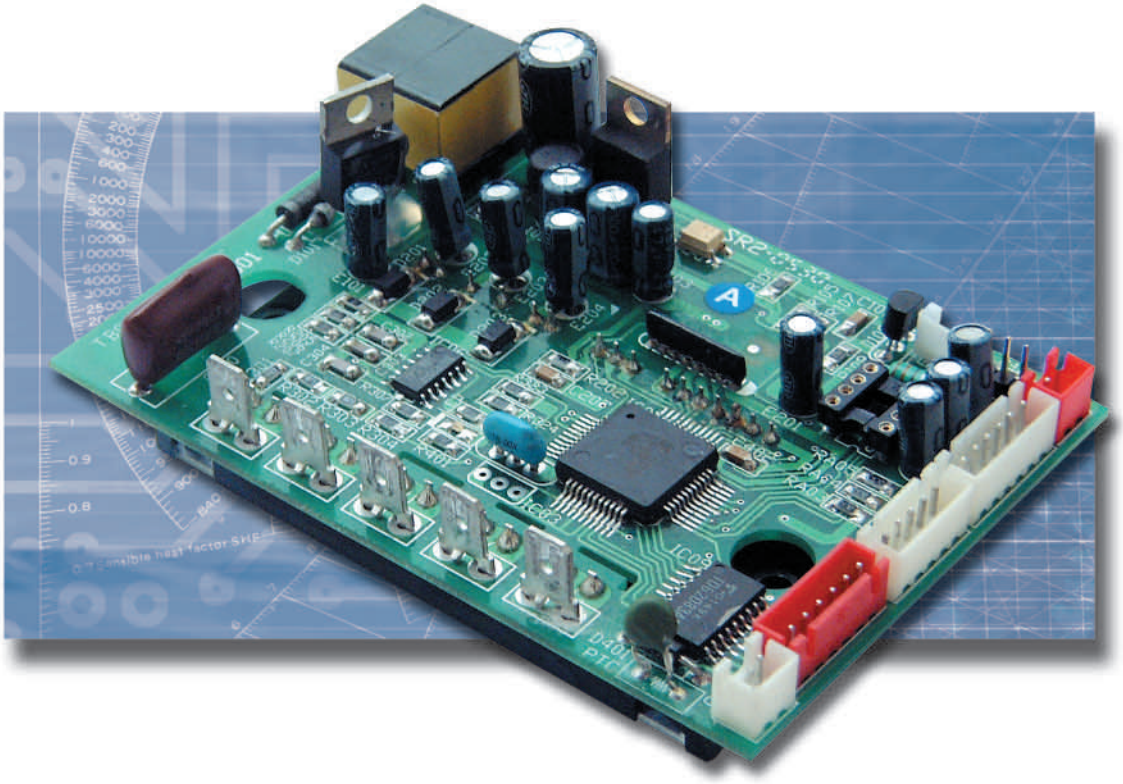
Electronic Board



McQuay® Air Conditioning

Engineered for flexibility and performance.™

McQuay Controllers Handbook

2006 Edition

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Fan Coil Unit (W1V3)

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- Capable to control Minichiller operating modes.
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Mode Selection

The system has 2 modes selection to be selected via the OD connector. The following notations are used to represent the various modes selected:

MODES	COOL	DRY	HEAT	FAN	OD
AP	X	X	X	X	SHORTED
EC	X	X		X	OPEN

Where X denotes modes available.

Power Up Settings

During power up, the system can be configured to memorised the settings prior to power down. This is done by shorting the 2 way straight header JP1/JH. The settings that are memorised are:

a) Mode & On/Off status
b) Set Temperature
c) Fan Speed
d) DC swing
e) AC swing
f) Flap stop coordinate (for DC swing off mode)

These data or settings are save in non-volatile memory.

The CPU will save the updated settings into the memory 10 seconds after changes are confirmed. However, it will take 3 seconds to update the memory if the unit change from on to off state.

If the JP1/JH is not shorted, the power up setting is OFF mode, temperature setting is 24°C, indoor fan speed is high and swing mode is off.

Unit ON/OFF

- ON/OFF triggering

ON/OFF triggering can be achieved by pressing the emergency ON/OFF button or the LCD remote controller ON/OFF button.

When the emergency ON/OFF button is pressed, the system mode setting will rotate in the following sequence:

MODEL	SEQUENCE
AP	- - - - - - - - > COOL > HEAT > OFF > - - - - - - - - - -
EC	- - - - - - - - - - - > COOL > OFF > - - - - - - - - - - - - - - -

The corresponding LEDs will also follow suit.

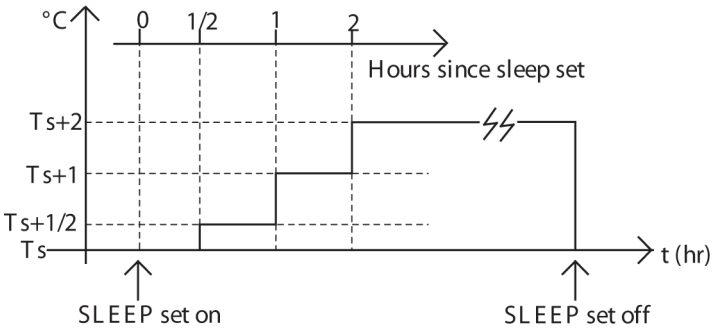
Pressing the remocon ON/OFF will toggle the system status either from ON to OFF or from OFF to ON.

Temperature Range And Setting

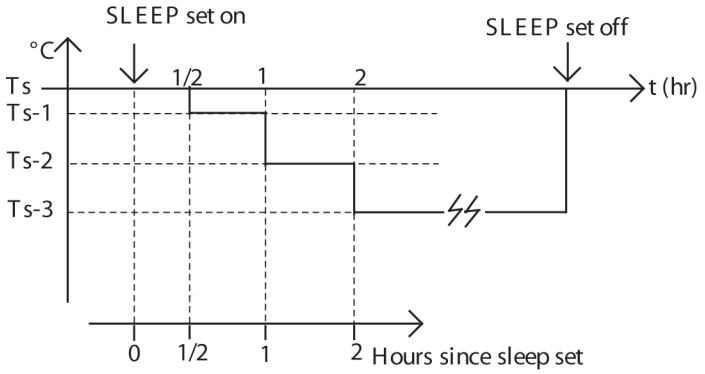
The operating temperature range is 16 °C to 30 °C, both inclusive. Temperature setting is allowed in COOL, DRY, and HEAT modes.

Sleep Function

This function will increase or decrease the set temperature with time. The COOL mode SLEEP profile is as follows:



The HEAT mode SLEEP profile is as follows:



The SLEEP option is only available for COOL, and HEAT modes.

This option is set/reset by on the LCD remocon.

Fan Speed Selection

The indoor fan speeds are LO, MED, HIGH or AUTO FAN in COOL and HEAT.

In FAN mode, only HI, MED and LO speeds are allowed.

Air Louvre And Air Swing

In AC swing option, the swing will run if indoor fan is on and vice versa.

In the air louvre option, the stepper motor will only run when the indoor fan runs. The louvre will be set at the maximum closing position when the main power is just turned on or when the unit is turned off. The swing angles of all operating modes (when swing option is activated) are as follow:

RSWG	REMARK	MODE	SWING ANGLE
3K	WM10F	COOL/DRY/FAN	100° <= X <= 140°
		HEAT	80° <= X <= 110°
220R	WM20F, WMXX1	COOL/DRY/FAN	120°<= X <= 160°
		HEAT	100°<= X <= 140°

where 0° is referred to as air louvre maximum closing point.

If unit change from OFF mode to ON mode , the flap will stop at the last position when it go from on to off mode.

Operating Modes

The system mode is set by the LCD remocon. The actual mode will be shown on the mode LEDs. Mode changes respond 2 seconds after data reception.

Cold Start

When the unit restarts 2 hours after it has stopped or during power-on-reset start, it is considered a cold start.

Cool Mode

- With Water Valve

The water valve will cut in if the Tr >= Ts + 1°C and the water valve will cut out if the Tr =< Ts. The thermostat cut in or out decision is made every 30 seconds.

In this mode, the indoor fan is always running. For manual speed, the indoor fan will run as per user set speed.

In AUTO FAN speed, the indoor fan speed will run as follows:

High :	Tr > Ts + 1°C
Medium :	Ts + 1°C > Tr > Ts
Low :	Ts > Tr

The fan speed decision is made every 30 seconds.

- Without Water Valve

The fan speed decision is made every 30 seconds.

In manual fan speed, the indoor fan speed will run as follows:

User set speed (H/M/L) :	Tr > Ts - 1°C
SLo (Super low) :	Ts – 0.5°C > Tr > Ts - 2°C
OFF :	Tr < Ts – 1.5°C

In auto fan speed, the indoor fan speed will run as follows:

High fan :	Tr > Ts + 0.5°C
Medium fan :	Ts + 1°C > Tr > Ts – 0.5°C
Low fan :	Ts > Tr > Ts - 1°C
SLo :	Ts > Tr > Ts - 2°C
OFF :	Tr < Ts – 1.5°C

Dry Mode

During the first 12 minutes of the DRY mode run from:

a) Cold Start or
b) Mode change from HEAT or FAN

Dry mode must run under cool mode with AUTO indoor fan for 12 minutes or until Tr =< Ts.

After this, the dry mode will operate like cooling cycle. However, only low fan is allowed to cut in.

Heat Mode

- With Water Valve

The thermostat cut in or out decision is made every 30 seconds.

The water valve will be cut in if the Tr =< Ts + 1°C and it will be cut out if Tr >= Ts + 2°C.

For manual speed, the indoor fan will run as per user set speed.

In AUTO FAN speed, the indoor fan speed will run as follows:

High Fan :	Tr < Ts + 1°C
Medium Fan :	Ts + 1°C < Tr < Ts + 2°C
Low Fan :	Ts + 2°C < Tr

The fan speed decision is made every 30 seconds.

- Without Water Valve

The fan speed decision is made every 30 seconds.

In manual fan speed, the indoor fan speed will run as follows:

User set speed (H/M/L) :	Tr < Ts + 1.5°C
SLo (Super low) :	Ts + 1°C < Tr < Ts + 3°C
OFF :	Ts + 2.5°C < Tr

In auto fan speed, the indoor fan speed will run as follows:

High fan :	Tr < Ts - 1°C
Medium fan :	Ts - 2°C < Tr < Ts + 1°C
Low fan :	Ts < Tr < Ts + 2°C
SLo :	Ts + 1.5 °C < Tr < Ts + 3°C
OFF :	Ts + 2.5°C < Tr

Fan Mode

Only HI, MED and LO speeds are allowed.

- With Water Valve

Indoor fan will run at user set speed.

- Without Water Valve

No fan mode is allowed. The unit will not give any response to the fan mode setting.

Off Mode

When the unit is off, no indication will be provided. All relays will be turned off immediately after the ON/ OFF triggering.

Water Pump

The water pump will on if the water valve is on during cooling cycle. The pump will remain on for at least 5’ after the water valve is off.

During mode change from cooling to non cooling mode, the pump will on for minimum 5’.

Water Level Switch

This normally close switch is to detect faults in water pump system. It will confirm for 30" for switch open and 60" for switch close.

Once switch is confirmed open, it will force the water valve to cut off . If the switch is closed within 5’, the water valve is allowed to cut in. If the switch does not close for more than 5’, the system will warn user regarding this fault. The water valve is not allowed to cut in.

Diagnostics

Error	OPERATION LED	Other LEDs	Seven Segments
Room Sensor missing	blinks 4 times	Fan blinks	E1 blinking
Indoor coil sensor missing	blinks 4 times	Sleep blinks	E2 blinking
Pump fault	blinks 2 times	Cool & Fan blink	E6 blinking
Pipe water temperature poor	blinks 3 times	Cool & Dry blink	E4 blinking
Pipe water temperature fault	blinks 1 time	Cool blinks	E5 blinking

Selections

- RSWING

This is used to configure the board's DC swing angles:

3k	-	WM10F
220R	-	WM20F

- RGL

This is used to configure the board's 9 minutes valve force on feature:

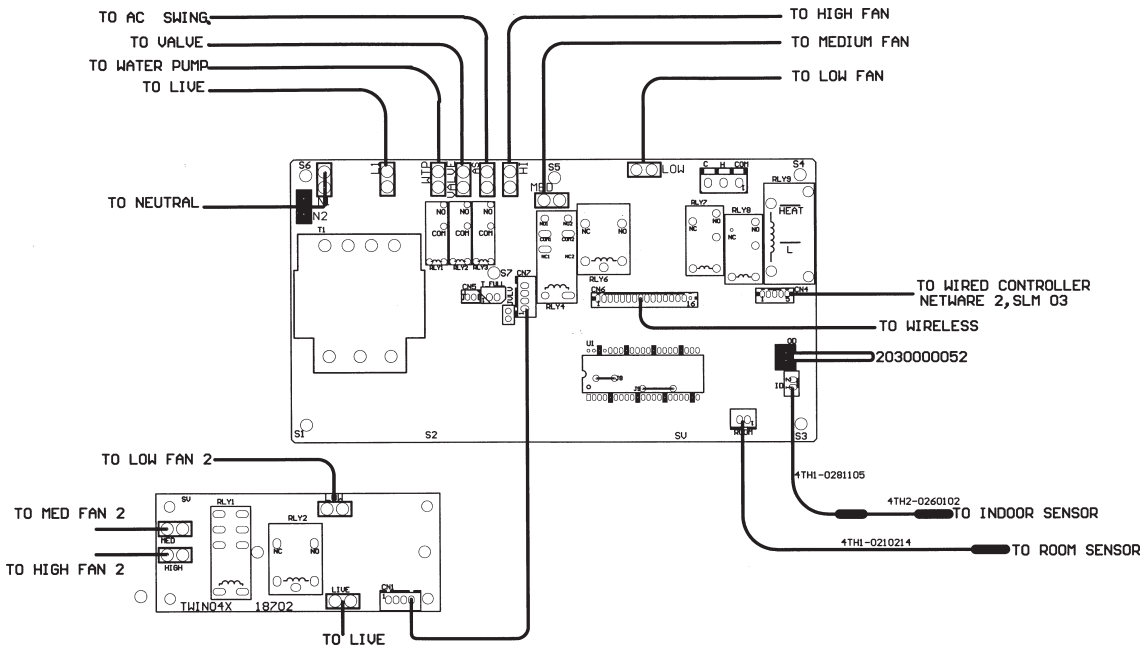
110k	-	Water valve force on option not available
22k	-	Water valve force on option available
7k5	-	Water valve force on option not available
3k	-	Water valve force on option available

9 Minutes Water Valve Force On

If the water valve is idle for more than 9 minutes during cool mode and room temperature is Ts (Ts = Set temperature) or warmer, the water valve is forced to cut in and this cycle is subjected to cool mode thermostat cut in/out condition.

Schematic Diagram

Figure 18 :



Fan Coil Unit (W2)

Features

- Heat/Cool/Dry*/Auto*/Fan system control
- Auto/High/Med/Low indoor fan speed control
- DC motor and AC motor swing control option
- LCD remote control or wired LCD or SLM control reception
- Fan Priority Setting
- Real time clock
- Real time On/Off timer
- Delay timer up to 15 hours
- Sleep function for Cool and Heat mode
- Preprogrammed Anti Freeze Set Point
- Room temperature sensing
- Load Shedding
- Cold start
- Memory backup for last state settings option
- Valve 9 minutes force on for Cool mode only
- Valve and valveless control options
- Wall-mount / non wall-mount unit control options
- Window Open Contact
- Water pump and water overflow protection control
- With networking capability via NIM
- Capable to control Mini Chiller operating modes
- Built in Diagnostic

* For 2-pipe system operation, there shall be no AUTO mode. It only applicable in Model 3 (4 pipe with boiler). Dry mode is selectable via wired LCD control panel or remote handset.

Model of Selection

There are 4 models selectable:

Model	Configuration	Operating Mode
1	2 pipes	Cooling or Heating (no Auto mode)
2	2 pipes + Aux. Heater	Cooling or Heating with Aux. Heater (no Auto mode)
3*	4 pipes with Boiler	Cooling only or Boiler (with Auto mode)
4*	4 pipes + Boiler	Cooling or Heating with boiler water (no Auto mode)

* Only for system with valves

Valve or Valveless Control Selection

This option is to select valve or valveless control for the chilled water system.

Jumper VALVE

Open	- Valveless control
Short	- Valve control

When valveless control is selected, there will be no fan mode.

Operating Modes

The system model can be configured via the following jumpers. For each model selected, the permissible operating modes are as follows:

Jumper	Configuration	Model	Operating Modes
M1	2 Pipes without Aux. Heater	1	Heat>Cool>Dry>Fan
M2	2 Pipes with Aux. Heater	2	Heat>Cool>Dry>Fan
M3	4 Pipes + Boiler	3	Heat>Cool>Dry>Auto>Fan
M4	4 Pipes + Boiler	4	Heat>Cool>Dry>Fan

Heat set point will always be offset +2°C internally except when in AUTO mode (in AUTO mode, heat set point will be offset -1°C).

Power Up Settings

During power up, the system can be configured to memorize the settings prior to power down. For system with Heat/Cool common set point, the memorized settings are:

a) Mode & On/Off status
b) Set Temperatures
c) Fan Speed
d) DC swing (Louver)
e) AC swing
f) Flap stop coordinate (for DC swing off mode)

If the swing mode is off, the flap will stop at the last stop position prior it is power down. For without last state memory, the power up setting is OFF mode, temperature setting is 24°C, indoor fan speed is high and swing mode is off.

Unit ON/OFF

There are 3 ways to turn on or off the system:

i) via On/Off triggering
ii) via delay timer* or
iii) via real time On/Off timer**

When unit is in OFF mode i.e. the On/Off LED is off, all valves will close, auxiliary heater/boiler and fan will turn off. This mode could only be override by 25 seconds of post heater fan retention period and antifreeze mode.

* Only SLM remote control or the remote handset has this delay timer function.
** Only for system with LCD remote control reception.

- ON/OFF triggering

Pressing the emergency ON/OFF button or the LCD remote controller ON/OFF button can achieve ON/OFF triggering. In doing so, the DELAY timer will be reset.

When the emergency ON/OFF button is pressed, the system mode setting will rotate in the following sequence:

SEQUENCE (with no bar heat)

- - - - - - - > COOL > HEAT > OFF > - - - - - - - -

SEQUENCE (with bar heat)

- - - - - - - - > COOL > OFF > - - - - - - - -

The corresponding LEDs will also follow suit.

Pressing the remote control ON/OFF will toggle the system status either from ON to OFF or from OFF to ON.

- Delay Timer

This delay timer is to simulate the ON/OFF pressing after the set number of hours and minutes. After triggering, the delay timer is set to 0 hours.

Pressing ON/OFF will also reset this timer to 0 hours.

- Real Time ON/OFF timer

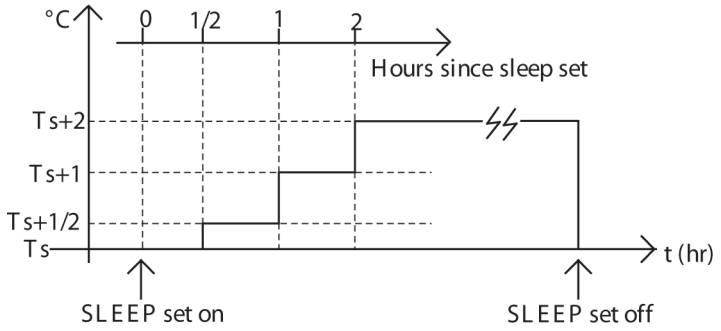
When the real time ON timer set time matches the internal real time clock, the unit will be switched on. Similarly, when the OFF time matches the real time clock, the unit is switched off. The timer settings are retained so that similar switching can occur 24 hours later.

This timer will be reset if the emergency ON/OFF switch is pressed.

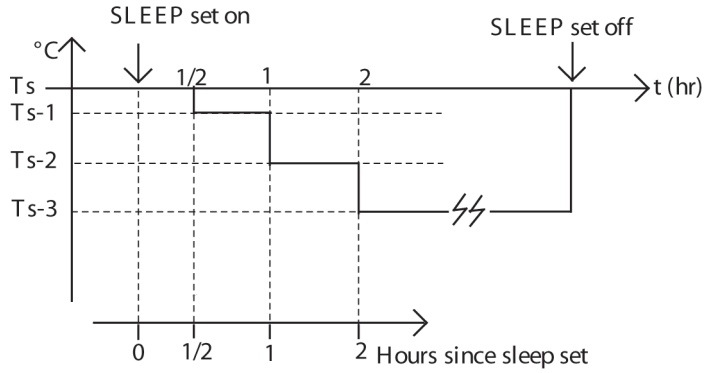
Sleep Function

This function will increase or decrease the set temperature with time.

The COOL mode SLEEP profile is as follows:



The HEAT mode SLEEP profile is as follows:



The SLEEP option is only available for system at COOL and HEAT modes. Changing to other modes will inhibit the SLEEP option and the timer will be reset. Pressing the emergency ON/OFF will reset the sleep timer. This option is set/reset by on the LCD remote controller.

Fan Priority Setting

This option is applied to COOL, HEAT and AUTO mode (apply only during thermostat off cycle). Two options to set the fan speed during thermostat off cycle via jumper FAN_PRIO:

Jumper FAN_PRIO	
Open	- Fan stop when thermostat cuts off
Short	- User set speed or low fan if auto fan mode is selected (default)

If FAN mode is selected, this setting is ignored, i.e. the fan continues to on. Thermostat off cycle refers to state when valve is closed. This feature is not valid during OFF mode and Load-shed in which fan is always off. For valve-less models, this setting is invalid.

Bar Heat Mode Setting

This option is to bar the user form using Heat mode for this chilled water. This option can be set via jumper HEAT:

Open - Bar Heat mode
Short - Heat mode allow to use

When bar heat is set, there will be no AUTO mode (for Model 3)

ON/OFF and Heat/Cool Output Dry Contact

When the system is in ON mode, ON/OFF contact will be shorted. Else, it will remain OPEN. When the system is in HEAT mode, Heat/Cool contact will be shorted. If the system is in COOL mode, the contact will be OPEN.

Post Heater Fan Retention

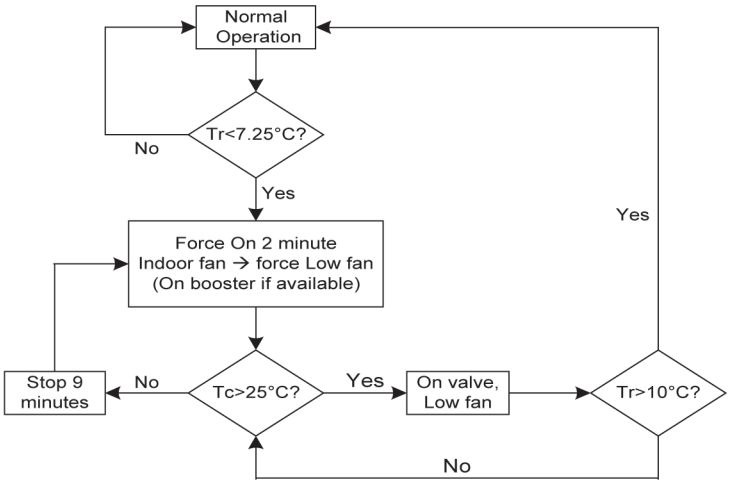
If the heater is used, the fan may not cut off until 25 seconds after the heater has cut off.

Thermostat Panel Override

User can change the Unoccupied mode to Occupied mode by changing the temperature set points (via wired controller or handset). However, this override can only last for 2 hours after the last change of the set points at the panel.

Preprogrammed Anti Freeze Set Point (for Model 3 & 4 ONLY)

In order to protect room from freezing, the set point could be fixed at 10°C. Disregard whether the unit is in OFF mode, when the room temperature drops to below 7.25°C, thermostat** will cut in and fan speed is forced to Low. When room temperature rises back to 10°C and above, thermostat will cut out and fan speed will follow jumper FAN_PRIO setting. The Anti-Freeze operation will be activated only if the dry contact is closed for more than 5 seconds. If the dry contact is opened for more than 5 seconds, antifreeze operation is deactivated. Anti Freeze has the highest priority among all unit operations.



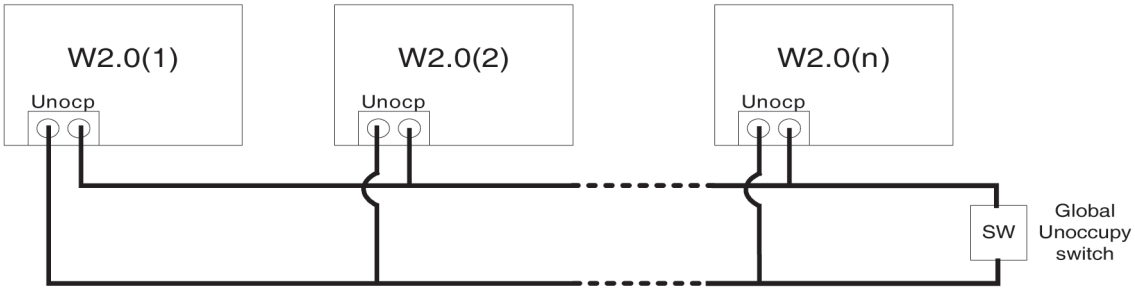
Antifreeze cycle

Preprogrammed Unoccupied Set Points (for Model 3 & 4 ONLY)

The fan coil unit can be set to run at fixed set point under either COOL or HEAT mode. If the fan coil unit is running in COOL mode, the fixed set point is 30°C. If the fan coil unit is running in HEAT mode, the fixed set point is 14°C.

This option is activated via a dry contact. If the dry contact is closed for more than 5 seconds, the Unoccupied mode is activated. If the dry contact is opened for more than 5 seconds, Occupied mode is activated. When Timer On is active, system goes back to Occupied mode for 2 hours. Then system will go back to Unoccupied mode.

The dry contact connection points can be connected in series with other fan coil unit (FCU) boards. If the dry contact is closed, Unoccupied mode will be activated on all the fan coil units which are connected in parallel, i.e.:



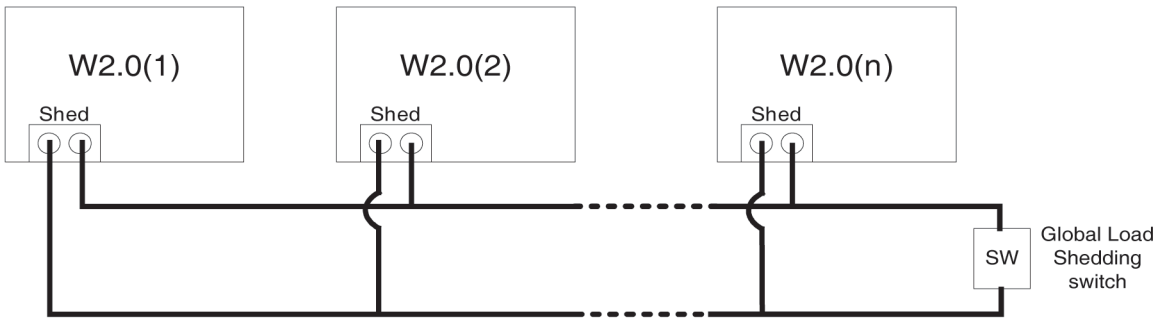
Global Unoccupied operation could also be activated via the network communication bus line by the master controller with or without the above connection.

Load Shedding (for Model 3 & 4 ONLY)

During load shedding, the fan, the valve and the heater will be cut out. However, this mode can be override by antifreeze mode.

This option can be activated via a dry contact. If the dry contact is closed for more than 5 seconds, load shedding mode is activated. If the dry contact is opened for more than 5 seconds, load shedding is deactivated. After the load shedding is deactivated, the system will maintain the settings prior load shedding.

The dry contact connection points can be connected in parallel with other fan coil unit (FCU) boards. If the dry contact is closed, load shedding mode will be activated on all the fan coil units which are connected in series, i.e.:



Global Load Shedding operation could also be activated via the network communication bus line by the master controller with or without the above connection.

Room Temperature Sensing

During power up, chilled water trying to use the room temperature sensed at the LCD thermostat panel. Once it has detected abnormal feedback such as sensor OPEN/SHORT/HIGH/LOW, it will switch to use the room temperature sensed at the fan coil return air.

Temperature Set Points Range

For Heat/Cool common set point model, the operating temperature range is 16°C to 30°C, both inclusive. Temperature setting is allowed in COOL, DRY, and HEAT modes.

Fan Speed

Three manual fan speeds are available, i.e. high, medium and low fan speeds. In auto fan speed, the fan speed will run depending on the sensed room or return air temperature and the set point. For valve-less configuration, there will be a super low fan speed control.

Water Pump

The water pump will on if the water valve is on during cooling cycle or when the float switch contact is opened. The pump will remain on for at least 5 minutes after the water valve is off. During mode change from cooling to non cooling mode, the pump will on for minimum 5 minutes.

Water Level Switch (Float Switch)

This normally close switch is to detect faults in water pump system. It will confirm for 30 seconds for switch open and 60 seconds for switch close.

Once switch is confirmed open, it will force the water valve to cut off (for cooling cycle only), water pump will always on, error indicator (E6) will be shown. If the switch is closed, the water valve is allowed to cut in.

2 Pipe Water Temperature Sensing

Pipe water temperature sensing is ONLY valid for 2 pipe system with or without auxiliary heater (Model 1 & 2). Additional thermistor shall be used for boiler pipe water temperature sensing for 4 pipe system.

- With Water Valve

During:

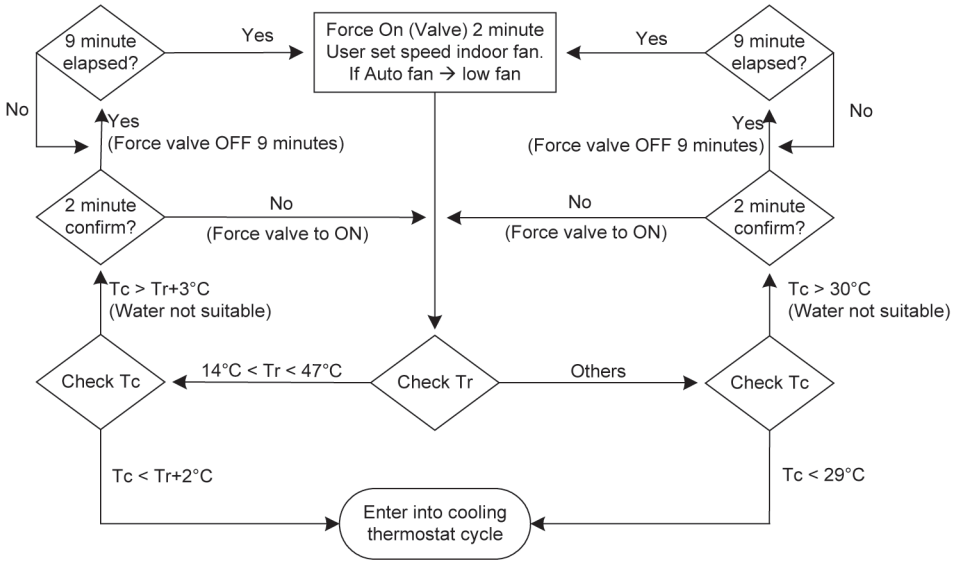
a) Power on reset and unit is turned on
or b) Mode change
or c) Unit recover from faults

The water valve and indoor fan at set fan speed will be forced to cut in for at least 2 minutes irrespective of thermostat cycle.

If AUTO fan is selected, it will run low fan. At 2 minute intervals, the system will repeat the checking. Auxiliary heater will not be used.

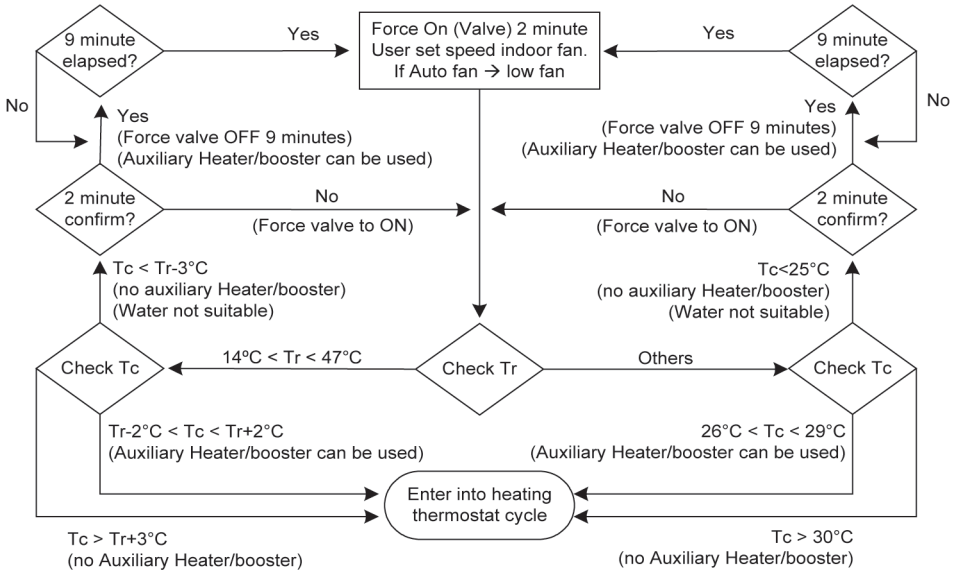
Room temperature will be updated every 30 seconds. Pipe water temperature (Tc) will be checked every 1 second.

- Cool cycle



After 2 minutes force on, indoor fan will run as per user set speed unless others specified.

- Heat cycle



After 2 minutes force on, indoor fan will run as per user set speed unless others specified.

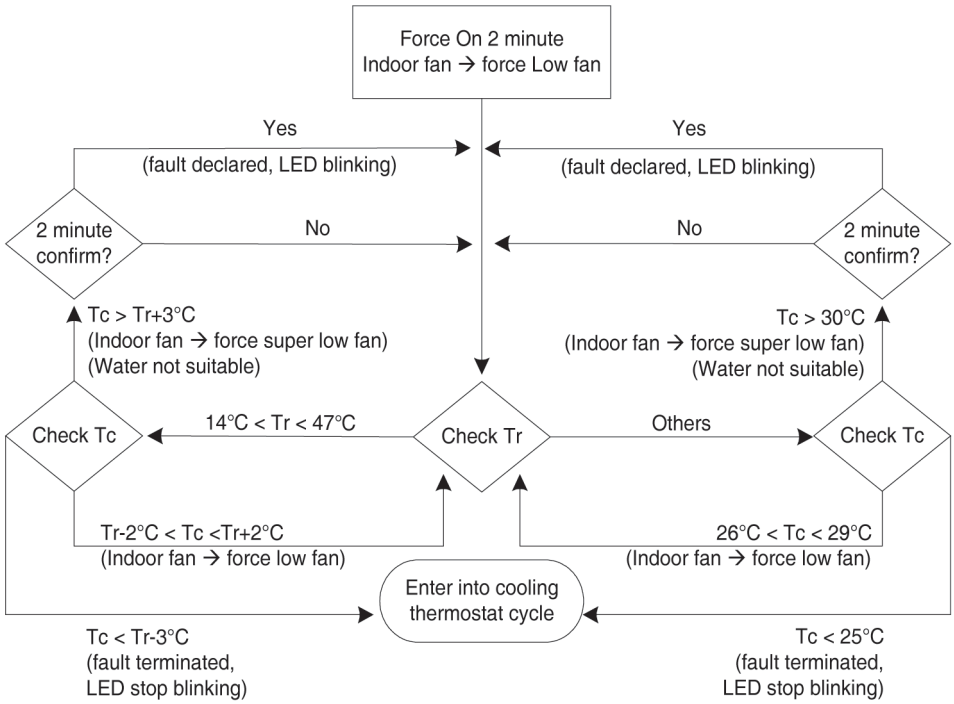
- Without Water Valve

During:
a) Power on reset and unit is turned on
or b) Mode change
or c) Unit recover from faults

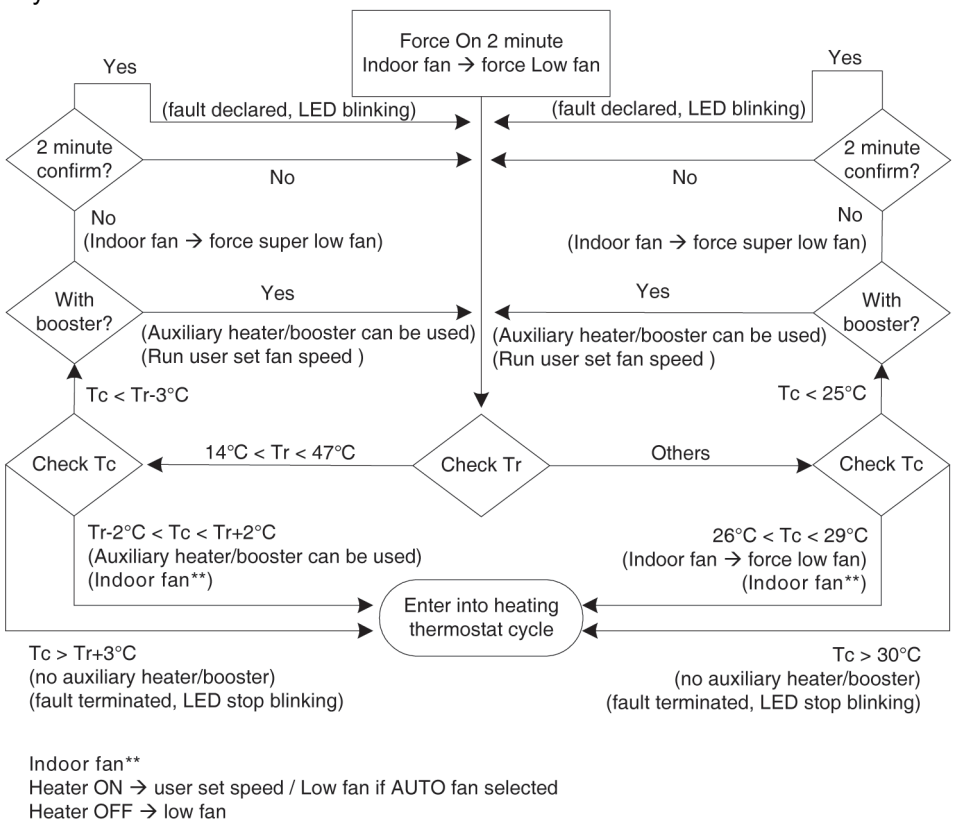
The indoor fan is forced to run at low fan speed for at least 2 minutes irrespective of thermostat cycle.

Room temperature will be updated every 30 seconds. Pipe water temperature (Tc) will be checked every 1 second.

- Cool cycle



- Heat cycle



Indoor fan**
Heater ON → user set speed / Low fan if AUTO fan selected
Heater OFF → low fan

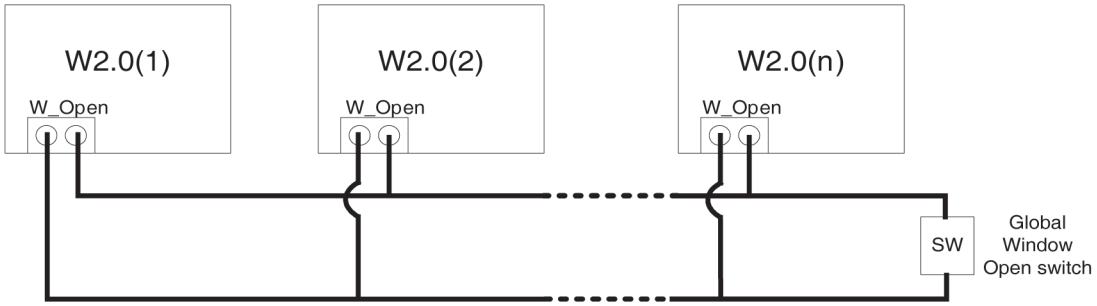
Window Dry Contact (for Model 3 & 4 ONLY)

If the window dry contact is closed for more than 30 seconds, Window Open mode is activated. Both the valve, the heater will cut out. The indoor fan will follow jumper FAN_PRIO setting.

For valveless system, the fan speed will run depending on the sensed room or return air temperature and the set point.

When the dry contact is opened for more than 5 seconds, Window close mode is considered. After window is confirmed closed, the system will maintain the settings prior Window open mode.

The dry contact connection points can be connected in parallel with other fan coil unit (FCU) boards. If the dry contact is opened, Window open mode will be activated on all the fan coil units which are connected in parallel, i.e.:



Cold Start

When the unit restarts 2 hours after it has stopped or during power-on-reset start, it is considered a cold start.

Cool Set Temp = Set Temp - 2°C
Heat Set Temp = Set Temp + 2°C

Activated sleep mode will stop cold start function.

Cool Mode (thermostat cycle)

- With Water Valve (cooling)

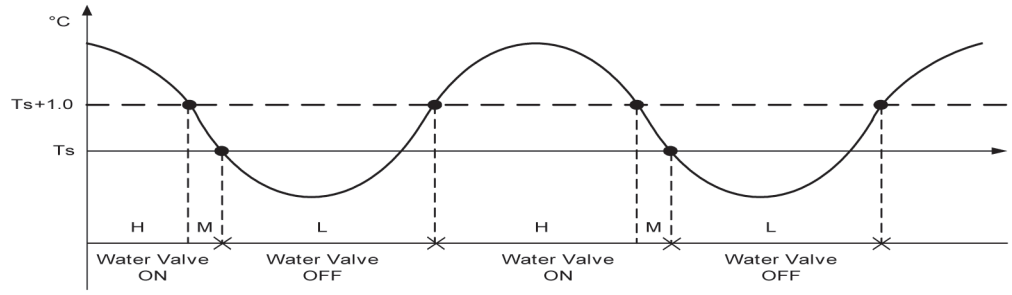
For all 4 models, if T(room) => T(set) by more than 1°C the valve will cut in. If T(room) <= T(set), the valve will cut out.

Minimum thermostat cut in or out time is 30 seconds. The indoor fan will follow jumper FAN_PRIO setting.

If jumper FAN_PRIO is ON:

For manual speed, the indoor fan will run as per user set speed.

In AUTO FAN speed, the indoor fan speed will run as follows:



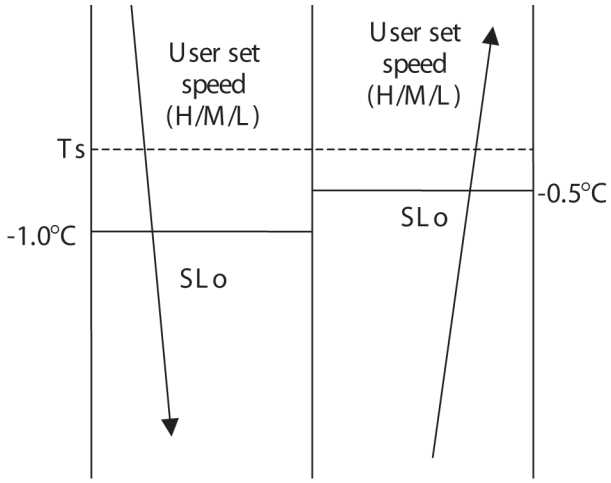
Minimum fan speed change time is 30 seconds.

During cold start, the working Set Temperature is set to User Set Temperature -2°C (cold blast). This will remain until the water valve has cut off or has run for at least 20 minutes. After that, the working Set Temp is reset back to the user Set Temp.

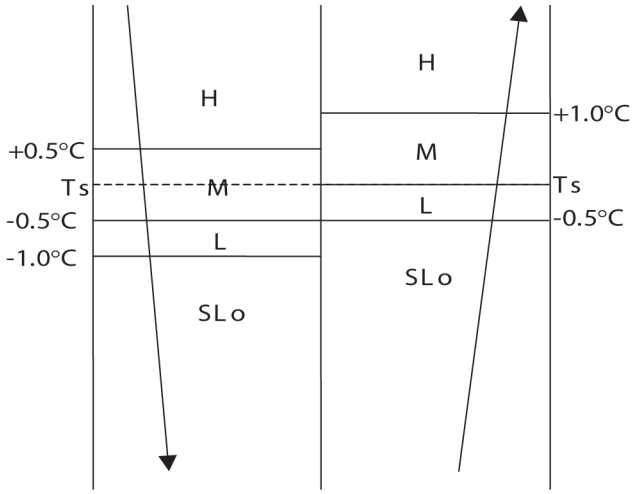
- Without Water Valve (cooling)

Minimum fan speed change time is 30 seconds.

In manual fan speed, the indoor fan speed will run as follows:



In auto fan speed, the indoor fan speed will run as follows:



During “SLo” region, the indoor low fan will cycle for 1 minute on and 1 minute off.

During cold start, the working Set Temperature is set to User Set Temperature -2°C (cold blast). This will remain until the indoor fan has cut off or has run for at least 20 minutes. After that, the working Set Temp is reset back to the user Set Temp.

During Cool mode with fan off, if the indoor fan has cut off for more than 9 minutes, the low fan will be forced to cut in for at least 2 minutes. Similarly, if unit is just turned on, the low fan will be forced to cut in for at least 2 minutes if the temperature during turn on inhibits indoor fan to run.

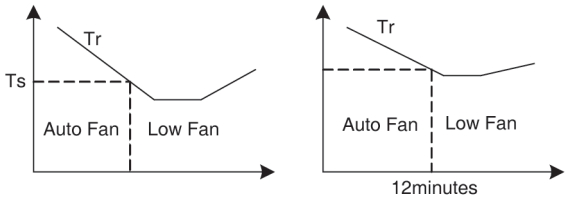
Dry Mode

During the first 12 minutes of the DRY mode run from:

i) Cold Start or
ii) Mode change

Dry mode must run under cool mode with AUTO indoor fan for 12 minutes or until Tr =< Ts

After this, the dry mode will operate like cooling cycle. However, only low fan is allowed to cut in.

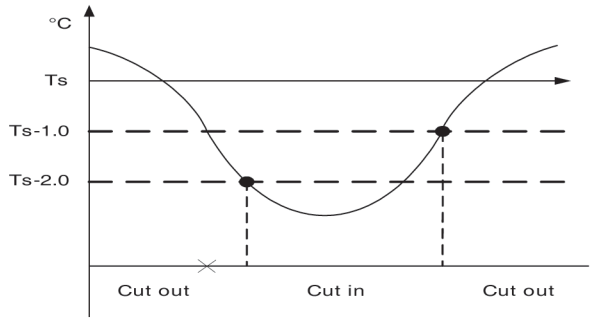


Heat Mode

- Auxiliary Heater/Booster (heating)

Minimum auxiliary heater/booster cut in and out is 30 seconds.

For boiler booster, it is allowed to use when:
a) The unit has been power on > 20 minutes
b) Its temperature must Tb > 28°C and Tb > Ts+5°C (This will be checked when the boiler has been forced to activate for 2 minutes).



If the boiler water is not suitable for more than 2 minutes, the heat valve will force to cut off for 5 minutes.

- With Water Valve (heating)

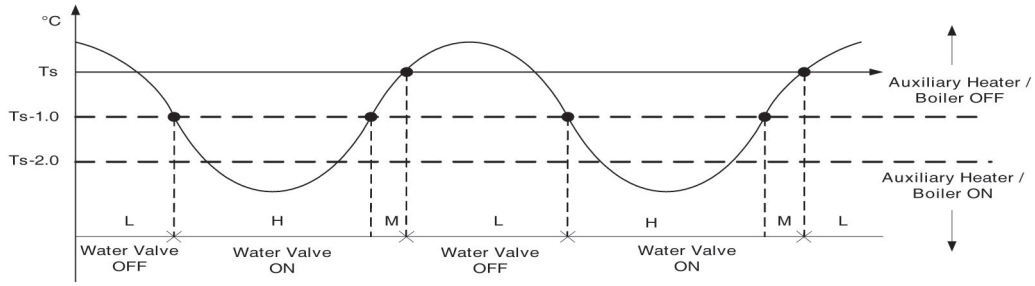
Minimum thermostat cut in or out time is 30 seconds.
Minimum fan speed change time is 30 seconds.

During cold start, the working Set Temperature is set to user Set Temperature +2°C (spurt heat). This will remain until the water valve has cut off or has run for at least 20 minutes. After that, the working set temperature is reset back to user Set Temperature.

For all 4 model system, the water valve (heat valve) cuts in if Tr <= Ts-1°C. When the Tr >= Ts, the valve will cut out.

For manual speed, the indoor fan will run as per user set speed.

In AUTO FAN speed, the indoor fan speed will run as follows:



If hot water is available, i.e. water is warm enough, the Heat thermostat cycle will operate as single stage Heating using the hot water as the only heat source (applicable to Model 2 & 4 only).

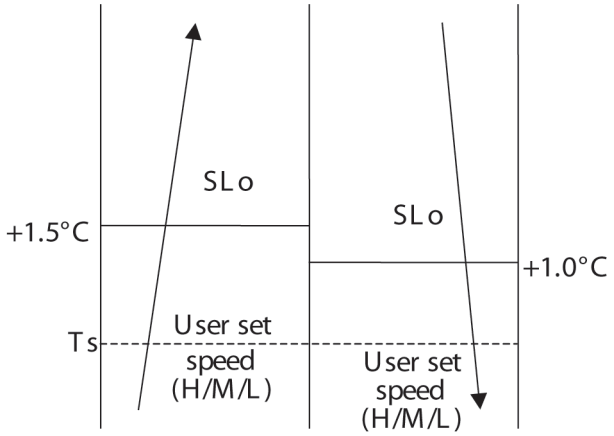
- Hot Keep

When the water valve or heater cuts out, the unit is in hot keep mode. Indoor fan will follow jumper FAN_PRIO setting. For heater, there will be a post heat fan retention time of 25 seconds. It is applicable to both valve and valveless system.

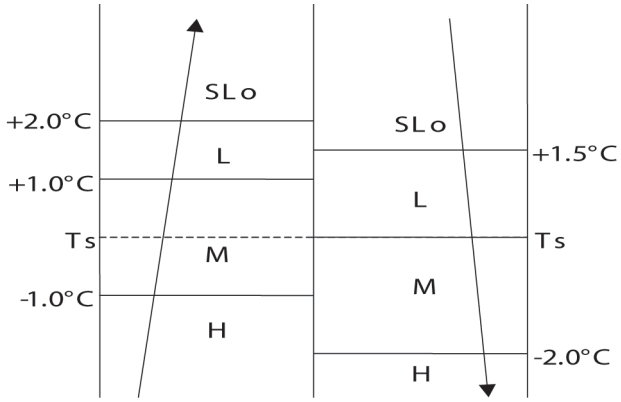
- Without Water Valve (heating)

Minimum fan speed change time is 30 seconds. During cold start, the working Set Temperature is set to user Set Temperature +2°C (spurt heat). This will remain until the indoor fan has cut off or has run for at least 20 minutes. After that, the working set temperature is reset back to user Set Temperature.

In manual fan speed, the indoor fan speed will run as follows:



In auto fan speed, the indoor fan speed will run as follows:



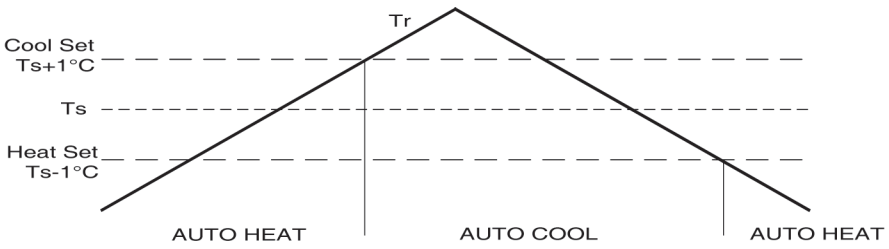
During Off/Low (was off) region, the indoor low fan will cycle for 1 minute on and 1 minute off.

During Heat fan off mode, if the indoor fan has cut off for more than 9 minutes, the low fan will be forced to cut in for at least 2 minutes. Similarly, if unit is just turned on, the low fan will be forced to cut in for at least 2 minutes if the temperature during turn on inhibits indoor fan to run.

Auto Mode (for Model 3 only)

The operations of Auto Cool mode and Auto Heat mode are as per normal Cool mode and Heat mode operation. During Auto Heat mode, when room temperature rises and equals to Cool set point, system will change to Auto Cool mode. If the room temperature falls down and reaches Heat set point, system will change to Auto Heat mode.

In Auto mode, the cool set temp will be offset +1°C while the heat set temp will be offset to -1°C.



Fan Mode

Three fan speeds is allowed in Fan mode, i.e. High, Medium and Low. The fan will continue to run irrespective of the setting on jumper FAN_PRIO. Fan mode is not available to valveless system.

9 Minutes Water Valve Force On

If the water valve is idle for more than 9 minutes during cool/dry mode and room temperature, Tr = Ts (Ts = Set temperature) or warmer, the water valve is forced to cut in 2 minutes.

Room Temperature Display Range

The room temperature display is: 0°C to 50°C or 32°F to 122°F.

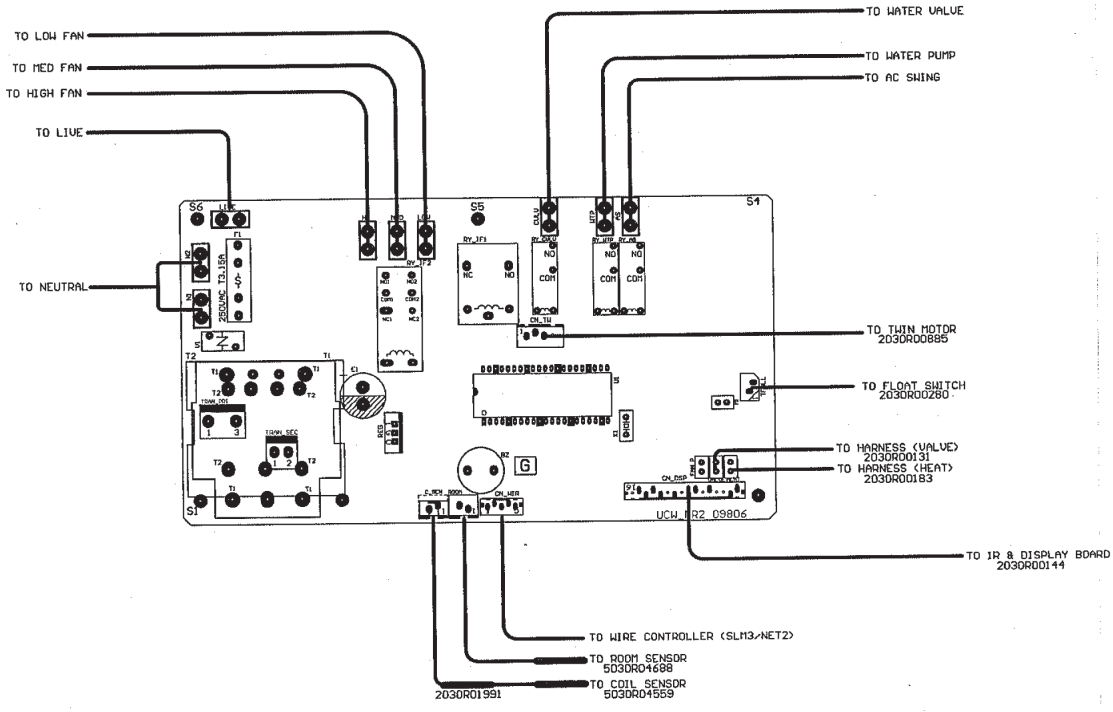
Diagnostics

Error	Cool LED	7 Segment Indicator
Room Sensor error (short/open)	1 blinks*	E1
Pipe Water Sensor Error (short/open)	2 blinks*	E2
Water Pump error	6 blinks*	E6
Pipe Water Temperature fault	5 blinks*	E5
Window open activated	3 blinks*	-
Antifreeze mode activated	7 blinks*	-
Load shedding activated	8 blinks*	-

*Blinking (1 second each) → off 3 seconds → blinking (1 second each)
Others LEDs will off.

Schematic Diagram

Figure 19 :



Mini Chiller - Single Compressor (MCH1)

Features

- HEAT/OFF/COOL outdoor system control.
- Compressor recycle protection (Anti short cycle timer).
- Frost/ice prevention in the chilled water.
- Compressor overload, water pump overload, high/low pressure and flow switch protections.
- Defrosting for outdoor coil during heat pump mode.
- LEDs indication for system condition and system temperatures.
- Separately adjustable cool mode & heat mode water-in (entering water) temperature.
- Auto pump run during standby mode.

System ON/OFF And Mode Setting

The system mode is determined by two contacts i.e. contact 1 & contact 2.

Mode	Contact1	Contact2	Green LED	Red LED
System OFF (standby)	OFF	OFF	OFF	OFF
Heat Mode	OFF	ON	OFF	ON
Cool Mode	ON	OFF	ON	OFF
System OFF - Error	ON	ON	OFF	OFF

Entering Water Temperature

This temperature setting for the entering water temperature is as follows:

Mode	Minimum	Maximum	Step	Factory Setting
Cool	3°C	15°C	1°C	12°C
Heat	35°C	50°C	1°C	40°C

- SW2 Factory Setting (for COOL mode)

Set Temperature °C	SW2		
	SW2-3	SW2-2	SW2-1
Set by VR3	**0**	**0**	**0**
3	**0**	**0**	**1**
4	**0**	**1**	**0**
5	**0**	**1**	**1**
6	**1**	**0**	**0**
7	**1**	**0**	**1**
8	**1**	**1**	**0**
9	**1**	**1**	**1**

1 = ON
2 = OFF

If this DIP switch setting is set to (0,0,0), the set temperature will be determined by the VR3 setting. Otherwise, this setting will override the VR3 setting.

- Cool Mode User Set Temperature

This is the setting of the entering water temperature during cool mode. The setting range is 10 °C to 15 °C. Setting is done by trimmer VR3 and the value will be shown on the 7-segment LED display. The set value can be read by adjusting the trimmer or by pushing the tact switch SW1. When reading this value, the green LED and the 7-segment display will flash.

- Heat Mode User Set Temperature

This is the setting of the entering water temperature during heat mode. The setting range is from 35 °C to 50 °C. Setting is done by trimmer VR1 and the value will be shown on the 7 segment LED display. The set value can be read by adjusting the trimmer or by pushing the tact switch SW1. When reading this value, the red LED and the 7-segment display will flash.

Initial System Power Up Condition

When the system is first power up, the water pump will run and the flow switch condition is checked. If the flow switch contact is closed within 3 minutes after the water pump run, operate the system as normal.

Thermistor Sensor Inputs

- Entering Water (water-in) Temperature Sensor (B1)

This sensor measures the temperature of the returned water from the indoor chilled water fan coil. When the temperature reaches the set temperature as determined by DIP switch SW2 or trimmer VR3, the compressor will either cut in or cut out.

- Leaving Water (water-out) Temperature Sensor (B2)

This sensor measures the leaving water temperature (T_{B2}) for anti-freeze protection. Therefore, it is only applicable for cooling mode only.

State	Temperature TB2	Time Delay	System Status
1	> X °C	Not Applicable	i) System run as normal
2	< X °C	< 20 secs	i) System run as normal
3	< X °C	> 20 secs	i) OFF compressor ii) OFF condenser fan iii) Water pump continue running iv) On antifreeze heater v) Green LED blinking to indicate fault condition vi) System reset by power supply ON/OFF only vii) Antifreeze heater will turn OFF if temperature TB2. 4°C viii) Display show error code E3

The temperature *X*°C is set by trimmer VR2 and the setting range is from +3°C to -4°C. The factory setting is +3°C. This setting can be read by pushing the tact switch SW1 or by simply adjusting the trimmer position. When display the set temperature, both the green and red LED and the 7-segment LED will blink.

- Air Temperature Sensor (B3)

This sensor measures the outdoor air temperature T_{B3}. This sensor is used for standby auto-pump run feature. This mode is only active during power standby mode.

Defrost sensor (B4)

This sensor is for the purpose of defrost during heat pump mode.

Digital Alarm Inputs

Input	Description	Contact Status	Comp.	Condenser Fan	4WV	Water Pump	LED *Note 3	7 segment Display	System Code	
A1	Compressor overload	Open	X	X	X	O	B	CO	Fault	
A1	Compressor overload	Closed	-	-	-	-	-	-	Normal	
A1	Condenser fan overload	Open	X	X	X	O	B	CO	Fault	
A1	Condenser fan overload	Closed	-	-	-	-	-	-	Normal	
A2	Water pump overload	Open	X	X	X	X	B	PO	Fault	
A2	Water pump overload	Closed	-	-	-	-	-	-	Normal	
A3	Flow switch	Open	X	X	X	X	B	FL	Fault	*Note 1
A3	Low switch	Closed	-	-	-	-	-	-	Normal	
A4	High pressure cut-off	Open	X	X	X	O	B	HP	Fault	
A4	High pressure cut-off	Closed	-	-	-	-	-	-	Normal	
A5	Low pressure cut-off	Open	X	X	X	O	B	LP	Fault	*Note 2
A5	Low pressure cut-off	Closed	-	-	-	-	-	-	Normal	

X = Stop
\- = ON or OFF as according to normal system requirement.
O = Run
B = Blink

*Note 1 :
Flow switch contact will only be sensed with 3 minutes timeout after the water pump is activated.

*Note 2 :
i) After power on unit, before compressor cut in, LP fault requires manual reset.
ii) At first compressor cut in after power on unit, LP fault will be ignored for first 3 minutes.
iii) For subsequent compressor cut in cycle, the LP fault will be ignored for the first 30 seconds.
iv) After each LP fault, the LP contact will be rechecked after 10 seconds, in case the contact is closed, the fault will be reset automatically.
v) The unit can only be reset manually after the 6th LP trip.

*Note 3 :
Fault condition can only be reset by switching OFF and ON of the system power supply, except LP fault.

Digital Outputs

- Compressor

Minimum compressor ON time = 2 minutes
Minimum compressor OFF time = 4 minutes

- Outdoor Fan

The outdoor fan is switched ON when the compressor is ON. The only exception is when the unit is in defrost mode. In this mode, the outdoor fan remain OFF when the compressor is ON.

- Water Pump

The water pump will run when the system is switched ON except under condition as stated in section Digital Alarm Inputs. The water pump may also operate when the system is on standby mode.

- 4-Way Valve (4WV)

The 4WV relay will be activated once the system enter into heat pump mode except during heat pump defrost cycle. If the system changes from cooling mode to heat pump mode or vice versa, the 4WV changes immediately.

- Antifreeze Heater

The antifreeze heater will be switched on if the leaving temperature (T_{B2}) is less than or equal to *X* °C. It will be switched off if T_{B2} is greater than *X* °C.

- Second Stage Electric Heater

This heater serves as the auxiliary heater for the heating mode if the temperature between the set temperature and the entering water temperature is too great.

- Fault Relay Output

This relay will be activated when a fault condition as mentioned in Section Digital Alarm Inputs occurs or the system enter into anti-freeze alarm mode.

- Defrost Mode

Start Defrost Conditions
a) Defrost timer start counting when Defrost Sensor (DS) <= 0°C
b) 45 minutes later and DS <=-3°C, defrosting start.
c) At any time if DS > 2°C for more than 150 seconds, defrost timer reset to 0.

Defrost Cycle
4WV, outdoor fan, electric heater off, compressor still running. 7 segment display “df”

Defrost Termination
a) DS > 14°C
b) After defrosting for 10 minutes OR
c) High pressure contact open

For defrost termination, HP contact open, the compressor will stop, but no error indication. The HP switch will be bypassed for 3 minutes. If contact not closed compressor will not run. If contact closes at any time, no more bypass. After 3 minutes if the high pressure switch is still open, “HP” error will be shown.

Defrost Termination Cycle
Compressor stop, outdoor fan on, 15 second later 4WV on, 20 second later compressor on. If compressor not allowed to on, outdoor fan will off after it is on for 35 seconds. Second stage electric heater will on/off accordingly.

Cool Mode Temperature Regulation

In Cool mode, the compressor will cut in if the entering water temperature is higher than the set temperature by 2 °C. The compresor will cut out if the entering water temperature is equal to set temperature. The above are subjected to timing protections of the compressor. The outdoor fan must run when the compressor is ON except during defrost mode.

Heat Mode Temperature Regulation

In Heat mode, the compressor will cut in if the entering water temperature is lower than the set temperature by 3 °C. The compressor will cut out if the entering water temperature is equal to set temperature. The above are subjected to timing protections of the compressor. The 2nd. stage electric heater is switched on if the entering water temperature is lower than the set temperature by 5 °C and is switch off when the difference is reduced to 2 °C. The outdoor fan must run when the compressor is ON except during defrost mode.

Calibration and Test Mode

The unit can enter into calibration and test mode by adding 10K resistor across calibration jumper during power up. The red and green LEDs will turn on if the tolerance of the thermistors are within the specification else both the LEDs will blink. The relay will also turn one by one.

Schematic Diagram

Figure 20 : MCH1 For Cooling Only Model

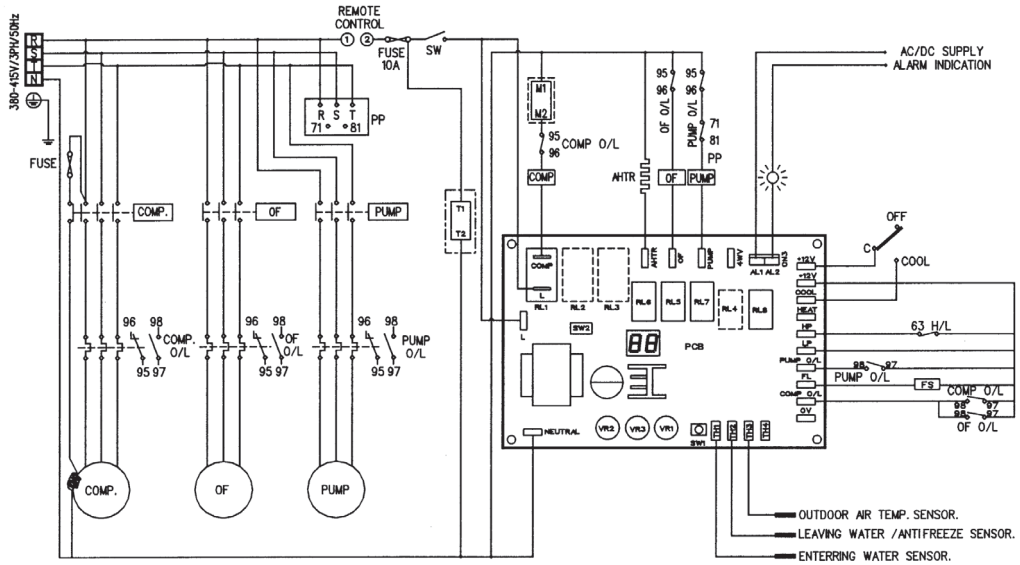
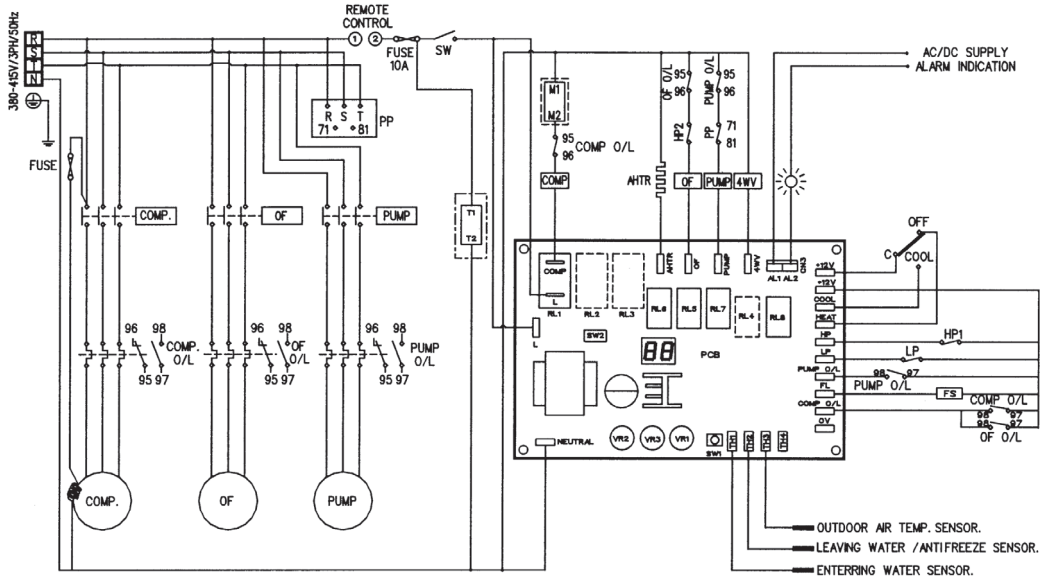


Figure 21 : MCH1 For Heatpump Model



Mini Chiller - Multi Compressor (MC1.0)

Features

- 1 compressor to 4 compressors system
- Networking. Single pump, separate pump system
- Chiller, Heat pump/boiler model
- Compressor load balance
- Winter antifreeze
- Cool mode antifreeze
- Condenser Coil Defrost. Alternative defrost. Manual defrost
- On/off timer 4 on/off timers every day, 7 days
- Last state memory
- System model/status/temperature/parameter display and programming

Main Board

- Contains all input and outputs mentioned above
- Connected to wired panel
- Wired network to other main board

Input/outputs (i - input, o - output)

a) Compressor system (For each unit of compressor)
   Compressor (o)
   4 Way Valve (o)
   Outdoor fan (o)
   Compressor overload contact (i)
   High pressure contact (i)
   Low pressure contact (i)
   Fan overload contact (i)
   Defrost (condenser) sensor (i)
   Discharge sensor (i)
   Defrost end contact (i)

b) Water system
   Water pump (o)
   Flow contact (i)
   Pump overload contact (i)
   Entering water temperature sensor (i)
   Leaving water temperature sensor (i)

c) Miscellaneous
   Antifreeze heater (o)
   Auxiliary heater (o)
   Boiler output (o)
   Alarm output (o)
   Alarm input (i)
   On/off contact (i)
   Cool/Heat contact (i)
   Outdoor air temperature sensor (i)

d) Serial communication (RS485 interface - for networking and to PC adaptor)
   Serial input (i)
   Serial output (o)
   Common ground

Wired Panel

- User/installer interface to main board
- Normal operation, programming of parameters
- Multiple line text display
- Display status of all units
- Alarm display and alert

Auxiliary Boards (optional)

- 3rd and 4th Compressor outputs and inputs
- PC interface board

Programmable Parameters

	General	Type	Unit	Default	Min	Max	Resolution
G1	Model 0 = Chiller 1 = Heat Pump 2 = Chiller/Boiler 3 = Heat pump/Boiler 4 = Chiller + Boiler 5 = Heat pump + Boiler	F	Flag	4 (chiller + Boiler)	0	2	1
G2	Number of compressor 1=1 compressor 2=2 compressor 3=3 compressor 4=4 compressor	F	Flag	1	1	4	1
G3	On/off input 0=disable, 1=enable	F	Flag	0 (disable)	0	1	1
G4	Cool/Heat input 0=disable, 1=enable	F	Flag	0 (disable)	0	1	1
G5	External alarm input 0=disable, 1=enable	F	Flag	0 (disable)	0	1	1
G6	Water system for chiller network 0=independent 1=modular	F	Flag	0 (disable)	0	1	1
G7	Unit number	F	Flag	0	0	50	1

	Sensor	Type	Unit	Default	Min	Max	Resolution
S1	Entering water sensor calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S2	Leaving water sensor calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S3	Air sensor calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S4	Defrost (condenser) sensor 1 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S5	Defrost (condenser) sensor 2 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S6	Defrost (condenser) sensor 3 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S7	Defrost (condenser) sensor 4 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S8	Compressor discharge sensor 1 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S9	Compressor discharge sensor 2 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S10	Compressor discharge sensor 3 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1
S11	Compressor discharge sensor 4 calibration	U	ºC (ºF)	0 (0)	-12 (-21.6)	12 (21.6)	0.1

	Regulator	Type	Unit	Default	Min	Max	Resolution
R1	Cooling set-point	D	ºC (ºF)	12 (53.6)	R5	R6	0.1
R2	Cooling differential	U	ºC (ºF)	1.5* (2.7)	0.4 (0.7)	10 (18)	0.1
R3	Heating set-point	D	ºC (ºF)	40 (104)	R7	R8	0.1
R4	Heating differential	U	ºC (ºF)	1.5* (2.7)	0.4 (0.7)	10 (18)	0.1
R5	Minimum Cooling set-point	U	ºC (ºF)	7 (44.6)	-20 (-4)	R6	1
R6	Maximum Cooling set-point	U	ºC (ºF)	20 (68)	R5	40 (104)	1
R7	Minimum Heating set-point	U	ºC (ºF)	30 (86)	-20 (-4)	R8	1
R8	Maximum Heating set-point	U	ºC (ºF)	50 (122)	R7	90 (194)	1
R9	Auxiliary heater set-point (threshold below heating set-point)	U	ºC (ºF)	5 (9)	0 (0)	40 (72)	0.1
R10	Auxiliary heater differential	U	ºC (ºF)	2 (3.6)	0.4 (0.7)	10 (18)	0.1
R11	Auto boiler set-point (threshold below heating set-point)	U	ºC (ºF)	5 (9)	0 (0)	40 (72)	0.1
R12	Auto boiler differential	U	ºC (ºF)	2 (3.6)	0.4 (0.7)	10 (18)	0.1
R13	Auto boiler start time threshold	U	min	30	0	199	1

	Compressor	Type	Unit	Default	Min	Max	Resolution
C1	Compressor minimum run time	U	sec	120	0	1990	10
C2	Compressor minimum stop time	U	sec	180	0	1990	10
C3	Time interval between two starts	U	sec	450	0	1990	10
C4	Start delay between two compressors	U	sec	15	0	199	1
C5	Pump on →compressor on delay	U	sec	180	0	1990	10
C6	Comp off → pump off delay	U	sec	60	0	1990	10
C7	Discharge cut-off set-point	U	ºC	120 (248)	0 (32)	150 (302)	1

	Condenser Defrost	Type	Unit	Default	Min	Max	Resolution
D1	Start defrost temperature	U	ºC (ºF)	0 (32)	-20 (-4)	D2	1
D2	End defrost temperature	U	ºC (ºF)	14 (57)	D1	40 (104)	1
D3	Maximum duration of defrost cycle	U	min	10	1	40	1
D4	Defrost interval time	U	min	45	0	199	1
D5	Delay before defrosting	U	sec	0	0	1990	10
D6	Delay after defrosting	U	sec	120	0	1990	10

	Cool Mode Antifreeze	Type	Unit	Default	Min	Max	Resolution
A1	Antifreeze heater set-point	U	ºC (ºF)	5 (41)	-40 (-40)	40 (104)	1
A2	Antifreeze heater differential	U	ºC (ºF)	2 (3.6)	0.4 (0.7)	10 (18)	0.1
A3	Antifreeze sensor select 0 = Leaving water 1 = Entering water	U	Flag	0 (leaving)	0	1	1
A4	Antifreeze alarm set-point	U	ºC (ºF)	3 (37)	-40 (-40)	40 (104)	1
A5	Antifreeze alarm differential	U	ºC (ºF)	2 (3.6)	0.4 (0.7)	10 (18)	0.1

	Alarm and Contact	Type	Unit	Default	Min	Max	Resolution
P1	Flow switch confirmation time	U	sec	5	0	199	1
P2	Flow switch alarm delay at pump start	U	sec	120	0	199	1
P3	Low pressure alarm delay at compressor start-up	U	sec	30	0	199	1
P4	Comp overload alarm reset type 0=Manual reset 1=Auto reset	U	Flag	0 (manual)	0	1	1

	Alarm and Contact	Type	Unit	Default	Min	Max	Resolution
P5	High pressure alarm reset type	U	Flag	1 (auto)	0	1	1
P6	Low pressure alarm reset type 0=Manual reset 1=Auto reset	U	Flag	1 (auto)	0	1	1
P7	Fan overload alarm reset type 0=Manual reset 1=Auto reset	U	Flag	1 (auto)	0	1	1
P8	Pump overload alarm reset type 0=Manual reset 1=Auto reset	U	Flag	0 (manual)	0	1	1
P9	Flow switch alarm reset type	U	Flag	0 (manual)	0	1	1
P10	Auxiliary alarm reset type	U	Flag	1 (auto)	0	1	1
P11	Antifreeze alarm reset type	U	Flag	1 (auto)	0	1	1
P12	Comp overload contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1
P13	High pressure contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1
P14	Low pressure contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1
P15	Fan overload contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1
P16	Pump overload contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1
P17	Flow switch contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1
P18	External alarm contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1
P19	Defrost end contact type 0=Normally close (NC) 1=Normally open (NO)	U	Flag	0 (NC)	0	1	1

General Parameters (“G”)

G1: Model selection
This parameter enables the selection of Model. Mode available for each model and operation of each mode is listed.

R - Using cool/heat set temperature and water inlet temperature to regulate on/off.
A - Using auxiliary heater/boiler set temperature and water inlet temperature to regulate heater/boiler on/off.

1) Chiller Model:
   Cooling mode: Compressor on/off (R).

2) Heatpump Model:
   Cooling mode: Compressor on/off (R).
   Heating mode: Compressor on/off (R), auxiliary heater on/off (A).

3) Chiller or Boiler Model:
   Cooling mode: Compressor on/off. (R).
   Boiling mode: Boiler on/off (R).

4) Chiller + Boiler Model:
   Cooling mode: Compressor on/off (R). Boiler always on.

5) Heatpump or Boiler Model:
   Cooling mode: Compressor on/off (R).
   Heating mode: Compressor on/off (R). Auxiliary heater on/off (A). Boiler on/off (A).
   Boiling mode: Boiler on/off (R).

6) Heatpump + Boiler Model:
   Cooling mode: Compressor on/off (R). Boiler always on.
   Heating mode: Compressor on/off (R). Auxiliary heater on/off (A). Boiler on/off (A).

G2: Number of compressor
This parameter sets the number of compressors and type of capacity-controlled.
1 to 4 = 1 to 4 compressors.

G3: On/off input
This parameter enables the on/off selection from on/off input. If the selection is enabled (G2 = 1) below is observed:

During power on, the system will start in on or off, depending to the input contact status (open-off, close-on). Overriding last state memory. If contact switches from on to off, system goes to off. If contact switches from off to on, system goes to on. User panel can always override the setting.

G4: Cool/Heat input
This parameter enables the cooling/heating selection from cool/heat input if it is enabled (G3 = 1). When enabled, below is observed:

During power on, system will start in cool or heat depending to the input contact status (open-cool, close-heat). Overriding last state memory. If contact switches from cool to heat, system goes to heat. If contact switches from heat to cool, system goes to cool. User panel can always override the setting.

G5: External alarm input
It enables the external alarm input if G5 = 1. The unit will sound an alarm if the input is at fault state. (See also P19: Auxiliary alarm contact type).

G6: Water system for chiller network
Selects the water system for the chiller network.
0 = isolated water system, 1 = merged water system.

G7: Unit number in group
This parameter sets the unit number in the network group, 0 is the master unit.

Sensor Parameters (“S”)

S1: Entering water sensor calibration
It allows to add an offset to the value measured by entering water sensor.

S2: Leaving water sensor calibration
It allows to add an offset to the value measured by leaving water sensor.

S3: Air sensor calibration
It allows to add an offset to the value measured by air sensor.

S4: Defrost (condenser) sensor 1 calibration
It allows to add an offset to the value measured by defrost sensor 1.

S5: Defrost (condenser) sensor 2 calibration
It allows to add an offset to the value measured by defrost sensor 2.

S6: Defrost (condenser) sensor 3 calibration
It allows to add an offset to the value measured by defrost sensor 3.

S7: Defrost (condenser) sensor 4 calibration
It allows to add an offset to the value measured by defrost sensor 4.

S8: Compressor discharge sensor 1 calibration
It allows to add an offset to the value measured by compressor discharge sensor 1.

S9: Compressor discharge sensor 2 calibration
It allows to add an offset to the value measured by compressor discharge sensor 2.

S10: Compressor discharge sensor 3 calibration
It allows to add an offset to the value measured by compressor discharge sensor 3.

S11: Compressor discharge sensor 4 calibration
It allows to add an offset to the value measured by compressor discharge sensor 4.

Regulator Parameters (“R”)

R1: Cooling set-point
It allows to set the Cooling set-point.

R2: Cooling differential
It allows to set the Cooling differential.
(R2 automatically set to 1.5°C if compressor number is changed to 1, it will be set to 3.0°C if compressor number is change to 2,3 or 4)

R3: Heating set-point
It allows to set the Heating set-point.

R4: Heating differential
It allows to set the Heating differential.
(R4 automatically set to 1.5°C if compressor number is changed to 1, it will be set to 3.0°C if compressor number is change to 2, 3 or 4)

R5: Minimum Cooling set-point
It allows to set the minimum Cooling set-point.

R6: Maximum Cooling set-point
It allows to set the maximum Cooling set-point.

R7: Minimum Heating set-point
It allows to set the minimum Heating set-point.

R8: Maximum Heating set-point
It allows to set the maximum Heating set-point.

R9: Auxiliary heater set-point
It sets the threshold below Heating set-point which the auxiliary is switched on.

R10: Auxiliary heater differential
It allows to set the Auxiliary heater differential. Note that heater could operate above heating set-point by manipulating R9 and R10.

R11: Auto boiler set-point
It sets the threshold below Heating set-point which the boiler can start.

R12: Auto boiler differential
It allows to set the Auxiliary heater differential. Note that boiler could operate above heating set-point by manipulating R11 and R12.

R13: Auto boiler start time threshold
It sets the time threshold for compressor to run before the boiler can start when condition R11 fulfilled.

Compressor Parameters (“C”)

C1: Compressor minimum run time
It sets the time when the compressor must remain on after it has been turned on, even if there is no more request for it, during thermostat cycle.

C2: Compressor minimum stop time
It sets the time when the compressor must remain off after it has been turned off, even if there is a request for its turning on.

C3: Time interval between two starts
It sets the minimum time interval between two successive on of a compressor.

C4: Start delay between two compressors
It sets the delay between the two compressors, to reduce voltage dip.

C5: Pump on → compressor on delay
It sets the delay for the first compressor (or auxiliary heater or boiler, depends on which come first) to turn on after the pump has been turned on. This delay is also applied to auxiliary heater and boiler.

C6: Compressor off → pump off delay
It sets the delay for the pump to turn off after the compressors (or auxiliary heater or boiler, depends on which come last) have been turned off.

C7: Discharge cut-off set-point
It is the threshold above which compressor will cut-off.

Defrost Parameters (“D”)

D1: Start defrost temperature
It sets the condenser temperature (measured by defrost sensor) threshold under which a defrosting cycle occurs. In order to activate a defrosting cycle such a condition must persist for a specific period of time (see parameter D5).

D2: End defrost temperature
It indicates the temperature threshold which makes the defrosting cycle end.

D3: Maximum duration of defrost cycle
It represents the maximum duration of defrosting cycle.

D4: Defrost interval time
It sets the interval after defrost timer start counting before checking for D1 temperature.

D5: Delay before defrosting
When the defrosting condition has been detected, but before the real activation of the cycle, the compressor stops. After the compressor stops, the 4 way valve will switch after D5/2. Compressor starts after D5 elapsed.

If D5 = 0, the 4 way valve will switch immediately while compressor still running.

D6: Delay after defrosting
When the defrosting cycle is over, the compressor stops. After the compressor stops, the 4 way valve will switch after D6/2. Compressor starts after D6 elapsed.

If D6 = 0, the 4 way valve will switch immediately while compressor still running.

Cool Mode Antifreeze Parameters (“A”)

A1: Antifreeze heater set-point
It sets the water temperature threshold under which the antifreeze heater is actuated. However, antifreeze heater will always on if antifreeze alarm occurs.

A2: Antifreeze heater differential
It sets the differential for antifreeze heater.

A3: Antifreeze sensor select
It indicates the sensor to be used for the control of antifreeze heater.

A4: Antifreeze alarm set-point
This parameter sets the water temperature threshold under which an antifreeze alarm will be set off.

A5: Antifreeze alarm differential
It sets the differential for antifreeze alarm.

Alarm and Contact Parameters (“P”)

P1: Flow switch confirmation time
It indicates a confirmation time before showing the flow switch alarm.

P2: Flow switch alarm delay at pump start
It allows to set a time delay to elapse before checking the flow switch at pump start-up.

P3: Low pressure alarm delay at compressor start-up
It indicates a time delay which is to elapse before showing the low pressure alarm at compressor start-up.

P4-P11: Alarm reset type
These parameters enable automatic reset or manual reset for the alarms. Automatic reset of alarm is limited to less than 6 alarm triggers within 2 hours, otherwise the alarm requires manually reset.

P12-P19: Alarm contact type
These parameters define the alarm contact type.
0 = Normally close (NC): close = normal, open = fault,
1 = Normally open (NO): open = normal, close = fault.

This is also a way to disable any unused contact for setting it to NO and leave it open.

Alarm Type	Reset	Alarm	Comp	Fan	Pump	4WV
Compressor overload (CO x 4)	Option	ON	OFF	OFF	-	OFF
High pressure (HP x 4)	Option	ON	OFF	OFF	-	OFF
Low pressure (LP x 4)	Option	ON	OFF	OFF	-	OFF
Fan overload (FO x 4)	Option	ON	OFF	OFF	-	OFF
Water flow error (FL)	Option	ON	OFF	OFF	OFF	OFF
Pump overload (PO)	Option	ON	OFF	OFF	OFF	OFF
External (EX)	Option	ON	OFF	OFF	OFF	OFF
Entering water sensor error	Auto	ON	OFF	OFF	-	OFF
Leaving water sensor error	Auto	ON	OFF	OFF	-	OFF
Outdoor Air sensor error	Auto	ON	OFF	OFF	-	OFF
Defrost sensor error (x 4) (HP models)	Auto	ON	OFF	OFF	-	OFF
Discharge sensor error (x 4)	Auto	ON	OFF	OFF	-	OFF
Cool mode Antifreeze (AF)	Option	ON	OFF	OFF	-	OFF
Memory error (ME)	Auto	ON	OFF	OFF	-	OFF

Cooling Mode Starting Sequence

Cooling mode selected → water pump starts (if not started) → outdoor fan 1 starts → compressor 1 starts → outdoor fan 2 starts → compressor 2 starts → outdoor fan 3 starts → compressor 3 starts → outdoor fan 4 starts → compressor 4 starts.

Heating Mode Starting Sequence

Heating mode selected → water pump starts (if not started) → 4 way valve energized → Auxiliary heater starts → outdoor fan 1 starts → compressor 1 starts → outdoor fan 2 starts → compressor 2 starts → outdoor fan 3 starts → compressor 3 starts → outdoor fan 4 starts → compressor 4 starts.

Cool Mode Antifreeze

- Runs in cool mode
- Settings can be selected in cool mode antifreeze parameters (“A”)
- Antifreeze heater can be turned on to prevent freezing
- Antifreeze alarm will be set-off if water temperature (entering or leaving) drops below antifreeze alarm set-point. Refer to alarms and signaling

Winter Antifreeze

- Runs when system in standby mode
- If outdoor air temperature <=5°C and entering water temperature <=5°C, water pump runs 5 minutes every hour. Antifreeze heater will turn on and off together with the water pump
- If entering water >6°C, water pump and antifreeze always stops
- If outdoor air <=2°C and entering water <=2°C, system enters heat mode
- If entering water temperature >15°C, system returns to standby mode

4 Way Valve (4WV)

4 way valve will be energized in heating mode. If the system switches from cooling mode to heating mode or vice versa, 4WV will switch accordingly. Compressor will be cut off first before 4WV switches.

Delay: Compressor off $\xrightarrow{55\,seconds}$ 4WV switch on $\xrightarrow{4\,seconds}$ compressor on.

Water Pump

Water pump will run when the system is on except under certain alarm conditions.

Condenser Defrost

Only ONE compressor can enter defrosting at one time. If more that 2 compressors fulfill defrost condition, the compressor with maximum accumulated run time will enter defrosting cycle.

- Start Defrosting Conditions
  Defrost timer start counting when defrost sensor <=D1.
  At any time if defrost sensor > 2°C for more than 150 seconds, defrost time reset to 0.
  After interval time set in D4, and defrost sensor <=D1, defrosting start.

- Pre Defrost Cycle
  When one compressor is confirmed to run defrost cycle, another compressor will turn on for 1 minute before the specific compressor enters defrost cycle. If no compressor can be turned on in 1 minute, defrost cycle will still starting.

- Defrosting Cycle
  Depends on D5 setting, if D5=0, 4WV, outdoor fan will turn off while compressor continues running. If D5 not=0, outdoor fan and compressor will turn off. D5/2 later 4WV turns off. D5 compressor turns on.

- Defrost Termination Conditions
  Defrost sensor > D2 OR
  Maximum duration of defrost cycle elapsed (D3) OR
  Defrost end contact open.

- Defrost Termination Cycle
  Depends on D6 setting, if D5=0, 4WV, outdoor fan turn on while compressor continues running.

  If D6 not=0, compressor will turn off. D6/2 seconds later 4-way valve turns on. D6/2 later outdoor fan and compressor turns on.

Outdoor Fan

Outdoor fan will run when its corresponding compressor were to start.

Delay: outdoor fan on $\xrightarrow{4\,\mathrm{sec}\,onds}$ compressor on.

Compressor Load Balance

The compressor with the shortest accumulated run time will start first. The compressor with the longest accumulated run time will be the first one to stop.

Manual Condenser Defrost

Upon receiving manual defrost from remote keypad, the system will enter defrosting cycle if defrost sensor <D2 and defrost end contact is normal.

Networking

Each units have its unit number. There can be up to 50 units in the communication bus. Unit number 0 is the master. In a network, unit 0 must exist. There are 2 types of networking.

i) Isolated water system

Master can do global control and individual slave control, slave unit can also have own operation mode. Master unit can monitor all units.

ii) Merged water system

Slave units can only follow master operation mode (on/off: If master off, slave cannot on, if master on, slave can off and on. Cool/heat, must follow master. If change, they will be overridden by master setting) of master unit. Master unit can monitor all units in the network. In the case of water system fault in the master, all the slave units will be stop.

- FL, PO, EX, antifreeze alarm in master, **ALL** stop
- FL, PO alarm **ONLY** detected in master
- Inlet, outlet, air sensor in master open/short **ALL** stop
- Inlet, outlet, air sensor in slave open/short, slave stop only
- CO, HP, LP, FO, DO, discharge & defrost sensor open/short, individual compressor stop only
- Outdoor defrost: individual compressor
- Winter Auto pump, available for master only

- Winter Auto heat, available for master only
- If fail to receive master status for 2 minutes, all slave unit will stop
- Slave should have same or longer pump on -> compressor on delay and flow switch checking delay
- Slave unit uses its own inlet water sensor for compressor cut in/out

Schematic Diagram

Figure 22 : MC01 for Cooling Only Model

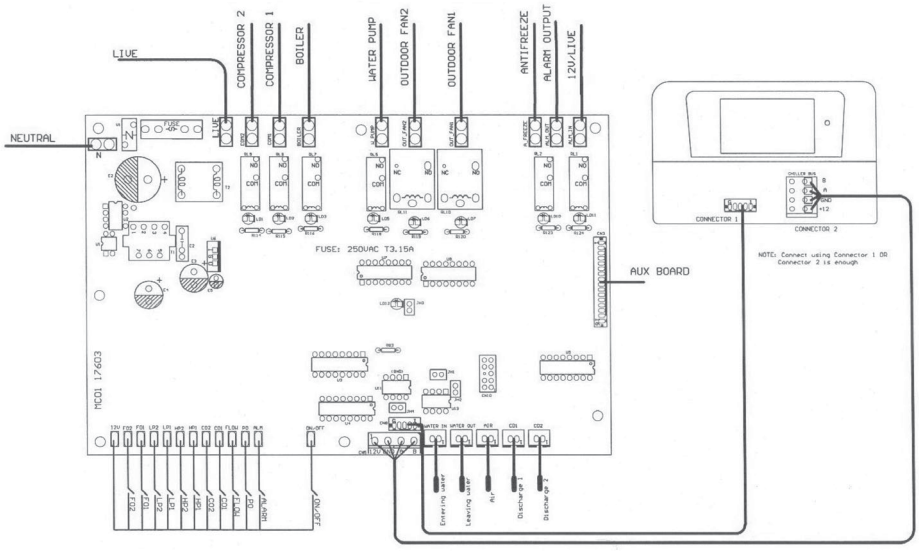
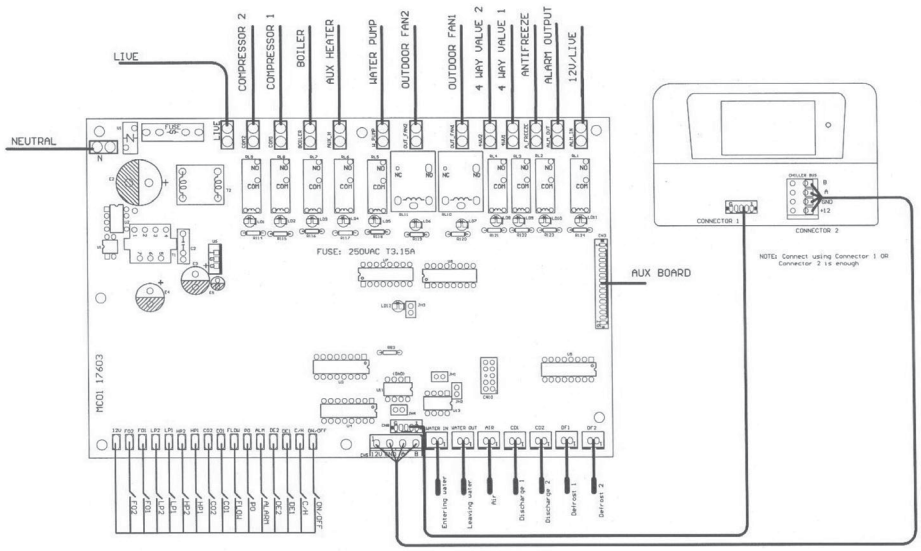
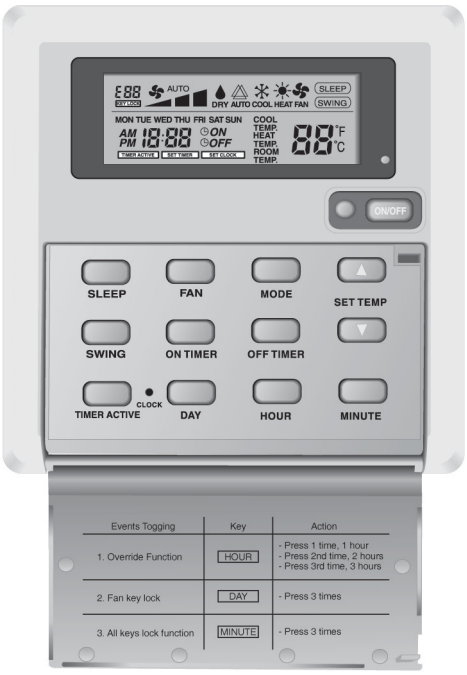


Figure 23 : MC01 for Heatpump Model



Netware 3

Outlook



Features

This controller has a Power LED indicator, IR receiver, a LCD display panel, 5VDC power supply input, and one or two ways communication input/output port.

- Cool/Heat/Fan/Dry/Auto modes
- Auto/High/Med/Low fan speed
- Temperature operate in °C or °F
- Room temperature display (optional)
- Sleep function
- Swing function
- Real-time clock and Day display
- 3 Events 7-day programmable timer
- Error indicator
- Key lock and Fan lock features
- Last state memory (Memory backup setting from main board)
- Override function

Hardware Setting

The unit has 6 options to control the board function.

Dipswitch 1: DSW1

OPTION	SET	OFF
No-Beep	LED will blink when IR received	'Beep' sound when IR received
RTC_H	RTC value from remote control will override RTC value from wired controller	RTC value will not affected by remote control
NORTC	No RTC, timer functions & displays	RTC & timer functions are available
NODRY	Dry mode NOT available	Dry mode available
20_30C	Set temp. range from 20°C – 30°C	Set temp. range from 16°C – 30°C
NOROOM	No room temp display	Room temp display available

Dipswitch 2: DSW2

J H	J D	Application	Model/Remark
OFF	OFF	AUTO DETECT	Depends on main board
OFF	SET	DX system	Export cool (EC)
SET	OFF	DX system	Heatpump (HP)
SET	SET	DX system	Auto Heatpump (AP)

Power Up Settings

The unit will start up with main board's last state setting during power up. If last state information is not available, the unit will use the default settings. The default settings are as below:

Unit : Off
Mode : Cool
Set Temp : 24°C
Fan Speed : High
Swing : Off
Timers : Inactive

Unit ON/OFF

There are 3 ways to turn on or off the unit:

i) via ON/OFF Timers
ii) via ON/OFF Key
iii) via IR Remote Control

Unit	LCD	Power LED	Timers	IR Reception
ON without TIMER ACTIVE	Full Display	ON	Inactive	Enable
OFF through On/off key	RTC only	OFF	Inactive	Enable
ON with TIMER ACTIVE	Full Display	ON	Active	Enable
OFF through TIMER ACTIVE	RTC only	BLINK in every 2 seconds interval	Active	Enable
Power Down (Operate by Backup Battery)	No Display	OFF	Inactive	Disable

Operating Temperature Range and Setting

The temperature setting range is from 16°C to 30°C (60°F to 86°F). Temperature setting is performed via pressing SET TEMP UP key or SET TEMP DOWN key. Pressing both keys simultaneously will toggle the temperature setting between °C and °F. No temperature setting is allowed during FAN mode.

Mode Function

Mode setting can be changed via key press on MODE key. The Model can be selected via option JH and JD.

Models	Modes
Export Cool (EC)	Cool > Dry > Fan > Cool >
Heatpump (HP)	Cool > Heat > Dry > Fan > Cool >
Auto Heatpump (AP)	Cool > Heat > Auto > Dry > Fan > Cool >

Fan Speed Function

Fan speed can be changed via pressing the FAN key:

Low > Med > High > Auto > Low >

Fan speed selection is not valid during Dry mode.

No Auto Fan speed for Fan mode. If there was Auto Fan in previous mode, when the mode setting change to Fan, then the unit will force to Low Fan speed. Auto Fan speed will resume when mode change to Cool, Heat or Auto mode.

Room Temperature Display

Room temperature is shown during the unit is ON. When any SET TEMP key is pressed, the set temperature will be shown for 5 seconds, then it will revert back to room temperature display. The display range is from 8°C to 37°C (46°F to 99°F).

When the temperature is below 8°C (46°F), “LO” will be displayed. If it rises above 37°C (99°F), “HI” will be displayed. ‘OP’ will be shown when the working room sensor is detected OPEN circuit or ‘SH’ will be shown when room sensor is detected SHORT circuit.

Real-time Clock (RTC) Display

Press CLOCK key one time will activate RTC setting mode. Pressing the same key again will disable RTC setting mode.

Under RTC setting mode, “SET CLOCK” will be shown on LCD. The RTC and Day setting can be changed by pressing DAY key, HOUR key or MINUTE key. If there is no further time related (DAY, HOUR and MINUTE) key is pressed for 15 seconds, the unit will quit from the CLOCK setting mode.

7-Day Programmable Timers

The unit has 3 event functions; each event has an ON TIMER and an OFF TIMER. Press the timer key (ON TIMER or OFF TIMER) will enable Event 1 timer setting mode. Press the same key again will enable Event 2 timer setting mode. Press the 3rd times will enable the Event 3 (Event handset) timer-setting mode. Subsequent key pressed the unit will quit from timer setting mode.

All timers are event triggered timers and can be overridden by the ON/OFF button or Override function.

- Set Event 1 and Event 2 Timers

  Under timer settings mode, “SET TIMER” will be shown on LCD and blink at 0.5 seconds interval. For Event 1 Timer setting, ‘◷ ON’ or ‘◷ OFF’ indication will appear and digit “1” will be displayed on the top left corner of the LCD. Indicator ‘◷ ON’ or ‘◷ OFF’ indication and digit “2” will be displayed during Event 2 timer setting.

- Set Event 3 Timer via Remote Control

  This timer can be controlled separately through remote control as well as ON TIMER or OFF TIMER keys. Timer 3 can be set like timers 1 and 2 like above except the DAY setting is not provided as this timer setting is valid everyday. An indicator ‘3’ will display during the Event 3 timer setting mode. ‘◷ ON’ or ‘◷ OFF’ will blink at 0.5s interval during the timer setting.
  The ON/OFF timer settings received from remote control will override the Event 3 timer setting from the unit.

- Activating and Canceling Timers

  These timers will not triggered if the timer is not activated. To activate the timers, press the TIMER ACTIVE key until “TIMER ACTIVE” appears on LCD. This symbol is to indicate Event 1, Event 2 and/ or Event 3 timers are active. Pressing the same steps will deactivate the timers and “TIMER ACTIVE” symbol will disappear.

  Another method to cancel the timers setting is changed all the hour setting of the timers to null one by one. When the setting is null, the LCD display —:—, then this respective timer will be disable.

** In case of power failure, and the timer has been set, upon power resume, the board will ON/OFF according to the timer setting. Other status will remain as per prior to power failure.

** For U1.4/U1.5 boards JH header (for last state memory) must be opened for this function to operate. This function is only applicable for U1.4/U1.5 IC operated PCBs only.

Sleep Function

To activate Sleep function, press the Sleep key once. “SLEEP” symbol will be shown. To disable Sleep function, press the Sleep key once again.

Swing Function

To activate Swing function, press the Swing key once. To disable Swing function, press the Swing key once again.

Key Lock

These key lock function to inhibit any setting change. Press the MINUTE key 3 times consecutively will activate key lock function; “KEYLOCK” will be shown on LCD. Upon all the keys are locked, only ON/OFF key and MINUTE key can be pressed. To cancel the key lock function, press the MINUTE key 3 times consecutively, the word “KEYLOCK” will be disappeared.

Fan Lock

When the DAY key is press 3 times consecutively within 1.5 seconds, the fan symbol will disappear and fan key will be inhibit from pressing. Press the DAY key 3 times to cancel the fan lock function.

Error Indicator

If any abnormal condition detected, an error code will be shown. When the transmission line between the main board and the unit line is opened, an error code ‘EOP’ will be shown. For those errors detected from main board, the format of error code will be as following:

“E01”, “E02”, “E03”, “E04” ... Etc.

Please refer to the main board error code for detail.

Override Function

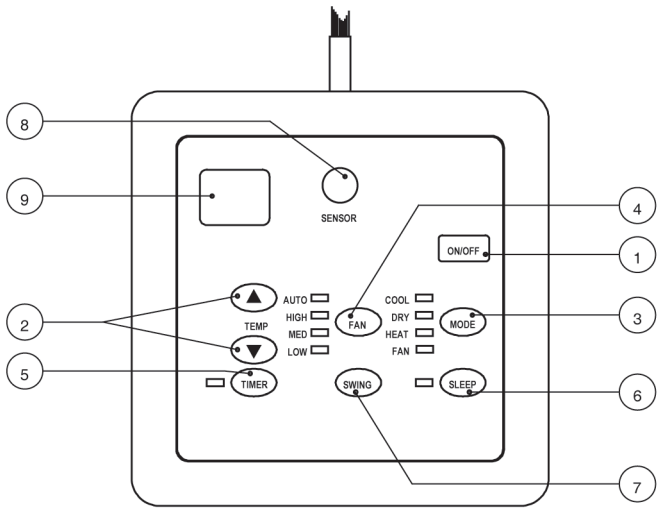
Press the HOUR key once will activate the override function for 1 hour. An indicator “H1” will show on the top left corner of the LCD. Press the same key again will increase the setting to 2 hours. An indicator “H2”

will be shown. Press the 3rd times will increase the setting to 4 hours. An indicator “H4” will be shown. Subsequent press will deactivate the override function.

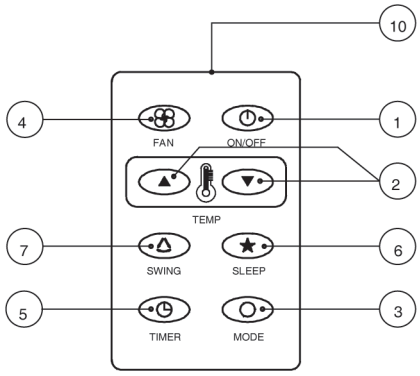
When the Override function is activated, all the timers will be bypassed and turn ON the unit for a fix periods of 1 hour, 2 hours or 4 hours depends on the selection, after when it will be turned off.

SLM3

Outlook



SLM



AC-5300 (OPTIONAL)

Operation Guide

1. "ON/OFF" Switch
   - Press to start the air conditioner unit.
   - Press again to stop the unit.

2. Temperature Setting
   - Set the desired room temperature.
   - Press button to increase or decrease the set temperature. Setting range are between 16°C to 30°C (60°F to 80°F).

3. Operation Modes
   - Press the "mode" button for select the type of operating mode.
     - Cooling Only:
       COOL, DRY, FAN
     - Heat Pump:
       AUTO, COOL, DRY, HEAT, FAN
       (AUTO mode is represented by both COOL and HEAT LED light on)

4. Fan Speed Selection
   - Press the button until the desired fan speed is achieved.

5. Timer
   - Press the set button to select the switch timer of the air conditioner unit (the setting range is between 1 to 10 hours).

6. “SLEEP” Mode
   - Press button to activate the sleep function. This function can only be activated under “cool” or heating mode operation. When it is activated under “cool” mode operation, the set temperature will increase 0.5°C after 30 minutes, 1°C after 1 hour and 2°C after 2 hours. If it is activated under “HEAT” mode operation, the set temperature will be decreased 0.5°C after 30 minutes, 1°C after 1 hour and 2°C after 2 hours.

7. Air Swing
   - Press button to activate the automatic air swing function.

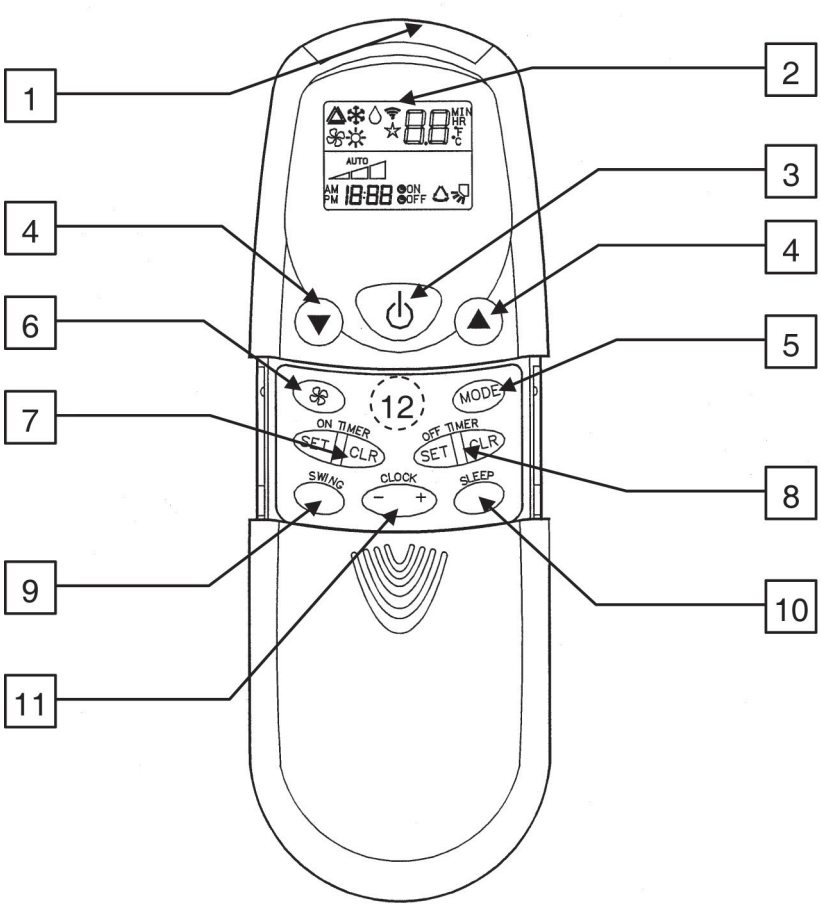
8. Sensor
   - Infra red sensor to receive signals from wireless controller.

9. LED Display
   - To display the set temperature (in °C) and timer delay setting (in hours).

10. Transmission Source
    - To transmit signals to the air conditioner.

G7

Outlook



Operation Guide

1. Transmission Source
   - The source where the signal will be transmitted.

2. Signal Transmission Indication
   - Blink to confirm the last setting has been send to the unit.

3. On/Off Button
   - Press once to start the air conditioner.
   - Press again to stop the unit.

4. Temperature Setting
   - To set the desired room temperature, press the button to increase or decrease the set temperature.
   - The temperature setting range is from 16°C to 30°C (Optional setting 18°C to 30°C).
   - Press both buttons simultaneously to toggle the temperature setting between °C and °F.

5. Operation Mode
- Press the MODE button to select the type of operating mode.
- For cooling only unit, the available modes are : COOL, DRY & FAN.
- For heat pump unit, the available modes are : AUTO, COOL, DRY, FAN & HEAT.

6. Fan Speed Selection
- Press the button until the desired fan speed is achieved.

7. On Timer Setting
- Press the SET button will activate the on timer function.
- Set the desired on time by pressing the SET button continuously. If the timer is set to 7.30am, the air conditioner will turn on at 7.30 sharp.
- Press the CLR button to cancel the on timer setting.

8. Off Timer Setting
- Press the SET button will activate the off timer function.
- Set the desired off time by pressing the SET button continuously.
- Press the CLR button to cancel the off timer setting.

9. Automatic Air Swing (Optional)
- Press the SWING button to activate the automatic air swing function.
- To distribute the air to a specific direction, press the SWING button and wait until the louver move to the desired direction and press the button once again.

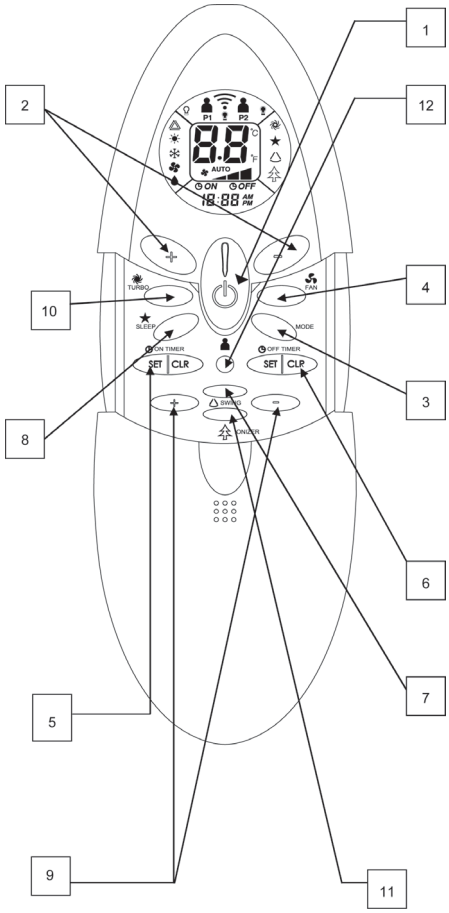
10. Sleep Mode Setting
- Press the button to activate sleep mode. This function is available under COOL, HEAT & AUTO mode.
- When it is activated in COOL mode, the set temperature will be increased 0.5°C after 30mins, 1°C after 1 hour and 2°C after 2 hours.
- When it is activated in HEAT mode, the set temperature will be decreased 1°C after 30mins, 2°C after 1 hour and 3°C after 2 hours.

11. Clock Time Setting
- Press button + or - to increase or decrease the clock time.

12. Turbo Function (Optional – Only Applicable To Inverter Unit)
- Press button for fast cooling or heating operation.
- The temperature will be increased internally if it is in the HEAT mode, decreased if in COOL or DRY mode. Fan speed will be increased if it is not at maximum speed.
- The temperature & fan speed will resume to user setting if the button is pressed again or after 20mins.
- Available under HEAT, COOL & DRY modes only.

G11

Outlook



Operation Guide

1. “ON/OFF” ⏻ Button
   - Press once to start the air conditioner unit.
   - Press again to stop the unit.

2. Temperature Setting
   - To set the desired room temperature, press the ▲ button to increase or ▼button to decrease the set temperature.
   - The temperature setting range is from 16°C to 30°C.
   - Press both buttons simultaneously to toggle ▲ and ▼ from °C to °F setting.

3. Operation Mode
   - Press the MODE button to select the type of operating mode.
   - For cooling only unit, the available modes are: COOL (❄), DRY ( ) and FAN ( ).
   - For heat pump unit, the available modes are: AUTO, COOL (❄), DRY ( ), FAN ( ) and HEAT (☀).

4. Fan speed selection

- Press the button continuously will toggle the fan speed in the following order: Low ( ) ——: Med ( ) ——: High ( ) ——: Auto
- Stop pressing when the desired fan speed appears on the display screen.

5. ON Timer Setting

- Press the SET button will activate the on timer function.
- Set the desired on time by pressing the SET button continuously. If the timer is set to 7.30am, the air conditioner will turn on at 7.30am sharp.
- Press the CLR button to cancel the on timer setting.

6. OFF Timer Setting

- Press the SET button will activate the off timer function.
- Set the desired off time by pressing the SET button continuously.
- Press the CLR button to cancel the off timer setting.

7. Automatic Air Swing

- Press the SWING ( ) button to activate the automatic air swing function.
- To distribute the air to a specific direction, press the SWING button and wait until the louver move to the desired direction and press the button once again.

8. Sleep Mode Setting

- Press the **SLEEP** button will activate the sleep mode function. This function is available under COOL, HEAT and AUTO mode.
- When the unit is operating under cooling mode, the set temperature is increased by 0.5°C after 30 minutes, 1°C after an hour, and 2°C after 2 hours.
- When the unit is operating under heating mode, the set temperature is decreased by 1°C after 30 minutes, 2°C after an hour and 3°C after 2 hours.

9. Clock Time Setting

- Press + button to increase the clock time.
- Press – button to decrease the clock time.

10. Turbo Mode

- Press the TURBO ( ) button to achieve the required set temperature in a short time.

11. Ionizer

- Press the button to activate the negative Ion function, which will refresh the indoor air effectively.

12. Personalize Setting

- Press button and hold for 3s to initiate personalized setting
- Set the individual setting e.g. MODE, SET TEMP or FAN SPEED and leave for 4s to save the setting into the programme.
- 2 groups of settings are allowed to store in the handset. Press once to activate the P1 setting, press again to cycle between P1 and P2.

Press any key to deactivate the personalize setting.

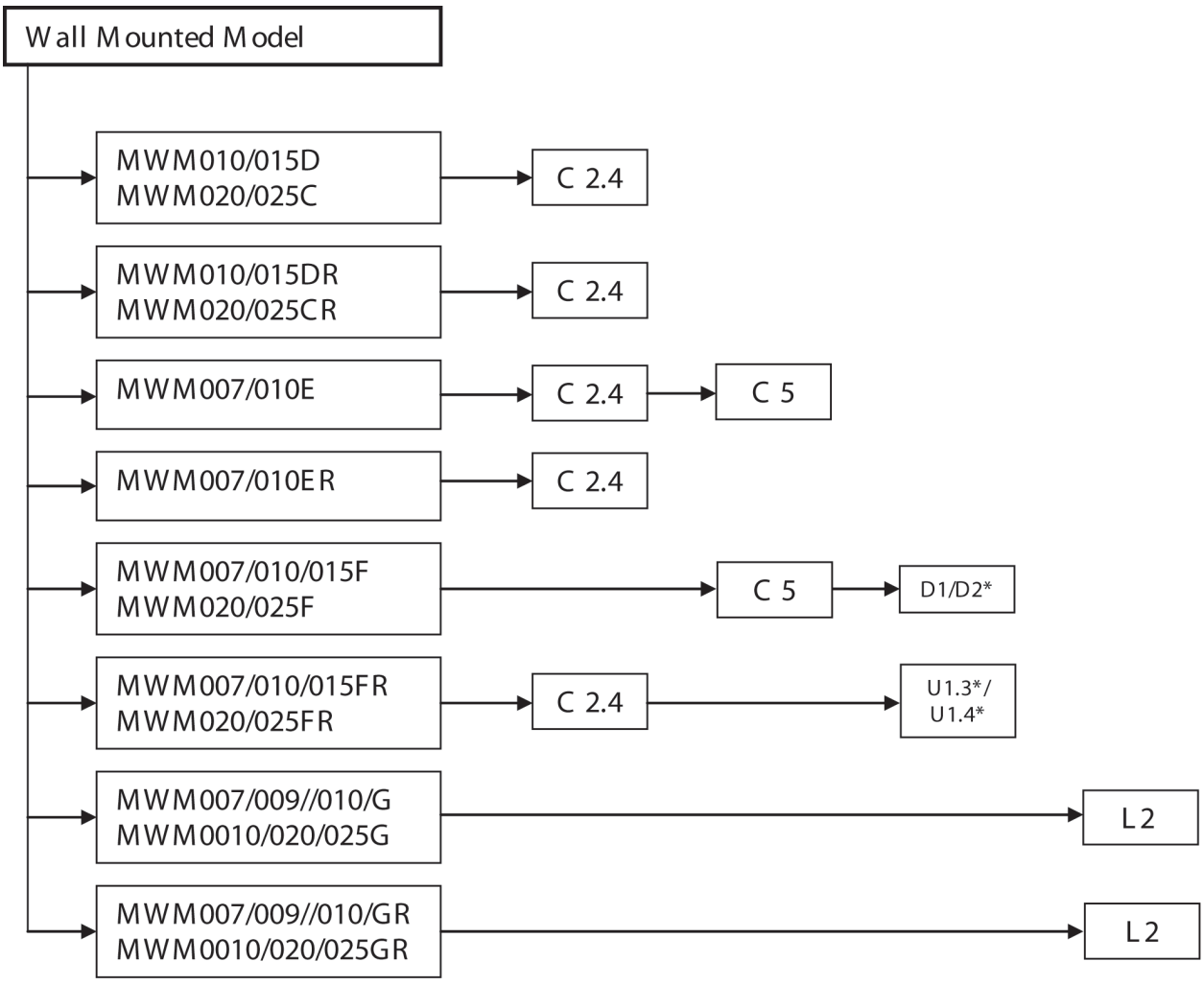
Appendix

Controllers' Development

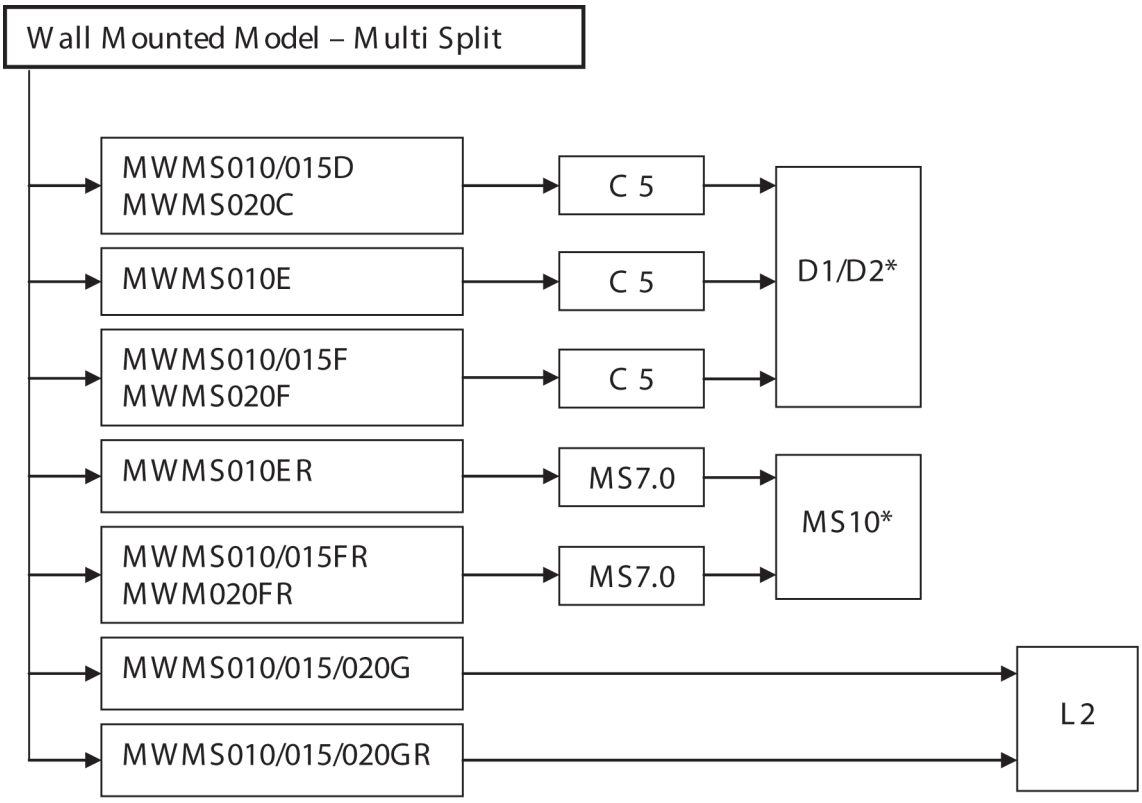
History of Controllers

YEAR	SOFTWARE USED IN MAIN BOARD	HANDSET		MODEL		REMARKS
		WIRELESS	WIRED	COOLING	HEATPUMP	
2001	Chilled Water W1V2	G6	Netware-1	MWM-FW/ MCM-DW/ MCC-CW/ MCK-AW/ MHSB-BW		Convertible PCB
2001	Sequential Controller	-	Sequential Controller	MDB (150-500) B	MDB (150-500) BR	Mutiple compressor
2001	Universal Board					
	D1.0	G6	-	MWM (010-025) F	-	Cooling only
	U1.3	G6	-	-	MWM (010-025) FR	Heatpump only
	U1.4	G6	SLM3 (4 core wire)	MCM-D/ MCK-A/ MCC-C	MCM-DR/ MCC-CR/ MCK-AR	Cooling & heatpump
2001	D2.0	G6 / G7	-	MWM (010-025) F	-	Cooling only
2001	Mini Chiller SZMC01	-	-	MAC/M4AC (040~058)A; MAC/M4AC075~125B	MAC/M4AC (040~058)AR; MAC/M4AC075~125BR	Cooling & heatpump
2001	Inverter VA1.0 (indoor) VB1.0 (outdoor)	G7-Turbo	-		MWMV010FR MLCV010BR	In set form only
2001	Rooftop	-	PAC204RC	MRT(080-200)A	MRT(080-200)A	
2002	Sequential Controller	-	Sequential Controller, SQ-LCD	MDB (150-500) D	MDB (150-500) DR	Mutiple compressor
2002	D2.0	G7	-	MWM030F	-	Cooling only
	U1.4	G7	SLM3 / Netware 2	MCK (015/020/025/030) B	MWM (010-025) FR ; MWM030FR MCK (015/020/025/030) BR	Heatpump only Cooling & Heatpump
2002	Chilled Water W1V3	G6	SLM3 / Netware 2	MWM-FW/ MCM-DW/ MCC-CW/ MCK-AW / MCK-BW		Valveless Application only
2002	Multi Split Indoor, MS10.0	G7	-	-	MWMS (010-020) FR	Auto Random Restart
2003	Mini Chiller MCH03A	-	-	MAC/M4AC (080/100/120/150) C	MAC/M4AC (080/100/120/150) CR	Cooling & heatpump
2003	Universal U1SB125	-	SLM3-Single speed	MDB (125/150) B1/C1/D1 MRT/M4RT (060/080/100/120) A	MDB (125/150) BR1/CR1/DR1 MRT/M4RT (060/080/100/120) A	Cooling & heatpump
2003	Sequential Controller, SQ	-	SQ-LCD	MRT/M4RT (150/200/250/300) A	MRT/M4RT (150/200/250/300) AR	Cooling & heatpump
2003	Chilled Water W1V3	G6	SLM3/Netware 2	MWM-FW/ MCM-DW/ MCC-CW/ MCK-AW / MCK-BW		Valve / Valveless Application
2004	L2	G11	SLM3/Netware 3	MWM / M5WM (007-025) G	MWM / M5WM (007-025) GR	Cooling & heatpump
2005	Universal board U1.5	G7	SLM3/Netware 3	MCM-D/ MCK-A/ MCC-C	MCM-DR/ MCC-CR/ MCK-AR	Cooling & heatpump
2006	L208	G11	SLM3/Netware 3	MCK / M5CK (020-050) A ; MCK(015-025)B ; MCK/M5CK(010-020)C	MCK / M5CK (020-050) AR ; MCK(015-025)BR ; MCK/M5CK(010-020)CR	Cooling & heatpump

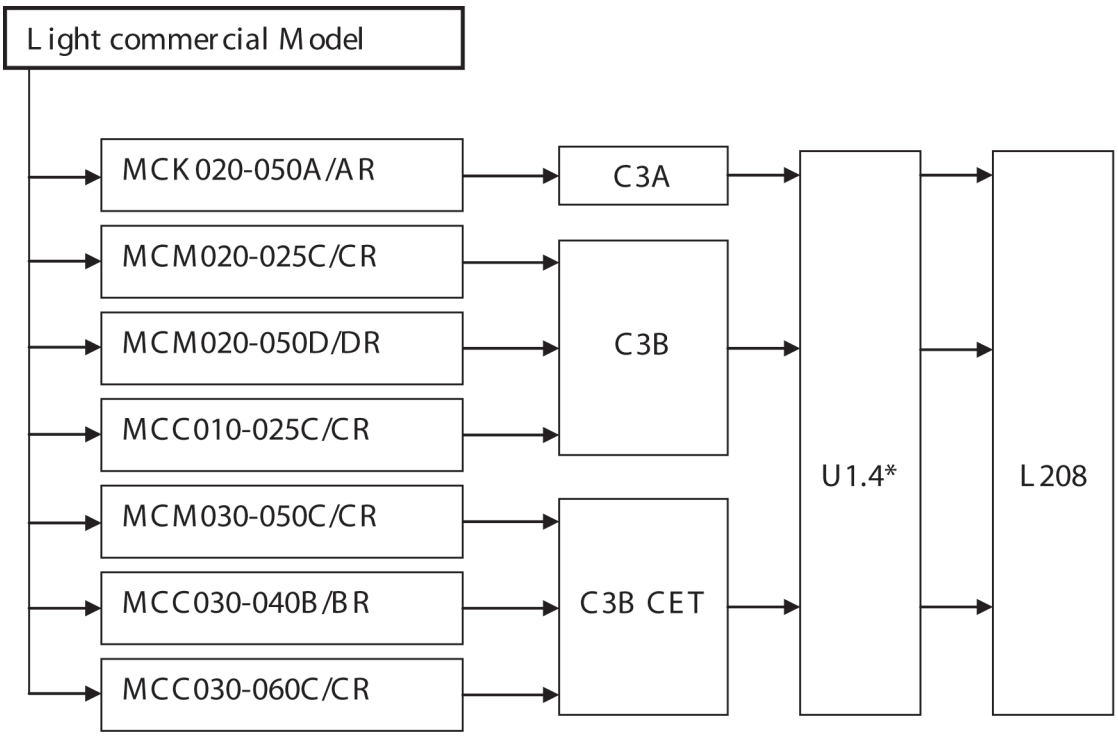
Controller Version



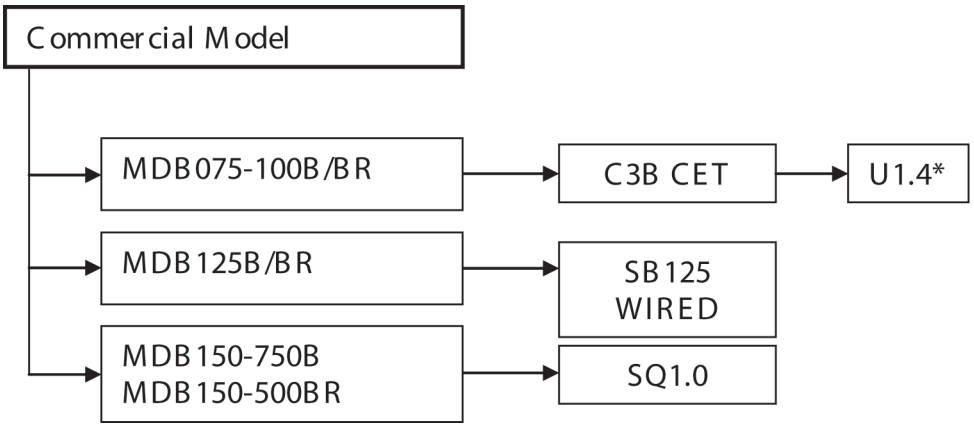
* With auto random restart feature



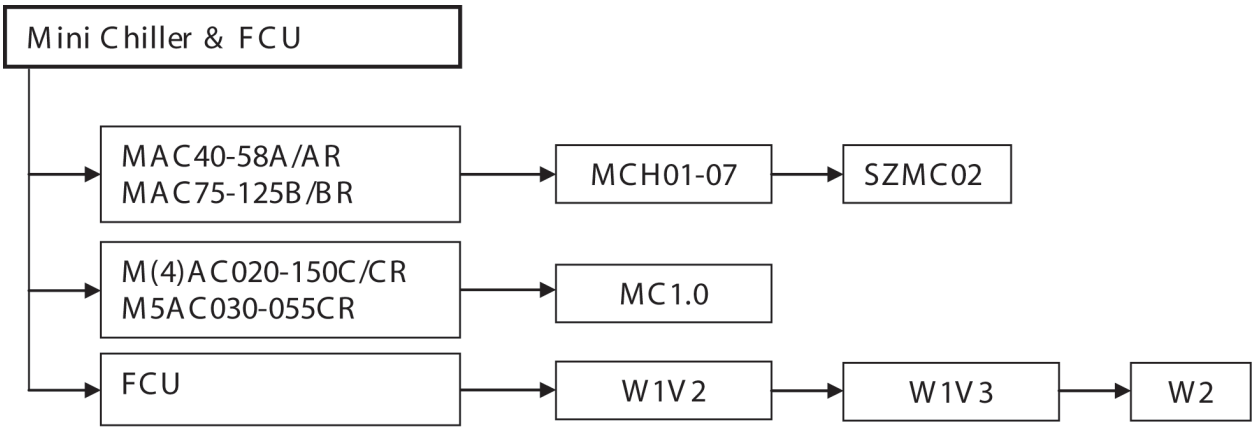
* With auto random restart feature



* With auto random restart feature



* With auto random restart feature



* With auto random restart feature

Handset Compatibility

Handset	Communicate with	Main Board										
		OMC - 03	SongJia	Jia Lih	C2	C3	C5	D1.0	U1.3	U1.4	U1.5	L208
Black Transmitor	=	X	X	X								
V1	=	X	X	X								
V2	=	X	X	X	X	X						
G2 (V1 Code)	=	X	X	X								
G2 (G2 Code)	=			X	X	X						
G3 (V2 Code)	=	X	X	X	X	X						
G3 (G3 Code)	=				X	X						
G6 (V2 Code)	=				X	X	X	X	X	X	X	
G7	=				X	X	X	X	X	X	X	X
G11	=				X	X	X	X	X	X	X	X
Wired Controller												
SLM (7 W)	=	X										
SLM (10 W)	=					X						
SLM3 (4 W)	=									X	X	X
Netware 3	=									X	X	X

PCB Identification

General

To identify a controller, the service personnel must first examine the PCB's (printed circuit board) name and also check the software version printed on the microprocessor. With a same PCB, the software version might be different (due to customization or improvement).

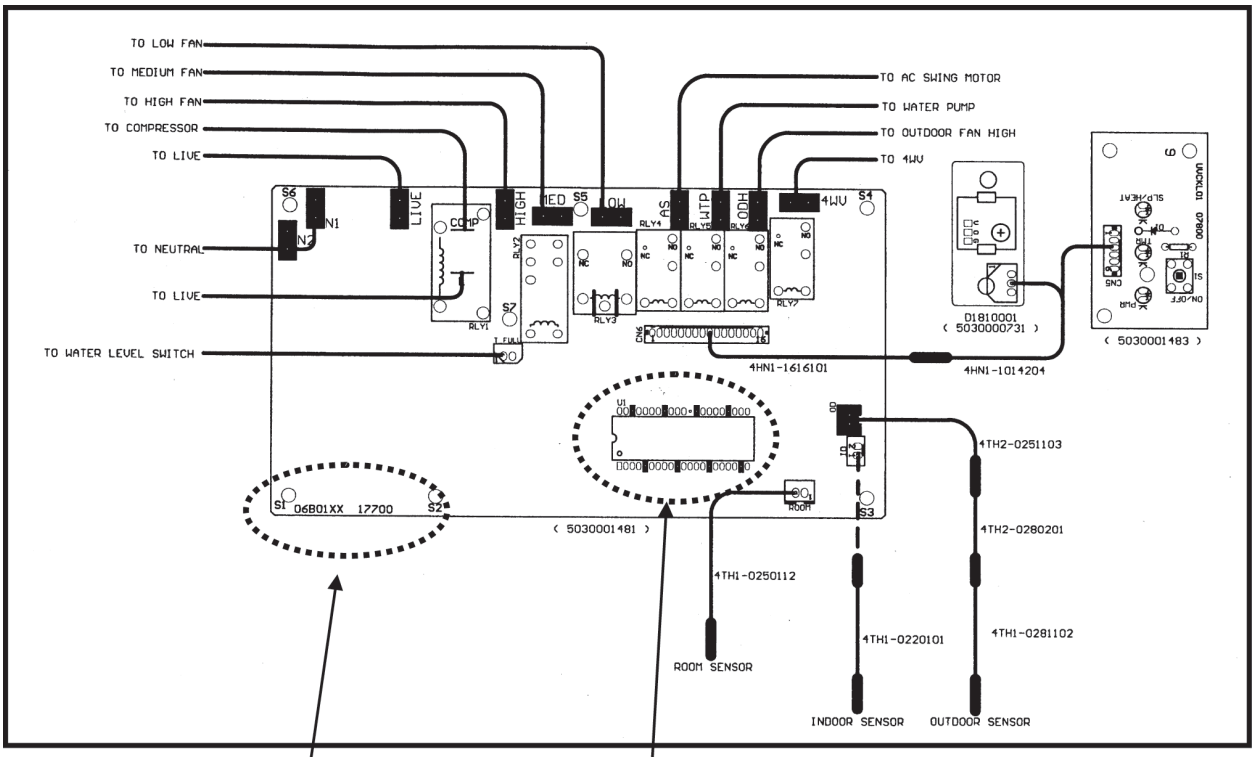


Table of Identification

Listed in the table below are the name of different PCB used for different air-conditioners.

MODEL	CONFIGURATION	PCB NAME	SOFTWARE
MCK-AW, MCC-CW, MCM-DW	VALVE	06A01	W1V2
MCK-A, MCM, MCC	EC/AP	06B01	U1.4
MCK-C	EC/AP	06B01	U1.4
MCK-AW/BW/CW, MCC-CW, MCM-DW	VALVELESS	06C01	W1V3
MCK-B	EC/AP	UNVCK	U1.4
MCK-BW	VALVE	UNVCK	W1V2
MWM-F	EC	WMF05XX	D2.0
MWM-F	EC	WMF04B/05B	L2
MWM-F	AP	WMF04A	U1.4
MWM-F	AP	WMF04B/05B	L2
MWM-FW	VALVE	WMF04A	W1V2
MWM-FW	VALVELESS	WMF06	W1V3
MWM 030F	EC	WMEXXXX	D2.0
MWM 030FR	AP	WM30E01	U1.4

Thermistor

Thermistor Resistance Calculation

1) For thermistor, the most important characteristic is the B value.
2) B_{25-50} means the B value between 25°C and 50°C.
3) In order to derive the B value between t_1 and t_2, first, we need to obtain the resistance of thermistor at t_1 and t_2. Lets assume R_1 (at t_1) and R_2 (at t_2).

   Substitute t_1, t_2, R_1 and R_2 into the formula below to obtain the B value:

   B value between t_1°C and t_2°C,

   $$B_{t1-t2} = \ln (R_1/R_2) \div [\, 1/(t_1 + 273.15) - 1/(t_2+273.15)]$$

   Example :

   B value for copper sensor between 25°C and 50°C,

   B_{25-50} = ln (10000/4085) ÷ [1/(25+273.15) – 1/(50+273.15)]
   = 3450

4) For copper sensor, $B_{25-50} = 3450$

   For silver sensor, $B_{25-50} = 3330$

5) Rearrange the formula, we get

   $$\ln (R_1/R_2) = B_{t1-t2} [\, 1/(t_1 + 273.15) - 1/(t_2 + 273.15)]$$

   Take reference at 25°C, copper sensor

   $$\ln (R_1/10000) = 3450 [\, 1/(t_1 + 273.15) - 1/298.15]$$

   Substitute R_1 with R and t_1 with T and rearrange the formula, we get

   $$R = 10{,}000 * e^{3450[\, 1/ (T+273.15) - 1/298.15]}$$

   Where, R = Resistance at T °C
   T = Temperature measured by thermistor

   For Silver sensor,

   $$R = 5{,}000 * e^{3330[\, 1/ (T+273.15) - 1/298.15]}$$

Resistance - Temperature Characteristics

TYPE	DTN-C1 03F3H-OYL 1128, 1148, 1158
MATERIAL NAME	3H
RESISTANCE	R25=10.000kΩ+ 1.0%-1.0%
B VALUE	B25/50=3450K+1.0% -1.0%

t°C	Rmin (kΩ)	Rnom (kΩ)	Rmax (kΩ)	t°C	Rmin (kΩ)	Rnom (kΩ)	Rmax (kΩ)
-10	4.42E+01	4.53E+01	4.65E+01				
-9	4.21E+01	4.32E+01	4.43E+01	41	5.47E+00	5.56E+00	5.64E+00
-8	4.02E+01	4.12E+01	4.22E+01	42	5.28E+00	5.37E+00	5.45E+00
-7	3.83E+01	3.92E+01	4.02E+01	43	5.10E+00	5.18E+00	5.27E+00
-6	3.66E+01	3.74E+01	3.83E+01	44	4.92E+00	5.01E+00	5.09E+00
-5	3.49E+01	3.57E+01	3.65E+01	45	4.75E+00	4.84E+00	4.92E+00
-4	3.33E+01	3.41E+01	3.49E+01	46	4.59E+00	4.67E+00	4.76E+00
-3	3.18E+01	3.26E+01	3.33E+01	47	4.44E+00	4.52E+00	4.60E+00
-2	3.04E+01	3.11E+01	3.18E+01	48	4.29E+00	4.37E+00	4.42E+00
-1	2.90E+01	2.97E+01	3.03E+01	49	4.15E+00	4.22E+00	4.30E+00
0	2.78E+01	2.84E+01	2.90E+01	50	4.01E+00	4.09E+00	4.16E+00
1	2.66E+01	2.71E+01	2.77E+01	51	3.88E+00	3.95E+00	4.03E+00
2	2.54E+01	2.59E+01	2.65E+01	52	3.75E+00	3.82E+00	3.90E+00
3	2.43E+01	2.48E+01	2.53E+01	53	3.63E+00	3.70E+00	3.77E+00
4	2.33E+01	2.37E+01	2.42E+01	54	3.51E+00	3.58E+00	3.65E+00
5	2.23E+01	2.27E+01	2.31E+01	55	3.40E+00	3.47E+00	3.54E+00
6	2.14E+01	2.18E+01	2.21E+01	56	3.29E+00	3.36E+00	3.43E+00
7	2.05E+01	2.08E+01	2.12E+01	57	3.18E+00	3.25E+00	3.32E+00
8	1.96E+01	2.00E+01	2.03E+01	58	3.08E+00	3.15E+00	3.22E+00
9	1.88E+01	1.91E+01	1.94E+01	59	2.98E+00	3.05E+00	3.12E+00
10	1.80E+01	1.83E+01	1.86E+01	60	2.89E+00	2.96E+00	3.01E+00
11	1.73E+01	1.76E+01	1.78E+01	61	2.80E+00	2.86E+00	2.93E+00
12	1.66E+01	1.69E+01	1.71E+01	62	2.71E+00	2.78E+00	2.84E+00
13	1.59E+01	1.62E+01	1.64E+01	63	2.63E+00	2.69E+00	2.75E+00
14	1.53E+01	1.55E+01	1.57E+01	64	2.55E+00	2.61E+00	2.67E+00
15	1.47E+01	1.49E+01	1.51E+01	65	2.47E+00	2.53E+00	2.59E+00
16	1.41E+01	1.43E+01	1.45E+01	66	2.40E+00	2.45E+00	2.51E+00
17	1.35E+01	1.37E+01	1.39E+01	67	2.32E+00	2.38E+00	2.44E+00
18	1.30E+01	1.32E+01	1.33E+01	68	2.25E+00	2.31E+00	2.37E+00
19	1.25E+01	1.27E+01	1.28E+01	69	2.19E+00	2.24E+00	2.30E+00
20	1.20E+01	1.22E+01	1.23E+01	70	2.12E+00	2.17E+00	2.23E+00
21	1.16E+01	1.17E+01	1.18E+01	71	2.06E+00	2.11E+00	2.17E+00
22	1.11E+01	1.12E+01	1.14E+01	72	2.00E+00	2.05E+00	2.10E+00
23	1.07E+01	1.08E+01	1.09E+01	73	1.94E+00	1.99E+00	2.04E+00
24	1.03E+01	1.04E+01	1.05E+01	74	1.88E+00	1.93E+00	1.98E+00
25	9.90E+00	1.00E+01	1.01E+01	75	1.83E+00	1.88E+00	1.93E+00
26	9.52E+00	9.62E+00	9.72E+00	76	1.77E+00	1.82E+00	1.87E+00
27	9.16E+00	9.26E+00	9.36E+00	77	1.72E+00	1.77E+00	1.82E+00
28	8.82E+00	8.92E+00	9.02E+00	78	1.67E+00	1.72E+00	1.77E+00
29	8.49E+00	8.59E+00	8.69E+00	79	1.63E+00	1.67E+00	1.72E+00
30	8.17E+00	8.27E+00	8.37E+00	80	1.58E+00	1.62E+00	1.67E+00
31	7.87E+00	7.97E+00	8.07E+00	81	1.53E+00	1.58E+00	1.62E+00
32	7.58E+00	7.68E+00	7.78E+00	82	1.49E+00	1.53E+00	1.58E+00
33	7.31E+00	7.40E+00	7.50E+00	83	1.45E+00	1.49E+00	1.54E+00
34	7.04E+00	7.14E+00	7.23E+00	84	1.41E+00	1.45E+00	1.49E+00
35	6.79E+00	6.88E+00	6.98E+00	85	1.37E+00	1.41E+00	1.45E+00
36	6.54E+00	6.64E+00	6.73E+00	86	1.33E+00	1.37E+00	1.41E+00
37	6.31E+00	6.40E+00	6.50E+00	87	1.30E+00	1.33E+00	1.38E+00
38	6.09E+00	6.18E+00	6.27E+00	88	1.26E+00	1.30E+00	1.34E+00
39	5.87E+00	5.96E+00	6.05E+00	89	1.23E+00	1.26E+00	1.30E+00
40	5.67E+00	5.75E+00	5.84E+00	90	1.19E+00	1.23E+00	1.27E+00