## 1.  INTRODUCTION

The following is the specification of Intronics Chiller Controller System (ICCS) for DCM / Century. It is a microprocessor base equipment which provides all control, protection and self diagnostic features with less wiring and easy to use.

The air conditioner can use hermatic or semi-hermatic type compressor(s). The condensing unit can be up to 2 refrigerating circuits with 2 compressors per circuit.

ICCS consists of

❑   Main control board

❑   Control panel unit (up to 2 units) with standard 6 meters length cable.

❑   3 temperature sensors, water in, water freeze 1 & water freeze 2 with standard 7 meters length.



They are connected by 4 core cables via RS485 connector with the length up to 1,000m. Two RS485 connectors are provided on the Main control board, then up to 2 Control panel units can be installed.

There are total of 12 I/O (3 Inputs & 9 Outputs).

**Inputs**

❑   Water temperature Sensor

❑   Freeze 1 sensor for refrigerating circuit 1

❑   Freeze 2 sensor for refrigerating circuit 2

**Outputs**

- ❑ Pump chiller relay
- ❑ Pump supply relay
- ❑ Alarm relay
- ❑ Fan motor 1 relay
- ❑ Fan motor 2 relay
- ❑ Compressor contactor relay for Circuit 1A ($C_{1A}$)
- ❑ Compressor contactor relay for Circuit 1B ($C_{1B}$)
- ❑ Compressor contactor relay for Circuit 2A ($C_{2A}$)
- ❑ Compressor contactor relay for Circuit 2B ($C_{2B}$)

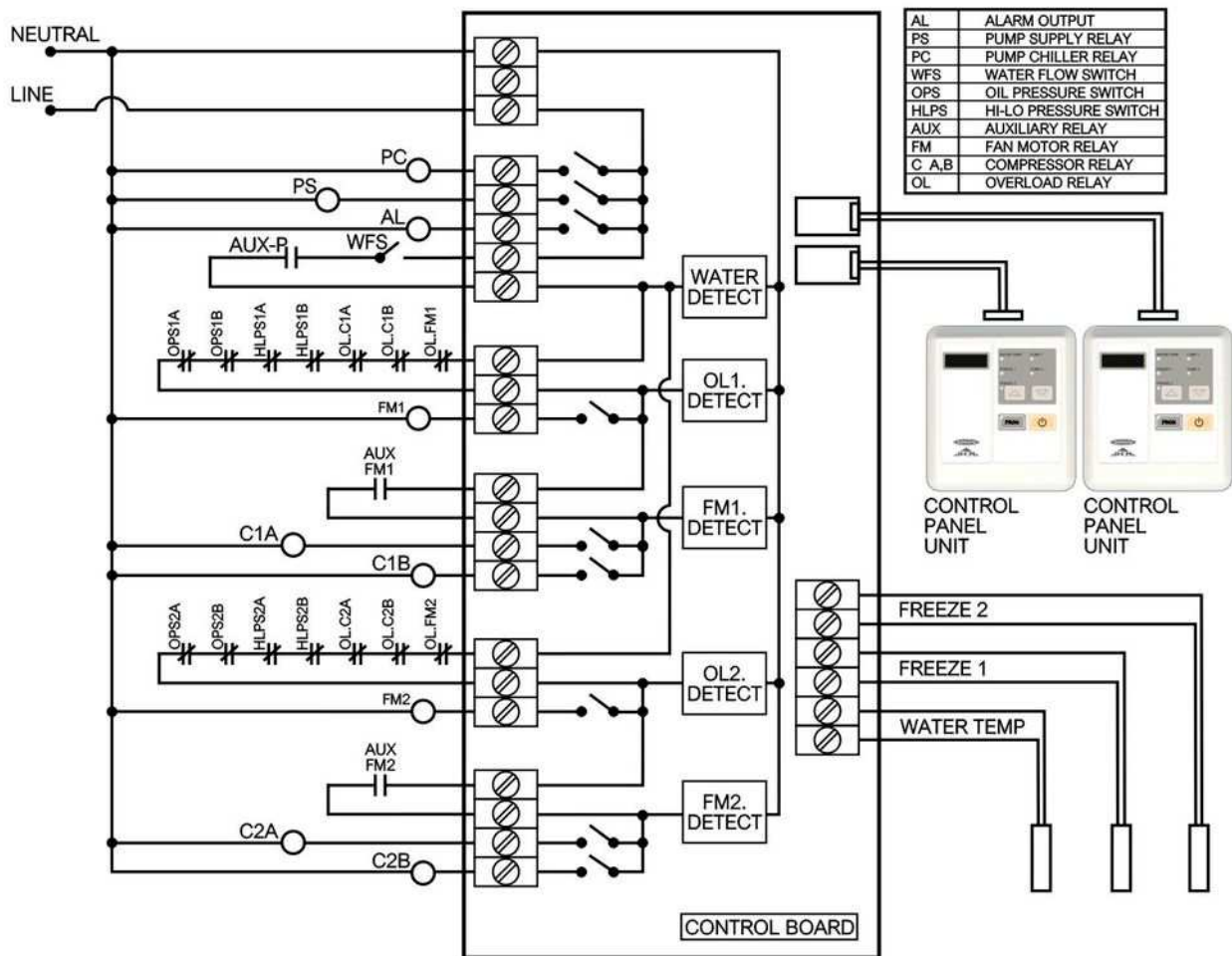Fig.1 is the block diagram of the system.



Fig. 1 System block diagram

## 2.  FEATURES

### 2.1  Water supply

Press [⏻] button to turn on/off the system. When turned on, it will turn on the relays for Chiller and Water supply pumps. After a delay time (according to Program 02), it will start to control the operation of the Fan motors and Compressors.

### 2.2  Temperature control

There are 2 refrigerating circuits ($C_1$ & $C_2$) in the system. Each circuit has 2 compressors (A & B). In each circuit, Compressor A will always be turned on before Compressor B. However when OFF, Compressor B will always be turned off before Compressor A.

The operating sequence of the refrigerating circuits can be programmed First on – First off or First on – Last off. The first operating circuit is called Lead circuit while the second is called Lag circuit.
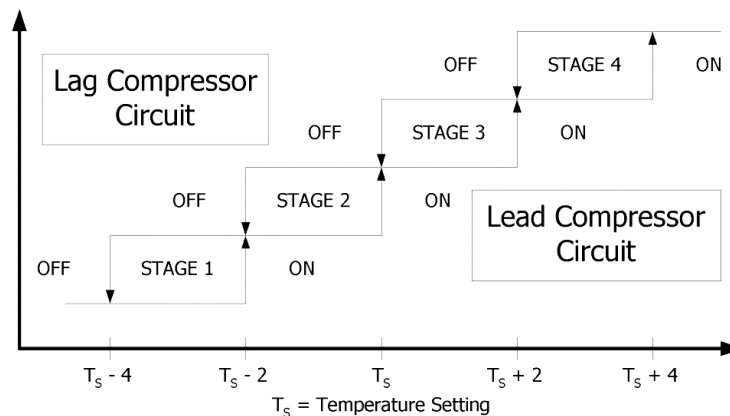


Fig. 2 : Operating sequence of compressors.

The Control will measure the water temperature ($T_w$) and compare with Setting temperature ($T_s$).

Then it will operate the compressors as per the graph above. However there will be a delay time of 60 seconds for the next compressor to be turned on.

One duty cycle is defined when all 4 compressors are turned on ($T_w \geq T_s + 4$) and all of them are turned off ($T_w \leq T_s - 4$).

If the First on – First off program is selected, the Control will alternate refrigerating circuits between the Lead – Lag circuits for every duty cycle.

If the First on – Last off program is selected, Circuit 1 will always be Lead circuit and Circuit 2 will always be Lag circuit.

### 2.3  Temperature display

When turned on, the Control panel will show the temperature measured by one of  three sensors

❑  Water-temp sensor which is the temperature of the water in the Chilling system.

❑  Freeze 1 sensor which is the temperature of the water at the point represented as Freeze indicator for Circuit 1.

❑  Freeze 2 sensor which is the temperature of the water at the point represented as Freeze indicator for Circuit 2.

The LED on the Control panel unit at the relevant position will be lit corresponding to the temperature on the 7-segment display.

### 2.4  Water supply error

When there is a problem regarding the water supply in the Chilling unit which can be sensed by

❑  The magnetic contactor of the water pump is not energized or

❑  The water flow switch does not operate.

The system will turn off the water pump, Fan motors and Compressors of all refrigerating circuits. The Control panel will show $Err.1$ in blinking.

After the error is fixed, the system reset is needed (See System Reset).

### 2.5  Overload error

The Control will detect the Overload status of Fan motors and Compressors. If  there any error which is sensed by

❑  Overload protection switch of Fan motor, or

❑  Overload protection switch or High/Low pressure switch or Oil pressure switch.

The system will turn off  Fan motor and Compressors of the relevant circuit. The Control panel will show

$Err.2$ in blinking if  it happens at Circuit 1.

$Err.4$ in blinking if  it happens at Circuit  2.

After the error is fixed, the system reset is needed.

### 2.6  Fan motor error

If the Fan motor of any refrigerating circuit does not operate. (its magnetic contactor is not energized).

❑  The system will turn off Fan motor and Compressors of the relevant circuit.

❑  The Control panel will show

$Err.3$ in blinking if it happens at Circuit 1.

$Err.5$ in blinking if it happens at Circuit .2

After the error is fixed, the system reset is needed.

### 2.7 Program error

In case there is an error in the program kept in the memory, the Control panel will show $Err.6$ and Program No. alternately in blinking.

### 2.8 Freeze function

There is a freeze protection in the system. As soon as the Water or Freeze sensor's reading is lower than 4 °C,

❑ The system will turn off Water pump, all fan motors & compressors.

❑ The Control panel will show $Err.7$ in blinking.

After the error is fixed, the system reset is needed.

### 2.9 System Reset

The System Reset can be done by

❑ Turn off the system by pressing ⏻ button, or

❑ Cut off the power supplied to the Control.

### 2.10 Water temperature sensor error

If the reading of the water temp. sensor is error,

❑ The Control will turn off the system.

❑ The Control panel will show $Err.8$ in blinking.

### 2.11 Freeze sensor error

If the reading of any water freeze sensor is error,

❑ The Control will turn off the system.

❑ The Control panel will show $Err.9$ in blinking.

### 2.12 Communication error

In case there is an error in the communication between the Main control board and the Control panel unit such as the communication line is disconnected, the Control panel will show $CAnt$ in blinking.

### 2.13 Alarm output

When any error happens, the Alarm relay will be energized.

### 2.14 Compressor delay protection

There is a 3 minute time delay for compressor to restart.

## 3. USER INTERFACE

### 3.1 Control panel



Fig.3 : Control panel

**Four digit of 7 segment display**

❑ Shows the temperature reading of Water temp, Freeze 1&2 sensors. It will display

$L\,o$ if the reading is below 0 ºC, and

$H\,i$ if the reading is over 48 ºC.

❑ Shows the setting parameters such as setting temperature, etc.

❑ Shows the error events.

**7 LEDs**

❑ Water temp. LED : if lit means the display shows the reading of Water temp sensor.

❑ Freeze 1 LED : if lit means the display shows the reading of Freeze 1 sensor.

❑ Freeze 2 LED : if lit means the display shows the reading of Freeze 2 sensor.

❑ Circuit 1 LED : shows the operating status of compressor(s) in the 1st refrigerating circuit.

❑ Circuit 2 LED : shows the operating status of compressor(s) in the 2nd refrigerating circuit.

❑ Program LED : shows the status while being in Programming mode.

❑ Power LED : shows the status of the system.

### 3.2 Main control board

There are 5 LEDs on the Main control board for user interface.

LED 1 - 4 display the ON/OFF status of Compressor $C_{1A}$, $C_{1B}$, $C_{2A}$, $C_{2B}$ respectively.

LED 5, when flashing shows the normal status of the system.

## 4. PROGRAMMING

### 4.1 Enter into Programming mode

To enter into the Programming mode is to

❑ Press and hold [PROG] button for 5 seconds, LED on the button will be flashing.

❑ Press [⏻] button while holding [PROG] button, the display will show the last program setting.

❑ Press [PROG] button to select the program number.

### 4.2 Program 1

Program 1 is for temperature setting. While in Program 1 ($PG:01$), press [▲] or [▼] button to change the setting in a range of 4-24 °C (0.5°C step).

### 4.3 Program 2

Program 2 is for delay time setting of the Compressor and Fan motor after the water flows. While in Program 2 ($PG:02$), press [▲] or [▼] button to change the setting in a range of 1-30 minutes.

### 4.4 Program 3

Program 3 is for operating sequence setting of the refrigerating circuits. While in Program 3 ($PG:03$), press [▲] or [▼] button to

$0$     =     First in – First out

$1$     =     First in – Last out

### 4.5 Exit from Programming mode

❑ Press [⏻] or not pressing any button within 30 seconds.