL 16000 BTUH 115-1-60	32.00	14.54
	TSVW	1	SAPPHIRE DIGITAL TSTAT KIT-CW	4.20	1.91
03	AQOCW-12	2	FAN COIL 12000 BTUH 115-1-60	64.00	29.09
	TSVW	2	SAPPHIRE DIGITAL TSTAT KIT-CW	8.41	3.82
04	AQOCW-18	1	FAN COIL 18000 BTUH 115-1-60	33.00	15.00
	TSVW	1	SAPPHIRE DIGITAL TSTAT KIT-CW	4.20	1.91
05	AQOCW-18	1	FAN COIL 18000 BTUH 115-1-60	33.00	15.00
	TSVW	1	SAPPHIRE DIGITAL TSTAT KIT-CW	4.20	1.91
06	AQOCW-18	2	FAN COIL 18000 BTUH 115-1-60	66.00	30.00
	TSVW	2	SAPPHIRE DIGITAL TSTAT KIT-CW	8.41	3.82
07	AQOCW-16	1	FAN COIL 16000 BTUH 115-1-60	32.00	14.54
	TSVW	1	SAPPHIRE DIGITAL TSTAT KIT-CW	4.20	1.91
08	AQOCW-18	3	FAN COIL 18000 BTUH 115-1-60	99.00	45.00
	TSVW	3	SAPPHIRE DIGITAL TSTAT KIT-CW	12.62	5.74
09	AQOW-10	1	FAN COIL 10000 BTUH 115-1-60	26.00	11.81
	TSVW	1	SAPPHIRE DIGITAL TSTAT KIT-CW	4.20	1.91
10	BTW-24	1	FAN COIL 24000 BTUH 115-1-60	24.02	10.91
	TSVW	1	SAPPHIRE DIGITAL TSTAT KIT-CW	4.20	1.91
11	221416-08	1	FLOW SWITCH BRASS/SS 1/2" NPT	0.30	0.13
	A6GE-115	3	ALPHA CHILLER 6 TON COOL ONLY w/R407C 115V CC 460/3/60	495.00	225.00
	AQCWP-03	1	REMOTE PANEL 3 UNIT CL 115V	2.00	0.90
	AQP6RE-115	1	PUMP RELAY 6 STATION 380-460/3 w/115V CONTROL CIRCUIT	5.00	2.27
	CD100B-49-15F	2	PUMP 1-1/2 HP 230-460/3/60 220-380/3/50	80.00	36.36
	PR-103	1	PUMP RELAY 3P 30A MAX. 115V CC	5.00	2.27
	STN-100	2	THERMOMETER W/BRASS WELL 30-180 deg F.	1.00	0.45
	WMK-1	1	CHILLWATER MAKE UP KIT UP TO 20 TONS	10.00	4.54
12	TSVW	13	SAPPHIRE DIGITAL TSTAT KIT-CW	54.72	24.87

COMPANY: NAVALEX DATE: 09/13/10 Page 2

AREA	PART NUMBER	QTY	DESCRIPTION	WEIGHT LBS	WEIGHT KGS
			TOTAL SYSTEM WEIGHT	1225.97 LBS	557.26 KGS

SPARE PARTS LISTING
FOR QUOTE 09101901
09/10/10

ASSEMBLY	PART NUMBER	DESCRIPTION
221416-08	221416-09	SWITCH -REED FOR 221416-08
A6GE-115	13600-A6T	CONDENSER ASSM. A6 W/TURBOTEC
	203720-02	COMP SCROLL 72 KBTU 460-3-60 COPELAND ZR72KCE-TFD-250
	205112-17	CONTACTOR 3P 17A 115V COIL ABB
	206610-01	DRIER 1/2 ODF-5/8 OD-EK084S SINGLE FLOW
	222102-00	THERMOSTAT AQ-30,AQF(H)-16~36
	222118-01	DIGITAL TEMP CONTROLLER 1 STG SINGLE SENSOR INPUT
	CHA-06-38	PLATE CH ASSM. A6 COOL ONLY
AQCWP-03	140904-00	FUSE HOLDER AQP8R 20A RATING
	141215-10	FUSE 10 AMP FOR AQP8R
	212211-00	LIGHT BLUE 115V 5/16" AQCWP, G4, AQSD3 SERIES
	212213-00	LIGHT AMBER 115V 5/16" AQCWP, G4, AQSD3 SERIES
	221422-00	TOGGLE SWITCH DPST 15A AQCWP
AQOCW-12	140354-00	MOTOR AQC(W), AQOC(W)-12,16 use with 500091-00 belly band
	VA5-115	POP TOP VALVE ASSM 5/8" 115V
AQOCW-16	140354-00	MOTOR AQC(W), AQOC(W)-12,16 use with 500091-00 belly band
	VA5-115	POP TOP VALVE ASSM 5/8" 115V
AQOCW-18	212681-20	MOTOR 1/5HP 3 SPD 115-1-60 1050 RPM 1/2"x4-1/8" 5" DIA
	VA5-115	POP TOP VALVE ASSM 5/8" 115V
AQOW-10	120510-00	BLOWER MTR ASSY AQO-10,12
	207021-00	CHILLWATER COIL 10000 btu
	218629-02	BOLT 1/4-28x3/8" ALLEN SOCKET STEEL w/ BRASS TIP
	224600-51	WASHER #10 FLAT 3/4"OD SS
	VA5-115	POP TOP VALVE ASSM 5/8" 115V
AQP6RE-115	205101-00	CONTACTOR 3 POLE 30A 115V
	217019-00	CIRCUIT BRD ONLY FOR AQP6R RLY
BTW-24	201204-00	BLOWER HOUSING PLASTIC C/W
	201205-00	BLOWER WHEEL ALUMINUM/STL HUB 5.75"d x 5.875"w 1/2" BORE CW
	212626-00	MOTOR 1/15 HP 3spd 5" DIA 115-1-60 8"x1/2"x8" 1000 RPM
	CCA-BTW-24	C/W COIL ASSEMBLY BTW-24 115V
	VA5-115	POP TOP VALVE ASSM 5/8" 115V

SPARE PARTS LISTING
FOR QUOTE 09101901
09/10/10

ASSEMBLY	PART NUMBER	DESCRIPTION
BTW-36	201204-00	BLOWER HOUSING PLASTIC C/W
	201205-00	BLOWER WHEEL ALUMINUM/STL HUB 5.75"d x 5.875"w 1/2" BORE CW
	212626-00	MOTOR 1/15 HP 3spd 5" DIA 115-1-60 8"x1/2"x8" 1000 RPM
	CCA-BTW-36	C/W COIL ASSEMBLY BTW-36 115V
	VA5-115	POP TOP VALVE ASSM 5/8" 115V
CD100B-49-15F	212641-00	MOTOR 1-1/2 HP 230-460/3 E100-150BD, CD100B-*-15F
	216513-00	BUNA SEAL C,E,F SERIES PUMPS
	216526-00	HEAD GASKET E100,RC300
	216570-01	VOLUTE, BRONZE FOR CD100B PUMP
	216570-06	SHAFT W/ SET SCREWS CD100B
	216570-49	IMPELLER CD100B 4.94"
	AQA-501N	SEAL KIT CD100B PUMPS w/ TYPE 21 SEAL - NEW w/ O-RING
PR-103	140412-68	CAPACITOR .56 mf 400VDC
	205120-15	MINI CONTACTOR 4P 115V COIL 12A RESISTIVE, 6.8A INDUCTIVE
STN-100	STN-100	THERMOMETER W/BRASS WELL 30-180 deg F.
TSVW	SENSOR-07	SENSOR AIR/WATER 7' TW2, TSV & HYDRO
	TSV-01	SAPPHIRE DISPLAY HEAD ONLY
	TSVW-PCB	SAPPHIRE DIGITAL TSTAT-CW
	TWSDC-15	SAPPHIRE DISPLAY CABLE 15'
WMK-1	EXT-442	EXPANSION TANK 8"x13"
	PRG-100	PRES.GAUGE 1/4"0-30 PSI 2"FACE
	PRV-329	PRESSURE REDUCING VALVE 1/2"

AQUA-AIR MANUFACTURING, division of the JAMES D. NALL CO.,INC.
1050 East 9th Street Hialeah, Florida 33010 U.S.A.
Phone: 305-884-8363 Fax: 305-883-8549

Chillwater Fan Coils

AQUA-AIR MANUFACTURING JAMES D. NALL CO.,INC.

FAN COIL LISTING FOR QUOTE 09101901

COMPANY: NAVALEX DATE: 09/10/10 Page 1

YACHT DESCRIPTION: GPA 330 55MT TOWBOAT FOR ACP

NOTES: CHILLER POWER INPUT 460/3/60 FAN COILS 115/1/60

REV 3: 4-28-10

AREA NO. & DESCRIPTION	QTY	MODEL NUMBER	FAN COIL DESCRIPTION
1 PILOTHOUSE	3	BTW-36	HORIZONTAL//VERTICAL FAN COIL CHILLWATER 1200 CFM 115/1/60
2 CAPTAIN	1	AQOCW-16	FAN COIL 16000 BTUH 115-1-60
3 ENGINEER	2	AQOCW-12	FAN COIL 12000 BTUH 115-1-60
4 CONFERENCE ROOM	1	AQOCW-18	FAN COIL 18000 BTUH 115-1-60
5 FLEET D'HEAD//LOBBY	1	AQOCW-18	FAN COIL 18000 BTUH 115-1-60
6 PORT HEAD//MESS	2	AQOCW-18	FAN COIL 18000 BTUH 115-1-60
7 GALLEY	1	AQOCW-16	FAN COIL 16000 BTUH 115-1-60
8 CREW CHANGE ROOM	3	AQOCW-18	FAN COIL 18000 BTUH 115-1-60
9 EOS	1	AQOW-10	FAN COIL 10000 BTUH 115-1-60
10 WORKSHOP	1	BTW-24	FAN COIL 24000 BTUH 115-1-60
	16	TOTAL FAN COIL QUANTITY	

AQUA-AIR MANUFACTURING JAMES D. NALL CO.,INC.

FAN COIL GRILLE SIZES FOR QUOTE 09101901

COMPANY: NAVALEX DATE: 09/10/10

YACHT DESCRIPTION: GPA 330 55MT TOWBOAT FOR ACP

NOTES: CHILLER POWER INPUT 460/3/60 FAN COILS 115/1/60

REV 3: 4-28-10

AREA NO. & DESCRIPTION	QTY	MODEL NUMBER	RATED CFM	RETURN IN²	RETURN CM²	SUPPLY IN²	SUPPLY CM²
1 PILOTHOUSE	3	BTW-36	1200	360	2322	240	1548
2 CAPTAIN	1	AQOCW-16	533	144	929	72	464
3 ENGINEER	2	AQOCW-12	400	120	774	60	387
4 CONFERENCE ROOM	1	AQOCW-18	600	156	1006	78	503
5 FLEET D'HEAD//LOBBY	1	AQOCW-18	600	156	1006	78	503
6 PORT HEAD//MESS	2	AQOCW-18	600	156	1006	78	503
7 GALLEY	1	AQOCW-16	533	144	929	72	464
8 CREW CHANGE ROOM	3	AQOCW-18	600	156	1006	78	503
9 EOS	1	AQOW-10	333	100	645	48	309
10 WORKSHOP	1	BTW-24	800	240	1548	160	1032

ALL GRILLE SIZES BASED UPON A 65% OPEN AREA

AQUA-AIR
MARINE AIR CONDITIONING SYSTEMS

CHILLWATER FAN COIL AQOW

FEATURES

- High capacity squirrel cage blower is designed for quiet operation with flexible duct systems.
- Standard flexible duct connector installed on the unit. This connect also adapts to Aqua-Air AT series adapter duct tees.
- Three way motorized water valve is pre-installed on the unit. A separate valve assembly is not necessary.
- Dual condensate outlets on the drain pan are factory connected into a common 1/2" hose barb tee for ease of installation.
- Vertically adjustable mounting legs with rubber vibration pads and mounting screws.
- The air bleeder is mounted on the end of a 12" plastic tube for easy access during commissioning of the system.
- All surfaces that might have condensate form on them are covered in 1/8" thick foam insulation.
- Units available for 115/1/60, 100/1/50, 208-230/1/60 and 200-220/1/50 power inputs.
- Aqua-Air BH series blower heaters bolt directly to the discharge of the blower.

SPECIFICATIONS		AQOW-05		AQOW-07		AQOW-10	
COOLING CAPACITY		5,000 BTU/HR 1,260 KCAL/HR		7,000 BTU/HR 1765 KCAL/HR		10,000 BTU/HR 2,520 KCAL/HR	
AIR FLOW CAPACITY		135 CFM	230 M^3H	270 CFM	460 M^3H	330 CFM	560 M^3H
WEIGHT		14 LBS	6.4 KG	17 LBS	7.7 KG	26 LBS	11.8 KG
WIDTH	A	15-1/8"	384mm	14-1/2"	368mm	16"	406mm
LENGTH	B	13-3/8"	340mm	14-1/2"	368mm	14-3/8"	365mm
HEIGHT	C	12"	305mm	12-7/8"	327mm	14-1/4"	362mm
AIR DISCHARGE	D	7-3/4"	197mm	8-7/8"	225mm	8-1/2"	216mm
CENTER LINE	E	2-3/4"	70mm	2-7/8"	73mm	2-7/8"	73mm
AMP DRAW 115 / 230		2.0	1.0	2.0	1.0	3.0	1.5
POWER, WATTS		127		127		190	
MIN RETURN AIR		64 in^2	413 cm^2	72 in^2	465 cm^2	100 in^2	645cm^2
MIN SUPPLY AIR		32 in^2	207 cm^2	40 in^2	258 cm^2	48 in^2	310 cm^2
CHILLWATER IN / OUT		5/8"	16mm	5/8"	16mm	5/8"	16mm
FLEX DUCT COLLAR		4"	102mm	5"	127mm	5"	127mm
MAXIMUM HEATER		1 Kw		1.5 Kw		1.5Kw	

ADD "C" TO THE END OF THE MODEL NUMBER FOR A 208-230/1/60 UNIT, "CK" FOR A 200-220/1/50 UNIT 80935.WPD

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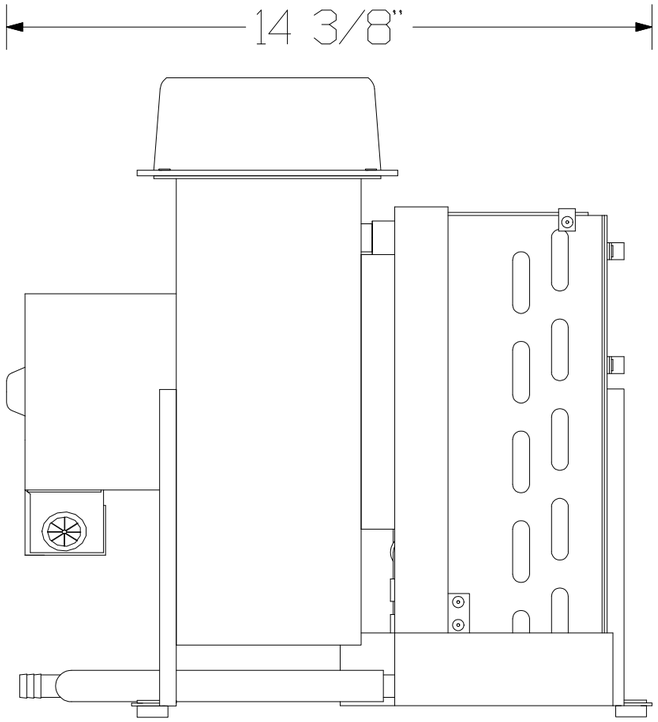
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 Email sales@aquaair.com



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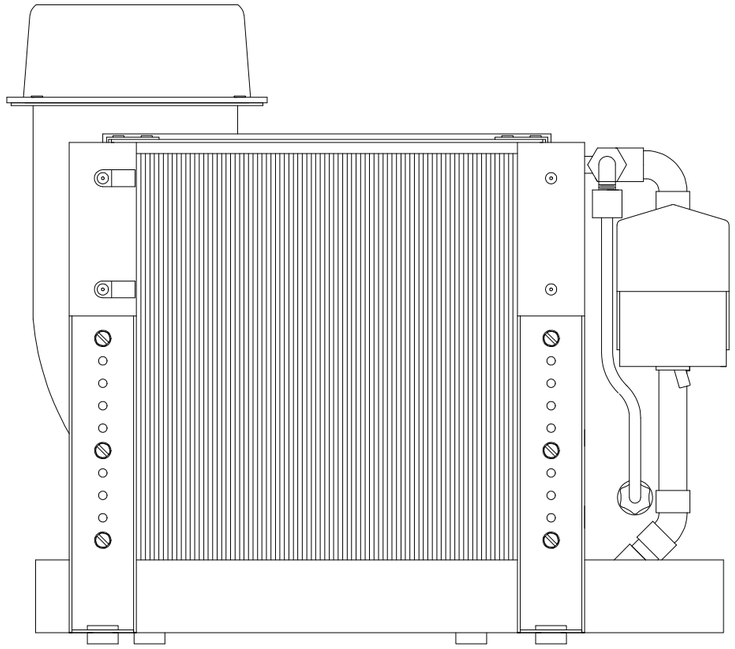
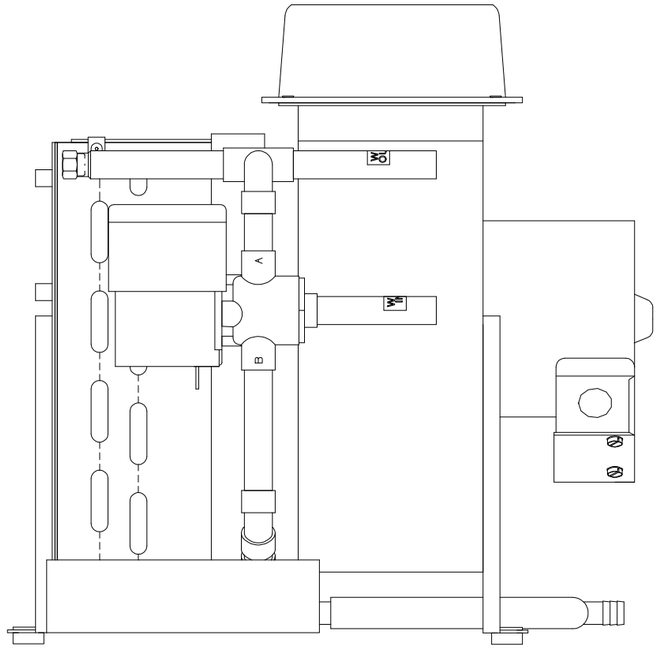


FRONT



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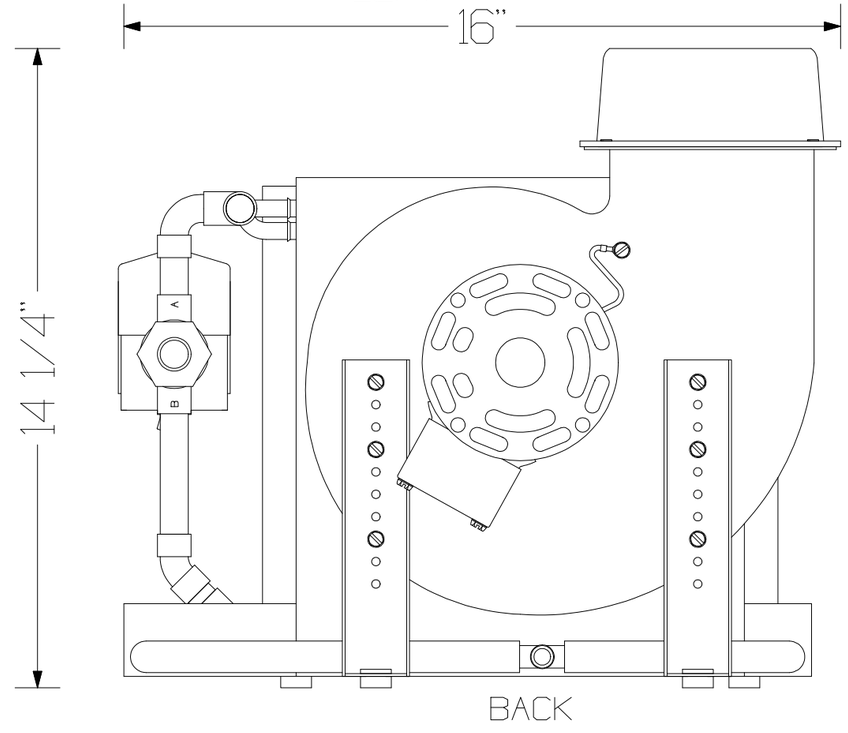

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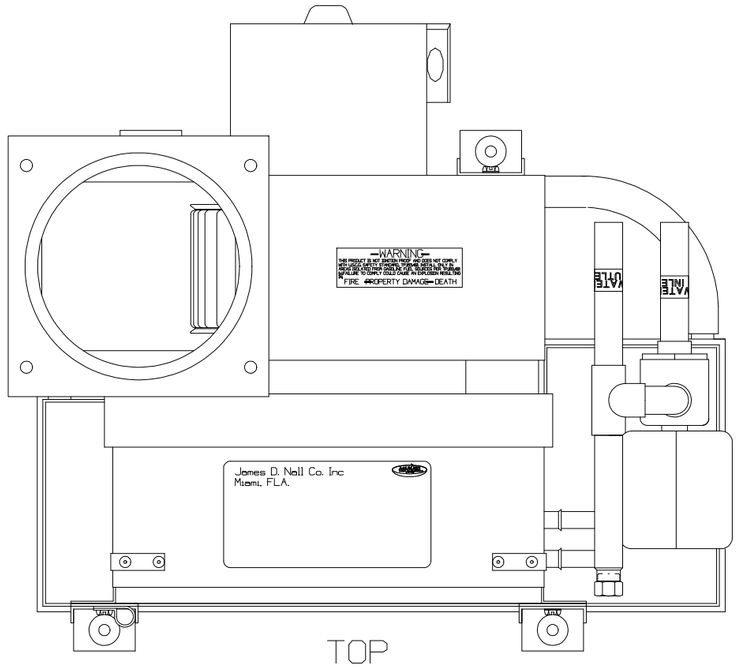

TOP

SCALE : INCHES

0 1 2 3 4 5 6 7 8 9 10

AQUA AIR MFG

AQOW-10

DRAWING NUMBER	AQOW-10-1	DRAWN BY	SB	DATE	04-06-10
SCALE	NONE	APPROVED BY	DN	REVISION DATE	REV A

AQUA-AIR
MARINE AIR CONDITIONING SYSTEMS

CHILLWATER FAN COIL AQOCW

FEATURES

- ❏ High capacity squirrel cage blower is designed for quiet operation with flexible duct systems.
- ❏ Flexible duct connector installed on the unit. This connector also adapts to Aqua-Air AT series adapter duct tees.
- ❏ Three way motorized water valve is pre-installed on the unit. A separate valve assembly is not necessary.
- ❏ Dual condensate outlets on the drain pan are factory connected into a common 1/2" hose barb tee for ease of installation.
- ❏ Vertically adjustable mounting legs with rubber vibration pads and mounting screws.
- ❏ The air bleeder is mounted on the end of a 12" plastic tube for easy access during commissioning of the system.
- ❏ All surfaces that might have condensate form on them are covered in 1/8" thick foam insulation.
- ❏ Units available for 115/1/60, 100/1/50, 208-230/1/60 and 200-220/1/50 power inputs.
- ❏ Aqua-Air BH series blower heaters bolt directly to the discharge of the blower.

SPECIFICATIONS	AQOCW-12	AQOCW-16	AQOCW-18
COOLING CAPACITY	12,000 BTU/HR 3,024 KCAL/HR	16,000 BTU/HR 4,032 KCAL/HR	18,000 BTU/HR 4,536 KCAL/HR
AIR FLOW CAPACITY	400 CFM 680 M^3H	530 CFM 900 M^3H	600 CFM 1019 M^3H
WEIGHT	32 LBS 14.5 KGS	32 LBS 14.5 KGS	33 LBS 15 KGS
AMPERAGE DRAW	2.7 @ 115-1-60 1.4 @ 230-1-60	4.0 @ 115-1-60 2.0 @ 230-1-60	4.0 @ 230-1-60 6.7 @ 115-1-60
POWER CONSUMPTION	311 W	460 W	920 W
MINIMUM RETURN AIR GRILLE SIZE	120 in^2 774 cm^2	144 in^2 929 cm^2	156 in^2 1006 cm^2
MINIMUM SUPPLY AIR GRILLE SIZE	60 in^2 387 cm^2	72 in^2 465 cm^2	78 in^2 503 cm^2
FLEX DUCT CONNECTOR	6"	6"	7"
CHILLWATER INLET / OUTLET SIZE	5/8" OD 16 mm OD	5/8" OD 16 mm OD	5/8" OD 16 mm OD
MAXIMUM DUCT HEATER	2 Kw	3Kw	3Kw

ADD "C" TO THE END OF THE MODEL NUMBER FOR A 208-230/1/60 UNIT, "CK" FOR A 200-220/1/50 UNIT

I:\WORDPERFECT\80940.WPD

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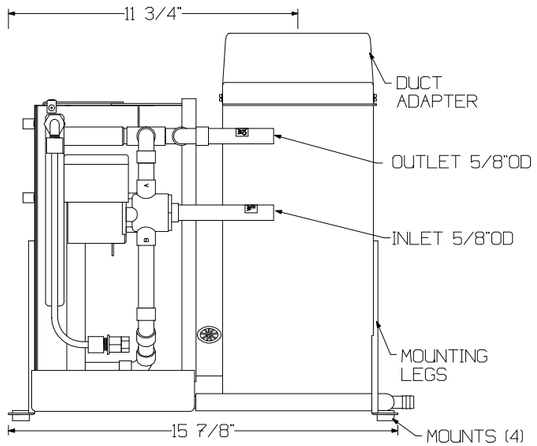
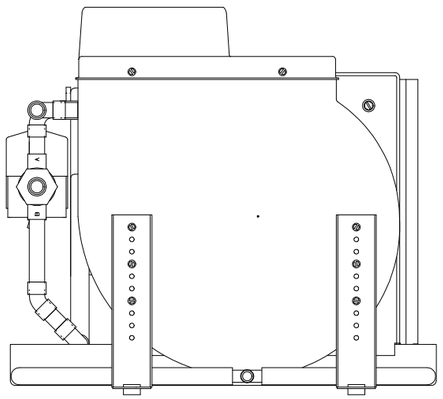
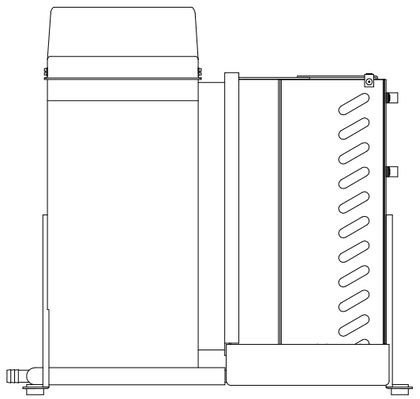
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 Email sales@aquaair.com



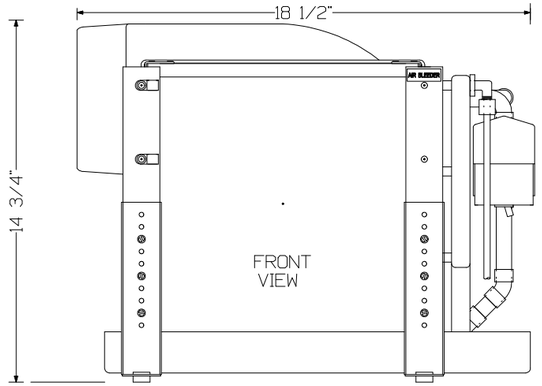
LEFT VIEW



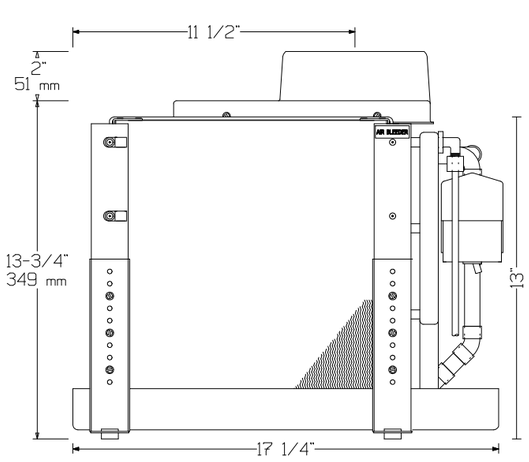
REAR VIEW



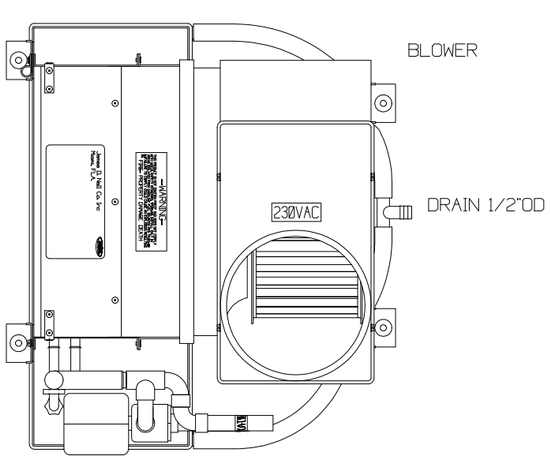
RIGHT VIEW



AQOCW-12,16 HORIZONTAL DISCHARGE BLOWER ROTATED 90°

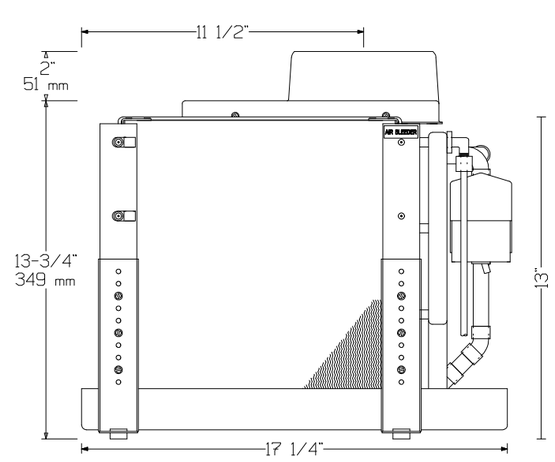


FRONT VIEW



TOP VIEW

SPECIFICATION		AQOCW-12	AQOCW-16
CAPACITY	BTU/HR KCAL/HR	12.000 3.024	16.000 4032
AIR CAPACITY	CFM CMH	400 680	533 906
WEIGHT	LBS KGS	32 14.5	32 14.5
AMPERAGE DRAW	115V 230V	2.7 1.4	4.0 2.0
POWER CONSUMPTION		311	311
MIN. RETURN AIR SIZE	SQ.IN. SQ.MM.	120 774	144 929
MIN. SUPPLY AIR SIZE	SQ.IN. SQ.MM.	60 387	72 465



AQOCW-12,16 VERTICAL DISCHARGE

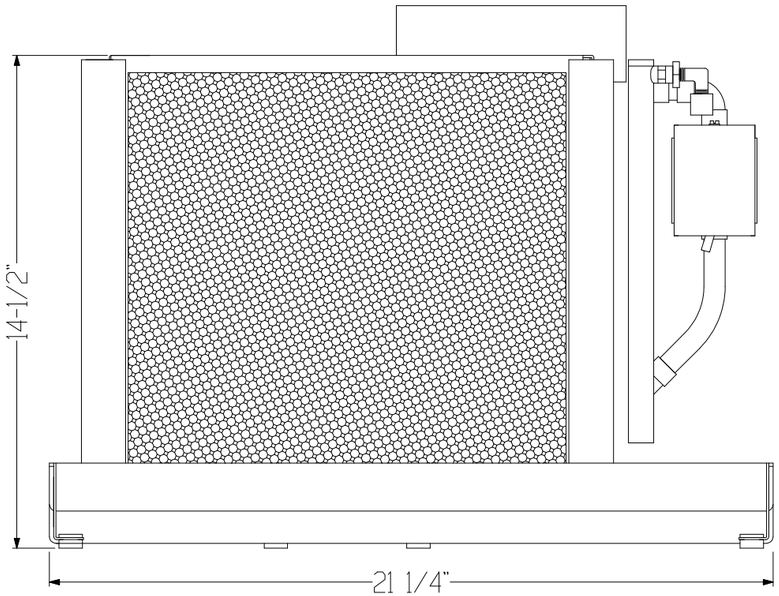
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

AQOCW - 12 & 16
FAN COIL UNITS WITHOUT B. HEATER

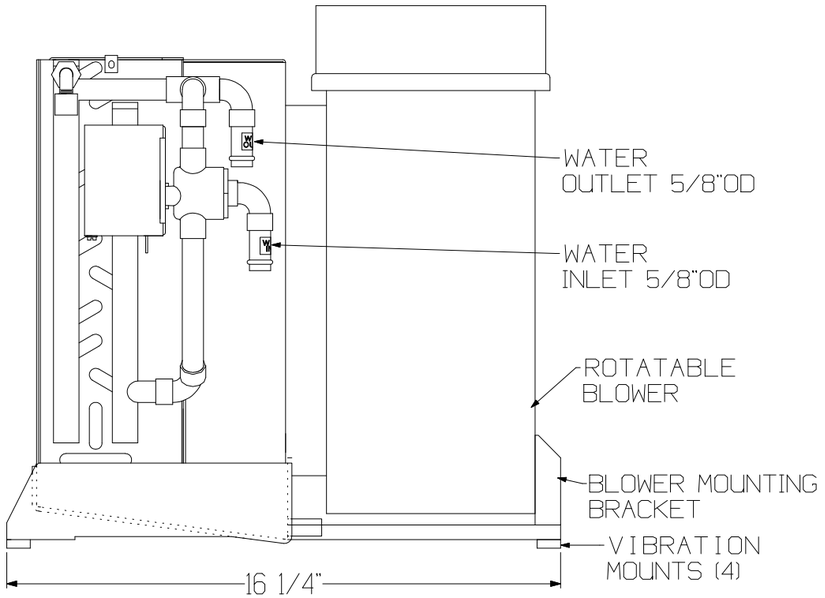
DRAWING NUMBER	DRAWN BY	DATE
AQOCW1216-1	SB	04-05-10

SCALE	APPROVED BY	REVISION DATE	REV
NONE	DN		A

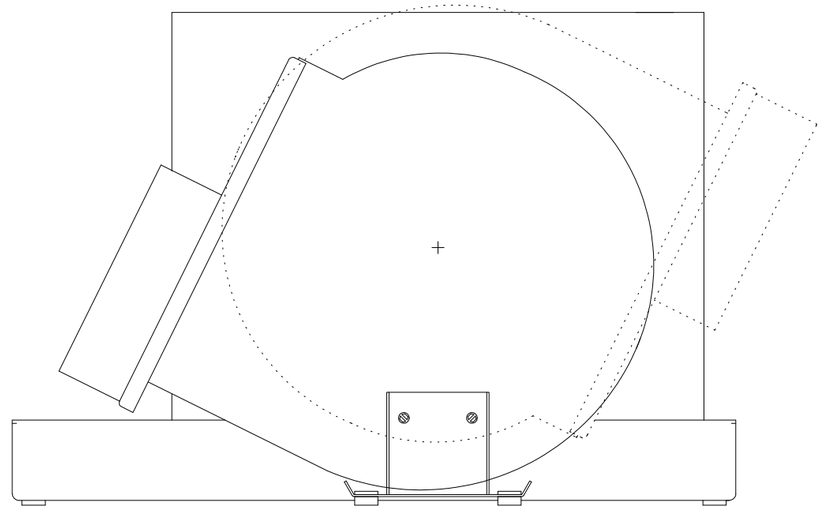
FRONT VIEW

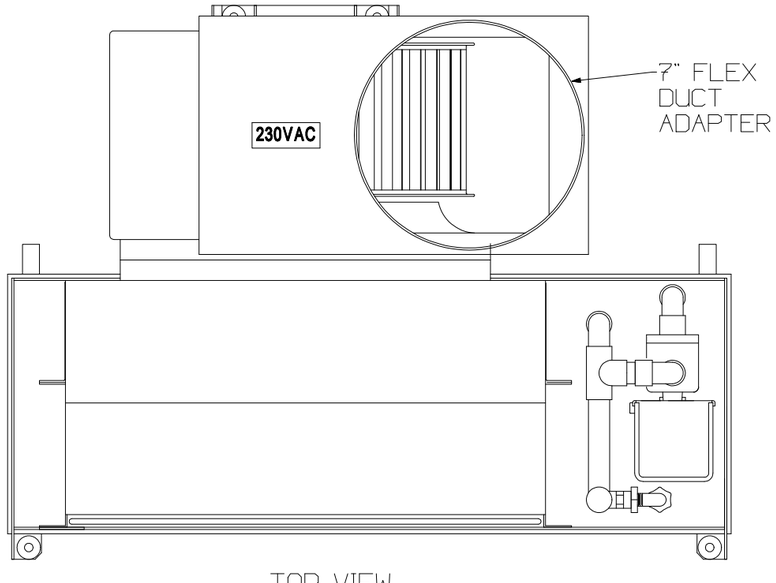


RIGHT VIEW



REAR VIEW SHOWING
LEFT AND RIGHT DISCHARGE





TOP VIEW

MODEL	AQOCW-18C	AQOCW-18
BTU/H	18,000	18,000
POWER	208/230-1-60	115-1-60
FAN AMPS	4.0 A	6.7 A

HOSE ADAPTER:	7"
CHILLWATER:	5/8" OD HOSE BARB
DRAIN:	1/2" OD
RETURN AIR:	156 sq. in.
SUPPLY AIR:	78 sq. in.

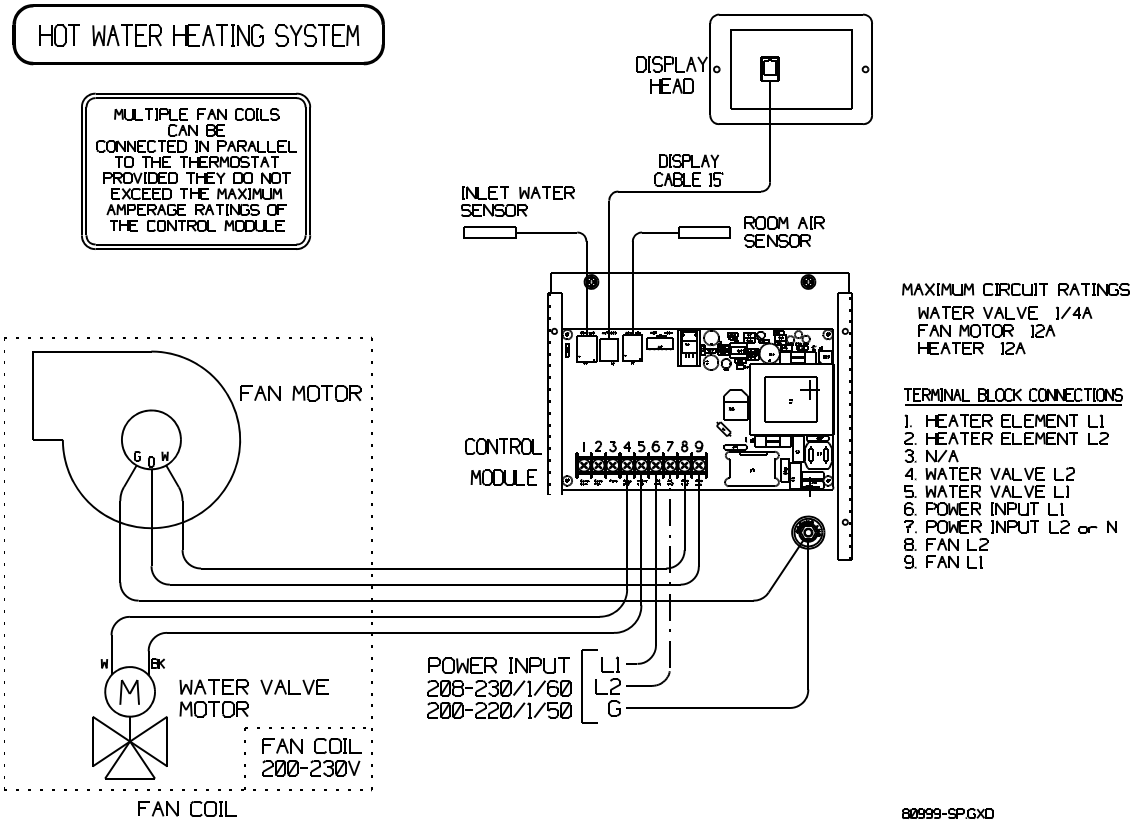
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

AQOCW-18 18,000 BTU 600 CFM CHILLWATER FAN COIL

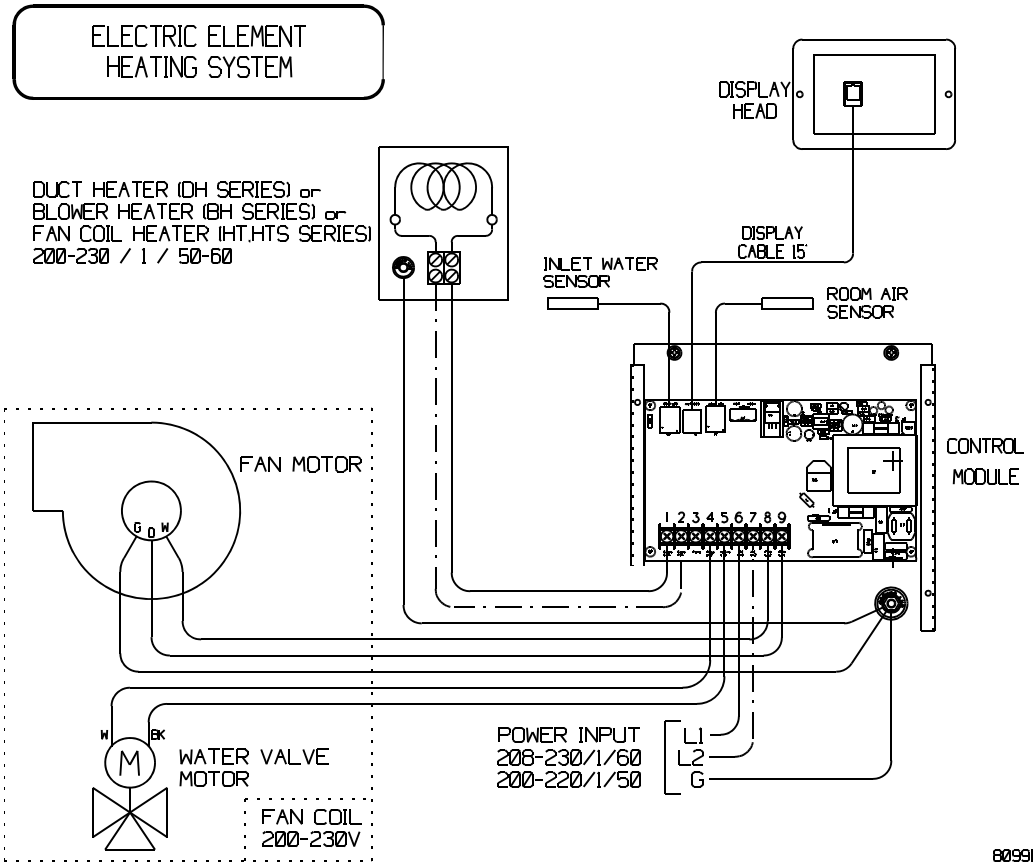
DRAWING NUMBER AQOCW-18	DRAWN BY DN	DATE 080330	
SCALE FULL	APPROVED BY	REVISION DATE	REV A

WIRING SCHEMATICS

HOT WATER HEATING SYSTEM



ELECTRIC ELEMENT HEATING SYSTEM



AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

FAN COIL - BLOW THRU BTW SERIES

FEATURES

- Seven models to choose from ranging in size from 6,000 to 36,000 BTUH
- Universal horizontal or vertical use
- Units are constructed of corrosion resistant aluminum and ABS plastic
- 1050 RPM motors for quiet operation
- Panels insulated internally to prevent external condensation
- Optional internally mounted incoloy rod type heating elements available for single phase input
- Three-way motorized water valve is standard with Pop-Top motor assembly
- Insulated and internally coated aluminum drain pan with anti-slosh foam media inside
- Condensate outlets (3/4") on both corners of the drain pan
- ABS blower housings with aluminum impellers
- Integral air bleeder for easy commissioning
- Units available for 115/1/60, 100/1/50, 208-230/1/60 and 200-220/1/50 power inputs.
- All unit coil assemblies are pressure tested to assure leak-proof performance
- All fan motors are test run to assure proper operation and air flow output

AQUA-AIR MANUFACTURING, division of the James D. Nall Co., Inc.
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 Email sales@aquaair.com

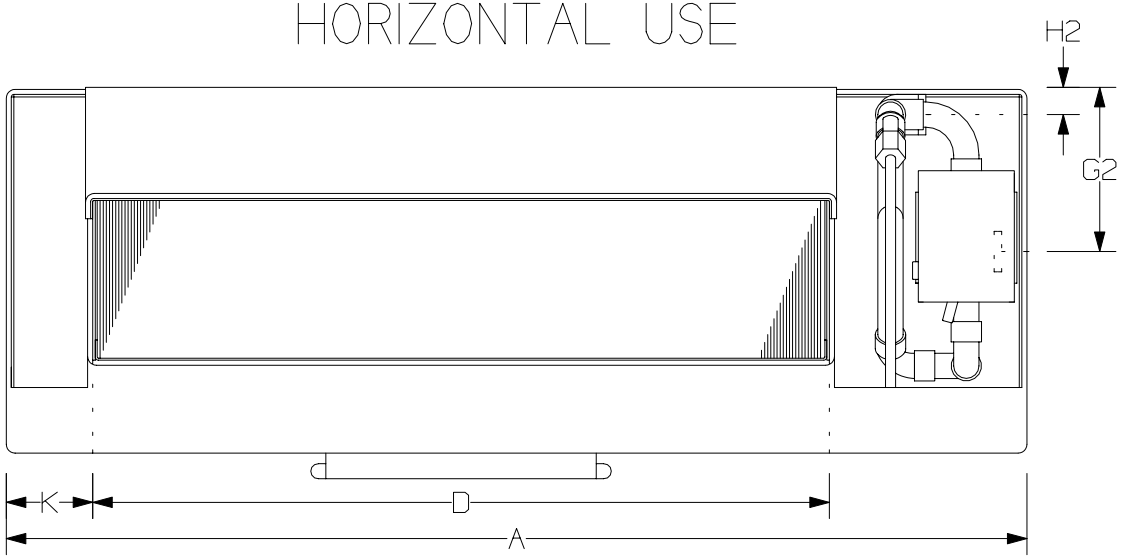
Technical Specifications

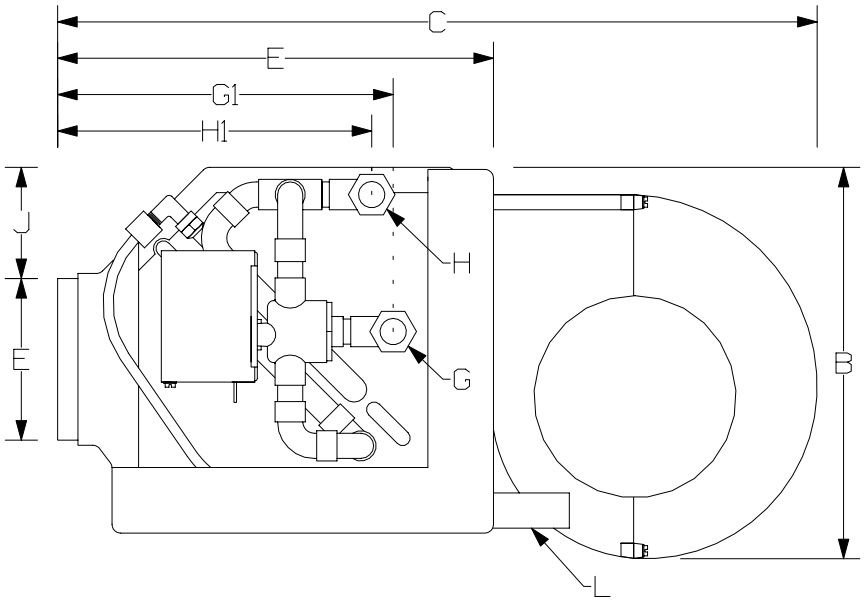
Unit Size		06	09	12	18	24	30	36
Cooling Capacity	BTU/HR KCAL/HR	6,000 1,512	9,000 2,268	12,000 3,024	18,000 4,536	24,000 6,048	30,000 7,560	36,000 9,072
Air Flow Capacity	CFM M^3H	200 340	300 510	400 680	600 1,020	800 1,360	1,000 1,700	1,200 2,040
Fan Amperage	115v 230v	2.70 1.35	2.70 1.35	2.70 1.35	2.70 1.35	5.40 2.70	5.40 2.70	5.40 2.70
Fan Wattage	W	311	311	311	311	621	621	621
Required Chillwater Flow	GPM LPM	1.2 4.5	1.8 6.8	2.4 9.1	3.6 13.6	4.8 18.2	6.0 22.7	7.2 27.3
Pressure Drop	Ft/H_2O kPa	2.7 8.1	6.5 19.4	4.8 14.3	6.2 18.5	7.6 22.7	9.4 28.1	11.1 33.1
Maximum Heater Size	kW BTU/HR KCAL/HR	1.0 3,415 861	1.5 5,123 1,291	2.0 6,830 1,721	3.0 10,245 2,582	4.0 13,660 3,442	5.0 17,075 4,303	6.0 20,490 5,164
Auxiliary Heater Size	kW BTU/HR KCAL/HR	1.0 3,415 861	1.0 3,415 861	1.0 3,415 861	1.5 5,123 1,291	2.0 6,830 1,721	3.0 10,245 2,582	3.0 10,245 2,582
Weight	LBS KGS	30.0 13.6	34.0 15.5	38.0 17.3	42.0 19.1	45.0 20.5	55.0 25.0	65.0 29.5
Minimum Supply Air Grille Size	in^2 cm^2	56 361	72 464	96 619	128 826	160 1,032	200 1,290	240 1,548
Minimum Return Air Grille Size	in^2 cm^2	84 542	108 697	144 929	192 1,238	240 1,548	300 1,935	360 2,322

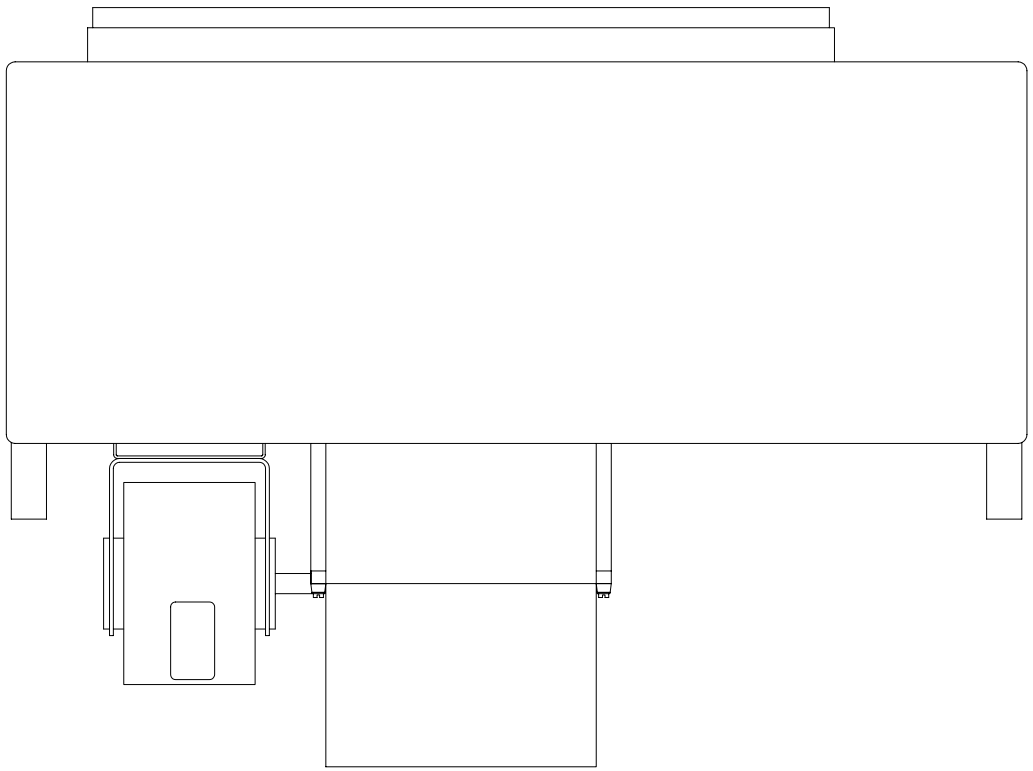
Unit Dimensions

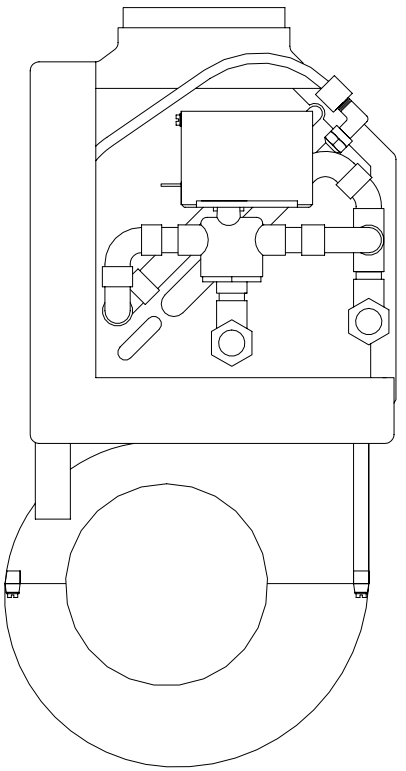
Unit Size	06	09	12	18	24	30	36
A	21" 534mm	25" 635mm	31" 788mm	39" 991mm	47" 1194mm	57" 1448mm	67" 1702mm
B	9-11/16" / 246mm						
C	18-13/16" / 478mm						
D	14-1/4" 362mm	18-1/4" 464mm	24-1/4" 616mm	32-1/4" 819mm	40-1/4" 1022mm	50-1/4" 1276mm	60-1/4" 1530mm
E	4" / 102mm						
F	10-13/16" / 275mm						
G	½" FPT Water Inlet						
G1	8-1/4" / 210mm						
G2	4-1/16" / 103mm						
H	½" FPT Water Outlet						
H1	7-3/4" / 197mm						
H2	11/16" / 18mm						
J	2-3/4" / 70mm						
K	1-7/8" / 48mm						
L	7/8" / 22mm Drain O.D.						

BTW-09 SHOWN
HORIZONTAL USE









BTW-09
SHOWN

VERTICAL
USE

MULTIPLE FAN COILS CAN BE CONNECTED IN PARALLEL TO THE THERMOSTAT PROVIDED THEY DO NOT EXCEED THE MAXIMUM AMPERAGE RATINGS OF THE CONTROL MODULE

CHECK HEATER AMP RATING. IF AMP DRAW EXCEEDS HTR CIRCUIT RATING AN OPTIONAL HTR RELAY BOX WILL NEED TO BE USED.

DISPLAY HEAD

DISPLAY CABLE 15'

FUSES	
FAN (F2)	12A
TX-PRIM. (F1)	500mA
TX-SEC. (F3)	500mA

SENSORS

INLET WATER SENSOR

ROOM AIR SENSOR

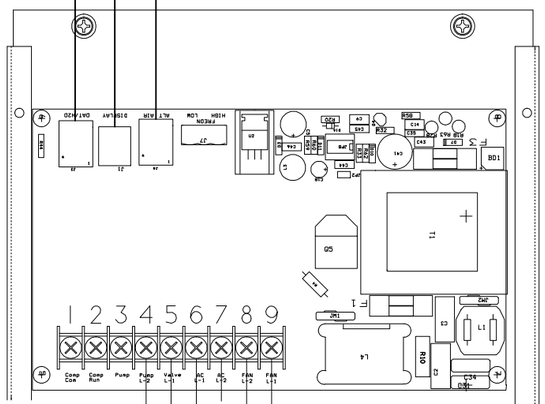
INLET WATER SENSOR NOTE

ATTACH SENSOR TO THE WATER INLET LINE AT FAN COIL WATER VALVE

FAN COIL

FAN MOTOR

G O W



1	2	3	4	5	6	7	8	9
L1	L2		L2	L1	L1	L2	L2	L1
HEATER ELEMENT 20A MAX			WATER VALVE 25A MAX		MAIN POWER INPUT 115 / 230V		FAN MOTOR 12A MAX	

W BK

M

WATER VALVE MOTOR

POWER INPUT
115/1/60
200-230/1/50-60

L1
L2 or N
G

MAXIMUM CIRCUIT RATINGS

WATER VALVE 1/4A
FAN MOTOR 12A
HEATER 20A

TERMINAL BLOCK CONNECTIONS

1. HEATER ELEMENT L1
2. HEATER ELEMENT L2
3. N/A
4. WATER VALVE L2
5. WATER VALVE L1
6. POWER INPUT L1
7. POWER INPUT L2 or N
8. FAN L2
9. FAN L1

NOTE: FAN COIL MOTOR & WATER VALVE MUST BE RATED FOR THE SAME VOLTAGE AS THE POWER INPUT.

NOTE: JP1 MUST BE CUT FOR CHILLED WATER APPLICATIONS.

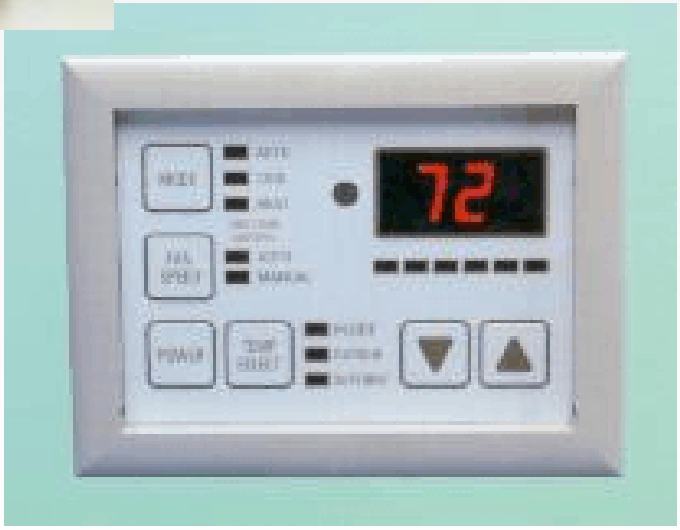
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

TSVW DIGITAL THERMOSTAT w/ SINGLE BTW Series STYLE FAN COIL 115 or 230V COOLING ONLY or with HOT WATER HEAT

DRAWING NUMBER	DRAWN BY	DATE
4011-09B	SB	03-10-05

SCALE	APPROVED BY	REVISION DATE	REV
NONE	CC		

Digital Thermostats



AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

SAPPHIRE DIGITAL THERMOSTAT TWS

Sapphire -The most advanced, aesthetically pleasing, rugged digital thermostat to grace the marine air conditioning industry yet. The technology, features and benefits address all our predecessors and those of the competition.

- Sapphire blue LED display
- Virtually unlimited colors of Vimar® bezels to choose from
- Largest fan and heater circuit rating in the business.
- User friendly programming
- Unique fuse protection for circuits.

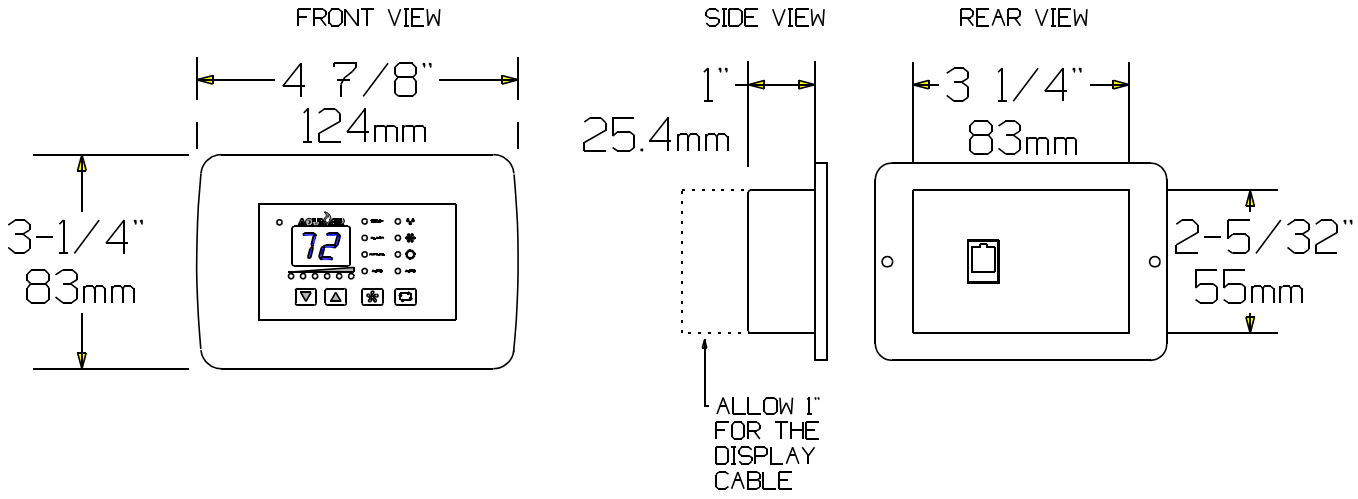
TWSV Sapphire Digital Thermostat
Shown with VIMAR VB-Nickel Bezel
Actual Size

AQUA-AIR MANUFACTURING, division of the James D. Nall Co., Inc.
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 E-mail sales@aquaair.com

Tempwise Sapphire Features

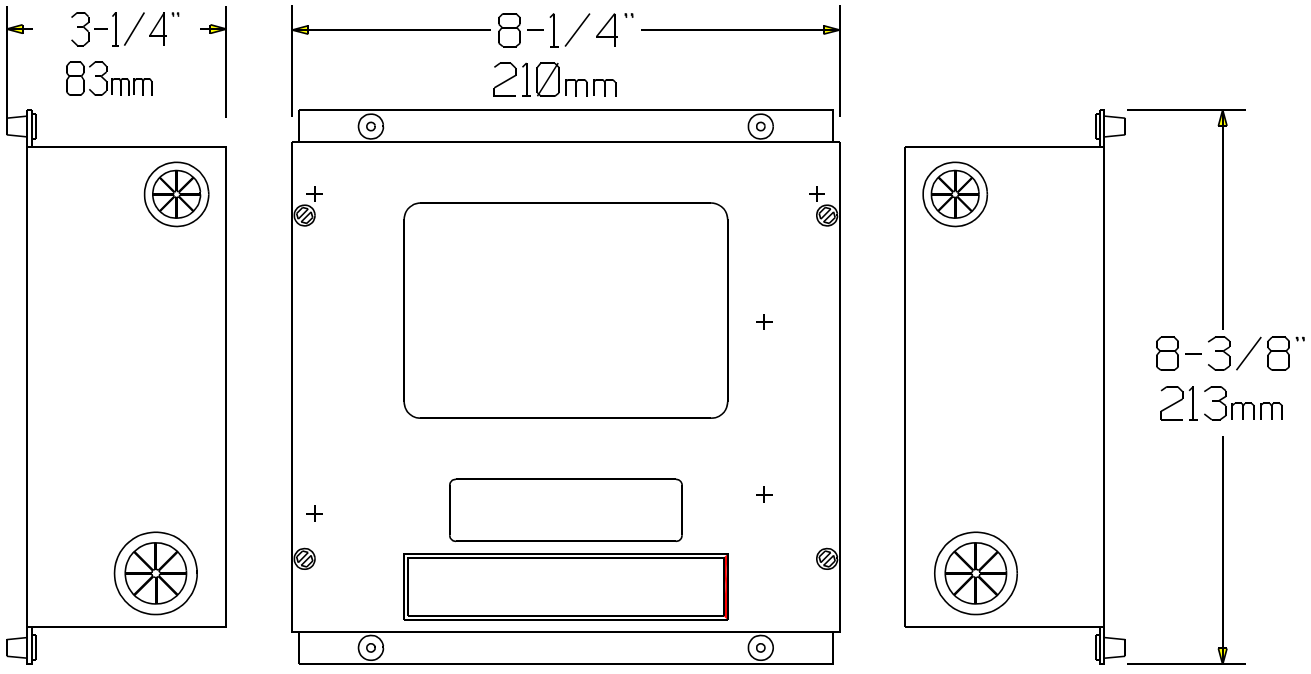
- Highest fan circuit rating in the industry…12 AMPS !!
- Will control up to six Aqua Air 16KBTUH Whispercoils™
- Sapphire Blue LED's with brightness control
- Dual voltage 115/230 capability
- Display cables are 50% smaller in diameter than the competitions making routing a snap
- Field replaceable fuse protection
- Modular plug connection for high and low pressure switches
- Uses less bulky 4 pin plugs for the display cable instead of the competitions 8
- Continuous room temperature display with one touch set point temperature display or change
- Maintains room temperature to within 2 degrees of set point
- Remote temperature sensing bulb or faceplate air temperature sensor can be used
- Fahrenheit or Centigrade temperature display
- Automatic or six manually selected fan speeds
- High speed and low speed fan limit settings
- LED bar graph visually indicates fan speed
- Fan can be set to run continuous or to cycle on and off as the room reaches the set point
- Dehumidification mode controls room temperature and humidity level
- Non-volatile EEPROM memory. Controller will not lose settings in memory due to power interruptions
- Electric element heaters up to 12A can be operated directly from the controller

THERMOSTAT DIMENSIONS



SAPPHIRE DISPLAY

CONTROL MODULE

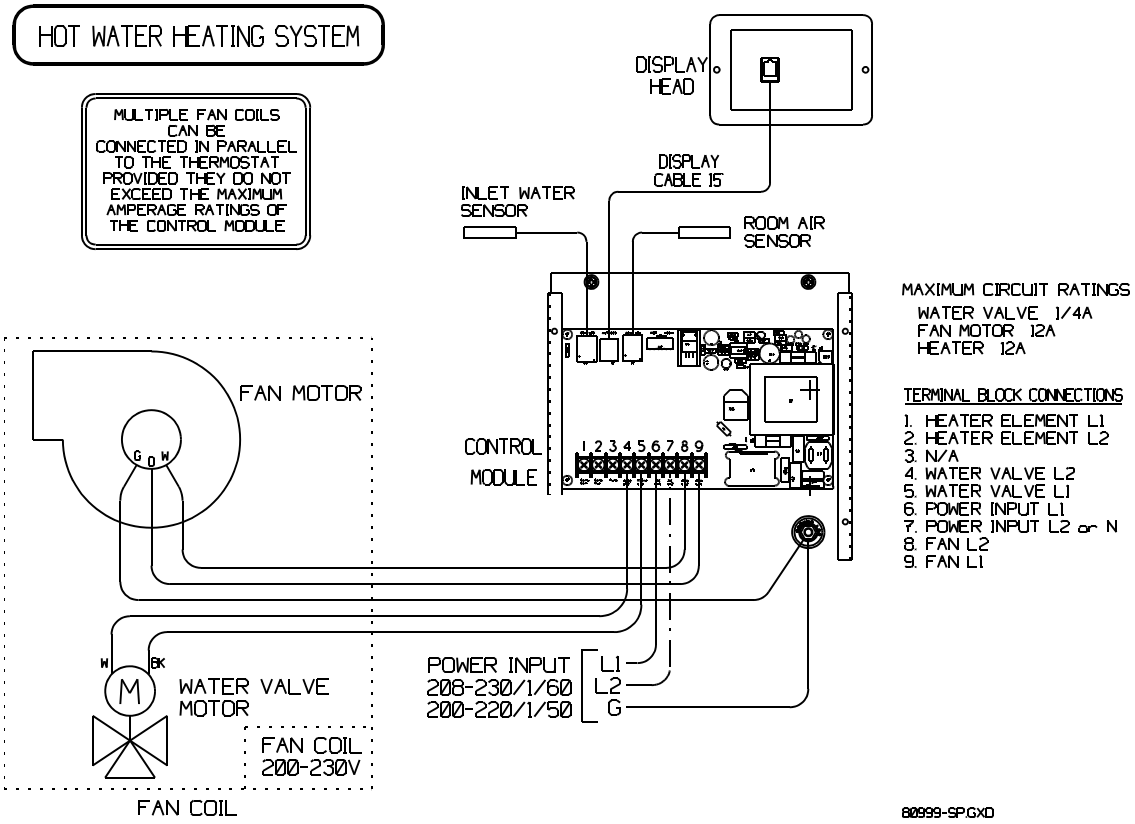


80999-SP.GXD

WIRING SCHEMATICS

HOT WATER HEATING SYSTEM

MULTIPLE FAN COILS CAN BE CONNECTED IN PARALLEL TO THE THERMOSTAT PROVIDED THEY DO NOT EXCEED THE MAXIMUM AMPERAGE RATINGS OF THE CONTROL MODULE



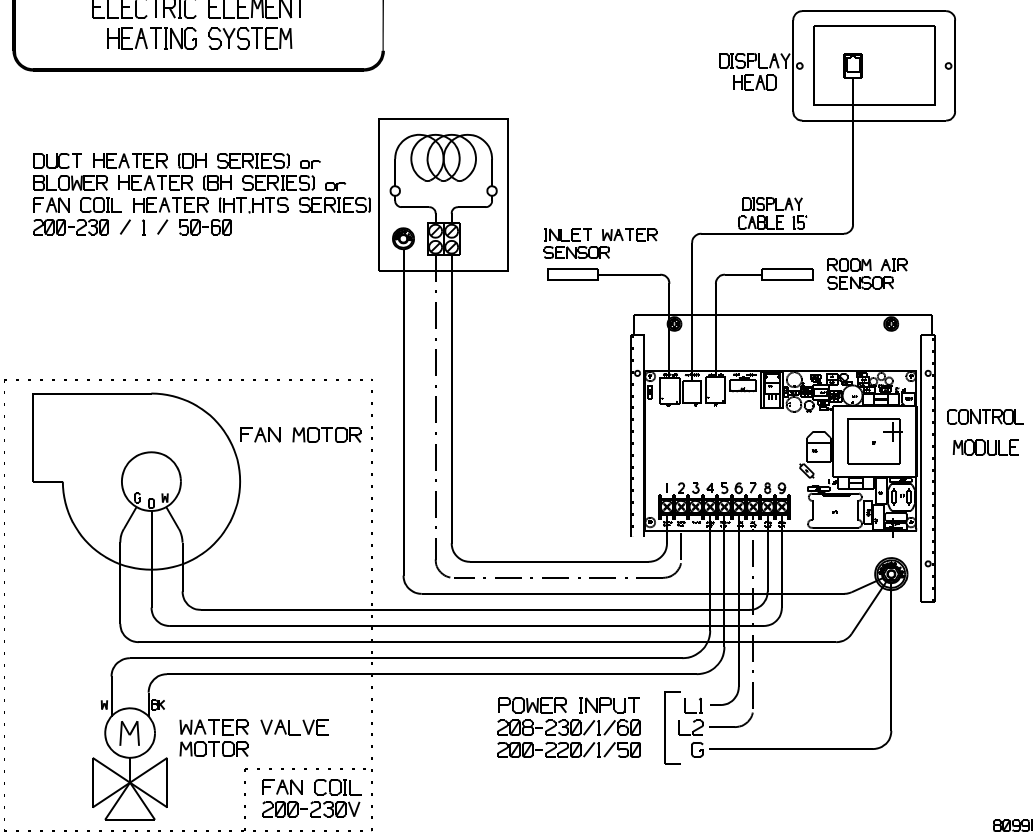
MAXIMUM CIRCUIT RATINGS
WATER VALVE 1/4A
FAN MOTOR 12A
HEATER 12A

TERMINAL BLOCK CONNECTIONS
1. HEATER ELEMENT L1
2. HEATER ELEMENT L2
3. N/A
4. WATER VALVE L2
5. WATER VALVE L1
6. POWER INPUT L1
7. POWER INPUT L2 or N
8. FAN L2
9. FAN L1

80999-SP.GXD

ELECTRIC ELEMENT HEATING SYSTEM

DUCT HEATER (DH SERIES) or
BLOWER HEATER (BH SERIES) or
FAN COIL HEATER (HT.HTS SERIES)
200-230 / 1 / 50-60



8099P-SP.GXD

AQUA AIR

MARINE AIR CONDITIONING SYSTEMS

Sapphire Series
TSVW & TWWS
Chillwater Digital Thermostats

Table of Contents

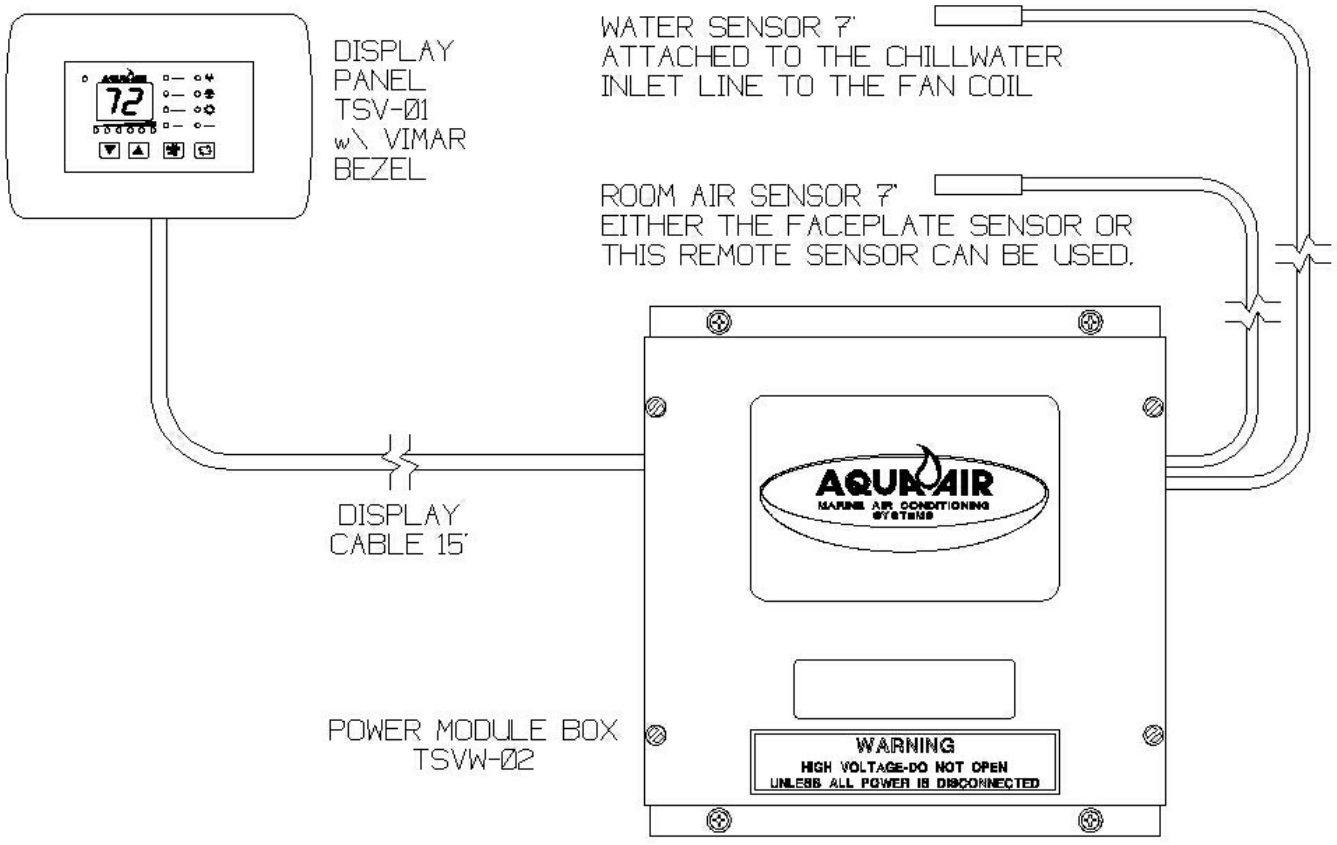
1. Introduction

The Aqua-Air Sapphire TSVW and TWWS Series Chillwater Thermostats has been designed specifically to operate chillwater fan coils. These fan coils will usually have a fan motor(s) and 3 way water regulating valve. They may also be equipped with an integral or remote heating element. All of these components can be regulated by the TSVW and TWWS Thermostats.

The only difference between the TSVW and TWWS digital thermostats are the display heads. The TSVW Thermostat utilizes the TSV-01 Display Head along with a Vimar bezel. The TWWS Thermostat uses the TWWS-01 Display Head which is physically the same size as the older TW-2000 digital thermostats

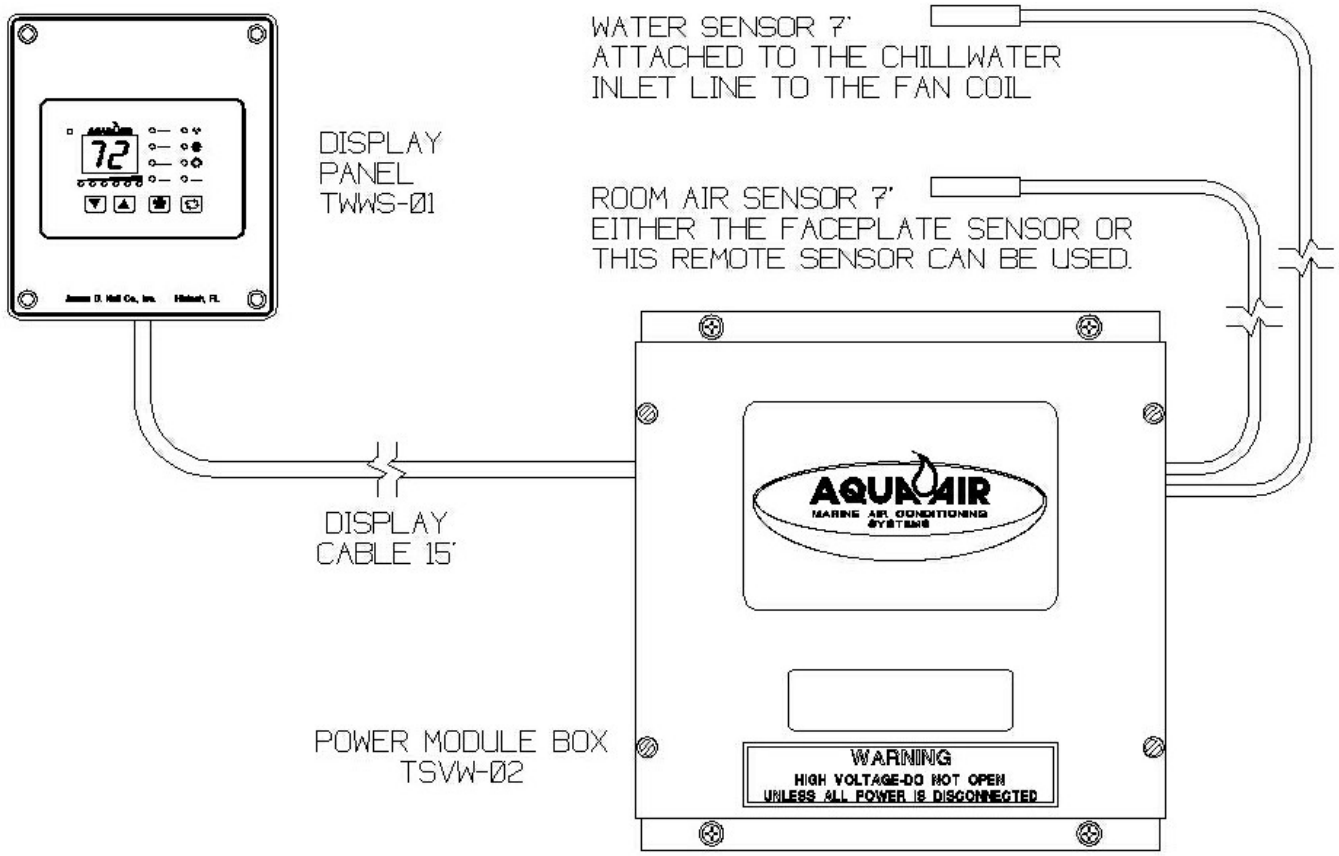
The TSVW Thermostat is comprised of the following main components:

1. Display Panel (TSV-01)
2. Display Cable (TSWDC-15)
3. Power Module Box (TSVW-02)
4. Room Air Sensor (TW2-SENSOR-07)
5. Water Sensor (TW2-SENSOR-07)



The TWWS Thermostat is comprised of the following main components:

1. Display Panel (TWWS-01)
2. Display Cable (TSWDC-15)
3. Power Module Box (TSVW-02)
4. Room Air Sensor (TW2-SENSOR-07)
5. Water Sensor (TW2-SENSOR-07)



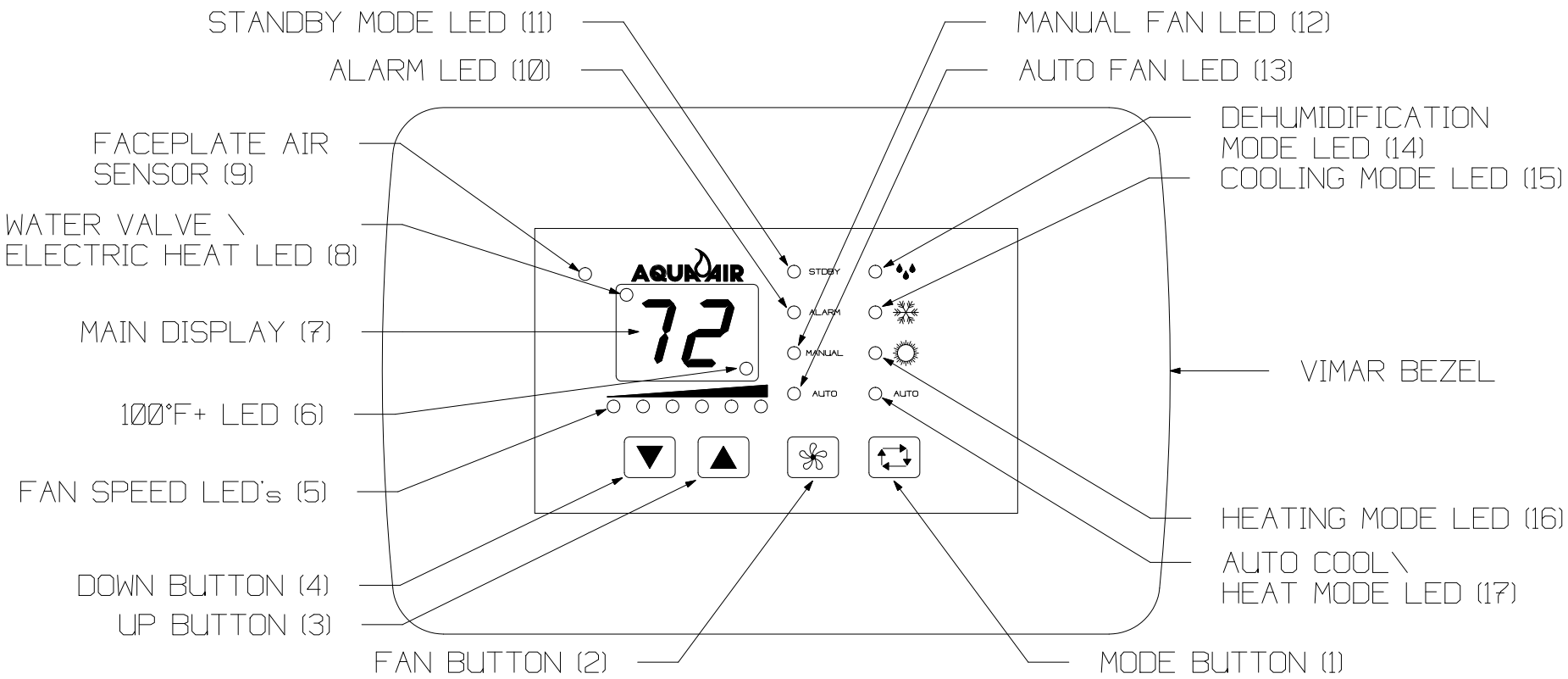
2. Display Panel

The TSV-01 Display Panel is the user interface with the TSVW Thermostat and the TWWS-01 Display Panel is the user interface with the TWWS Thermostat. They allow the user to make all necessary changes to operating modes, temperature settings and fan speed settings. They also allows the user to make changes to a set of Programming Parameters that controls many of the features of the thermostat.

The TSV-01 Display Panel has been designed to use the Vimar Idea Series metal bezels giving you an almost unlimited number of color options to match any decor. The bezel snaps on and off easily and it hides all of the mounting screws for the display panel

On the following two pages are diagrams showing all of the features of the two display panels. Each feature has a number associated with it. Descriptions for each feature begin on the page following the diagrams.

TSVW SAPPHIRE SERIES
DIGITAL DISPLAY PANEL



Features of the TSV-01 and TWWS-01 Display Panel are:

1. MODE BUTTON - The Mode Button is used to select one of the four operating modes and standby (off) mode. Pressing and releasing the Mode Button will advance you to the next mode. Continue to do this until you have reached the desired mode. The available modes are as follows:

STANDBY	Thermostat is OFF, no Cooling or Heating functions are available. The fan can be operated in the Manual mode. Indicated by LED 11.
DEHUMIDIFICATION	Thermostat is in the Dehumidification Mode indicated by LED 14.
COOLING	Thermostat is in the Cooling Mode only, indicated by LED 15.
HEATING	Thermostat is in the Heating Mode only, indicated by LED 16.
AUTO	Thermostat is in the Auto Mode where it will automatically choose between Cooling and Heating as the room temperature dictates. This mode is indicated by LED 17.

2. FAN BUTTON - The Fan Button is used to select between AUTO and MANUAL Fan Speed Control as indicated by LED's 12 and 13 respectively. To go from AUTO to MANUAL Mode press the Fan Button once. To change Fan Speeds while in MANUAL Mode press the Fan Button once and then the Up or Down Button to increase or decrease, respectively, the Fan Speed. To switch from MANUAL to AUTO Mode press the Fan Button twice

3. UP BUTTON - The Up Button is used to increase values for set points, fan speeds and programmable parameters. During normal operation, momentarily pressing the Up Button will display the Set Point. Continued pressing of the Up Button will increase the Set Point

4. DOWN BUTTON - The Down Button is used to decrease values for set points, fan speeds and programmable parameters. During normal operation, momentarily pressing the Down Button will display the Set Point. Continued pressing of the Down Button will decrease the Set Point.

   To view the Chillwater Inlet Temperature sensed by the TSVW Water Sensor.
   1. Press and HOLD the Down Button (4)
   2. Press and RELEASE the Up Button (3)

   This will display the temperature sensed by the TSVW Water Sensor.

5. FAN SPEED LED's - These six LED's indicate the current Fan Speed 1-6. Low Speed (#1) is the left most LED and High Speed (#6) is indicated by the LED on the far right.

6. 100°F+ LED - Indicates that the actual temperature displayed is in excess of 100° F. Add the value displayed to 100 to get the actual temperature. If the 100°F LED is lit and the display shows 10 then the actual temperature would be 110°F.

7. MAIN DISPLAY - This is a 2 digit, 7 segment LED display. Normally the current room temperature is displayed. It can also display the Set Point, Water Temperature, Programmable Parameters and Alarm codes.

8. WATER VALVE / ELECTRIC HEAT LED - This LED indicates if the Water Valve output has been turned on (in either the Cooling or Heating mode) or, if an Electric Heater is being used and the control has been programmed for it (Programmable Parameter A5 = EL), it will indicate when the Electric Heater output is energized.

9. FACEPLATE AIR SENSOR - The TSVW can use either this Faceplate Air Sensor to sense the room temperature or the Air Sensor that is plugged into the Power Module PC Board. This is selected by Programmable Parameter B1. If the Faceplate Sensor is used it is not necessary to have the Air Sensor plugged into the PC Board.

10. ALARM LED - Indicates that the control is in a fault condition.

11. STANDBY MODE LED - Indicates that the control is in the Standby Mode. All Cooling and Heating functions are turned off. If the fan is in the Auto Mode then it will be turned off. If the Fan is in the Manual Mode then the Fan will still operate at the last fan speed selected.

12. MANUAL FAN LED - Indicates the Fan Speed is in the Manual Speed Selection Mode

13. AUTO FAN LED - Indicates the Fan Speed is in the Automatic Speed Selection Mode

14. DEHUMIDIFICATION MODE LED - Indicates that the control is in the Dehumidification Mode

15. COOLING MODE LED - Indicates the control is in the Cooling Mode

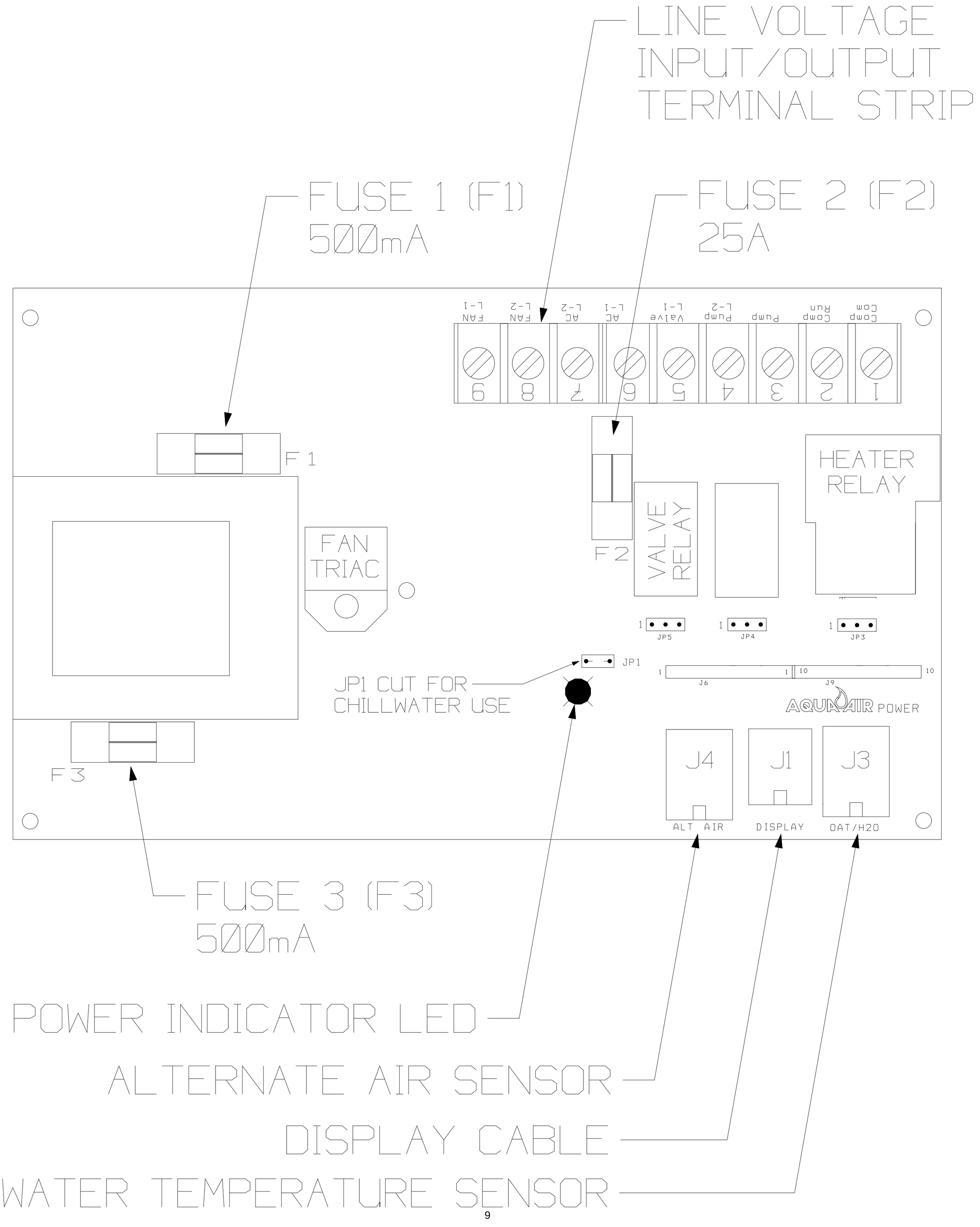
16. HEATING MODE LED - Indicates the control is in the Heating Mode

17. AUTO COOL/HEAT MODE LED - Indicates the control is in the Automatic Cooling or Heating Mode. In this mode the control will automatically select, based on the room temperature and the set point, whether the control is operating in the Cooling or Heating Mode.

3. Power Module Box

The Power Module Box is comprised of the Main Power PC Board enclosed inside of an aluminum enclosure. The PC Board's main features are shown on the following page.

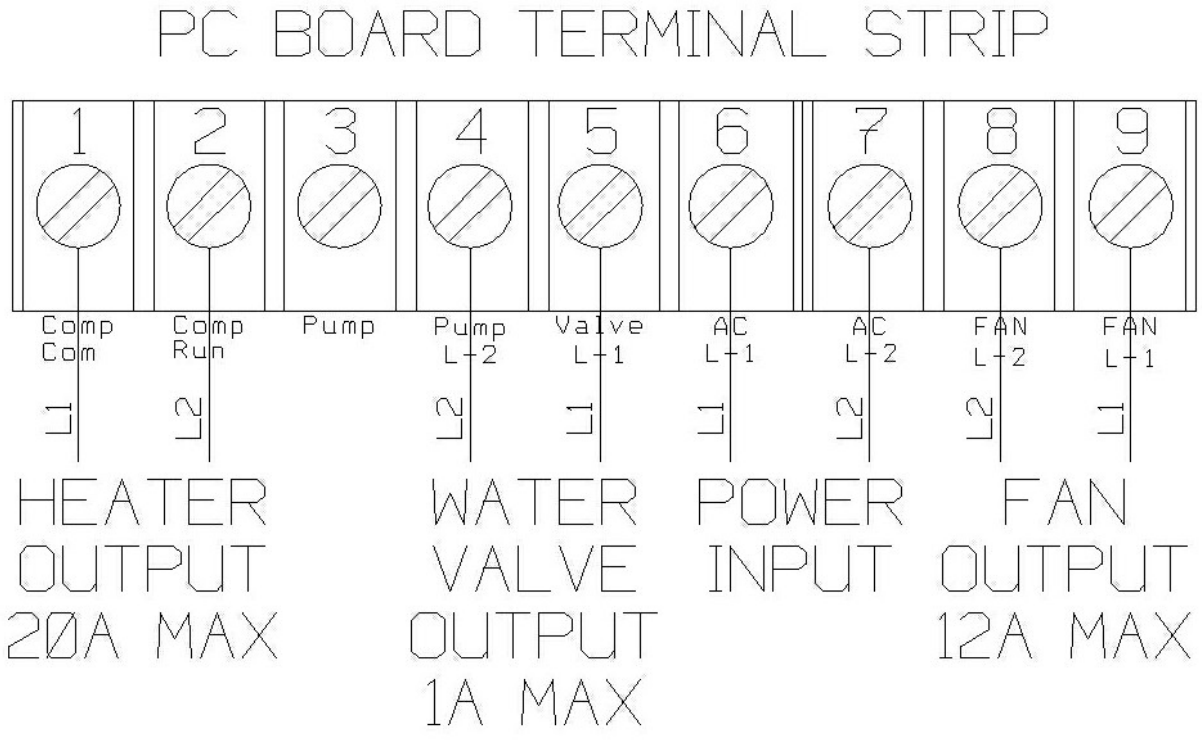
TSVW POWER MODULE P.C. BOARD
TWS-PCBOARD



POWER MODULE PC BOARD JUMPERS				
Jumper	**Description**	**Type**	**Specification**	**Notes**
JP1	Chillwater / Direct Expansion Selection	Wire	C/W: Jumper Cut D/X: Jumper Not Cut	Do not cut with power applied to board.
JP3	Heater Relay Test	3 pos. pin	Install jumper in positions 1 & 2 to energize the heater	
JP5	Water Valve Relay Test	3 pos. pin	Install jumper in positions 1 & 2 to energize the water valve	

POWER MODULE PC BOARD FUSES			
Fuse	**Description**	**Fuse Amperage Rating**	**Fuse Size Part Number**
F1	Protects against a line voltage short circuit on the primary side of the transformer TX	500 mA (1/2 A)	5mm x 20mm TWS-PCBFUSE1
F2	Protects against a short circuit on the Heater or Water Valve Circuits	20 A	5mm x 20mm TWS-PCBFUSE1
F3	Protects against a control circuit short circuit on the secondary side of the transformer TX	500 mA (1/2 A)	5mm x 20mm TWS-PCBFUSE1

Basic External Wiring Connections to the TSVW & TWWS PC Board Located in the Power Module Box



4. Chillwater Operation

Below are the steps necessary for the basic operation of the control.

Entering the Cooling Mode
Press and release the Mode Button (1) until the Cooling Mode LED (15) is lit.

Entering the Heating Mode
Press and release the Mode Button (1) until the Heating Mode LED (16) is lit.

Automatic (Auto) Cool / Heat Mode
Press and release the Mode Button (1) until the Auto LED (17) is lit

Entering the Dehumidification Mode
Press and release the Mode Button (1) until the Dehumidification Mode LED (14) is lit.

Turn the Control OFF (Standby Mode)
Press and release the Mode Button (1) until the Standby Mode LED (11) is lit.

View the Set Point Temperature
Press and release either the Up Button (3) or the Down Button (4).

Increasing the Set Point Temperature
Press and release the Up Button (3) until you reach the desired temperature

Decreasing the Set Point Temperature
Press and release the Down Button (4) until you reach the desired temperature

Putting the Fan Mode into Manual
Press and release the Fan Button (2) until the Manual Fan LED (12) is lit

Increasing the Fan Speed in the Manual Fan Mode
Press and release the Fan Button (2) and then press and release the Up Button (3) until you reach the desired speed as indicated by the Fan Speed LED's (5).

Decreasing the Fan Speed in the Manual Fan Mode
Press and release the Fan Button (2) and then press and release the Down Button (4) until you reach the desired speed as indicated by the Fan Speed LED's (5).

Putting the Fan Mode into Auto
Press and release the Fan Button (2) twice

Displaying the Chillwater Inlet Temperature at the Fan Coil
Press and hold the Down Button (4) then press and release the Up Button (3)

Changing the Fan Speeds in the Standby Mode
Press and release the Up Button (3) or the Down Button (4) until the desired speed is reached. To turn the fan off in the Standby Mode press the Down Button (4) until all of the Fan Speed LED's are off.

5. Entering the Programming Mode

There are currently 14 different programmable parameters in the TSVW Thermostat. All of these parameters can be changed from the Display Panel with some simple keystrokes.

The Program Mode can ONLY be entered while the control is in the Standby Mode

To Program the TSVW Control:

1. Press the Mode Button until the control is in the Standby Mode which is indicated by the Standby Mode LED (11)

2. Press the Up Button and the Down Button at the SAME time. The first Programmable Parameter code “P1" will appear in the window for 2 seconds and then the P1 setting that is currently stored in the control will appear.

3. To change the parameter setting press and release the Up or Down Buttons.

4. The Fan Button advances you to the next parameter. Advancing to the next parameter SAVES the previous parameter setting. If you do not advance to the next parameter the setting WILL NOT BE SAVED unless you press the Mode Button to exit the Programming Mode (see 5 below).

5. Pressing the Mode Button exits the Programming Mode. Any changes made to any of the parameter settings will be saved.

6. If you do not press any buttons for 30 seconds the control will automatically exit from the Program Mode. The last parameter change will NOT BE SAVED.

Programmable Parameters			
Parameter Number	**Description**	**Default**	**Range**
P1*	High Fan Speed Limit (% of input voltage)	100 “00."	56 - 100 (100 = 00.)
P2* **	Low Fan Speed Limit (% of input voltage)	50	30 - 55
P3	Unused-Reserved for future applications	N/A	N/A
P4	Temperature Sensor Calibration	0	-10° to +10° F
P5 to P8	Unused-Reserved for future applications	N/A	N/A
P9	Display LED Brightness Control	13	4 = minimum 13 = maximum
A1	Displays °F or °C	°F	°F / °C
A2	Unused-Reserved for future applications	N/A	N/A
A3	Reverse Fan Speed in Heating Mode	rE	No = Normal rE = Reverse
A4	Continuous Fan Operation or Cycling on Demand	Co	CY = Cycle Co = Continuous
A5	Hot Water Heating or Electric Element Heat	Of	Of = Hot Water EL = Electric Heat
A6	Fan Motor Type, Shaded Pole or Split Capacitor	SP	SP = Shaded Pole SC = Split Capacitor
A7	Reset Memorized Programming Defaults	nO	nO = Normal Rs = Reset Default
A8	Force Water Valve Open for 4 Hours to Bleed the Air from the Chillwater Loop	no	no = Normal Operation oP = Open
A9	Ambient Air to Chilled Water Temperature Differential	15° F	5° to 25° F
b1	Air Temperature Sensed from the Display Panel or the Air Sensor connected to the PC Board	on	on = PC Board of = Display Panel
b2	Delay Before Fan Turns Off	30s	30 - 199 seconds

* P1 and P2 values are expressed as a percentage of the input voltage. If the setting for P1 is 90 then the maximum voltage output at high fan speed (speed 6) will be approximately 90% of the input voltage. As you are changing the settings in P1 and P2 the fan will operate and change according to the settings you are entering.

** If Electric Heat is selected (A5 = EL) then P2 must NOT be set lower than 50 and parameter b2 must be set to a minimum of 60 seconds.

FAULT CODES	
Code	**Description**
E1	Display cable damaged. Check to see if the cable has been cut or otherwise damaged.
LA	Low Voltage Input to Power Module Box. Check your incoming voltage to the Power Module Box and verify that it is within +/-10% of the rated voltage
AA	Air Sensor Failure or Disconnected. If you get this error code and you intend to use the air sensor on the Display Panel change Parameter **b1** to “of”.

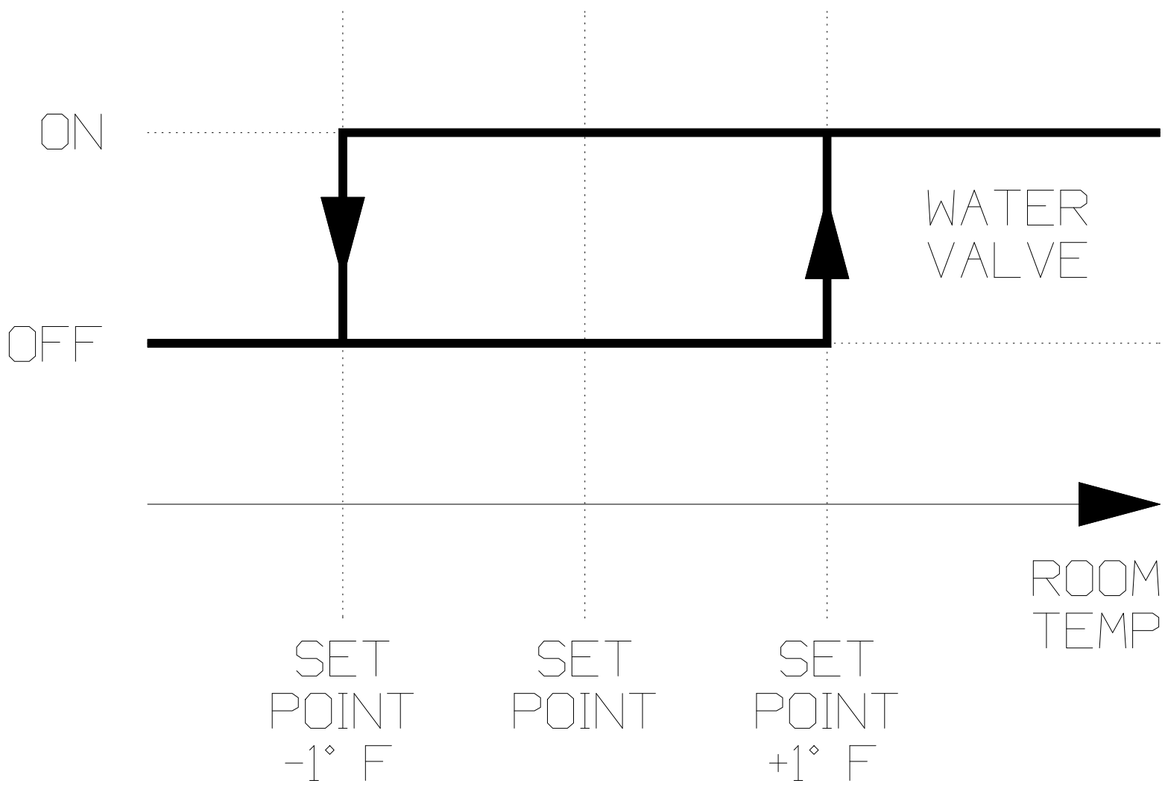
6. Control Operation Flow Charts and Diagrams

On the following pages are flow charts and graphic representations of how the control operates the water valve, fan and heater (if so equipped) in each of the 4 operating modes. Some of the abbreviations are as follows:

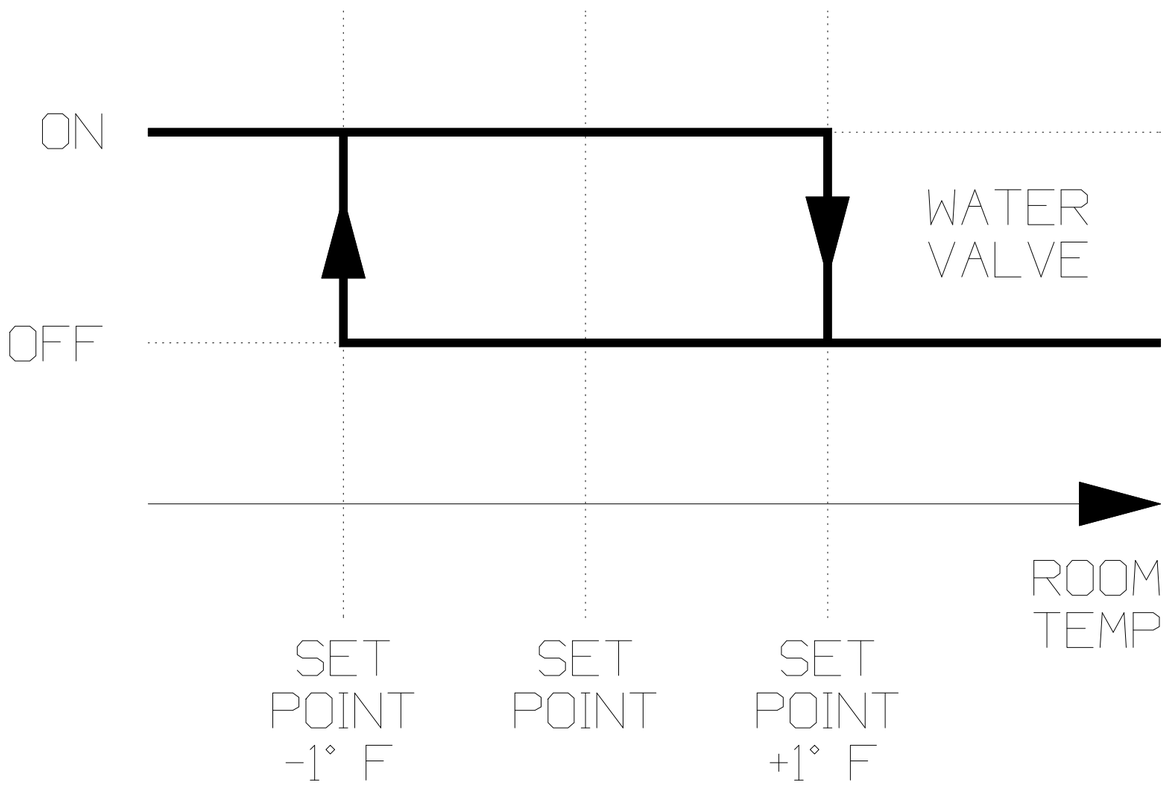
TERM	Definition
Abs	Absolute Value. The Absolute Value of 5 is 5. The Absolute Value of (-3) is 3. The Absolute Value of an equation that returns a negative number is always a positive number. Therefore Abs (3-8) = 5
DELTA	Difference between two values. As used in this manual it is the difference between two temperatures
Hysteresis	The lag between making a change, such as increasing or decreasing temperature, and the response or effect of that change. It typically refers to turn-on and turn-off points. For example, if a thermostat set for 70 degrees turns on when the temperature reaches 68 and turns off at 72, the hysteresis is the range from 68 to 72.
LED	Light Emitting Diode. These are all of the lights on the display panel. The two 7 segment numerical displays are each made up of 7 individual diodes.
Tair	Air Temperature as sensed by either the Display Panel or Room Air Sensor
Twater	Water Temperature as sensed by the Water Sensor
To	Ambient air to chillwater differential. This is set in P18.
Tset	Set Temperature of the thermostat

WATER VALVE & HEATER OPERATION

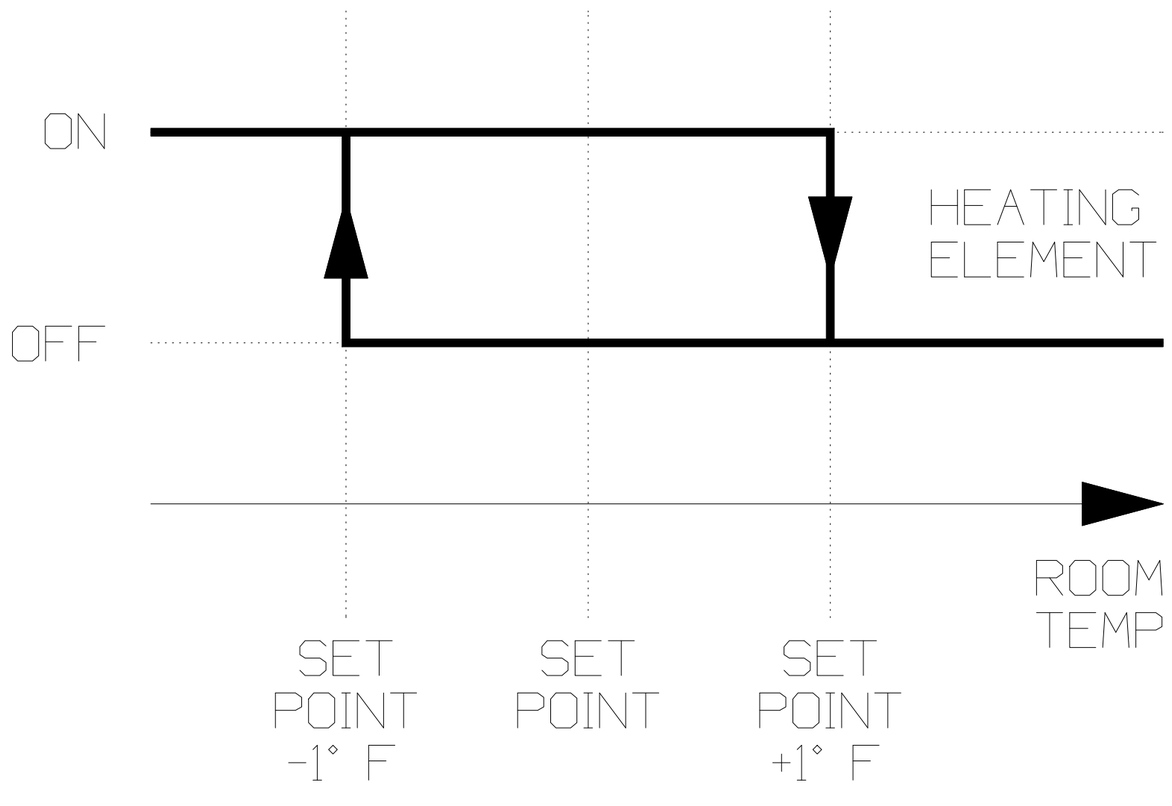
COOLING MODE - WATER VALVE



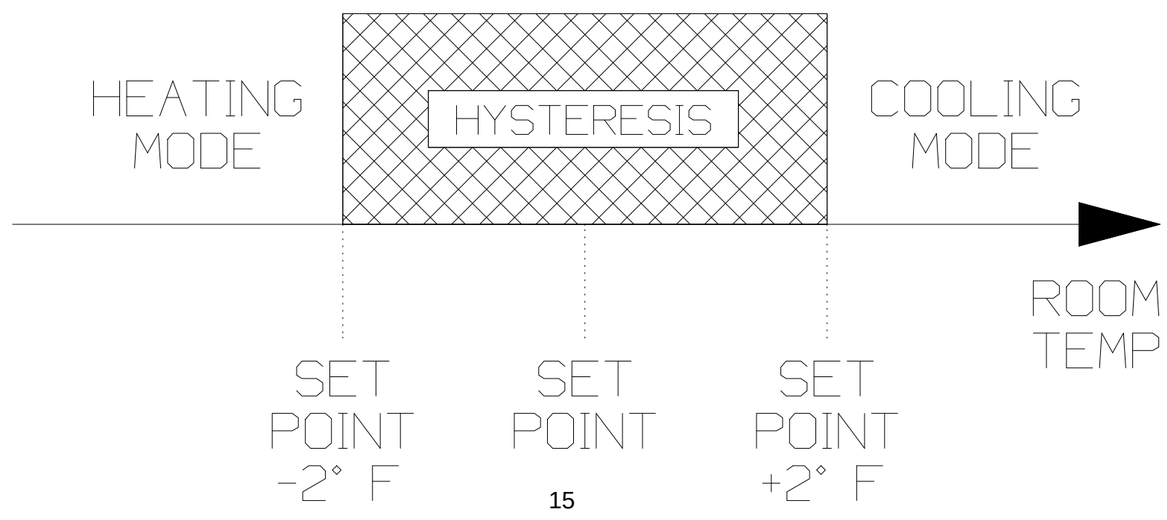
HEATING MODE - WATER VALVE
PARAMETER A5 = HOT WATER ONLY (Of)



HEATING MODE - HEATING ELEMENT
PARAMETER A5 = ELECTRIC HEAT (EL)

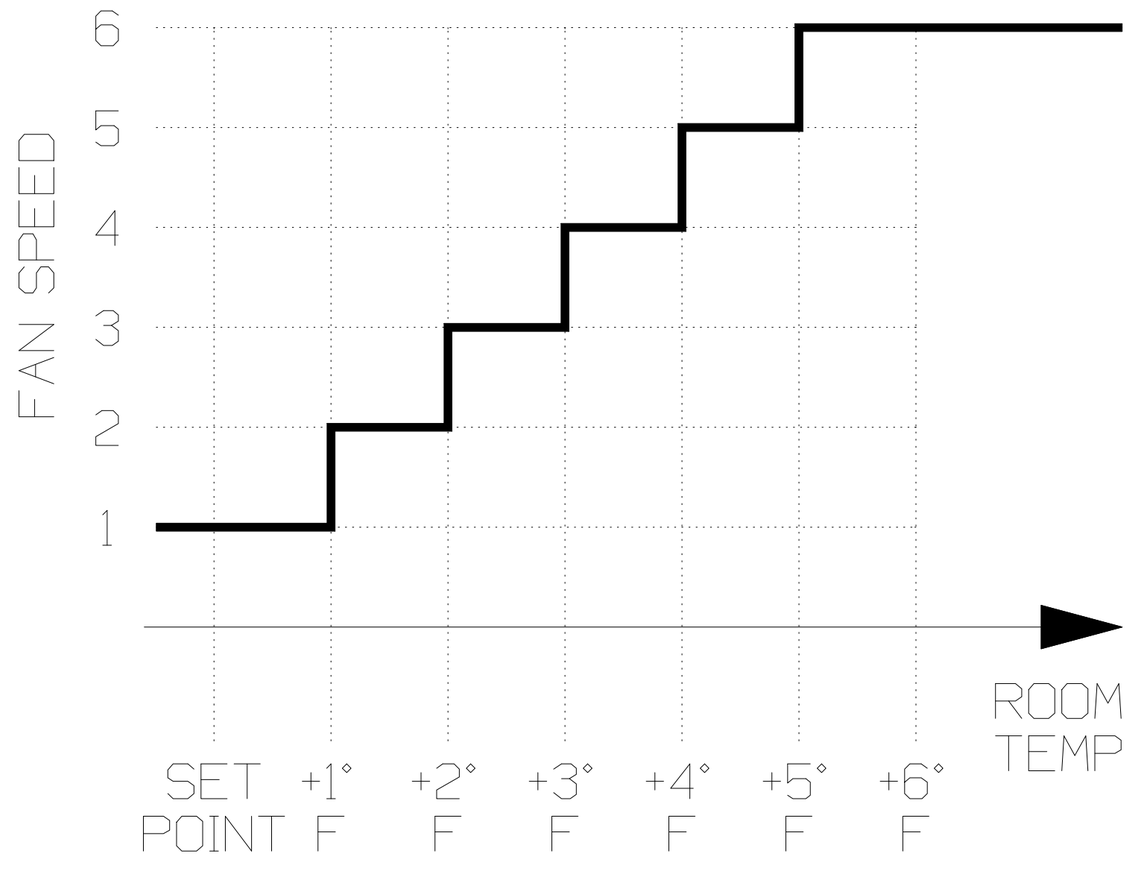


AUTOMATIC FUNCTION
MODE CHANGEOVER

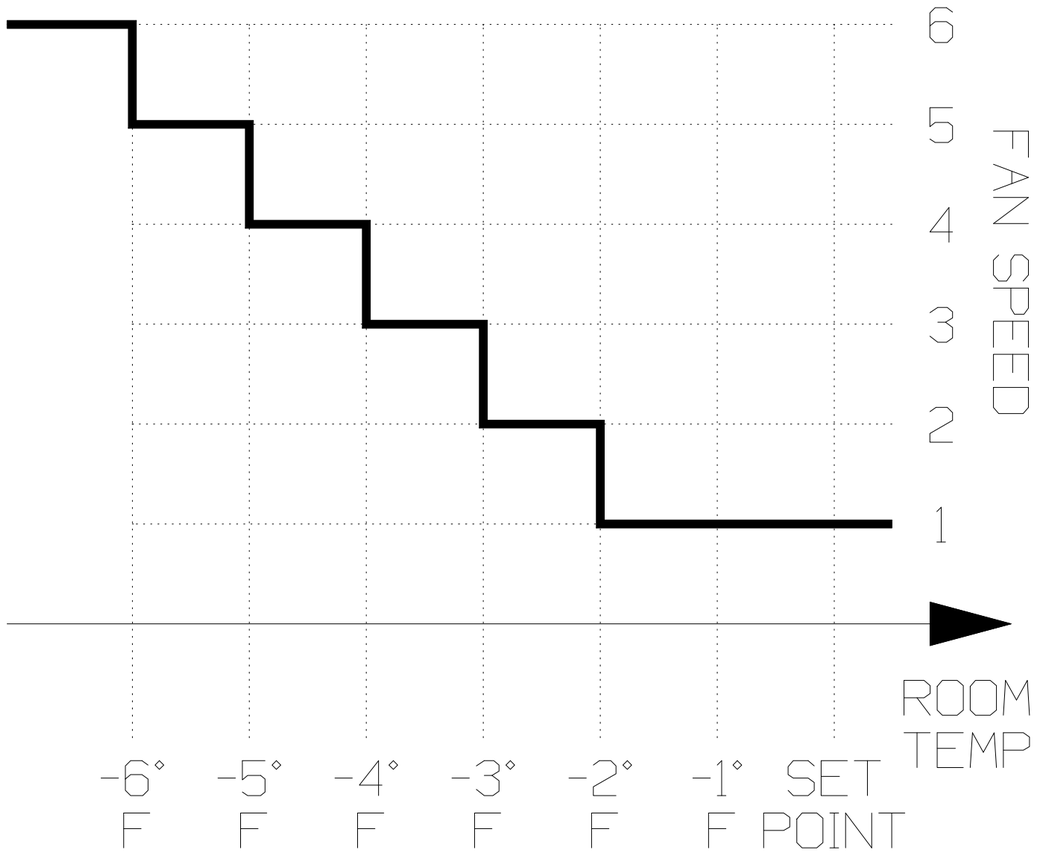


AUTO FAN SPEED OPERATION

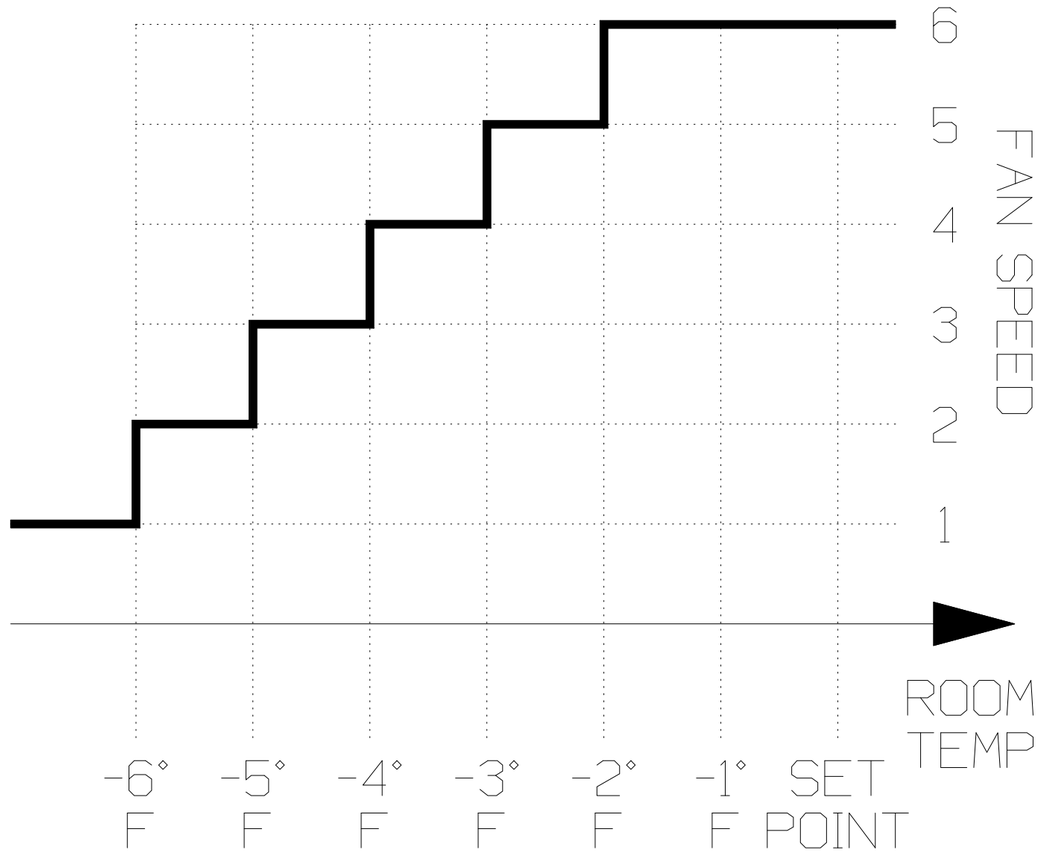
COOLING MODE



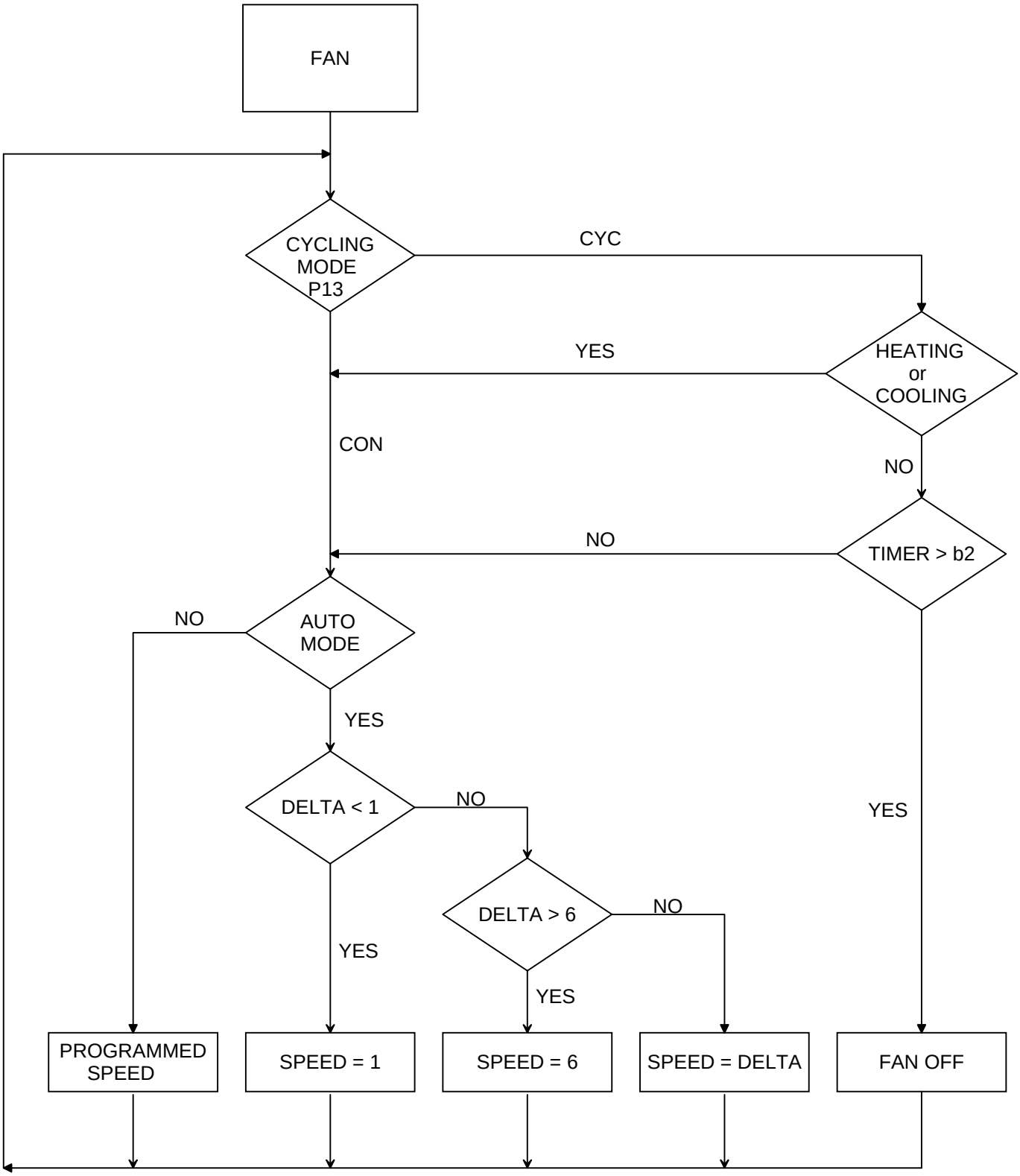
HEATING MODE
PARAMETER A3 = NORMAL (No)



HEATING MODE
PARAMETER A3 = REVERSE (rE)



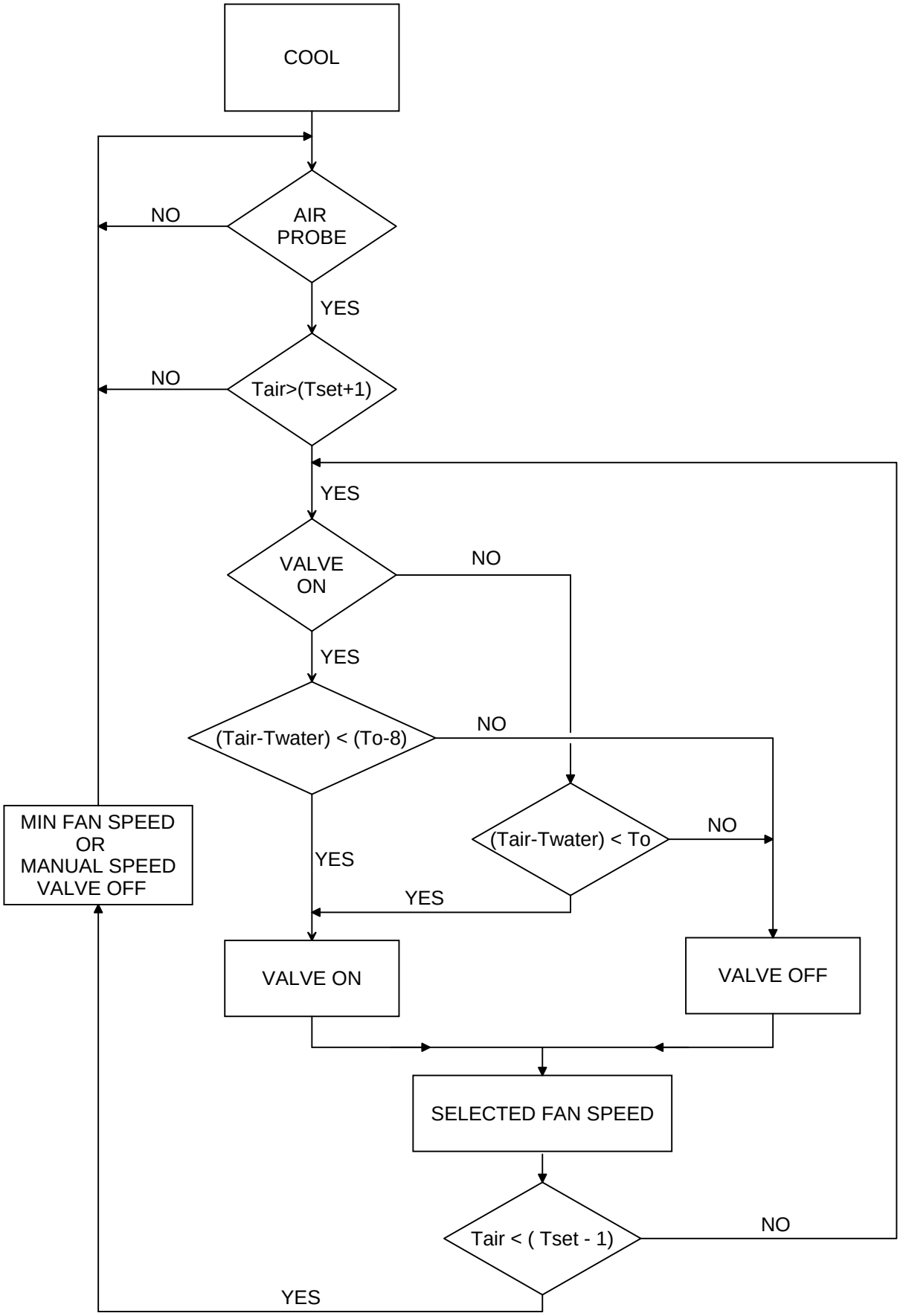
FAN OPERATION & SPEED SELECTION



Normal Fan Operation
DELTA = Abs(Tair - Tset)

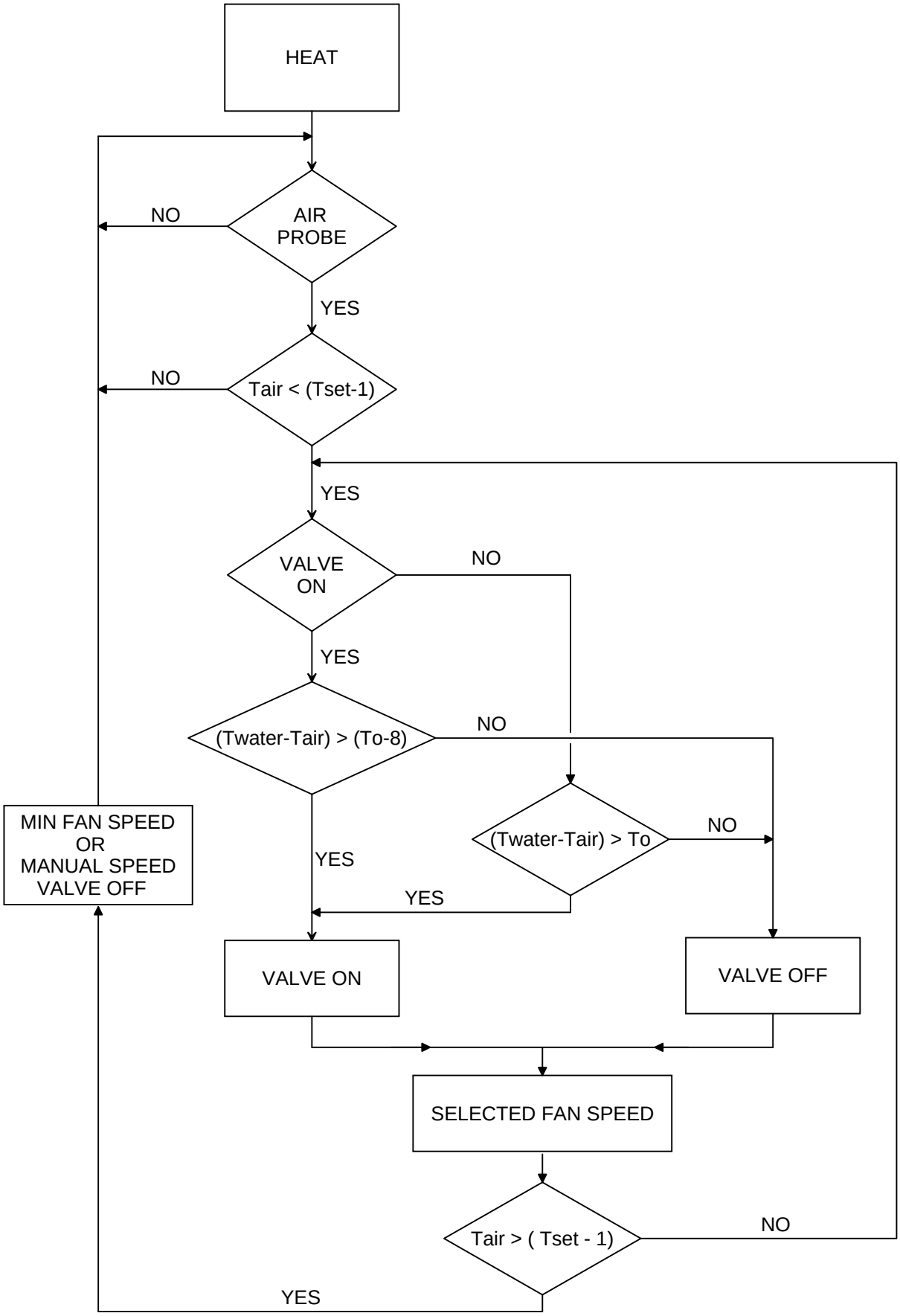
Reverse Fan Operation
DELTA = Abs[Abs(Tair - Tset) - 6]

COOLING MODE



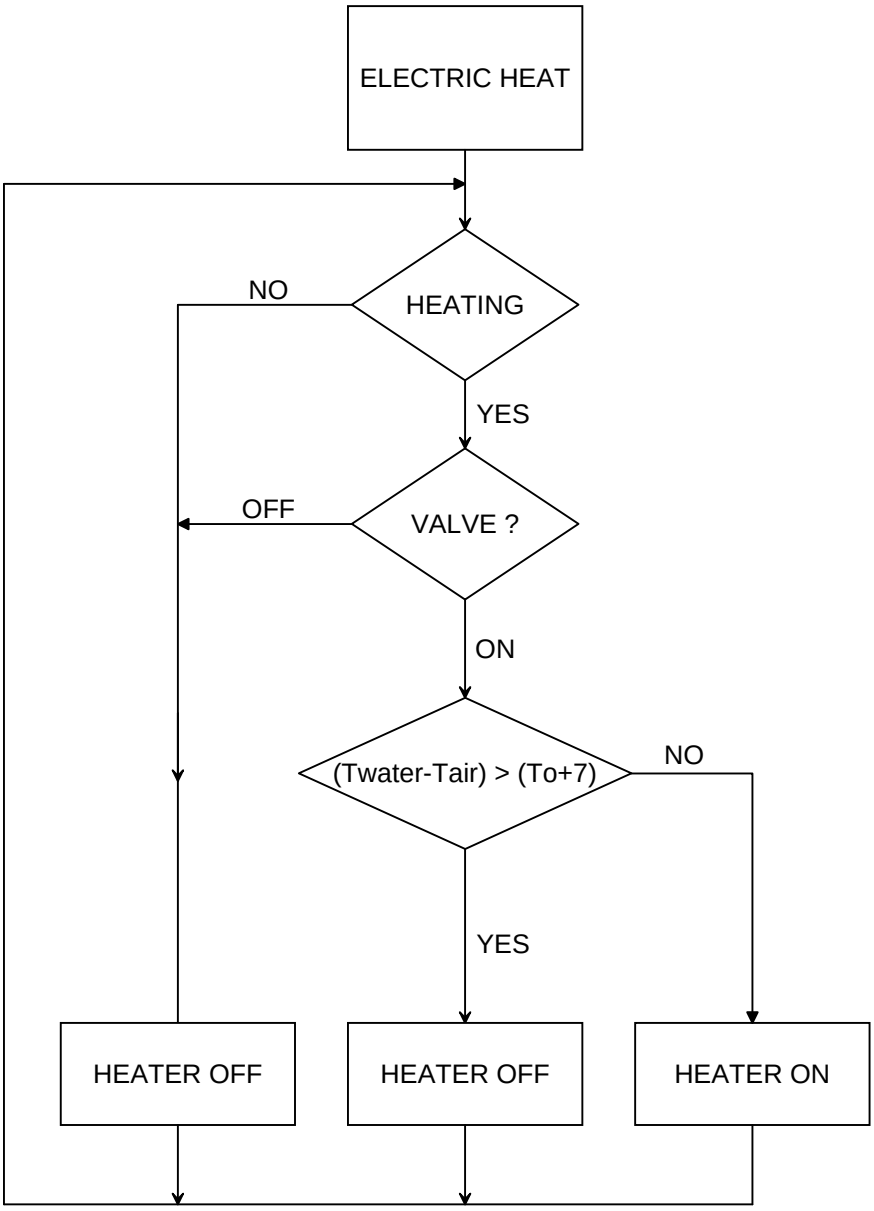
To = Ambient air to Chillwater Temperature Differential P18

HEATING MODE



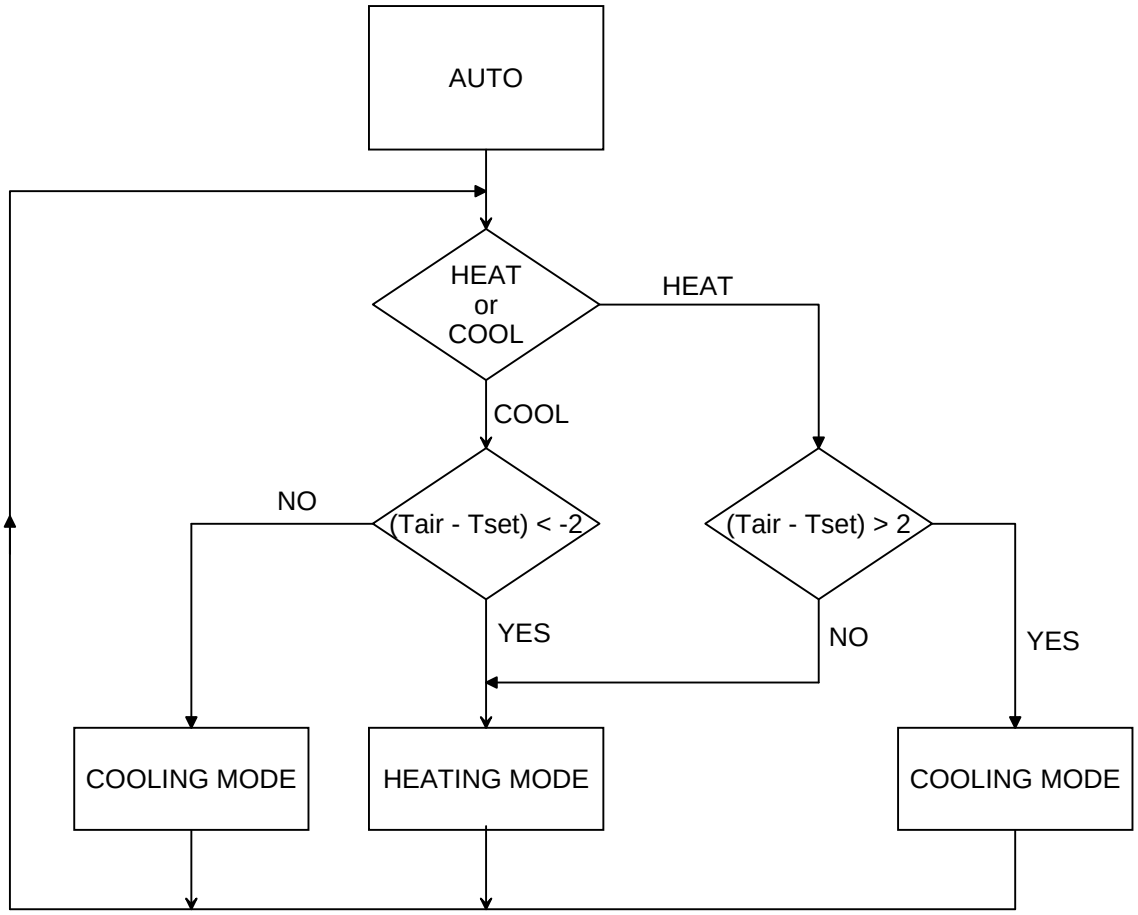
To = Ambient air to Chillwater Temperature Differential P18

ELECTRIC HEATER

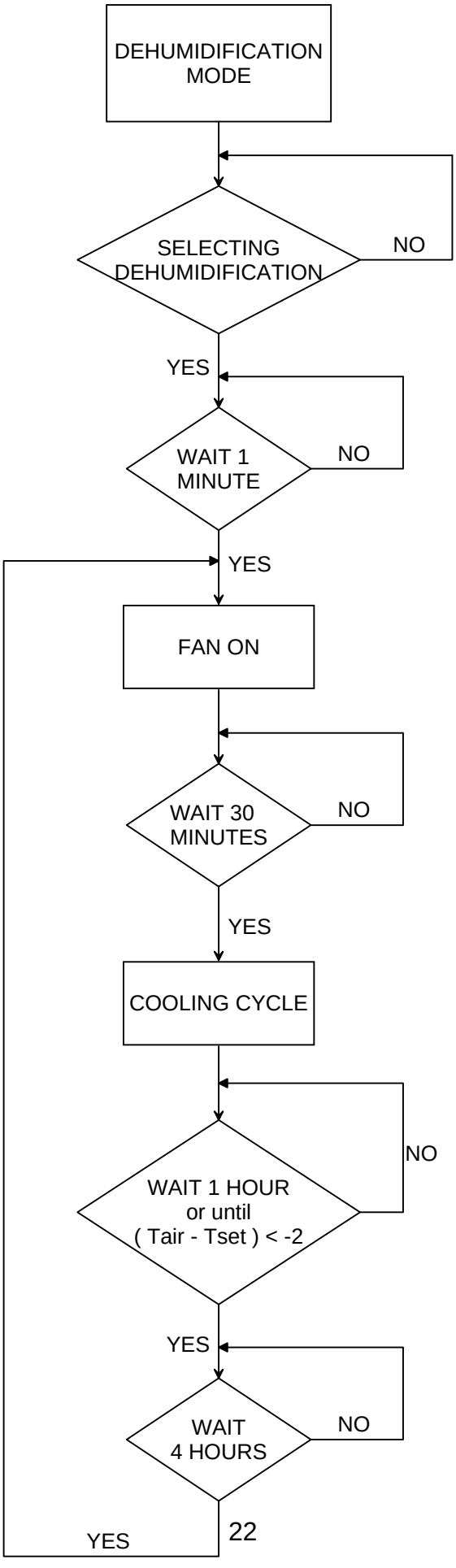


To = Ambient air to Chillwater Temperature Differential P18

AUTO MODE


AUTO
HEAT
or
COOL
HEAT
COOL
NO
(Tair - Tset) < -2
(Tair - Tset) > 2
YES
NO
YES
COOLING MODE
HEATING MODE
COOLING MODE

DEHUMIDIFICATION MODE



MULTIPLE FAN COILS CAN BE CONNECTED IN PARALLEL TO THE THERMOSTAT PROVIDED THEY DO NOT EXCEED THE MAXIMUM AMPERAGE RATINGS OF THE CONTROL MODULE

FUSES	
FAN (F2)	25A
TX-PRIM. (F1)	500mA
TX-SEC. (F3)	500mA

DISPLAY HEAD

DISPLAY CABLE 15'

SENSORS

INLET WATER SENSOR

ROOM AIR SENSOR

FAN COIL

FAN MOTOR

G O W

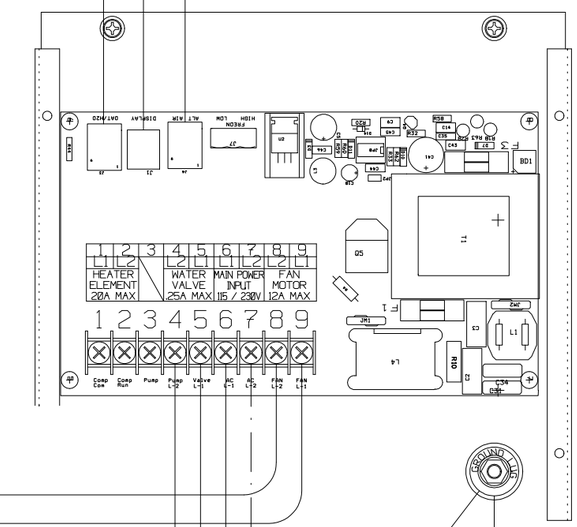
W BK

M

WATER VALVE MOTOR

POWER INPUT
115/1/60
200-230/1/50-60

L1
L2 or N
G



INLET WATER SENSOR NOTE

ATTACH SENSOR TO THE WATER INLET LINE AT FAN COIL WATER VALVE

MAXIMUM CIRCUIT RATINGS

WATER VALVE 1/4A
FAN MOTOR 12A
HEATER 20A

TERMINAL BLOCK CONNECTIONS

1. HEATER ELEMENT L1
2. HEATER ELEMENT L2
3. N/A
4. WATER VALVE L2
5. WATER VALVE L1
6. POWER INPUT L1
7. POWER INPUT L2 or N
8. FAN L2
9. FAN L1

NOTE: ALL L2's ARE COMMON TO EACH OTHER

NOTE: FAN COIL MOTOR, WATER VALVE & HEATER MUST BE RATED FOR THE SAME VOLTAGE AS THE POWER INPUT.

NOTE: JP1 MUST BE CUT FOR CHILLED WATER APPLICATIONS.

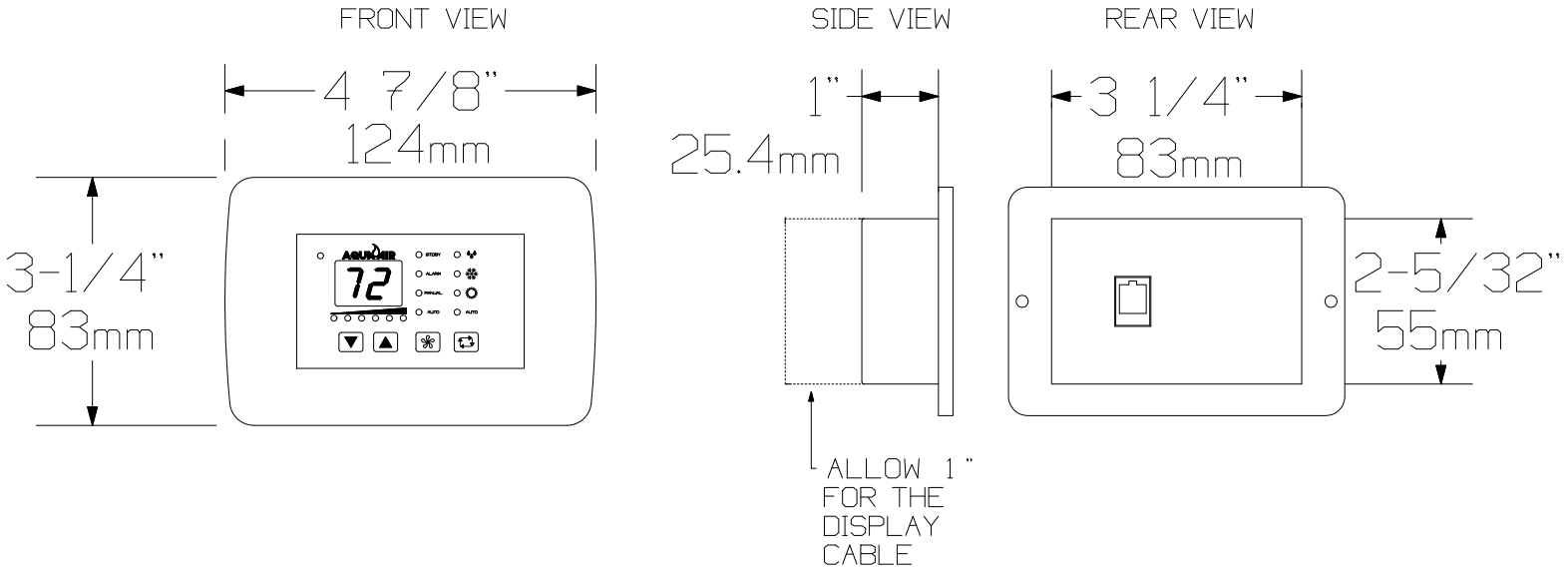
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

TSVW DIGITAL THERMOSTAT w/ SINGLE AQOW / AQOCW STYLE FAN COIL 115 or 230V COOLING ONLY or with HOT WATER HEAT

DRAWING NUMBER	DRAWN BY	DATE
4011-17A	SB	05-04-05

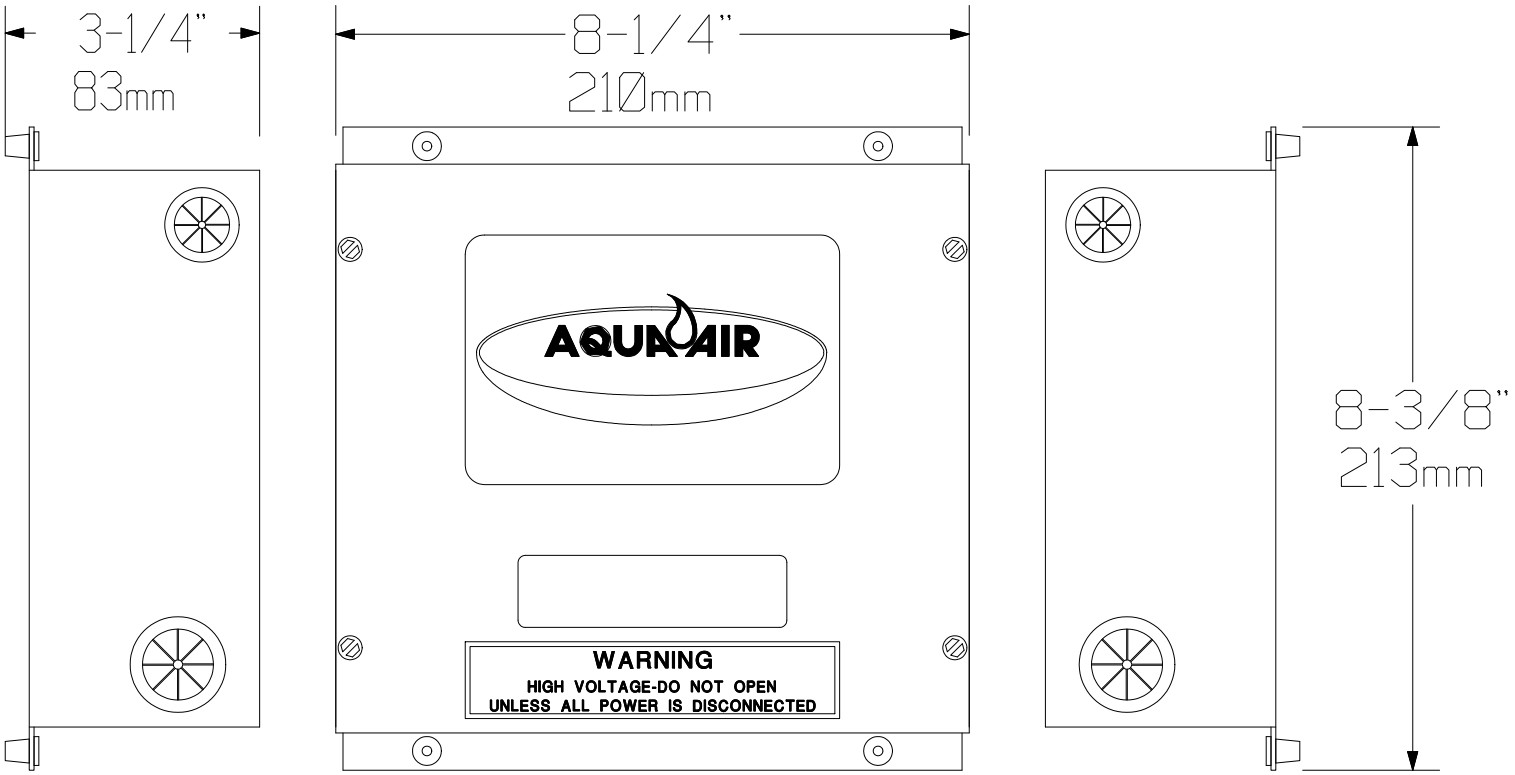
SCALE	APPROVED BY	REVISION DATE	REV
NONE	CC		A

TSVW COMPONENT DIMENSIONS



TSV-01 DISPLAY

TSVW-02 CONTROL MODULE



80999-SP.GXD

Chiller Units

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

COMPACT CHILLER ALPHA SERIES

The Alpha Series Compact Chiller Module is the largest selling chiller in the megayacht industry today. Over the last decade more Alpha's have been installed in yachts than all other brands combined. Since its introduction in 1993 it has constantly evolved. Alpha's shipped today feature 308 stainless steel chassis' and fasteners, scroll compressors and Awlgrip® coatings. What has not changed is the compactness and unrivaled reliability. In recent comparisons to other brands, the Alpha was on an average 22% lighter and 38% smaller in volume. This means major weight and space savings when the units are racked. Alpha's are built in capacities from 24,000 to 72,000 BTU/H (19-60,000 BTU/H 50 Hz) and all share the same chassis dimensions. Should a vessels BTU requirements exceed 72,000 BTU/H, multiple chillers can be racked together for a larger total capacity.

Features

- Copeland Scroll compressors
- Stainless Steel chassis and fasteners
- Awlgrip® Matterhorn White finish
- Available in either Reverse Cycle or Cooling Only units
- Access ports for high and low refrigerant pressure
- High and low automatic reset refrigerant pressure switches
- 90-10 Cupronickel seawater condensers
- Stainless steel plate chiller
- Electrical box can be remote mounted
- Honeywell digital temperature controller with integral time delay
- Freeze prevention thermostat
- 3 phase units can be used with Variable Frequency Drives (VFD's)
- All units performance tested before shipping
- R-407C environmentally friendly refrigerant

A	5	H	G	D	Model Number Nomenclature	
					C	208-230 / 1 / 60
					CK	200-220 / 1 / 50
					D	208-230 / 3 / 60
					DK	200-220 / 3 / 50
					E	440-480 / 3 / 60
					EK	380-415 / 3 / 50
					G	R-407C Refrigerant
					BLANK	COOLING ONLY
					H	REVERSE CYCLE
					CAPACITY, IN TONS, AT RATED VOLTAGE	

Physical Specifications

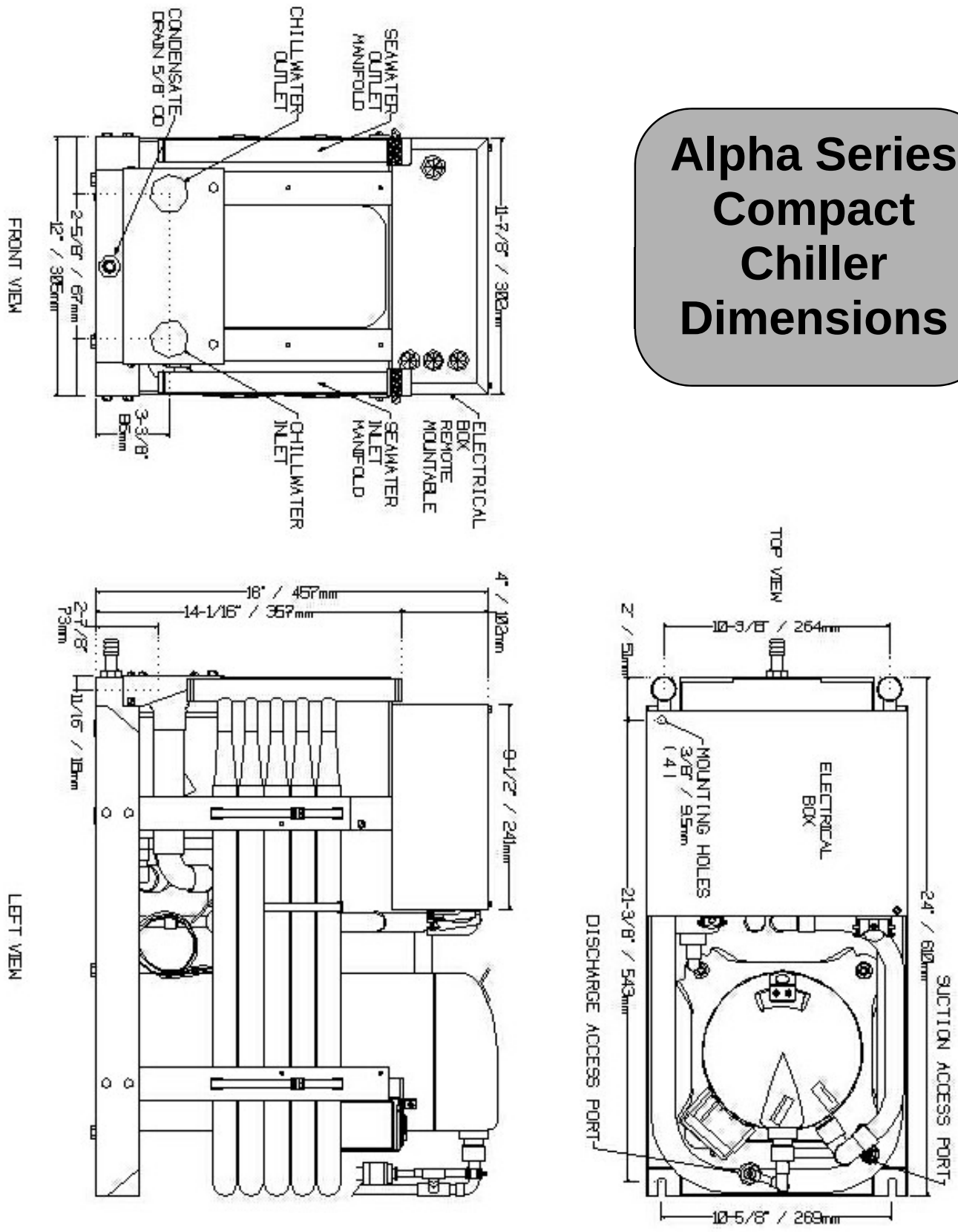
MODEL	CAPACITY BTU/HR	AVAILABLE VOLTAGES	WEIGHT		CHILLWATER INLET / OUTLET	MINIMUM CHILLWATER FLOW		SEAWATER INLET / OUTLET	MINIMUM SEAWATER FLOW	
			LBS	KGS		GPM	LPM		GPM	LPM
A1.7*	19,920	200-220 / 1 / 50	140	64	½" FPT	4.0	15.3	5/8" OD	6.8	25.9
A2*	24,000	208-230 / 1 / 60 208-230 / 3 / 60 460 / 3 / 60 380-415 / 3 / 50	140	64	½" FPT	4.8	18.3	5/8" OD	8.0	31.0
A2.5*	30,000	200-220 / 1 / 50	157	71	3/4" FPT	6.0	22.9	1" OD	10.0	38.1
A3*	36,000	208-230 / 1 / 60 208-230 / 3 / 60 460 / 3 / 60 380-415 / 3 / 50	157	71	3/4" FPT	7.2	27.4	1" OD	12.0	45.8
A3.3*	40,000	200-220 / 1 / 50	161	73	1" FPT	7.9	30.1	1" OD	13.2	50.3
A4*	48,000	208-230 / 1 / 60 208-230 / 3 / 60 460 / 3 / 60 380-415 / 3 / 50	161	73	1" FPT	9.6	36.5	1" OD	16.0	61.0
A5*	60,000	208-230 / 1 / 60 208-230 / 3 / 60 460 / 3 / 60 380-415 / 3 / 50	161	73	1-1/4" FPT	12.0	45.6	1" OD	20.0	76.3
A6*	72,000	208-230 / 3 / 60 460 / 3 / 60	165	85	1-1/4" FPT	14.4	54.5	1" OD	24.0	90.8

* See Model Number Nomenclature chart above for additional letter codes

Performance Specifications

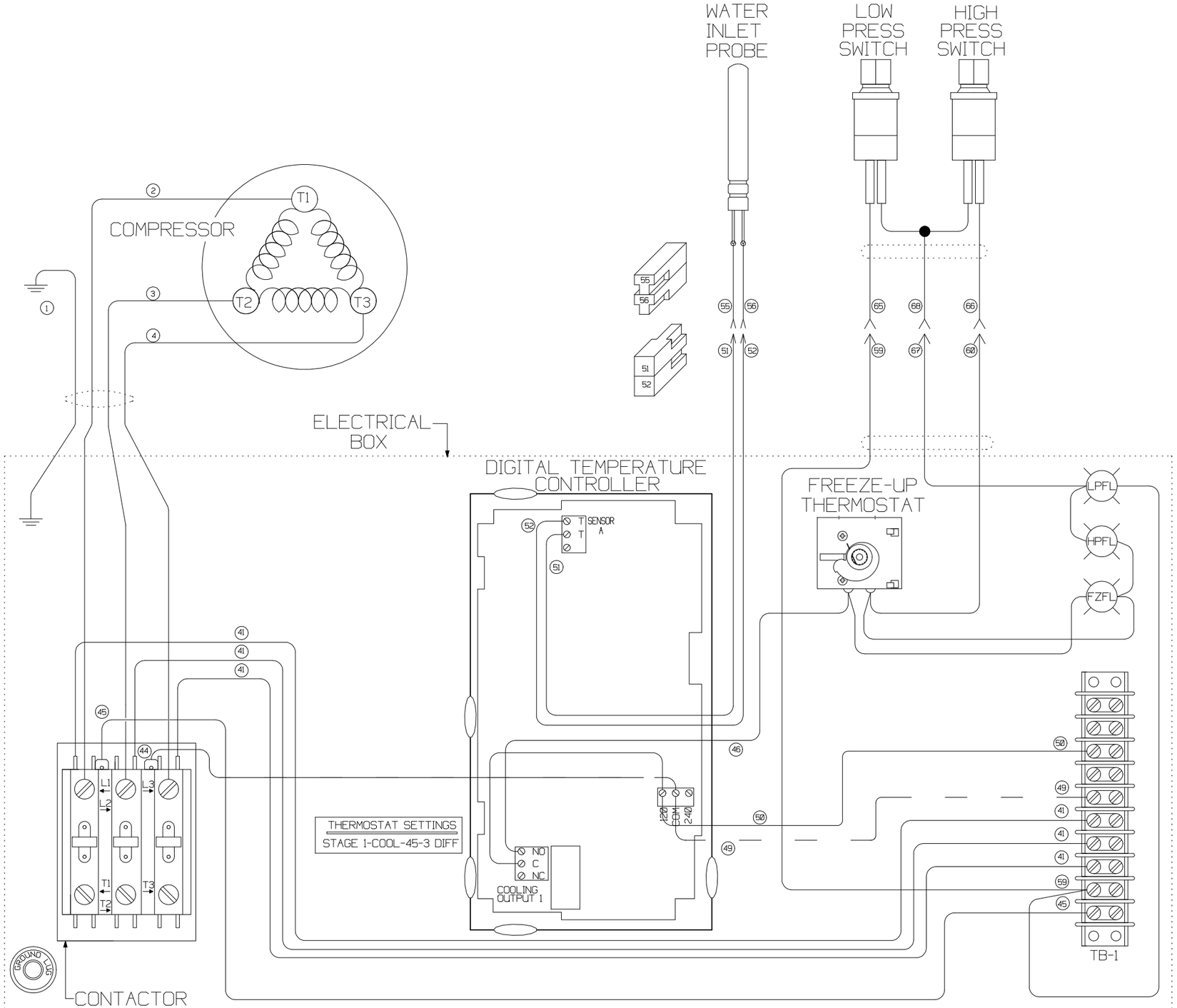
MODEL	CAPACITY			POWER SUPPLY			FULL LOAD AMPS FLA	POWER INPUT W	LOCKED ROTOR AMPS LRA
	BTU/HR	KCAL/HR	TONS	VOLTAGE	PHASE	Hz			
A1.7HGCK	19,920	4,980	1.7	200-220	1	50	6.3	1158	47
A2HGC	24,000	6,000	2.0	208-230	1	60	6.4	1395	56
A2HGD	24,000	6,000	2.0	208-230	3	60	4.9	1380	45
	19,920	4,980	1.7	200-220	3	50	4.8	1145	48
A2HGE	24,000	6,000	2.0	460	3	60	2.5	1380	23
	19,920	4,980	1.7	380-415	3	50	2.4	1145	24
A2.5HGCK	30,000	7,500	2.5	200-220	1	50	10.4	1872	73
A3HGC	36,000	9,000	3.0	208-230	1	60	10.6	2255	88
A3HGD	36,000	9,000	3.0	208-230	3	60	7.6	2210	77
	30,000	7,500	2.5	200-220	3	50	7.5	1834	76
A3HGDK	36,000	9,000	3.0	200-220	3	50	9.2	2450	88
A3HGE	36,000	9,000	3.0	460	3	60	3.8	2210	39
	30,000	7,500	2.5	380-415	3	50	3.7	1834	38
A3HGEK	36,000	9,000	3.0	380-415	3	50	4.6	2450	44
A3.3HGCK	40,000	10,000	3.3	200-220	1	50	11.9	2536	107
A4HGC	48,000	12,000	4.0	208-230	1	60	14.4	3055	129
A4HGCK	48,000	12,000	4.0	200-220	1	50	15.1	3125	140
A4HGD	48,000	12,000	4.0	208-230	3	60	9.3	3005	120
	40,000	10,000	3.3	200-220	3	50	9.2	2450	88
A4HGDK	48,000	12,000	4.0	200-220	3	50	11.4	3005	115
A4HGE	48,000	12,000	4.0	460	3	60	4.7	3005	60
	40,000	10,000	3.3	380-415	3	50	4.6	2450	44
A4HGEK	48,000	12,000	4.0	380-415	3	50	5.7	3005	58
A5HGC	60,000	15,000	5.0	208-230	1	60	18.2	3765	169
A5HGD	60,000	15,000	5.0	208-230	3	60	11.6	3655	137
	50,000	12,500	4.0	200-220	3	50	11.4	3005	115
A5HGDK	60,000	15,000	5.0	200-220	3	50	14.7	3615	140
A5HGE	60,000	15,000	5.0	460	3	60	5.8	3765	85
	50,000	12,500	4.0	380-415	3	50	5.7	3005	58
A5HGEK	60,000	15,000	5.0	380-415	3	50	7.4	3615	43
A6HGD	72,000	18,000	6.0	208-230	3	60	13.2	4220	156
	60,000	14,000	4.7	200-220	3	50	13	3490	172
A6HGE	72,000	18,000	6.0	460	3	60	6.6	4220	75
	60,000	14,000	4.7	380-415	3	50	6.5	3490	74

Alpha Series Compact Chiller Dimensions



AQUA-AIR MANUFACTURING, division of the James D. Nall Co., Inc.
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 Email sales@aquaair.com
www.aquaair.com

REVISIONS			
REV	DESCRIPTION	BY	DATE
B	DRAWING WAS REVISED TO REMOVE TIME DELAY FROM THE ELEC. BOX	SB	09-25-09
C	DRAWING WAS REVISED TO ADD SAFETY FAULT LIGHTS FOR LPS. HPS & FZT.	SB	09-09-10



1	GN	14	14/4 COND
2	WH	14	
3	BK	14	
4	R	14	
41	R	16	
44	B/R	16	
45	P/W	16	
46	P/W	16	
47	P/W	16	
49	B/R	16	
50	P/W	16	
51	W	18	18/2 COND
52	GN	18	
55	W	18	18/2 COND
56	BK	18	
59	R	18	18/2 COND
60	BK	18	
65	R	18	18/2 COND
66	BK	18	
67	R	18	18/2 COND
68	BK	18	

NOTE: WIRE NUMBERS NOT LISTED ARE NOT USED ON THIS UNIT

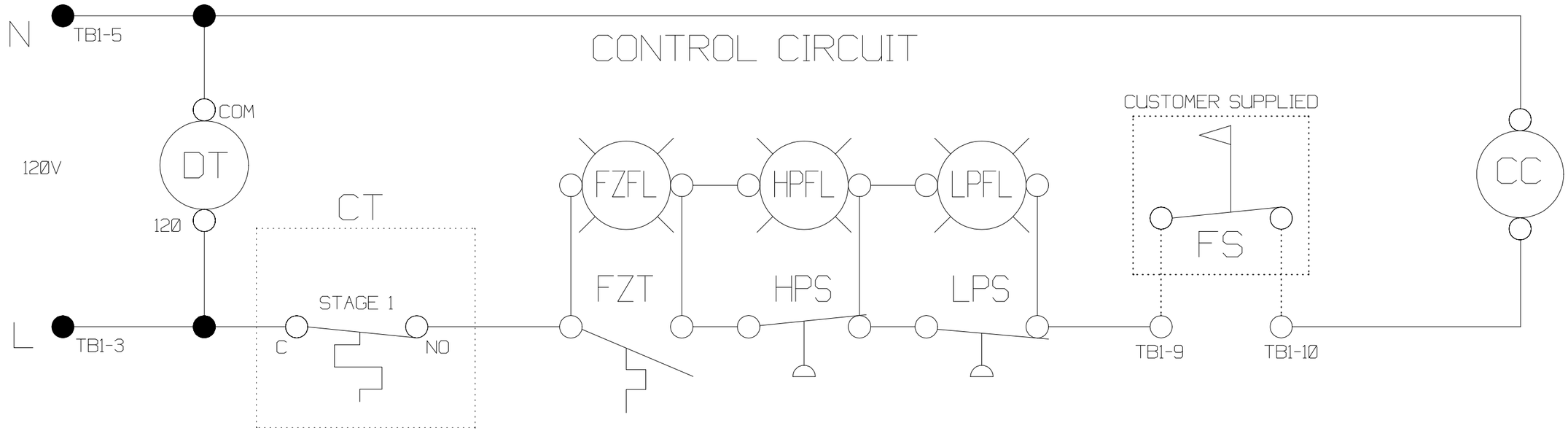
120V CONTROL CKT.

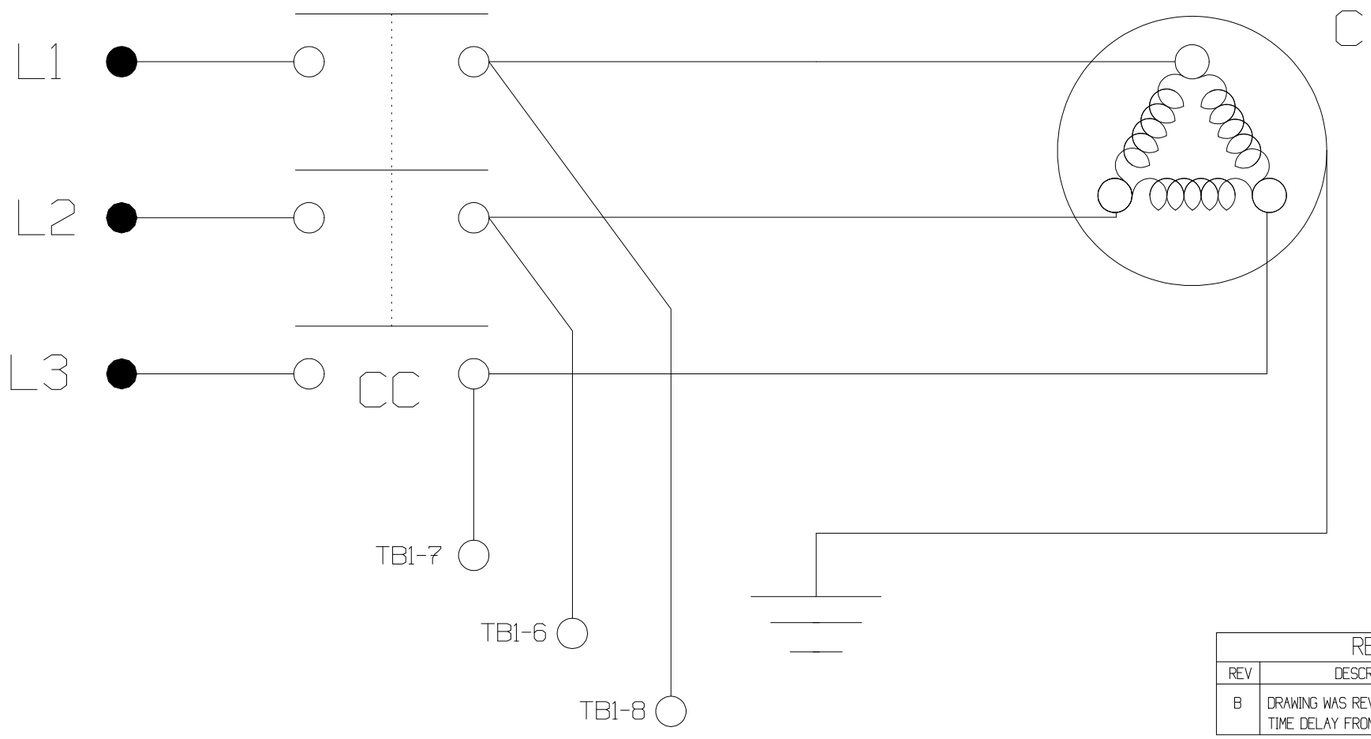
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

A2-6E INT. WIRING W/ SCROLL COMPRESSOR

120V CONTROL CIRCUIT 460/3/60

DRAWING NUMBER	4012-42D	DRAWN BY	SB	DATE	09-29-09
SCALE	NONE	REVISED BY	DN	REVISION DATE	09-09-10
				REV	C





C	COMPRESSOR
CC	COMPRESSOR CONTACTOR
CT	COOLING THERMOSTAT
DT	DIGITAL THERMOSTAT
FS	FLOW SWITCH
FZFL	FREEZEUP FAULT LIGHT
FZT	FREEZE-UP THERMOSTAT
HPFL	HIPGH PRE FAULT LIGHT
HPS	HIGH PRESSURE SWITCH
LPFL	LOW PRE FAULT LIGHT
LPS	LOW PRESSURE SWITCH
TB	TERMINAL BLOCK

120V CONTROL CKT.

REVISIONS			
REV	DESCRIPTION	BY	DATE
B	DRAWING WAS REVISED TO REMOVE TIME DELAY FROM THE SCHEMATIC	SB	09-25-09

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

A2-6E W/ SCROLL COMPRESSOR
INTERNAL WIRING LADDER SCHEMATIC
120V CONTROL CIRCUIT 460-3-60

DRAWING NUMBER	4012-43D	DRAWN BY	SB	DATE	09-29-09
SCALE	NONE	REVISED BY	DN	REVISION DATE	09-09-10
				REV	C

Physical Properties of Refrigerants	R-407C
Environmental Classification	HFC
Molecular Weight	86.2
Boiling Point (1 atm, F)	-43.6
Critical Pressure (psia)	672.1
Critical Temperature (F)	187
Critical Density (lb./ft^3)	32
Liquid Density (70 F, lb./ft^3)	72.35
Vapor Density (bp, lb./ft^3)	0.289
Heat of Vaporization (bp, BTU/lb.)	106.7
Specific Heat Liquid (70 F, BTU/lb. F)	0.3597
Specific Heat Vapor (1 atm, 70 F, BTU/lb. F)	0.1987
Ozone Depletion Potential (CFC 11 = 1.0)	0
Global Warming Potential (CO2 = 1.0)	1674
ASHRAE Standard 34 Safety Rating	A1
Temperature Glide (F) (see section II)	10

Available in the following sizes:

R-407C

25R407C 25 lb cylinder
115R407C 115 lb cylinder*

*Deposit Required

R-407C (R-32/125/134a) (23 / 25 / 52 wt%)

A blend of R-32, R-125 and R-134a that has very similar properties to R-22 in air conditioning equipment. There is a slight decrease in capacity and efficiency, however R-407C can be used in essentially the same equipment to perform the same job with only minor engineering modifications. New systems built with R-407C must have POE lubricants, and retrofitted R-22 systems would need the resiual oil flushed with POE. R-407C has a 10F temperature glide, which should not pose any operation-related problems for a typical system.

Applications: Air conditioning, higher temperature refrigeration

Retrofitting: for R-22 page 90

Pressure-Temp Chart

	R-407C	
Temp (F)	Liquid (psig)	Vapor (psig)
-40	3.0	4.4
-35	5.4	0.6
-30	8.0	1.8
-25	10.9	4.1
-20	14.1	6.6
-15	17.6	9.4
-10	21.3	12.5
-5	25.4	15.9
0	29.9	19.6
5	34.7	23.6
10	39.9	28.0
15	45.6	32.8
20	51.6	38.0
25	58.2	43.6
30	65.2	49.6
35	72.6	56.1
40	80.7	63.1
45	89.2	70.6
50	98.3	78.7
55	108	87.3
60	118	96.8
65	129	106
70	141	117
75	153	128
80	166	140
85	180	153
90	195	166
95	210	181
100	226	196
105	243	211
110	261	229
115	280	247
120	300	266
125	321	286
130	342	307
135	365	329
140	389	353

THERMODYNAMIC PROPERTIES OF R-407C

Temp [F]	Pressure Liquid [psia]	Pressure Vapor [psia]	Density Liquid [lb/ft^3]	Density Vapor [lb/ft^3]	Enthalpy Liquid [Btu/lb]	Enthalpy Vapor [Btu/lb]	Entropy Liquid [Btu/R-lb]	Entropy Vapor [Btu/R-lb]
-60	10.2	6.9	87.66	0.1418	-6.192	100.9	-0.01508	0.2575
-55	11.8	8.0	87.14	0.1641	-4.653	101.6	-0.01126	0.2558
-50	13.5	9.4	86.61	0.1890	-3.108	102.3	-0.00747	0.2542
-45	15.4	10.8	86.08	0.2169	-1.557	103.0	-0.00372	0.2527
-40	17.6	12.5	85.55	0.2480	0.000	103.7	0.00000	0.2512
-35	19.9	14.3	85.01	0.2825	1.564	104.4	0.00369	0.2498
-30	22.6	16.4	84.46	0.3206	3.134	105.1	0.00735	0.2484
-25	25.4	18.7	83.91	0.3628	4.711	105.8	0.01099	0.2472
-20	28.6	21.2	83.36	0.4092	6.296	106.5	0.01460	0.2459
-15	32.0	24.0	82.80	0.4602	7.888	107.2	0.01818	0.2448
-10	35.8	27.1	82.23	0.5160	9.488	107.9	0.02174	0.2437
-5	39.9	30.5	81.66	0.5771	11.10	108.5	0.02528	0.2426
0	44.3	34.2	81.08	0.6438	12.71	109.2	0.02879	0.2416
5	49.1	38.3	80.50	0.7164	14.34	109.8	0.03229	0.2406
10	54.3	42.7	79.90	0.7954	15.97	110.5	0.03576	0.2396
15	59.9	47.4	79.30	0.8812	17.62	111.1	0.03922	0.2387
20	66.0	52.6	78.70	0.9742	19.27	111.7	0.04265	0.2378
25	72.5	58.3	78.08	1.075	20.94	112.3	0.04608	0.2370
30	79.4	64.3	77.46	1.184	22.62	112.9	0.04948	0.2361
35	86.9	70.9	76.82	1.302	24.30	113.5	0.05288	0.2353
40	94.9	77.9	76.18	1.429	26.00	114.1	0.05626	0.2346
45	103.4	85.4	75.52	1.566	27.72	114.6	0.05963	0.2338
50	112.5	93.5	74.85	1.714	29.44	115.1	0.06298	0.2331
55	122.2	102.2	74.18	1.873	31.18	115.7	0.06633	0.2323
60	132.4	111.5	73.48	2.044	32.94	116.2	0.06968	0.2316
65	143.4	121.4	72.78	2.229	34.71	116.7	0.07301	0.2309
70	154.9	131.9	72.06	2.428	36.49	117.1	0.07635	0.2302
75	167.2	143.1	71.32	2.642	38.30	117.6	0.07968	0.2295
80	180.2	155.1	70.57	2.872	40.12	118.0	0.08301	0.2288
85	193.8	167.7	69.80	3.120	41.96	118.4	0.08634	0.2281
90	208.3	181.2	69.00	3.387	43.82	118.8	0.08967	0.2274
95	223.5	195.4	68.19	3.675	45.71	119.1	0.09301	0.2266
100	239.6	210.5	67.35	3.985	47.62	119.4	0.09636	0.2259
105	256.5	226.5	66.48	4.321	49.55	119.7	0.09972	0.2251
110	274.3	243.4	65.59	4.684	51.52	120.0	0.1031	0.2243
115	292.9	261.2	64.66	5.078	53.51	120.2	0.1065	0.2235
120	312.5	280.0	63.70	5.505	55.54	120.3	0.1099	0.2226
125	333.0	299.9	62.70	5.971	57.60	120.4	0.1133	0.2217
130	354.6	320.8	61.65	6.479	59.71	120.5	0.1168	0.2208
135	377.1	342.9	60.55	7.037	61.86	120.5	0.1203	0.2197
140	400.7	366.1	59.39	7.652	64.06	120.4	0.1239	0.2186

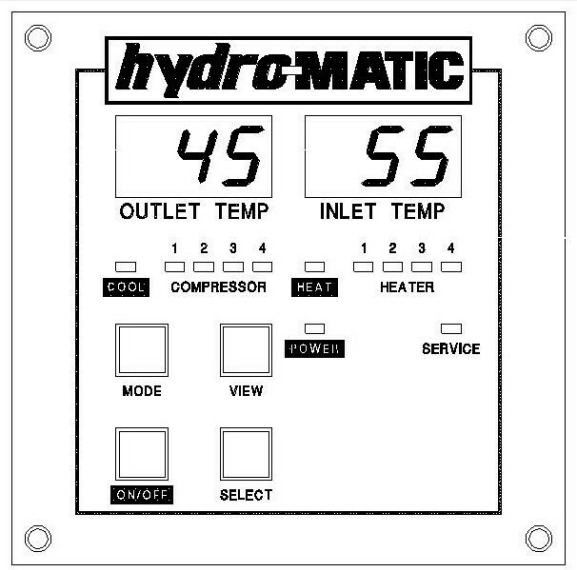
TEMPERATURE - PRESSURE CHART FOR
R-22, R-410A, R-407C, R-134A & R-404A REFRIGERANTS

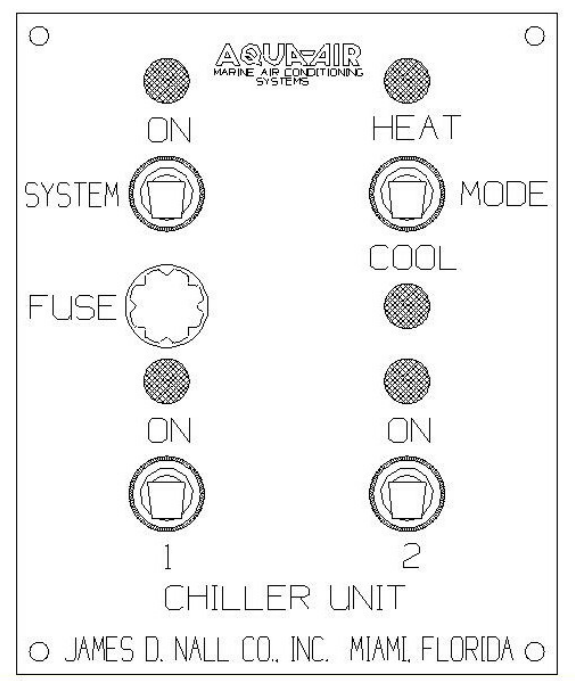
Temperature		Refrigerant				
°F	°C	R-22	R-410a	R-407c	R-134a	R-404a
-60	-51.1	*11.9*	*0.9*	*15.0*	*21.6*	-
-55	-48.3	*9.2*	1.8	*13.7*	*20.2*	-
-50	-45.6	*6.1*	4.3	*11.1*	*18.6*	-
-45	-42.8	*2.7*	7.0	*8.1*	*16.7*	-
-40	-40.0	0.6	10.1	*4.8*	*14.7*	4.9
-35	-37.2	2.6	13.5	*1.1*	*12.3*	7.5
-30	-34.4	4.9	17.2	1.5	*9.7*	10.3
-25	-31.7	7.5	21.4	3.7	*6.8*	13.5
-20	-28.9	10.2	25.9	6.2	*3.6*	16.8
-18	-27.8	11.4	27.8	7.2	*2.2*	18.3
-16	-26.7	12.6	29.7	8.4	*0.7*	19.8
-14	-25.6	13.9	31.8	9.5	0.4	21.3
-12	-24.4	15.2	33.9	10.7	1.2	22.9
-10	-23.3	16.5	36.1	11.9	2.0	24.6
-8	-22.2	17.9	38.4	13.2	2.8	26.3
-6	-21.1	19.4	40.7	14.6	3.7	28.0
-4	-20.0	20.9	43.1	15.9	4.6	29.8
-2	-18.9	22.4	45.6	17.4	5.5	31.7
0	-17.8	24.0	48.2	18.9	6.5	33.7
1	-17.2	24.8	49.5	19.6	7.0	34.7
2	-16.7	25.7	50.9	20.4	7.5	35.7
3	-16.1	26.5	52.2	21.2	8.0	36.7
4	-15.6	27.4	53.6	22.0	8.6	37.7
5	-15.0	28.3	55.0	22.8	9.1	38.8
6	-14.4	29.1	56.4	23.7	9.7	39.8
7	-13.9	30.0	57.9	24.5	10.2	40.9
8	-13.3	31.0	59.3	25.4	10.8	42.0
9	-12.8	31.9	60.8	26.2	11.4	43.1
10	-12.2	32.8	62.3	27.1	12.0	44.3
11	-11.7	33.8	63.9	28.0	12.6	45.4
12	-11.1	34.8	65.4	29.0	13.2	46.6
13	-10.6	35.8	67.0	29.9	13.8	47.8
14	-10.0	36.8	68.6	30.9	14.4	49.0
15	-9.4	37.8	70.2	31.8	15.1	50.2
16	-8.9	38.8	71.9	32.8	15.7	51.5
17	-8.3	39.9	73.5	33.8	16.4	52.7
18	-7.8	40.9	75.2	34.8	17.1	54.0
19	-7.2	42.0	77.0	35.9	17.7	55.3
20	-6.7	43.1	78.7	36.9	18.4	56.6
21	-6.1	44.2	80.5	38.0	19.2	57.9
22	-5.6	45.3	82.3	39.1	19.9	59.3
23	-5.0	46.5	84.1	40.2	20.6	60.6
24	-4.4	47.6	85.9	41.3	21.4	62.0
25	-3.9	48.8	87.8	42.4	22.1	63.4
26	-3.3	50.0	89.7	43.6	22.9	64.8

Temperature		Refrigerant				
°F	°C	R-22	R-410a	R-407c	R-134a	R-404a
27	-2.8	51.2	91.6	44.7	23.7	66.2
28	-2.2	52.4	93.5	45.9	24.5	67.7
29	-1.7	53.7	95.5	47.1	25.3	69.2
30	-1.1	54.9	97.5	48.4	26.1	70.7
31	-0.6	56.2	99.5	49.6	26.9	72.1
32	0.0	57.5	101.6	50.9	27.8	73.8
33	0.6	58.8	103.6	52.1	28.6	75.3
34	1.1	60.2	105.7	53.4	29.5	76.9
35	1.7	61.5	107.9	54.8	30.4	78.5
36	2.2	62.9	110.0	56.1	31.3	80.2
37	2.8	64.3	112.2	57.5	32.2	81.7
38	3.3	65.7	114.4	58.9	33.1	83.5
39	3.9	67.1	116.7	60.3	34.1	85.2
40	4.4	68.6	118.9	31.7	35.0	86.9
41	5.0	70.0	121.2	63.1	36.0	88.6
42	5.6	71.5	123.6	64.6	37.0	90.4
43	6.1	73.0	125.9	66.1	38.0	92.2
44	6.7	74.5	128.3	67.6	39.0	94.0
45	7.2	76.1	130.7	69.1	40.0	95.8
46	7.8	77.6	133.2	70.6	14.1	97.6
47	8.3	79.2	135.6	72.2	42.2	99.5
48	8.9	80.8	138.2	73.8	43.2	101.4
49	9.4	82.4	140.7	75.4	44.3	103.3
50	10.0	84.1	143.3	77.1	45.4	105.3
55	12.8	92.6	156.6	106.0	51.2	115.3
60	15.6	101.6	170.7	116.2	57.4	126.0
65	18.3	111.3	185.7	127.0	64.0	137.4
70	21.1	121.5	201.5	138.5	71.1	149.3
75	23.9	132.2	218.2	150.6	78.6	161.9
80	26.7	143.7	235.9	163.5	86.7	175.4
85	29.4	155.7	254.6	177.0	95.2	189.6
90	32.2	168.4	274.3	191.3	104.3	204.5
95	35.0	181.9	295.0	206.4	113.9	220.2
100	37.8	196.0	316.9	222.3	124.1	236.8
105	40.6	210.8	339.9	239.0	134.9	254.2
110	43.3	226.4	364.1	256.5	146.3	272.5
115	46.1	242.8	389.6	274.9	158.4	291.9
120	48.9	260.0	416.4	294.2	171.1	312.1
125	51.7	278.1	444.5	314.5	184.5	333.4
130	54.4	297.0	474.0	335.7	198.7	355.6
135	57.2	316.7	505.0	357.8	213.5	379.1
140	60.0	337.4	537.6	380.9	229.2	403.7
145	62.8	359.1	571.7	405.1	245.6	429.6
150	65.6	381.7	607.6	430.3	262.8	456.8
155	68.3	405.4	645.2	456.6	281.0	484.8

Italics indicates vacuum (inches of mercury) Standard font indicates pressure (pounds per inch gauge)

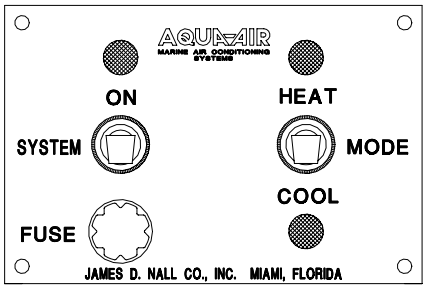
Chiller Unit Control Panel



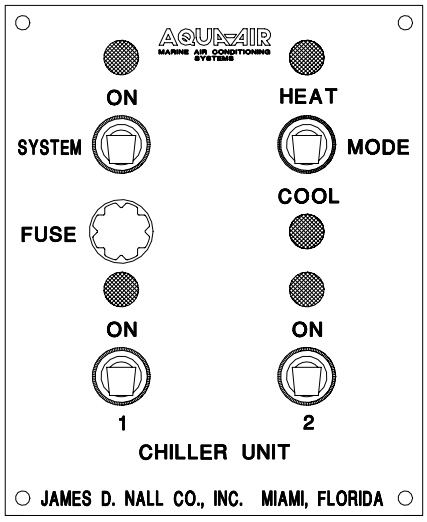


CHILLER CONTROL PANEL AQCWP

The AQCWP Series Control Panels provide the capability of remote switch control for the Alpha Series chiller units. The AQCWP panel interfaces between the chillers, chillwater pump, flow switch and immersion heater (if used). Indicator lights on the front panel show the operating mode that the unit is in (cooling or heating) and the number of chiller units that are on. The AQCWP panel circuitry is protected by a 10 amp fuse. The panel is constructed of black phenolic material with white engraving. Special panels are available on a custom basis.

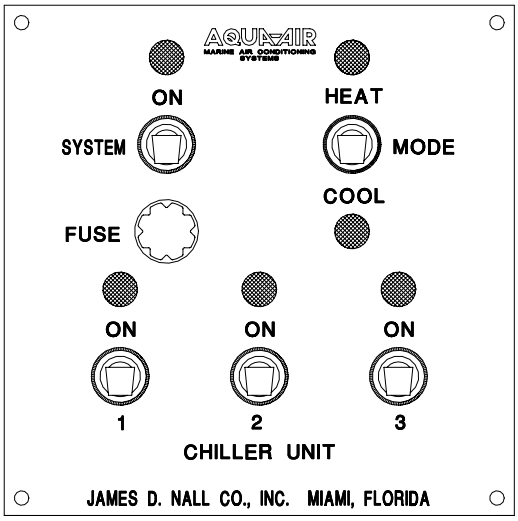


AQCWPH-01

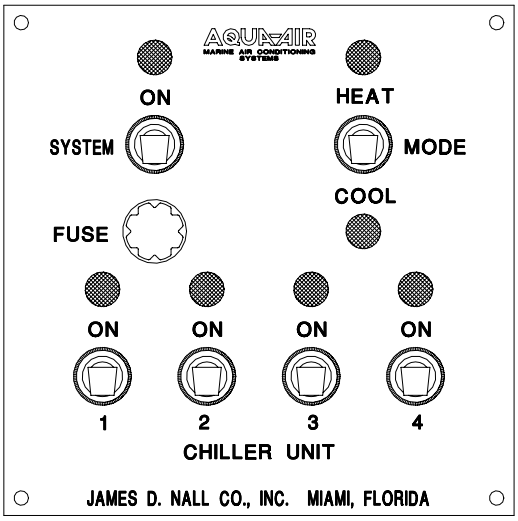


AQCWPH-02

AQCWPH-03



AQCWPH-04



AQUA-AIR MANUFACTURING, division of JAMES D. NALL CO., INC
1050 EAST 9th STREET HIALEAH, FLORIDA 33010 U.S.A.
PH. 305-884-8363 FAX 305-883-8549

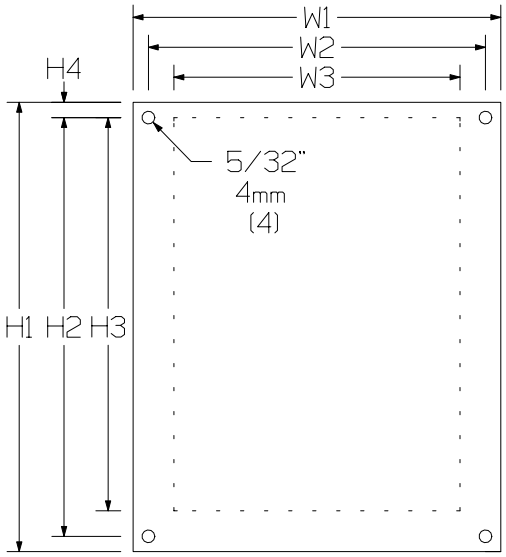
AQCWP CONTROL PANEL NOMENCLATURE

AQCWPH-Ø4C

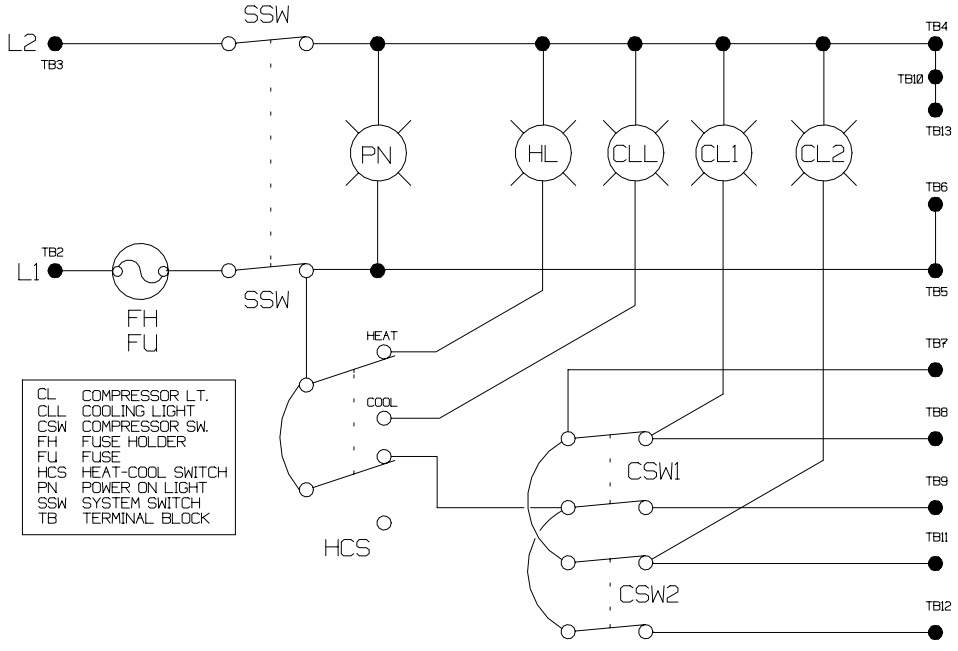
- PANEL TYPE
  - BLANK - COOLING ONLY
  - H - COOLING / HEATING
- CONTROL CIRCUIT VOLTAGE
  - BLANK - 115V
  - C - 230V
- NUMBER OF CHILLERS

AQCWP CONTROL PANEL DIMENSIONS

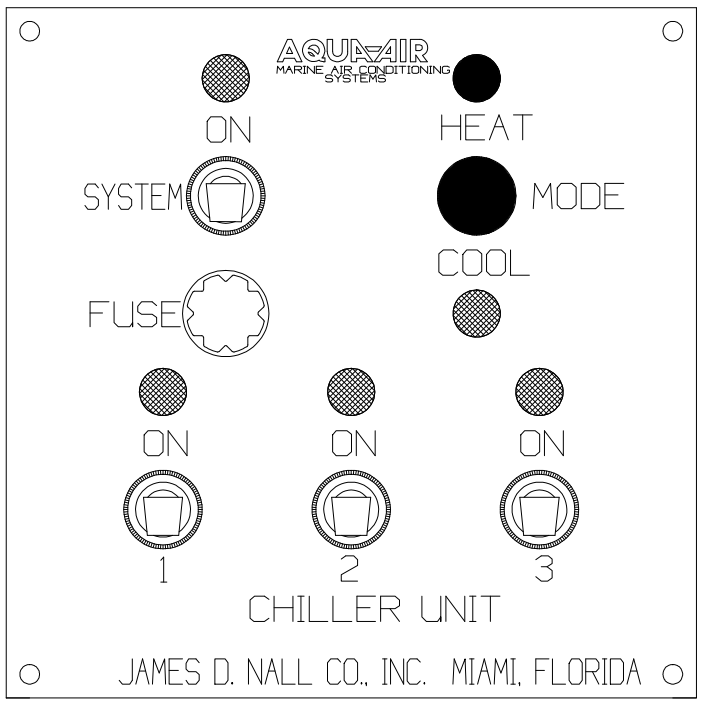
PANEL \ DIMENSION	W1	W2	W3	H1	H2	H3	H4
AQCWP-Ø1	4-1/2"	4-1/8"	3-1/2"	3"	2-5/8"	2-11/16"	13/16"
	114mm	105mm	89mm	76mm	67mm	68mm	5mm
AQCWP-Ø2	4-1/2"	4-1/8"	3-1/2"	5-1/2"	5-1/8"	4-13/16"	13/16"
	114mm	105mm	89mm	140mm	130mm	122mm	5mm
AQCWP-Ø3	5-1/2"	4-1/8"	3-1/2"	5-1/2"	5-1/8"	4-13/16"	13/16"
	140mm	105mm	89mm	140mm	130mm	122mm	5mm
AQCWP-Ø4	5-1/2"	4-1/8"	3-1/2"	5-1/2"	5-1/8"	4-13/16"	13/16"
	140mm	105mm	89mm	140mm	130mm	122mm	5mm



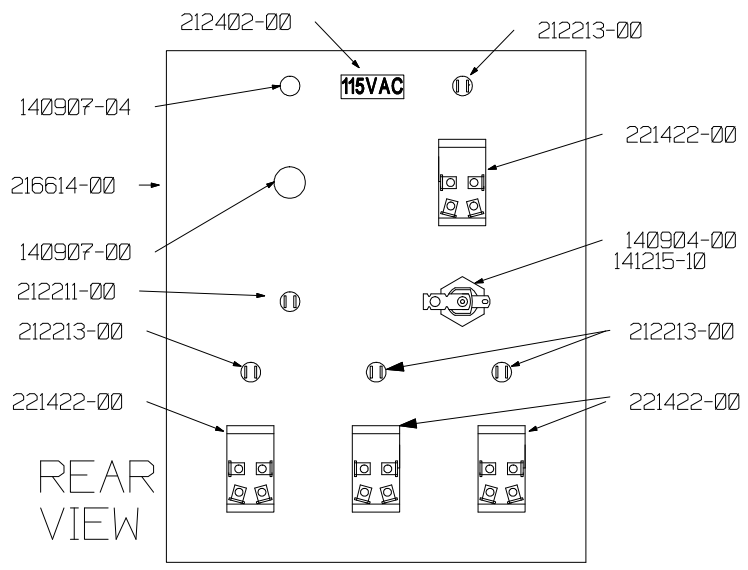
SAMPLE INTERNAL WIRING SCHEMATIC
AQCWPH-Ø2C



SCALE: FULL



FRONT VIEW



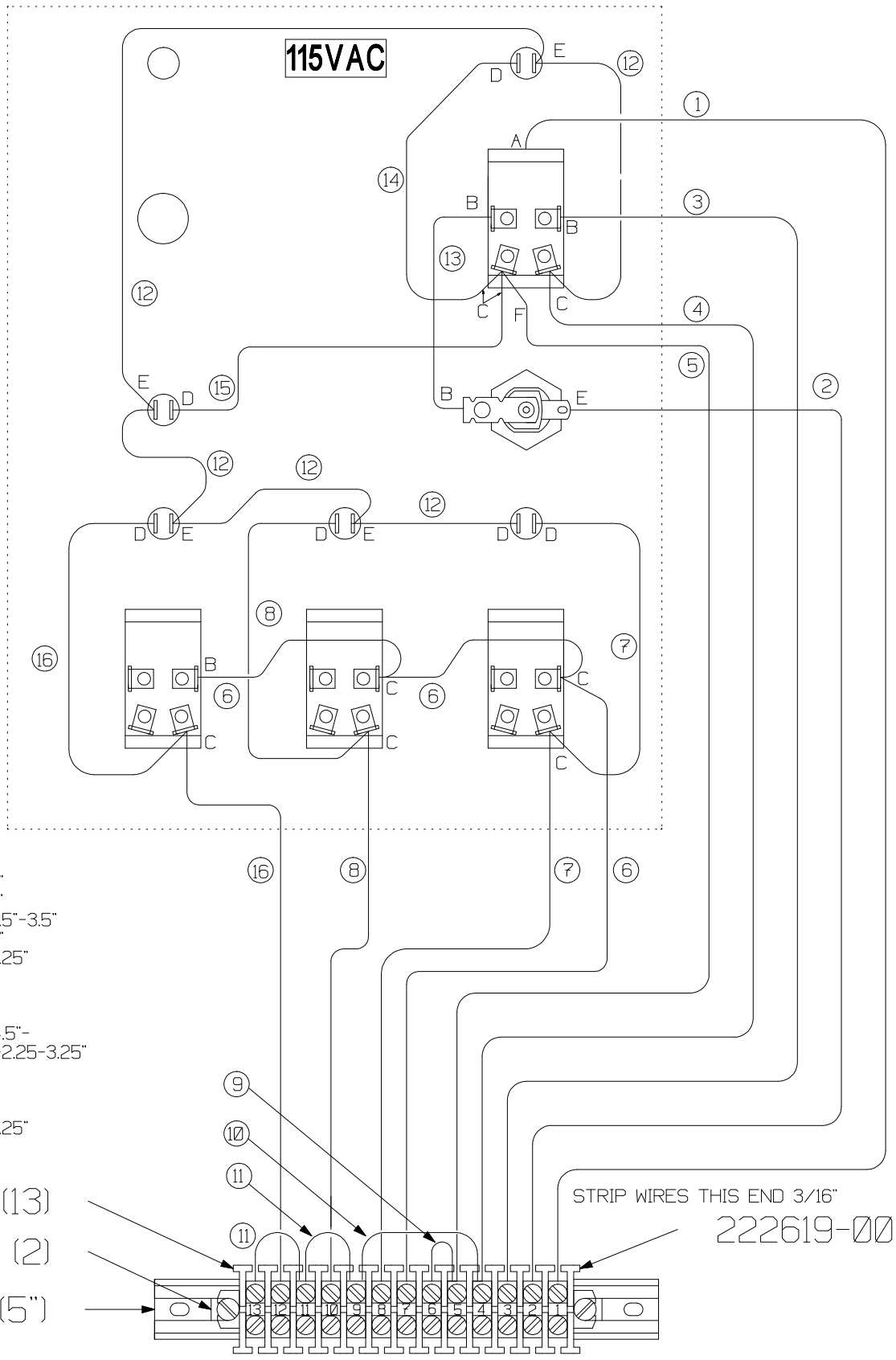
REAR VIEW

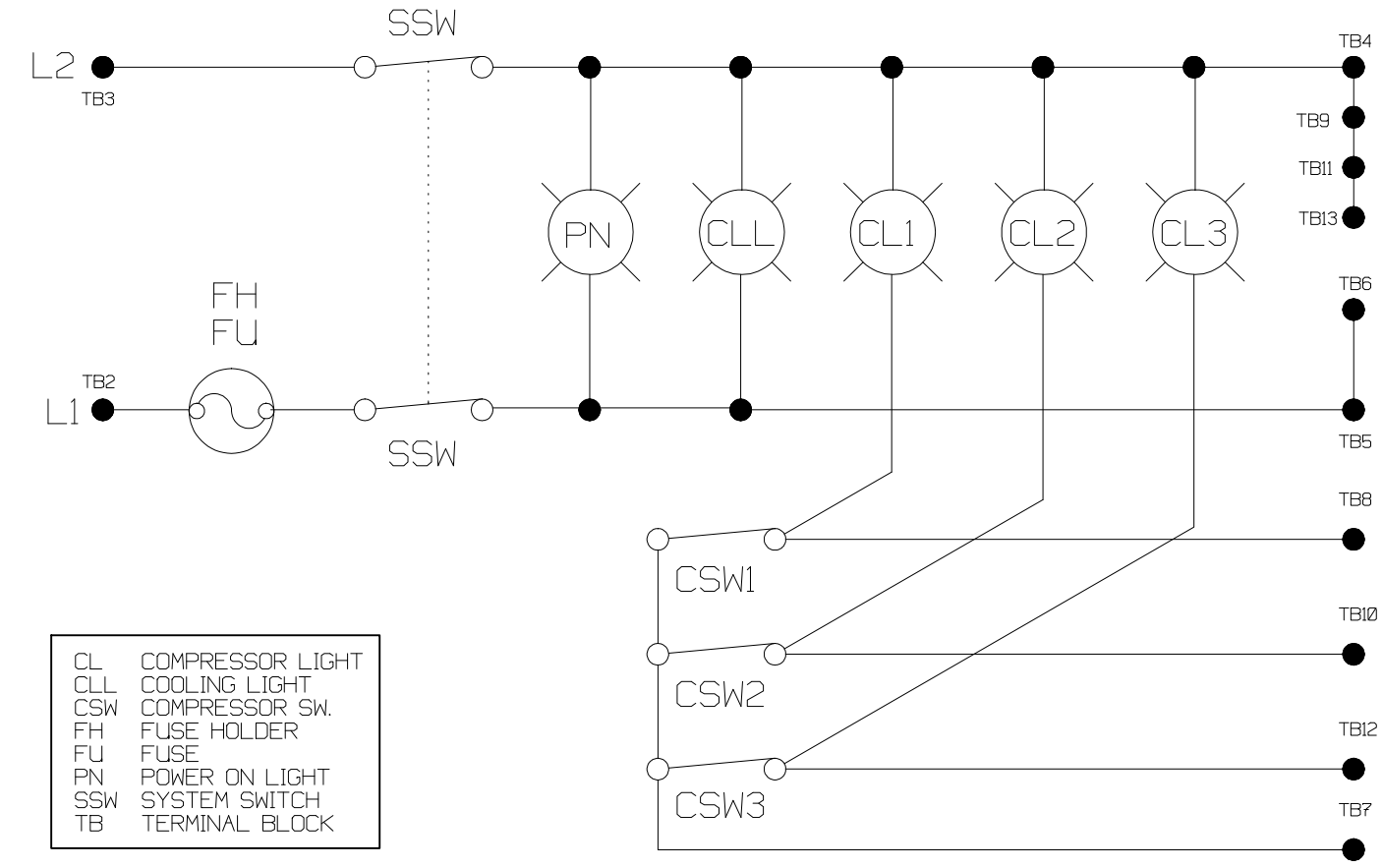
TERMINALS

A	222001-05
B	222003-05
C	222003-06
D	222003-04
E	222003-07
F	222003-02

WIRE LEGEND

1	GN 14	32"
2	BK 14	30"
3	B/R 14	31"
4	B/R 14	33.75"
5	PK 14	30.50"
6	Y 16	29"-3.5"-3.5"
7	P 16	28"-3"
8	P/W 16	28"-3.25"
9	Y 16	2"
10	B/R 16	3"
11	B/R 16	2"
12	B/R 16	3.5"-4.5"-2.25"-2.25-3.25"
13	BK 14	3"
14	BK 16	3"
15	BK 16	3.5"
16	P/BK 16	28"-3.25"



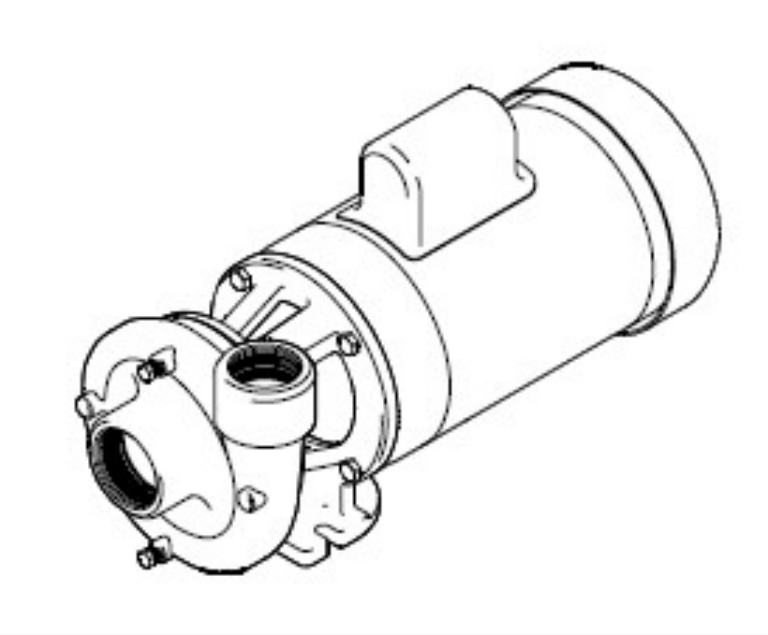


CL	COMPRESSOR LIGHT
CLL	COOLING LIGHT
CSW	COMPRESSOR SW.
FH	FUSE HOLDER
FU	FUSE
PN	POWER ON LIGHT
SSW	SYSTEM SWITCH
TB	TERMINAL BLOCK

115V

AQUA AIR MFG		
AQCWP-03 REMOTE PANEL 115V COOLING ONLY		
DWG# 4006-01B	10-13-93	DN

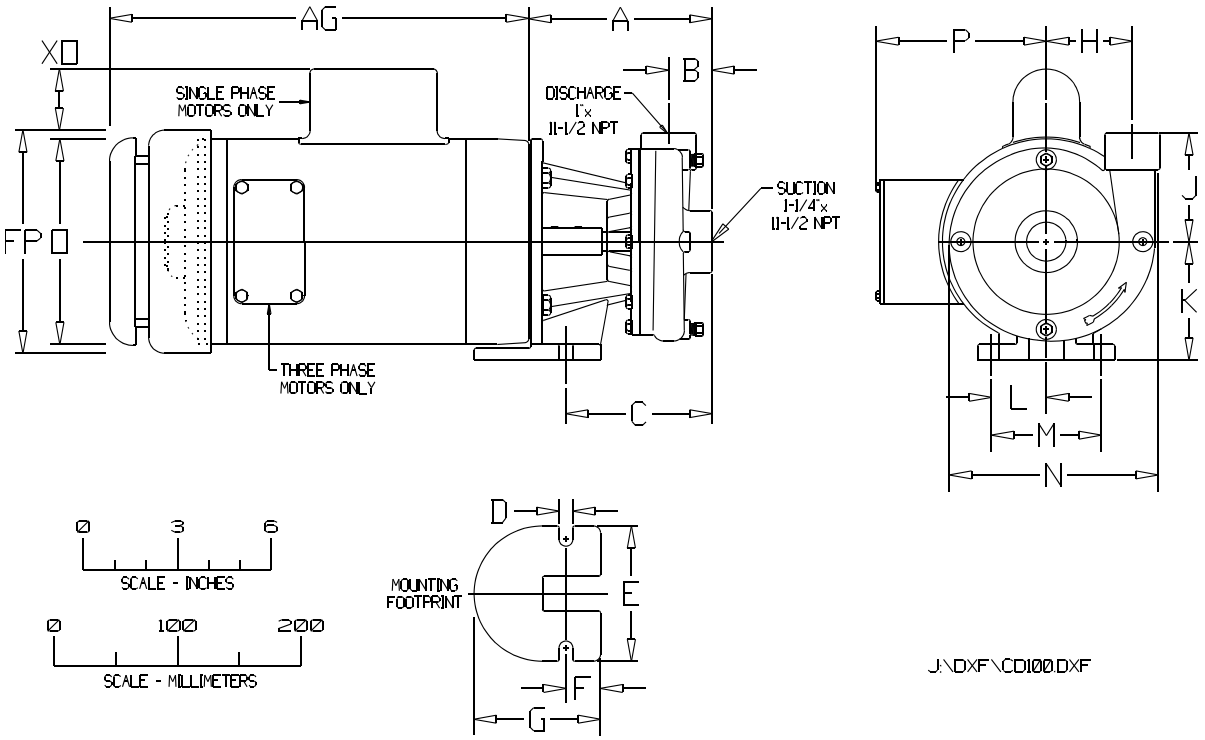
Pumps



AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

CENTRIFUGAL PUMP CD100 SERIES

The CD100 Series Centrifugal Pump is available in bronze for seawater use, cast iron for chillwater use or stainless steel for special applications. Motors are available for all voltages, 50 and/or 60 Hertz, single or three phase. The standard motor style is ODP (Open Drip Proof). TEFC (Totally Enclosed, Fan Cooled) motors are available on special order. Flow rates up to 70 GPM and heads of 95' are available with this pump.



A	B	C	D	E	F	G	H	J	K	L	M	N	P
5.88" 149mm	1.38" 35mm	4.63" 118mm	0.44" 11mm	4.38" 111mm	1.13" 29mm	4.00" 102mm	2.75" 70mm	3.50" 89mm	3.81" 97mm	1.75" 44mm	3.50" 89mm	6.69" 170mm	5.44" 138mm

MOTOR SIZES			MOTOR END DIMENSIONS			
HP	RPM	FRAME	AG	FP	O	XO
1/4	1800	56C	7.75" / 197mm	6.13" / 156mm	5.38" / 137mm	2.06" / 52mm
1/3	3600	56C	8.50" / 216mm			
½	3600	56C	8.75" / 222mm			
3/4	3600	56C	9.25" / 235mm			
1	3600	56C	9.75" / 248mm			
1-1/2	3600	56C	10.50" / 267mm	7.19" / 183mm	6.88" / 175mm	2.25" / 57mm
2	3600	56C	11.13" / 283mm			

CD100 SERIES PUMP MODEL NUMBER DESCRIPTION

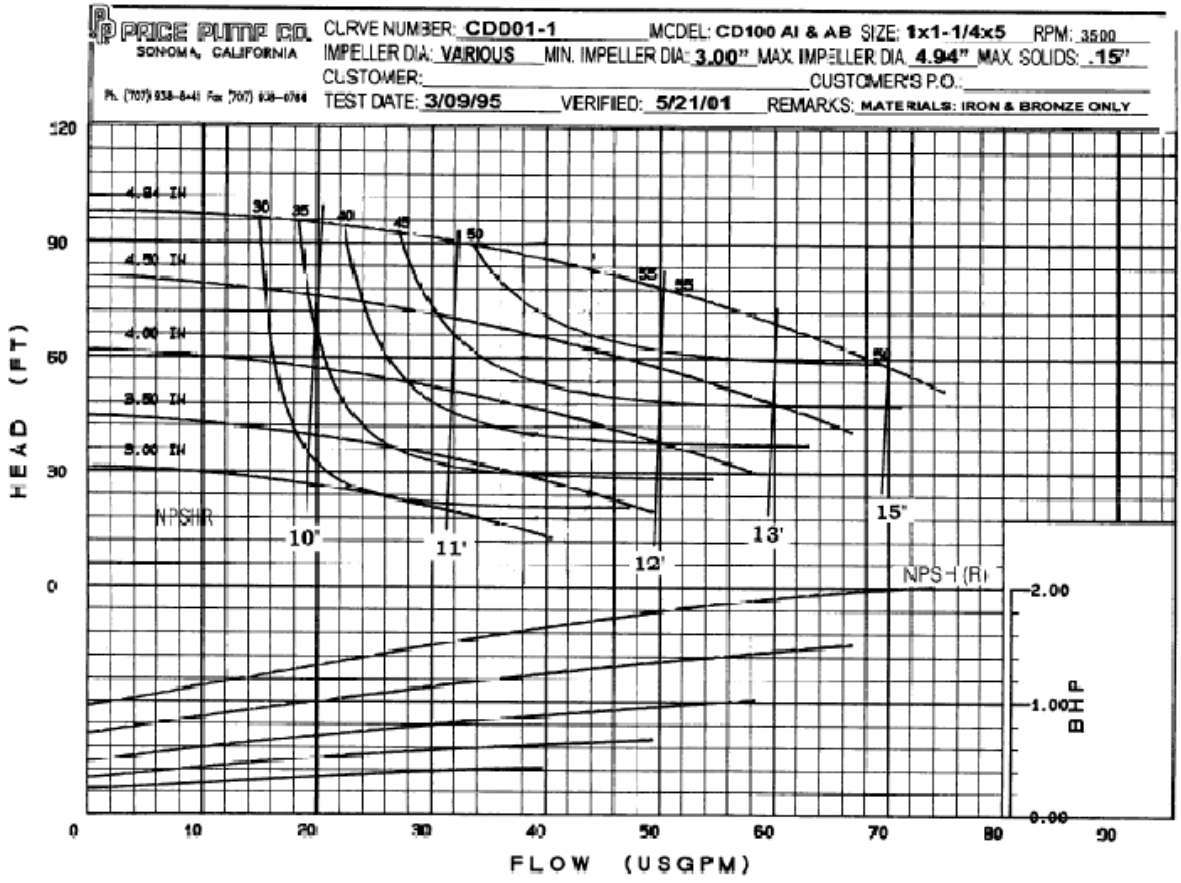
ITEM	CODE	DESCRIPTION	CD100	B	-	42	-	07	-	C
PUMP HEAD MATERIAL	B	BRONZE								
	I	CAST IRON								
	S	STAINLESS STEEL								
IMPELLER SIZE	30	3.00" DIAMETER								
	36	3.63" DIAMETER								
	40	4.00" DIAMETER								
	42	4.25" DIAMETER								
	45	4.50" DIAMETER								
	49	4.94" DIAMETER								
PUMP MOTOR HORSEPOWER	02	1/4 HP								
	03	1/3 HP								
	05	1/2 HP								
	07	3/4 HP								
	10	1 HP								
	15	1-1/2 HP								
	20	2 HP								
MOTOR TYPE	-	**O**pen **D**rip **P**roof								
	T	**T**otally **E**nclosed **F**an **C**ooled								
PUMP MOTOR POWER INPUT	C	115-230 / 1 / 60								
	K	100-220 / 1 / 50								
	F	230-460 / 3 / 60								
	J	220-380 / 3 / 50								

The example above is a CD100 series pump, bronze head and impeller, 4.25" diameter impeller, 3/4 horsepower, 115-230 / 1 / 60 power input, ODP motor. Custom impeller diameters available upon request at an extra charge

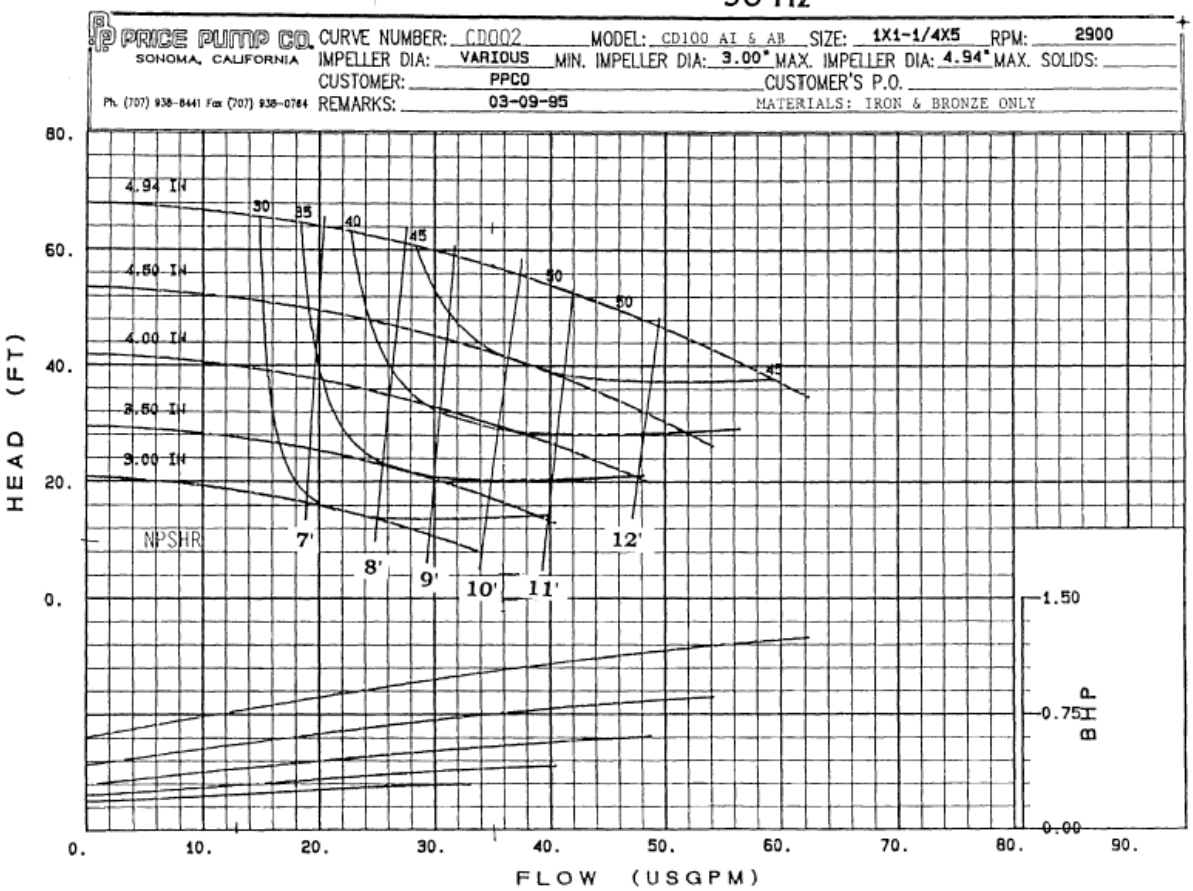
STANDARD PUMP MODEL NUMBERS

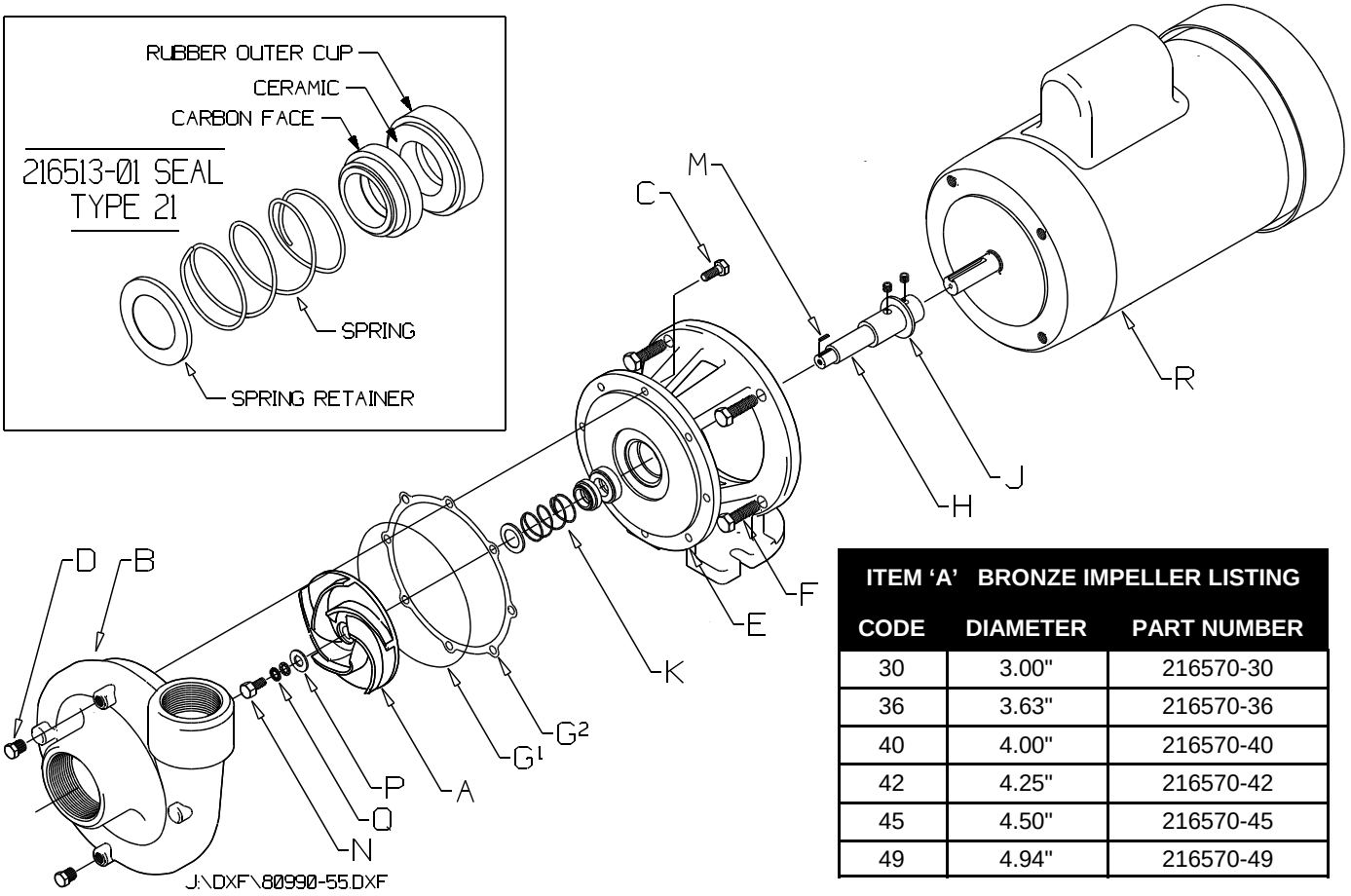
NEW MODEL	OLD MODEL
CD100B-49-02	E100-25B
CD100B-36-03	E100-33B
CD100B-40-05	E100-50B
CD100B-42-07	E100-75B
CD100B-45-10	E100-100B
CD100B-49-15	E100-150B
ADD MOTOR VOLTAGE CODE TO THE END OF THE NEW NUMBER TO FORM A COMPLETE PUMP MODEL NUMBER	

60 Hz


PRICE PUMP CO.
SONOMA, CALIFORNIA
Ph. (707) 938-8441 Fax (707) 938-0764
CURVE NUMBER: CD001-1
MODEL: CD100 AI & AB SIZE: 1x1-1/4x5 RPM: 3500
IMPELLER DIA: VARIOUS MIN. IMPELLER DIA: 3.00" MAX. IMPELLER DIA. 4.94" MAX. SOLIDS: .15"
CUSTOMER: CUSTOMER'S P.O.
TEST DATE: 3/09/95 VERIFIED: 5/21/01 REMARKS: MATERIALS: IRON & BRONZE ONLY
4.94 IN
4.50 IN
4.00 IN
3.50 IN
3.00 IN
NPSHR
10'
11'
12'
13'
15'
NPSH (R)
2.00
1.00
0.00
BHP
HEAD (FT)
FLOW (USGPM)

50 Hz


PRICE PUMP CO.
SONOMA, CALIFORNIA
Ph. (707) 938-8441 Fax (707) 938-0764
CURVE NUMBER: CD002
MODEL: CD100 AI & AB SIZE: 1X1-1/4X5 RPM: 2900
IMPELLER DIA: VARIOUS MIN. IMPELLER DIA: 3.00" MAX. IMPELLER DIA: 4.94" MAX. SOLIDS:
CUSTOMER: PPCO CUSTOMER'S P.O.
REMARKS: 03-09-95 MATERIALS: IRON & BRONZE ONLY
4.94 IN
4.50 IN
4.00 IN
3.50 IN
3.00 IN
NPSHR
7'
8'
9'
10'
11'
12'
1.50
0.75
0.00
BHP
HEAD (FT)
FLOW (USGPM)



ITEM 'A' BRONZE IMPELLER LISTING		
CODE	**DIAMETER**	**PART NUMBER**
30	3.00"	216570-30
36	3.63"	216570-36
40	4.00"	216570-40
42	4.25"	216570-42
45	4.50"	216570-45
49	4.94"	216570-49

PUMP PARTS LISTING		
ITEM	**PART NUMBER**	**DESCRIPTION**
A	SEE CHART	IMPELLER, BRONZE
B	216570-01	VOLUTE, BRONZE
C	216511-00	VOLUTE BOLT (4)
D	216540-00	PIPE PLUG 1/8" NPT
E	216570-04	BRACKET, BRONZE
F	216510-00	MOTOR BOLT (4)
G1	216526-01	O-RING
G2	216526-00	GASKET
H	216570-06	SHAFT w/ SET SCREWS
J	216570-07	SLINGER
K	216513-01	SEAL, TYPE T21
M	216570-05	IMPELLER KEY
N	216570-02	IMPELLER LOCKDOWN BOLT
P	216570-03	IMPELLER FLAT WASHER
Q	216570-08	IMPELLER LOCK WASHER
R	SEE CHART	PUMP MOTOR

ITEM 'R' MOTOR LISTING			
HP	**115-230/1/60**	**230-460/3/60**	**MOTOR TYPE**
1/4	212635-00	212636-00	ODP
1/3	212621-00	212637-00	ODP
1/2	212622-00	212631-00	ODP
3/4	212630-00	212632-00	ODP
1	212638-00	212639-00	ODP
1-1/2	212640-00	212641-00	ODP
2	212642-00	212643-00	ODP
1/4	212677-02	212678-02	TEFC
1/3	212677-03	212678-03	TEFC
1/2	212677-05	212678-05	TEFC
3/4	212677-07	212678-07	TEFC
1	212677-10	212678-10	TEFC
1-1/2	212677-15	212678-15	TEFC
2	212677-20	212678-20	TEFC

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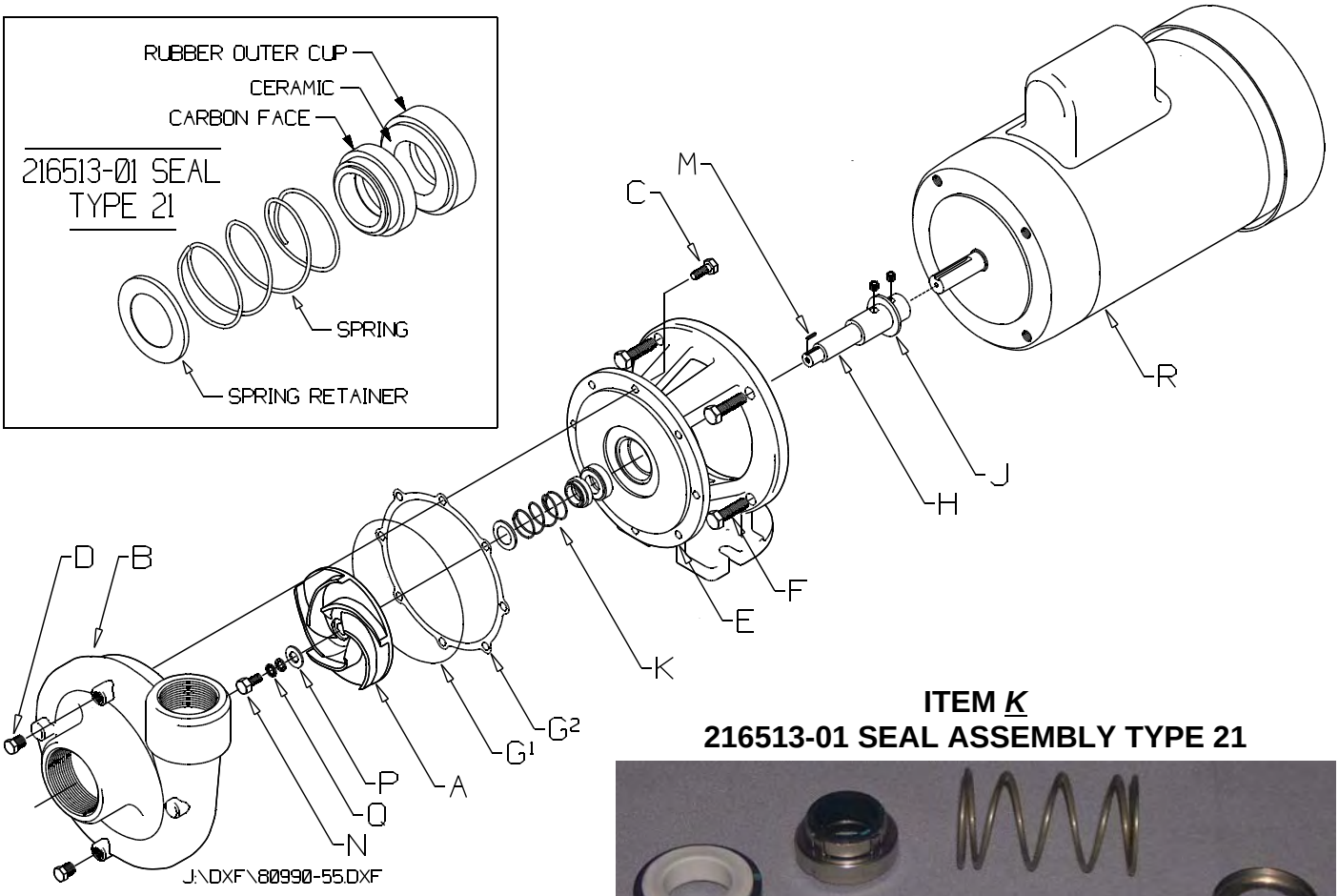
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 email sales@aquaair.com

CD Series Seal Replacement

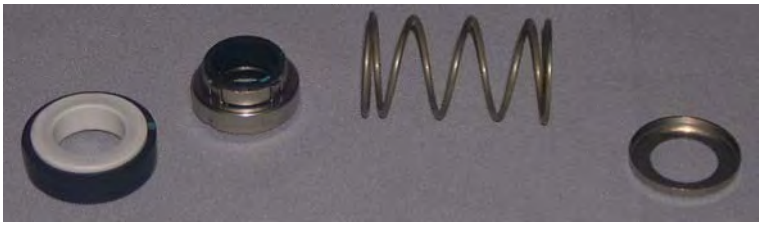
Please refer to the drawing at the bottom of the page for component references (A) through (R).

DISASSEMBLY

1. Disconnect the power source to the pump motor.
2. Disconnect the electrical connections, tagging the wires carefully to preserve the correct rotation. Loosen the bolts holding the pump bracket (E) to the surrounding structure.
3. Disconnect the piping or hoses that are connected to the pump inlet and outlet on the volute (B).
4. Remove the pump and motor assembly to the seal replacement repair area.
5. Remove the volute (B) from the pump bracket (E) by removing the bolts (C).
6. Remove the impeller (A) by removing the impeller lockdown bolt (1/4-20 bolt) (N) and lockwashers (P,Q). Slide the impeller off of the shaft (H). Do Not throw the shaft key (M) away. A small pair of c-clamp or standard vise grips may be clamped to the pump shaft (H) to prevent rotation while unscrewing the impeller lockdown bolt. Avoid damaging the set screws of the shaft with the vise grips.
7. Slide the seal head, spring and spring retainer (K) from the shaft. This is the carbon portion of the seal.
8. Remove the four motor bolts (F) and remove the bracket (E) from motor.
9. Remove the ceramic seal seat from the pump bracket (E). This is the portion of the seal (K) that is pressed into the rear of the pump bracket (E). Use a wooden or plastic dowel to tap the seal seat from the bracket. Also remove the rubber cup that the ceramic seal seat is pressed into.



ITEM *K*
216513-01 SEAL ASSEMBLY TYPE 21



REASSEMBLY

1. Clean the seal seat cavity of the pump bracket (E) thoroughly.
2. Thoroughly clean the pump shaft (H). Assure that the shaft is not grooved and that there is no evidence of pitting or fretting. If the shaft is grooved, fretted or worn, replace it.
3. Install the the pump shaft (H) onto the motor shaft, aligning the set screws of the pump shaft with the keyway of the motor shaft. Ensure that all debris and burrs are removed from the motor shaft and that the rubber slinger (J) is in place.
4. To install the seal place the bracket (E) on a firm surface with the seal seat cavity (pump end) up. Then place a small amount of vegetable oil on the rubber seat cup. Place the seat in the seal cavity with the ceramic portion face up toward the pump end. Evenly push the seat into the cavity with your fingers then gently tap the seat into place with a wooden dowel or plastic rod (1-1/8" / 28mm OD). To help ensure the seat is not damaged place the cardboard disk supplied with the seal over the seat face.
5. Install the bracket (E) on the motor (R). Secure the bracket with the four motor bolts (F).
6. Pull out the pump shaft (H) as far as it will go toward the volute (B) end and slightly snug one set screw to hold the shaft in place.
7. Installing the seal head assembly:
   a. Apply a small amount of vegetable oil on the pump shaft and I.D. of the rubber inner liner of the carbon portion of the seal.
   b. Install the rotary seal head (carbon portion) onto the pump shaft and slide toward the seat until the carbon face touches the ceramic seal seat.
   c. Install the seal spring and retainer.
8. Install the impeller (A) onto the end of the shaft (H). Install the shaft key (M), impeller flatwasher (P), 2 lockwashers (Q) and lockdown bolt (N). Tighten the lockdown bolt securely (10 ft. lbs.). ***Serviceable Loctite must be used on the lockdown bolt. Lockwasher pairs must be assembled cam face to cam face***.
9. Loosen the pump shaft (H) set screws.
10. Install new volute gasket or O-ring (G1 or G2) and mount the volute (B) to the bracket (E). Secure with bolts (C) and tighten evenly.
11. Setting impeller clearance: Slide the pump shaft forward until the impeller touches the inside of the volute. Slide the shaft back **.010-.015".** Do not slide the shaft back any further. This will damage the seal. Tighten the pump shaft set screws. Turn the shaft by hand to ensure the impeller does not rub against the volute.
12. Return the pump to the installation and reconnect electric connections.
13. Start pump momentarily (2 seconds or less) to observe the shaft rotation. If the rotation corresponds to the rotation arrow on the front of the volute, the pump may be put into service. If the rotation is incorrect, switch any two leads on 3-phase motors. Check the wiring diagram of the motor for single phase rotation changes.
14. Remove the top pipe plug (if applicable) or open the air bleeder on the front of the volute and prime the pump thoroughly, ***making sure all air is purged from the pump head*.** Water should come out of the plug hole or bleeder before attempting to start the pump. ***All air must be purged before allowing the pump to run continuously*.**
15. Start the pump allowing adequate time to purge all of the air from system. Observe any gauges, flow meters, etc. to see if the pump performs properly.

DO NOT ALLOW THE PUMP TO RUN DRY AS THIS WILL DESTROY THE SEAL AND VOID THE PUMP WARRANTY. A BROKEN CERAMIC SEAL IS CAUSED BY THE PUMP BEING RUN WITH INSUFFICIENT WATER IN THE HEAD OR TOO MUCH TENSION ON THE SEAL SPRING

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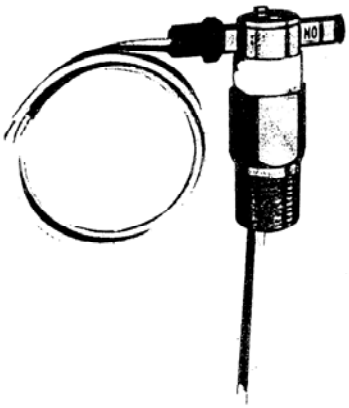
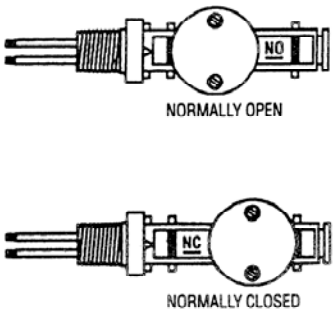
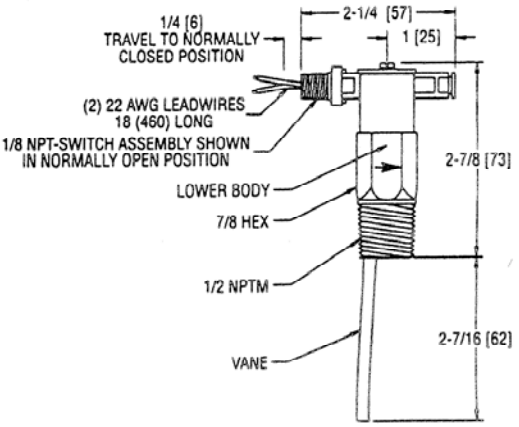
Accessories

CHILLWATER FLOW SWITCH 221416-08







INSTALLATION

1. Carefully unpack switch and remove any packing material from lower housing. Trim the vane at the appropriate mark for the size of pipe being used. See actuation/deactuation chart. *CAUTION:* Mechanical shock or vibration can cause permanent damage to the reed switch. Take care to avoid dropping the unit on hard surfaces or impacting the switch assembly.

2. Apply Teflon® thread tape or sealant to the 1/2" NPT male mounting threads and install switch in the system piping with the arrow on side pointing in the direction of flow.

3. Connect wiring in accordance with local electrical codes. NOTE: the 1/8" NPT fitting is *not* a conduit connection and any loading on this fitting can adversely affect switch operation. Also, any rigid connection to this fitting will prevent adjustment of switching action between normally open and normally closed.

4. Inductive, capacitive and lamp loads can all create conditions harmful to the reed switch.

A) *Inductive loads* can be caused by electromagnetic relays, electromagnetic solenoids and electromagnetic counters, all with inductive components as the circuit load.

B) *Capacitive loads* can be caused by capacitors connected in series with or parallel to the reed switch. In a closed circuit the cable length (150 ft. or more) to the switch can introduce a capacitance.

C) *Lamp loads* can be caused by switching lamp filaments which have low cold resistance.

In addition to these causes, exceeding any of the maximum electrical ratings can lead to premature or immediate failure. This includes inrush and surge currents greater than the maximum switching current. Use caution when evaluating system loads and current. To accommodate these conditions, see diagrams on the reverse which depict possible solutions.

5. After installation, set the switch action to NO (normally open) or NC (normally closed). Normally closed contacts open and normally open contacts close when increasing flow actuates the reed switch. To change, loosen, but do not remove, the two screws on the top cap. Slide the reed switch assembly to expose the switch action selected. Tighten screws when adjustment is complete.

MAINTENANCE

Following final installation of the Flow Switch, no routine maintenance is required. A periodic check to confirm proper actuation/deactuation is recommended. These units are not field repairable

PHYSICAL DATA

Temperature Limit: 200°F (93°C) maximum.
Operating Pressure: Brass body – 1000 psig (69 bar) maximum. Stainless steel body – 2000 psig (138 bar) maximum.
Piping Connection: 1/2" NPT male.
Switch: Hermetically sealed single pole, single throw reed switch. Field adjustable between normally open and normally closed.
Electrical Ratings: 1.5A @ 24 VDC resistive, 0.001A @ 200 VDC resistive, 0.5A @ 120 VAC.
Wire: 22 AWG×18 inches (460 mm) long.
Switch Body: Choice of standard brass or optional 303 stainless steel.
Reed Switch Housing: Polypropylene.
Vane: 301 stainless steel, 7/16" wide×.020" thick (11×.51 mm).
Wetted Materials: 301, 302 and 316 stainless steel, ceramic 8 magnet, brass or optional 303 stainless steel body.
Installation: Install with index arrow pointing in direction of flow. Can be mounted in any position.
Weight: 4½ ounces (128 grams).
Overall Length: 5.25 inches (133 mm).

Cold Water Flow Rates Approximate actuation/deactuation GPM upper, LPM lower				Air Flow Rates Approximate actuation/deactuation SCFM upper, NM³/H lower			
Pipe	Trim	N.O.	N.C.	Pipe	Trim	N.O.	N.C.
½"	L	2.6/2.3 9.8/8.7	2.6/2.5 9.8/9.5	½"	L	10.3/8.8 17.5/15	10.2/9.2 17.3/15.6
¾"	J	3.1/2.7 11.7/10.2	3.1/2.8 11.7/10.6	¾"	J	13/11.6 22.1/19.7	12.9/11.6 21.9/19.7
1"	H	4.8/4.5 18.2/17	4.8/4.4 18.2/16.7	1"	H	19.2/17.6 32.6/29.9	18.9/17.6 32.1/29.9
1¼"	E	6.2/5.6 23.5/21.2	6.1/5.6 23.1/21.2	1¼"	E	24.8/22.2 42.1/37.7	24.5/22.5 41.6/38.2
1½"	C	8.2/7.7 31/29.1	8.2/7.7 31/29.1	1½"	C	33.4/31.2 56.8/53	33/30.6 56.1/52
2"	Full	9.5/9.1 36/34.4	9.5/9 36/34.1	2"	Full	50.2/48.4 85.3/82.2	50.2/47.7 85.3/81.1

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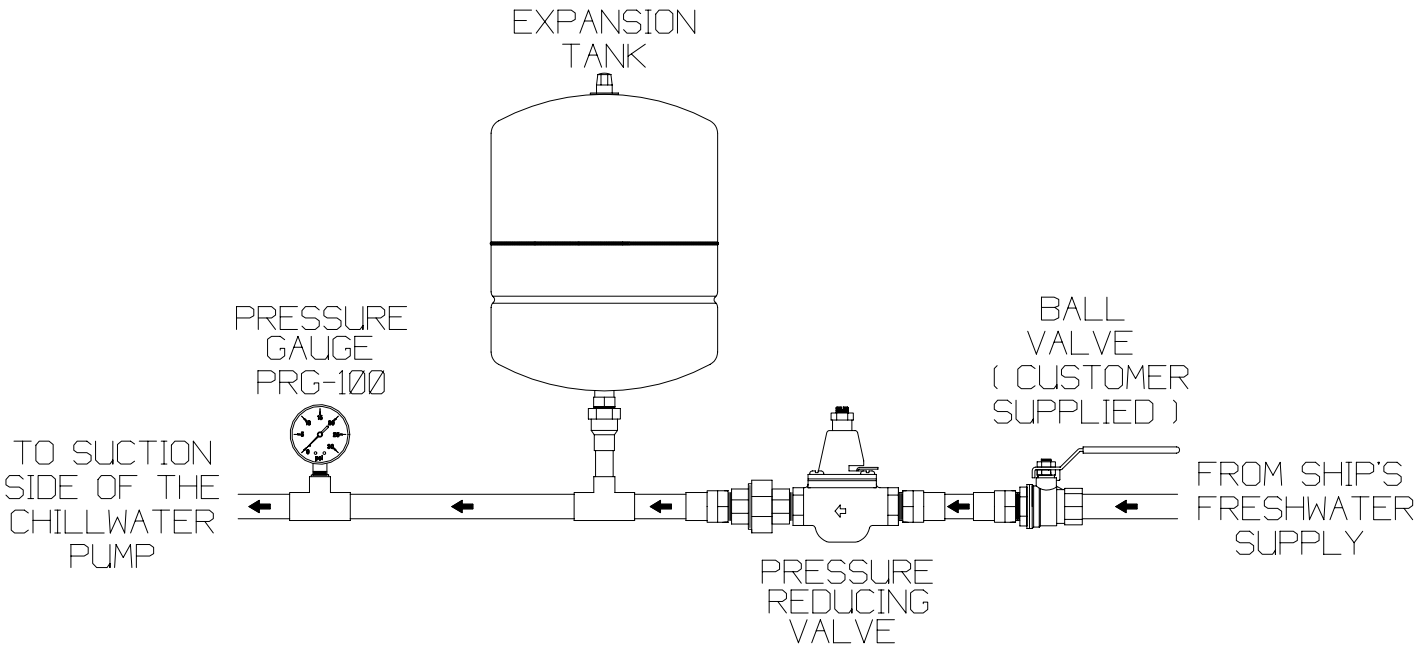
AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

FRESH WATER MAKEUP KITS WMK



WMK-1

FOR SYSTEMS LESS THAN OR EQUAL TO 20 TONS

EXT-442	EXPANSION TANK
PRV-329	PRESSURE REDUCING VALVE 1/2"
PRG-100	PRESSURE GAUGE

WMK-2

FOR SYSTEMS GREATER THAN 20 TONS

EXT-445	EXPANSION TANK
PRV-335	PRESSURE REDUCING VALVE 3/4"
PRG-100	PRESSURE GAUGE

FOR FURTHER INFORMATION SEE THE INDIVIDUAL PRODUCT BROCHURES.

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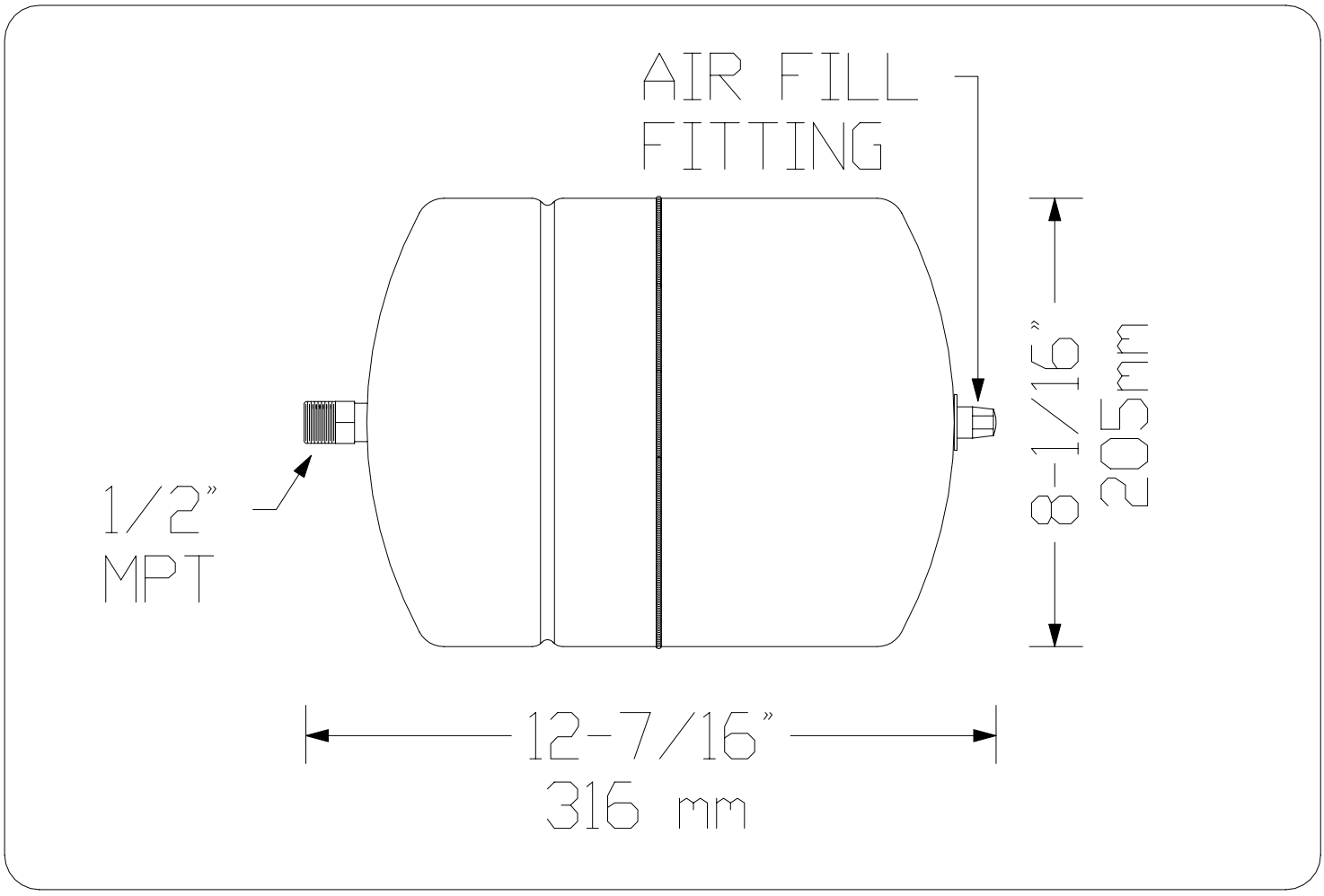
PH. 305-884-8363 FAX 305-883-8549

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

EXT-442 EXPANSION TANK

The EXT-442 Expansion Tank allows for the expansion and contraction of water in a closed loop chillwater system. When water is heated in a closed loop system a provision must be made for expansion. The flexible diaphragm in the center of the expansion tank provides a barrier between the expanded water and the factory precharge of air. As the expanded water enters the tank the diaphragm exerts pressure on the precharged air, compressing it and increasing the tank pressure. The expanded water reenters the system when the system temperature decreases; thus, maintaining system pressure within defined limits.



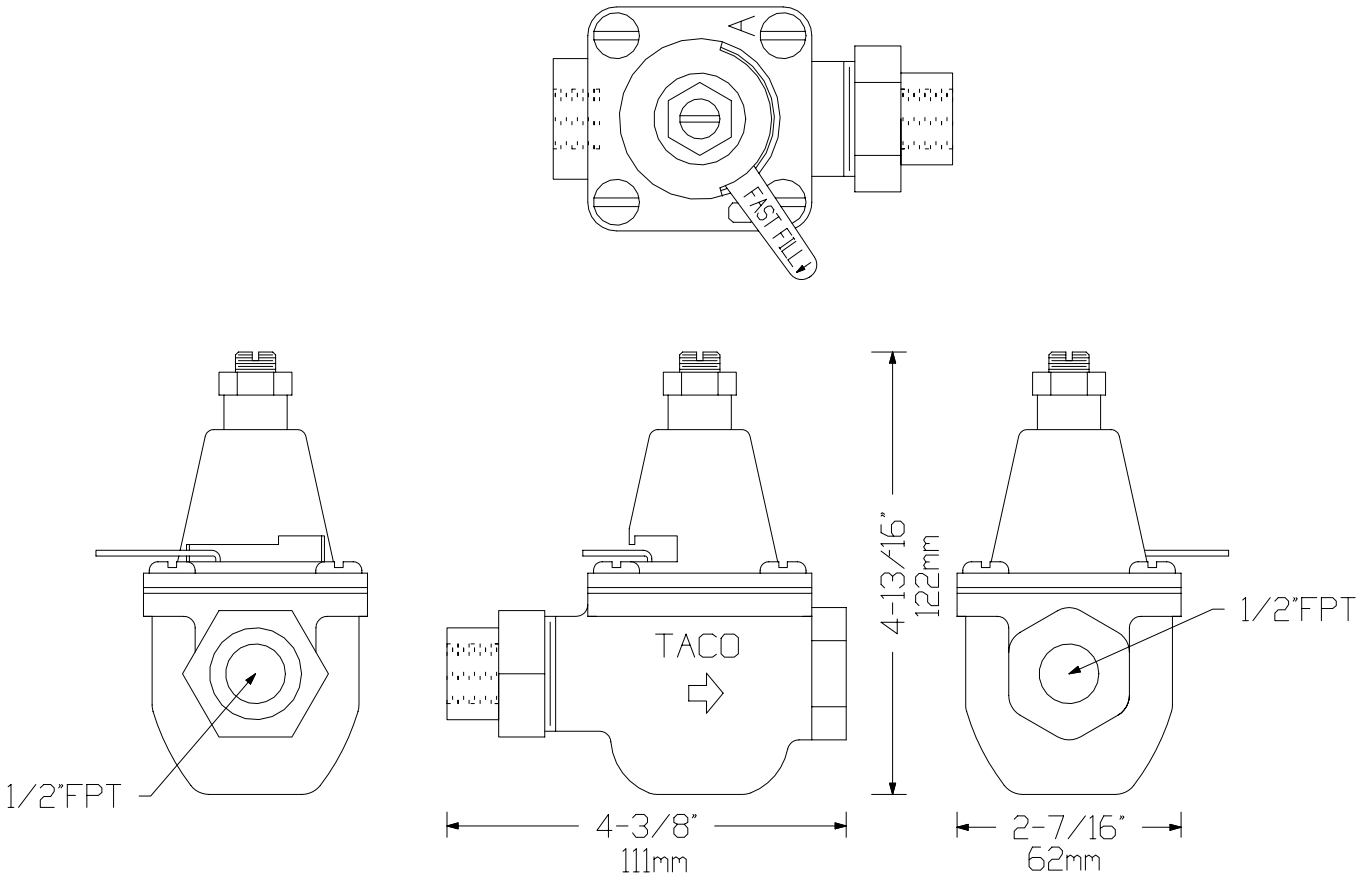
MAXIMUM WORKING PRESSURE: 100 PSIG
FACTORY PRE-CHARGE PRESSURE SETTING: 12 PSIG
MAXIMUM WORKING TEMPERATURE: 212°F / 100°C
WEIGHT: 5.0 LBS / 2.3 KG

AQUA AIR MANUFACTURING, div of the JAMES D. NALL CO., INC.
1050 E. 9th STREET, HIALEAH, FLORIDA 33010 U.S.A.
PH. 305-884-8363 FAX. 305-883-8549

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

PRV-329 PRESSURE REDUCING VALVE

The PRV-329 pressure reducing valve reduces the ships' fresh water system pressure to the desired system pressure. It also automatically feeds water to the system when the system pressure drops below the appropriate setting. It is installed in the fresh water makeup line between the fresh water inlet and the expansion tank.



MAXIMUM WORKING PRESSURE: 100 PSIG
FACTORY OUTLET PRESSURE SETTING: 12 PSIG
OUTLET PRESSURE SETTING RANGE: 5-25 PSIG
MAXIMUM WORKING TEMPERATURE: 212°F / 100°C
WEIGHT: 2.2 LBS / 1.0 KG

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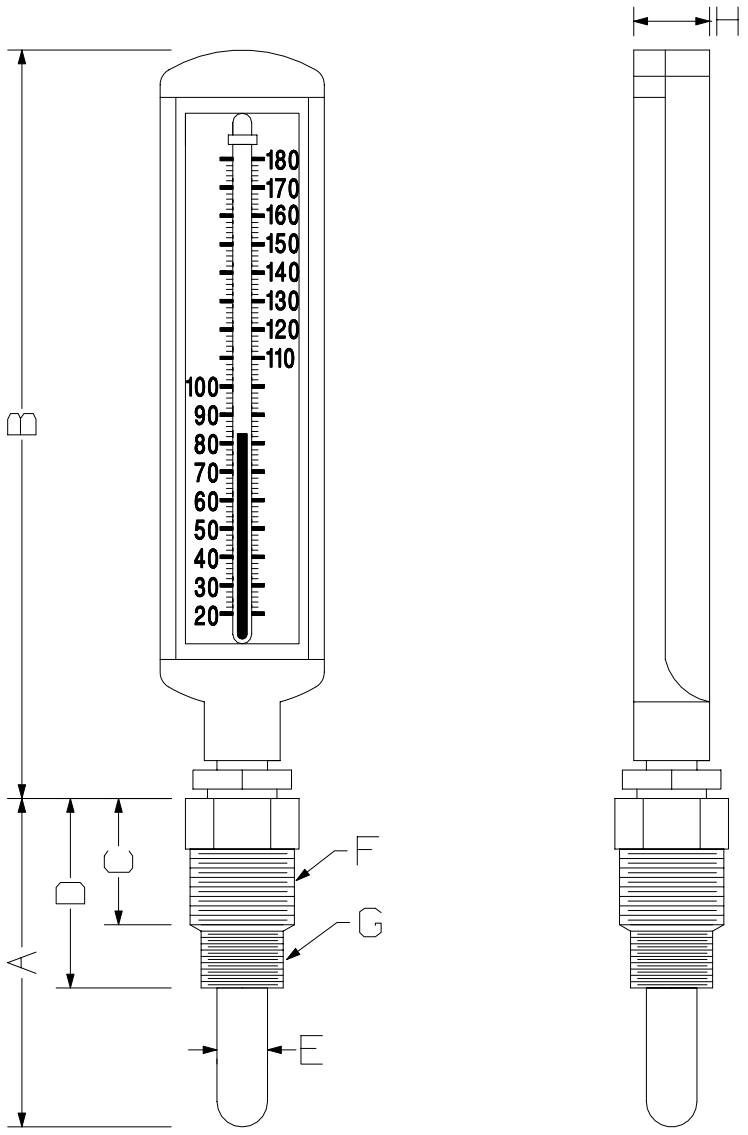
AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

IMMERSION THERMOMETER STN



STN-100 IMMERSION THERMOMETER DIMENSIONS								
UNIT \ DIMENSION	A	B	C	D	E	F	G	H
INCHES	3-1/4"	7-7/16"	1-1/4"	1-7/8"	1/2"	3/4" NPT	1/2" NPT	3/4"
MM	83mm	188mm	32mm	48mm	13mm			19mm

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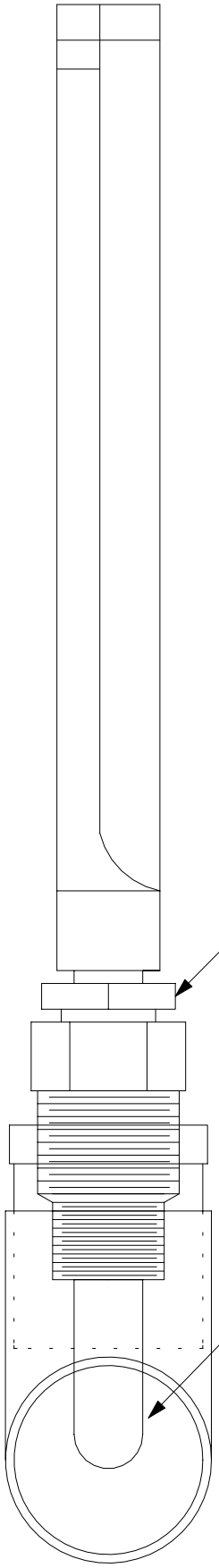
1050 EAST 9th STREET HIALEAH, FLORIDA 33010 U.S.A.
PH. 305-884-8363 FAX 305-883-8549

80993

INSTALLATION RECOMMENDATIONS



SIDE VIEW OF
STN-100
IMMERSION THERMOMETER

THERMOMETER UNSCREWS
FROM BRASS IMMERSION WELL

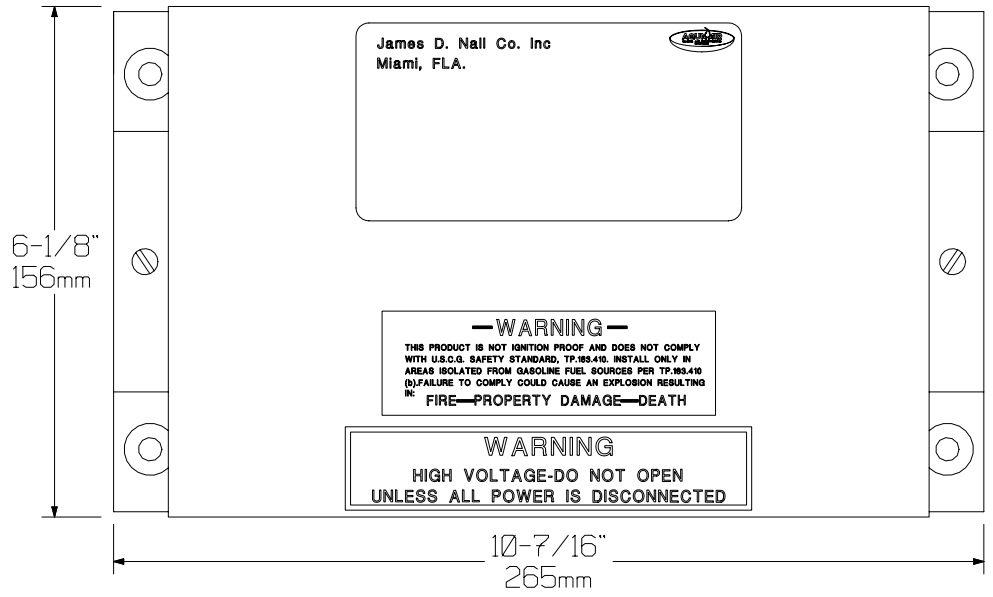
INSTALL SO THAT IMMERSION
WELL EXTENDS INTO MAIN
FLOW OF WATER. THIS MAY
NECESSITATE INCREASING
THE SIZE OF THE TEE TO
PREVENT THE WELL FROM
BEING A FLOW RESTRICTION

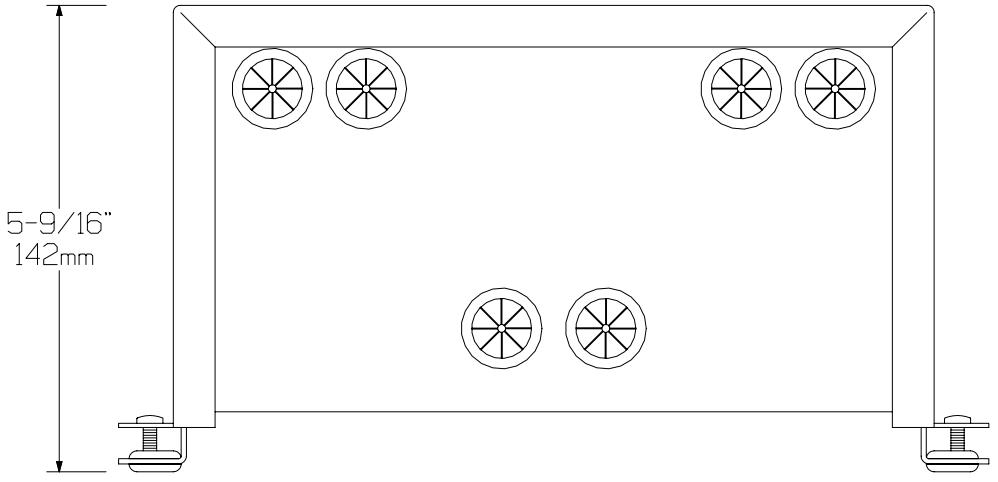
AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

AQP6RC,D & E PUMP RELAY

The AQP6RC, D and E Pump Relays are used when the amperage draw of the pump to be controlled exceeds the amperage carrying capabilty of the controller you are using. Each relay will accept as many as 6 triggering inputs in either 100-120/1/50-60 or 200-240/1/50-60 power range.

AQP6RC	200-240/1/50-60	2 POLE	20A MAX
AQP6RD	200-240/3/50-60	3 POLE	30A MAX
AQP6RE	380-460/3/50-60	3 POLE	30A MAX





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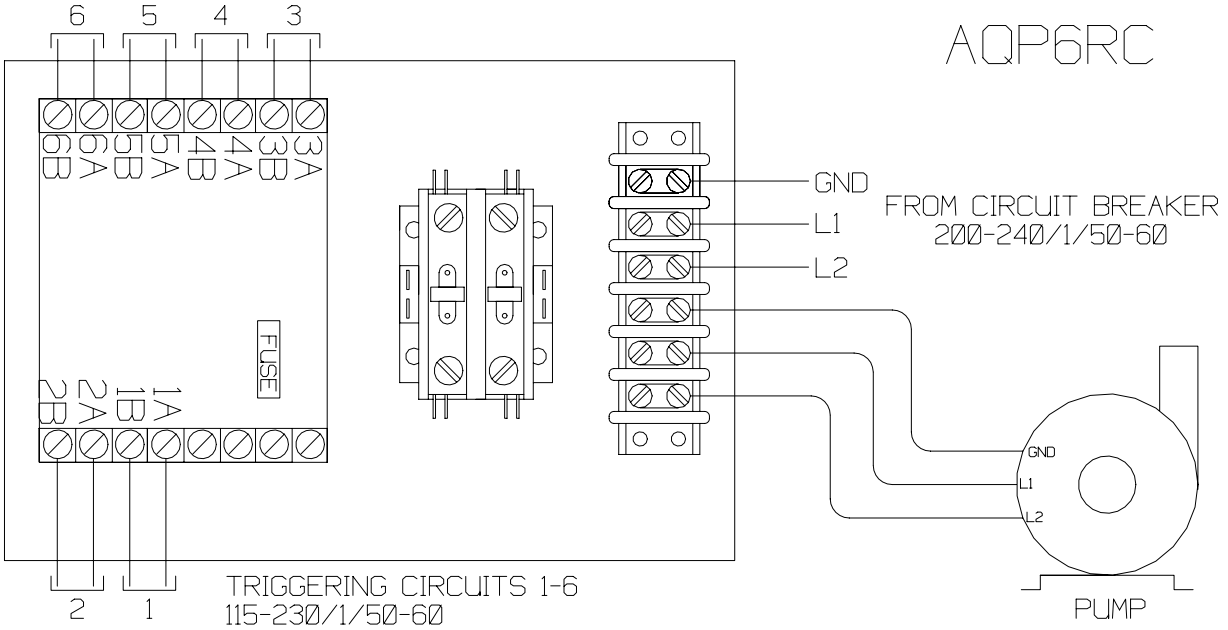
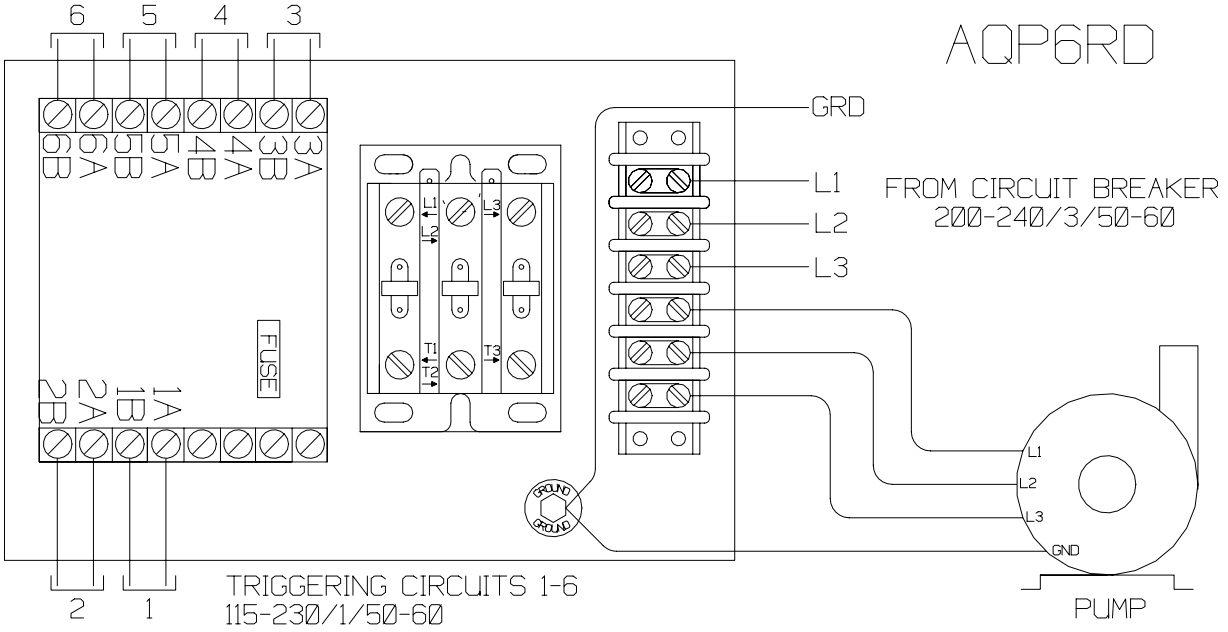
PH. 305-884-8363 FAX 305-883-8549

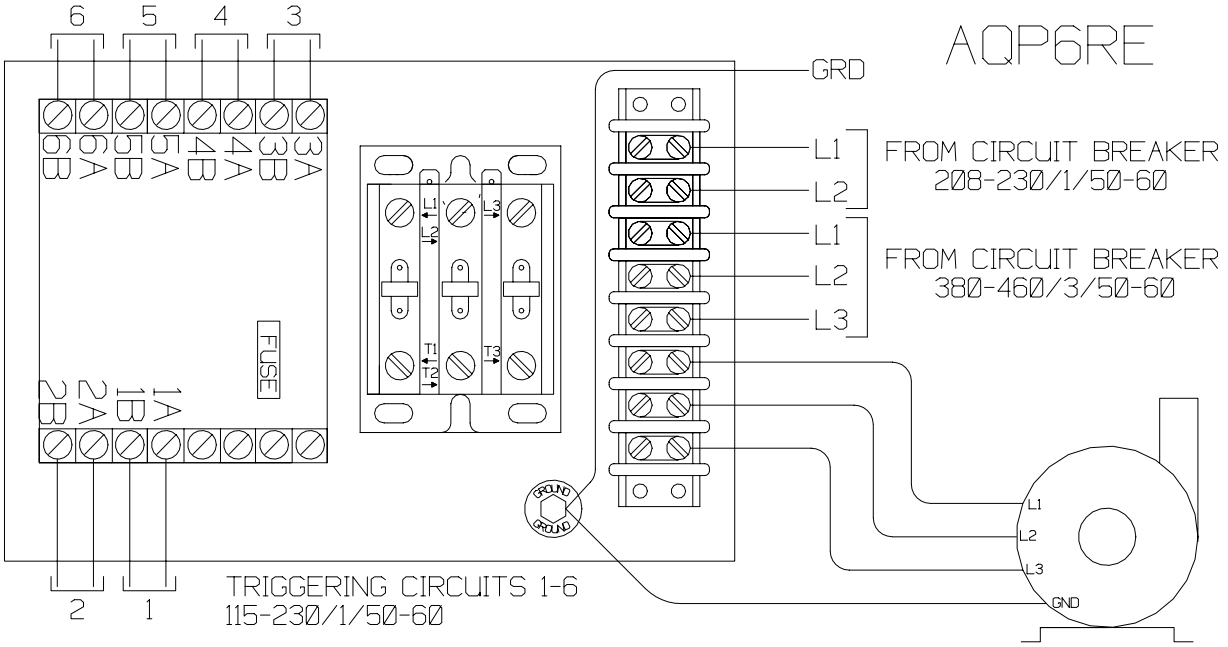
AQP6RC

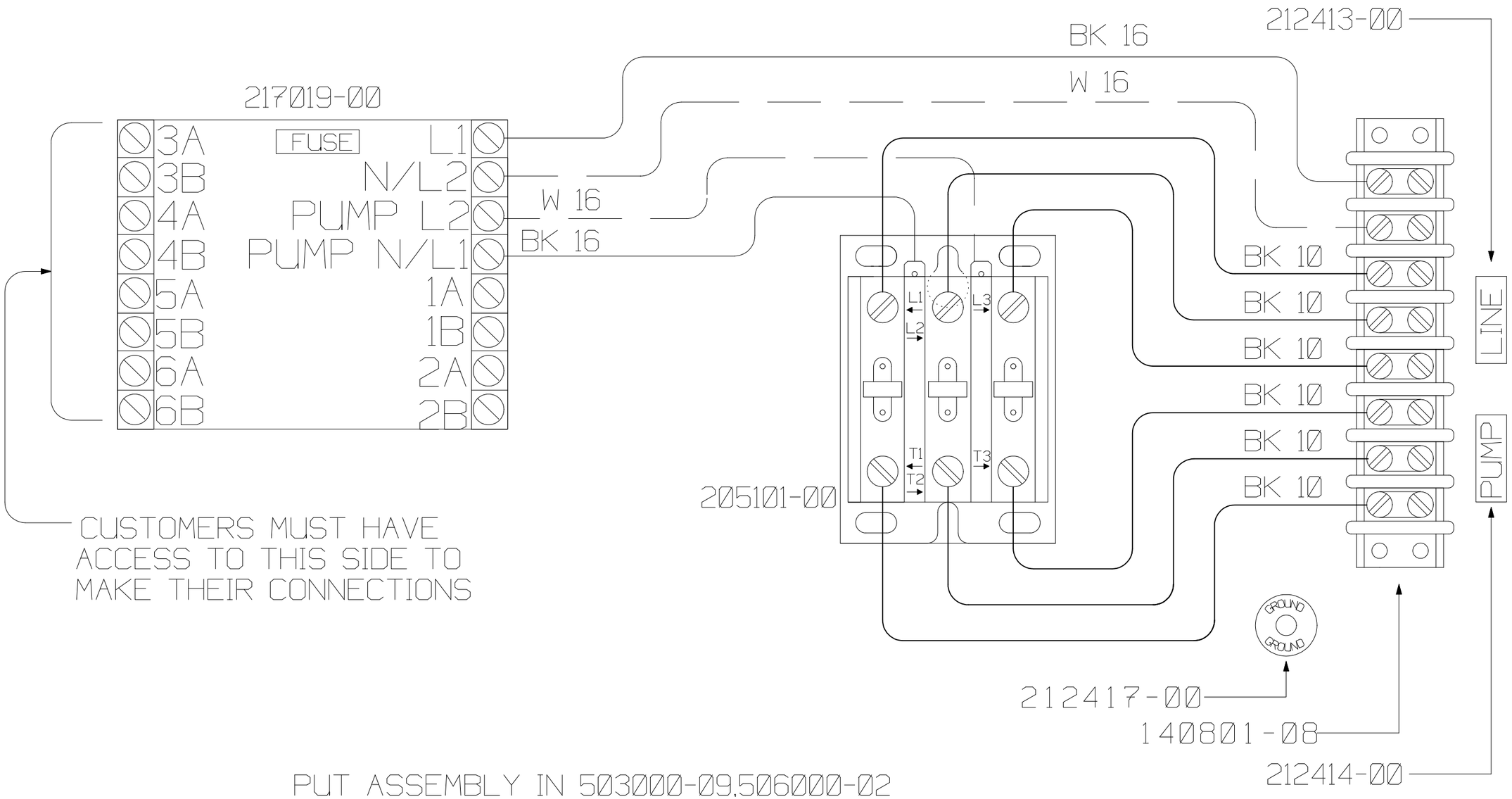


AQP6RD



AQP6RE





PUT ASSEMBLY IN 503000-09,506000-02
AQP8R SERIES BOX

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

AQP6RE-115 PUMP RELAY
380-460/3/50-60 w/ 115V CC

DRAWING NUMBER	DRAWN BY	DATE
4005-35B	CP	03-22-00

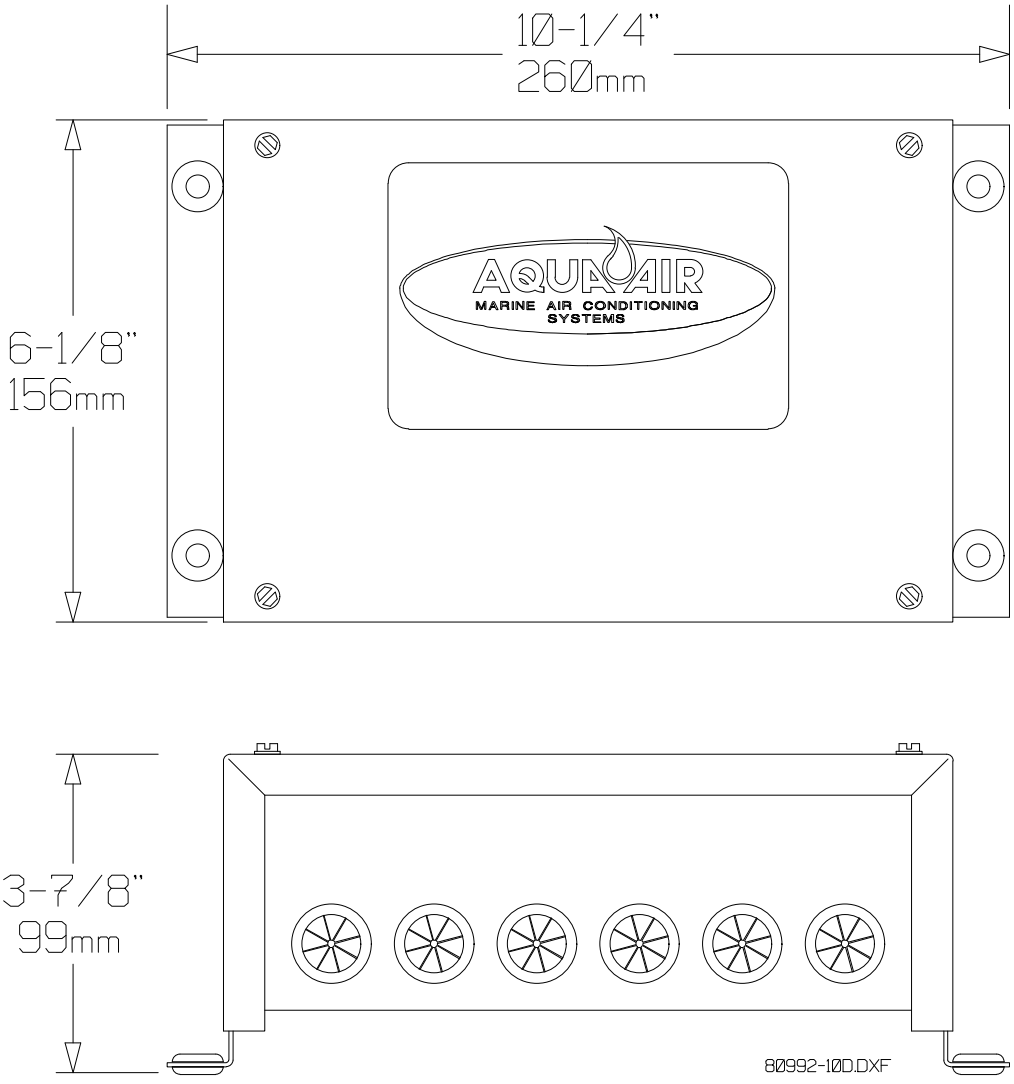
SCALE	APPROVED BY	REVISION DATE	REV
NONE			

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

PUMP RELAY PR-100 PR-103

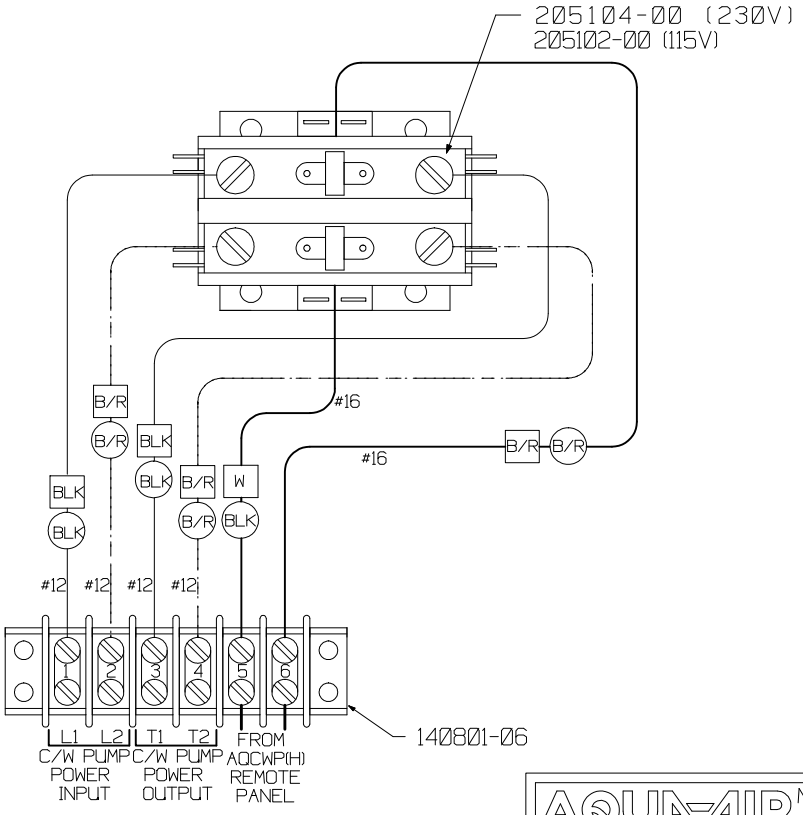
The PR Series Pump Relay is used when the amperage draw of the pump to be controlled exceeds the amperage carrying capability of the controller you are using.

MODEL	CONTROL CIRCUIT	CONTACTOR
PR-100	100-115/1/50-60	2 POLE
PR-100C	200-230/1/50-60	2 POLE
PR-103	100-115/1/50-60	3 POLE
PR-103C	200-230/1/50-60	3 POLE



i:\wordpfct\81097 PUMP RELAY.wpd

AQUA-AIR MANUFACTURING, division of the James D. Nall Co., Inc.
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 Email sales@aquaair.com



ELEC. BOX: 503000-19
ELEC. BOX COVER: 506000-08

FOR PR-100

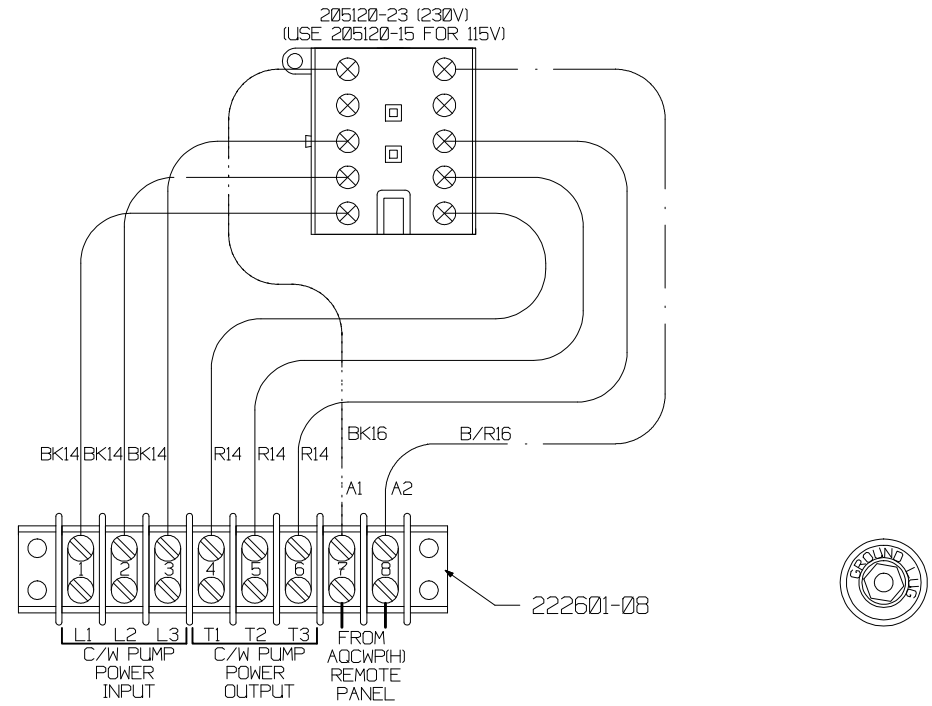
FOR PR-100C

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

PR-100 & PR-100C
WIRING DIAGRAM

DRAWING NUMBER	DRAWN BY	DATE	REV
4012-52	DN	11-11-09	A

SCALE	APPROVED BY	REVISION DATE
NONE		



ELEC. BOX: 503000-19
ELEC. BOX COVER: 506000-08

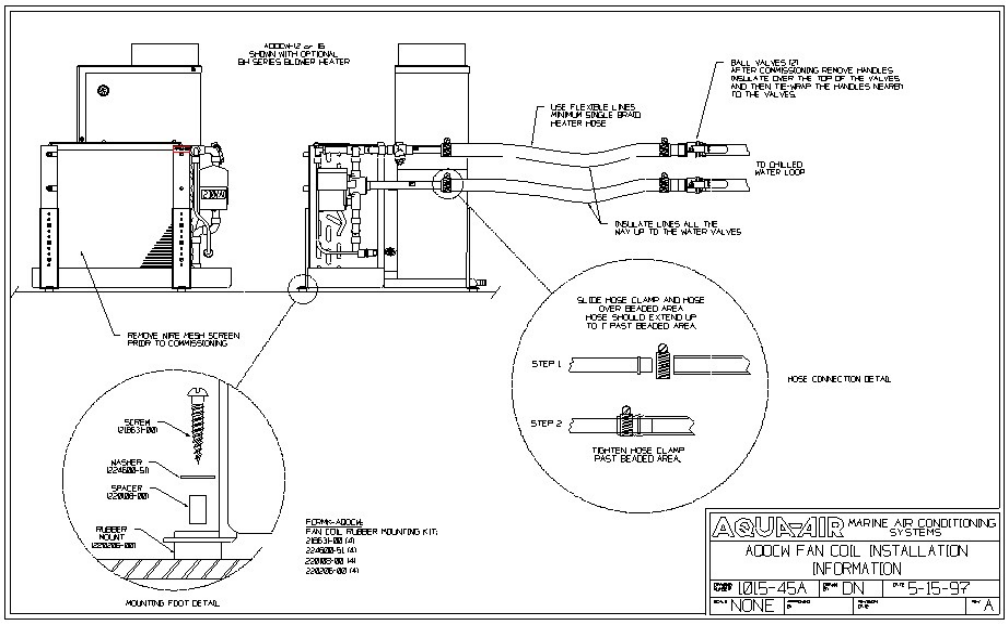
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

PR-103 & PR-103C
WIRING DIAGRAM

DRAWING NUMBER	DRAWN BY	DATE	REV
4012-11	SB	03-17-09	A

SCALE	APPROVED BY	REVISION DATE
NONE	DN	

Installation/ Operation/ Maintenance



AQUA-AIR

MARINE CHILLWATER AIR CONDITIONING

INSTALLATION
OPERATION
MAINTENANCE

AQUA-AIR
AQUA-AIR
AQUA-AIR

DIVISION of the JAMES D. NALL CO., INC. MIAMI, FL.

INSTALLATION, OPERATION AND MAINTENANCE OF AQUA-AIR® CHILLWATER MARINE AIR CONDITIONING SYSTEMS

I. INTRODUCTION

The purpose of this manual is twofold : (1) To give you an idea of what the basic chillwater system components are and (2) to give you the necessary information such as installation instructions, wiring diagrams, charts and start up procedures. This will enable you to install, test and operate an Aqua-Air® chillwater system.

Aqua-Air® chillwater systems come in standard 16, 24, 30, 36, and 60,000 BTU models. The 16, 24, and 36,000 BTU models can be supplied in cooling only or reverse cycle configurations. The 30, and 60,000 BTU models are supplied in the cooling only configuration with the option of adding a sidearm heater system to the unit. Fan coils are available in size from 3000 BTU (100 CFM) to 36,000 BTU (1200 CFM) in 115 or 230 volt, 60 cycle. All of the units can be run on 50 cycle current with a 17% decrease in capacity.

II. SYSTEMS OVERVIEW

There are basically three different chillwater systems available from Aqua-Air®:

1. Systems utilizing cooling only chillers with fan coils equipped with strip heaters
2. Systems utilizing reverse cycle chillers with fan coils
3. Systems utilizing cooling only chillers equipped with sidearm heaters and fan coils.

Each system will be briefly explained below.

A. Cooling Only Chiller — Fan Coils with Strip Heaters

In the cooling cycle, cold water that was chilled to a maximum low temperature of 42° F (6° C) is sent via a parallel piping system to the fan coils. This cold water passes through the fan coil, room air is blown or drawn across the coil and then discharged into the room. Room temperature is controlled by a thermostat that electrically opens or closes an electric water valve on the fan coil unit. As the room temperature reaches the desired setting on the thermostat, electric power is shut off to the water valve, bypassing the cold water back to the chiller and eliminating the cooling effect. In the heat cycle, the water valve remains in the closed position and the electric strip heater is energized. These remain energized until the thermostat reaches the set point. At that moment the strip heater is turned off. The advantage to this system is that you can have individual thermostatic control in each area. One room can be cooled while another one is being heated. Care must be taken when turning on the strip heaters to not overload the shoreline. The strip heaters can be turned on at the same time as the chiller.

B. Reverse-Cycle Chillers with Fan Coils

In the cooling cycle, cold water that has been chilled to a maximum low temperature of 42° F (6° C) is sent via a parallel piping system to the ship's fan coils. This cold water passes through the fan coil, room air is blown or drawn across it and then discharged into the room. In the heating cycle, the chiller goes into the reverse cycle mode. Water heated to a maximum of 120° F (49° C) is then sent to each fan coil. The thermostat senses the room temperature and sends an electrical signal to the aquastat. The aquastat is a SPDT thermostat that senses the temperature of the water that is passing through the pipes and turns the fan coil water valve on or off. With the thermostat in the cool position and cold water running through the pipes, the water valve remains in the open position. If the chiller is turned to the heat mode, hot water begins passing through the pipes. The aquastat senses this and turns the water valve off. If the thermostat is in the heat mode and cold water is passing through the pipes, the aquastat will keep the fan coil water valve closed. If the chiller is turned to the heat position and hot water begins passing through the pipes and fan coils, the aquastat will sense this and open the water valve. A summary of this is shown in the chart below:

CHILLER MODE	THERMOSTAT MODE	WATER TEMPERATURE	WATER VALVE STATUS
COOLING	COOLING	COLD	OPEN
COOLING	HEATING	COLD	CLOSED (BYPASS)
HEATING	COOLING	HOT	CLOSED (BYPASS)
HEATING	HEATING	HOT	OPEN

The major drawback of this system is that when the seawater temperature reaches 41° F, the unit loses 50% of its heating capacity. As the temperature decreases to 36° F, the unit will have lost almost all if its heating capacity.

C. Cooling Only Chiller — Sidearm Heating System

This system is very similar to the second system except for the method by which the water is heated in the heating mode. In the heat mode, the water passes through a sidearm heater (electric water heater) instead of the chiller. This water then is sent to the fan coils where air is blown or drawn across the coil, producing the heating effect.

III. GENERAL DESCRIPTION OF THE BASIC COMPONENTS

A chillwater cooling (and heating system) is comprised of the following main components:

1. Fan coils
2. Chiller units
3. Chillwater pump
4. Seawater pump
5. Thermostats and fan speed controls
6. Fan coil relays
7. Pump relays
8. Fresh water makeup system

The following paragraphs explain the function of each component.

A. Fan Coils

The fan coil, also referred to as an airhandler or cooling coil, is a water to air heat exchanger located in the space to be either heated or cooled. The fan coil is made up of the following major components:

1. Coil
2. Motorized water valve
3. Squirrel cage blower
4. Metal chassis.

The coil itself is constructed of aluminum fins and copper tubing. Water is piped into the bottom of the coil and then out of the top of the coil.

The regulating device that controls whether water is flowing through the fan coil is the motorized water valve. This motorized valve is energized by the thermostat in the room. There are two different types of valves: two way and three way. The two way valve is a simple on-off type valve. When electrically energized by the thermostat, the water valve opens and when the power is turned off the valve closes. The three way valve, when de-energized, bypasses the supply water back to the return line. When energized, the water passes normally through the fan coil. Three way valves are recommended for use on all of the fan coils. The two way valves can be used on fan coils that are part of a system that has at least one fan coil with a three way water valve or on a system that has two or more chillers connected together by a manifold with an internal check valve that bypasses the water if all of the fan coils were to shut off at once. The reason for this is that the chillers must have a constant supply of water returning to them. If two way valves are used on all of the fan coils and all of the valves were to shut off at once, there would be no water returning to the chillers. This could cause eventual failure of the chillwater pump plus also provide the chiller with an opportunity to freeze up internally if the fail-safe controls were to be defective. If there is at least one fan coil in the system with a three way valve then the water could still flow through that unit if all of the other valves on the other units were to turn off simultaneously. On a system with more than one chiller and a manifold system, the water could bypass through the manifold check valve and return back to the chillers if all of the two way water valves were to de-energize at the same time. These are the only two ways in which the two way water valve should be implemented into a system. They should NEVER under any circumstances be used on a system utilizing hot water heat. On a hot water system, an aquastat is placed on the incoming water line into the water valve. As previously discussed in the first section, the aquastat senses the temperature of the water in the pipes. If a two way valve is used and the valve shuts off, there is no flow of water past the aquastat. On initial startup of the system, the water valve might possibly never open because the aquastat would only be sensing the temperature of the water right at the water valve inlet rather than the temperature of the water that the chiller would be producing.

On each fan coil unit, there is a balancing valve installed on the water valve return line. This is used to regulate the total amount of water that a fan coil receives. Upon installation of the fan coil and when the system is running, the balancing valve is adjusted to provide for a ten degree temperature differential between the incoming water and the water that is leaving the fan coil. On the balancing valve, when the screw slot is in line with the tube, the valve is in the fully open position. When the slot is across the line, the valve is in the fully restricted position. In this position, the water flow is not completely shut off but is severely restricted. If there is less than a ten degree differential in the fan coil inlet and outlet water temperatures, water is passing too quickly through the coil. Turn the balancing valve toward the closed position to restrict the water flow until the ten degree split is achieved. If there is more than a ten degree temperature differential, the water is passing through the fan coil too slowly. The balancing valve should be opened up until the ten degree split is achieved.

All of the chillwater fan coils produced by Aqua-Air® utilize squirrel cage blowers. These provide for the necessary air velocity needed in duct systems while at the same time provide quiet air distribution.

There is an air bleeder on each of the fan coils. This is used to release any air that might become trapped in the system during the startup phase. The use of these bleeders is discussed later in the startup procedure section.

B. Chiller Units

Chiller units consist of the following basic components:

1. Compressor
2. Cupronickel condenser

3. Chiller tank
4. Electrical box
5. Reversing valve (if it is a heat pump model)

All of the above components are mounted on a metal chassis. This chassis can be fastened down directly or shock mounted.

Compressors on the AQF(H)-16CW and AQ-30-2 are 115-1-60 (100-1-50). The standard compressors on the AQF(H)-16CWC, AQF(H)-24CWPC, AQF(H)-36CWPC, AQ-30, AQ-30-2C and AQ-60 are 230-1-60 (200-1-50). They can also be supplied in 230-3-60 (200-3-50) on the AQF(H)-36CWPC, AQ-30 and AQ-60.

The systems function as follows: freon gas is compressed in the unit compressor and then piped to the seawater condenser. The seawater passing through the condenser absorbs the heat brought about when the gas is compressed. As the hot freon gas decreases in temperature, it changes in state from a gas to a liquid. This liquid is then piped to the chiller tank. Capillary tubes meter the liquid into the chiller. Before the liquid enters the chiller, it experiences a decrease in pressure while passing through the capillary tubes. When it enters the chiller coil itself it begins to absorb the heat in the water that is passing through the outer chiller jacket. As it absorbs this heat the liquid refrigerant begins changing back to a gas. It is then piped back to the compressor to start the cycle all over again.

The electrical box contains all of the starting components, terminal blocks, thermostats and power relays that are necessary for the operation of the unit. There is always a freeze-up and a cycling thermostat on the Unit. If it is a reverse cycle model there will also be a heating thermostat. The freeze-up control shuts the entire unit off if the temperature of the water in the chiller goes down to 38° F. Normally this will happen only if the water passing through the unit completely stops. The cycling thermostat normally would have shut the unit off at 42° F. On the AQ-30-2 and the AQ-60 (dual compressor models) the #2 compressor is set to go off when the chillwater temperature reaches 45° F. The #1 compressor goes off when the water temperature reaches 42° F. On reverse cycle units, the heating thermostat shuts the unit off at 120° F.

There should always be a water flow safety control (FSC-206 or 210) mounted on the chillwater outlet line leaving the chiller. This device senses if there is sufficient water flow passing through the chiller coil. It is tied into the unit control circuit so that if there is not enough water passing through the chiller the unit will not start. This acts as a back-up to the freeze-up control.

C. Chillwater Pumps

With the AQF(H)-16CW(C), AQF(H)-24CWPC and AQF(H)-36CWPC it is necessary to mount an independent chillwater pump. The AQ-30, 30-2, and 60 all have an internal chillwater pump. This pump is used to circulate the water through the chiller and then to the rest of the system. On systems that have more than one chiller, a single large chillwater pump is used to circulate water to the fan coils. This pump is located in the water supply line between the chillers (or manifold if used) and the fan coils. On the systems using the smaller AQF(H) units it is sometimes economically feasible to use a single large pump to pump the water through the chillers and then on to the system.

D. Seawater Pumps

The seawater pump is used to circulate the raw water (seawater in most cases) through the chiller condenser. A basic rule of thumb to follow is that you need about 4 GPM per 12,000 BTU of chiller capacity. An example of this is a 24,000 BTU chiller would require about 8 GPM or 480 GPH. The next seawater pump (500 GPH) is the appropriate choice.

All of the seawater pumps supplied by Aqua-Air® are of the centrifugal type and are not self priming. This means that they must be mounted below the waterline of the boat UNDER ALL CONDITIONS!

E. Thermostats and Fan Speed Controls

There are two basic types of thermostats supplies by Aqua-Air®:

1. Pilot duty
2. Line voltage duty

The thermostats that fall under the category of pilot duty are:

1. AQT39 Series
2. AQSD3W Series

On the AQT39 series, the water valve circuit should not exceed 1.0 amp @ 115 volts and the fan circuit 5.0 amps @ 115 volts.

On the AQSD3W series, the water valve circuit should not exceed 10 amps @ 115 volts, the fan circuit 4.0 amps @ 115 volts and the auxiliary circuit 15.0 amps @ 115 volts. On 230v systems the amperage carrying ratings are doubled (ex. 4 amps @ 115v would be 8 amps @ 230v). These thermostats are usually used with the fan coil relays to prevent overloading the thermostat circuits. All of the relay specifications are given in the section on fan coil relays.

The thermostats that fall under the category of line voltage thermostats are:

1. AQS1W Series — Cooling only
2. AQS3W Series — Heating and Cooling

On these thermostats, the water valve circuit and heating circuit (AQS3 only) are rated for 18.0 amps @ 115 volts, the fan circuit for 4.0 amps @ 115 volts and the auxiliary circuit for 20 amps @ 115 volts. Because of their large amperage carrying capacity, it is usually not necessary to use a relay with these thermostats. However, on applications where more than one fan coil is run off of a single thermostat, it may be necessary to use a relay system if the amperages of the equipment are greater than the amp carrying capability of the thermostat.

Fan speed controls are broken up into the following categories:

1. Two speed
2. Three speed
3. Variable speed

The two speed switches are available with or without an off position. These are used specifically on the AQOHW units. The maximum amperage load that can be placed on these switches is 15 amps @ 115 volts. The three speed switch is only available with an OFF-HI-MED-LOW switch and auxiliary set of points. These were used on the older Aqua-Air® fan coils with three speed fan motors, which are no longer in production. The maximum amperage load that can be placed on this switch is 10 amps @ 115 volts. The variable speed fan controls are available either with or without an off position. The maximum amperage load on these switches is 4 amps @ 115 volts. All of the above fan speed controls without an off position are used together with the AQT39A or H in areas where there is only a single fan coil being controlled by the thermostat. Fan speed controls with an off position are used in areas where there is more than one fan coil being controlled by a single thermostat. These fan speed controls can be used with any of the listed thermostats.

F. Fan Coil Relays

There are several different fan coil relay boxes used with the chillwater systems. Below is a chart outlining their use:

RELAY SELECTION CHART

APPLICATION	HR-100	HRS-100	MFR-100	FR-100	FRS-100
1. Single fan coil w/strip heat on a single thermostat	×				
2. Multiple fan coils w/strip heat on a single thermostat		×	×		
3. Multiple fan coils on a hot water heating system on a single thermostat				×	×

In the above systems where there are multiple fan coils on one thermostat in a single area, there is only one master relay (MFR-100 or FR-100) per area. One of the fan coils in the area is selected to be the master fan coil and is then connected to the master relay. All of the other fan coils in that area are connected to slave relays (HRS-100 or FRS-100). There is an individual slave relay for every fan coil in the area except for the master relay. Relays that are used with the strip heater systems are available with three pole heater contactors for three phase strip heaters. All of the relays are available with either 115 or 230 volt control circuits.

G. Pump Relays

A pump relay is necessary when one seawater pump supplies water to two or more chiller units. Aqua-Air® offers two different types of pump relays.

1. AQP2R

   This pump relay was designed for use on systems with one seawater pump and two chillers. It should also be remembered that both chillers should be on the same shore line if this type of relay is to be used. If they are not on the same shore line, then the AQP8R should be used. The AQP2R has an open point contact and is therefore not ignition protected. Because of this it should never be mounted in an area that might contain gasoline vapors. The AQP2R gets its power from the chiller units and therefore does not need an external power source.

2. AQP8R

   This relay is constructed entirely of solid state components. It can handle from 2-8 chiller units. For each chiller unit there is an individual trigger (PEC-115 or 230) used to energize the system. There can be a mixture of trigger voltages used in any box. The trigger voltage is based on the individual system control systems. The AQP8R requires an external power sources that is the same voltage as the pump. Because of its solid state construction, the AQP8R is ignition protected.

H. Fresh Water Make-up Components

On a chillwater system, there has to be a fresh water make-up system tied into the ships main fresh water system. This system is necessary during initial start-up to introduce water into the system. Also, certain amounts of water are lost through the normal operation of the chiller system. The water that is lost is replaced by the fresh water make-up system. The components that are included in this system are:

1. Pressure reducing valve
2. Expansion tank
3. Water pressure gauge.

The pressure reducing valve reduces the water pressure from the ship's main system to a pressure of approximately 12-15 PSI. The valve is set at the factory for 12 PSI. This is the normal system pressure setting. As water is cooled or heated it expands and contracts to a small extent. This expansion and contraction is compensated for by the expansion tank. The water pressure gauge is used to monitor the system pressure. There should be a gate valve separating the ship's fresh water system from the chillwater system fresh water make-up system. This should be left on at all times except when repair work is being done to the chillwater lines. If not left on the system can become air bound and then not operate at maximum efficiency.

IV. INSTALLATION OF BASIC COMPONENTS

★ ★ ★ WARNING ★ ★ ★

Failure to comply with the installation instructions given below could produce hazardous conditions resulting in the injury or death of the ship's occupants and destruction of the vessel itself. Make sure that the warnings that are listed at the end of this guide are fully understood and followed.

If there are any parts of this manual that are not fully understood, please contact Aqua-Air® so that we can further clarify the point.

★ ★ ★ ★ ★ ★ ★

A. Fan Coil

In all applications, the fan coil should be installed so that the air discharge is at least three feet above the floor level. The best possible situation is to have the air discharge at or near the ceiling. The reason for this is that cold air is denser than air at ambient temperature. When the cold air is discharged from the grille, it begins to fall because it is heavier than the surrounding air. The cooling unit should be installed with the drain pan at the bottom of the unit. In this position it will be able to catch any condensation coming off of the fan coil itself. A drain fitting should be installed and a hose run from the fitting to a shower sump or overboard discharge. It should not be connected to a seawater discharge from any other pump as this will prevent the unit from draining. There should be at least a 1″ drop in the line as soon as it leaves the drain fitting. It is not advisable to run the drain into the bilge where the water could become stagnant and foul smelling. The two recommended places to send the drains is either into a shower sump or into an independent overboard fitting. On a hot, humid day, as much as several pints of water can be removed from the air by the fan coil.

It is important that there is adequate space for the air to travel to and from the fan coil. On type AQBHW, AQH, AQP and AQV fan coils, the cross sectional area of the discharge should equal to the fan coil area. On type AQBVW, AQCW, AQOCW, AQCW-L, AQOW and AQOHW fan coils, the discharge grille area should be equal to twice the blower flange area. This will not only reduce the amount of noise that is heard from the unit but it will also improve the air flow characteristics of the system. On most grilles there are numerous air restrictions such as blade, frames, levers, etc. When reference is made to the cross sectional area of a grille, it is speaking of the open, unrestricted area of the grille. On some grilles as much as half of the face area is obstructed. In this instance it would be necessary to double the size of the grille to get the necessary face area.

A return air filter should be in place on either the back of the return air grille, in the return air duct or on the cooling unit itself. These filters should be cleaned on a monthly basis if the system is used regularly. Suggested supply air and return air grille sizes are listed on the individual unit brochures.

The fan coil is wired to either the thermostat or the fan coil relay box. Please refer to the end of the manual for wiring diagrams.

If the water regulating valve is mounted directly on the unit, there must be access to it after the unit is installed. This will prevent any costly service problems from occurring later. On the AQH model fan coils there should be at least 2″ of clearance behind the blower housing. This will allow removal for servicing. All return air access holes to the units should be large enough to allow for removal of the filter (AQP, AQV) and/or the motor tray (AQH, P, V).

★ ★ ★ WARNING ★ ★ ★

To avoid an electrical shock from a piece of equipment that has shorted out, always ground an Aqua-Air® system in the manner outlined below:

1. **Use wire of a suitable size with a ground to feed power to the switch assembly terminal block or the fan coil relay box. Make sure that the ground wire is connected to the ground lug inside of the circuit breaker panel.**
2. **Connect the ground wire to the ground lug on the switch assembly terminal block or the fan coil relay box.**
3. **Connect the green wire from the fan coil to this same lug.**
4. **Connect a wire of suitable size with a ground wire from the circuit breaker panel to the ground lug on the chiller.**
5. **Connect a ground wire from the seawater pump, chillwater pump and pump relay (if used) to the chiller ground lug.**
6. **Connect the chiller unit ground lug to the ship's bonding system.**
7. **Check for continuity between all of the above points.**

Failure to comply with the above instructions can result in serious injury or death.

★ ★ ★ ★ ★ ★ ★

B. Chiller Units

The Aqua-Air® chiller units are designed for installation in almost any area in the boat. They are unaffected by moisture,

AIR CONDITIONING SEAWATER SYSTEM

① Thru-hull fitting, speed scoop type. Should be located as close to the keel as possible (6″ away max.), forward of the stuffing box and aft of the foward engine room bulkhead.
② Sea-cock.
③ Seawater strainer. Must have a removeable internal basket for cleaning purposes. Can also be used with an outside strainer in areas where there is a heavy debris or jellyfish problem.
④ Seawater pump. Must be mounted below the waterline under all conditions.
⑤ Condensing unit seawater inlet (lower of the two fittings).
⑥ Condensing unit seawater outlet (higher of the two fittings).
⑦ System high point. There can be only one high point in the system.
⑧ Overboard fitting. No more than 1-2″ above the waterline to allow for quiet water drainage . Water discharge should be visible from deck. There should be a separate seawater overboard for each system.

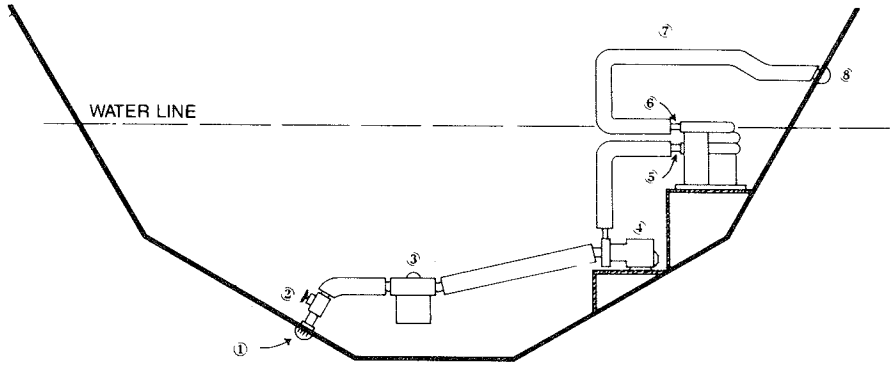


FIGURE 1

vibration or ambient temperatures up to 140° F. They are also designed to withstand the heavy jolts that a unit can experience in a boat when it is in a heavy sea. All of the refrigerant components are hermetically sealed.

The chiller units can be installed wherever there is sufficient space. The chiller should either be screwed or bolted down in a horizontal position. It is not necessary to mount the units on shock mounts because the compressors on the units are already shock mounted. The unit should be mounted in such a way that it is easily accessible for service work or maintenance. There should be a minimum of 18″ clearance over the top of the unit in case the compressor ever has to be removed. There should also be easy access to the electrical box. This is very essential.

When hard piping a chiller in, there should always be hose connections between the chiller and the pipe. There should also be a gate valve on the piping so that if the chiller has to be removed, the valve can be shut off and the flexible hose connections loosened. This will prevent losing all of the water in the system when the chiller is being worked on.

C. Pumps

In a chillwater system there are two types of pumps:

1. Chillwater pump
2. Seawater pump

The AQ-30, AQ-30-2(C) and the AQ-60 come equipped with their own internal chillwater pump. The only time that an external chillwater pump is used is when two or more chillers are manifolded together. In this application, the internal chillwater pumps are used solely to pump water through the chiller coil itself and then on to the chillwater manifold. The main chiller pump then circulates the water to the rest of the system. The AQF(H) chillers use a separate chillwater pump. This should again pump through the chiller tank and then on to the system or manifold. The only acceptable ways of mounting the chiller pump is shown in **Figure 2** below.

SHOWN BELOW ARE THE ONLY TWO ACCEPTABLE WAYS THAT A PUMP SHOULD BE MOUNTED. ANY OTHER WAY CAN CAUSE AIRLOCKS OR EXCESSIVE PUMP MOTOR BEARING WEAR.

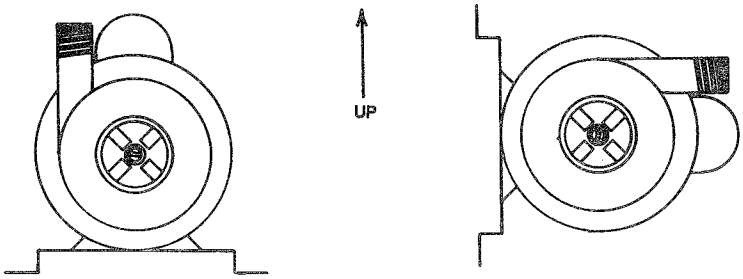


FIGURE 2

The seawater pumps used on the Aqua-Air® systems are centrifugal pumps. Because of this they are not self priming and therefore must be mounted in the following manner:

1. The pump must be securely mounted at a point in the hull that is below the water line of the boat under all conditions (see **Figure 1**). The position of the pump should be as close to the centerline of the boat as possible, no further forward than the front of the engine compartment and no further aft than the propeller shaft stuffing boxes. The pump should be mounted in a horizontal position and never on its head or end. The only two acceptable positions are shown in **Figure 2.**
2. To make the system self-purging, there must be a steady uphill run from the seawater inlet to the sea strainer to the pump through the chiller and then to the overboard. This will permit any air in the system to easily escape. If the pump should ever become air locked removing the hose from the outlet of the pump will release the air. The seawater inlet for this pump should have a clamshell type scoop over the inlet to force water into the thru hull when the vessel is moving. If this type is not used a suction can be created across the seawater inlet, starving the pump of water.
3. To wire a pump into a single chiller, connect the black and white wires coming from the pump to the proper lugs on the chiller unit. The green wire should be connected to the ground lug. On a system with a pump relay, connect the black and white wires to the terminal block marked "PUMP." The green wire should then be connected to the ground lug.

D. Thermostats and Fan Speed Controls

Thermostats and fan speed controls are the devices by which temperature is controlled, fan speed is regulated and system status indicated.

The thermostats supplied by Aqua-Air® have either an internal temperature sensor (AQT39A, B, H, HZ, M) or a remote temperature probe (AQSD3, AQSW1, AQSW3). Thermostats with internal temperature sensors should be mounted a minimum of 5′ above the floor. They should also be mounted in an area where the supply air does not blow directly on the thermostat. Mounting them on exterior walls, engine room bulkheads and in locations where the sun can shine directly on the thermostat is also discouraged. An electrical box should be placed over the rear of the thermostat to prevent the wires from being damaged.

Thermostats with remote temperature sensors are mounted over a suitable size hole and then fastened in place with four screws. The wire coming off of the thermostat end in a terminal strip which should also be securely mounted. After all of the wiring is completed, the covers that were supplied with the thermostat should be put over the terminal block and the rear of the thermostat.

The thermostat has a 10′ temperature probe. The bulb at the end of this length must be mounted in the return air flow going to the fan coil or in an area in the room where it will sense the average temperature of the room. The outlines given above for mounting the thermostats with internal temperature sensors should be followed with this type of installation. When mounting the sensing bulb near the unit, it should never come in direct contact with the unit itself. To do so would render the thermostat inoperative. It is also recommended that the bulb not be painted as this lessens the sensitivity of the thermostat.

Independent fan speed controls are usually mounted in an area very close to the fan coil that they are controlling. The wires and terminal block coming off the back of the unit should be securely mounted. All protective covers should be installed as soon as the wiring has been completed.

E. Piping

There are several different mediums by which chillwater systems can be piped. The most commonly used are:

1. Type L or M copper pipe
2. PVC (CPVC if it is a hot water heating system)
3. Single braid hose.

Regardless of the type of piping used, all of the pipes must be insulated. The recommended wall thickness for insulation on chillwater lines is ½″. All of the insulation joints should be sealed by first gluing and then taping them neatly with duct tape. If there are any areas where air can get to the pipes, condensation will start to form on the pipes. This condensation will eventually water log the insulation, rendering it worthless.

All of the drain lines from the fan coils should also be insulated with a minimum of ⅜″ wall insulation. If these lines are not insulated they can also sweat.

F. Relays

Fan coil relays (HR, HRS, MFR, FR, FRS) are used when the system amperage is too great for the thermostat to handle. These relays should be mounted in an easily accessible area near the fan coil that they serve.

Pump relays should be mounted as close as possible to the pumps but not in an area where they could get wet if there was to be a water leak form one of the pumps. Please refer back to the section where a description of the different types of pump relays were given. This will also help determine where a relay should be mounted, i.e. in the engineroom or in another location.

V. STARTUP PROCEDURES FOR AQUA-AIR® MARINE CHILLERS

A. Introducing Fresh Water into the Chillwater System

1. Make sure that there is sufficient fresh water in the pressurized fresh water system to fill the entire chillwater system.
2. Open the gate valve separating the main fresh water system from the chillwater makeup system and allow water to enter the chillwater system.
3. If there is a pressure gauge on the chillwater system it should indicate 12-15 PSI on the chillwater side. These are the normal operating pressures.

B. Chillwater Pump Startup

1. AQF(H)16, 24, 36CWPC
   A remote changeover switch (AQCWP series) is used to turn the chillwater pump on.
2. AQ-30, AQF(H) 16, 24, 36CWPC
   When the switch on the side of the chiller electrical panel is turned on, the chillwater pump will come on.
3. AQ-30-2, AQ-60
   Turn the top black switch on. This will energize the internal chillwater pump. On the AQ-60 there is a pipe plug at the top of the chillwater pump head. Remove this momentarily to release any trapped air. Before replacing, put pipe sealant on the plug threads.
4. If two or more chillers are used, turn the circuit breaker on for the main chiller pump. If it has a plug in the head, remove to allow air to escape. Replace as described above after only water comes out. Then turn on the individual pumps on the chillers as described above.

C. Bleeding Air from the System

1. Turn on each individual room thermostat to the full cooling position. Make sure that the water valve on the fan coil is open. This can be determined by looking at the water valve. With the lever at the top and looking at the top of the valve, the lever should be in the full left position.
2. Start with the lowest unit in the boat, progressing to the highest, begin bleeding each unit. On the units with schrader fittings, depress the pin inside of the fitting to release the trapped air. On the units with the screw type bleeder, turn the screw counter clockwise until air and/or water begins coming out of the bleeder outlet. After only water comes out, turn the screw clockwise to shut the bleeder off.
3. Continue this operation until no air is heard passing through the chillwater lines. Any air in the lines reduces the chillers cooling capacity.

D. Turning the Chiller Compressors On

1. Make sure that the seawater pump is properly connected to the chiller. Also be sure that the seawater inlet valve is open and the seawater strainer is not restricted in any way.
2. AQF(H)-16, 24, 36CWPC
   After the main chillwater pump switch has been turned on at the remote changeover panel the selector switch should be turned to the desired mode. On the AQCWP-01(C) unit turning the mode switch to either cooling or heating will energize the compressor on the chiller. On the AQCWP-02, 03(C) after the operation mode has been selected then the individual chillers can be turned on at the switch panel. The compressors will come on when there is sufficient water flow through the chiller. All units are set to cycle off at 42 degrees.
3. AQ-30
   When the switch on the unit is turned to the on position or cool position, the compressors will automatically come on when there is sufficient water flowing through the water flow switch (FSC-210). On the AQ-30 there is a standard 10 second delay. This is optional on the other units. All units are set to cycle off at 42 degree water temperature.
4. AQ-30-2, AQ-60
   The two switches below the top black switch control the compressors. The switch closest to the front is the #1 compressor while the other is #2. Either compressor can be turned on independent of the other. There is a standard 10 second delay on compressor #1 and 20 second delay on compressor #2. As long as all the air has been bled from the system, the compressors should come on after the time delay period. The #2 compressor will cycle off at 45 degree water temperature and the #1 compressor at 42 degrees.
5. At this point, if the unit does not come on and the wiring has been checked and all the air has been removed from the system, adjust the internal baffle inside the FSC flow switch so that it partially restricts the water flow. If the unit still does not come on, a competent air conditioning service mechanic should be brought it.

   The system is fully operational and will cycle on and off automatically. On systems that have a cooling only chiller with heat strips on the fan coils, it is not necessary to turn the chiller off when heat is desired. The individual airhandler water valves will shut off when the heat mode is selected. As the water temperature in the water lines decreases to 42 degrees the chiller will cycle off by itself. On a reverse cycle unit either heating or cooling must be selected at the chiller or at the remote changeover switch that is optional with this system.

VI. MAINTENANCE

A. Cooling Units

All of the fan motors (except the AQCW series units) should be lubricated on a yearly basis with SAE20 oil. At the beginning of the boating season, the cooling unit drain pan should be checked for proper drainage. This can be done by pouring a quart of water in the drain pan. It should completely drain within 30 seconds. Also, all of the return air filters should be cleaned. This should be done on a monthly basis when the system is in continual use.

B. Chiller Unit

The chiller unit requires no maintenance at all that can be provided by the boat owner. It is a sealed unit and there should never be a need to add any refrigerant to the system.

C. Seawater System

The seawater pump requires no maintenance. The seawater strainer should be cleaned on a monthly basis when the system is in use. This time period will vary based upon the surrounding water conditions.

VII. WINTERIZING

A. The Seawater Circuit

1. Chiller Unit — Remove the seawater hose running from the chiller unit condenser inlet to the seawater pump outlet. This will allow all of the water in the condenser to drain out.
2. Seawater Pump — Close the seawater inlet and loosen the screws on the head of the pump. This will allow the water to drain from the pump.
3. Seawater Strainer — Drain and clean the strainer.
4. Seawater Inlet — Remove as much water as possible from the seawater inlet.

B. The Chillwater System

At least 25% of the water in the chillwater circuit should be drained and replaced with propylene glycol anti-freeze. This mixture should then be circulated for several hours to make sure that the anti-freeze has adequately mixed with all of the fresh water in the chillwater circuit. This mixture can be left in the system under normal operating conditions.

CHILLER UNIT RECOMMENDED WIRE AND BREAKER SIZES

UNIT	VOLTAGE	WIRE SIZE	BREAKER SIZE
AQFH-16CW	115V	#10	30 AMP
AQFH-16CWCC	230V	#12	20 AMP
AQFH-24CWPC	230V	#12	20 AMP
AQFH-36CWPC	230V	#10	30 AMP
AQ-30	230V	#10	30 AMP
AQ-30-2	115V	#08	50 AMP
AQ-30-2C	230V	#12	20 AMP
AQ-60	230V	#06	50 AMP

AMPERAGE RATINGS FOR RESISTANCE HEATING LOADS

	SINGLE PHASE						THREE PHASE				
KW	120V	208V	240V	380V	440V	480V	208V	240V	380V	440V	480V
1	8.4	4.8	4.2	2.7	2.3	2.1	2.8	2.5	1.8	1.4	1.3
2	16.7	9.7	8.4	5.3	4.6	4.2	5.6	4.9	3.6	2.7	2.5
3	25.0	14.5	12.5	7.9	6.9	6.3	8.4	7.3	5.4	4.0	3.7
4	33.4	19.3	16.7	10.6	9.1	8.4	11.2	9.7	7.2	5.3	4.9
5	41.7	24.1	20.9	13.3	11.4	10.5	13.9	12.1	9.0	6.6	6.1
6	50.0	28.9	25.0	15.8	13.7	12.5	16.7	14.5	10.8	7.9	7.3
7	58.3	33.7	29.2	18.6	16.0	14.7	19.6	16.9	12.6	9.3	8.5

WIRE AMPERAGE RATINGS

(105° C — 600V — Copper-Stranded)

AWG Size	Amps/Conductor
#18	5 AMPS
#16	7 AMPS
#14	15 AMPS
#12	20 AMPS
#10	30 AMPS
#08	40 AMPS
#06	50 AMPS

★ ★ ★ WARNING ★ ★ ★

The James D. Nall Company, Inc. hereafter referred to as the "Manufacturer" makes the following warnings in regard to the use of its products. Even though these warnings are comprehensive, there are certain dangers that might arise which at this thime, are unforseeable. A thorough understanding of the dangers outlined below will help as a guide for spotting other potentially dangerous situations. This understanding is very important in assuring your safety.

★ ★ ★ ★ ★ ★ ★

Electricity

Aqua-Air® products operate on voltages ranging from 115 v. to 440 v. AC power. Because of the danger involved with these voltages, all metal components (bases, cabinets, units), must be grounded in some way to the ship's grounding system. Some of the relays switches and thermostats used in the Aqua-Air® systems are not ignition proof. Because of this, the ventilations blower on a boat should be run for five minutes prior to and during the operation of any Aqua-Air® product or system. All electrical connections must be sealed or covered in such a way as to prevent contact by unauthorized personnel. Such contact could lead to permanent injury or death.

Electrolysis

Any electrical leakage of a component can cause electrolysis. This could lead to the deterioration of a thru-hull which could cause leakage of water into the boat which could result in sinking the vessel. All Aqua-Air® products must be kept clean and dry. They should be periodically checked for electrical leakage. If detected, the faulty component should be either repaired or replaced.

Gas

All Aqua-Air® systems utilize refrigerant number 22 (monochlorodiflouromethane). This gas is non-toxic and non-flammable. This gas contains no oxygen and will therefore not support life. When burned this gas deteriorates into potentially lethal gases. If a refrigerant gas leak is discovered, evacuate all personnel from the area and prohibit the use of any item using an open flame. Due to the high pressures involved in refrigeration systems, eye protection, gloves and long-sleeved clothes should be worn during servicing of a system. Extensive frost burns can occur to the eyes and skin if they come into contact with liquid refrigerant.

Ventilation

To either cool or heat air, Aqua-Air® systems move air through a heat exchanger by means of either a propeller fan or blower system. This process naturally causes a suction on one side of the unit and a pressurized area on the other. These heat exchangers or "cooling units" as they are referred to in our brochures must be installed so that this suction-pressure action does not (1) pressurize an area to the extent of causing structural failure of the area which could cause injury and does not (2) cause a suction in an area where vapors from batteries, fuel, and operating equipment exist. If a cooling unit were installed in this way then these vapors could possibly be discharged into a living space where they could be hazardous.

The best way to prevent the introduction of dangerous gases into a living space is to make sure all living spaces are carefully sealed from all other spaces. It is never advisable to completely seal an area without some sort of auxiliary ventilation in the event of lethal gas or fumes escaping from any source.

Condensate

All Aqua-Air® units produce water condensate from the air during normal operation in the cooling mode. This water must be drained overboard. If allowed to drip on wood, dry rot can form causing structural failure. If allowed to drip on electrical components, deterioration of the components can occur. When the cooling unit is in operation, a negative pressure is exerted on the condensate line. Always locate condensate outlets as far as possible from sources of fumes or dangerous gases. These fumes and gases could be drawn into the system due to this negative pressure resulting in a potentially hazardous situation.

★ ★ ★ WARNING ★ ★ ★

Never sleep in a closed area in a boat when any equipment, which functions as a direct result of the combustion of a volatile fuel, is in operation (such as engines, power plants, oil fired heaters, etc.). At any time their exhaust system could fail leading to a build-up of dangerous gases within the closed area.

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AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

JAMES D. NALL CO., INC.
MIAMI, FLORIDA
1-800-325-1337-AAM

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

CHILLWATER PIPING INSULATION and MOUNTING SPECIFICATION

Insulation Specifications

A. Insulation material shall be flexible, closed-cell elastomeric insulation in tubular or sheet form.
B. Materials shall have a flame spread rating of 25 or less and a smoke density rating of 50 or less when tested in accordance with ASTM E84, latest revision. In addition, the product when tested shall not melt or drip flaming particles, and the flame shall not be progressive.
C. Materials shall have a maximum thermal conductivity of 0.27 Btu-in/h-ft^2-°F at a 75 °F mean temperature when tested in accordance with ASTM C177 or ASTM C518, latest revisions.
D. Materials shall have a maximum water vapor transmission of 0.10 perm-inches when tested in accordance with ASTM E96 (Procedure A), latest revision.
E. A minimum wall thickness of 3/4" (19mm) shall be used throughout the system.
F. Recommended brands of tubing insulation are: Rubatex (Rubatex Corporation) and Armaflex (Armstrong World Industries)

Insulation Adhesive Specifications

A. Adhesive shall be the insulation manufacturers recommended contact adhesive.
B. The recommended adhesive shall have, at a minimum, the same properties as the insulation listed above and shall not detract from any of the system ratings listed above.

Installation on Piping

A. Install pipe insulation, whenever possible, by sliding unslit sections over the covered ends of piping or tubing. Alternately, insulation can be slit and applied to the piping or tubing. All seams and butt joints shall be adhered and sealed using the approved insulation adhesive. All seams and joints should be wrapped with a cloth type duct tape to further assure that the joint does not open up. The tape should not be applied in such a way as to compress the insulation.
B. Insulation shall be pushed on the pipe, never pulled. Stretching of insulation may result in open seams or joints.
C. Proper size insulation must be used on all tube and pipe. Insulation must be tight on the tube or pipe to prevent air pockets where condensation can form.
D. All insulation edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp knives must be used.

Installation on Fittings

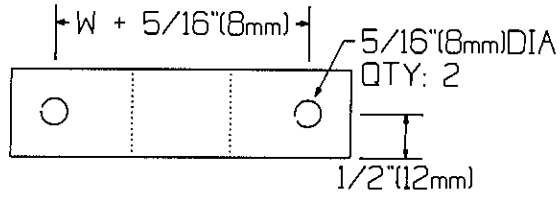
A. All fittings will be insulated with the same thickness insulation as the adjacent piping. Insulation of fittings using insulated tape (1/8") is not recommended.
B. Insulation on pipe fittings or valves will be miter cut as to closely fit the fitting or valve. It is recommended on metal valves to remove the handles so that the entire valve will be enclosed in insulation.

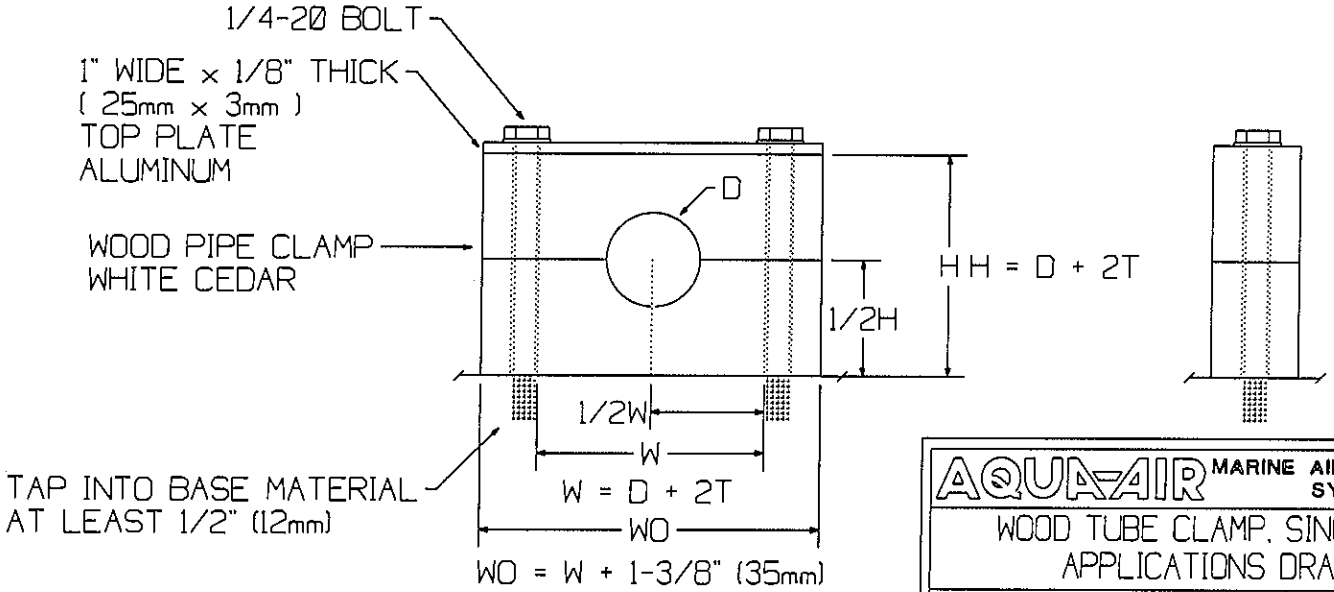
I:\wordpfct\81092 piping & insulation spec.wpd

AQUA-AIR MANUFACTURING, division of the James D. Nall Co., Inc.
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 Email sales@aquaair.com

D - PIPE OUTSIDE DIAMETER
T - INSULATION WALL THICKNESS
W - WIDTH TO INSIDE OF CLAMP MOUNTING HOLES
WO - CLAMP OVERALL WIDTH
H - HEIGHT OF WOOD CLAMP

DIMENSIONS ASSUME THE USE OF 1/4" (6mm) DIAMETER BOLTS





AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

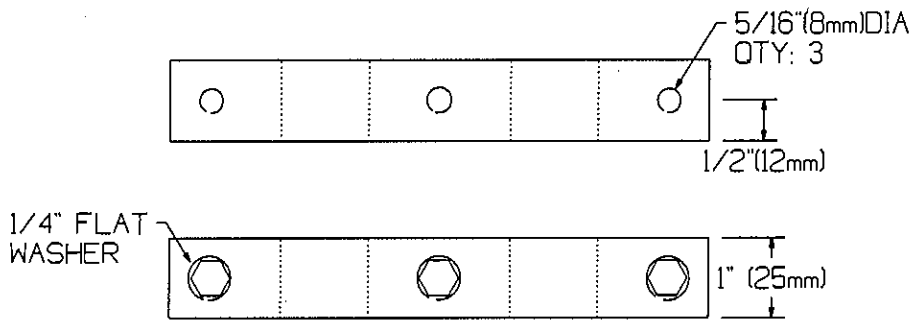
WOOD TUBE CLAMP, SINGLE PIPE APPLICATIONS DRAWING

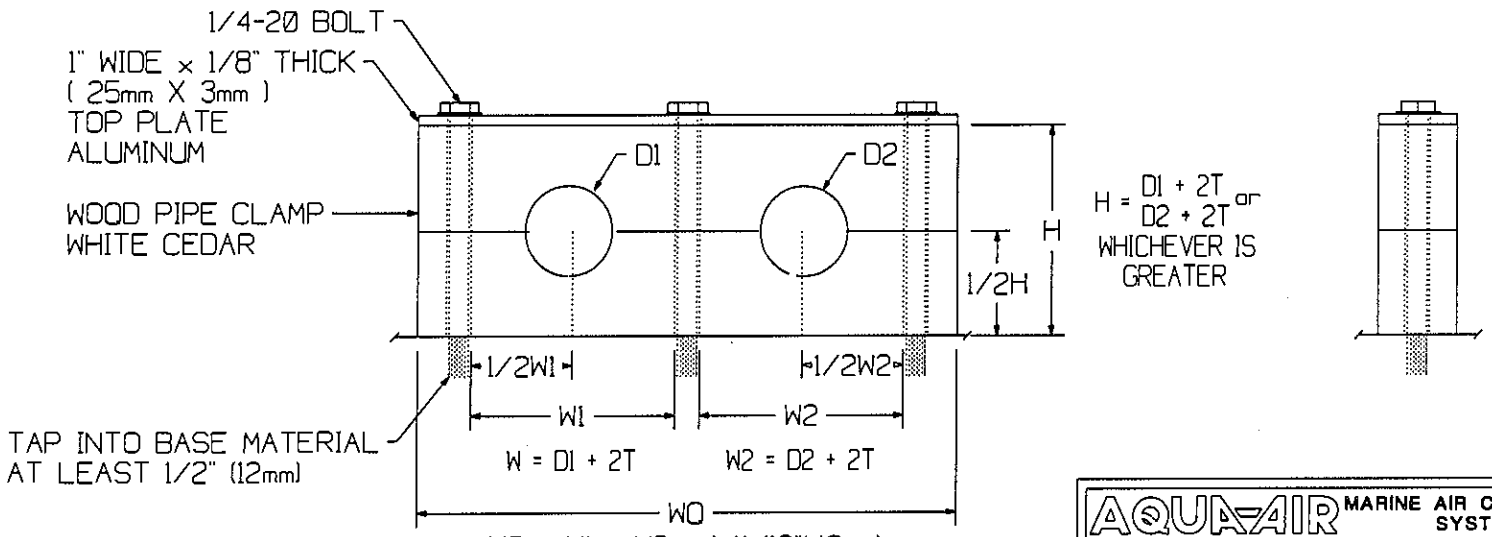
DRAWING NUMBER	DRAWN BY	DATE
1016-01A	DN	08-95

SCALE	APPROVED BY	REVISION DATE	REV
			A

D1 - PIPE #1 OUTSIDE DIAMETER
D2 - PIPE #2 OUTSIDE DIAMETER
T - INSULATION WALL THICKNESS
W1 - WIDTH TO INSIDE OF MOUNTING HOLES-PIPE #1
W2 - WIDTH TO INSIOE OF CLAMP MOUNTING HOLES-PIPE #2
WO - CLAMP OVERALL WIDTH
H - HEIGHT OF WOOD CLAMP

DIMENSIONS ASSUME THE USE OF 1/4" (6mm) DIAMETER BOLTS





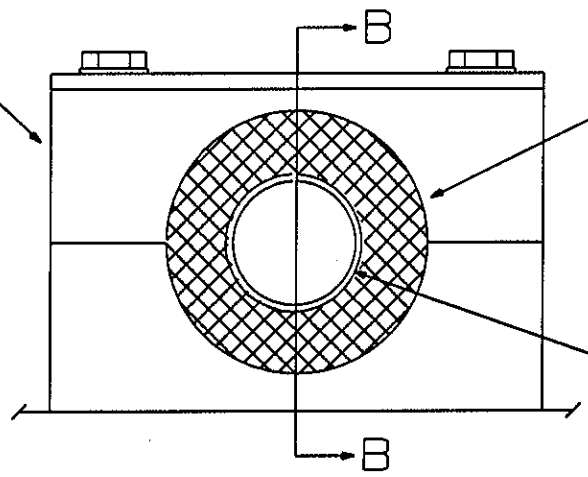
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

WOOD TUBE CLAMP, DUAL PIPE APPLICATIONS DRAWING

DRAWING NUMBER	DRAWN BY	DATE
1016-02	DN	8-95

SCALE	APPROVED BY	REVISION DATE	REV
NONE			A

SECTION A-A

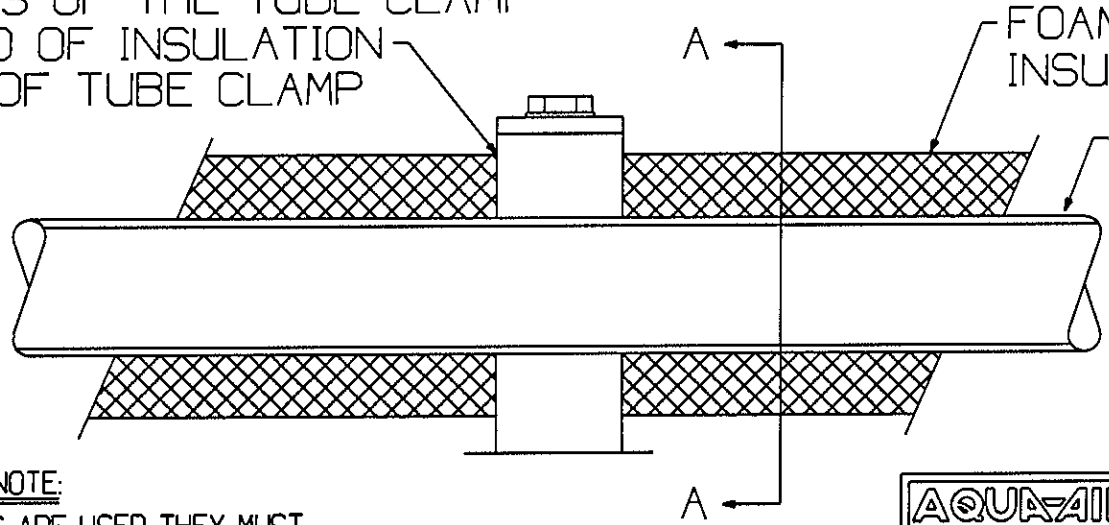


WOOD TUBE CLAMP
SEE DRAWINGS
1016-01A.02

FOAM TUBE INSULATION

TUBE

INSULATION BUTTS UP AGAINST THE SIDES OF THE TUBE CLAMP
GLUE END OF INSULATION TO SIDE OF TUBE CLAMP



FOAM TUBE INSULATION

TUBE

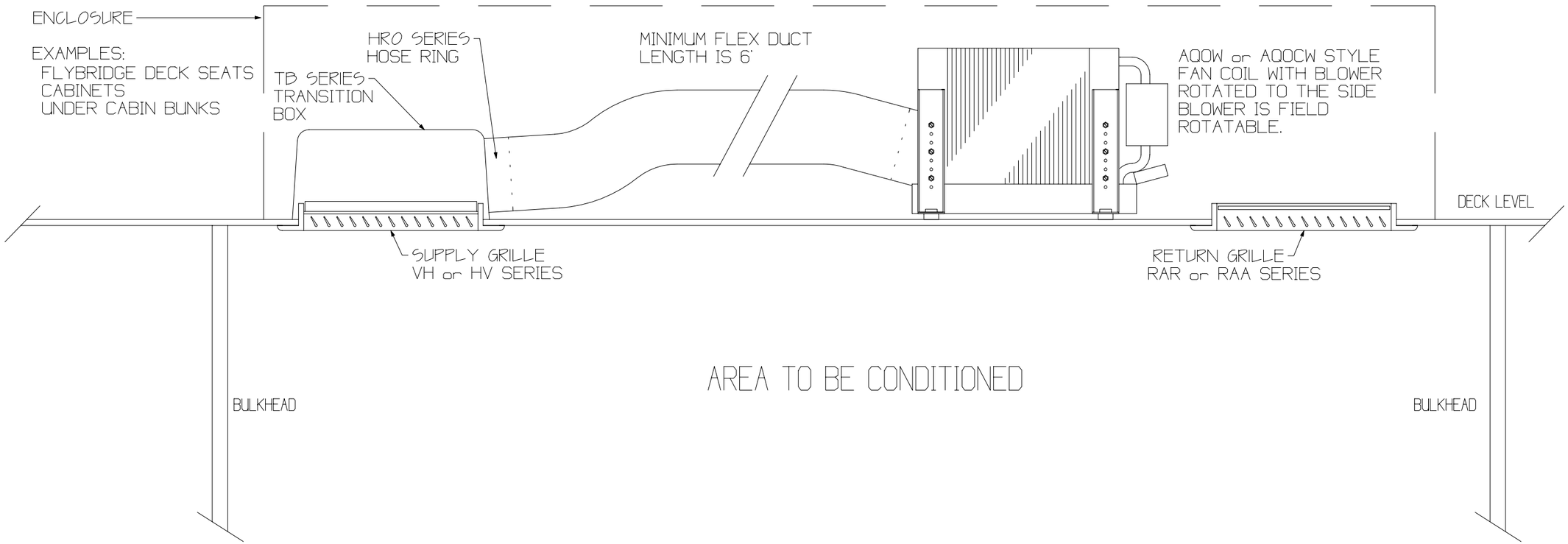
NOTE:
IF PLASTIC CLAMPS ARE USED THEY MUST BE TOTALLY INSULATED WITH THE SAME WALL THICKNESS FOAM INSULATION AS IS USED ON THE TUBING.

SECTION B-B

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

INSTALLATION OF TUBING AND INSULATION WITH TUBE CLAMPS

1016-01B	DN	08-95	
NONE			A



INSTALLATION NOTES

1. IT IS NOT NECESSARY TO HAVE A RETURN AIR DUCT BETWEEN THE FAN COIL AND THE RETURN AIR GRILLE AS LONG AS THE ENCLOSURE THAT THE FAN COIL AND RETURN AIR GRILLE ARE LOCATED IN ARE SEALED SO THAT NO AIR WILL BE DRAWN FROM ANY OTHER AREAS.
2. THE REASON FOR THE 6' MINIMUM FLEX DUCT LENGTH IS BLOWER AIR NOISE DISSIPATION. SHORTER LENGTHS OF FLEX DUCT WILL CREATE A NOISIER INSTALLATION. ALL FLEX DUCT MUST BE RUN WITHOUT SHARP BENDS OR KINKS. DUCTING SHOULD BE STRETCHED AS MUCH AS IS POSSIBLE.
3. THE HRO HOSE ADAPTER IS SHIPPED LOOSE FROM THE TB TRANSITION BOX TO ALLOW THE INSTALLER FLEXIBILITY IN LOCATING THE AIR INLET TO THE TRANSITION BOX. THE HOSE ADAPTER MAY BE INSTALLED ON ANY SIDE OR BACK OF THE TRANSITION BOX. TO INSTALL THE HOSE ADAPTER PLACE THE HOSE ADAPTER AGAINST THE BOX WHERE YOU WANT TO LOCATE IT. USING A PENCIL DRAW A LINE AROUND THE INSIDE OF THE HOSE ADAPTER ON THE TRANSITION BOX TO MARK WHERE YOU WILL NEED TO CUT THE BOX. CUT THE PLASTIC BOX USING A SHARP KNIFE OR JIGSAW. LINE THE HOSE ADAPTER UP WITH THE HOLE ON THE BOX. DRILL FOUR HOLES LARGE ENOUGH FOR RIVETS THROUGH THE HOSE ADAPTER INTO THE BOX. BEFORE RIVETING, PLACE A BEAD OF SILICONE SEALANT AROUND THE PERIMETER OF THE HOSE ADAPTER WHERE IT WILL MATE TO THE BOX. THIS WILL PREVENT ANY AIR LEAKAGE. RIVET THE HOSE ADAPTER TO THE BOX.
4. INSTALL RETURN AIR GRILLES SO THAT WHEN YOU LOOK INTO THE FACE AREA OF THE GRILLE YOU DO NOT SEE THE FILTER MATERIAL.
5. SUPPLY AND RETURN GRILLES MUST BE AT LEAST MINIMUM AREA SPECIFIED FOR THE PARTICULAR FAN COIL THAT THEY ARE INSTALLED WITH.
6. THE RETURN AIR PATH BETWEEN THE RETURN AIR GRILLE AND FAN COIL MUST BE AT LEAST AS LARGE IN AREA AS THE RETURN AIR GRILLE SIZE. RESTRICTIONS TO THE RETURN AIR PATH WILL HINDER UNIT PERFORMANCE.
7. DRAINS SHOULD BE RUN DOWNHILL FROM THE FAN COIL UNDER BOTH STATIC AND RUNNING CONDITIONS.
8. SEE THE SYSTEM INSTALLATION MANUAL FOR FURTHER INSTRUCTIONS.

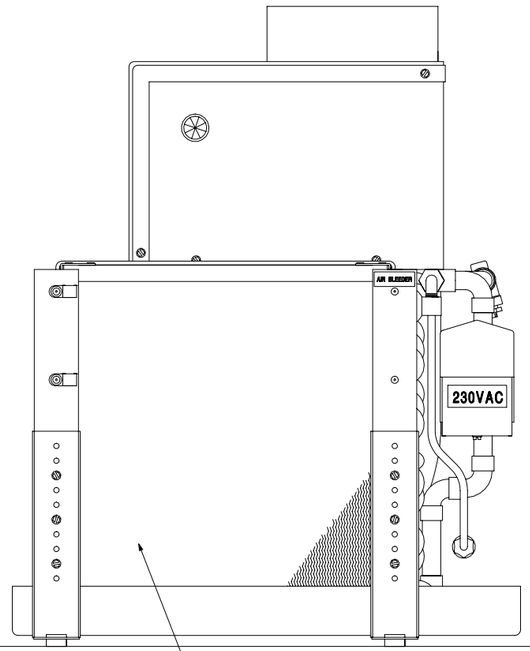
AQUA-AIR **MARINE AIR CONDITIONING SYSTEMS**

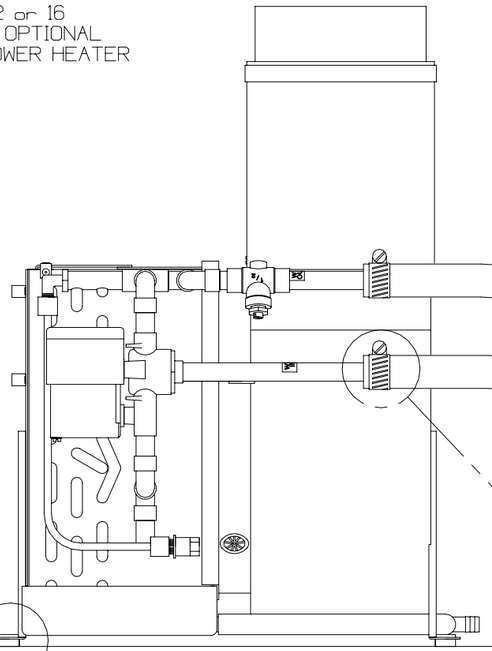
AQOW, AQOCW OVERHEAD INSTALLATION

DRAWING NUMBER	DRAWN BY	DATE
1015-38	DN	6-18-93

SCALE	APPROVED BY	REVISION DATE	REV
			A

AQOCW-12 or 16
SHOWN WITH OPTIONAL
BH SERIES BLOWER HEATER





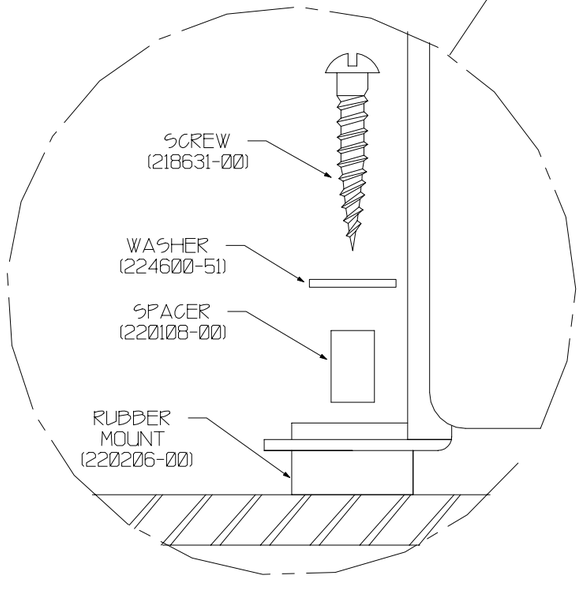
BALL VALVES (2)
AFTER COMMISSIONING REMOVE HANDLES
INSULATE OVER THE TOP OF THE VALVES
AND THEN TIE-WRAP THE HANDLES NEARBY
TO THE VALVES.

USE FLEXIBLE LINES
MINIMUM SINGLE BRAID
HEATER HOSE

TO CHILLED
WATER LOOP

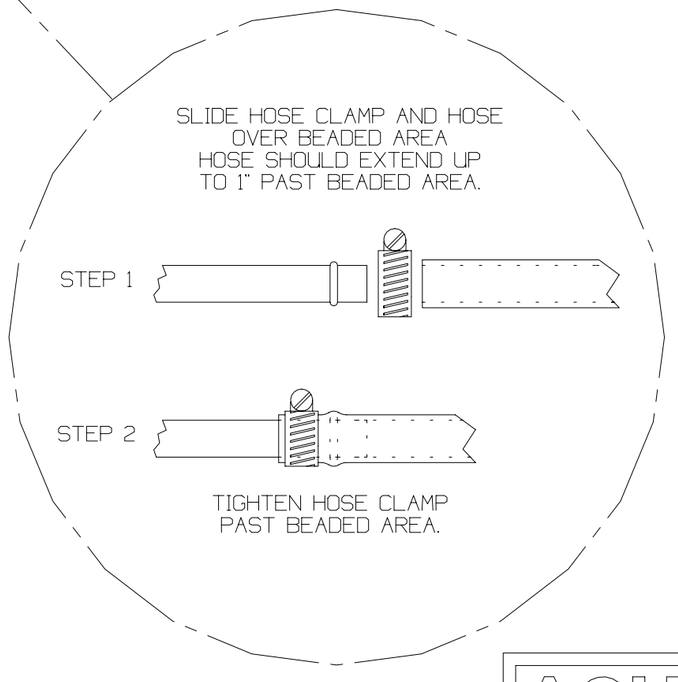
INSULATE LINES ALL THE
WAY UP TO THE WATER VALVES

REMOVE WIRE MESH SCREEN
PRIOR TO COMMISSIONING



MOUNTING FOOT DETAIL

FCRMK-AQOCW:
FAN COIL RUBBER MOUNTING KIT:
218631-00 (4)
224600-51 (4)
220108-00 (4)
220206-00 (4)



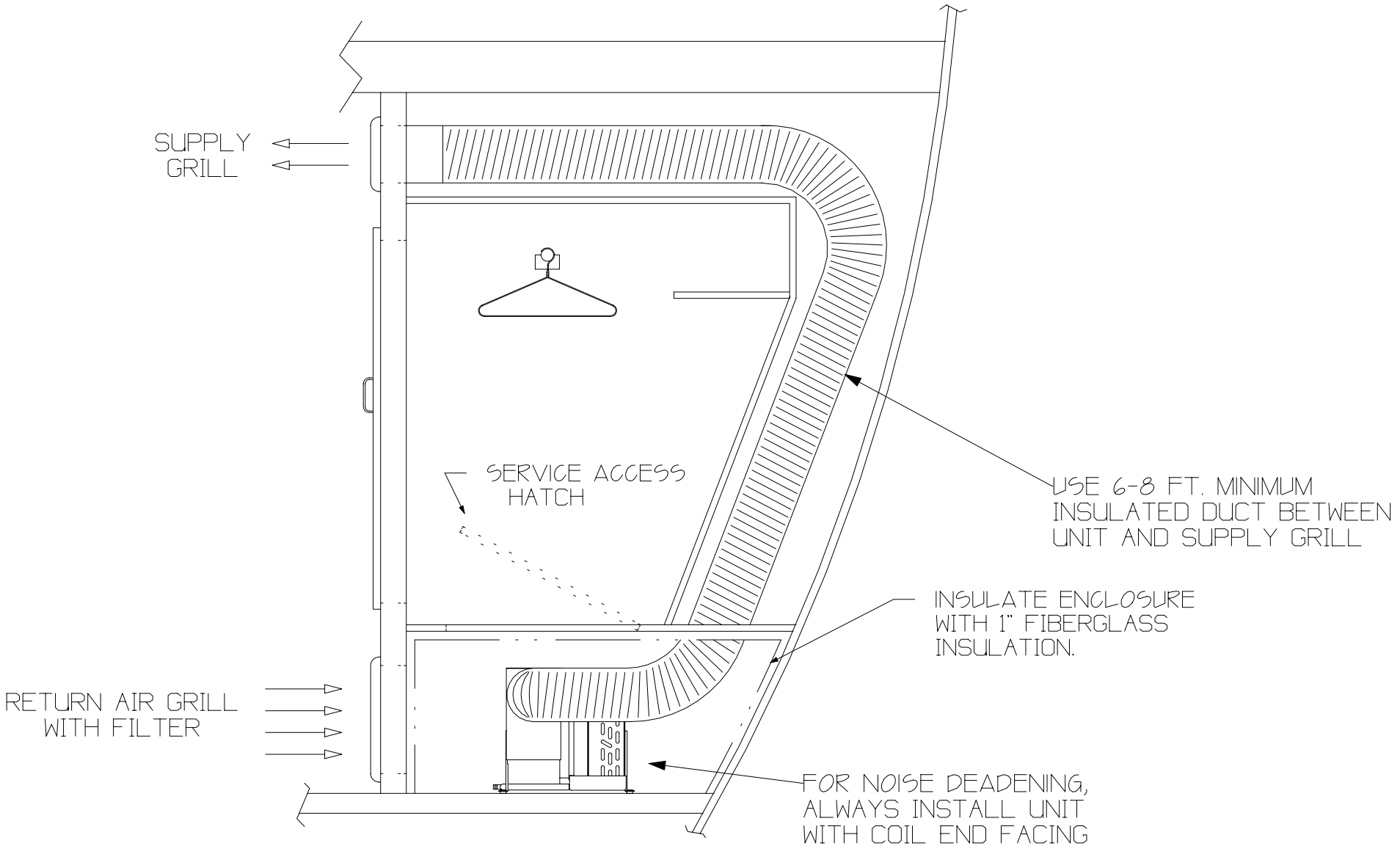
HOSE CONNECTION DETAIL

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

AQOCW FAN COIL INSTALLATION INFORMATION

DRAWING NUMBER	DRAWN BY	DATE
1015-45A	DN	5-15-97

SCALE	APPROVED BY	REVISION DATE	REV
NONE			A



TYPICAL INSTALLATION

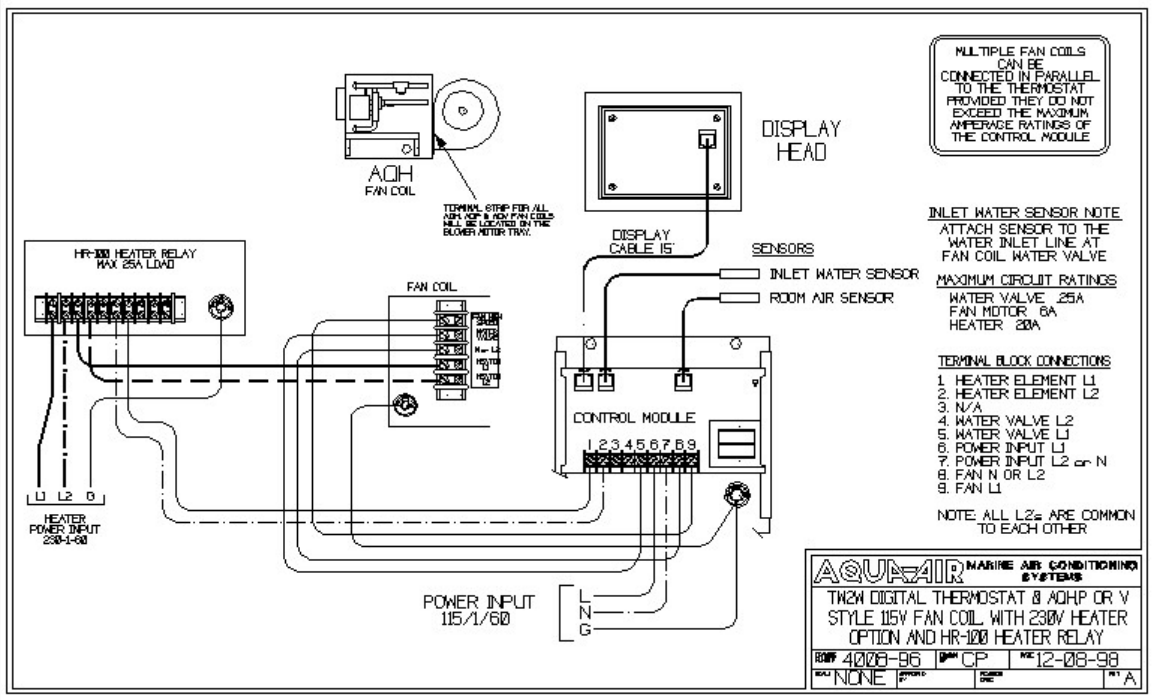
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

AQOCW INSTALLATION DETAILS

DRAWING NUMBER	DRAWN BY	DATE
1015-45B	DN	5-17-97

SCALE	APPROVED BY	REVISION DATE	REV
NONE			A

Wiring Diagrams



AQUA-AIR MANUFACTURING JAMES D. NALL CO.,INC.

DRAWING LISTING FOR QUOTE 09101901

COMPANY: NAVALEX DATE: 09/10/10 Page 1

YACHT DESCRIPTION: GPA 330 55MT TOWBOAT FOR ACP

NOTES: CHILLER POWER INPUT 460/3/60 FAN COILS 115/1/60

REV 3: 4-28-10

AREA NO. & DESCRIPTION	DRAWING	
1 PILOTHOUSE	4011-09B	TSVW DIGITAL TSTAT w/(1)BTW FAN COIL 115/230V COOLING ONLY OR HOT WATER HEAT
2 CAPTAIN	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
3 ENGINEER	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
4 CONFERENCE ROOM	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
5 FLEET D'HEAD//LOBBY	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
6 PORT HEAD//MESS	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
7 GALLEY	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
8 CREW CHANGE ROOM	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
9 EOS	4011-17A	TSVW DIGITAL TSTAT w/(1) AQOW/AQOCW FC 115/230V COOLING ONLY/HOT WATER HEAT
10 WORKSHOP	4011-09B	TSVW DIGITAL TSTAT w/(1)BTW FAN COIL 115/230V COOLING ONLY OR HOT WATER HEAT
11 CHILLER	4012-73	(3) A2-6E w/AQCWP-03 CONTROL PANEL, FS, AQP6RE-115 & PUMPS 460/3/60 115V CC

MULTIPLE FAN COILS CAN BE CONNECTED IN PARALLEL TO THE THERMOSTAT PROVIDED THEY DO NOT EXCEED THE MAXIMUM AMPERAGE RATINGS OF THE CONTROL MODULE

CHECK HEATER AMP RATING. IF AMP DRAW EXCEEDS HTR CIRCUIT RATING AN OPTIONAL HTR RELAY BOX WILL NEED TO BE USED.

DISPLAY HEAD

DISPLAY CABLE 15'

FUSES	
FAN (F2)	12A
TX-PRIM. (F1)	500mA
TX-SEC. (F3)	500mA

SENSORS

INLET WATER SENSOR

ROOM AIR SENSOR

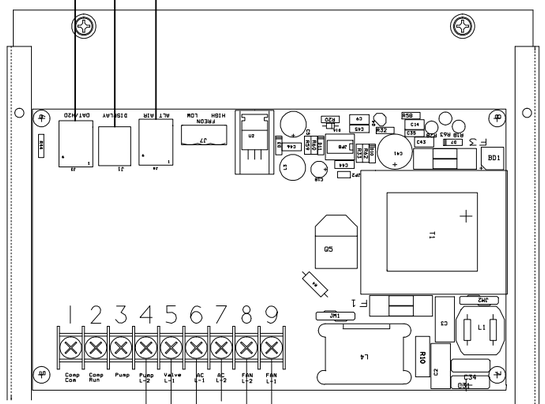
INLET WATER SENSOR NOTE

ATTACH SENSOR TO THE WATER INLET LINE AT FAN COIL WATER VALVE

FAN COIL

FAN MOTOR

G O W



1	2	3	4	5	6	7	8	9
L1	L2		L2	L1	L1	L2	L2	L1
HEATER ELEMENT 20A MAX			WATER VALVE 25A MAX		MAIN POWER INPUT 115 / 230V		FAN MOTOR 12A MAX	

W BK

M

WATER VALVE MOTOR

POWER INPUT
115/1/60
200-230/1/50-60

L1
L2 or N
G

MAXIMUM CIRCUIT RATINGS

WATER VALVE 1/4A
FAN MOTOR 12A
HEATER 20A

TERMINAL BLOCK CONNECTIONS

1. HEATER ELEMENT L1
2. HEATER ELEMENT L2
3. N/A
4. WATER VALVE L2
5. WATER VALVE L1
6. POWER INPUT L1
7. POWER INPUT L2 or N
8. FAN L2
9. FAN L1

NOTE: FAN COIL MOTOR & WATER VALVE MUST BE RATED FOR THE SAME VOLTAGE AS THE POWER INPUT.

NOTE: JP1 MUST BE CUT FOR CHILLED WATER APPLICATIONS.

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

TSVW DIGITAL THERMOSTAT w/ SINGLE BTW Series STYLE FAN COIL 115 or 230V COOLING ONLY or with HOT WATER HEAT

DRAWING NUMBER	DRAWN BY	DATE
4011-09B	SB	03-10-05

SCALE	APPROVED BY	REVISION DATE	REV
NONE	CC		

MULTIPLE FAN COILS CAN BE CONNECTED IN PARALLEL TO THE THERMOSTAT PROVIDED THEY DO NOT EXCEED THE MAXIMUM AMPERAGE RATINGS OF THE CONTROL MODULE

FUSES	
FAN (F2)	25A
TX-PRIM. (F1)	500mA
TX-SEC. (F3)	500mA

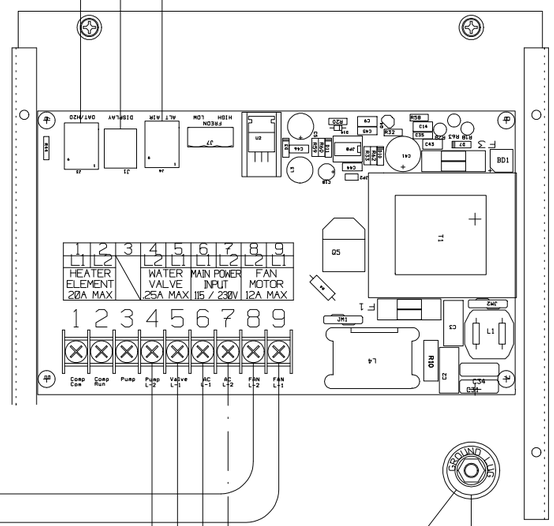
DISPLAY HEAD

DISPLAY CABLE 15'

SENSORS

INLET WATER SENSOR

ROOM AIR SENSOR



FAN COIL

FAN MOTOR

G O W

W BK

M

WATER VALVE MOTOR

POWER INPUT
115/1/60
200-230/1/50-60

L1
L2 or N
G

INLET WATER SENSOR NOTE

ATTACH SENSOR TO THE WATER INLET LINE AT FAN COIL WATER VALVE

MAXIMUM CIRCUIT RATINGS

WATER VALVE 1/4A
FAN MOTOR 12A
HEATER 20A

TERMINAL BLOCK CONNECTIONS

1. HEATER ELEMENT L1
2. HEATER ELEMENT L2
3. N/A
4. WATER VALVE L2
5. WATER VALVE L1
6. POWER INPUT L1
7. POWER INPUT L2 or N
8. FAN L2
9. FAN L1

NOTE: ALL L2's ARE COMMON TO EACH OTHER

NOTE: FAN COIL MOTOR, WATER VALVE & HEATER MUST BE RATED FOR THE SAME VOLTAGE AS THE POWER INPUT.

NOTE: JP1 MUST BE CUT FOR CHILLED WATER APPLICATIONS.

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

TSVW DIGITAL THERMOSTAT w/ SINGLE AQOW / AQOCW STYLE FAN COIL 115 or 230V COOLING ONLY or with HOT WATER HEAT

DRAWING NUMBER	DRAWN BY	DATE
4011-17A	SB	05-04-05

SCALE	APPROVED BY	REVISION DATE	REV
NONE	CC		A

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

ON
HEAT
SYSTEM
MODE
COOL
FUSE
ON ON ON
1 2 3
CHILLER UNIT
JAMES D. NALL CO. INC. MIAMI, FLORIDA

AQCWP-Ø3
REMOTE PANEL
115V

CAN BE CONNECTED
TO THE POWER INPUT
FOR CHILLER 1,2 OR 3

14 GA
GRD
L1
L2
CONTROL
CIRCUIT
POWER INPUT
115/1/6Ø

TO
CHILLER
UNIT
#3 A6GD
16 GA
P
B/R

TO
CHILLER
UNIT
#2 A6GD
16 GA
P
B/R

CHILLWATER PUMP RELAY

PR-1Ø3
MAX. LOAD: 10A @460V

CHILLER PUMP
POWER INPUT
460/3/60
L1
L2
L3
GND

CHILLER PUMP
460/3/60

16 GA

Y 16ga
Y 16 ga

FLOW SWITCH
221416-08

CHILLER #1 ELEC. BOX

THERMOSTAT
home menu

L1 L2 L3 GND
POWER INPUT
460/3/60

P
B/R
USER
INSTALLED
JUMPER

16 GA

AQP6RE-115
SEAWATER PUMP RELAY, 6 STATION

TO
ADDITIONAL
CHILLERS
2
3

3A FUSE L1
3B N/L2
4A PUMP N/L2
4B PUMP L1
5A 1A
5B 1B
6A 2A
6B 2B

TRIGGERING CIRCUITS 1-6
115/1/60

MAX. PUMP LOAD:
30 AMPS @ 380-460V

CONTROL
CIRCUIT
115/1/60
L1 L2

FROM SW PUMP
CIRCUIT BREAKER
460/3/60
L1 L2 L3 G

L1
L2
L3
GRD
SEAWATER PUMP
460/3/60

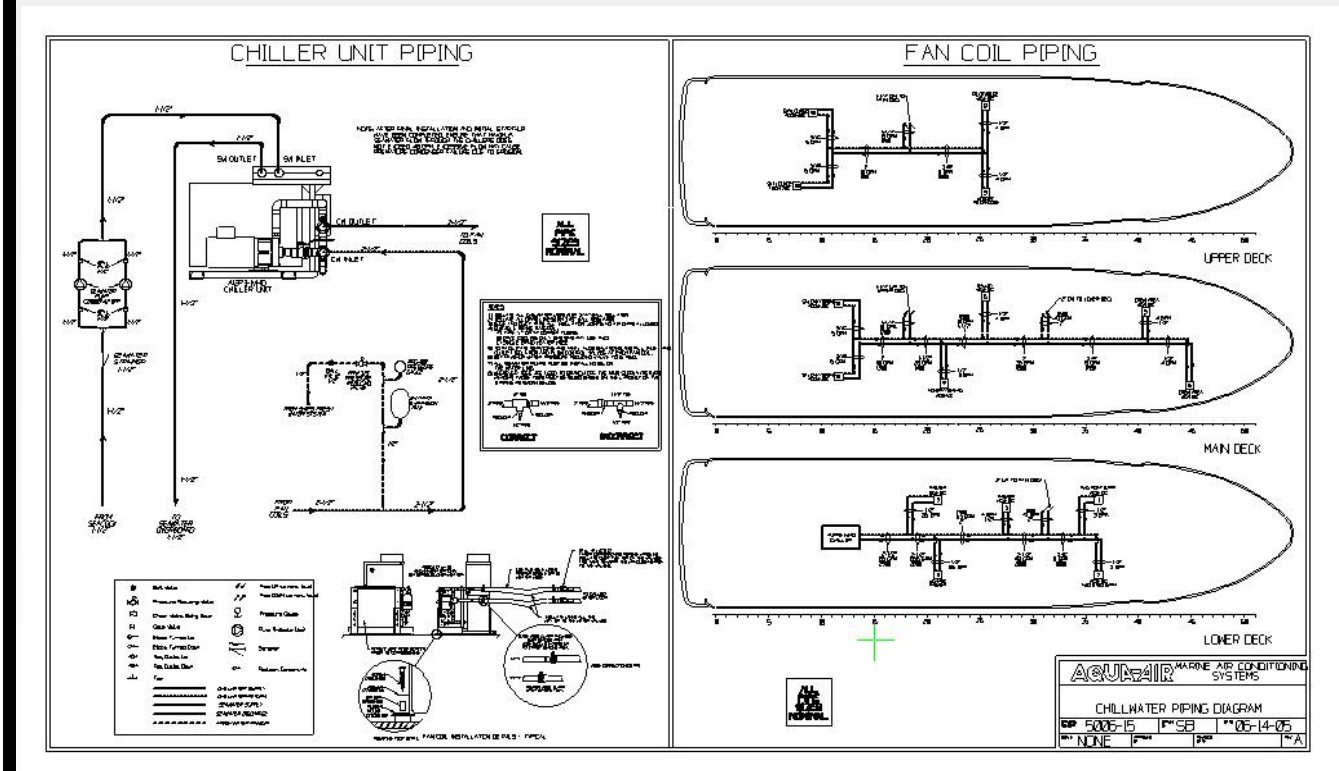
AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

(3) A2-6E w/AQCWP-Ø3 PANEL,
FLOW SWITCH, PR-1Ø3 RELAY,
AQP6RE-115 REALY & PUMPS 460/3/60

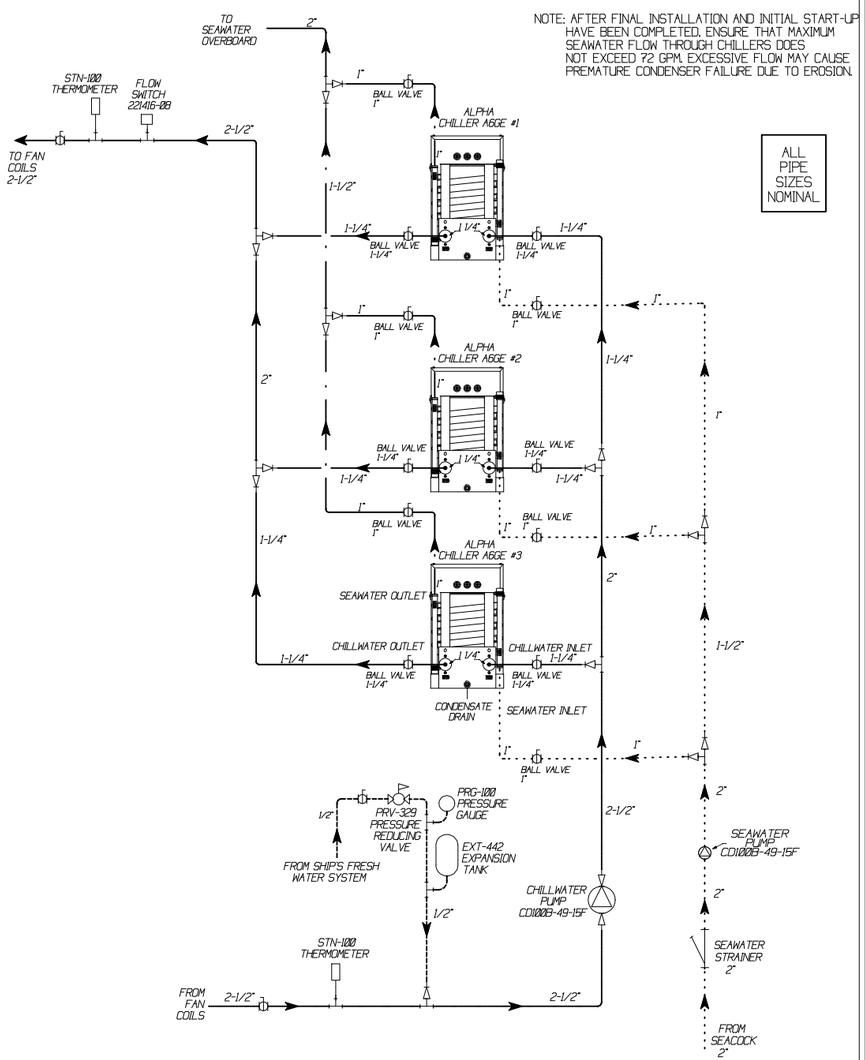
DRAWING NUMBER	DRAWN BY	DATE
4Ø12-73	SB	Ø9-1Ø-1Ø

SCALE	APPROVED BY	REVISION DATE	REV
NONE	DN		

Piping Diagrams



CHILLER UNIT PIPING

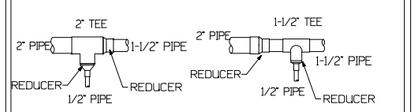


NOTE: AFTER FINAL INSTALLATION AND INITIAL START-UP HAVE BEEN COMPLETED, ENSURE THAT MAXIMUM SEAWATER FLOW THROUGH CHILLERS DOES NOT EXCEED 72 GPM. EXCESSIVE FLOW MAY CAUSE PREMATURE CONDENSER FAILURE DUE TO EROSION.

ALL PIPE SIZES NOMINAL

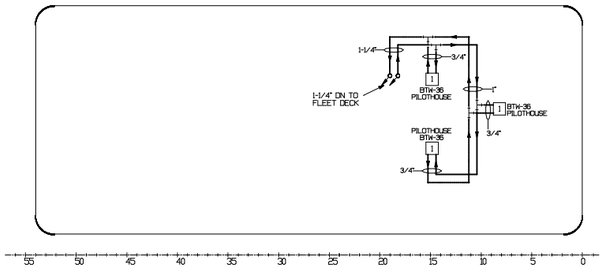
NOTES:

1) INSULATE ALL CHILLWATER LINES WITH 3/4" WALL INSULATION
2) INSULATE ALL DRAIN LINES WITH 3/8" WALL INSULATION
3) GLUE AND DUCT TAPE ALL INSULATION JOINTS-NO AIR GAPS ALLOWED
4) SUITABLE PIPING MATERIAL:
   A) TYPE "L" OR "M" COPPER TUBING
   B) CPVC (COOLING ONLY SYSTEMS MAY USE PVC)
   C) SINGLE BRAID HEATER HOSE
5) TO FACILITATE SERVICING AND FINAL FLOW BALANCING, INSTALL INLET AND OUTLET ISOLATION AND FLOW CONTROL VALVES AT EACH FAN COIL.
6) SET MAKE-UP WATER PRESSURE REDUCING VALVE TO 15 PSIG.
7) ALL SEAWATER PUMPS MUST BE INSTALLED BELOW THE WATER LINE.
8) WHENEVER TEES ARE USED TO BRANCH OFF THE MAIN SUPPLY/RETURN HEADER, THOSE TEES MUST BE SIZED BASED ON THE LARGEST OF THE 3 PIPES AS SHOWN BELOW:

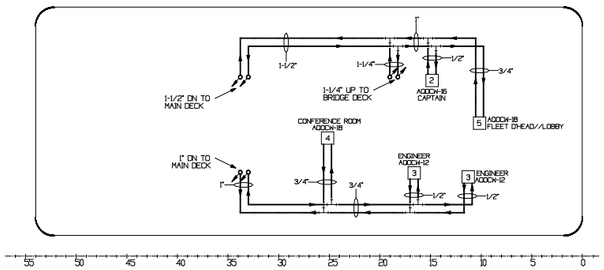


- Ball Valve
- Pressure Reducing Valve
- Check Valve, Swing Gate
- Gate Valve
- Elbow, Turned Up
- Elbow, Turned Down
- Tee, Outlet Up
- Tee, Outlet Down
- Tee
- Pipe UP to next level
- Pipe DOWN to next level
- Pressure Gauge
- Pump (Indicate Use)
- Strainer
- Reducer, Concentric
- CHILLWATER SUPPLY
- CHILLWATER RETURN
- SEAWATER SUPPLY
- SEAWATER DISCHARGE
- FRESH WATER MAKEUP

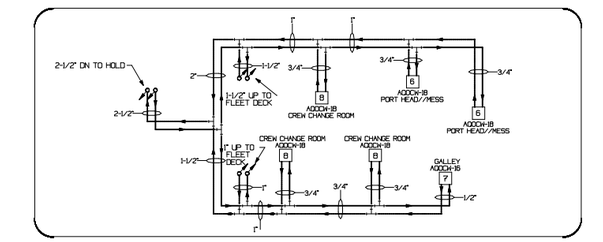
FAN COIL PIPING



BRIDGE DECK

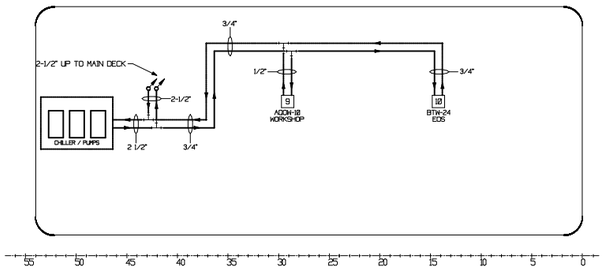


FLEET DECK

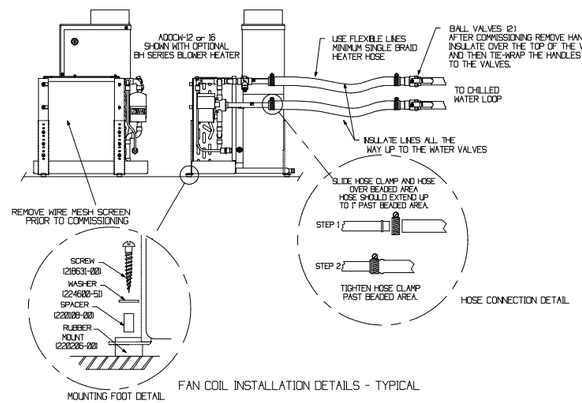


MAIN DECK

ALL PIPE SIZES NOMINAL



HOLD



FAN COIL INSTALLATION DETAILS - TYPICAL

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

NAVALEX / GPA 330 55MT TOWBOAT FOR ACP
HVAC PIPING DIAGRAM

DRAWING NUMBER	DRAWN BY	DATE
5006-52	SB	09-13-10

SCALE	APPROVED BY	REVISION DATE	REV
NONE	DN		A

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

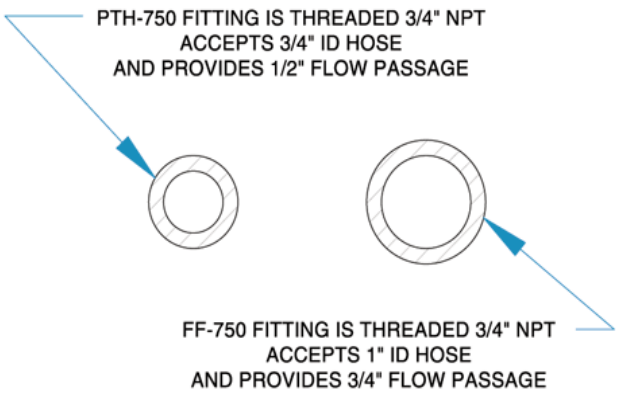
Centrifugal Pump Piping Connections

One of the most common problems that we see with the installation of both chillwater and seawater pumps is the restriction of water flow due to the use of incorrectly sized components. This reduction of flow in and out of the pump reduces the capacity of the system and prevents it from performing up to specifications. Chillers freezing up due to low chillwater flow or chillers tripping on head pressure faults because of low seawater flow are all symptoms of this problem.

Standard Fitting

One of the biggest problems in many systems is the standard male pipe x hose barb adapter (shown at left). They are restrictive because the hose barb size is the same as the male pipe connection. For example, on a 2" fitting, the male pipe size is 2" and the hose barb is designed to slip *inside* of a 2" ID hose. While the male pipe size and hose size are correct, the hose barb section of the fitting is restrictive. To allow for a 2" OD size on the hose barb the actual ID size of the hose barb is somewhat closer to 1-5/8", a 19% decrease in cross sectional area.

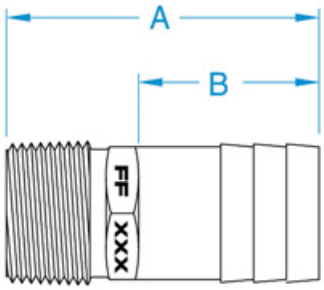
If you want to use male pipe x hose barb fittings you need to use one that is either 1) a "full flow" design or 2) an oversized fitting. There is only one company that I am aware of that makes a "full flow" design and that company is Groco Marine Products (www.groco.net , phone 410-712-4242). They offer these fittings in sizes from 1/2" to 3". A comparison between a standard flow fitting and a full flow fitting is shown to the right.



Standard Hose Barb

Full Flow Hose Barb

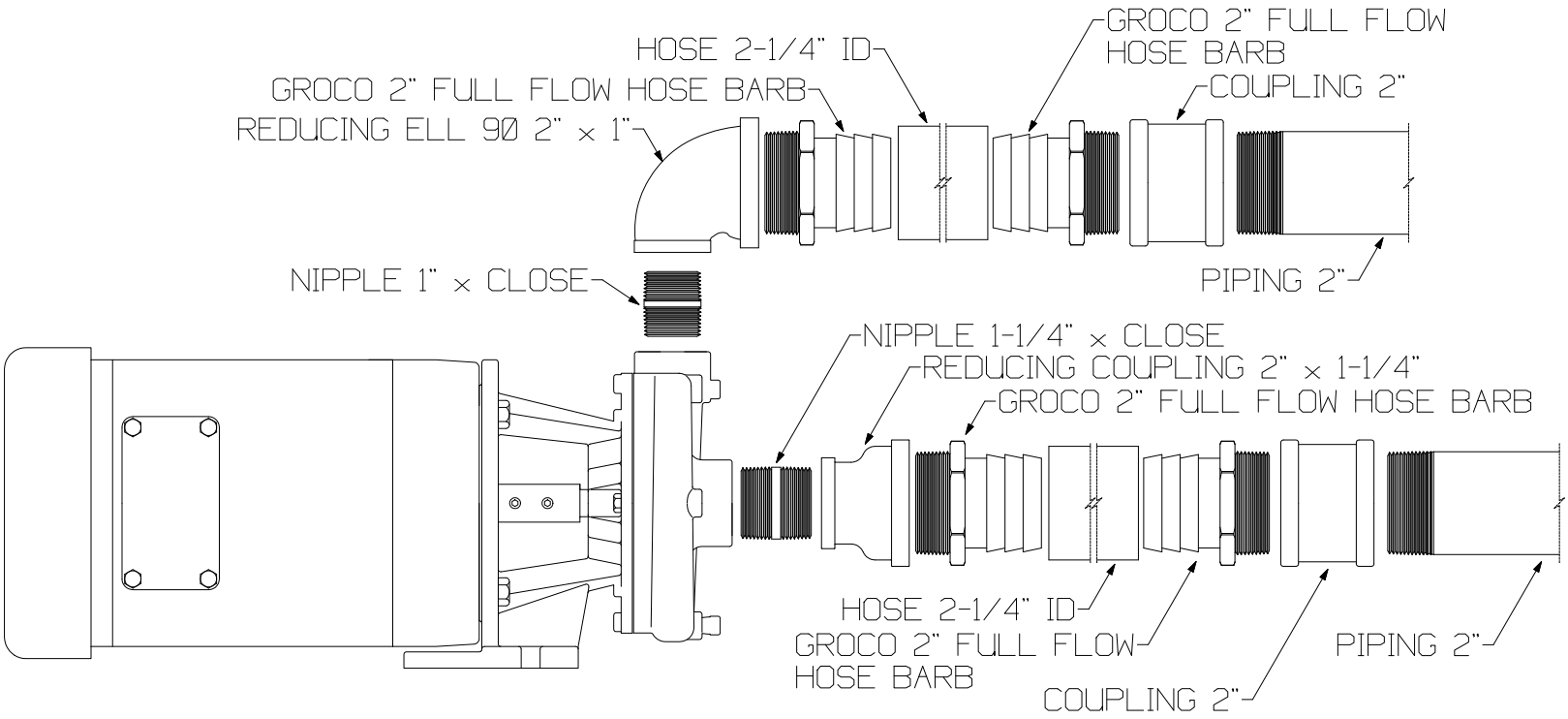
As you can see from the pictures above the difference in open internal area is considerable. The hose size will be larger for each size, i.e. a 2-1/4" hose for a 2" fitting but at least you will not restrict the flow to and from the pump. Dimensions for the full flow hose barbs are shown below.

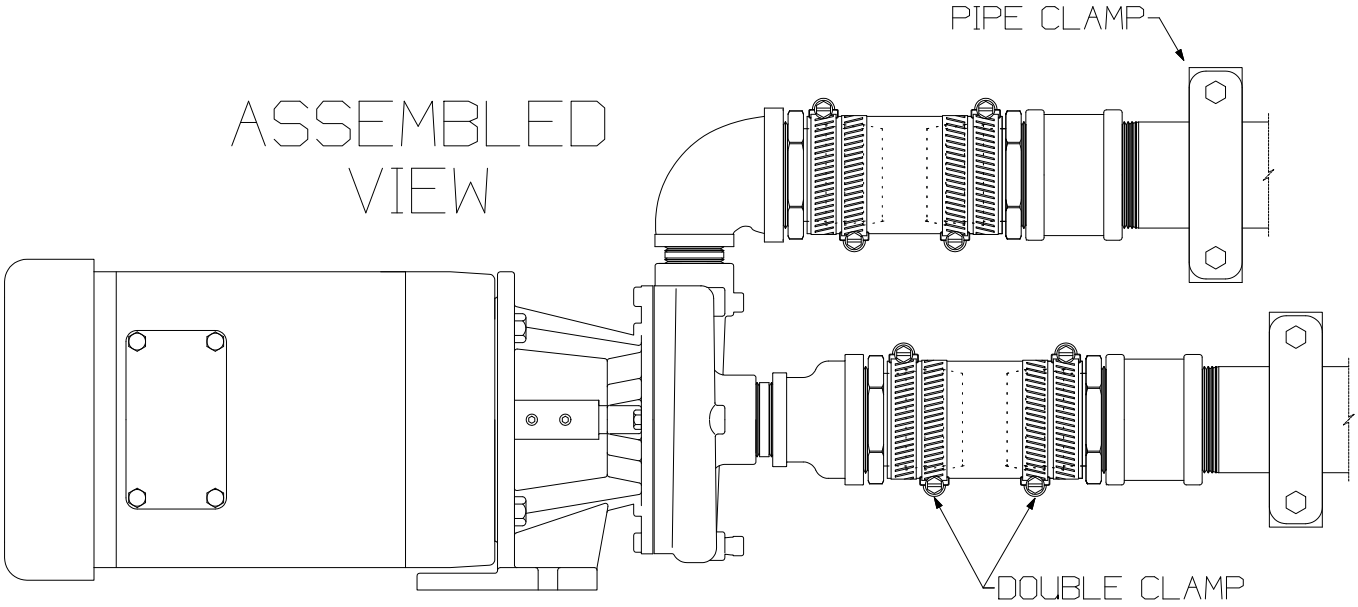


MODEL NO.	NPT PIPE	HOSE ID	DIMENSIONS IN INCHES A	B	WEIGHT (LBS.)	PKG
FF-500	1/2"	3/4"	2.28	1.38	.20	10
FF-750	3/4"	1"	2.39	1.38	.25	10
FF-1000	1"	1-1/4"	2.48	1.38	.32	10
FF-1125	1"	1-1/8"	2.48	1.38	.34	10
FF-1250	1-1/4"	1-1/2"	2.65	1.55	.64	10
FF-1500	1-1/2"	1-3/4"	3.00	1.90	.70	10
FF-2000	2"	2-1/4"	2.89	1.75	.96	10
FF-2500	2-1/2"	2-3/4"	3.47	2.00	1.45	1
FF-3000	3"	3-1/2"	3.61	2.00	2.60	1

If you are unable to use the full flow hose barbs the only other solution is to increase the size of the fittings by one size. If the piping schematic requires a 2" line size, use a 2-1/2" fitting. This will prevent any restrictions to flow.

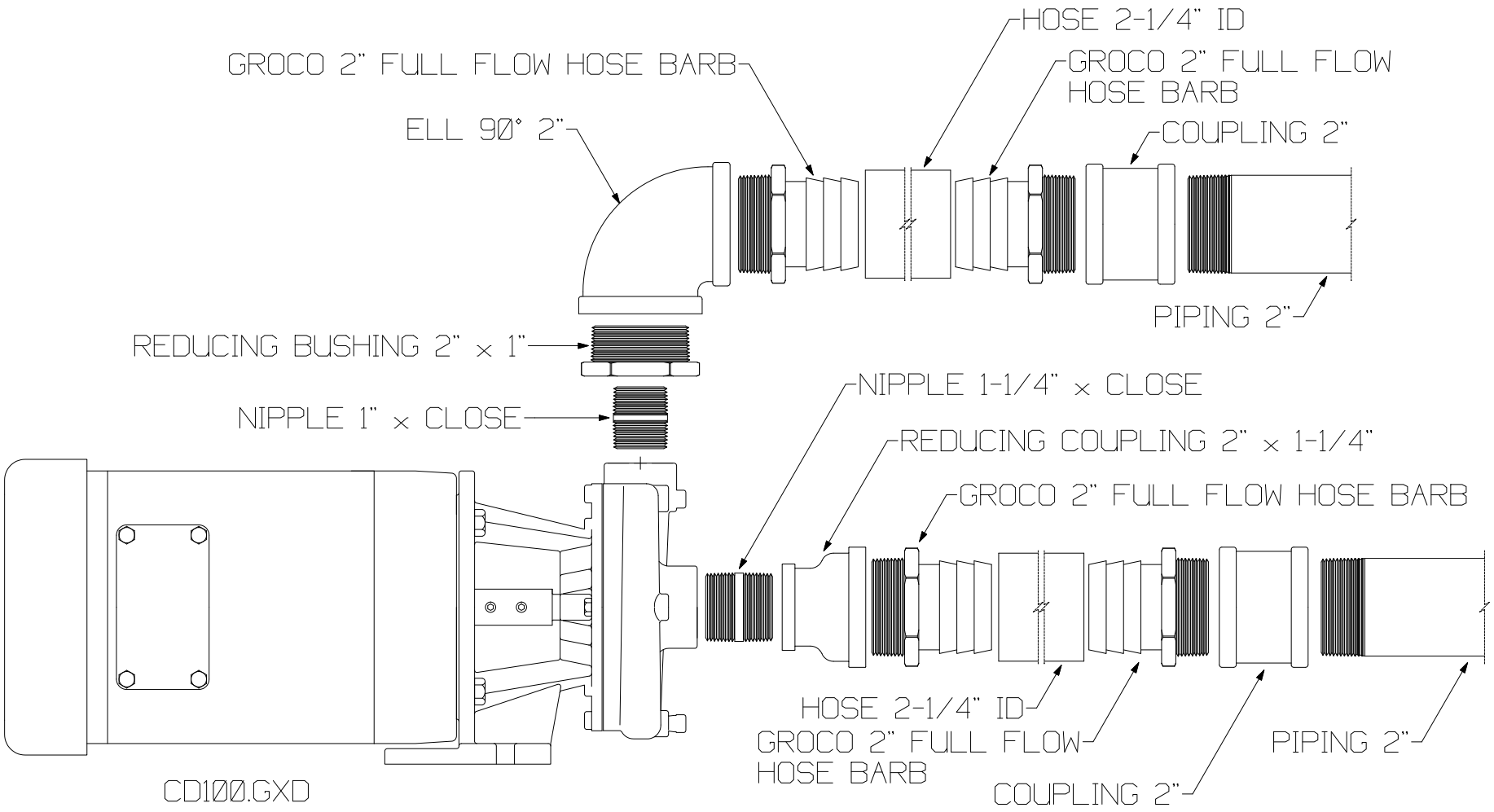
On the following pages are drawings showing the correct piping connections to a CD100 series pump using full flow hose barbs and standard hose barbs.. Please notice the *immediate* transition from the pump suction and discharge fitting sizes to the piping size that is required by the main piping network. In all of the following examples the piping network is 2" nominal (ID or **I**nside **D**imension).





CD100 SERIES PUMP INSTALLED IN A 2" PIPING NETWORK USING GROCO FULL FLOW MALE ADAPTER HOSE BARB FITTINGS OPTION 1 USING A REDUCING ELL ON DISCHARGE OF PUMP

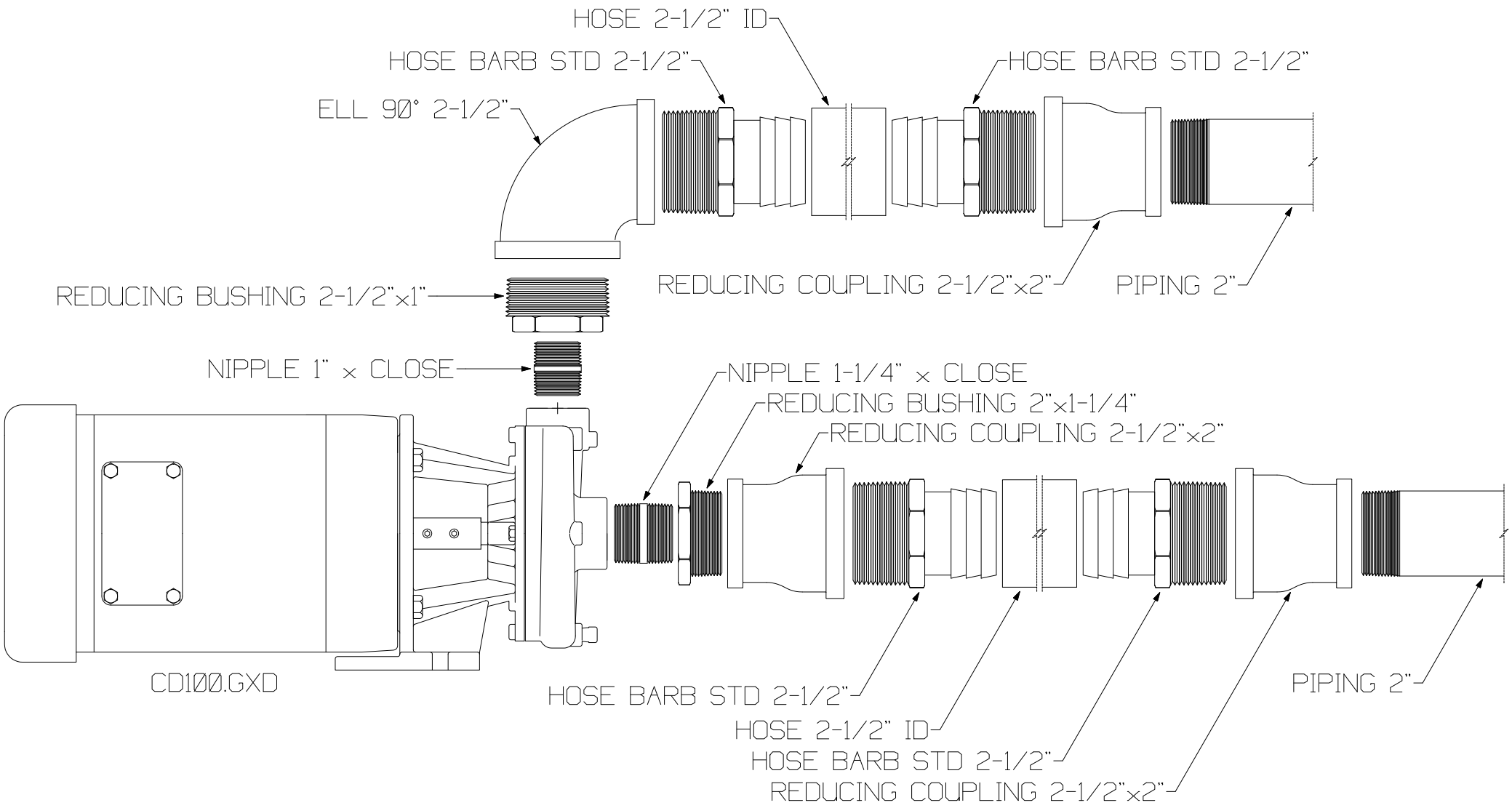
CD100.GXD



CD100 SERIES PUMP INSTALLED IN A 2" PIPING NETWORK USING GROCO FULL FLOW MALE ADAPTER HOSE BARB FITTINGS

OPTION 1

USING A REDUCING BUSHING AND STANDARD ELL ON THE DISCHARGE OF THE PUMP



CD100 SERIES PUMP INSTALLED IN A 2" PIPING NETWORK USING STANDARD MALE ADAPTER HOSE BARB FITTINGS OPTION 2

Warranty
&
Service

James D. Nall Co., Inc.
Aqua-Air Manufacturing
Limited Warranty

I. GENERALLY

A. This limited Warranty applies to any products manufactured by the James D. Nall Co., Inc., herein sometimes referred to as "COMPANY," "MANUFACTURER" or "AQUA-AIR." The Company furnishes this written notice that its products and systems are under a limited warranty to be free from design and manufacturing defects in material and workmanship under normal use and service or as otherwise authorized by the Manufacturer. The obligation of the Company is limited to replacing or repairing any component which will disclose defects within the time frames defined in section II (Warranty Period) and which, upon examination, may appear to the satisfaction of the Company to be defective or not as specified for its performance. Within thirty (30) days of the discovery a claim must be filed with the Company and the faulty component must be returned, transportation prepaid, to the Company. At the specific option of the Company it may, as an alternative to the return of the component, examine and inspect it in place at its usual location. Nothing herein contained will create any obligation of the Company to so examine or inspect the component away from the premises of the Manufacturer.

B. This Warranty will not apply to:
1. Failures resulting from abuse, fire or submergence.
2. Any part manufactured by the Company which will have been altered so as to impair original characteristics.
3. Any parts which fail as a result of misuse, improper application or improper installation.
4. Items not manufactured by the company, i.e., items which are purchased from another manufacturer and supplied as received by the Company without alteration or modification. The Company will disclose the existence of any warranty, limited or otherwise, if any, given by the manufacturer of any items not made by Aqua-Air.
5. Components or parts used by or applied by the purchaser as an integral part of products not manufactured by the Company.
6. The failure of the buyer to give the required notice or to comply with other conditions of this limited warranty.

C. This limited warranty is made in lieu of all other express warranties, obligations or liabilities on the part of Aqua-Air. In addition, Aqua-Air disclaims, without limitation, any liabilities arising from incidental or consequential damages except as may occur while the product is being operated by and under the control of the Company. In such instances where a cash refund is made, the refund will effect the cancellation of the contract of sale with no subsequent reservations of rights being retained by the purchaser. The terms and conditions of this limited warranty will be governed by the laws of the State of Florida.

D. No dealer is the agent for Aqua-Air except for the purpose of administering this limited warranty to the extent herein provided. Aqua-Air does not authorize any dealer or other person to assume for Aqua-Air any liability in connection with this limited warranty or any liability or expense incurred in the replacement or repair of its products other than those expressly authorized herein.

E. The Company reserves the right to improve its products through changes in design or material without being obligated to incorporate such changes in products of prior manufacture and to make changes at any time in design, materials or part of units of any one year model, without obligation or liability to owners of units of the same year's model of prior manufacture.

F. This warranty gives you, the purchaser, specific legal rights. You also have implied warranty rights, including an implied warranty of merchantability, which means that your product must be fit for the ordinary purpose for which such goods are used. The duration of this implied warranty is limited to the duration of the expressed warranty as found in section II, WARRANTY PERIOD.

G. This warranty extends only to the original purchaser (other than for purposes of resale) of Aqua-Air warranty equipment and any other such person who is entitled, under applicable State law, to enforce against the warrantor the obligations of the warranty.

II. WARRANTY PERIOD

A. The limited warranty covers the following periods (whichever comes first):

1. Twelve (12) months from the date that the selling dealer puts the system into operation or

2. Eighteen (18) months from the date that the system is sold to the original purchaser.

In the case of factory installed equipment, the warranty period begins when the selling dealer first puts the equipment into operation. The warranty beginning date may be prior to the date of delivery to the retail purchaser. No warranty claim can be honored unless the owners' registration form is on file with the Company. This form, which is enclosed, should therefore be returned to Aqua-Air immediately upon purchase of items covered by this warranty.

B. All Aqua-Air components have a name plate on which there is a model and serial number. The serial number is date coded, indicating when the unit was originally sold.

C. To determine whether or not any Aqua-Air component is in warranty you may contact Aqua-Air at:

Aqua-Air Manufacturing, division of the James D. Nall Co., Inc
1050 E. 9th St., Hialeah, FL 33010
Phone: 305-884-8363 Fax: 305-883-8549 Email: service@aquaair.com

III. WARRANTY COVERAGE

The Aqua-Air warranty covers the basic component units manufactured by Aqua-Air. Installation and application of Aqua-Air components are not warranted by Aqua-Air because Aqua-Air has no control or authority over the selection, location, application or installation of these components. The following are installation or application considerations not covered by the Aqua-Air warranty:

1. Flare or solder joint leaks in the connecting copper tubing.
2. Condensate leakage resulting from the inadequately insulated connecting tubing or improperly installed condensate drains.
3. Water flow problems resulting from the improper plumbing considerations or inadequate filters or strainers.
4. Low voltage or loss of power as a result of inadequate wiring, circuit breakers, fuses or wire connectors.
5. Low capacity output resulting from improperly sized or located air grilles, vents, ducts, plenums or cooling units.
6. Inadequate cooling or heating capacity resulting from the selection of undersized equipment. Aqua-Air may make recommendations as to the capacity of the equipment for a specific installation, however, the final decision concerning exactly what equipment will be used and the responsibility for the effectiveness of the equipment selected lies solely with the purchaser. The only exception and only case in which Aqua-Air would assume full responsibilities would be in the event Aqua-Air were retained under a separate contract to make such determinations.
7. Inadequate cooling or heating resulting from systems being improperly charged with refrigerant gas.
8. Pump seal leakage due to the pumps being run with insufficient water in the head.

IV. LIMITED WARRANTY ALLOWANCES

Limited warranty allowances as outlined in publications F-104 and F-110 are also available to defer expenses incurred in the repair or replacement of all such components for the period of the system warranty. Replacement parts and components for out-of-warranty systems are also warranted for one year but no allowance to defer expenses incurred in the repair or replacement of such components is available. Components or parts not used as an integral part of an Aqua-Air system are not covered by the Company warranty.

Services

- New Installations
- Repairs
- Refits
- Engineering

Manufacturing

- Chiller Units, 2-300 ton
- Fan Coils, 5-48,000 BTU/H
- Air Handlers 1-15,000 CFM
- Split Systems 5-60,000 BTU/H
- Self Contained 5-24,000 BTU/H
- Custom Refrigeration Units
- PLC / Touchscreen Chiller Control packages
- Digital Thermostats

Sapphire Series Digital Thermostat

Chillwater Fan Coils

FlexAir Series Air Handlers for Ducted Systems & Fresh Air Makeup

PLC / Touchscreen Chiller Controls

Aqua-Air Manufacturing
James D. Nall Co., Inc.
1050 E 9th St., Hialeah, FL 33010
Phone 305-884-8363 800-328-1043
Fax 305-883-8549
Email sales@aquaair.com
www.aquaair.com

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

Marine Chillwater System Specialists

Modular Chiller Systems

75 Ton Semi-Hermetic 4 Stage Chiller 2008 Retrofit on 172' Motoryacht

AQUA AIR

MARINE AIR CONDITIONING SYSTEMS

The **James D. Nall Company** has, since 1941, provided Yacht Owners with the highest quality Marine Air Conditioning Service and Equipment available.

In 1972 the company started manufacturing its now legendary Marine Chillwater Systems under the **Aqua-Air** brand name.

In 1983 the company began manufacturing a quality line of small direct expansion marine air conditioning systems.

In 2003 the **James D. Nall Company** renewed its commitment to full time dockside service support to the yachting community.

We are Committed to Providing the Highest Level of Quality Service Available !

The **James D. Nall Company** offers the following distinct advantages over all other marine air conditioning service companies:

- 66 years of experience in all facets of the marine air conditioning and refrigeration business
- Factory trained service technicians with the latest available troubleshooting technology
- Factory direct equipment sales offer the greatest value for your dollar.
- We maintain a library of ships' manuals for **Aqua-Air** customers dating back to the early 90's. Most of these are now available in digital PDF format.

New Installations

The company can provide a complete turnkey package for installing a new air conditioning system aboard your new project. Beginning with the design phase all the way through system commissioning . . . it's one stop shopping.

Repairs

We can provide service on all **Aqua-Air** systems and out-of-warranty service on **all** other brands of marine air conditioning equipment.

Refits

When it's time to replace the existing system aboard your yacht, we're the people to call. We'll replace your existing equipment with an **Aqua-Air** system specifically designed for your requirements.

Engineering

The backbone of our company is our engineering department. From piping, ducting and electrical schematics to final installation drawings, we can provide it all.

AQUA AIR

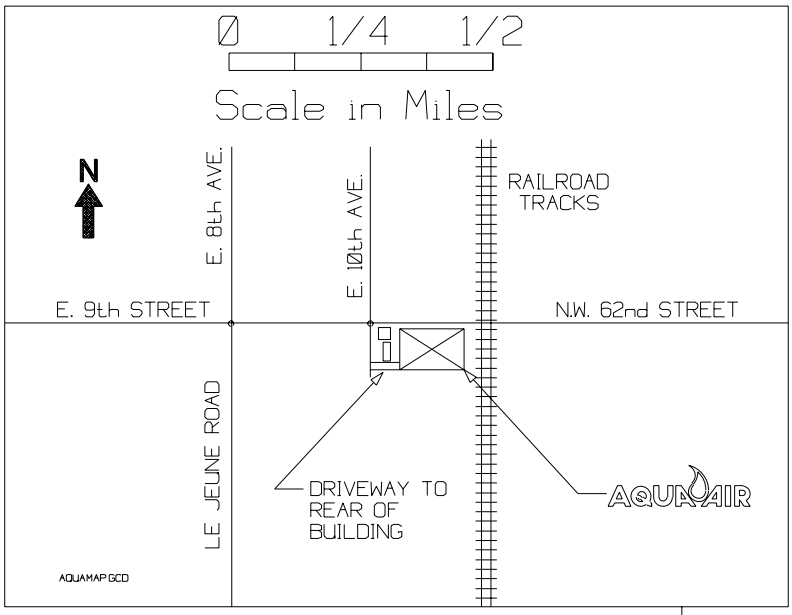
MARINE AIR CONDITIONING SYSTEMS

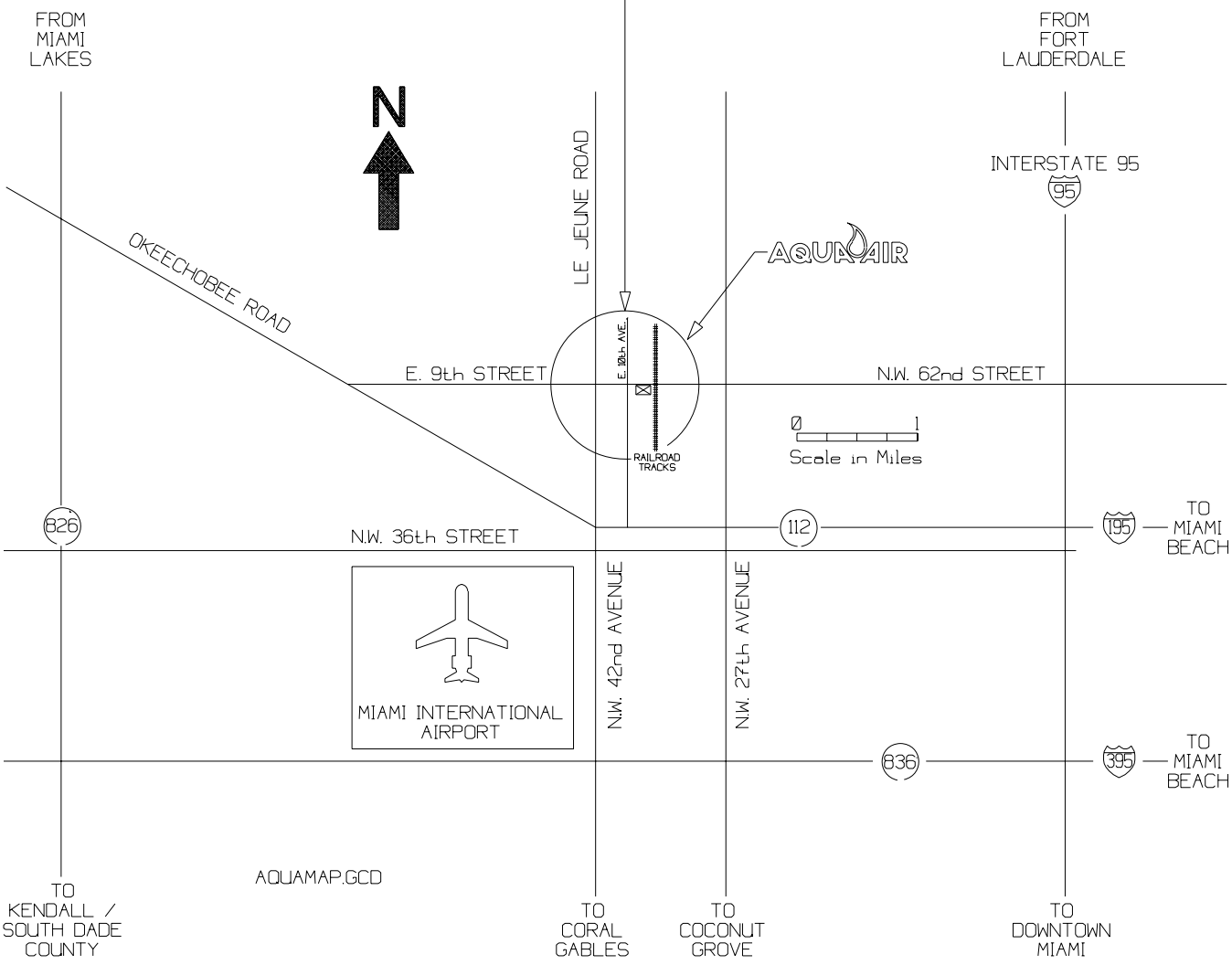
Aqua-Air Manufacturing
division of the James D. Nall Co., Inc.
1050 E. 9th St., Hialeah, FL 33010
305-884-8363 phone
800-328-1043 toll free U.S.
305-883-8549 fax

email: sales@aquaair.com
website: www.aquaair.com

TRAVEL DIRECTIONS

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS





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AQUA-AIR MANUFACTURING, division of the James D. Nall Co., Inc.
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Ph. 305-884-8363 Fax 305-883-8549 E-mail sales@aquaair.com