Webasto BlueCool Premium (WBCP) Series Chilled Water Marine Air Conditioning Systems Operation And Installation Instructions

To find an authorized Webasto marine installation center near you, please call (800) 860-7866 toll free or visit our web site at: www.webasto.us

- Diagnoisis and repair of malfunctioning, non-functioning or damaged Webasto cooling systems requires special factory training, technical information, special tools and special equipment.
- ALWAYS carefully follow Webasto installation instructions and heed all WARNINGS.
- Improper installation voids all warranties on this product.

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Webasto BlueCool® Premium Series AC Systems

Limited Warranty

Webasto Product North America, Inc. (herein after referred to as Webasto) warrants BlueCool Marine® air conditioner kits against defects in material and workmanship for two (2) years or 3000 hours of operation, which ever comes first, effective at the time of purchase by the end user.

Replacement parts are covered for six (6) months or the remainder of the original warranty period, which ever is longer. Replacement air conditioners are considered a "Replacement Part".

The intent of the Webasto warranty is to remedy defects in material and workmanship in the manner provided herein. During the warranty period the exclusive remedy will be for Webasto, at its discretion, to repair or replace those parts which are demonstrated to be defective in material or workmanship.

While warranty is provided to the "end user", it is to be administered and serviced through a Webasto Authorized Dealer in accordance with the Webasto warranty policy.
To locate the nearest "Webasto Authorized Dealer" phone Webasto Product North America at 1-800-860-7866.

While this warranty covers parts and labor, if the air conditioner was self installed by the end user or someone other than a Webasto Authorized Dealer, the diagnosis and repair must be completed by a Webasto Authorized Dealer in order to receive compensation under the terms of this warranty.

Limitations and Exclusions:

Webasto specifically excludes and limits from warranty the following:

- Normal wear.
- Damage to product in transit: all claims must be filed with carrier.
- Improper installation, which is not in accordance with valid, supplied installation instructions.
- Deterioration due to normal wear, corrosion, abuse, neglect, damage, accident, improper storage or operation.
- Modification of product by alteration, use of non-genuine parts or repair by unauthorized personnel.
- Economic loss for expenses related to travel, vessel disability, personal injury or other incidental or consequential damages arising from any breach of this expressed warranty.

Owners Responsibilities:

1) Perform Webasto recommended maintenance procedures per Webasto Owners Manual.

2) A Warranty Registration Card is included with each BlueCool Marine® kit. It is the end users responsibility to complete this card and return it to Webasto for registration. Proof of purchase is required for all units that are not registered.

This warranty gives you specific rights and you may also have other rights which vary by State or Province.

THE WARRANTY DESCRIBED IN THIS POLICY SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Foreword

General

The air conditioning units covered in this manual can be used to cool marine vessel cabins and cockpits Installation accessories can be found in our accessories list for boats/ships.

Scope and Purpose

These instructions are intended to support the installation of BlueCool Premium air conditioning units in marine vessels.

Acknowledged engineering conventions must be observed for the installation work.

Safety and Important Information Symbols and their Meaning

Warning
This symbol is used to highlight that non-compliance with instructions or procedures can result in serious injuries or death to personnel.

Caution
This symbol is used to highlight that non-compliance with instructions or procedures may cause damage to equipment.

Attention
This symbol is used to highlight and draw specific attention to important information.

Flammable or Combustible
This symbol is used to highlight and draw specific attention to flammable or combustible materials or risks.

IMPORTANT SAFETY INFORMATION – Read Before Proceeding with Installation!

WARNING!

ALWAYS switch air conditioning units off during refueling or when in a refueling area.

CAUTION!

Location of wiring and control devices and installation of air ducting are important for proper operation. Failure to comply with the installation instructions provided may result in poor operation or damage to air conditioner and vessel components.

ATTENTION

- *It is the installer's responsibility that the installation complies with all applicable American Boat & Yacht Council and U.S. Coast Guard regulations. Also, all relevant state and provincial licensing regulations if any, governing the installation and use of auxiliary heating devices in watercraft must be observed.*
- *For information concerning special marine applications or marine applications you are not sure of, contact an authorized Webasto marine dealer or Webasto Product N. A., Inc. directly at:* ***1-800-555-4518 (USA) or 1-800-667-8900 (Canada)****.*

Typical Installation

The illustration below shows a typical installation of a self-contained air conditioning unit.

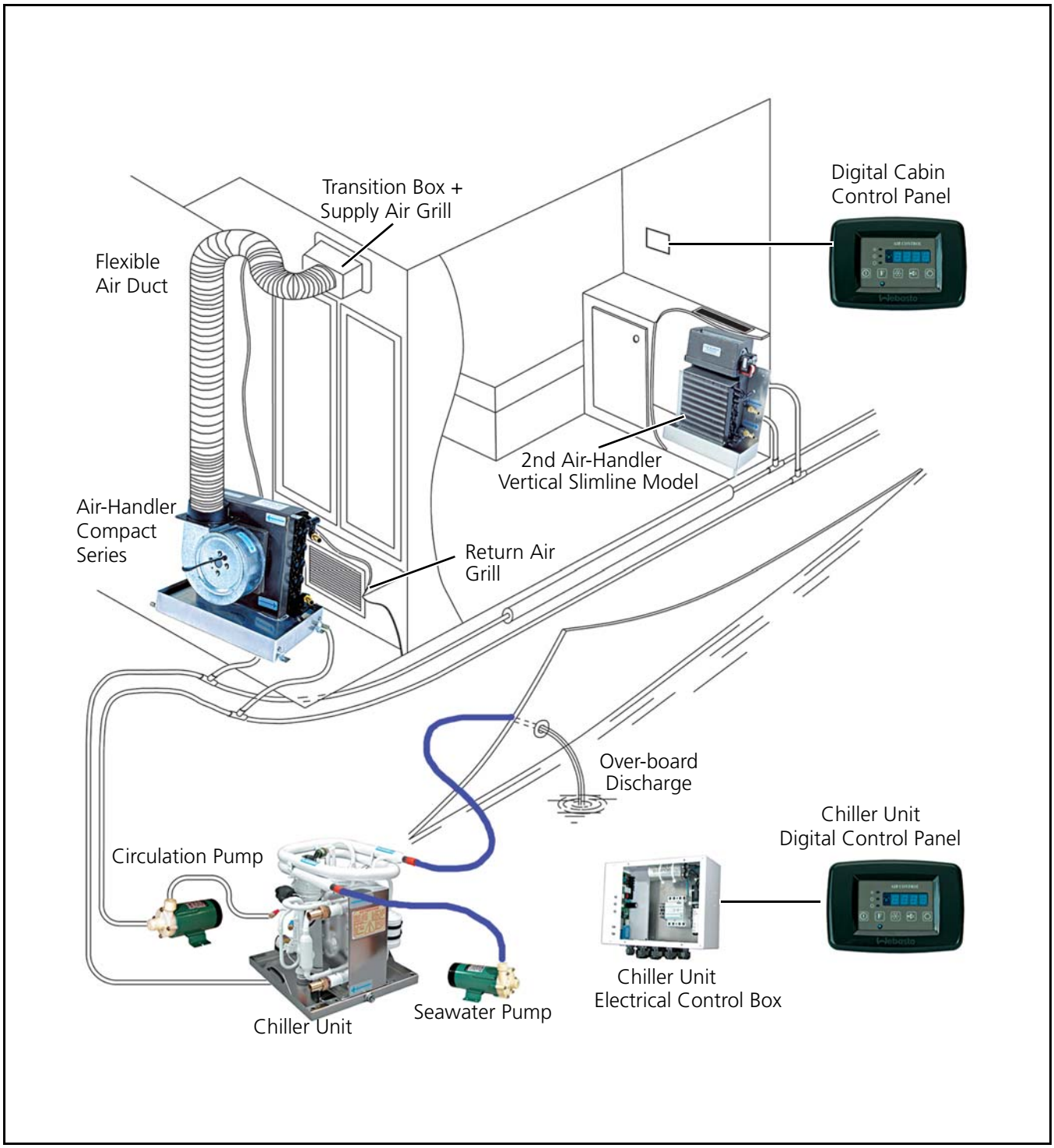


Figure 1. Typical Installation

DESCRIPTION AND OPERATION

Chiller Unit

ATTENTION

All Webasto air conditioning units pump seawater around the condenser to aid in the cooling process.

Cooling Cycle

The compressor compresses the refrigerant gas which is then condensed to liquid as it passes through the seawater cooled condenser. The liquid refrigerant is injected through a small nozzle and evaporates. This evaporation process produces the refrigeration effect. The evaporation takes place in a tubular coil (also called: evaporator coil). A pump forces a glycol/water mixture through a seperate circuit in the the evaporator. While passing through the evaporator the temperature of the glycol/water is lowered by approximately 59° F (15 °C) and is pumped to heat exchangers located throughout the vessel.

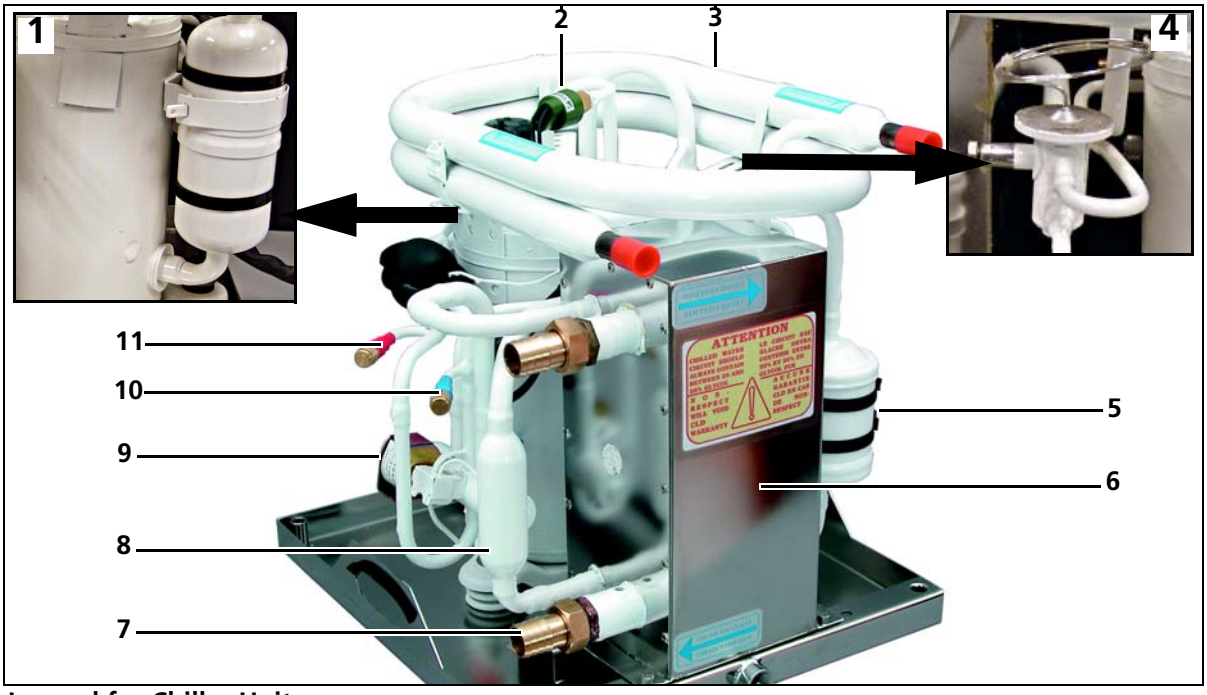
Heating Cycle

ATTENTION

The heat cycle becomes inefficient when the outside water temperature drops below 43° F (6° C) approx.

It is quite possible to produce heat with an air conditioning unit. For this purpose a 3-way reversed cycle valve is added. During the heat cycle the condenser effectively becomes the evaporator and cools down the seawater. The finned evaporator becomes the condenser and produces heat to approx.113/122° F (45/50° C).

Figure 2. Chiller Unit



Legend for Chiller Unit:

1 Compressor Unit and Accumulator
2 High Pressure Switch
3 Cupro-nickel Condenser
4 Expansion Valve
5 Filter Dryer
6 Evaporator
7 Chiller Coolant Circuit
8 Capillary Tube / Muffler
9 Reversed Cycle Valve (Cool / Heat)
10 Low Pressure Service Port
11 High Pressure Service Port


Fig. 3

Chiller Unit Component Description

Compressor

The compressor is a pump that pressurizes and circulates the refrigerant in the air conditioning system.

- Available in 115V or 230V
- Powered by shore power or generator
- Available in scroll or rotary formats
- Designed to pump gas only - Not liquid

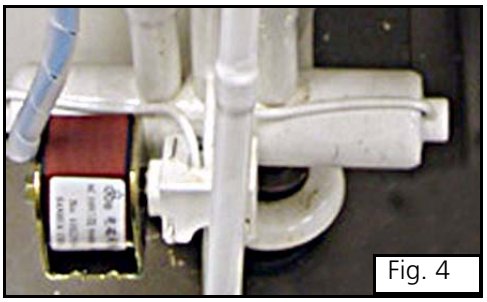


Fig. 4

3 Way Valve

The 3 way valve, or reversed cycle valve, enables the chiller unit to function as a heat pump.

When the system is running in heat mode, the refrigerant is pumped through the system in the opposite direction absorbing the warmth out of the condenser.

In cooling mode, it brings the warmth to the condenser.

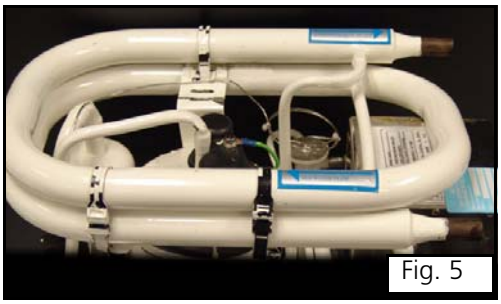


Fig. 5

Condenser

The condenser is a heat exchanger. As part of the system's high side, the condenser is used to liquefy the high-pressure vapor discharged from the compressor.

The condenser used on this system is a double walled tubular design which allows seawater to pass through the center. Seawater is used to aid in the cooling and heating cycles.

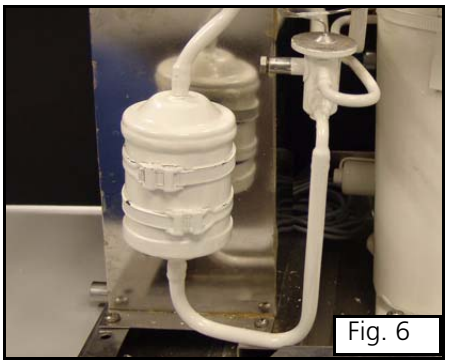


Fig. 6

Filter Dryer

The filter dryer is a security part in the system.
It removes small particles and absorbs water (if there is any) out of the liquid gas in the system.

Expansion Valve

Variable valve, placed between condenser and evaporator. Enables a pressure difference between the high and low side of the system. Regulates the volume of the refrigerant passed to the evaporator

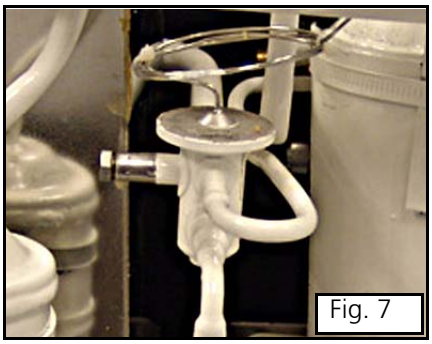


Fig. 7

Capillary Tube

Ensures a regular flow of gas to the evaporator and reduces the noise that is produced when the gas is leaving the expansion valve.

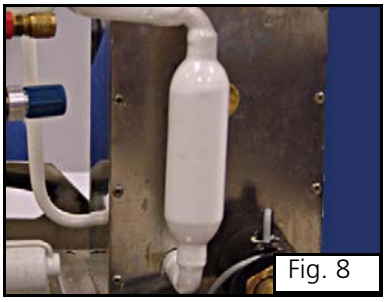


Fig. 8

Evaporator (Chiller)

Like the condenser, the evaporator is also a heat exchanger. Unlike a condenser, which is designed to release large quantities of heat, the evaporator is used to absorb large quantities of heat. The cold liquid refrigerant absorbs the warmth from the chiller water circuit which is on the other side of the plates.

The evaporator is part of the system's low side.

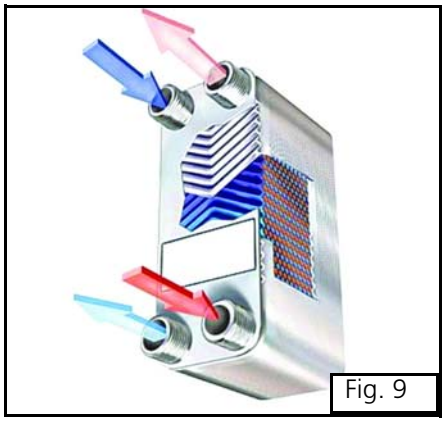


Fig. 9

Accumulator

The accumulator serves as a temporary holding tank for liquid refrigerant. Its primary function is to separate the vapor from the liquid, then release the vapor to the compressor.


Fig. 10


Fig. 11

High and Low Pressure Switches

The high and low pressure switches are installed in the incoming and outgoing lines of the compressor. If a pressure is too high or too low, a signal is sent to the controller card, which will switch off the compressor. At the same time a failure code is given on the control panel F01-low or F02-high) Values: High pressure, 350-250 psi (24-17 bar) Low pressure, 15-35 psi (1-2.4 bar)


Fig. 12

Water or Air Temperature Sensor (Optional)

The water or air temperature sensor monitors the temperature in the air or chilled water circuit and sends that information to the controller card. The controller card uses this information to switch the system On and Off.

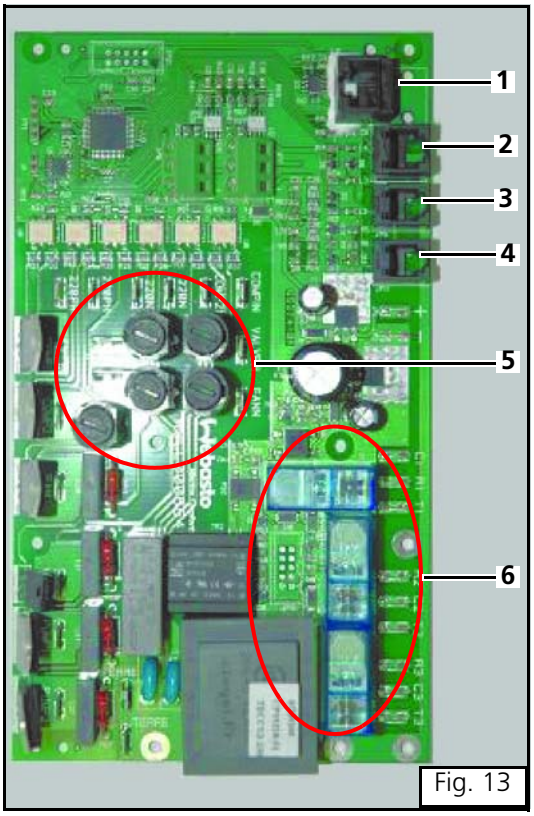


Fig. 13

Chiller Controller Card TECC Version 3

The new controller card is a direct replacement for previous model cards. It does however have some new features for present and future purposes. The new card can be easily identified by the Webasto logo and fuses located on the front of the card. The new card also has additional relays and a second water temperature sensor inlet intended for future use.

- (1) Digital Display Connector
- (2) Air Temperature Sensor Connector (Optional)
- (3) Water Temperature Sensor Connector
- (4) Water Temperature Sensor Connector - **For Future Use Only!**
- (5) Fuses
- (6) Relays

Air Handlers

Webasto offers various types and sizes of air handlers to simplify the installation process.

Slim Line Cross Flow Air Handler
4,000 - 12,000 BTU

Fig. 14

Compact Air Handler
4,500 - 24,000 BTU

Fig. 16

Horizontal Cross Flow Air Handler
4,000 - 12,000 BTU

Fig. 15

Slim Line Cross Flow Air Handler
4,000 - 12,000 BTU

Fig. 17

Water Pumps

Webasto uses two different types of water pumps to circulate fluid through the chiller and seawater circuits, magnetic drive and mechanical. Water pumps are available for 115V and 230V applications. Refer to the Marine Parts Catalog for the correct size and voltage output to fit your needs.

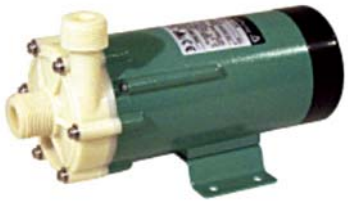


Fig. 18

Magnetic Drive Water Pumps

Water Pumps WB250 to WB1000

ATTENTION

WB250 and WB350 are to be used for seawater cooling only.

Maximum BTU Ratings at 50/60hz:
Chiller Loop - 24000
Seawater Loop - 12000 to 48000

Fig. 19

Water Pumps WB1500 to WB2000

Maximum BTU Ratings at 50/60hz:
Chiller Loop - 60000 to 84000
Seawater Loop - 72000 to 96000

Fig. 20

Water Pumps WB3500 to WB7400

Maximum BTU Ratings at 50/60hz:
Chiller Loop - 144000 to 500000
Seawater Loop - 144000 to 500000

Fig. 21

Mechanical Drive Pumps

Water Pumps WB2500 to WB7500

ATTENTION

Model WB7500 can only be used for chiller water circulation, not for seawater cooling.

Maximum BTU Ratings at 50/60hz:
Chiller Loop - 84000 to 500000
Seawater Loop - 144000 to 325000

Optional Cabin Controls

MTH - Mechanical Thermostat

The MTH thermostat has a control for setting the desired set-point temperature and a selector to switch between summer and winter operation.

– (1) Summer/ Winter Selector
– (2) Set-point Adjustment Knob

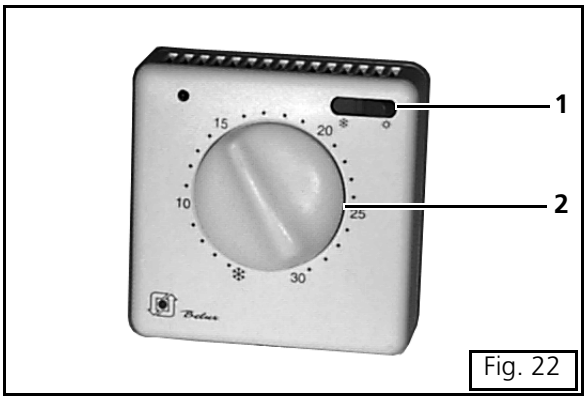


Fig. 22

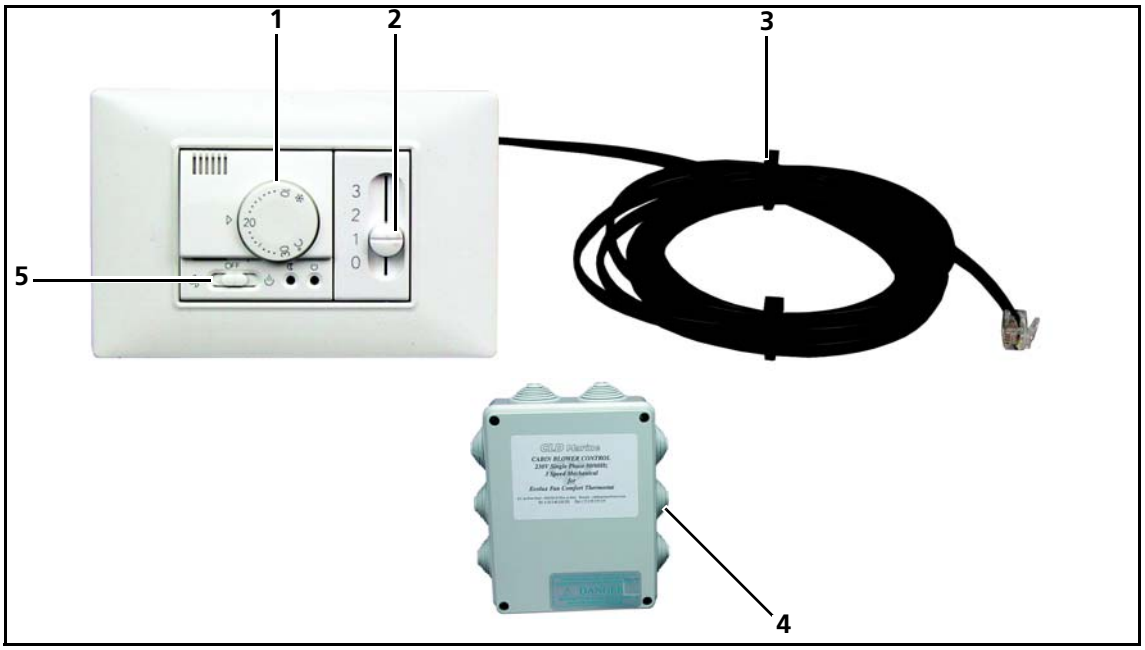
MTH2 - Mechanical Thermostat + 3 Speed Control

The MTH2 mechanical thermostat incorporates a 3 position selector which can be linked to a simple 3 speed blower control system. The assembly is delivered with a multi-conductor plug to avoid cabling errors.

PLANA (Vimar) 3 speed Thermostats

Based on the modular Plana series by Vimar with the same features as MTH2.

Figure 23. MTH2 - Mechanical Thermostat + 3 Speed Control



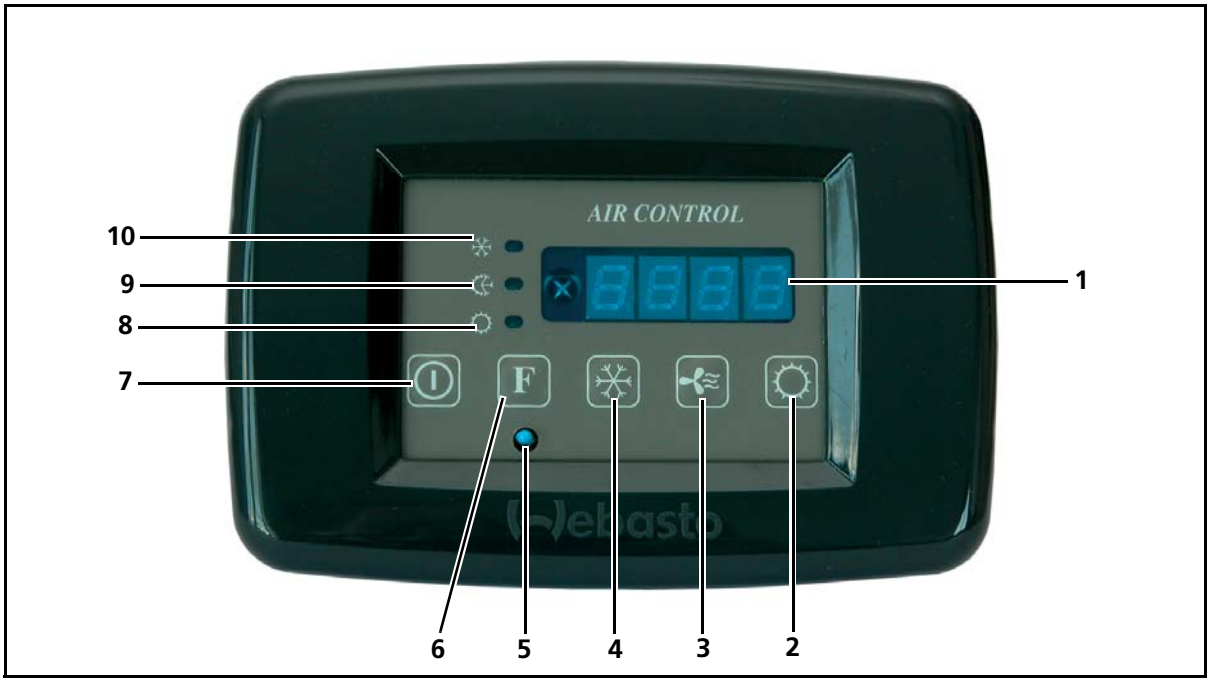
Legend For MTH2 - Mechanical Thermostat + 3 Speed Control:

1 Thermostat Knob
2 Blower Speed Knob (0 + 3)
3 Display Cable 4.5 ml
4 3 Speed Controller
5 Heat/ Cool Selector + On/ Off Selector

Chiller Control Digital Display

All Webasto air conditioning units are controlled by a Digital Display which gives access to all functions necessary for the normal operation of the unit and attached accessories (blowers, pumps, etc.).
In order to start the system you only need to press the <On/Off> key on the digital display. From there on the electronic control unit takes care of the progressive starting up of the air conditioning unit and attached accessories (blowers, pumps, etc.), as well as it normal functioning.
The digital display will show the present air temperature of the cabin in which the digital display is situated or where the main temperature sensor is located (incase the optional secondary temperature sensor is used). After a delay of approx. 20 seconds the display will indicate the cycle in which operation will start i.e. <COOL> or <HEAT>. The choice will depend upon the setpoint temperature and the air temperature as measured by the display panel.
After a further delay of approx. 50 seconds the compressor(s) will start up and the normal operation cycle will begin.

Figure 24. Chiller Control Digital Display



Legend for Chiller Control Digital Display:

1 Temperature or Function Readout
2 Set Point Modification Key (Sun Key) - Press to read setpoint temperature - Hold to raise setpoint temperature.
3 Dedicated Blower Speed Key
4 Set Point Modification Key (Snow Key) - Press to read setpoint temperature - Hold to lower setpoint temperature.
5 Integrated Air Temperature Sensor
6 Function Key - Allows access to secondary functions and programming
7 On/Off Key - Press to turn on - Press again to turn off.
8 Led indicating system working in heat mode
9 Led indicating automatic cycle-switching is active
10 Led indicating system working in cool mode

2004 Series Digital Display

The WEBASTO <CHILLER CONTROL> digital display gives access to information and controls at three distinct levels:

Immediate Access - Level 1

1. Room temperature readout in the main 4 LED display window
2. 3 small LED's to the left indicating the operating cycle presently active: cool cycle only operation; automatic cycle (switching governed by the end users entered setpoint temperature); heat cycle only operation.
3. 2 setpoint keys give immediate access to the thermostatic setpoints for blower control ("Sun"and "Snow" keys). These keys are also used to alter programming values.

Modification of Setpoint Temperature

The setpoint temperature, i.e. the temperature desired by the operator for blower operation can be modified as following:

1. Press and hold one of the setpoint selector keys and wait until the new desired setpoint temperature is obtained.
2. Release the setpoint key. The display will return to normal room temperature readout after approx. 5 seconds. Non-volatile memory keeps last settings.

Secondary Commands and Info -Level 2

The F/Blower key gives immediate access to a number of secondary commands which need to be accessed frequently for day to day operation. First access is to the blower speed control, then chilled water temperature readout, etc.

Programming Commands - Level 3

A number of programming commands that do not need to be accessed for day-to-day operation are hidden and require a special procedure to enable access and modification (See **Programming Access**). An access code can be enforced to avoid accidental modification of programming values.

Startup Delay

After pushing the On/Off key the LED's will display <On> while initializing the system. Push again to stop operation; the display will briefly show <Off> before extinction. The appropriate LED to the left (heat, cool, etc.) will come on after approx.15 seconds and compressor operation will start after approx.50 seconds. The seawater circulation pump will come on immediately after system initialization.

Special Features

Dedicated Blower Speed Key

The 2004 Digital Display provides for a dedicated blower speed key which allows you to cycle through the speed settings. The <F> key from 2004 onwards is only used for programming and setting purposes.

The 2004 displays are backwards compatible with the older TCC electronic controller cards. In that case however the dedicated Blower key is not operational.

Automatic Blank/Sleep Mode Programmable Time Delay

Factory default:15minutes. While in blank/sleep mode the cycle LED flashes discretely every 20 seconds. To go back to normal operation push any key.

Calibrate All Blower Speed Settings In Real Time Mode

It is now possible to calibrate all speed settings (1 to 5) before actually putting the system into service (See **Blower Speed Setting Calibration**).

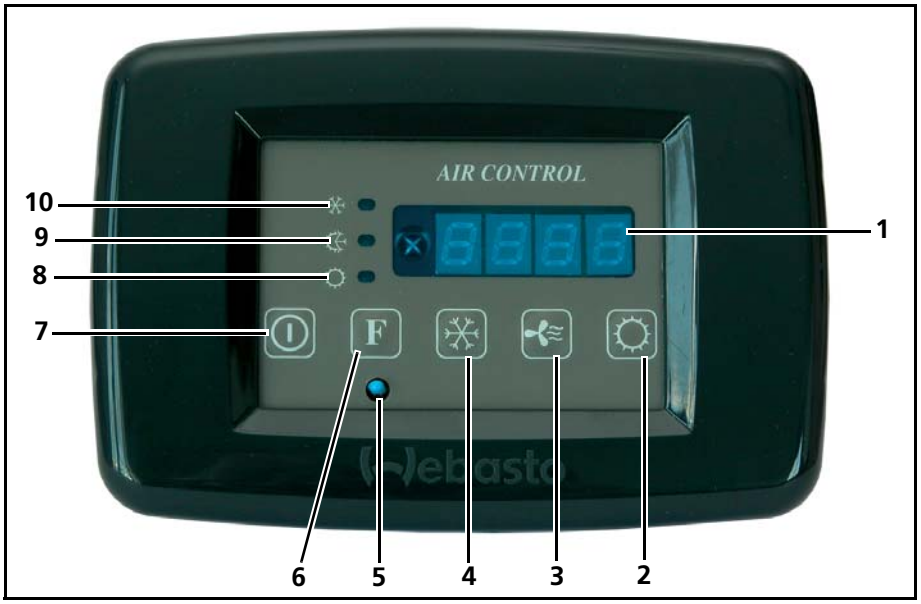
Infrared Remote Control

Infrared remote control can be obtained as an option. This remote control is based on the standard protocols also used by TV and other appliances. Although the WEBASTO controls have been chosen so as to avoid interference with most TV models, the end user should be aware that in certain cases interference may occur with TV sets or other appliances.
In general, it is therefore advisable to avoid locating a WEBASTO Air Control panel next to other appliances using infrared control units.

Access Code

The end user can deny access to all program settings by introducing an access code (see **Programming Access** - code <b>). Blower speed and setpoints always remain accessible. Once an access code is validated, the digital panel will show <Code> if the end user tries to access functions other than blower speed or setpoint. To gain full access push the sun key to reach the code value as programmed and push the F/Blower key again to gain access to full program settings.

Figure 25. Chiller Control Digital Display



Legend for Chiller Control Digital Display:

1 Temperature or Function Readout
2 Set Point Modification Key (Sun Key) - Press to read setpoint temperature - Hold to raise setpoint temperature.
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8 Led indicating system working in heat mode
9 Led indicating automatic cycle-switching is active
10 Led indicating system working in cool mode

Chiller Control Digital Display

The central <CHILLER CONTROL> digital display which controls general operation of the condensing unit(s) can also directly control the blower(s) of the saloon/cabin where the main temperature sensor is located. This direct blower control is optional and not used in all installations.

Blowers in the wheel-house for instance, where the <CHILLERCONTROL> display is located, can be directly controlled by the TECC card. The <FAN> outlet of the TECC controller card offers manual speed settings and thermostatic control in the same manner as the individual cabin controls.

This central blower control is therefore quite distinct from the secondary Cabin Control systems where the <AIR CONTROL> digital display only operates the blower(s) of the cabin where the display is situated without any direct link to the main condensing unit.

Any blowers directly connected to the TECC controller card will be activated after the cycle LED comes on. However, blowers will only become active if the chilled water temperature is compatible with the entered set-point.

If blower operation cannot be activated the error code <bA11> will flash briefly and then remain visible when accessing blower control through F/Blower key (See **Error Codes**).

Blower operation will only start after a compatibility check with the temperature of the chilled water circuit. Example: in <Cool> mode with a set-point temperature of 70° F (21° C)., blower operation will only start after the temperature of the water circuit has reached 68° F (20° C) or less. This avoids start-up of blower operation with a non compatible water circuit temperature.

For these TECC cards it is possible to altogether stop blower operation by choosing the option <0> after manual blower speed <1>.

This allows to altogether stop blower operation by the main controller card during the night for example while still continuing to operate the chiller unit for the rest of the ship's air-handlers.

With the <CHILLERCONTROL>, blower control is completely distinct from compressor operation:

1. Blower control will continue even if compressor operation is thermostatically stopped.
2. Compressor operation will continue even if the blower is thermostatically stopped.

It is not possible to operate the blowers in a different cycle from compressor operation; for instance, compressors running in cool cycle and blowers in heat cycle. In that case compressor operation will have priority and blower operation will be stopped (error code <bA11>).

Chiller Control Secondary Commands

The <F> key gives immediate access to commands and displays necessary for day-to-day operation. When pushing the <F> key you will see a code which indicates the type of command or display and the present value.

The following is a list of commands / displays In order of appearance:

Table 1: Chiller Control Secondary Commands

Command	Display Readout	Setting(s)
Blower speed control	< b A> (0,1,2,3,4,5)	A = automatic blower speed adjusted to temperature differential. 0 = blower stop 1 to 5 = manual speed control Note: Speed control is in real time mode i.e.changes are effected immediately without any validation procedure.

Table 1: Chiller Control Secondary Commands

Command	Display Readout	Setting(s)
ATTENTION *The following functions need validation before a new value is accepted. Press the <F> key and go to the next function line. Validation will occur automatically when the display goes back to room temperature readout. Validation can be forced by pushing the On/Off key while in F mode. and confirmed by the message <memo>.*		
Read out of chilled water temperature	<H10.2> (10.2 ° C) <H50.3> (50.3° F)	Example
Cycle mode choice	<F 3> (1 to 5)	The following cycle modes can be chosen manually: 1 = cool cycle only 2 = heat cycle only 3 = automatic cycle switching with reversible compressor 4 = automatic cycle switching without reversible compressor 5 = heat cycle only without reversible compressor
AC Voltage readout	< U232> (232 Volts)	Example
Manual on/off Compressor 1	<1C01>	<1C01> = Compressor 1 on <1C00> = Compressor 1 off
Manual on/off Compressors 2 - 4	<2C01>	<2C01> = on, <2C00> = off <3C01> = on, <3C00> = off <4C01> = on, <4C00> = off
Startup Priority Compressors 1 to 4	<P123>	<P123> = 1,2,3,4; <P341>=3,4,1,2 <P A> = automatic priority rotation; when in this priority mode, the starting order will be changed every restart after a thermostatic cutout.
Time delay between compressor startup	<L 9> (9 seconds)	programmable from 1 to 9 seconds
Individual thermostatic advance compressors 1 to 4. In relation to the general chilled water temperature set-point, it is possible to differentiate the cut-out temperature for each compressor.	<1L0.0> Factory default setting	<2L1.2> means compressor 2 will cut out 1.2° before the general set-point value. So for a general value of 4°, compressor 2 will cut out at 4 + 1.2 = 5.2 °. Same is possible for the other compressors.
Automatic dehumidification while absent.	<d 0> Factory default setting	0 = non active1 = 1 cycle per 24H2 = 2 cycles per 24H etc.
Display time of secondary functions (F/Blower key) by periods of 20 seconds	<t 1> Factory default setting	Setting = 20 seconds

Digital Cabin Blower Control (See Figure 25)

Individual cabins controlled by WEBASTO Digital Cabin Controls are completely independent from the central condensing unit i.e.there is no direct electrical or electronic link between the cabin control unit and the central TECC controller.
The chilled water temperature sensor allows the Cabin Control to ascertain which cycle (heat or cool) is presently valid.
A Cabin Control can be operated entirely independently from the main condensing unit, i.e.:

1. it can be switched off or turned on at any time by the end-user
2. the end-user can set any temperature set-point as long as it is compatible with the general operation mode valid (heat or cool)
3. blower operation can be individually controlled and programmed

Flashing of Error Code <bA11>

If the user programs a set-point temperature incompatible with the general water circuit temperature as presently available (for example, set-point requested: 68° F (20° C) for a room temperature of 77° F (25° C) and a water-circuit temperature of 95° F (35° C) =Cool cycle requested with the chilled water circuit obviously working in heat cycle.
Blower operation will be stopped and error code <bA11> will blink for approx.10 seconds. After that the error code will still be visible when accessing blower control by the F/Blower key.The error code will disappear and normal blower operation will resume as soon as the water circuit temperature drops below 68° F(20° C).

Direct Readout of Water Circuit Temperature At Air-handler Entry

All Cabin Controls allow the user to immediately visualize the water circuit temperature at the entry of the cabin's air-handler (push F/Blower key).This feature allows the user to ascertain that water circulation is normal through the air-handler without abnormal differences as compared with the condensing unit water exit. (Normally temperature rise between condensing unit exit and air-handler entry should not exceed approx. 39° F (4° C).) Before getting worried however, the first thing to check is the proper attachment of the cabin control water temperature sensor to the air-handler entry and its proper insulation from outside interference.

Digital Cabin Control -Type CAB 2000 Series

This is the most common type of digital cabin control and includes:

1. digital display <AIRCONTROL>
2. CAB controller card in plastic box
3. 4 m (13 ft.) display cable
4. 2.5 m (8.2 ft.) chilled water temperature cable
5. 4 m (13 ft.) air temperature sensor (optional)

The digital display <AIRCONTROL> includes an air temp. sensor housed behind the 2 small openings on the front panel. It is sometimes necessary however to use the optional external air-sensor if for instance the digital display is subject to direct heat induction (sun-rays, instruments from behind, etc.).
All CAB controls include an outlet for solenoid water valve control on the entry of the air-handler.

Optional 3-way Solenoid Valve Systems

Water flow is completely halted when set-point temperature is reached and returned directly to the return line through a nozzle. When using 3-way valves it is possible to adopt continuous blower operation. See Schematic on page 41.

Special Features

The Digital Cabin Control includes the same special features covered previously for the Digital Chiller Control. Refer to the Special Features section beginning on pg.16 for additional information.

Cabin Control Secondary Commands

The <F> key gives immediate access to commands and displays necessary for day-to-day operation. When pushing the <F> key you will see a code which indicates the type of command or display and the present value.

The following is a list of commands / displays In order of appearance:

Table 1: Cabin Control Secondary Commands

Command	Display Readout	Setting(s)
Blower speed control	< b A> (0,1,2,3,4,5)	A = automatic blower speed adjusted to temperature differential. 0 = blower stop 1 to 5 = manual speed control Note: Speed control is in real time mode i.e.changes are effected immediately without any validation procedure.
Read out of chilled water temperature	<H10.2> (10.2 ° C) <H50.3> (50.3° F)	Example
Control of external heat-source	<F 1> (1 to 5)	<F 1> = normal auto-reverse cycle (cool/heat) without external heat source. <F 2> = auto-reverse cycle operation with external heat assistance. In that case the outlet connectors <HEAT> on the cabin controller card are activated together with the <VALVE> outlet when heat cycle is selected. This external heat source can be an AC heating element or any other source such as ceramic heaters etc. <F 3> = heat operation with external heat source only. In the case the <VALVE> outlet on the controller card is not activated and only the <HEAT> connectors are operational.
Automatic dehumidification while absent.	<d 0> Factory default setting	0 = non active1 = 1 cycle per 24H2 = 2 cycles per 24H etc.
Display time of secondary functions (F/Blower key) by periods of 20 seconds	<t 1> Factory default setting	Setting = 20 seconds

INSTALLATION

Installation and Positioning of Seawater Pump

Seawater Cooling

Install the pump/strainer assembly as close as possible to the center of the boat, with a minimum of 25 cm below the water surface. Mount the pump in such a way, that the water flow from the pump to the unit is always running up, this will prevent air bubbles in the line, making bleeding the system much easier.

ATTENTION

It is strongly recommended to install an air-bleeder system immediately at the discharge outlet of the pump. This advice is especially valid for pumps 125/250/350/1000/1500 and 2000. The 2500 and higher generally will not require a bleeder system to ensure proper operation.

It is strongly recommended to install a water-scoop at the entry of the sea-cock and directed towards the bow of the boat so that at speed positive pressure builds up in the supply line to the sea-water pump.

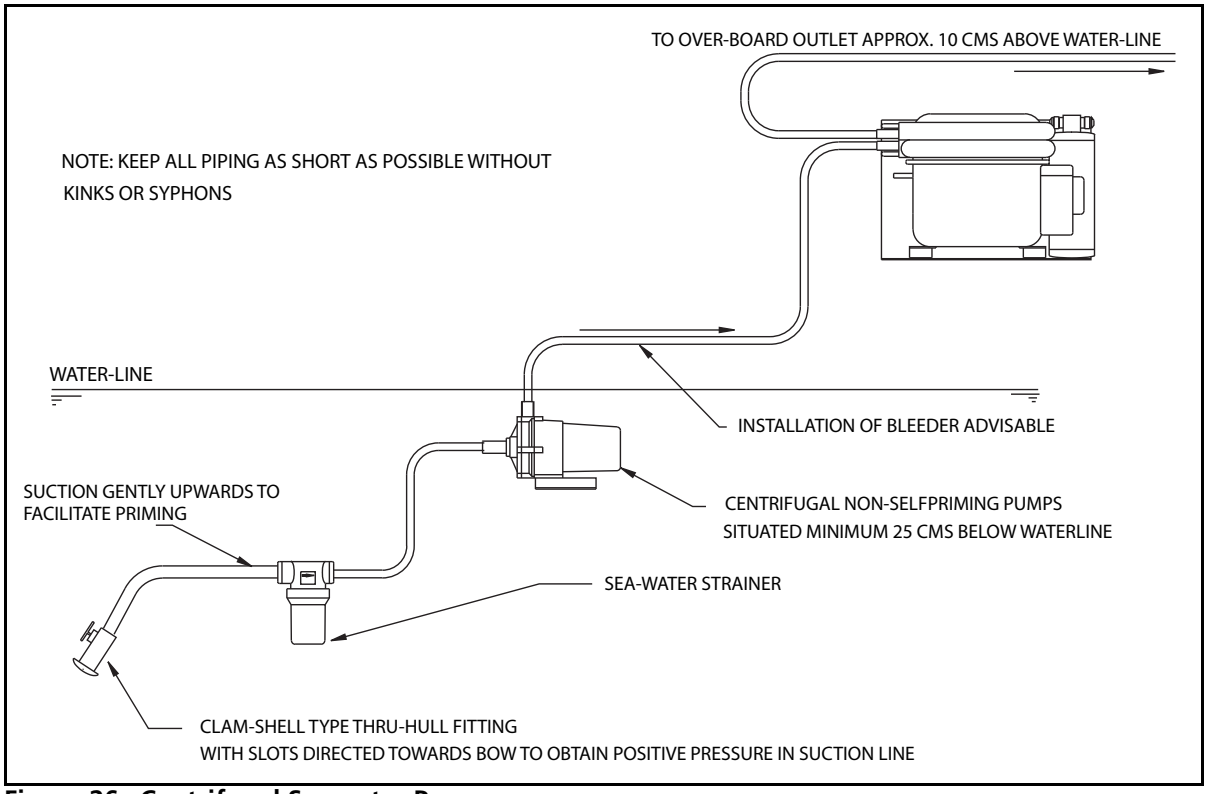


Figure 26. Centrifugal Seawater Pump

Seawater Cooling Exits

Provide for a separate seawater exit for each air-conditioning unit installed even if only one pump provides cooling for all units. To prevent back pressure, ensure cooling pump exit is a minimum of 10 cm above the water line.

Introduce shut-off valves for each unit if 1 pump provides cooling for more than 1 air-conditioning unit. This will allow easy priming of the circuit and also calibration of the seawater flow for each air-conditioning unit in case of imbalance in the water tubing lengths.

Chilled Water System Installation

Pressurized / Non Pressurized Systems

Chilled water circuit can be static non-pressurized or pressurized with membrane type expansion tanks. If the system adopted is static, the expansion tank should be the highest point of the circuit while taking into consideration the possible heeling angle under sail. Expansion tanks should always be connected to the suction side of the circulation pump.

Free Flow Versus Solenoid Valve Control

The water circuit can be free-flow where the water flow is continuous through all air-handlers and thermostatic control for each air-handler is obtained by stopping blower operation. In this case it is advisable to introduce manual ball-valves on each of the air-handler entries so as to enable balancing out of the water flow if necessary. In case of a solenoid valve system where each air-handler is equipped with a electrical solenoid valve controlled by the WEBASTO Cabin Control, it is not necessary to provide for other entry valves.

Water Circuit Temperature Sensors

To obtain a satisfactorily working system it is of utmost importance that the water circuit temperature sensors are correctly placed accordingly to WEBASTO specifications.
In order to exclude any erroneous temperature pick-up, WEBASTO provides specific locations on its condensing units.
These points are short tubular housings which cross the chilled water outlets at the following locations:

- Single Evaporator Chiller Units: Exit temperature sensor: the water-circuit exit on each evaporator is provided with a tubular transverse housing where this temperature sensor should be placed.
- Twin Evaporator Chiller Units (TWIN/CI): For TWIN-CI modules with 2 compressors on1 tray and independent evaporators, the chilled water sensor is attached to the Tee junction where the 2 exit pipes of the evaporator meet. The sensor should be properly insulated against external influence. All TWIN-CI units delivered by WEBASTO come with the sensor installed in the proper location.

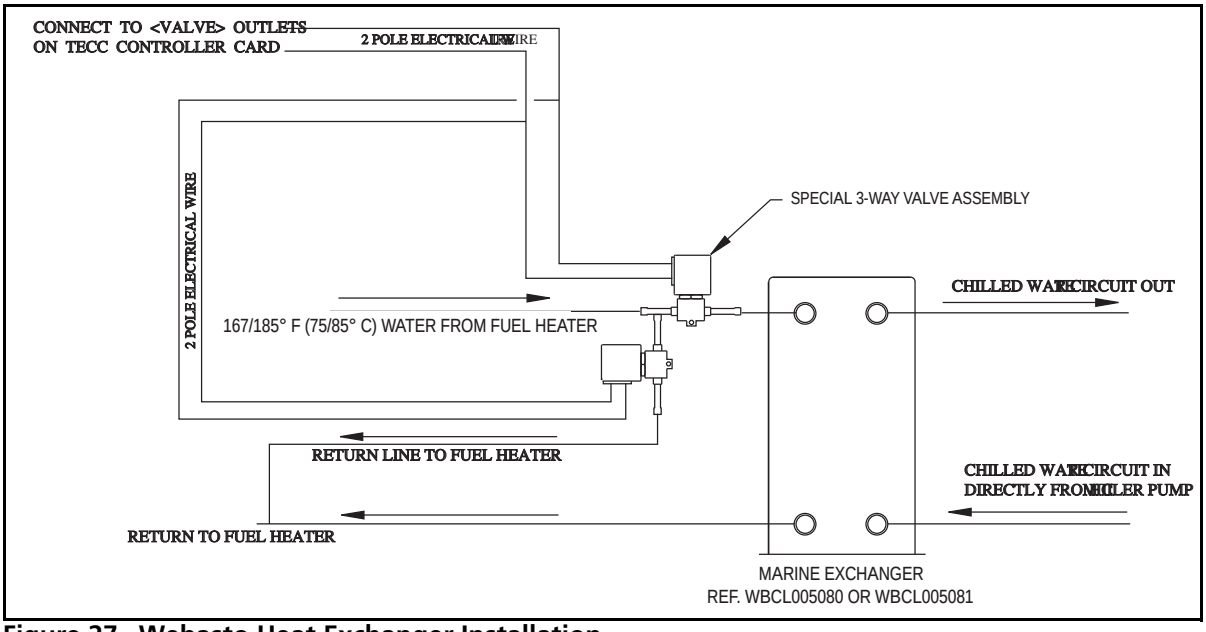


Figure 27. Webasto Heat Exchanger Installation

Added Heat-Exchangers

ATTENTION

Refer to Figure 27 for an example of a Water-to-Water exchanger specially adapted for fuel heaters (Webasto, etc.)

The TECC controller card is configured to except additional heat-exchangers in the chilled water circuit of various types:

- Water/Water exchanger to use the185/194° F (85/90° C) hot water circulation from a fuel operated heater
- Electrical calorifiers
- Engine heat, Etc.

ATTENTION

The following guidelines are basic, but important for success when installing a chiller coolant circuit. The most important thing to remember is the water-flow rate in a chiller coolant circuit is approximately 33 percent lower than the normal flow rates of a household central heating system, so you must pay special attention to all possible restrictions.

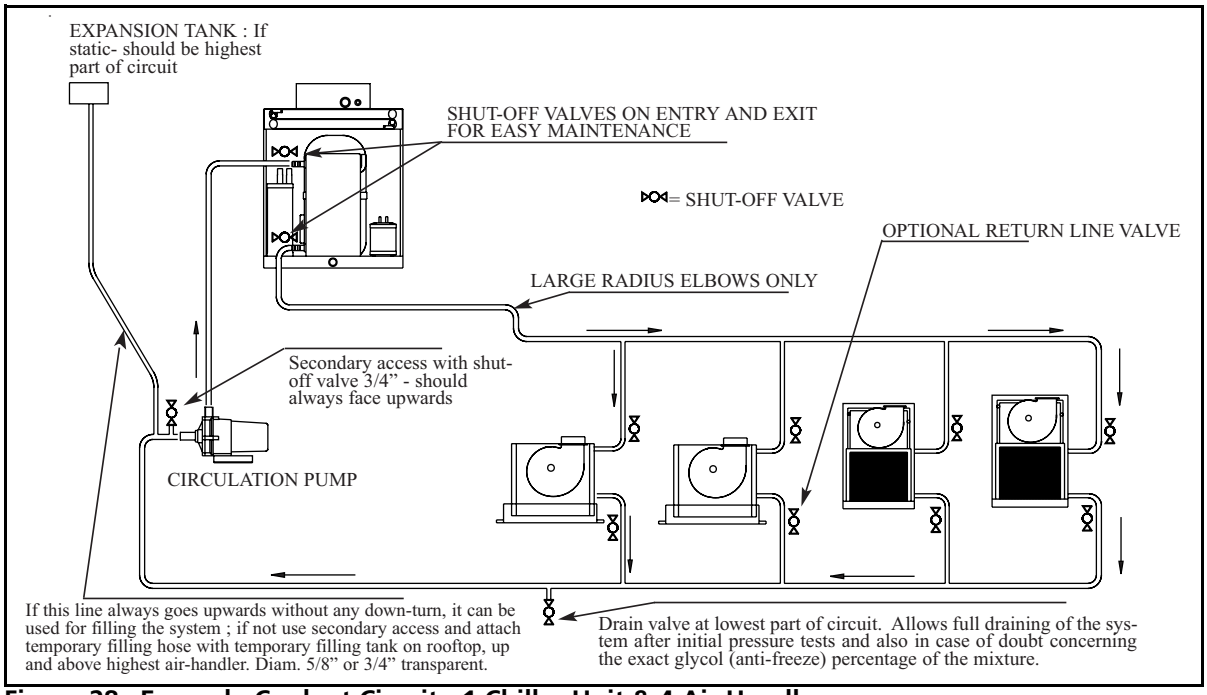


Figure 28. Example Coolant Circuit - 1 Chiller Unit & 4 Air-Handlers

Fig. 29

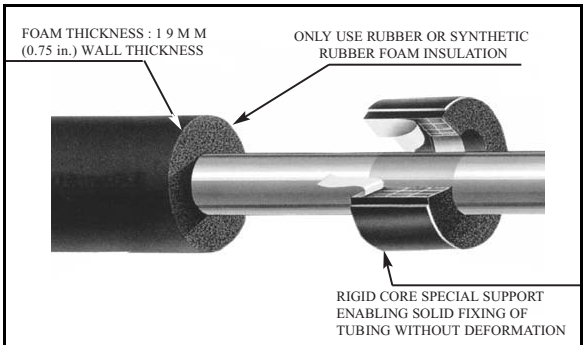


Fig. 30

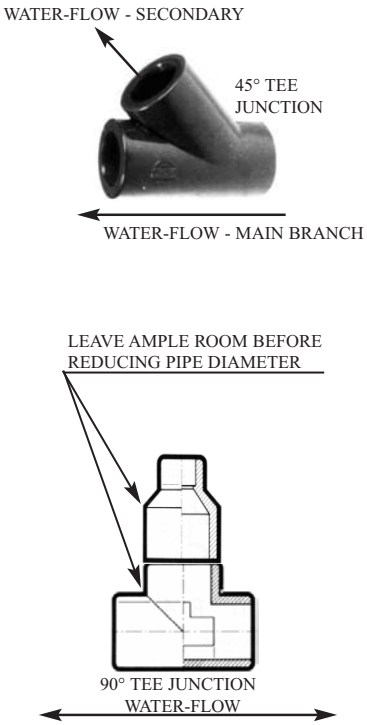


Fig. 31

Chilled Water Piping and Accessories

Chilled water piping can be in rigid plastic tubing and/or flexible reinforced hoses. Internal dimensions of tubing should be in conformity with piping as supplied by WEBASTO.
PAY SPECIAL ATTENTION TO:

Elbows

– Only use large radius elbows. Short radius elbows entail a flow-rate loss of approx. 2.5% per elbow. A succession of 8 short radius elbows will result in total flow-rate reduction of 100% x0.975x0.975x0.975x0.975 etc. = 81.66%.

– Large radius elbows only result in a flow-rate loss of approx. 0.5%. When large radius elbows are unavailable, use 2 successive 45° short radius elbows instead. See Figure 29.

Pipe Insulation

– Only use rubber or synthetic rubber foam insulation (Armstrong Armaflex, Rubatex, or similar). Do not use polyethylene foam insulation.

– Insulation foam thickness should be at least 19 MM (0.75 in.).

– Do not use split-type open insulation as this type tends to come apart over time.

– Try to use rigid foam core supports to secure piping. See Figure 30.

Tee Junctions

– It is preferable to use oblique Tee junctions for secondary branching. If 45° Tees are not available make sure the reduction in diam. on the secondary line is made after the junction Tee so as to obtain the largest possible entry diam.

Entry Diam. of Air-Handlers

– Always respect the minimum entry diam. of the air-handlers. Secondary piping to the air-handlers should not be less than the prescribed diam. See table below: (all diam. are net internal).

Model/BTU	Entry/Exit Diam.
4000/4500	12 mm (1/2 in.)
6000	12 mm
9000	15 mm (5/8 in.)
12000	15 mm
16000	15 mm
24000	20 mm (3/4 in.)

Anti-freeze Solution

CAUTION!

Webasto will void the product warranty if a glycol/water mixture (20/25% glycol + 70/75%fresh water) in the chilled water circuit is not maintained.

It is imperative to add approx. 20 TO 25% pure glycol to the chilled water circuit to avoid accidental freezing of the system during the winter. Glycol will also prevent the condensing unit/evaporator(s) from freezing up should the temperature control fail. There is a safety cut-out for an evaporator that is freezing up by means of the low pressure switch, but this safety device may allow a temporary drop of temperature to approx. 28° F (-2° C) before stopping the system.

Filling and Purging A Chilled Water Circuit

The following procedure is the most effective way to prepare the chilled water circuit for operation. With this method there is absolutely no need to purge air at each individual air-handler provided the filling hose has a sufficiently large diameter and always goes upwards to the filling tank.
Follow each step in the order given:

1) Install a purging tee on entry/suction side of circulation pump.
   - This tee should enable the temporary connection of a filling hose of at least 15 mm interior diam.
   - The filling entry must be directed upwards only.
   - Install a shut-off valve to enable quick closing of the access point upon completion of this procedure.

2) Install a temporary charging recipient (jerry can etc) in such a way that this recipient is the highest point of the circuit and that the hose from the access tee to the jerry can **only goes upwards**.
   - It is advisable to use transparent hose from the tee to the jerry can.

3) Open all bleeders on all air-handlers.
4) Start filling the circuit from the jerry can.
   - watch bleeder points on all air-handlers. Close all bleeders immediately when solid water comes out.
   - No further bleeding from the air-handlers will berequired from there on.

5) Connect the 230V supply to the circulation pump so as to be able to switch the circulation pump on and off manually.
   - The easiest method is to connect a temporary lead to the circulation pump with a manual switch.
   - Make sure the jerry can is at least half full at that stage.
   - Start circulation pump for approx. 15 seconds and stop it. You will notice massive air bubbles going upwards through the filling hose. Repeat this several times until the air bubbles become small enough to leave the pump on continuously without cavitating.

6) Leave the pump on continuously for at least 45 minutes.
   - You will notice a continuous stream of small bubbles going upwards and solid water going downward.

7) Help the final purging of the system by selectively closing the shut-off valves on all air-handlers so as to force the water flow through the other air-handlers.
   - This will finish purging any residual air that may have been trapped in an individual air-handler.

8) Stop the circulation pump once all air bubbles are gone and the pump runs without cavitation.
9) Close the shut-off valve and disconnect the temporary filling station.
10) **For pressurized systems only.** After satisfactory purging of all air in the system, close valve on tee entry to the suction pump with pump running so as to build up maximum pressure in the system. Then if necessary increase pressure by opening valve to pressurized water system.

Refilling after leak

Never refill system with fresh water only; besure to always maintain glycol mixture ofbetween. 20 and 25% glycol - 75/80% freshwater.

Cooling Flow Rates

CHILLER	FLOW RATE	CHILLER	FLOW RATE
HCSC12/D	10 l/min (2.64 gl. min)	HCSC96/D Twin Scr	60 l/min (15.85 gl. min)
HCSC16/D	12 l/min (3.17 gl. min)	HCSC100/D Quattro	60 l/min (15.85 gl. min)
HCSC20/D	14 l/min (3.69 gl. min)	HCSC108/D Tri Scr	66 l/min (17.43 gl. min)
HCSC24/D	15 l/min (3.96 gl. min)	HCSC120/D Quattro	72 l/min (19.02 gl. min)
HCSC30/D	18 l/min (4.75 gl. min)	HCSC126/D Tri Scr	78 l/min (20.60 gl. min)
HCSC36/D	22 l/min (5.81 gl. min)	HCSC144/D Tri Scr	90 l/min (23.77 gl. min)
HCSC42/D	26 l/min (6.86 gl. min)	HCSC180/D Tri Scr	108 l/min (28.53 gl. min)
HCSC48/D	30 l/min (7.92 gl. min)	HCSC216/D Tri Scr	120 l/min (31.70 gl. min)
HCSC24/D Twin	20 l/min (5.28 gl. min)	HCSC252/D Tri Scr	135 l/min (35.66 gl. min)
HCSC32/D Twin	24 l/min (6.34 gl. min)	HCSC240/D Quattro	140 l/min (36.98 gl. min)
HCSC40/D Twin	28 l/min (7.39 gl. min)	HCSC288/D Quattro	160 l/min (42.26 gl. min)
HCSC50/D Twin	30 l/min (7.92 gl. min)	HCSC336/D Quattro:	180 l/min (47.55 gl. min)
HCSC60/D Twin	36 l/min (9.51 gl. min)	HCSC384/D Quattro	200 l/min (52.83 gl. min)
HCSC72/D Twin/Tri	45 l/min (11.88 gl. min)	HCSC448/D Quattro	230 l/min (60.75 gl. min)
HCSC80/D Quattro	56 l/min (14.79 gl. min)	HCSC504/D Quattro	250 l/min (66.04 gl. min)
HCSC84/D Twin Scr	52 l/min (13.73 gl. min)	HCSC572/D Quattro	280 l/min (73.96 gl. min)
HCSC90/D Tri	54 l/min (14.26 gl. min)		

Fig. 32

Air Ducting - Ventilation

Air-Ducts

Flexible air-ducts need to be of good quality with sufficiently strong steel or plastic reinforcement. Spiral type ducts should be extended to their maximum possible length to obtain max. interior smoothness. For very long duct sections preference should be given to rigid ducts (in PVC for example) which offer a far greater smoothness than flexible spiral type ducting and therefore will greatly reduce internal friction. It is advisable to use insulted type ducts to avoid condensation on the outside of the air-ducts.

ATTENTION

- *Do not restrict air flow by bending the air-ducts too tightly or by accidental deformation.*
- *Do not install air-ducts of excessive lengths (+ 2.5 m or 8.2 ft.); the pressure loss and consequent reduction of air-flow will seriously diminish the efficiency of the installation.*

Minimum Air Grill Sections

In order to obtain an acceptable noise level at max. blower speed certain requirements regarding grill and duct sections should be observed. Also, the size of the transition box behind the supply air grill is important. See table 2. to select correct grill sections according to BTU rating.

Table 2: Air Duct Requirements

AIR HANDLER-WBCC MODEL	SUPPLY AIR GRILL MODEL/SECTION	RETURN AIR GRILL MODEL/SECTION	DUCT DIAM. <1.8 M (6 ft.) DUCT Length	DUCT DIAM. >1.8 M (6 ft.) DUCT Length
4000/ 4500 BTU	1 x 8x4" 150 cm²	1 x 12x5" 325 cm²	80 mm (3 in.)	100 mm (4 in.)
6000 BTU	1 x 10x4" 190 cm²	1 x 11x8" 490 cm²	100 mm (4 in.)	125 mm (5 in.)
9000 BTU	1 x 12x4" 235 cm²	1 x 11x8" 490 cm²	100 mm (4 in.)	125 mm 5 in.)
12000 BTU	1 x 10x5" 250 cm²	1 x 14x7" 550 cm²	125 mm (5 in.)	150 mm (6 in.)
16000 BTU or	1 x 12x6" 390 cm²	1 x 14x10" 800 cm²	125 mm (5 in.)	150 mm (6 in.)
16000 BTU	2 x 10x4" 380 cm²		125 mm (5 in.)	150 mm (6 in.)
24000 BTU	2 x 10x5" 500 cm²	1 x 14x12" 1000 cm²	2 x 125 mm (5 in.)	2 x 150 mm (6 in.)
32000 BTU	2 x 12x5" 650 cm²	2 x 14x10" 1600 cm²	2 x 125 mm (5 in.)	2 x 150 mm (6 in.)
NOTE: For duct lengths over 1.80 ml, it may be possible to use the nominal duct diameter (for example 100 mm - 6000 BTU model), if instead of spiral type flexible ducts, rigid perfectly smooth interior ducts are used.				

Blower Outlets

ATTENTION

Avoid 90° turns directly from blower outlets all costs as they introduce severe restrictions in the air flow.

All WEBASTO blowers (except on 24000 BTU models) can be rotated through 45° steps so as to obtain a straight-line outlet from the blower. See Figure 33 for approved installation.

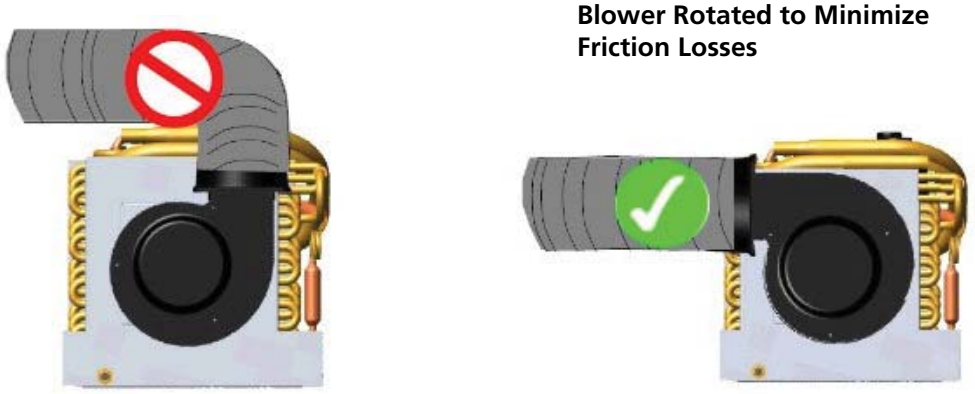
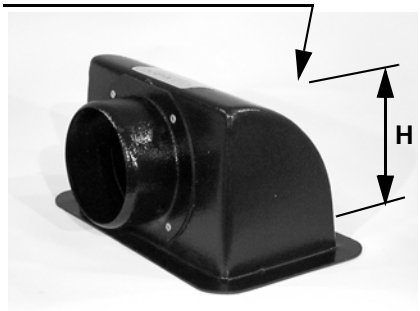


Figure 33. Rotating Blower Outlet

Transition Boxes

Transition boxes behind supply air grills serve as an expansion area for the air flow. They reduce the velocity of the air flow and therefore reduce air noise when crossing the outlet louvres. The depth of the transition box is an important factor to allow dispersion of the air flow. The table below gives the necessary information as to the minimum dimensions advisable for such transition boxes.

Deflection curve for longitudinal entry transition boxes



DUCT DIAM.	MINIMUM VALUE OF "H"
80 mm (3 in.)	100 mm (4 in.)
100 mm (4 in.)	120 mm (4.75 in.)
125 mm (5 in.)	140 mm (5.5 in.)
150 mm (6 in.)	165 mm (6.5 in.)

Figure 34. Transition Box Information

Return Grill Offset

It is best to avoid placing a return air grill directly opposite the finned coil surface of an air-handler. This will inevitably allow propagation of direct blower motor noise through the grill. Always try to offset the grill so the return air does not flow directly to the coil inlet. This will lower direct noise propagation significantly.
Install the return air grill as low as possible, in such a way that it is protected for the intake of dust etc. Try to maintain a 10cm free space from the floor.

Air Outlet Grill

The air outlet grill must be placed as high as possible. Position the louvers so that they are "user friendly". Do not point them directly to body's, stoves, control panels etc. Do not under size the grills and hoses.
Figure 35 is an example how it must **not** be done.


Fig. 35

Air-Handlers

Air-handlers can be located in: wardrobe closets; under seats; under the births, ect.

ATTENTION

- *Ensure the blower outlet is correctly positioned.*
- *Isolate the drip pan and extend the condensation drain.*

Air-Handler Coils

The finned coils of the evaporators and/or air-handlers are fragile. Realign the fins if damaged during installation to ensure proper air flow.
Return air should be filtered to avoid accumulation of dust on the coil fins. This can be obtained by 2 means:

- Install WEBASTO supplied return air grills which include a filter element behind the grills.
- Install a filtering element just in front of the return air coil surface. Such filter material can be also obtained from WEBASTO Marine.

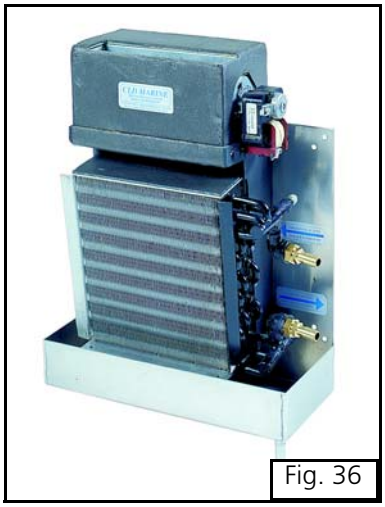


Fig. 36

Air-Handler Water Flow Rates:

Model/BTU	Flow Rate
4000/4500	5 L / min (1.32 gl. min)
6000	6 L / min (1.58 gl. min)
9000	9 L / min (2.37 gl. min)
12000	11 L / min (2.90 gl. min)
16000	15 L / min (3.96 gl. min)
20000	17 L / min (4.49 gl. min)
24000	20 L / min (5.28 gl. min)
30000	24 L / min (6.34 gl. min)
48000	40 L / min (10.56 gl. min)

Standard Electrical Accessories

Figure 37 contains the minimum standard control elements delivered with all WBCP units. Electrical contents: control box; display cable; digital control panel (external air sensor is optional).

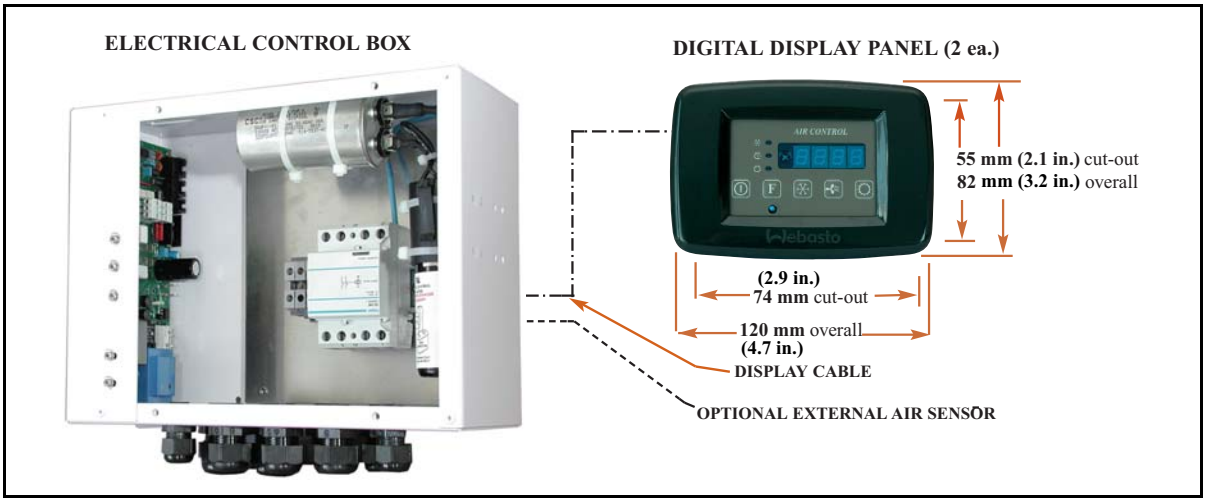


Figure 37. Minimum Standard Control Elements

Digital Display Panel

Install the digital display in a location free from outside influences, i.e.:

- Direct sunlight
- heaters
- stoves
- lights; etc.

The external temperature sensor should be used if any of the aforementioned conditions could not be avoided.

DIP Switches

The TCC controller card has a dip switch arrangement which should be set and maintained according to the number of compressors on line.

ATTENTION

- If DIP SWITCHES are not set according to the number of compressors effectively on line, the TCC controller card may behave in unpredictable manner
- The initialization <init> can not be completed
- Card remains locked on startup.
- HP/BP alarms for non-existing compressors

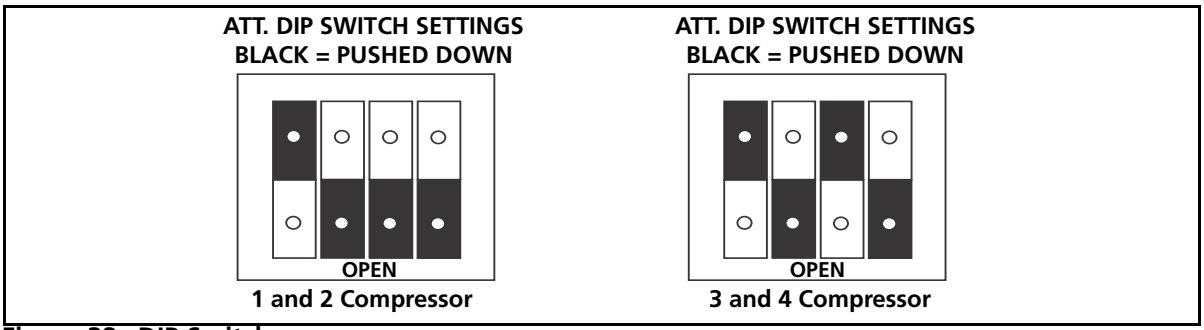


Figure 38. DIP Switches

Minimum Cable Sections per Chiller Model (Ground Wires not shown)

Table 3:

Model Description	Voltage	Phase	Section mm2
SINGLE COMPRESSOR UNITS			
WBCP20 - SCROLL	230	1	2 x 2.5 mm2
WBCP24 - SCROLL	230	1	2 x 2.5 mm2
WBCP30 - SCROLL	230	1	2 x 4 mm2
WBCP36 - SCROLL	230	1	2 x 4 mm2
WBCP42 - SCROLL	230	1	2 x 6 mm2
WBCP48 - SCROLL	230	1	2 x 6 mm2
TWIN COMPRESSOR UNITS (CI models - 2 independent refrigerant circuits)(Section per Compressor - for single supply line increase section accordingly)			
WBCP40/D TWIN SCROLL	230	1	2 x 2.5 mm2
WBCP52/D TWIN SCROLL	230	1	2 x 2.5 mm2
WBCP64/D TWIN SCROLL	230	1	2 x 4 mm2
WBCP72/D TWIN SCROLL	230	1	2 x 4 mm2
WBCP84/D TWIN SCROLL	230	1	2 x 6 mm2
WBCP96/D TWIN SCROLL	230	1	2 x 6 mm2
WBCP84/D TWIN SCROLL	400	3	3 x 2.5 mm2
WBCP96/D TWIN SCROLL	400	3	3 x 2.5 mm2
TRI-COMPRESSOR UNITS (CI models - 3/4 independent refrigerant circuits)(Section per Compressor - for single supply line increase section accordingly)			
WBCP108/D TRI SCROLL	230	1	2 x 4 mm2
WBCP126/D TRI SCROLL	230	1	2 x 6 mm2“
WBCP126/D TRI SCROLL	400	3	3 x 2.5 mm2
WBCP144/D TRI SCROLL	230	1	2 x 6 mm2
WBCP144/D TRI SCROLL	400	3	3 x 2.5 mm2
WBCP180/D TRI SCROLL	400	3	3 x 4 mm2
WBCP216/D TRI SCROLL	400	3	3 x 4 mm2
WBCP252/D TRI SCROLL	400	3	3 x 6 mm2
WBCP288/D QUATRO SCRL	400	3	3 x 4 mm2
WBCP336/D QUATRO	400	3	3 x 6 mm2

Programming Access

Entering Programming Mode

To enter programming mode:

1. Turn on the unit by pressing the <On / Off> key (5).
2. Raise or lower the setpoint temperature to 29° C (84° F) or 15° C (59° F).
3. Turn off system by pressing the <On / Off> key (5).

ATTENTION

The first time you press the On / Off key after raising or lowering the setpoint the display may read "NENO", if so press the On / Off key again and the unit will turn off.

Perform steps 4. and 5. only if the chiller digital display was previously code locked.

4. Press <snow> and <sun> keys (2 & 3) simultaneously and hold them until the word "CODE" is visible on the display (1).
5. Press and hold the <sun> key (2) until 64 appears on the display (1) and then press the <F> key (4). Now you are in the deep programming mode. To validate and memorize modified parameters press the <F> key (4) and proceed to the following programming line.

Figure 39. Using Digital Display to Access Programming

Accessing Hidden Programming

To gain access to the hidden programming functions proceed as following:

1. Raise setpoint to max. value, i.e. 84° F (29°C) (or alternatively to lowest value i.e. 59° F (15°C) - push Off key (5) to extinguish digital display.
2. Press <snow> and <sun> keys (3) simultaneously for approx. 3 seconds until you see to the left of the display window a single number code indicating the programming line presently valid and to the right the programming value.
3. To go to the next programming line, push the <F> key (4).

ATTENTION

If you modify the programming value of any line, you need to validate this new value by pushing the <F> key again to move to the next line. This step will validate and memorize the changes made.

Re-initializing of Factory Default Settings

It is possible to force the program to reinitialize all program values to factory default settings by the following procedure:

1. When reading the <b> line as above (through the 84° F (29° C) setpoint), push the <sun> key until the program version starts to flash. Keep the <sun> key pushed down until the display shows <init>.
2. Leave programming mode by pushing On/Off key - you are now back to the factory default settings.

Table 4: Description of Chiller Control Programming Codes - setpoint at 84° F (29° C)

Code #	Factory Setting	Description	Optional Settings
Functions accessible by raising the setpoint to 84° F (29° C)			
Code <0 >	39° F (+4° C)	Lower set-point temperature of the chilled water circuit when in cool cycle. This value gives the compressor cut-out point when in cool cycle.	Adjustment range: between 32° F (0°C) and59° F (+15° C).
Code <1 >	45° F (+7° C)	Higher set-point temperature of the chilled water circuit when in cool cycle. This value gives the re-start point of the compressor(s) after a thermostatic interruption (in cool cycle).	Adjustment range: between 2°C and +18°C.
Code <2 >	104° F (40° C)	Higher set-point temperature of the chilled water circuit when in heat cycle. This value gives the cut-out point of the compressor(s) when functioning in heat cycle.	Adjustment range: between 86° and 31° F (30° and 55° C).
Code <3 >	99° F (37° C)	Lower set-point temperature of the chiller water circuit when in heat cycle. This value gives the re-start point of the compressor(s) after a thermostatic interruption (in heat cycle).	Adjustment range: between 80° F (27° C) and 125°F (52° C)
Code <4 >	0	Calibration of the chilled water circuit temperature.	Adjustment range: between 16° to 48° F (-9° to +9° C)
Code <5 >	15	Time delay in minutes before the digital display goes into blank/sleep mode. Cycle LED flashes discretely to indicate system is operational.	
Code <6 >	1	First start up delay in seconds after connecting AC supply. To stage starting of several WBCC units when switching on AC supply after an interruption.	Adjustment range: between 1 and 20 seconds.
Code <7 >	0 Correction	Calibration of room temperature readout.	Adjustment range: between 48° and 16° F (+9° and -9° C).
Code <8 >	0	Factory calibration of AC voltage 50 Hz as displayed on the digital panel when accessing the secondary commands - F/Blower key.	Adjustment range: between -20 and +20 Volt.

Table 4: Description of Chiller Control Programming Codes - setpoint at 84° F (29° C)

Code #	Factory Setting	Description	Optional Settings
Code <9 >	0	Functioning principle of staging relay:0 = relay functions as a staging relay.	1 = functions as the outlet control for a solenoid valve system for the air-handlers directly controlled by the main TECC controller. 2 = functions as a witness for a system halt and general alarm (A01,A02,A09,etc) Contacts closed between C2 and R2 or contacts open between C2 and T2 = no alarm Contacts open between C2 and R2 or contacts closed between C2 and T2 = general alarm and system halt.
Code <A>	0	Factory calibration of AC voltage 60 Hz as displayed on the digital panel when accessing the secondary commands by the F key.	Adjustment range: between -30 and +20 Volt
Code <b >	Program version		

Table 5: Description of Chiller Control Programming Codes - setpoint at 59° F (15°C)

Code #	Factory Setting	Description	Optional Settings
Functions accessible when lowering the setpoint temperature to 59° F (15°C)			
Code <0 >	195V AC for 230V units 90V AC for 115V units	Low voltage cutout value. Time delay is 5 seconds approx. i.e. the low voltage situation will have to persist during more than 5 seconds before cutout occurs. After cutout the electronic controller resets and will start a new cycle. So a renewed attempt to start the compressor will occur after approx. 90 seconds. During low voltage cutout the display panel will show the 3 letters <AAA>.	**Note:** Compressor manufacturers decline all responsibility for defects resulting from operating the compressors below recommended voltage levels. Do not lower factory settings.
Code <1 >	0	Infrared remote control 0 = Infrared remote control disabled (in this mode no interference is possible with other Infrared commands)	1 = Infrared remote control active
Code <2 >	0	Choice of small relay setting indicating cool/ heat cycle operation or alarm status. 0 = cycle indication: • Contacts closed between C1 and T1 = heat cycle • Contacts closed between C1 and R1 = cool cycle • System Halt: contacts closed between C1and R1.	1 = alarm status. Relay functions as a witness for a system halt and general alarm (A01,A02,A09,etc) Contacts closed between C1 and R1 or contacts open between C1 and T1 = no alarm Contacts open between C1 and R1 or contacts closed between C1 and T1 =general alarm and system halt.
Code <3 >	0	Blower Settings: 0 = thermostatic control of blower operation i.e. blower operation will be interrupted thermostatically when reaching the appropriate set-point.	1 = uninterrupted blower operation regardless of the thermostatic control.
Code <4 >	0	Choice between integrated air sensor and external air sensor: 0 = external air sensor.	1 = air sensor integrated in digital display
Code <5 >	0	Celsius or Fahrenheit display 0 = Celsius	1 = Fahrenheit
Code <6 >	Modification speed No. 5 (max)		
Code <7 >	Modification speed No. 4		

Table 5: Description of Chiller Control Programming Codes - setpoint at 59° F (15°C)

Code #	Factory Setting	Description	Optional Settings
Code <8 >	Modification speed No. 3		
Code <9 >	Modification speed No. 2		
Code <A>	Modification speed No. 1		
Code <b >	64	Access code for programming mode. **Note:** If the system is locked and the access code cannot be found, you can access the programming line by using the factory code number:64	0 = No access code required. 1 to 99 = access code/number activated.
Code <c >	1	Duration in minutes of heat cycle operation under the dehumidifying cycle.	
Code <d >	1	Duration in minutes of cool cycle operation under the dehumidifying cycle.	

Table 6: Description of Blower Control Programming Codes - setpoint at 84° F (29° C)

Code #	Factory Setting	Description	Optional Settings
Functions accessible by raising the setpoint to 84° F (29° C)			
Code <4 >	0	Calibration of the chilled water circuit temperature.	Adjustment range: between 16° to 48° F (-9° to +9° C)
Code <5 >	15	Time delay in minutes before the digital display goes into blank/sleep mode. Cycle LED flashes discretely to indicate system is operational.	
Code <7 >	0 Correction	Calibration of room temperature readout.	Adjustment range: between 48° and 16° F (+9° and -9° C).
Code <8 >	0	Factory calibration of AC voltage 50 Hz as displayed on the digital panel when accessing the secondary commands - F/Blower key.	Adjustment range: between -20 and +20 Volt.
Code <b >	Program version		

Table 7: Description of Blower Control Programming Codes - setpoint at 59° F (15°C)

Code #	Factory Setting	Description	Optional Settings
Functions accessible when lowering the setpoint temperature to 59° F (15°C)			
Code <1 >	0	Infrared remote control 0 = Infrared remote control disabled (in this mode no interference is possible with other Infrared commands)	1 = Infrared remote control active
Code <2 >	1	Blower type: Centrifugal or Cross-Flow. 1 = centrifugal + cross-flow	0 = centrifugal blowers only
Code <3 >	0	Blower Settings: 0 = thermostatic control of blower operation i.e. blower operation will be interrupted thermostatically when reaching the appropriate set-point.	1 = uninterrupted blower operation regardless of the thermostatic control.
Code <4 >	0	Choice between integrated air sensor and external air sensor: 0 = external air sensor.	1 = air sensor integrated in digital display
Code <5 >	0	Celsius or Fahrenheit display 0 = Celsius	1 = Fahrenheit
Code <6 >	Modification speed No. 5 (max)		
Code <7 >	Modification speed No. 4		
Code <8 >	Modification speed No. 3		
Code <9 >	Modification speed No. 2		
Code <A>	Modification speed No. 1		
Code <c >	1	Duration in minutes of heat cycle operation under the dehumidifying cycle.	
Code <d >	1	Duration in minutes of cool cycle operation under the dehumidifying cycle.	

Blower Speed Setting Calibration (Chiller and Cabin Controls)

ATTENTION

Never program speeds so low that the blower is in danger of stopping or will not re-start at that setting. This will inevitably entail motor-windings burn-out and will not be covered by WEBASTO warranty.

Maintenance and Routine Checks:

When starting up an air conditioning unit it is advisable to carry out a certain number of routine checks to ensure proper functioning of the unit:

1. Always clean the sea water strainer and check (especially after a long absence minimum once each week or more if needed) the functioning of the seawater cooling system. Immediately stop the system if no seawater comes out of the pump exit after compressor start up.
2. Periodically check the air filter in the return air grills for the air handlers, clean as needed using a vacuum or soap and water.
3. Check condensation drain from the evaporator and chiller drain pan.
4. Check air ducts for damage. A damaged air duct may stop air flow through the evaporator, freeze up the evaporator and subsequently damage the compressor.
5. When preparing for winter check the chilled water circuit and fill as needed with fresh water/glycol solution (up to 50% depending on local winter conditions) when filling the system. (NOTE: it is not necessary to flush the entire system each year only as needed)
6. Annually (or more if needed) have the sea water system flushed (acid flushed) to prevent sediment build up that can cause poor heat exchange and / or low water flow through the condenser.

Maintenance, Routine Checks and Troubleshooting:

CAUTION!

Always use genuine Webasto service and replacement parts to ensure trouble-free operation of the system.

ATTENTION

Some troubleshooting requires comprehensive knowledge about structure and theory of operation of the air conditioning components and should only be performed by authorized Webasto trained specialists.

1. No system operation: check main electrical supply, fuses, etc.
2. The digital display shows 3 letters <AAA>. This means a persistent state of low voltage (less than 195 V AC for 230V units and 90V AC for 115V units). The system will restart as soon as the voltage level climbs above cutout level and the system will then restart after a time-delay of 1 minute approx. (NOTE: System voltage cutout set to anything lower than 195 voids all warranty)
3. The compressor will start but no seawater circulation can be observed:
   - Check seacock (ball valve) to seawater pump to be certain it is open.
   - Check seawater strainer for restrictions and debris.
   - Check if pump motor runs and the impeller rotates. If the pump does not turn with the compressor working, check power supply from the main control unit box to the pump.

4. Compressor and pump work but no correct operation in either cool or heat cycle:
   - Check for proper air ventilation, blowers. If air flow completely stops with the compressor working, the evaporator coils may freeze up completely, obstructing all air circulation.
   - During the heat cycle with low seawater (flow) circulation you may actually freeze up the seawater in the cupro-nickel condenser and completely block the system.
   - Check voltage level. Do not operate a system with a persistent voltage level below 195V AC for 230V units and 90V AC for 115V units.
   - Check refrigerant charge if operation is still not satisfactory, after having checked all the above points. (NOTE: This should only be done by a certified refrigerant technician)
5. The compressor works but is subject to intermittent stops without having attained the desired setpoint temperature. The HP and LP (if present) pressure safety switches stop the compressor because of abnormal working pressures either on the high or on the low side.
   - Check for proper functioning of the cooling circuit.
   - Check ventilator/blower system for obstructions.
   - Check refrigerant charge (over-charge or insufficient charge level).
   - Check for Error codes / interrupted system operation.
6. The heat cycle takes very long to get started. Normal if the seawater temperature is very low. If seawater temperature drops below approx. 46° F (8° C) the heat cycle becomes much less effective and takes time to provide heat.
7. The heat cycle functions very well but the compressors stop by means of the high pressure safety switch. The heat cycle functions with a very high seawater temperature and therefore the high pressure side exceeds the safety limit. You may try to remedy this situation by slightly restricting the seawater flow but not so much as to freeze up the condenser. Do not forget to open up the seawater circulation again when switching back to <COOL>.

Visual Error Codes - Digital Display

The following malfunctions will be displayed directly on the digital display by a code and will be followed by a system halt (except for <bA11> and <cA11>). Whenever any of these codes appear the system is stopped for approx 60 seconds and then a restart is attempted. If for more than 30 minutes the same malfunction occurs, the system will be stopped completely and the error code will become steady. No more restarts will be attempted and the user will have to re-set the system by pushing the On/Off switch or by temporarily cutting out the AC supply to the system

Code A01 to A08 *: Pressure safety cutout of compressors 1 to 4.The HP (High Pressure) and LP (Low Pressure) (if present) safety controls are directly controlled by the micro-processor including the time-delays for restart, etc.*)

ATTENTION

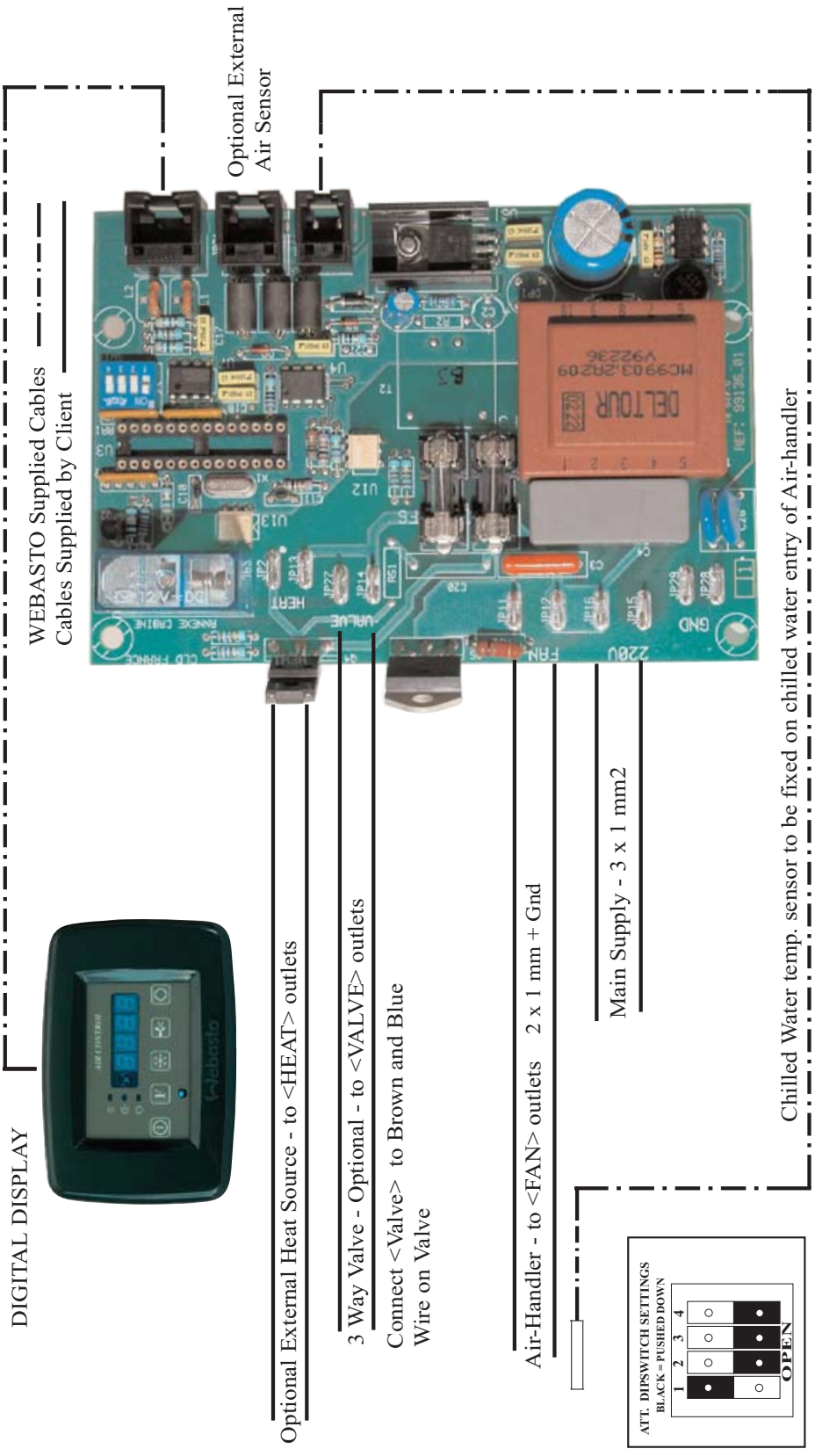
If any of these error codes appear too frequently and no appropriate action can be taken with the available means on board, it is necessary to call a specialist.

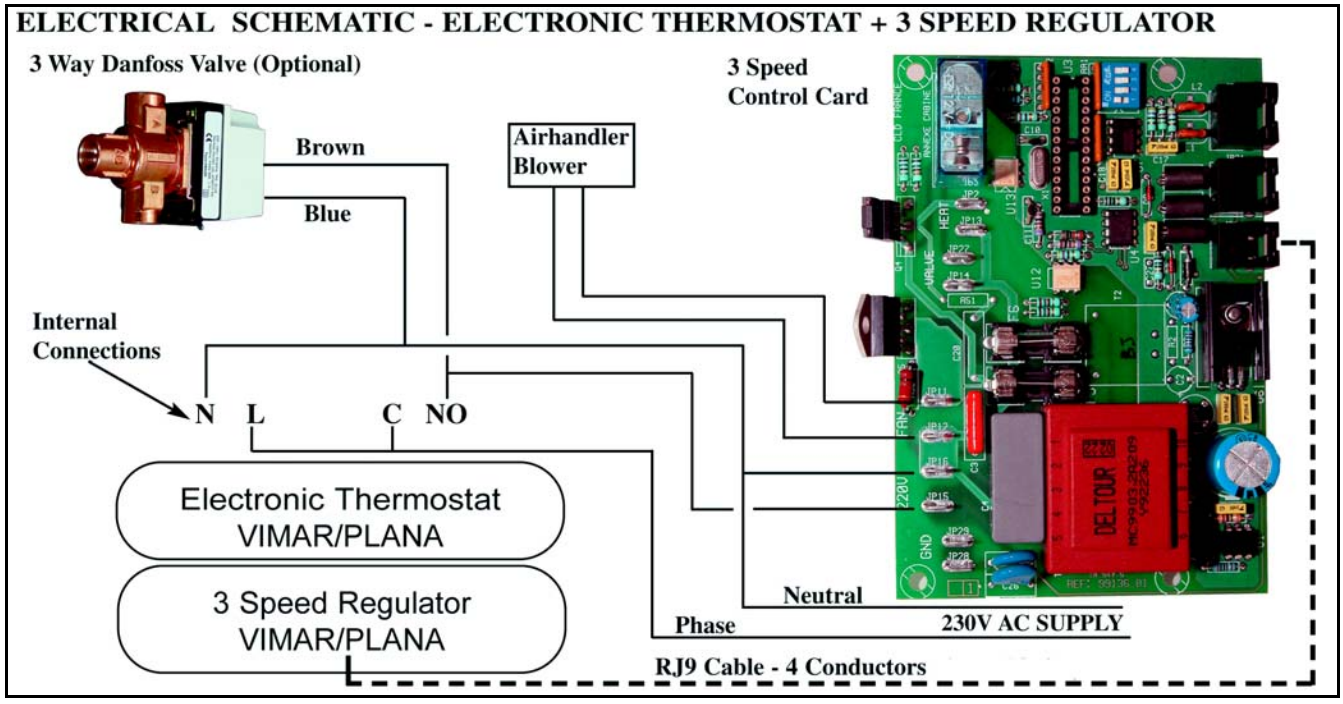
Do not persist with manual restarts in such cases as this may cause major damage to the principal components (compressors, pumps, etc.) Shut the system off and call a Webasto Authorized Dealer or call Webasto at – 1-800-860-7866

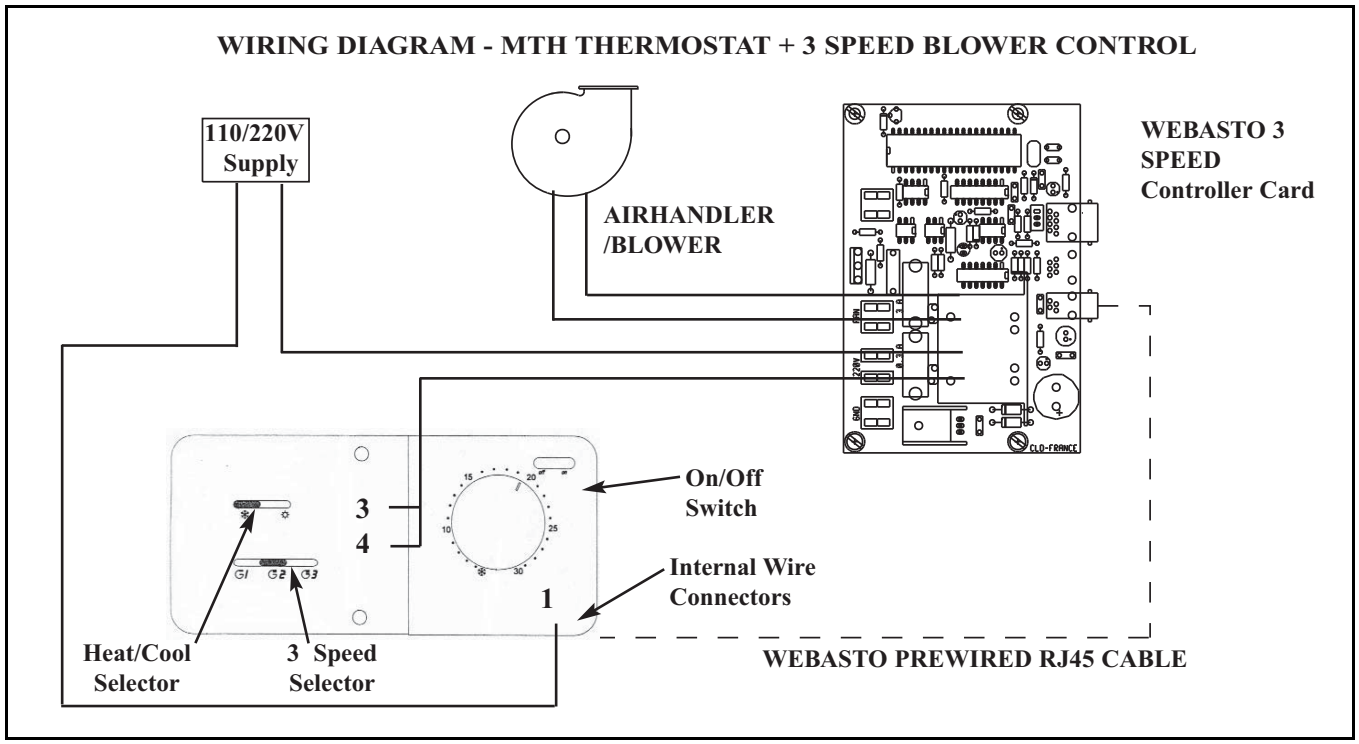
Table 8: Error Codes

Code	Description
Code <AAA>	Persistent low voltage (voltage below 195V AC for 230V units and 90V AC for 115V units) for more than 5 seconds.
<A01>	BP (low pressure) cut out - compressor 1 • Seawater circulation deficient when running in heat cycle mode • Insufficient refrigerant charging level. • Abnormal seawater temperature conditions in heat cycle (seawater temperatures under 43° F (6° C).approx.) • First startup in heat cycle with very low chilled water circuit temperatures (below 46° F (8°C) approx.).
<A02>	HP (high pressure) cut out - compressor 1 • Insufficient or non-existent seawater cooling, check seawater pump. • Too much refrigerant in system. Call a specialist! • Abnormal sea water temperature conditions in heat cycle (seawater temperatures above 63° F (17° C) approx.).
<A03>	BP cut out - compressor 2 • Insufficient refrigerant charging level. • Abnormal seawater temperature conditions in heat cycle (seawater temperatures under 43° F (6° C).approx.). • First startup in heat cycle with very low chilled water circuit temperatures (below 46° F (8°C) approx.).
<A04>	BP cut out - compressor 2 • Insufficient or non-existent seawater cooling, check seawater pump. • Too much refrigerant in system. • Abnormal sea water temperature conditions in heat cycle (seawater temperatures above 63° F (17° C) approx.).
<A05> to <A08>	Same as above for compressors 3 and 4 (if present).
<A09>	Absent or defective external or internal (Display Face) air sensor.
<A10>	Absent or defective chilled water sensor.
<bA11>	Blower operation from TECC card impossible because of non-compatible water temperature versus programmed set-point. This is the only error code which will not result in a complete system halt.
<CA11>	All compressor(s) have been deactivated by soft <F> procedure: <1C00>,<2C00>, etc. To re-activate, reprogram as follows: <1C01>,etc.

Digital Cabin Control Electrical and Other Connections - Cab

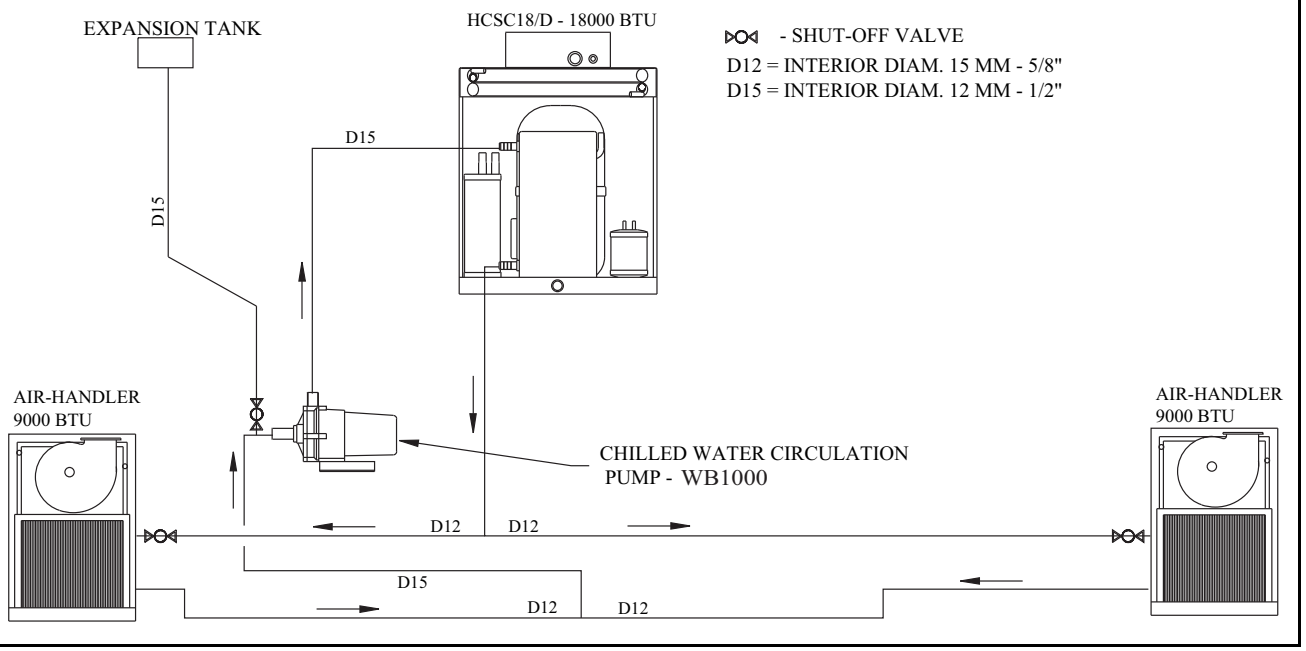



ELECTRICAL SCHEMATIC - ELECTRONIC THERMOSTAT + 3 SPEED REGULATOR
3 Way Danfoss Valve (Optional)
Brown
Blue
Airhandler Blower
3 Speed Control Card
Internal Connections
N
L
C
NO
Electronic Thermostat VIMAR/PLANA
3 Speed Regulator VIMAR/PLANA
Neutral
Phase
230V AC SUPPLY
RJ9 Cable - 4 Conductors

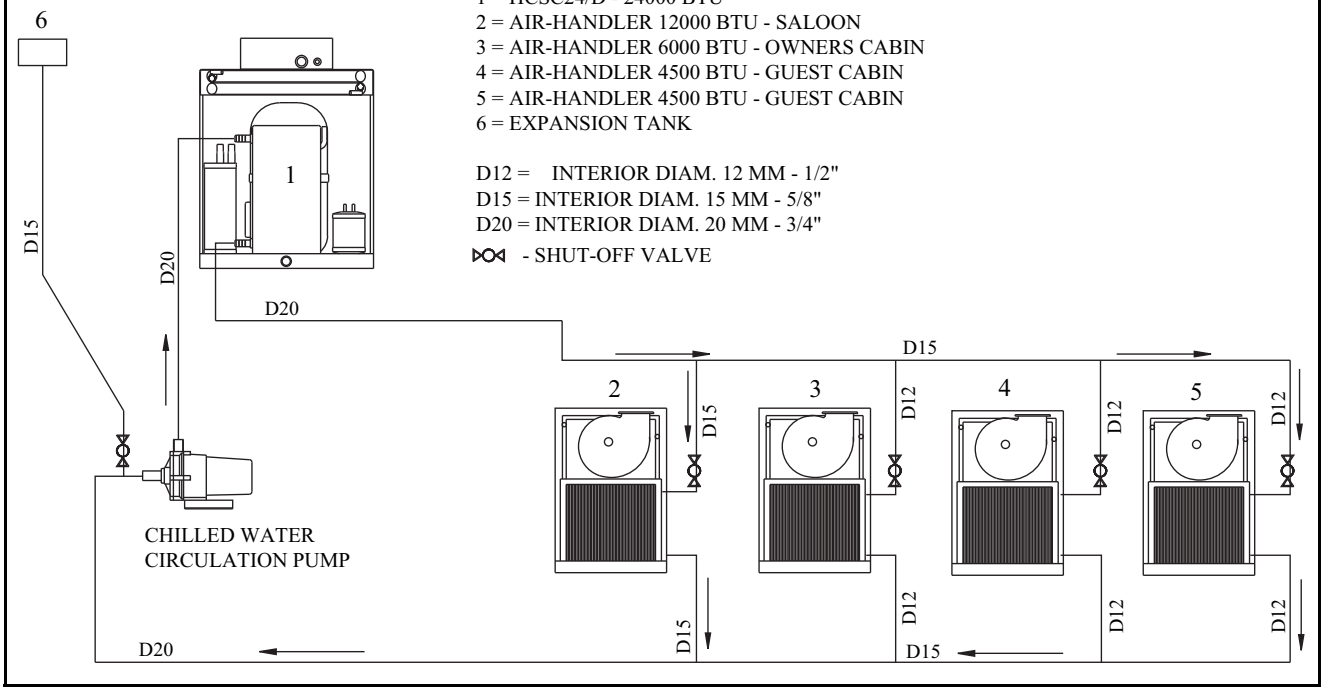

WIRING DIAGRAM - MTH THERMOSTAT + 3 SPEED BLOWER CONTROL
110/220V Supply
AIRHANDLER /BLOWER
WEBASTO 3 SPEED Controller Card
3
4
1
On/Off Switch
Internal Wire Connectors
Heat/Cool Selector
3 Speed Selector
WEBASTO PREWIRED RJ45 CABLE

TYPICAL SCHEMATIC EXAMPLES OF CHILLED WATER CIRCUITS

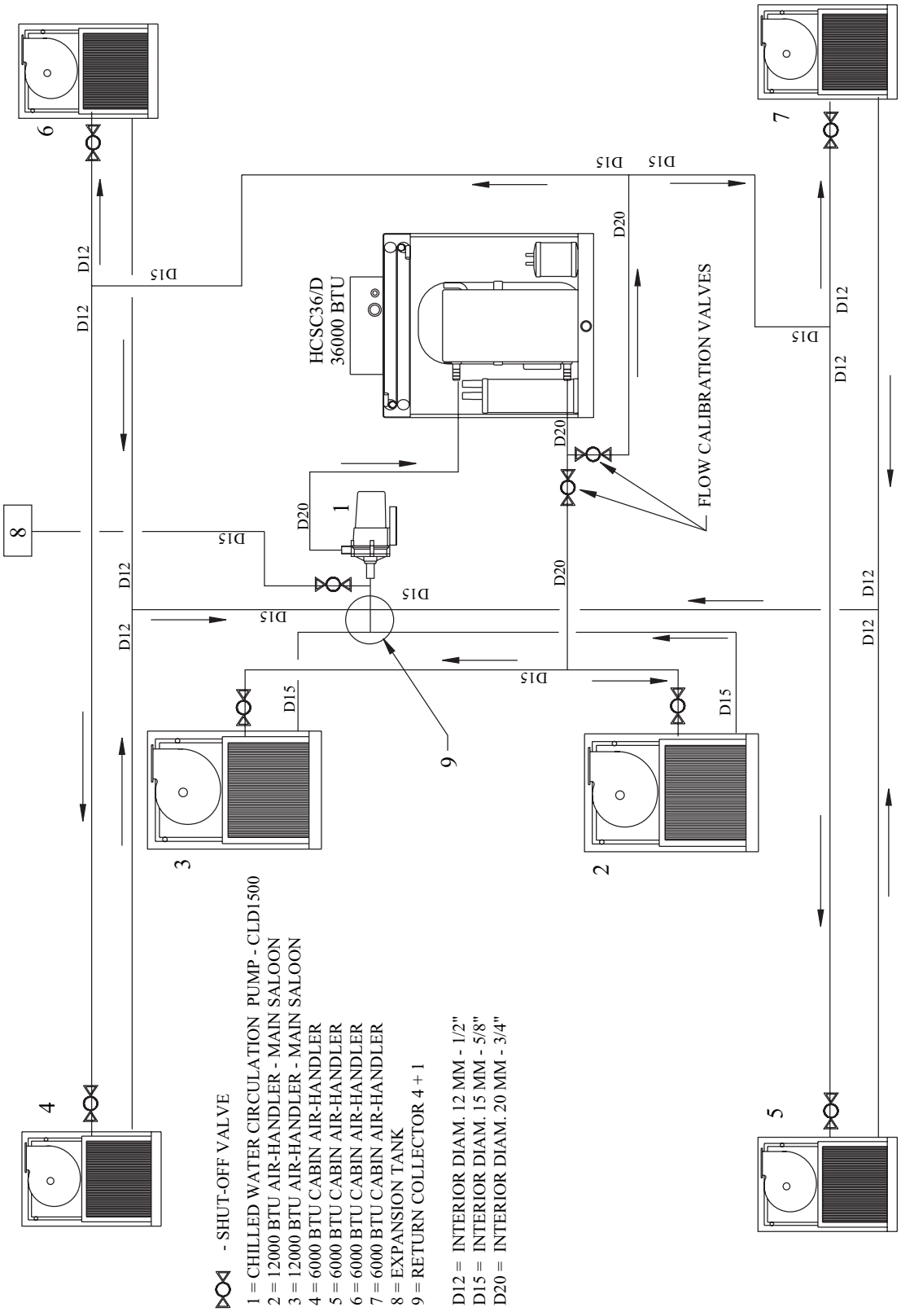
EXAMPLE N° 1 - SMALL 18000 BTU CHILLER - CENTRAL LOCATION + 2 AIR-HANDLERS



EXAMPLE N° 2 - MONO-HULL WITH WBCP24/D - STERN LOCATION + 4 AIR-HANDLERS



EXAMPLE N° 3 - CATAMARAN WITH WBCP36/D - CENTRAL LOCATION + 6 AIR-HANDLERS

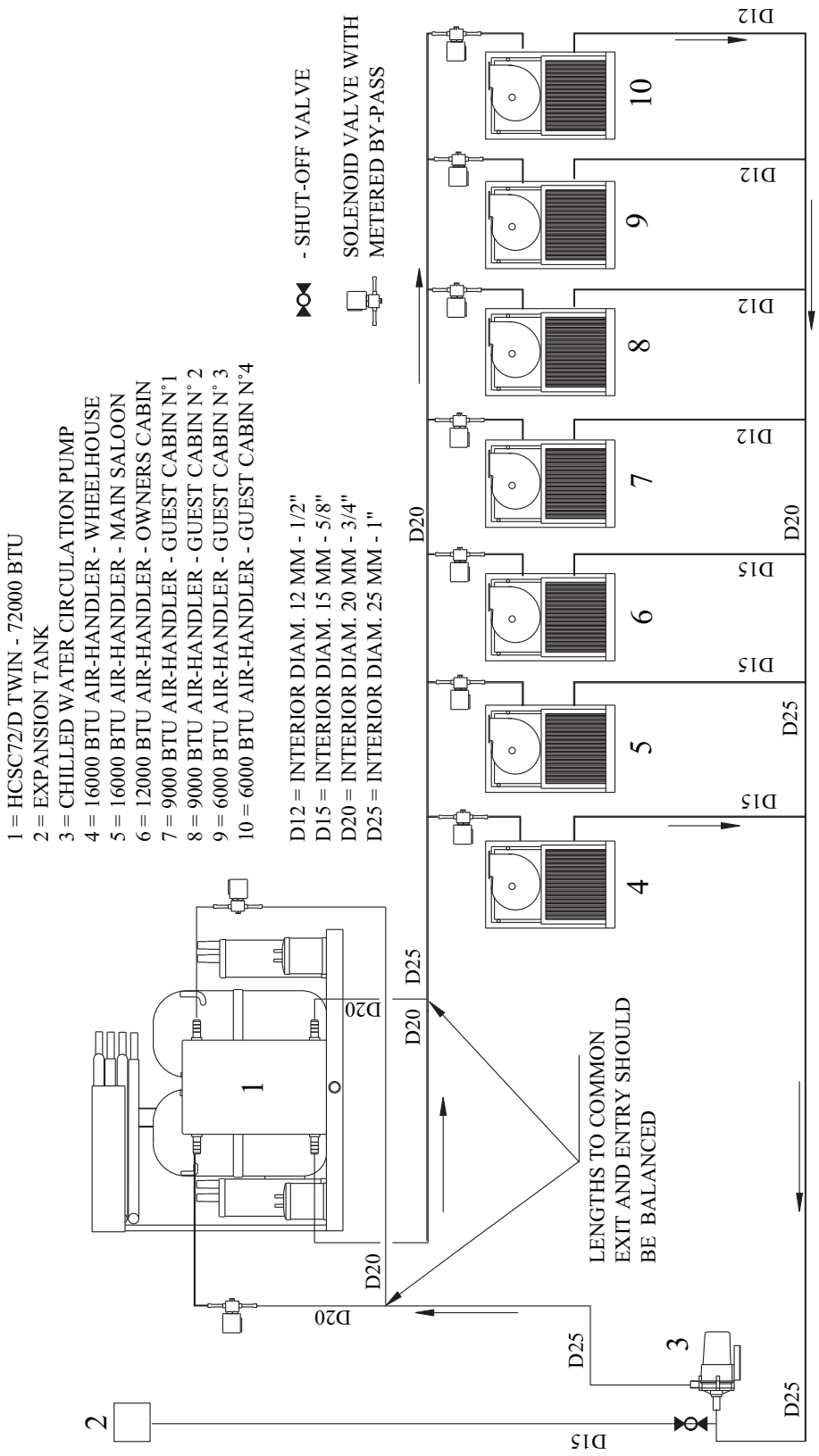


- SHUT-OFF VALVE

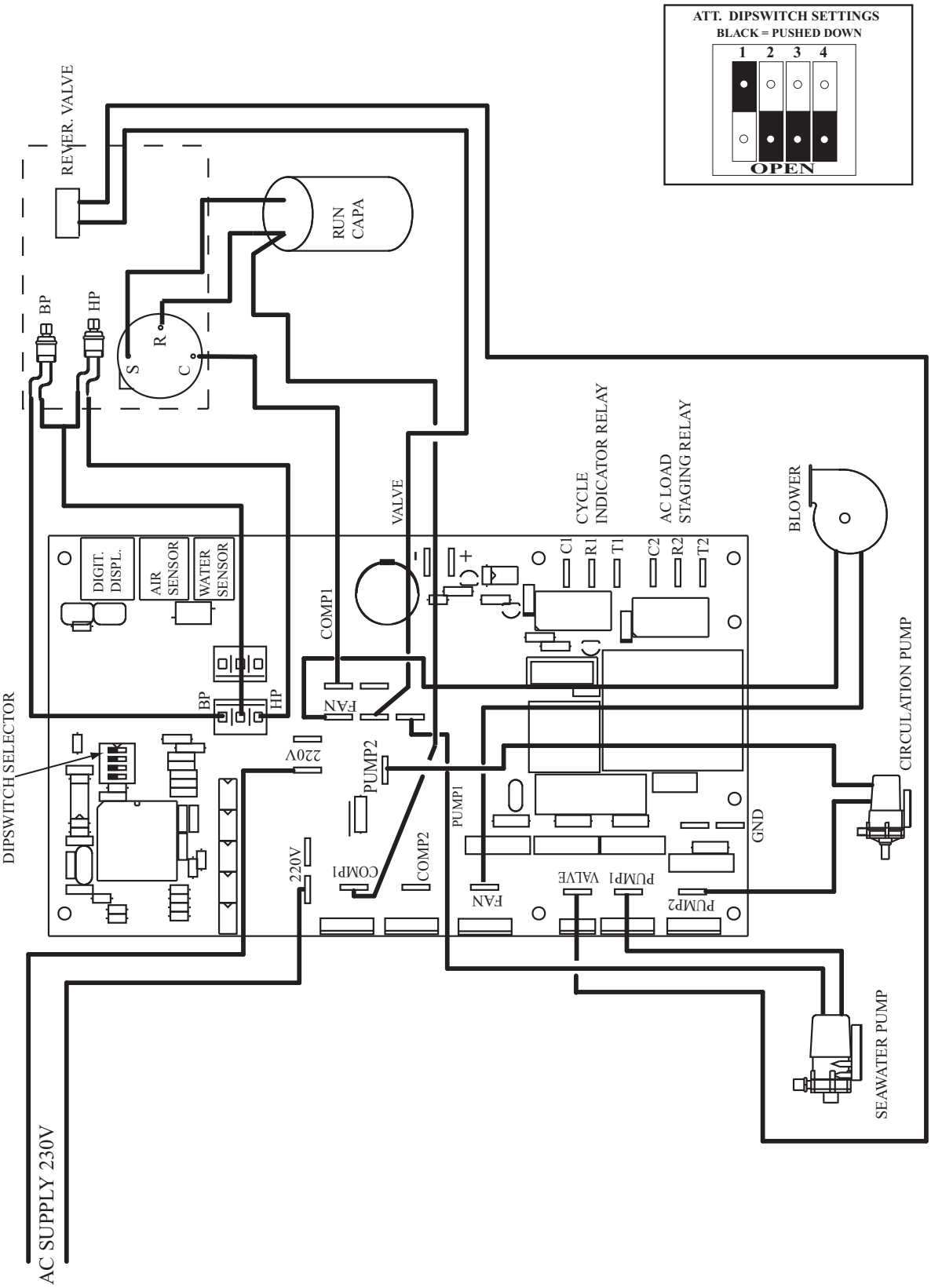
1 = CHILLED WATER CIRCULATION PUMP - CLD1500
2 = 12000 BTU AIR-HANDLER - MAIN SALOON
3 = 12000 BTU AIR-HANDLER - MAIN SALOON
4 = 6000 BTU CABIN AIR-HANDLER
5 = 6000 BTU CABIN AIR-HANDLER
6 = 6000 BTU CABIN AIR-HANDLER
7 = 6000 BTU CABIN AIR-HANDLER
8 = EXPANSION TANK
9 = RETURN COLLECTOR 4 + 1

D12 = INTERIOR DIAM. 12 MM - 1/2"
D15 = INTERIOR DIAM. 15 MM - 5/8"
D20 = INTERIOR DIAM. 20 MM - 3/4"

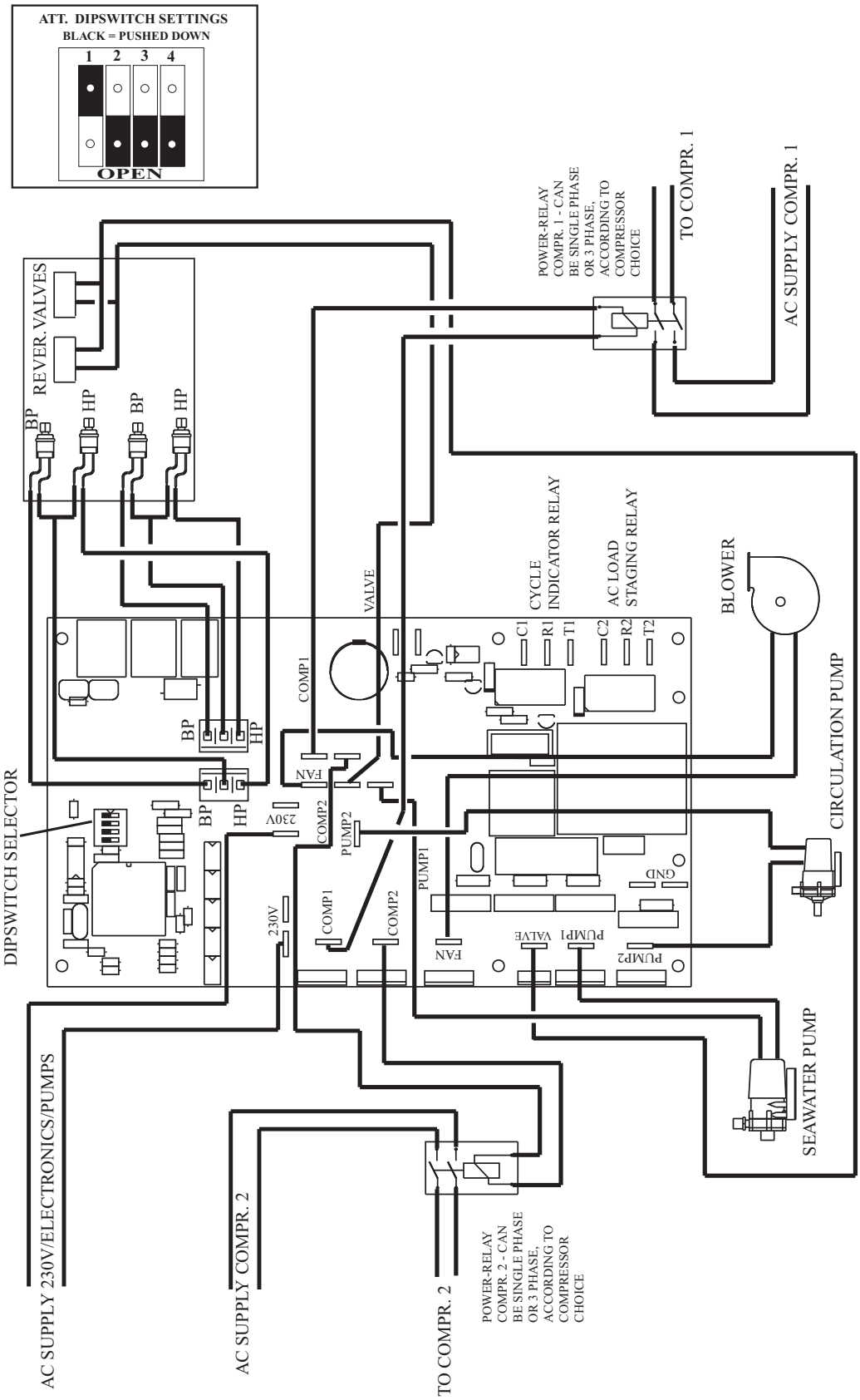
EXAMPLE N° 4 - M/Y WITH WBCP72/D TWIN - STERN LOCATION + 10 AIR-HANDLERS



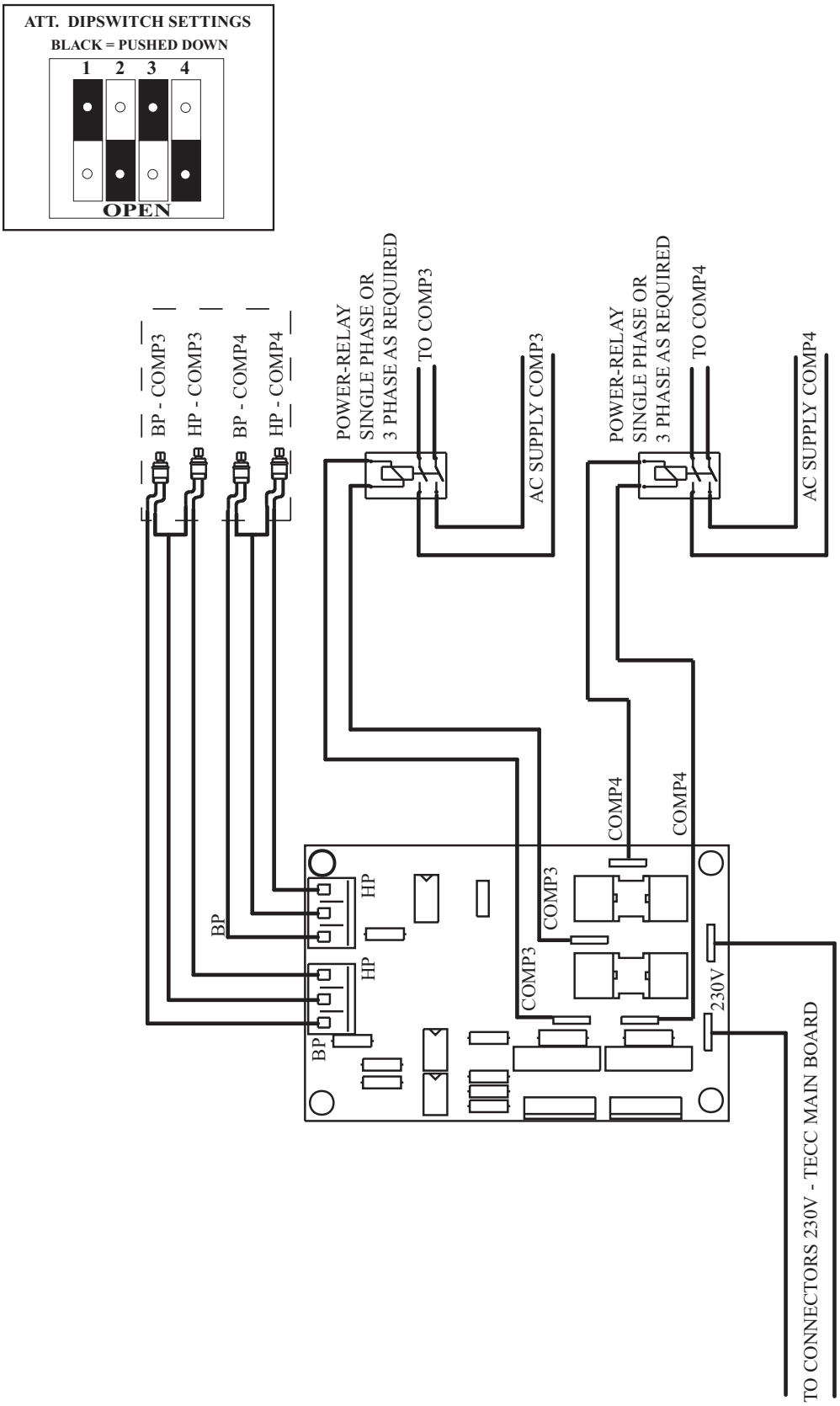
WIRING DIAGRAM WBCP UNITS - 230V 1 PHASE - 16000 TO 30000 BTU- 1 COMPRESSOR
(For single compressors 36 to 48000 BTU, a power-relay is used - refer to drawing on next page)



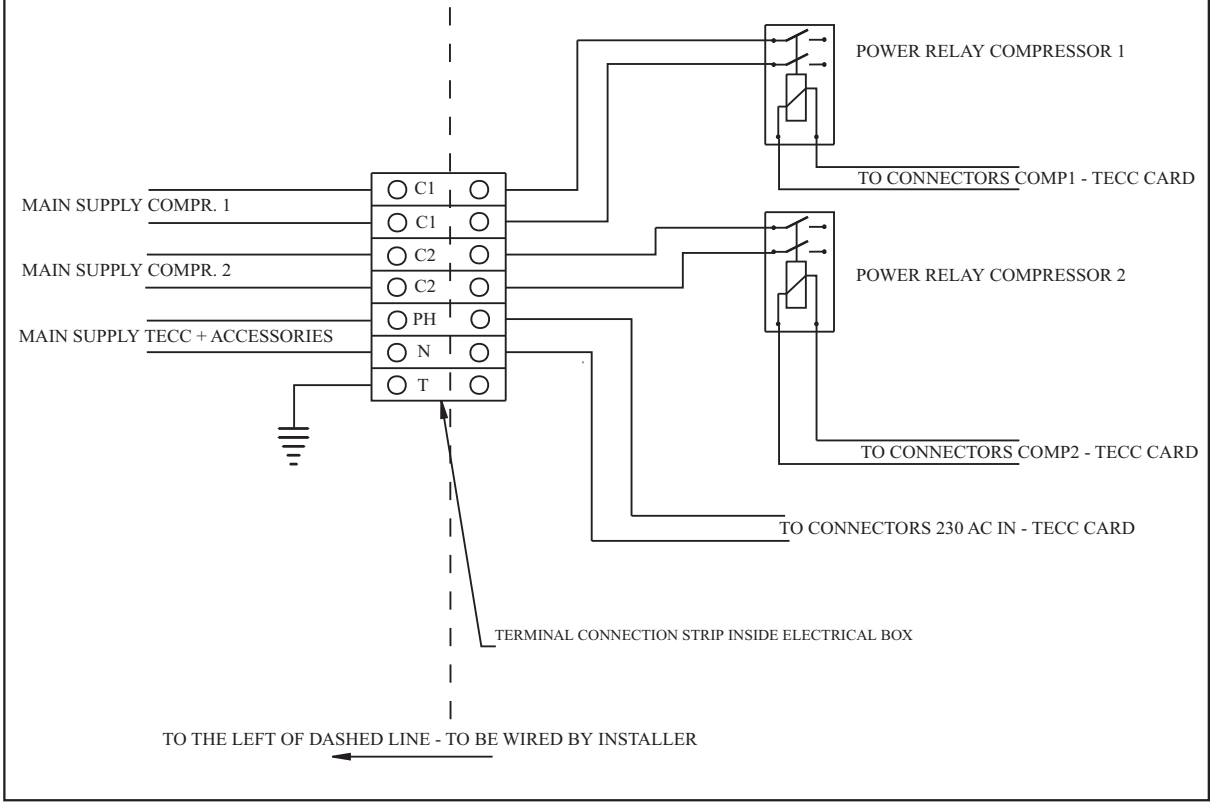
WIRING DIAGRAM WBCP CONDENSING UNITS - 1/3 PHASE - COMPRESSORS 1 AND 2



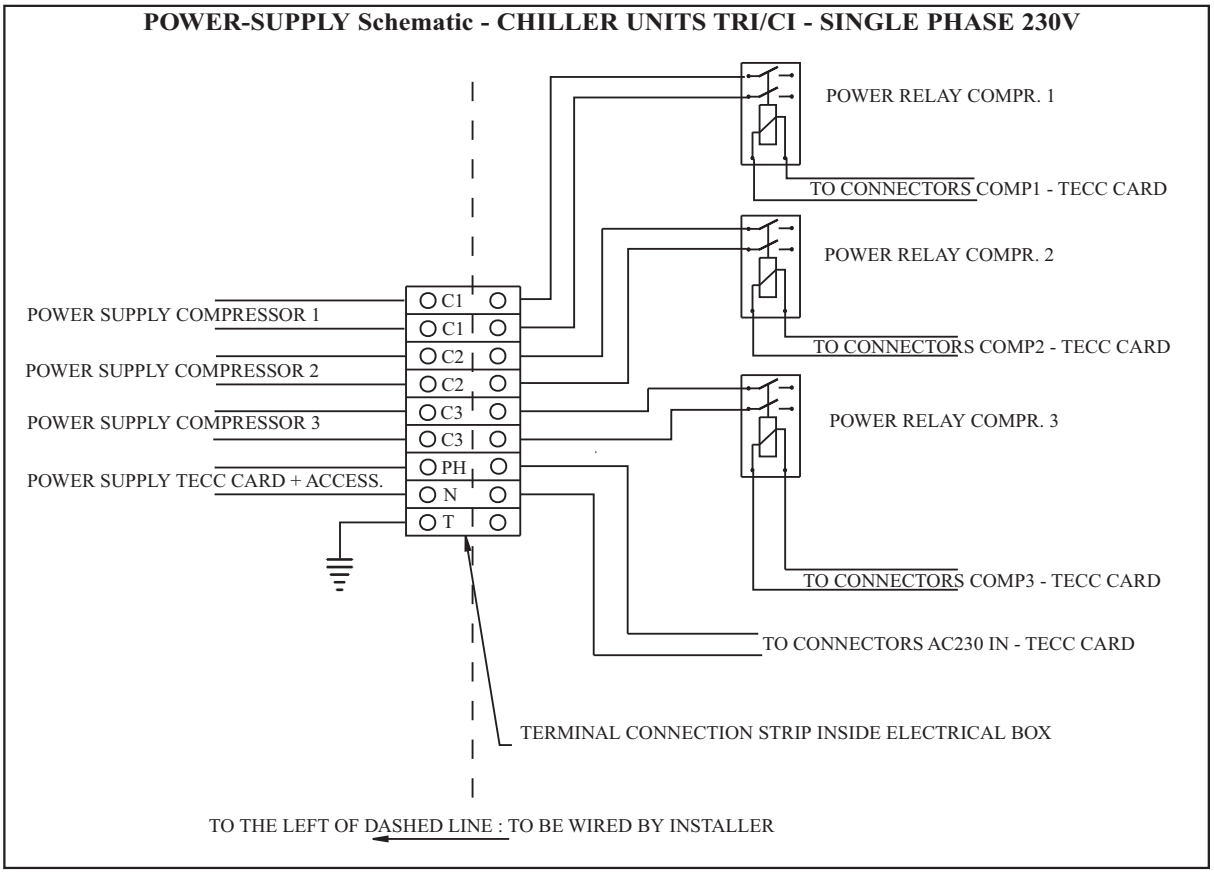
WIRING DIAGRAM WBCP CONDENSING UNITS - 1/ 3 PHASE - COMPRESSORS 3 AND 4



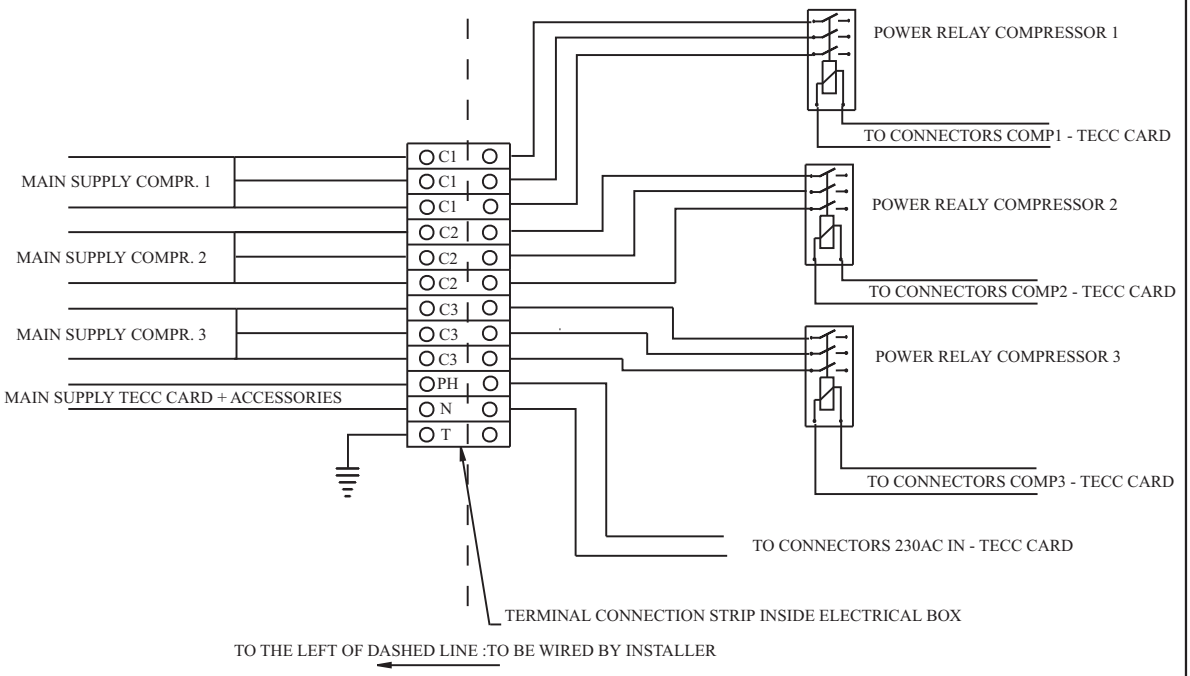
POWER-SUPPLY Schematic - CHILLER UNITS TWIN/CI - SINGLE PHASE 230V



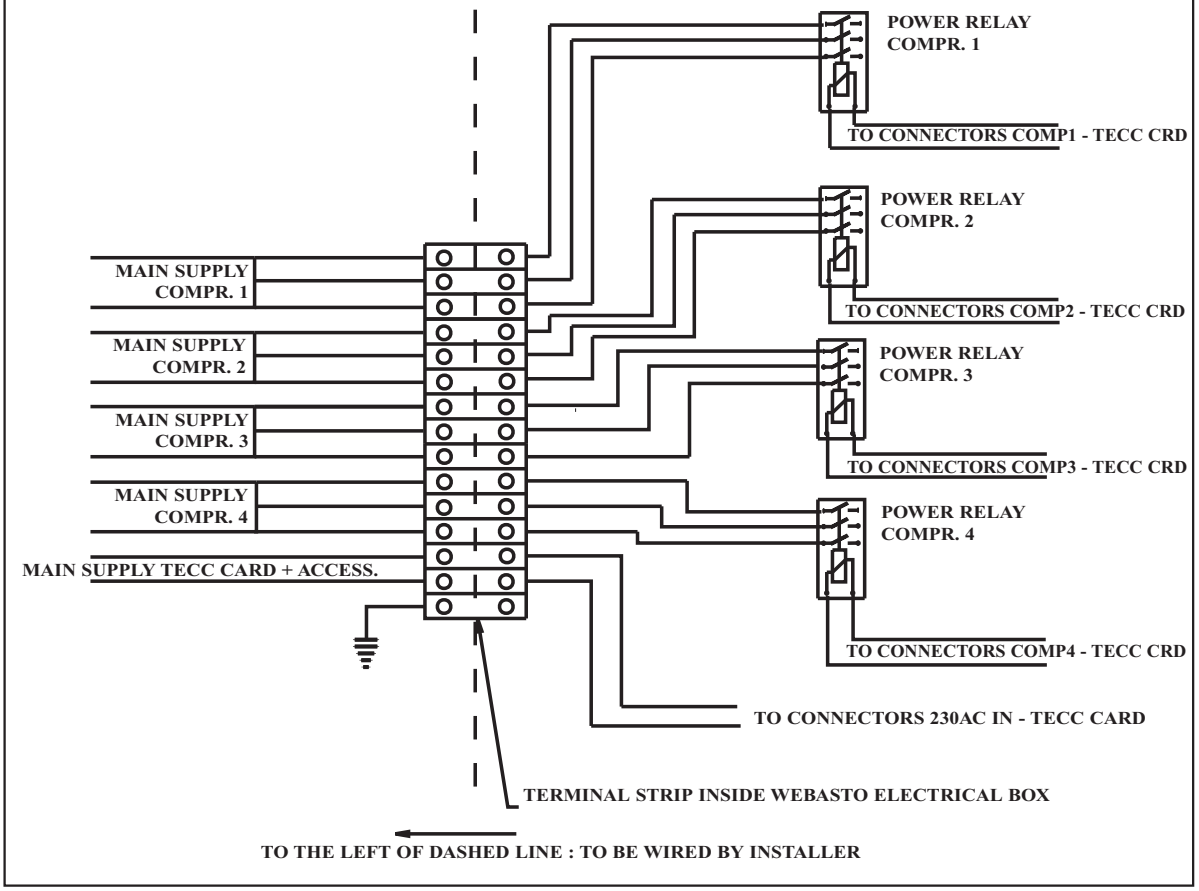
POWER-SUPPLY Schematic - CHILLER UNITS TRI/CI - SINGLE PHASE 230V



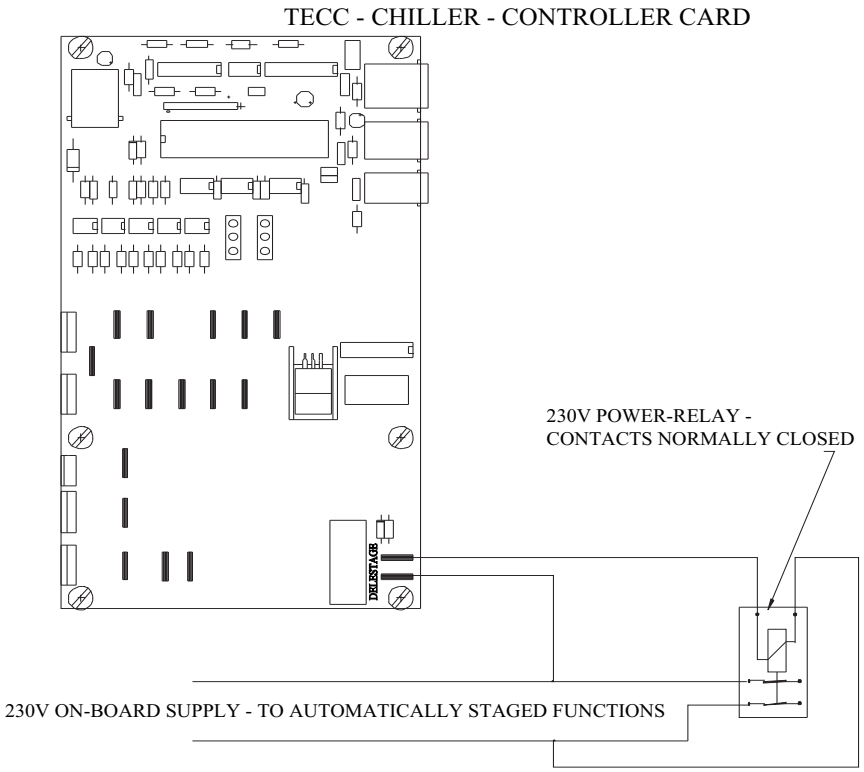
POWER-SUPPLY Schematic - CHILLER UNITS TRI/CI - 3 PHASE 400V



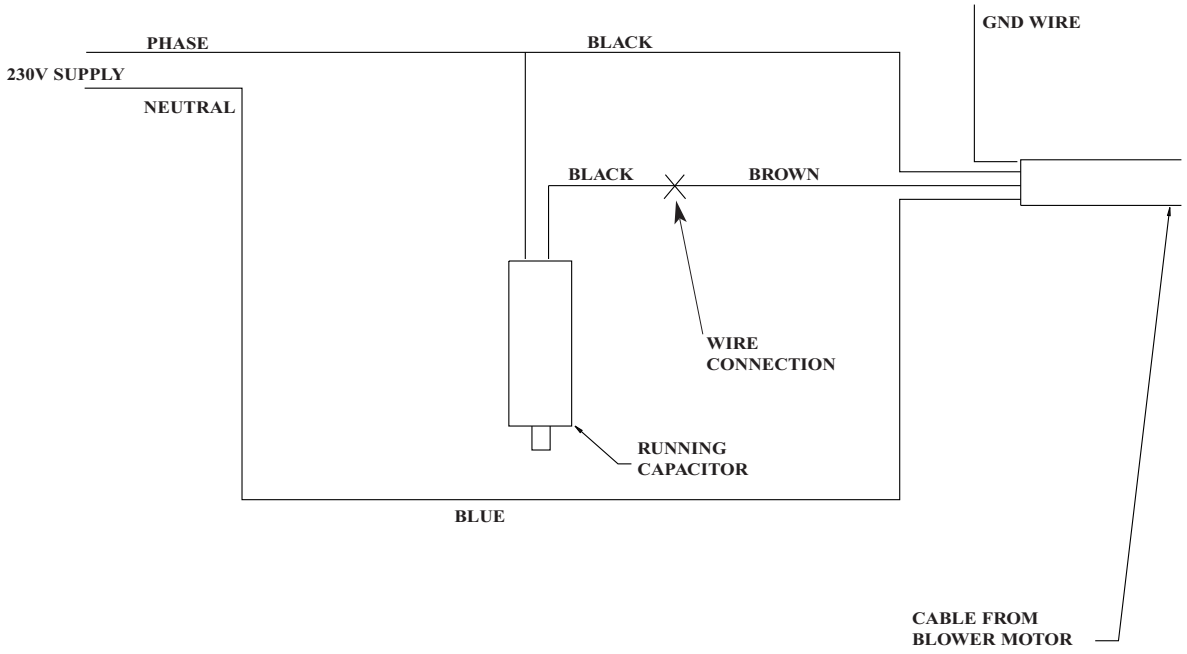
POWER-SUPPLY Schematic - CHILLER UNITS QUATRO/CI - 3 PHASE 400V



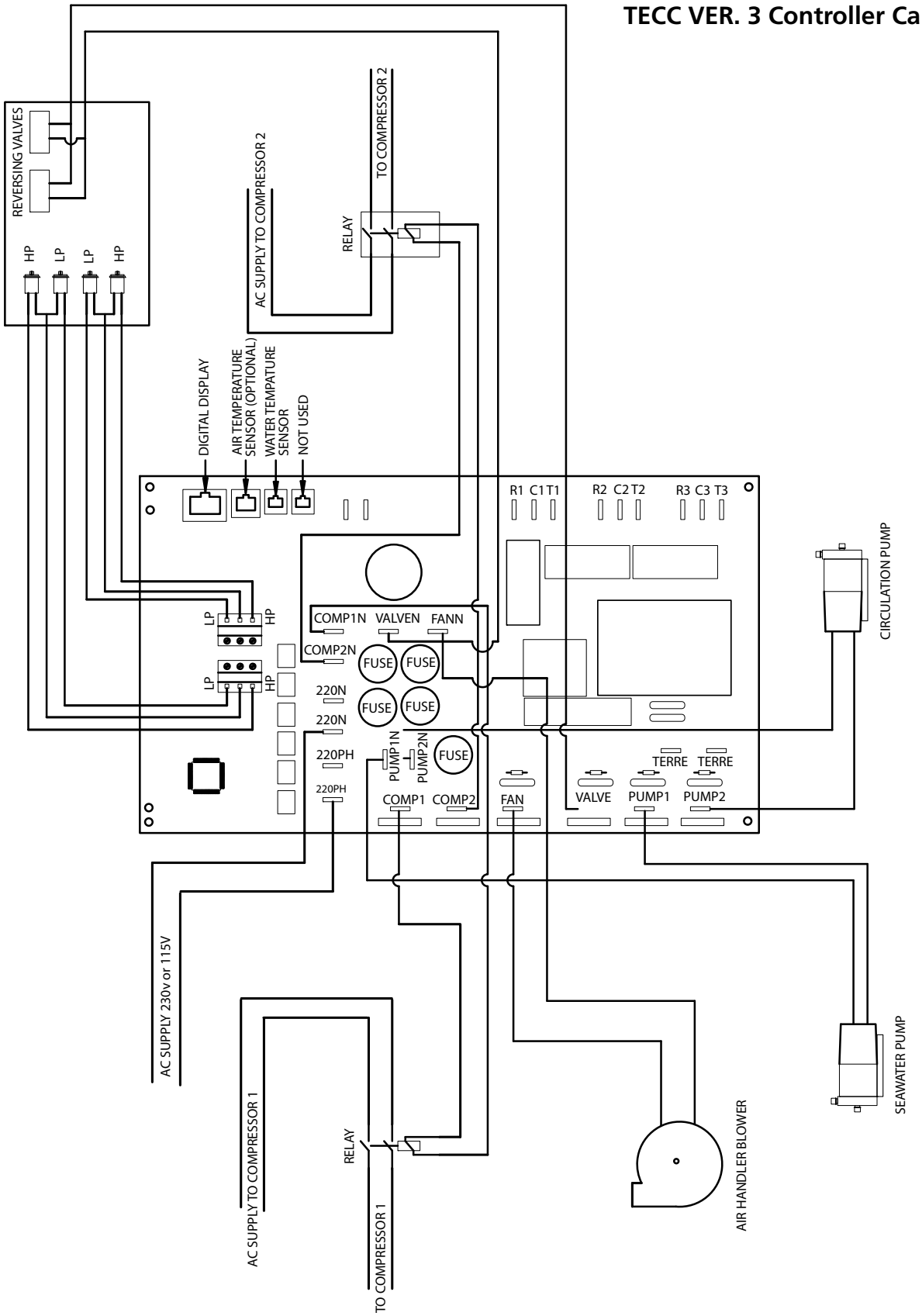
AUTOMATIC STAGING RELAY - SECONDARY 230V ON-BOARD FUNCTIONS



RUNNING CAPACITORS FOR BLOWER MOTORS -ECOFIT/EBM



TECC VER. 3 Controller Card



NOTES:

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	Unsatisfactory				**Excellent**
Please rate the overall usefulness of the documentation.	1	2	3	4	5
Rate the completeness and clarity of the instructions: did the procedures provide enough detail?	1	2	3	4	5

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