

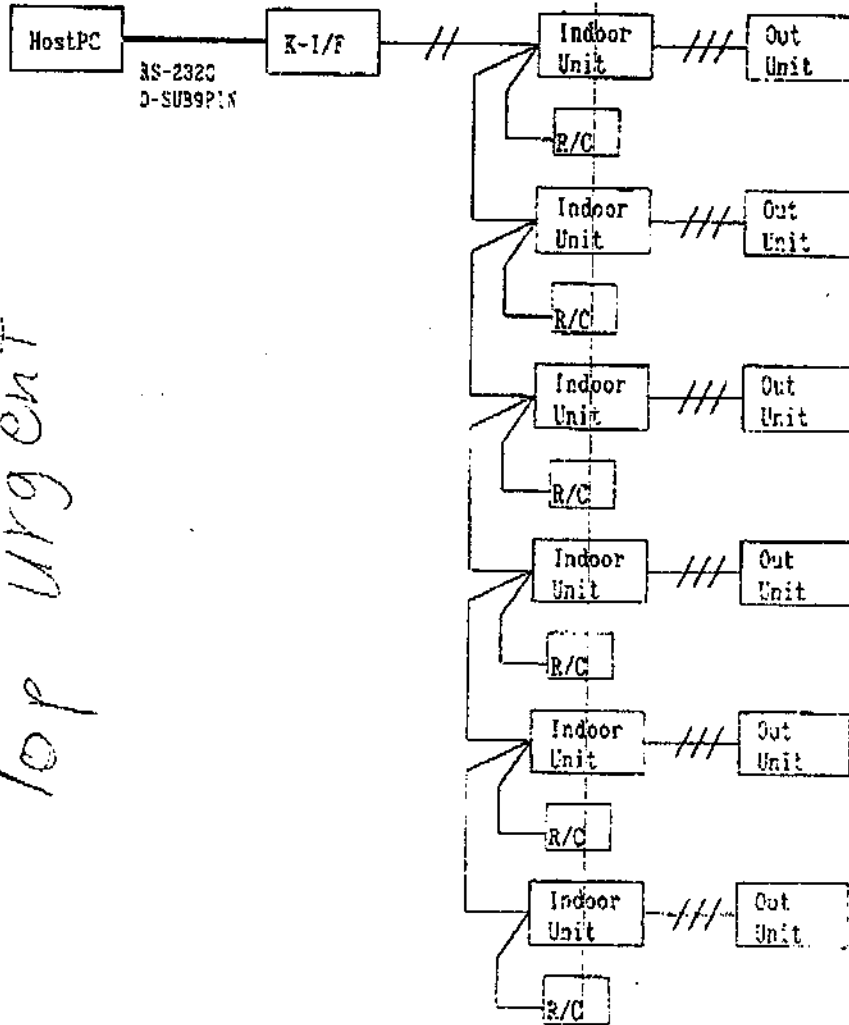
To: Nickolay

K-control Interface Signal Transmission Protocol

1. Outline

Defining the signal transmission between K-Interface and Host PC for K-Interface.

2. System configuration chart



Top urgent

M/G Mark

- (1) Max.6 indoor units can be connected to 1 Interface
Possible to monitor, change the settings of each indoor unit in a group
1 group consists of one indoor unit with single address with R/C
- (2) System setting
 - K-1/F : Setting Group address(SW2), No. of connecting indoor units(SW4)
 - Group address(SW2) : Setting range 1 ~ 4 5
 - No. of connecting indoors(SW4) : Setting range 1 ~ 6
 - Indoor unit : Setting the unit address(SW2)
 - R/C : Setting the group address(SW17-1~6)
 - Address of indoor unit No.1=Group address of K-1/F
 - Address of indoor unit No.2=Group address of K-1/F+1
 - Address of indoor unit No.6=Group address of K-1/F+5

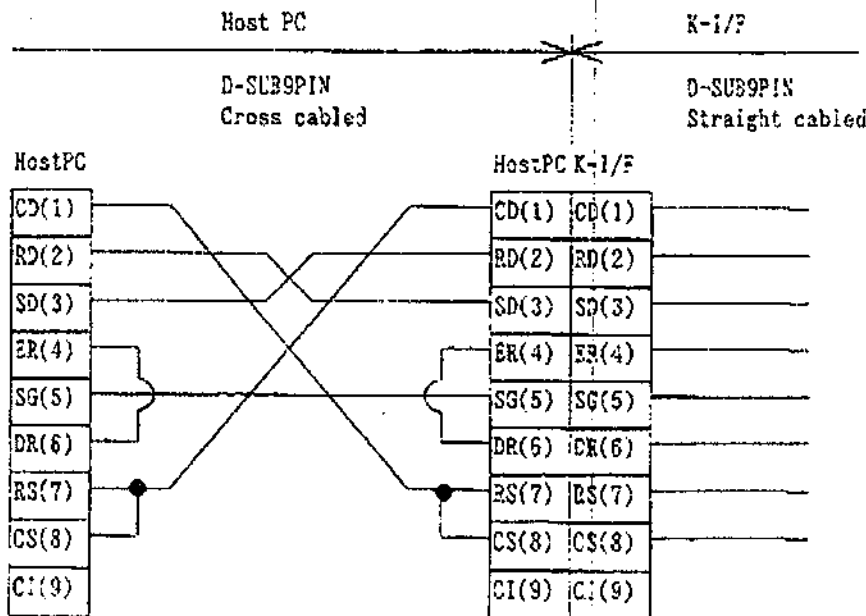
3. Signal Transmission Interface

3-1. Signal Transmission Method

Sign. Trans. Method	Half Duplex Communication
Synchronous Method	Asynchronous
Sign. Control Meth.	Special Control Method
Speed	1,200 bps
Code	JIS 7 Bit + 1 parity
Detecting Default	Vertical parity (Even number parity) Horizontal parity (LRC method)*
Connector	RS-232C Host PC : D-sub 9 PIN (Female, cross cabled) K-I/F : D-sub 9 PIN (Male, straight cabled)

*LRC : Longitudinal Redundancy Check

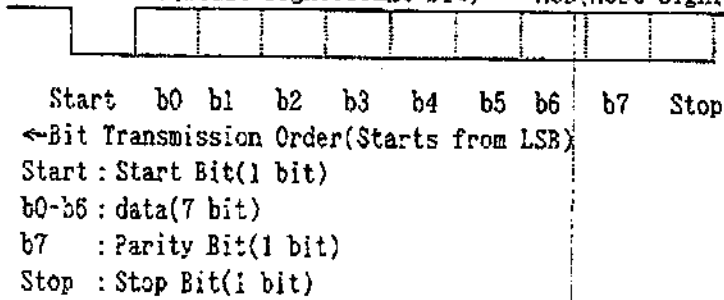
3-2. Hardware Interface (Spec. between PC and K-I/F)



4. Transmission Control

4-1. Data Transmission Order

LSB(Least Significant Bit) MSB(Most Significant Bit)



4-2. Mark for Transmission Control

The following shows the mark used to describe transmission control.

Mark	Code	Definition
STX	X '0 2	Start of text
ETX	X '0 3	End of text

4-3. Transmission format

The following shows the composition of transmission format for 1 packet

S	S	U	Record	E	B
T	A	A		T	C
X				X	C

- (1) STX
This shows the start of text
- (2) SA (Self address)
Address of sender : PC:X '3 0, K-1 / F:X '2 0
- (3) UA (User's address)
Address of sender : PC:X '3 0, K-1 / F:X '2 0
- (4) Record
Max.16 letters text
Order message:8 letters, call for monitor:2 letters,
Monitor response:16 letters
- (5) ETX
This shows the end of text
- (6) BCC (Block Check Character)
Detected data of defaluted text. From the character after STX to ETX
data will have XOR (Exclusive OR) performed and regarded as BCC

4/13

4-4. Controlled order

The following shows the transmission command between PC and K-I/F

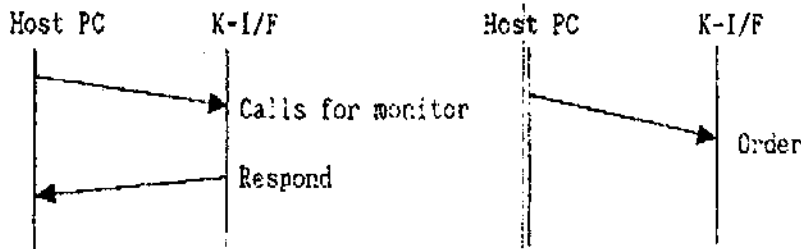
Send/Receive	Command	Transmission condition
Host PC→K-I/F	Order	Controlling the unit from Host PC, orders can't be given when calling for monitor
Host PC→K-I/F	Call for monitor	Sending at a certain intervals from host PC to 1 group(1 unit) Refer to bottom (3)
K-I/F→Host PC	Respond	Send the answer back when the unit was called

(1) Monitor

Assign indoor unit address
For monitoring

(2) Order

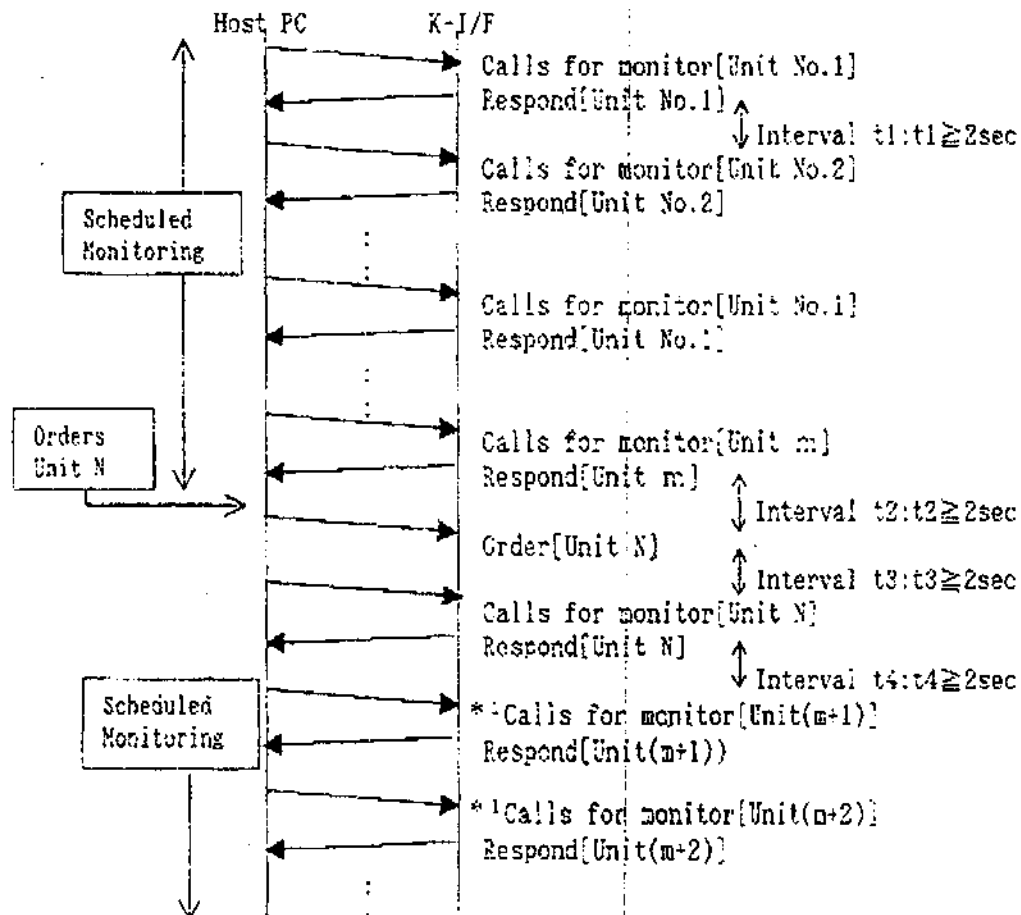
Assign the indoor unit address to order
Address00 gives the order to all units



(3) Basic signal transmission flow

The followings will be the basic sequence

- ① Conducting scheduled monitoring
- ② Orders will given at radom needs and monitors the relevant unit immediately
- ③ Repeats scheduled monitoring



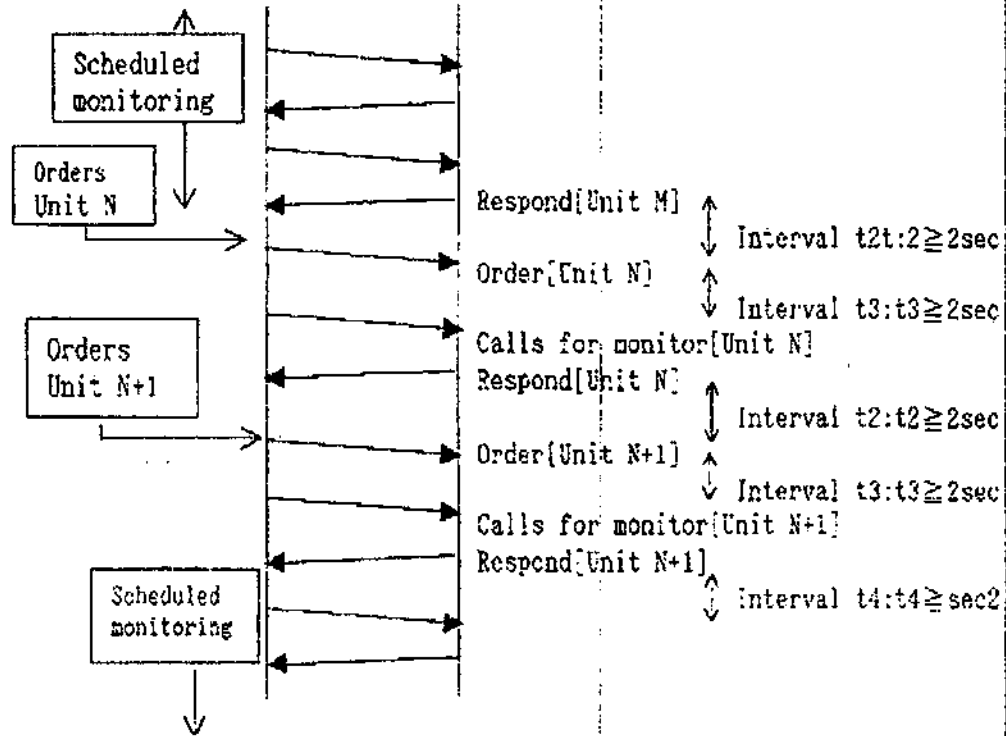
*Interval t1,t2, t4:
It will be t1 (t2 or t4) sec. Later and sends Signal

※ Interval t3:
After giving the order signal, hostPC sends signal after t3sec.

*1: Restart from Unit No.1 Or possible to start from unit No.N+1

(4) Continuous order transmission flow

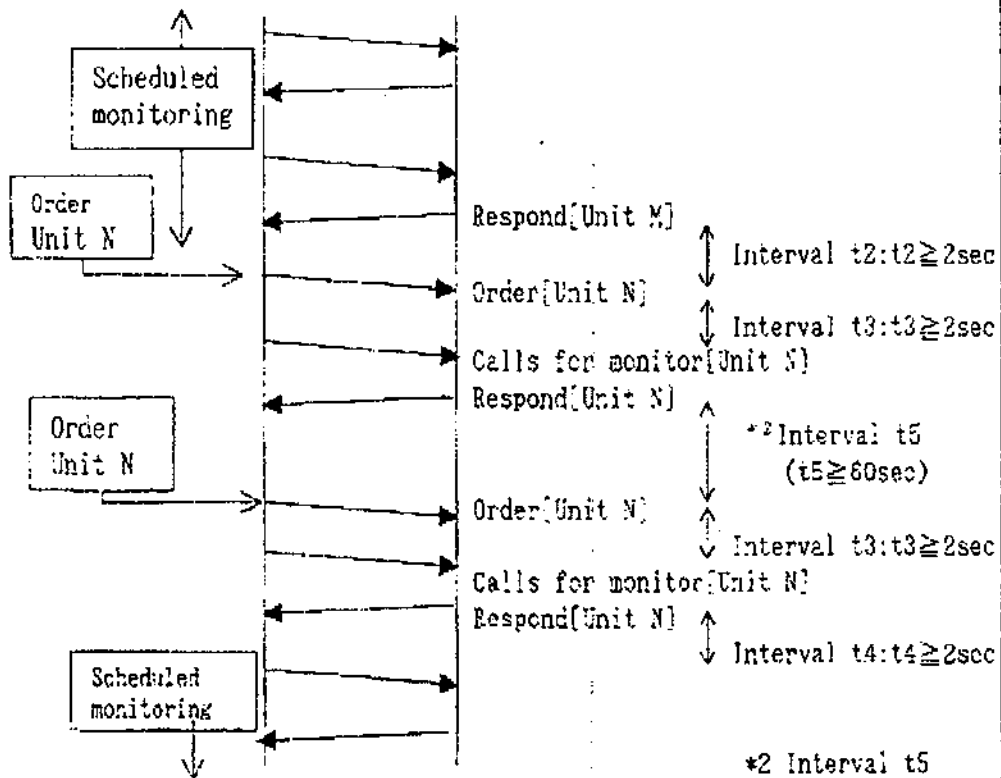
a) Sending order signals continuously to different units



b) Intervals for sending orders to same unit

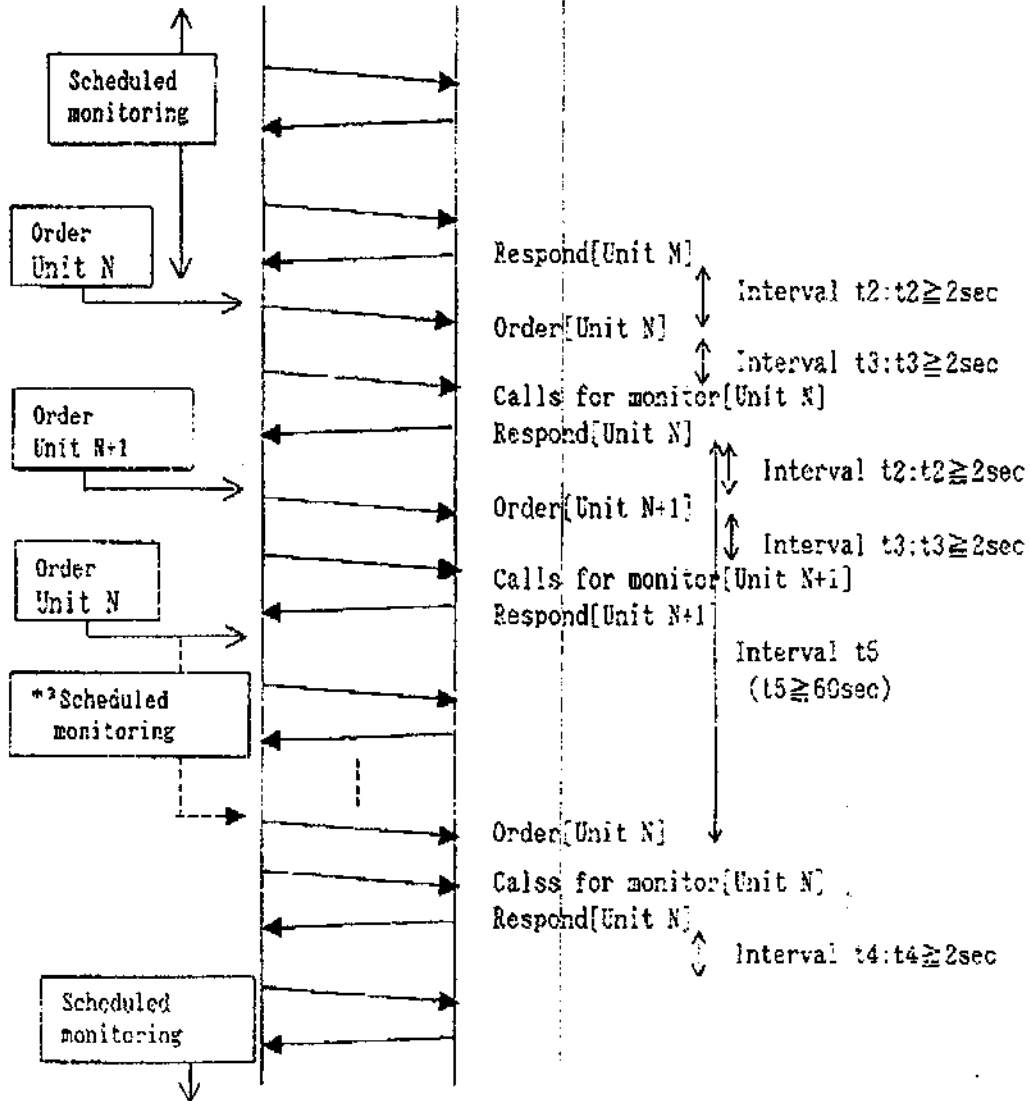
Please leave t_5 seconds intervals to send orders to same unit

<ex.1 sending orders continuously to same unit>



*2 Interval t_5
 During this interval, you can conduct scheduled monitoring and sending signals to other units (refer to ex.2) but consider how to cope with signals that may be sent from Mr.Slim remote controller to host PC

<ex.2 sending orders to different units>



*3 Should you need to conduct scheduled monitoring at this time, please consider how to cope with the signals that may be sent from remote controller to host PC

4-5. Receiving invalid data

(1) Undefined Code

Undefined Code can be explained as receiving the combination of undefined bit in each code.

(2) Receiving Invalid Packet

The following shows the invalid packet

- ① When Host PC (or K-I/F) receives different SA, UA
- ② When Host PC (or K-I/F) deletes BCC error
- ③ When receiving order to unit address that does not exist on the system. (Spec for K-I/F side)

(3) Receiving Invalid Data

When there is a undefined data in the record, only the data of the undefined code will be regarded invalid

4-6. Detecting mis-setting the unit address data; signal sent from host PC

When receiving the calls for monitor that has sent to the unit address that does not exist, the recorded data of respond will be "?"
(Spec for K-I/F side)

4-7. Signal Transmission Error

(1) Detecting Signal Transmission Error of Host PC (Spec for host PC side)

It will be regarded as transmission error when there is no response in 5 seconds after calls for monitor. Monitoring will be continued during signal transmission error. If there were to be a respond, it will be regarded as normal signal transmission. If the respond does not corresponds to the order, Host will send the same order to K-I/F.

※ Transmission intervals for resending the order shall refer to

「(4): Continuous order transmission flow, section b) Intervals for sending orders to same unit」

(2) Detecting Connection Error of Host PC (Spec for K-I/F side)

It will be regarded as connection error of host PC when the interface does not receive the calls for monitoring for 1 hour.

When detecting connection error, remote controller operation data will be changed to approved remote controller operation.

Spec for Signal Transmission

5. Text and Message

5-1. Composition of the record

- (1) Calls for monitoring : Unit address (2 letters)
- (2) Respond : Unit address (2 letters) + Setting data and Condition data (11 letters) + Average indoor temperature (3 letters)
- (3) Order : Unit address (2 letters) + order (6 letters)

	Calls for Monitor	Respond	Order
RE CO RD	Unit address (2 letters)	Unit address (2 letters)	Unit address (2 letters)
		Unit Off(1 letter)	Unit Off(1 letter)
		R/C control(1 ltr.)	R/C control(1 ltr.)
		Run mode(1 letter)	Run mode(1 letter)
		Set temperature (2 letters)	Set temperature (2 letters)
		Suction temperature (3 letters)	Filter reset(1 ltr.) Fan speed(1 letter)
		Filter sign cond. (1 letter)	
		Abnormal code (2 letters)	
		Mean indoor temp. (3 letters)	
		Fan speed (1 letter)	

5-2. Text data

Text data should all be using ASCII letters

0~9 (30H~39H)

A~F (41H~46H) , P (50H) , ? (3FH)

9/13

6. Definition of Data

Data	Letters	Commands	Definition of Data
Unit address	2	Order/ Calls Monitor/ Respond	Range: 00 ~ 50 00 : order to all units 01 ~ 50 : order/Calls for monitor, Respond (setting the address for controlling unit)
Unit On/Off	1	Order/ Respond	0 : Off 1 : On
R/C Control	1	Order/ Respond	0 : OK to control by R/C 1 : Not OK to control by R/C
Run mode	1	Order/ Respond	0 : Auto 1 : Cooling 2 : Heating 3 : Dry
Set temperature	2	Order/ Respond	00 ~ 99 °C Regulates at temp. range that can be set in each operating mode. If the temp. is out of operating range, the temp. will automatically set to lowest/highest temp. Cooling/Dry : 19 ~ 30 °C Heating : 17 ~ 28 °C Auto : 19 ~ 28 °C
Suction temperature	3	Respond	00.0 ~ 99.9 °C K-I/F replies from 8 ~ 39 °C at 1 °C interval, there will be no temp. using decimal points. Initial data: 08.0
Filter sign condition	1	Respond	0 : Filter sign OFF 1 : Filter sign ON
Error code	2	Respond	Normal Code 00 : Normal Error Code E0 : Signal Transmission Error (K-I/F → Indoor unit, R/C → Indoor unit) P1 : Indoor unit suction sensor error P2 : Indoor coil thermostat error P3 : Signal transmit error (Indoor → R/C) P4 : Drain sensor error P5 : Drain pump error P6 : Frost/Excessive heating protection P7 : System error P8 : Condensing unit error Changed the 1 byte error code to 2 byte; using ASCII letters
Reset filter sign	1	Order	0 : Not performed 1 : Performed filter resetting
Mean indoor temperature	3	Respond	00.0 ~ 99.9 °C Initial setting 00.0
Fan speed	1	Order/ Respond	1 : Lo 2 : Hi

Note: The temperature data transmission between host PC and K-I/F are conducted using °C.

Please convert from deg. F to deg. C (and vice versa) to display on host PC.

We have attached the conversion table for your use.

*Host PC → K-I/F: Convert from deg. F to deg. C and send the signal.

*K-I/F → host PC: Convert from deg. C to deg. F and display on the monitor.

Communication data between Host PC and K I/F

<Operating>

- Host PC sends this packet to K-I/F to operate.
- Table_1 shows the structure of transmission format of operating data.

Table_1 Transmission Data Packet of Operation

Data No.	Name of Data	Definition of data	Remarks
1	STX (Start of Text)	0 2 _H	
2	SA (Self Address)	3 0 _H (Host PC address=30 _H)	
3	EA (User Address)	2 0 _H (K-I/F address=20 _H)	
4	Address of Air-conditioner Unit to operate	10 ¹ Digit	Data Range : 01~50 (ASCII CODE)
5		10 ⁰ Digit	
6	Record Operation Data	ON/OFF	0 : OFF 1 : ON (ASCII CODE)
7		Remote Control Available or not	0 : Available 1 : Not Available (ASCII CODE)
8		Operation Mode	0 : Auto 1 : Cooling 2 : Heating 3 : Dry (ASCII CODE)
9		Set Temperature data	10 ¹ Digit
10	10 ⁰ Digit		
11	Status Data	Filter sign reset	0 : No operation 1 : Reset (ASCII CODE)
12	ETX (End of Text)	0 3 _H	
13	BCC (Block Check Code)	LRC from SA to ETX (Longitudinal Redundancy Check)	

<Calls for Monitor >

- Host PC sends this packet to K-I/F to calls for monitoring data.
- Table_2 shows the structure of transmission format of calling for monitor.

Table_2 Transmission Data Packet of Calling for Monitor

Data No.	Name of Data	Definition of data	Remarks
1	STX (Start of Text)	0 2 _H	
2	SA (Self Address)	3 0 _H (Host PC address=30 _H)	
3	UA (User Address)	2 0 _H (K-I/F address=20 _H)	
4	Record Address of Air-conditioner Unit to monitor	10 ¹ Digit	Data Range:01~50 (ASCII CODE)
5		10 ⁰ Digit	
6	ETX (End of Text)	0 3 _H	
7	BCC (Block Check Code)	LRC from SA to ETX (Longitudinal Redundancy Check)	

<Respond to the calls for monitor>

- K-I/F sends this packet to Host PC in order to reply to the calls for monitor.
- Table_3 shows the structure of transmission format of the reply to calls for monitor.

Table_3 Transmission Data Packet of Respond to Host PC

Data No.	Name of Data	Definition of data	Remarks	
1	STX (Start of Text)	0 2 _H		
2	SA (Self Address)	2 0 _H (K-I/F address=20 _H)		
3	UA (User Address)	3 0 _H (Host PC address=30 _H)		
4	Address of Air-conditioner Unit	10 ¹ Digit	Data Range:01~50 (ASCII CODE)	
5		10 ⁰ Digit		
6	Operation Data	ON/OFF 0 : OFF 1 : ON	(ASCII CODE)	
7		Remote Controller availability 0 : Available 1 : Not Available	(ASCII CODE)	
8		Operating Mode 0 : Auto 1 : Cooling 2 : Heating 3 : Dry	(ASCII CODE)	
9		Set Temperature Data	10 ¹ Digit	Data Range: * 00~99°C (ASCII CODE)
10	10 ⁰ Digit			
11	Record	Intake Temperature Data	10 ¹ Digit	Data Range * 00.0~99.9°C (ASCII CODE) Initial Data=08.0
12			10 ⁰ Digit	
13			10 ⁻¹ Digit	
14	Status Data	Status of Filter Sign 0 : Filter Sign OFF 1 : Filter Sign ON	(ASCII CODE)	
15		Error code	Upper Digit	* 00/E0/P1~P8 (ASCII CODE)
16			Lower Digit	
17		Average data of Indoor Temperature	10 ¹ Digit	Data Range : 00.0~99.9°C Initial Data=00.0 (ASCII CODE)
18	10 ⁰ Digit			
19	10 ⁻¹ Digit			
20	ETX (End of Text)	0 3 _H		
21	BCC (Block Check Code)	LRC from SA to ETX (Longitudinal Redundancy Check)		

※ASCII CODE is as follows ;

0~9 : 3 0_H~3 9_H
 A~F : 4 1_H~4 6_H
 P : 5 0_H
 ? : 3 F_H

*1 Each operating mode has range to set temperature as below;

- Cooling/Dry: 19~30°C
- Heating : 17~28°C
- Auto : 19~28°C

The data that is out of above range must be changed as follows;

- Upper temp. → Maximum data
- Lower temp. → Minimum data

*2 Minimum Intake Temperature data is fixed to "0".

*3 At Normal operation, Code="00"(Zero Zero)

If there is some abnormality, Error code is as follows;

E0(E-Zero) : Communication error (K-I/F→Indoor, Remote Controller→Indoor)

F1 : Abnormality of room temperature thermistor(RT1)

P2 : Abnormality of indoor coil thermistor(RT2)

P3 : Communication error (Indoor→Remote Controller)

P4 : Abnormality of drain sensor

F5 : Malfunction of drain pump

F6 : Coil frost protection is working

F7 : System Error

F8 : Abnormality in outdoor unit

※Upper digit means "O"/"E"/"P".