



## Contents

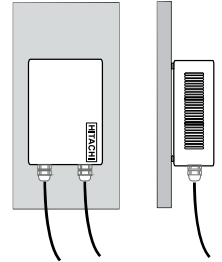
1.	Safety Summary	4
2.	Component names	4
3.	Specifications	5
4.	Installation work	6
4.1	Dimensional data	6
4.2	Fastening	6
5.	Wiring connections	7
5.1	Electrical wiring	7
5.2	DIP switch setting	8
6.	Operation	12
6.1	PACKAGED: Data available	12
6.2	CHILLER: Data available	15
6.3	Alarm code list for CHILLER	16
6.3.1	CHILLER alarms code list	16
6.3.2	Cycle alarms code list	17
7.	Troubleshooting	18

**Note:**

*This manual provides basic information for installing and wiring HARC-MODBUS.*

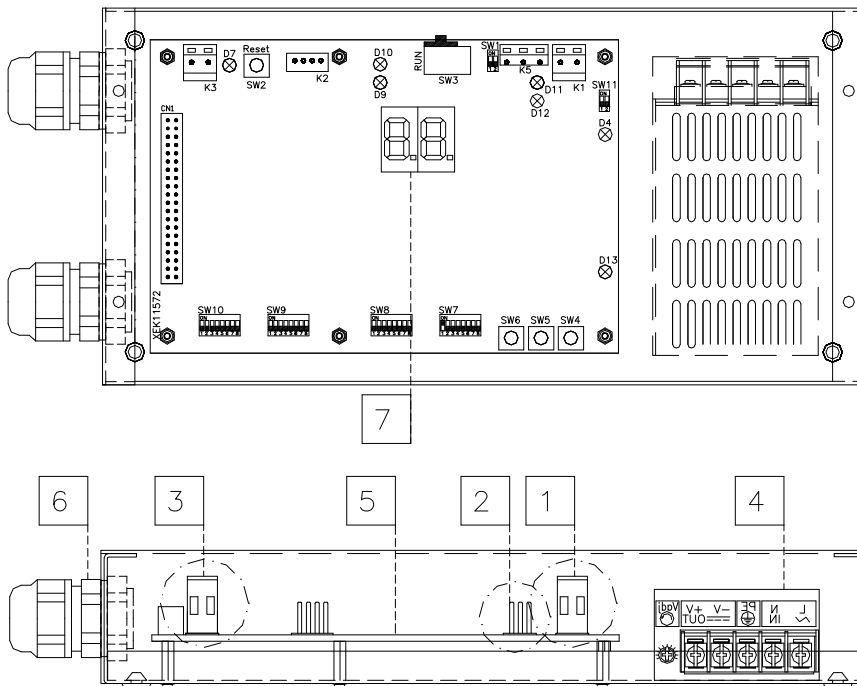
## 1. Safety Summary

- ⚠ Caution:**  
Do not connect voltage input to the control system before installation is correctly done.
- Read this manual carefully before performing installation work.
- Read this manual in order to configure the HARC-MODBUS.
- ⚠ Attention:**  
Do not install HARC-MODBUS in places... :
- with vapour, oil or dispersed liquids.
  - with heat sources nearby (sulphuric surroundings).
  - where accumulation, generation or leaks of inflammable gases has been detected.
  - that are near the sea, in saline, acid or alkaline surroundings.
- ⚠ Attention:**  
Install HARC-MODBUS away from possible sources of electromagnetic waves.
- Respect local electrical standards.
- Use a power circuit that is not subject to peak demands.
- Ensure that there is enough free space around the HARC-MODBUS (see figure) so that the heat may dissipate adequately (refer to "Installation Work").
- If you install the HARC-MODBUS in vertical position, install the power supply in the lower part.



## 2. Component names

The figure shows the names of the HARC-MODBUS components.



- 1 K1: H-LINK Connector:  
Connected to CSNET WEB
- 2 K5: Serial port RS485
- 3 K3: +5V DC Power connection
- 4 Power source: 230V AC / 5V DC
- 5 H-LINK PCB
- 6 Packing glands (2)
- 7 7-segments

### 3. Specifications

#### Hardware Specifications

Item	Specifications
Power supply	1~230V $\pm$ 10% 50Hz
Consumption	25W (maximum)
Outer dimensions	Width: 143mm, Depth: 302mm, Height: 76mm
Weight	1.75kg
Assembling conditions	Indoors (in a control panel or desktop)
Ambient temperature	0~40°C
Humidity	20~85% (Without condensation)

#### MODBUS - Communication with upper system

Item	Specifications
K5	Serial Port RS485 (3 Pins connector) - MODBUS Protocol
Communication line	Twisted pair cable. Polarity
Communication system	Half-duplex, multipoint serial connection
Communication method	Non parity or odd/even parity selection. Data length: 8 bits (see chapter 5)
Baud rate transmission	19200/9600 Baud (see chapter 5)
Length	max. 1200m according EIA-485

#### H-LINK - Communication with units

Item	Specifications
Communication with	HITACHI PACKAGED/CHILLER
Communication line	Twisted pair shielded cable, non polarity
Communications system	Half-duplex
Communication method	Asynchronous
Speed of transmission	9600 Bauds
Length of wiring	1000m maximum (total length of HLINK I/O bus)
Maximum number of HARC MODBUS	8 HARC-MODBUS/H-LINK SYSTEM (PACKAGED) 1 HARC-MODBUS/H-LINK SYSTEM (CHILLER)



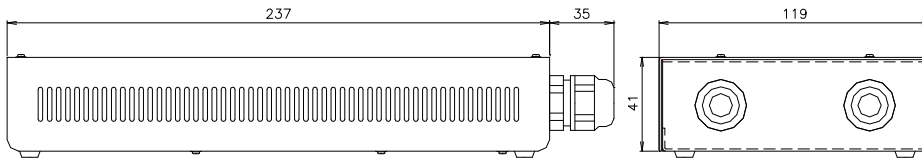
**Attention::**

*HARC-MODBUS cannot operate Indoor Units without any Remote Control Switch connected.*

## 4. Installation work

When unpacking the HARC-MODBUS, check that it has not suffered damage during transport.

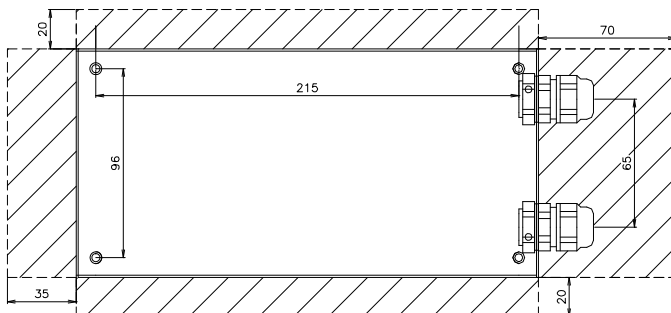
### 4.1 Dimensional data



### 4.2 Fastening

Perform the following procedure:

- 1 Remove the rubber supports.
- 2 Unscrew the 4 screws from the top cover and remove it.
- 3 Attach the box to the rear vertical board from the inside with M4 screws (not provided) and place 3mm washers on the outside to separate the box from the wall.
- 4 Reinstall the top cover. Be careful to position it correctly.
- 5 Keep free grated area for ventilation and cable connection.



#### ⚠ Attention:

- Before applying power and turning on HARC-MODBUS you must ensure that:
  1. All circuits to be connected are correctly applied.
  2. All H-Link connections have been set up.
  3. Follow the local regulations for the electrical installation of HARC-MODBUS and associated circuits.

Any unit that is not connected or is not under power when turning on HARC-MODBUS, will not be recognised and will have to be configured later.

#### ⚠ Caution:

- The signals' cables should be as short as possible. Keep a distance of more than 150 mm from other power cables. Don't wire them together (although they may intersect). If they must necessarily be installed together, take the following measures to avoid noise:
  - Protect the signal cable with a metal tube which is earthed at one end.
  - For communications, use shielded wire which is earthed at one end.

#### ⚠ Danger:

- Always disconnect the power supply for HARC-MODBUS when handling the machine, in order to avoid electrical discharges.
- Do not connect the interface to the power supply until the installation has been completed.
- Comply strictly with local security codes and regulations when connecting the machine to the electric network.
- You will need a three-wire cable (two cores and earth) with a suitable plug at one end.

## 5. Wiring connections

### 5.1 Electrical wiring

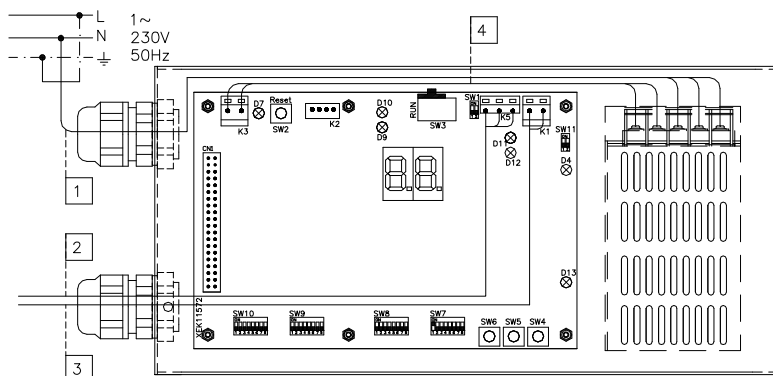
In order to run, HARC-MODBUS must be connected to the corresponding input and output signals, power supply cables and H-LINK.

No.	Connection	Cable Specifications
1	Power supply circuit 1~ 230V 50Hz 25W (With protection circuit)	Select wires according local regulations (recommended minimum 1.5mm <sup>2</sup> H05RN-F)
2	MODBUS	3 cables harness 0.75mm <sup>2</sup> (H05RN-F type). Use different colour for each cable. (Serial Port RS485)
3	H-LINK	Communication cables for the connection of HARC-MODBUS to an Hitachi installation, via CSNET WEB or any Hitachi unit using same H-LINK terminals. Twisted pair shielded cable 0.75mm <sup>2</sup> (H05RN-F TYPE). Shield must be grounded in one side only.
4	PCBs Power supply +5V DC. I <sub>max.</sub> = 5A DC	Pair cable 0.75mm <sup>2</sup> (H05RN-F TYPE)



**Note:**

All cables, except 4 are field supplied.



Field supplied Protections:

CB/EF: 5A

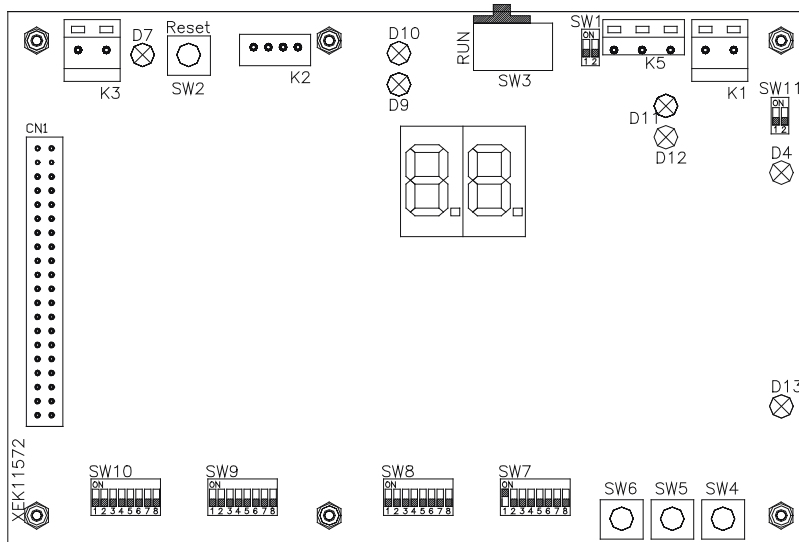
ELB: 2/40A/30mA

CB: Circuit Breaker

EF: Electric Fuse

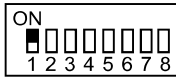
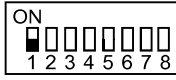
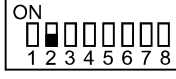
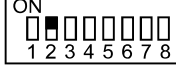
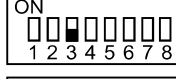
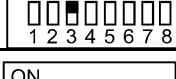
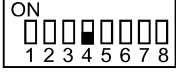
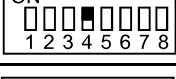
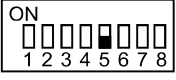
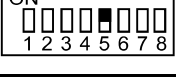
ELB: Earth Leakage Breaker

## 5.2 DIP switch setting

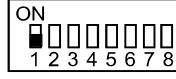
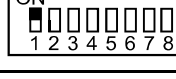


Name	Function	Factory setting	Description
SW1	Not available		All in off (no function)
SW2	Reset	–	Reset button. To be used in case of program has been locked
SW3 (TELE)	Not available		Factory purposes. Never change it
SW4	Configuration	–	Setting functions
SW5	Configuration	–	Setting functions
SW6	Configuration	–	Setting functions
SW7	Options 2		SW7-1: OFF-SLAVE / ON-MASTER. To be used in case of several HARC-MODBUS in the same H-LINK address SW7-2: OFF - EVENT CONTROL / ON - CHANGE CONTROL SW7-3: OFF - Parity disabled / ON - Parity enabled SW7-4: OFF - Even parity / ON - Odd parity SW7-5: OFF - 19200 Bps / ON - 9600 Bps SW7-(6~8): Not used
SW8	Options 1 (Application type)		SW8-1: OFF-PACKAGED / ON-CHILLER. To be set according units application SW8-2~8: Not used
SW9	Not available		All in off (no function)
SW10	HARC MODBUS address		HARC MODBUS address from 1 to 32 by pins 1 to 5
SW11	H-LINK DSW		2-Pins DSW SW11-1: H-LINK end resistance SW11-2: H-LINK fuse protection
D4, D11	H-LINK	–	H-LINK transmission
D7	Power	–	Power supply ON/OFF
D9/D10	Not used	-	-
D12	MODBUS	-	Modbus communication in RS485
D13	Operation	-	Normal software operation

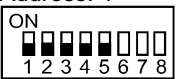


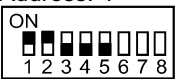






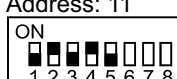
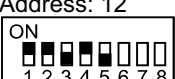
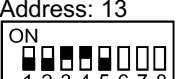

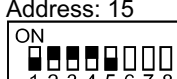
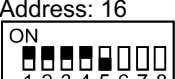
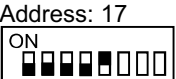
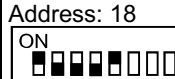
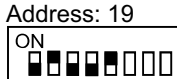
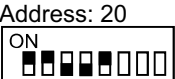
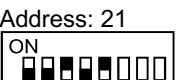


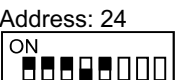
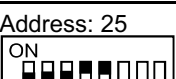

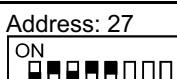
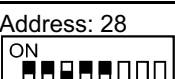
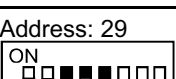
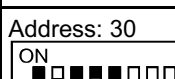
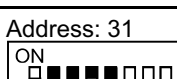
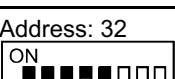
### ■ SW7 – FUNCTIONS SETTING 1

SW7	Description
 	<p><b>Configuration as MASTER/SLAVE:</b></p> <p>MASTER: SW7-1=ON Only one HARC-MODBUS can be set as a MASTER HARC-MODBUS Setting by default</p> <p>SLAVE: SW7-1= OFF It should be 1 HARC-MODBUS configured as MASTER, all the rest of HARC-MODBUS must be configured as SLAVE in the same H-LINK</p>
 	<p><b>Data Refresh Mode</b></p> <p>Configuration as EVENT CONTROL: SW7-2:OFF Parameters are refreshed to the IU each time BMS writes a setting parameter (even if no value is changed). Setting by default</p> <p>Configuration as CHANGE CONTROL: SW7-2:ON Parameters are refreshed to the IU only when some values are changed</p>
 	<p><b>Parity configuration</b></p> <p>SW7-3: OFF: No parity configuration</p> <p>SW7-3: ON: Parity communication (see SW7-4 configuration for parity type)</p>
 	<p><b>Parity type configuration</b></p> <p>SW7-4: OFF: Even parity (if SW7-3 is ON)</p> <p>SW7-4: ON: Odd parity (if SW7-3 is ON)</p>
 	<p><b>Communication Baud rate</b></p> <p>SW7-5: OFF 19200 Bps</p> <p>SW7-5: ON 9600 Bps</p>

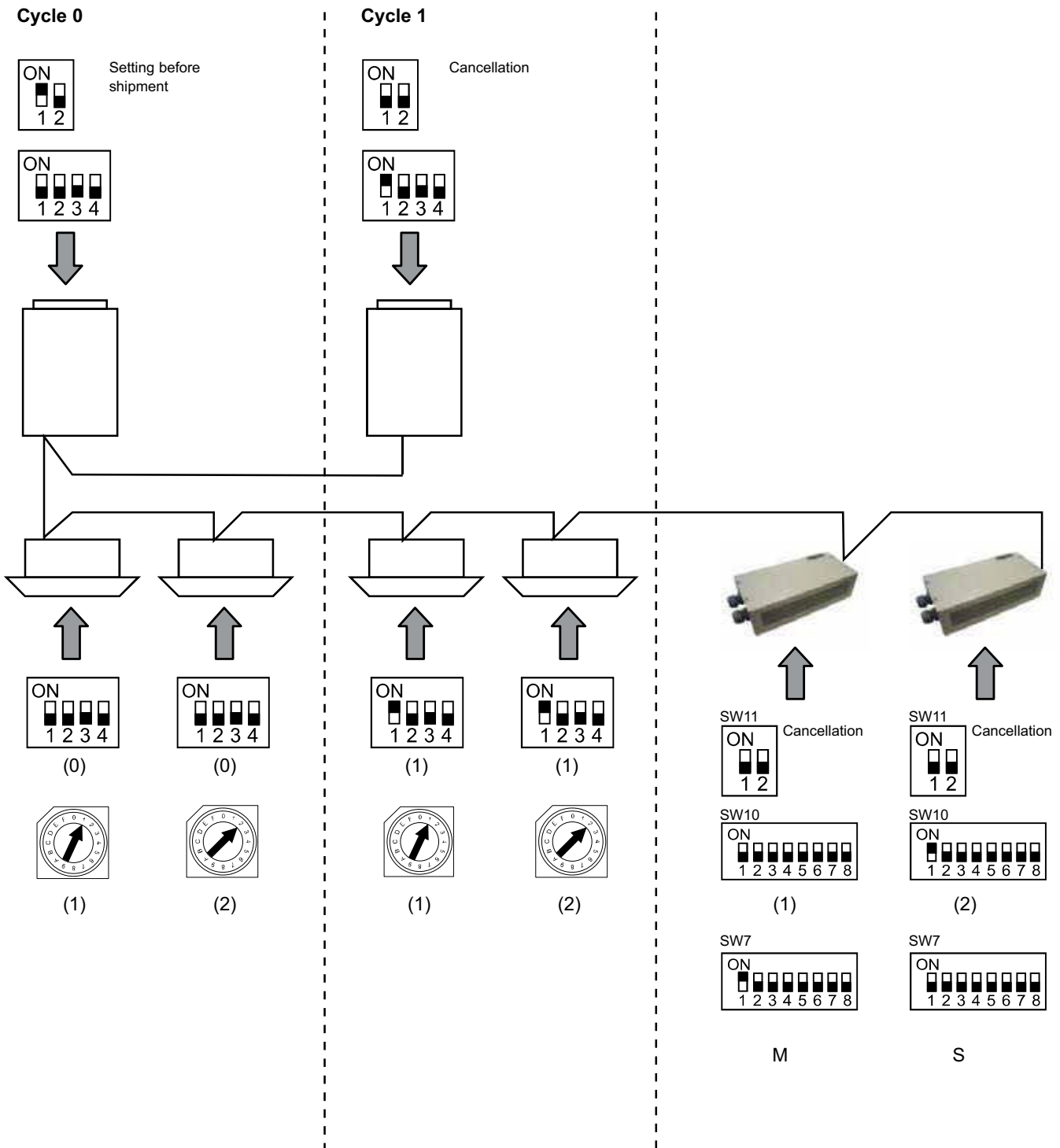
### ■ SW8 – FUNCTIONS SETTING 2

SW8	Description
 	<p><b>Configuration for PACKAGED / CHILLER</b></p> <p>PACKAGED Applications: SW8-1: OFF</p> <p>CHILLER Applications: SW8-1: ON</p>

■ SW10 – HARC address H-LINK (Same concept of O.U./Refrigerant cycle address)

SW10				Description
Address: 1 	Address: 2 	Address: 3 	Address: 4 	Configuration of HARC Address  HARC-MODBUS address used by MODBUS system  SW10 pins 1~5 must be set according the corresponding drawing of the desired address  SW10 pins 6~8 must be kept in OFF
Address: 5 	Address: 6 	Address: 7 	Address: 8 	
Address: 9 	Address: 10 	Address: 11 	Address: 12 	
Address: 13 	Address: 14 	Address: 15 	Address: 16 	
Address: 17 	Address: 18 	Address: 19 	Address: 20 	
Address: 21 	Address: 22 	Address: 23 	Address: 24 	
Address: 25 	Address: 26 	Address: 27 	Address: 28 	
Address: 29 	Address: 30 	Address: 31 	Address: 32 	

■ Example



## 6. Operation

### 6.1 PACKAGED: Data available

Address (Note 1)	Name	Description	Read/Write
0	EXIST	EXIST: 0: Not exist 1: Exist	Read
1	SYSTEM_ADDRESS	System Address: 0 ~ 15 in H-LINK 1	Read
2	UNIT_ADDRESS	Unit Address: 0 ~ 15 in H-LINK1	Read
3	SET_ONOFF	On/Off setting order: 0: Stop 1: Run	Read/Write
4	SET_MODE	Mode Setting order: 0: Cool 1: Dry 2: Fan 3: Heat 4: Auto	Read/Write
5	SET_FAN	Fan Setting order: 0: Low 1: Medium 2: High	Read/Write
6	SET_TSET	Setting Temperature: 17°C ~ 30°C	Read/Write
7	SET_LOUVER	Louver Setting: 0 ~ 8 (8 is Auto)	Read/Write
8	SET_CENTRAL	Central Setting Bit 0: On/Off (always can be stopped) Bit 1: Mode Bit 2: Setting Temp Bit 3: Fan	Read/Write
9	READ_ONOFF	On/Off Read: 0: Off 1: On	Read
10	READ_MODE	Mode Read 0: Cool 1: Dry 2: Fan 3: Heat 4: Auto	Read
11	READ_FAN	Fan Read 0: Low 1: Medium 2: High	Read
12	READ_TSET	Setting Temperature Read (17°C to 30°C)	Read
13	READ_LOUVER	Louver Read 0 ~ 8 (8 is Auto)	Read
14~18	(Not used)	(Not used)	(Not used)
19	ERROR_CODE	Alarm Code	Read
20~21	(Not used)	(Not used)	(Not used)
22	OPER_CONDITION	Unit Operation Condition 0: OFF 1: Thermo OFF 2: Thermo ON 3: Alarm	Read
23~31	(Not used)	(Not used)	(Not used)

Note 1: Offset Position is: 20000 + N\*32 + Address as shown in table, where N is Indoor Unit Address.

### ■ Configuration method

Every HARC-MODBUS can control up to 32 I.U, considering that in the same H-LINK can be connected up to 128 I.U, it must be set which indoor units are selected for each HARC-MODBUS.

This configuration is not required in case of CHILLER application.

Setting concept consist in an "id" table listing up to 32 numbers for the assignation of each OU+IU addresses as shows next:

Id	Refrigerant cycle address	Indoor unit address
00	00	00
01	00	01
02	00	02
03	00	03
04	00	04
05	00	05
06	00	06
07	00	07
08	00	08
09	00	09
10	00	10
11	00	11
12	00	12
13	00	13
14	00	14
15	00	15

Id	Refrigerant cycle address	Indoor unit address
16	01	00
17	01	01
18	01	02
19	01	03
20	01	04
21	01	05
22	01	06
23	01	07
24	01	08
25	01	09
26	01	10
27	01	11
28	01	12
29	01	13
30	01	14
31	01	15



#### Note:

- It can be selected for 1 HARC-MODBUS up to 32 I.U from 16 different refrigerant cycles or 32 I.U from the same refrigerant cycle.



#### Caution:

- Be sure not to set same Indoor Unit to more than one HARC-MODBUS. This error is undetectable and can cause undesired operations.

No.	Action	7 segments (display)	Remarks
1	Press SW4 for 3 seconds	id	Configuration mode selected
2	Press SW4	00	Id selection (IU No.) from 0 to 31 by pushing SW5 ▲ or SW6 ▼
3	Press SW4	ou	Refrigerant cycle address
4	Press SW4	--->00	Refrigerant cycle address selection from 0 to 15 (e.g. 00) (by pushing SW5 ▲ & SW6 ▼)
5	Press SW4	iu	Indoor unit address
6	Press SW4	--->00	Indoor unit address selection from 0 to 15 (e.g. 00) (by pushing SW5 ▲ & SW6 ▼)
For "id" 01 repeat steps 1 to 6			
7	Press SW4 for 3 seconds	id	Configuration mode selected
8	Press SW4	00->01	Id selection (IU No.) from 0 to 31 by pushing SW5 ▲ or SW6 ▼
9	Press SW4	ou	Refrigerant cycle address
10	Press SW4	--->00	Refrigerant cycle address selection from 0 to 15 (e.g. 00) (by pushing SW5 ▲ & SW6 ▼)
11	Press SW4	iu	Indoor unit address
12	Press SW4	--->01	Indoor unit address selection from 0 to 15 (e.g. 01; push SW5 once) (by pushing SW5 ▲ & SW6 ▼)
... Repeat steps 1 to 6 for all the rest "id"			
187	Press SW4 for 3 seconds	id	Configuration mode selected
188	Press SW4	00->31	Id selection (IU No.) from 0 to 31 by pushing SW5 ▲ or SW6 ▼
189	Press SW4	ou	Refrigerant cycle address
190	Press SW4	--->01	Refrigerant cycle address selection from 0 to 15 (e.g. 01; push SW5 once) (by pushing SW5 ▲ & SW6 ▼)
191	Press SW4	iu	Indoor unit address
192	Press SW4	--->15	Indoor unit address selection from 0 to 15 (e.g. 15; push SW6 once) (by pushing SW5 ▲ & SW6 ▼)

## 6.2 CHILLER: Data available

Address	Name	Description	Values	Read/Write
0	EXIST	Exist	0: Not exist 1: Exist	Read
1	SYSTEM_ADDRESS	Chiller Address	0~ 15 in H-LINK 1	Read
2	(Not used)	(Not used)	(Not used)	(Not used)
3	ONOFF_SET	On/Off setting order:	0: Stop 1: Run	Read/Write
4	MODE_SET	Mode Setting order	0: Cool 1: Heat	Read/Write
5	TEMP_SET_C	COOL setting temperature	(see note *)	Read/Write
6	TEMP_SET_H	HEAT setting temperature		
7	CENTRAL_SET	Central Setting	0: Local 1: Remote	Read/Write
8	ONOFF_STATUS	On/Off Status	0: Off 1: On	Read
9	MODE_STATUS	Mode Status	0: Cool 1: Heat	Read
10	TEMP_C_STATUS	COOL Setting Temperature Status		Read
11	TEMP_H_STATUS	HEAT Setting Temperature Status		Read
12	WATER_INLET	Inlet temperature		Read
13	WATER_OUTLET	Outlet temperature		Read
14	AMBIENT_TEMPERATURE	Ambient temperature		Read
15	OPER_CONDITION	Unit operation condition	0: OFF 1: Thermo OFF 2: Thermo ON 3: Alarm	Read
16	ERROR_CODE_CH	Alarm code for general CHILLER alarm		Read
17~22	ERROR_CODE_CYC	Alarm code for cycle alarm (1~6)		Read
23~31	(Not used)	(Not used)	(Not used)	(Not used)



### Notes:

- Offset Position is:  $40000 + N * 32 + \text{Address}$  as shown in table, where  $N$  is Water Chiller Address.
- Status (real value) and Set (value ordered) parameters have usually the same value but, in some cases, some of them can be different. It is recommended to use Set parameters for normal control.
- \*) When Temperature Setting and Operation Mode are changed at the same time, order first the operation mode change and later set the desired temperature.

### 6.3 Alarm code list for CHILLER

#### 6.3.1 CHILLER alarms code list

CHILLER alarm		Description	H-LINK
7SEG1	7SEG2		Code
11	11	Failure of Water Inlet Temperature Thermistor	20
12	12	Failure of Water Outlet Temperature Thermistor (only for single cycle unit)	21
22	22	Failure of Ambient Temperature Thermistor (open/short)	24
5P	5P	No Feedback Signal from Water Pump	26
13	13	Activation of Freeze Protection Control (only for single cycle unit)	27
6C	6C	Alarm of Water Failure (Differential Pressure Switch or Flow Switch Option)-Condenser	28
6E	6E	Alarm of Water Failure (Differential Pressure Switch or Flow Switch Option)-Evaporator	29
14	14	Activation of Thermostat for excessively High Water Temperature (Only single cycle units)	30
AP	AP	Activation of additional protection device	31
05	05	Phase Abnormally	32
CP	CP	Error Communication between Control PCB (PCB <sub>C1</sub> , PCB <sub>C2</sub> )	33
03	03	Error communication between Chiller and Remote Controller (H-LINK)	34
EU	EU	Error Communication between Expansion Valve PCB and Control PCB	36
40	40	Incorrect Operation	40~45, 47,47,54

## 6.3.2 Cycle alarms code list

Cycle alarm		Description	H-LINK
7SEG1	7SEG2		Code
<i>Cn</i>	<i>Hn</i>	Activation of High Pressure Switch	1
<i>Cn</i>	<i>Ln</i>	Activation of Low Pressure Control	2
<i>Cn</i>	<i>7n</i>	Activation of Compressor Internal Thermostat	3
<i>Cn</i>	<i>6n</i>	Activation of Discharge Gas Thermistor	4
<i>Cn</i>	<i>5n</i>	Activation of Thermal Relay for Compressor or Malfunction of Auxiliary Relay ARn	5
<i>Cn</i>	<i>F0</i>	Incorrect Setting of Fan Number	6
<i>Cn</i>	<i>4n</i>	Activation of Fan Motor Internal Thermostat	7
<i>Cn</i>	<i>Ln</i>	Excessively Low Pressure	8
<i>Cn</i>	<i>9n</i>	Excess Low Temperature of Cooler Inlet Refrigerant	10
<i>Cn</i>	<i>27</i>	Failure of Discharge Gas Pressure Sensor (open/short)	11
<i>Cn</i>	<i>28</i>	Failure of Suction Gas Pressure Sensor (open/short)	12
<i>Cn</i>	<i>12</i>	Failure of Water Outlet Temperature Thermistor (for non single cycle unit)	14
<i>Cn</i>	<i>23</i>	Failure of Discharge Gas Thermistor (open/short)	15
<i>Cn</i>	<i>26</i>	Failure of Suction Gas Thermistor (open/short)	16
<i>Cn</i>	<i>05</i>	Phase Abnormally	17
<i>Cn</i>	<i>21</i>	Failure of Cooler Inlet Refrigerant Thermistor (open/Short)	19
<i>Cn</i>	<i>6n</i>	Activation of Suction Gas Thermistor	20
<i>Cn</i>	<i>13</i>	Activation of Freeze Protection Control (for non single cycle unit)	21
<i>Cn</i>	<i>24</i>	Failure of Thermistor set before Expansion Valve (open/short)	23
<i>Cn</i>	<i>25</i>	Failure of Water Outlet Thermistor - Cooler Backside (open/short)	24
<i>Fn</i>	<i>51</i>	Inverter power Supply abnormally	34

## 7. Troubleshooting

N°	Alarm Code	Description	Countermeasure
1	EE → 61	Indoor Units have not communicated with HARC-MODBUS for more than 10 min.	<ol style="list-style-type: none"> <li>1. Ensure that H-LINK connection is correctly done in HARC (K1) and also Indoor Units.</li> <li>2. Ensure that Power are supplied to Air Conditioners.</li> </ol>
2	EE → 63	Indoor Units have never communicated with HARC-MODBUS	<ol style="list-style-type: none"> <li>1. Ensure that H-LINK connection is correctly done in HARC (K1) and also in Indoor Units.</li> <li>2. Ensure that Power are supplied to Air Conditioners.</li> </ol>
3	D7 is always OFF	No LED is flickering on PCB and 7 segments are OFF	<ol style="list-style-type: none"> <li>1. Ensure that 230 are supplied to Power Source.</li> <li>2. Ensure that +5V DC is supplied to K3.</li> </ol> <p><b>i</b> <b>Notes:</b></p> <ul style="list-style-type: none"> <li>- Power source output DC signal has a rotary switch that must be correctly set to get +5V DC.</li> <li>- D7 must be in ON.</li> </ul>
4	D12 is never flickering	HARC-MODBUS is not reading/ sending data (D12 is never flickering)	<ol style="list-style-type: none"> <li>1. Check connection between MODBUS devices and K5.</li> </ol>
5	D12 is not flickering	HARC is not operating (D13 is not flickering)	<ol style="list-style-type: none"> <li>1. Check SW3 is in RUN position. If no, set RUN and push reset.</li> </ol>
6	D4 & D11 are not flickering	There is no H-LINK communication from HARC-MODBUS	<ol style="list-style-type: none"> <li>1. D4 is flickering but D11 is not flickering. → See line N°6, countermeasure 1.</li> <li>2. D4 neither D11 are not flickering. → See line N°3, countermeasure 1.</li> </ol>