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MEGA CHILL



user manual

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MEGA CHILL



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1. INTRODUCTION



The Subzero 'MEGA CHILL' is a controller that integrates all the control functions required by a chiller. It is a complete, independent, rugged and highly reliable unit. It is one of the most efficient chiller controller of its kind in the country with the kind of features it provides.

A user friendly LCD screen displays all parameters and message alarms on the display. In addition to the LCD there are LED's provided for instant status of all controls in the system.

1.1 Main Features

The Mega Chill controller allows you to manage refrigeration units having different configurations.

- WATER condensation.
- AIR condensation.

System's Functions:

The system controls and regulates the following conditions :

- Water temperature according to the user's location of the sensor.
- Protection of the compressor with indication of any possible fault.
- Display of Device status on LCD and temperature on LED.
- Regulates level of water via a water solenoid valve.

1.2 Hardware Description

The basic system comprises of

- Mega Chill User interface
- Input / Output board

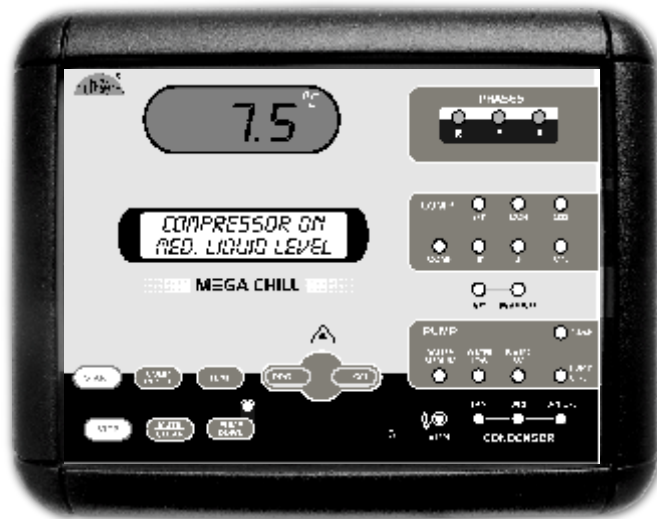
Mega chill is the intelligent part of the system. It also represents the 'user interface' for an easy communication between user and the controller.

2. Accessories in Box

1. Transformer
2. Sensor 2No.
3. Liquid Sensor 3No.
4. Catalogue
5. Prokey
6. Fitting Screw

3. Hardware

2.1 Mega Chill User Interface



Mega Chill User Interface is a user friendly board which integrates all controller keys, display LCD and display LEDs.

Liquid Crystal Display (LCD)

The LCD screen shows description of the controller parameters, and any other information concerning the controlled variables.

Display 2 rows X 16 characters
Character Size 5.56 X 2.96 mm

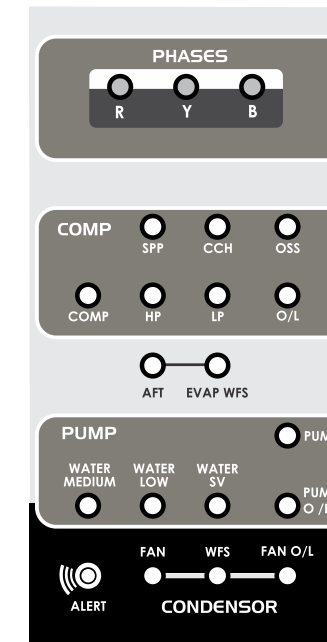
COMPRESSOR ON
 MED. LIQUID LEVEL

Liquid Crystal Display (LCD)

Light Emitting Diodes (LED)

There are 21 LED indications on the chiller front panel indicating:

- Phases - all 3 phases are displayed as Red, Yellow, Blue.
- Faults - Red blinking LED ALERT Indicates that there is a fault.
- Individual device fault - Red LED indicates that there is a fault in that particular device.
- Device OK status - Green LED indicates that the device is OK.



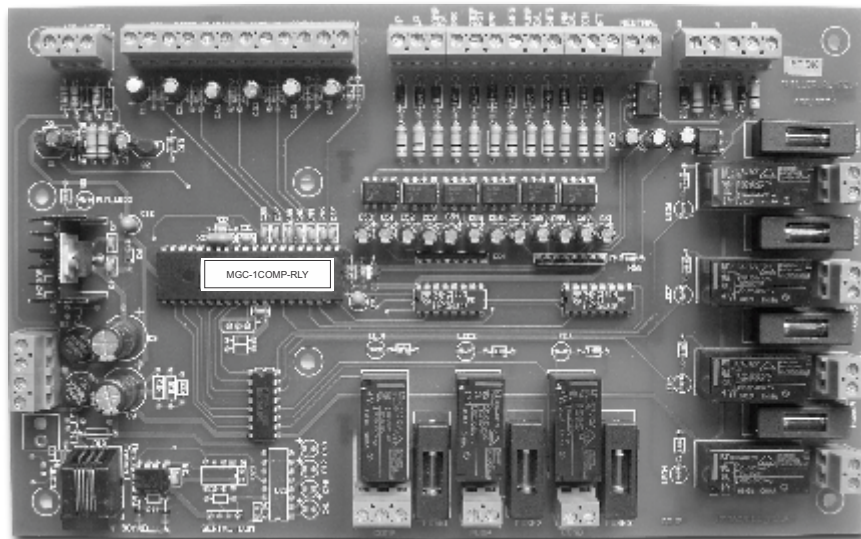
Light Emitting Diodes (LED)

2.2 Input/Output Board

The Relay board represents the core of the system, where the signals coming from the probes, digital inputs etc. are processed.

On this board you can locate :

1. Terminals for power source- 10Vac (yellow) & 9 Vac (red)
2. Liquid level sensor inputs (black wire)
3. Analog inputs (sensors)
4. Digital Inputs (alarms)
5. Digital outputs (relay)
6. Telephone connector for user interface connection.



Input/ Output

2.3 Sensors

Japanese NTC thermistors, housed in a water proof I.P. 68 metal casing.



(Custom made sensors are available in various sizes and material)

2.4 Prokey

This hardware key enables the manufacturer to enter programming Level 2.



Prokey
(Only for equipment manufacturer)

2.5 Transformer

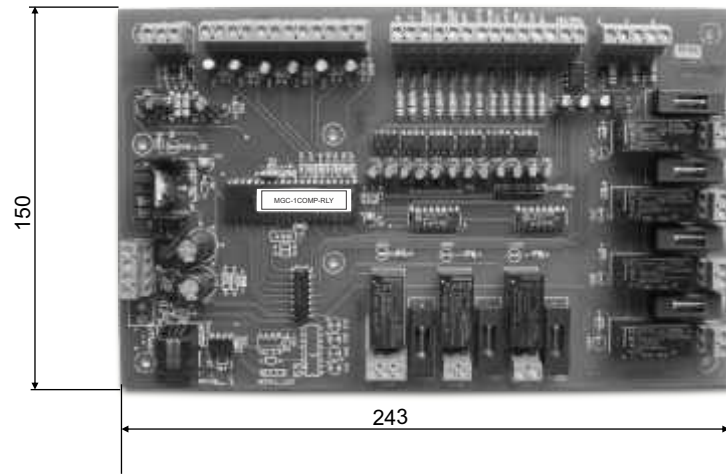
System uses a highly reliable R core transformer as it's power supply source.



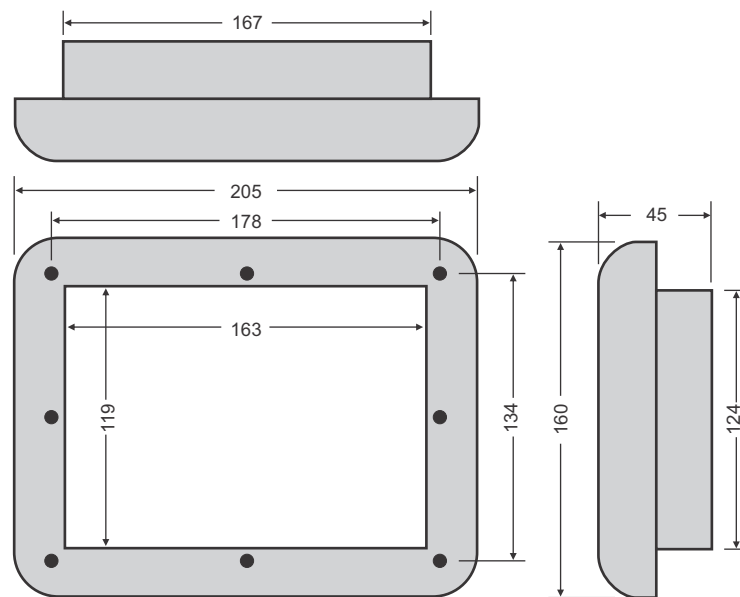
Transformer

2.6 Dimensions

Input / Output Board

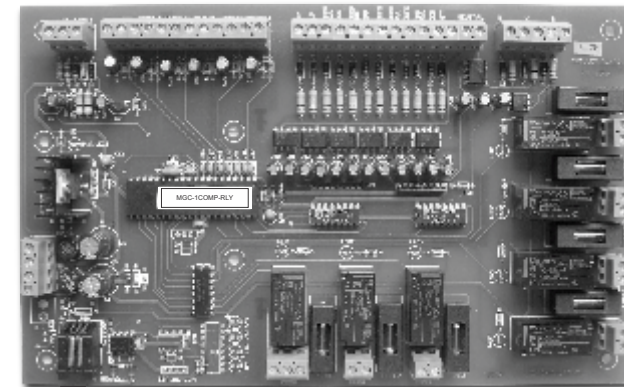


Mega Chill User Interface

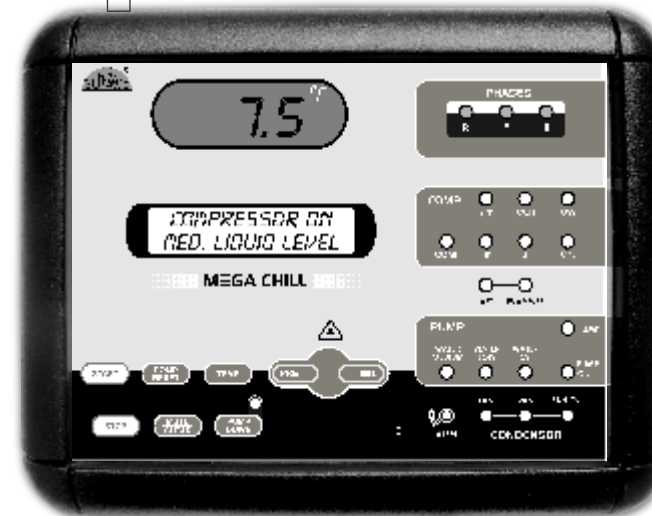


Panel cutout 124 mm X 167 mm (All dimensions in mm)

2.7 Connections

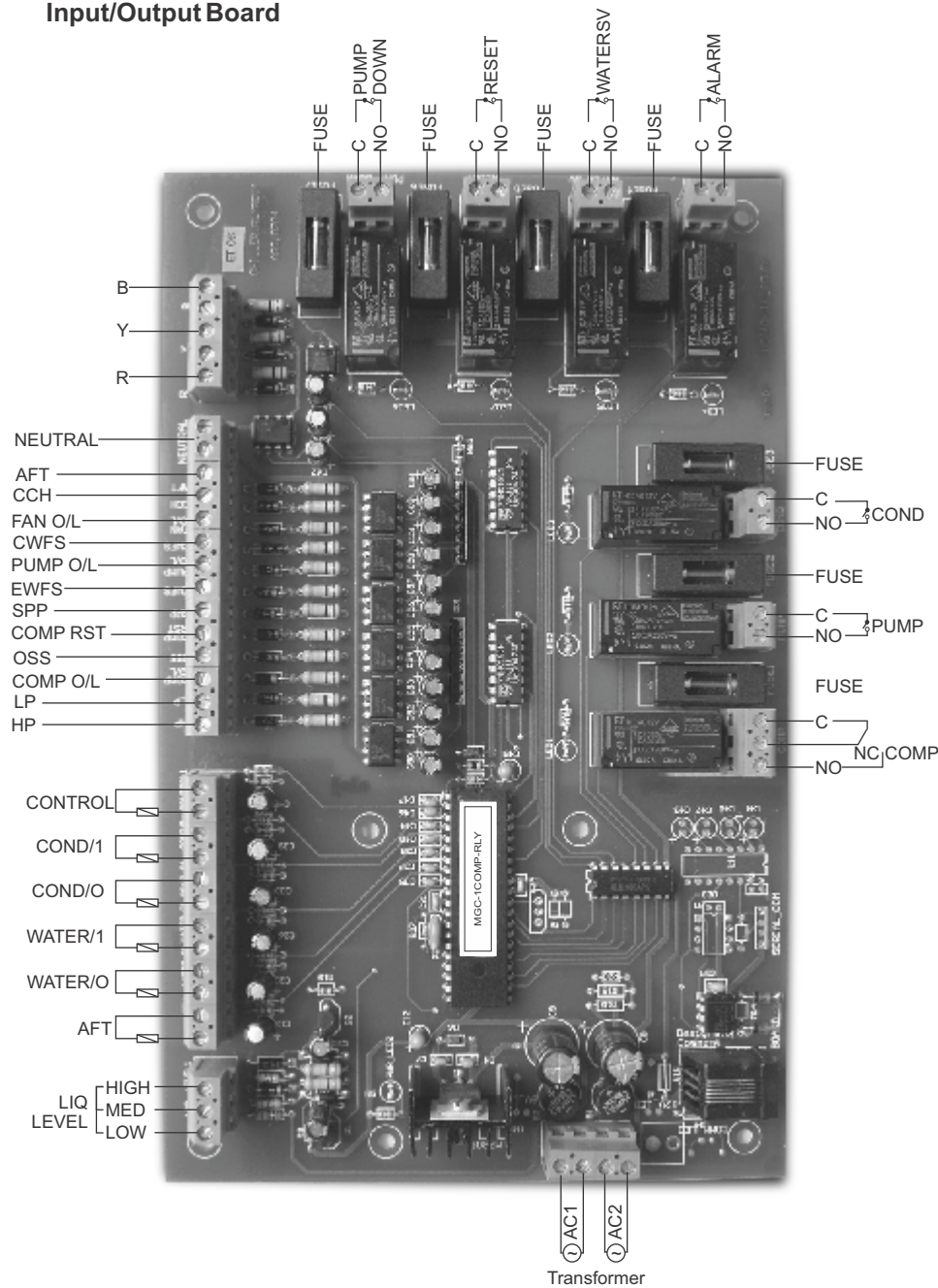


6 way telephone cable



Chiller Interface Terminal for panel mounting

Input/Output Board



3. Operations

3.1 Description - Input / Outputs Analog Inputs (Probe)

The system has the following analog (probe) inputs.

1. **CONTROL** - Used as the main controlling probe based on which the set point will regulate the system.
2. **E/INLET** - Indicates Water (Evaporator) inlet temperature
3. **E/OUTLET** - Indicates Water (Evaporator) outlet temperature.
4. **C/INLET** - Indicates Condenser Inlet temperature.
5. **C/OUTLET** - Indicates Condenser Outlet temperature.
6. **AFT** : Used as an Internal Anti Freeze control.

Digital Outputs (Relay)

System will operate the following devices

1. **Pump**
2. **Compressor**
3. **Condenser Fan**
4. **Alarm**
5. **Water Solenoid Valve**
6. **Bitzer Comp Reset**
7. **Liquid SV**

Mega chill manages the following protections

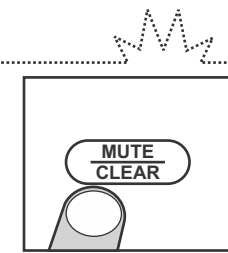
Digital Inputs (Trip Signals)

1. **HP** - High Pressure
2. **LP** - Low Pressure
3. **OSS** - Oil Safety Switch
4. **AFT** (AntifreezeThermostat)- External
5. **Compressor Overload**
6. **Pump Overload**
7. **CCH** - Crankcase Heater
8. **COOND. O/L** - Condenser Overload
9. **SPP Single Phase Preventor**
10. **CWFS (water cooled)-** Condenser Water Flow Switch.
11. **EWFS** - Evaporator Water Flow Switch
12. **Bitzer Comp O/L**
13. **R** - R Phase
14. **Y** - Y Phase
15. **B** - B Phase
16. **Medium Water Level**
17. **Low water level**

Controller informs the user of a fault condition via a buzzer and anALARM RELAY.

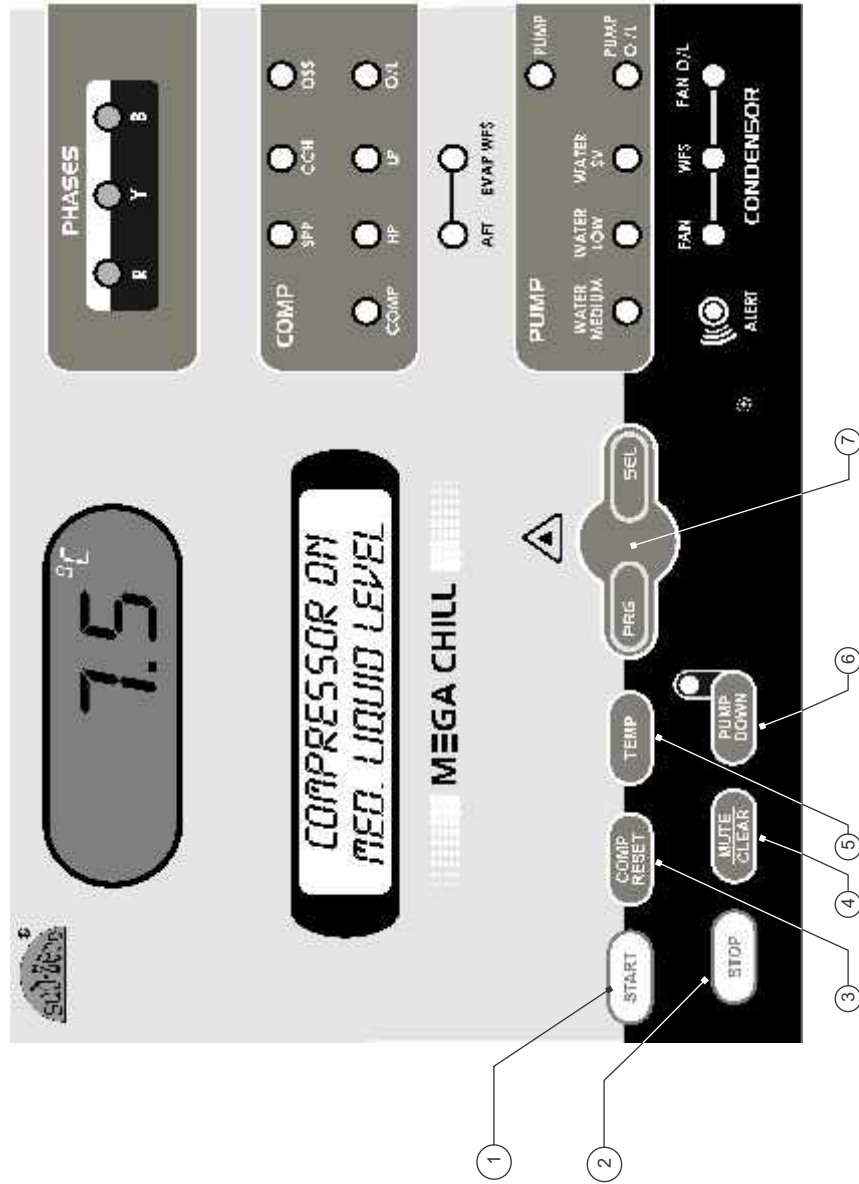
WARNING :

HP,LP, OSS and Antifreeze are by default in manual reset mode. In case of any fault the user can reset them by pressing the CLEAR key for 4 sec. These can be changed to auto reset by changing P4 parameter.



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3.2 Mega Chill Keypad



1. START

Places the Mega Chill an operative status, from the standby status in which it normally is after being powered ON.

2. STOP

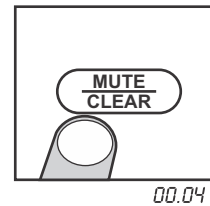
Stops the system and brings Mega Chill back to a standby status.

3. COMP RESET

In case of an internal compressor reset for example in Bitzer compressors due to high winding temperature, this switch will reset the power to the compressor.

4. MUTE / CLEAR

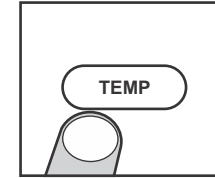
Pressing Mute / Clear once will disable the buzzer.



Pressing Mute / Clear for 4 seconds will reset all alarms that have been set for MANUAL RESET.

5. TEMP

The system has 5 analog inputs (probes) in addition to the control probe. To view these, press the 'TEMP' key once.



The LCD will display the probe location and it's relevant temperature on the LED display. To view the various probes, use the UP/DOWN key to scroll through. To exit this parameter, press the 'TEMP' key again and the display will return to normal operating conditions.

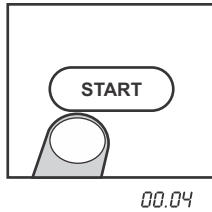
6. PUMP DOWN

Pressing PUMP DOWN for 4 seconds forces a manual pump Down cycle.

7. PRG SEL, UP & DOWN

Used to enter and navigate in programming mode.

3.3 How to Turn ON/OFF the Chiller



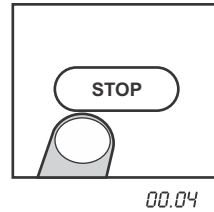
Press and hold the 'START' key for 4 sec. the unit will change from standby to working status. Unit can only be switched on when there are no errors.

The first device to start is the Water Pump. Then, as required, Mega Chill will switch on the compressor and other devices depending on the setting.

WARNING:

The pump functioning has total priority. If the pump stops due to any alarm condition, the controller will be placed in a standby position

PUMP TRIP
PUMP OL



Press and hold the 'STOP' key for 4 sec. to switch the controller into standby position.

The unit also turns off and moves to a standby position when there is an error status.

NOTE:

It is also possible to enable the auto start function by selecting '1' in H2 parameter. Once selected, the machine will automatically restart after a power off condition.

0=AUTO START OFF
1=AUTO START ON

3.4 Water Pump

PUMP is the first device to be activated after the chiller has started. Pump functioning has absolute priority amongst all other devices.

The pump's status is always ON even if the set temperature has been achieved.

ALARMS

The alarms that can block the pump are:

- ▶ WATER FLOW SWITCH (This alarm is ignored for a selected time as per parameter P1 & P2)
- ▶ PUMP OVERLOAD
- ▶ LOW LIQUID LEVEL

3.5 Water temperature

Regulation of the water temperature is based on the CONTROL PROBE. This control probe can be installed by the user at the inlet or outlet of the evaporator, or any other location, where he wants to regulate the water / media.

3.6 Set-Point and Differential

Set point is the temperature at which the chiller has to be regulated. At this temperature the compressor will switch off. Differential is the temperature added to the set point after which the compressor restarts. For example, If the Set point is 2°C, the compressor will switch off at 7°C and restart at 9°C (7+2=9°C).

3.7 Antifreeze

The antifreeze procedure activates when the AFT probe temperature reaches or goes below the selected threshold in para A1, The compressors are immediately stopped, without pump-down procedure and the liquid line solenoid valve is de-energised. The antifreeze alarm is displayed on the LCD.

The system will not allow a restart until AFT temperature reaches or goes above A1 + A2.

To disable the ANTIFREEZE based on the internal AFT probe, change A0 parameter to 0.

3.8 PUMP-DOWN

The PUMP-DOWN procedure can be enabled through H1 parameter.

PUMP-DOWN STAGE :

- A.** De-energisation of the Liquid Solenoid Valve.
- B.** The compressor keeps operating until the LOW pressure cutout input intervenes.
- C.** When the system cuts off on the input from the low pressure cutout, the compressor turns OFF and the PUMP-DOWN procedure is over.

If the compressor remains on for more than 50 seconds without cutting off on the low pressure switch, Megachill will force a compressor shut down and indicate a FAULTY PUMP-DOWN procedure provided the CUT IN temp has not been achieved. In this case check the LIQUID SOLENOID VALVE and LOW PRESSURE CONTROL. If within 50 seconds, the CUT IN temp has been achieved, the system will activate the solenoid and continue operating normally without pump down.

PUMP-DOWN CYCLE

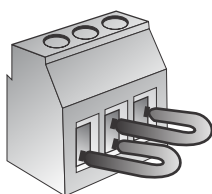
A pump-down cycle is used to pump all refrigerant into a receiver or condenser during the OFF cycle. The purpose is to prevent refrigerant from migrating to the crankcase, where it can condense and saturate the oil. Without a pump-down cycle, the crankcase can fill liquid refrigerant during a long off-cycle. At start up, the liquid refrigerant can flood the cylinders and damage the compressor much like a floodback. (Large compressors have springs on intake) After the system has cooled the evaporator sufficiently, a solenoid valve closes in the liquid line and the compressor pumps refrigerant into the condenser or receiver, where it remains until the next on-cycle.

3.9 Water Level

System controls the level of water in the evaporator tank via three water level sensors, High, Med & Low. As soon as the level of water goes below the Med level, the controller will activate a Water Solenoid Valve. In case the level goes below the Low level sensor, the system trips and displays a Low Liquid Level Fault.

WARNING

If the machine controlled by mega chill is not using the water level sensing feature, it is necessary to short all water inputs concerning the water level. This will disable the liquid level errors.



4. PROGRAMMING

4.1 Programming Levels

There are two programming levels allowing authorized personnel to enter and change parameters

LEVEL 1 - USER

Can be directly accessed by the user for the selection of

- Control Probe calibration
- AFT Probe calibration
- Temperature set point
- System Auto start
- Keypad Lock

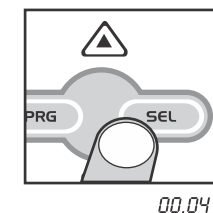
LEVEL 2-MANUFACTURER

Can only be accessed by the chiller manufacturer via a PROKEY for.

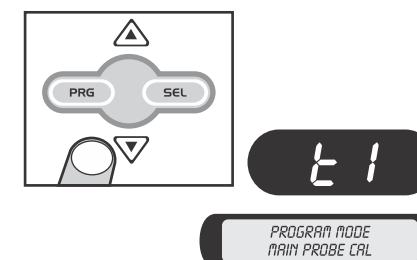
- Setting of all parameters.

4.2 USER PARAMETERS

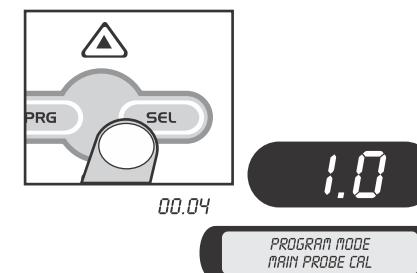
1) If you press and hold SEL for 4 seconds, the display shows the code of the first parameter.



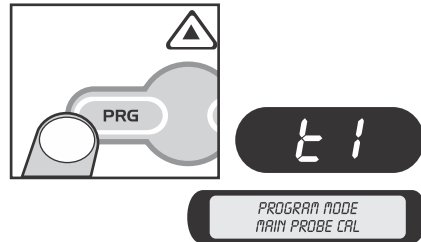
2) Using the UP and DOWN arrow keys allows scrolling all user parameters.



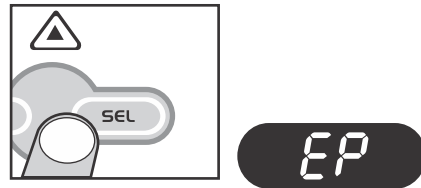
3) Press SEL again to display the required user parameter and modify it's value with the UP and DOWN key.



- 4) Press PRG to store the modified parameters and return to the user parameters menu.



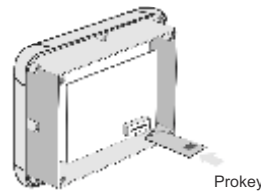
- 5) To end programming and exit user mode, press SEL key when LED display shows EP.



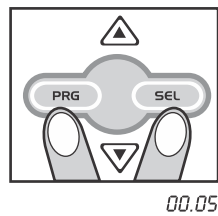
If you do not press any key within 60 seconds after having entered this procedure, the unit will return to normal operation without storing the values of the modified parameters.

4.3 FACTORY PARAMETERS

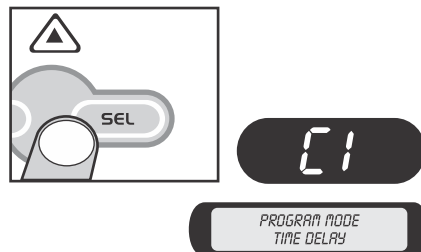
These 'working' parameter are protected with a hardware key (Prokey) to prevent any unauthorized access to the data.



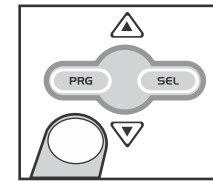
- 1) Press PRG + SEL for more than 5 seconds to enter the FACTORY parameters. Prior to entering this mode, the Prokey must be inserted in a socket behind the user Interface, as illustrated above.



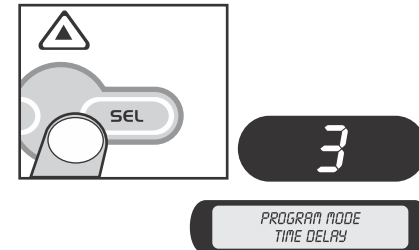
- 2) Press SEL to enter the FACTORY parameter section.



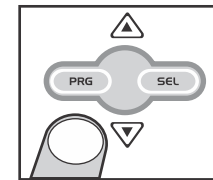
- 4) Using the UP and DOWN keys allows scrolling all factory parameters.



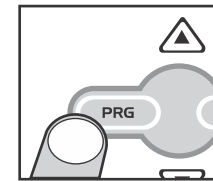
- 4) Press SEL display the required factory parameter.



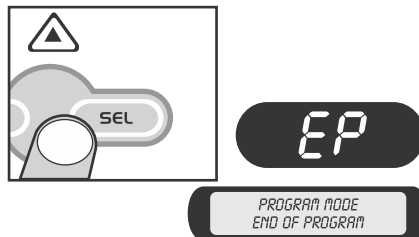
- 5) Modify it's value with the UP and DOWN key.



- 6) Press PRG to store the modified values and exit the procedure, while SEL allows you to return to the FACTORY parameters menu.



- 7) To end programming and exit FACTORY mode, press SEL key when LED display shows EP (End Programming)



If you do not press any key within 60 seconds after having entered this procedure, the unit will return to normal operation without storing the values of the modified parameters.

4.4 Parameter Description & Values

Para : Parameter
Set By : U = User, F = Factory
Fac. : Factory set values

M.U.: Measuring Unit
mini : time in minutes
Sec : time in seconds
°C : Temperature in degree centigrade

MAX : Maximum settable Limit
MIN : Minimum settable Limit
Var : Variation
Flag : Operating status/condition.

Para	Description	Set by	MIN	MAX	Fac.	M.U.	Var.
T1	Control Probe Calibration During the course of time there may be a slight offset in the actual temperature and the temperature displayed, e.g. if the actual temperature is 20°C and the temperature on the controller shows 22°C, set this parameter to -2 and once out of this mode, the temperature will display 20°C (22-2°C)	U	-10	10	0	°C	0.5
T2	AFT Probe Calibration Setting Procedure same as T1	U	-10	10	0	°C	0.5
R1	Set Point for Control Probe (Page no 15)	U	-30	50	10	°C	0.5
R2	Cooling Differential	F	1	10	2	°C	0.5
R3	Maximum Cooling Set Point Once set at a particular range, this will not allow the set point to go above this range and below R4 setting e.g. Setting this parameter at 25°C will not allow the set point to go above 25°C. If the temperature reaches 25°C the display will show HT(High Temp) & at this point the alarm will activate.	F	1	10	2	°C	0.5
R4	Minimum Cooling Set-Point Once set at a particular range, this will not allow the set point to go below this range and above R3 setting e.g. Setting this parameter at -15°C will not allow the set point to go below -15°C	F	-30	R3	-30	°C	0.5

Para	Description	Set by	MIN	MAX	Fac.	M.U.	Var.
	Also, if the temperature reaches -15°C the display will show LT(Low Temp) and at this point the alarm will activate.						
C1	Time Delay for Compressor Restart e.g. If this parameter is set at 3 minutes, the compressor will cut off at the set temperature, but will not restart for a minimum of 3 minutes. This time delay is also effective at 'Power On' of the system. This safety feature is used to protect the compressor from restarting within a short period due to power fluctuations.	F	0	10	3	Min	1
F1	Fan Operating Mode 0 = Fan always On 1 = On when compressor is ON.	F	0	1	0	Flag	1
F2	Starting Time of Fans Fans will start these many seconds before the compressor starts. This helps in preventing sudden increase in pressure and power surges.	F	0	120	20	Sec.	1
A0	To activate Antifreeze Probe 0 = Deactivate Antifreeze Probe 1 = Activate Antifreeze Probe	F	0	1	0	Flag	1
A1	Antifreeze Set Point for AFT Probe	F	-30	R1	4	°C	1

Para	Description	Set by	MIN	MAX	Fac.	M.U.	Var.
A2	Differential for AFT Probe	F	1	10	2	°C	1
P1	Flow Switch Alarm Delayed at Power On If this parameter is set at 30 seconds, the system will activate the flow switch alarm only if the error persists for or more than 20 seconds. In this manner, a false alarm can be avoided during normal operation.	F	0	120	5	Sec.	1
P2	Flow Switch Alarm Delayed during normal operation If this parameter is set at 20 seconds then the system will activate the flow switch alarm only if the error persists for or more than 20 seconds. In this manner, a false alarm can be avoided during normal operation.	F	0	90	5	Sec.	1
P3	Low Pressure Alarm delayed during compressor start up If this parameter is set at 30 seconds, the system will activate the low pressure switch alarm only if the error persists for or more than 30 seconds. In this manner, a false alarm can be avoided due to low pressure at compressor start up.	F	0	120	40	Sec.	1
P4	Reset of Alarms 0 = Manual Reset for HP, LP, AFT alarms 1 = Auto Reset for HP, LP, AFT alarms	F	0	1	0	Flag	1
LP	Keypad Lock 0 = Keypad Active 1 = Keypad Locked	U	0	1	0	Flag	1

Para	Description	Set by	MIN	MAX	Fac.	M.U.	Var.
H1	Pump Lock 0 = Inactive 1 = Active. In this case pump down will perform every time the compressor cuts off and also allows a manual pump down via keypad.	F	0	1	0	Flag	1
H2	AUTO START on Power On 0 = Standby on power on. 1 = Auto Start on power on.	U	0	1	0	Flag	1
H3	R Y B Phase Error 0 = Inactive 1 = Active. In case of '0', system will ignore R Y B errors.	F	0	1	1	Flag	1
FS	Factory Set Parameters To restore default settings of the controller. When set to 1 all parameters are programmed to factory settings. Used to debug setting related problems.	F	0	1	0	Flag	1
EP	End of Programming Once the SEL keys pressed, the controller goes into the normal mode.	F	0	1	1	Flag	1

5.ALARM

System has alarms for every input except crankcase heater. In a fault conditions, the respective LED will turn red and/or flash. For Example : if a HP Trip fault occurs, the HP LED will turn Red and the Compressor LED will turn Red and flash. In addition to this, the error message 'HP TRIP' will be displayed on the LCD and the buzzer & alarm will activate.

HP, LP and OSS TRIP alarms will not be displayed while compressor is in OFF position.

The particular device will be protected by switching it off. After the alarms have been cleared either with automatic reset or by pressing the 'CLEAR' key for four seconds the controller will restart under normal operating conditions.



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6. TECHNICAL SPECIFICATIONS

1. Analog Inputs

- a) Sensor type : Japanese NTC thermistors.
- b) Specification : 10K @ 25°C
- c) Resolution : 0.5°C
- d) Accuracy : +/- 1°C

Controlling Temp. Range

- a) -30°C to + 50°C

2) Digital Inputs

(Potential Free Contacts)

- a) Max continuous input voltage : 230 Vac
- b) Input current (closed contract): 10 mA

3) Digital Output (Relay)

- a) Type : SPDT
- b) Contacts : C & NO (C, No, NC for compressor)
- c) Rating : 230 Vac, 10A (res)
All digital outputs are fused

4) Operating Temperature

- (User Interface & Relay Board)
- A) +50°C to +50°C
(Non-condensing)

5) Storage Temperature

- (User interface & Relay Board)
- a) -20°C to + 70°C
(non-condensing)

6) Operating Humidity

- Max 80% (non-condensing)

7) Storage Humidity

- Max 80% (non-condensing)

8) Mounting

- a) User interface :
Panel mounting
- b) Relay Board :
Panel mounting

9) I.P. Standards

- a) Probe - Ip68
- b) Mega Chill User Interface -
If buzzer hole is sealed,
rating is Ip65 for front.
Silicon sealant
should be applied
along the perimeter of the
panel cut out before the unit is
fitted to obtain Ip65 grade.
- c) I/O Board - Not Applicable

10) Min. Cable Section

- (Screw terminal relay board)
- 0.5 mm²

11) Max. Cable Section

- (Screw terminal relay board)
- 2.5 mm²

12) Fuse 1.5A

13) Transformer Torroidal type

- Primary Input : 230Vac, 50Hz
- Output :
- Secondary 1: 9Vac,
350mA
- Secondary 2: 10Vac, 500mA

7. PRECAUTIONS & CARE

Controller should be installed in a place protected by vibration, water and corrosive gases and where ambient temperature does not exceed the values specified in the technical data.

Probe : To give correct reading, the probe must be installed in a place protected from thermal influences, which may affect the temperature to be controlled.

Maintenance

Cleaning : Clean the surface of the controller with a soft moist cloth. Do not use abrasive detergents, petrol, alcohol or solvents.

CAUTION

WIRING : The probe and its corresponding wires should never be installed in a conduit next to control or power supply lines. The electrical wiring should be done as shown in the diagram. The power supply circuit should be connected to a protection switch. The terminals admit wires of upto '2.5 mm²'.

WARNING:

Improper wiring may cause irreparable damage and personal injury. Kindly ensure that wiring is done by qualified personnel only.