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Air conditioning and CAN communication protocol

(Application:All Bus air conditioner)

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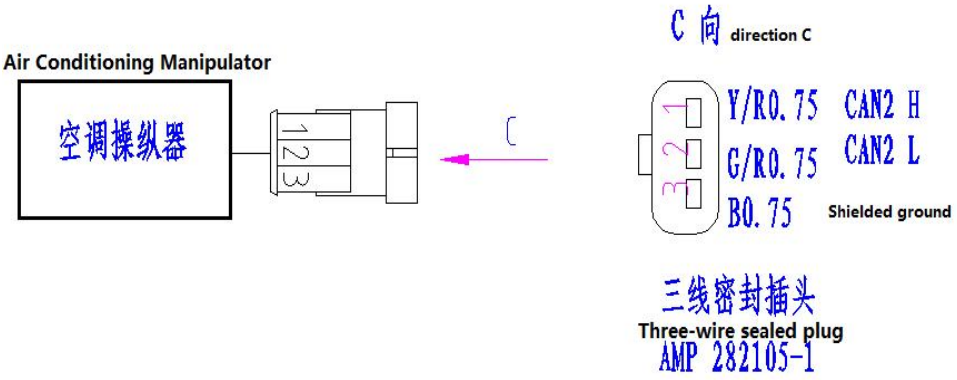
Air conditioning and CAN communication protocol

1: Introduction

The establishment of an air-conditioning system and a host vehicle information exchange platform to achieve air-conditioning and main vehicle interconnection is a common need for the development of air-conditioning and passenger cars. In order to achieve air-conditioning and instrumentation through the CAN bus connection, mutual communication for information sharing establish this agreement. The master car meter draws a zone in the display to show information about the air conditioning operation. The air conditioner operation status, current indoor temperature, and air conditioning fault information are displayed in the air conditioner operation. When you need to view, you can display more running information and fault information by scrolling.

2. Electrical Interface Specification

A single node of the air-conditioning manipulator accesses the body bus without terminating resistors (air-conditioning internal communication is another group network and body buses are not used). Air-conditioning side uses AMP 282105-1 three-wire sealed plug, as defined below



3. Communication specification

■The CAN bus communication rate：250KbPS

■CAN BUS Network message structure diagram

IDENTIFIER 11BITS											SRR	IDE	IDENTIFIER EXTENSION 18BITS															
priority			R	DP	PDU FORMAT(PF)						SRR	IDE	PF		PDU SPECIFIC(PS)								SOURCE ADDRESS(SA)							
3	2	1	1	1	8	7	6	5	4	3			2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
28	27	26	25	24	23	22	21	20	19	18			17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Remark :

1) The above is the allocation table for the 29 identifiers：

2) Among them, the priority level is 3, could have 8 priorities; R is normally fixed to 0; DP is now fixed to 0

CAN network address distribution table:

CAN bus node addresses are defined from J1939 standards;

The name of the node	SOURCE ADDRESS(SA)
Bus instrument	0x17($23_{(10)}$)
The air conditioning system	0x19($25_{(10)}$)

4. Message format

Note : The blue words used for double system modification;

Note :The green words used for single system modification;

Message 1: Air conditioning system working status (send from air conditioner panel)

OUT	IN	ID					Period ms
A/C system	Bus Instrument	P	R	DP	PGN	SA	1000
		6	0	0	FFC1 (65473)	19 (25)	
DATA							
Location	Date definition	Date description					
Byte1	Air conditioning working mode: cooling	bit 7~6 00: Cooling off 01: Cooling on 10: retain 11: invalid					
	Air conditioning working mode: heating	bit 5~4 00: Heating off 01: Heating on 10: retain 11: invalid					
	Air conditioning working mode: Fresh air	bit 3~2 00: Fresh air off 01: Fresh air on 10: retain 11: invalid					
	Retain	bit 1~0					
Byte2	Retain	bit 7~6					
	Air conditioning working mode: Automatic	bit 5~4 00—Manual mode 01—Automatic mode					
	Retain	bit 3~2					
	Air conditioning working mode: Ventilation	bit 1~0 00—Ventilation mode off 01—Ventilation mode on					
Byte3	Evaporator Fan Estimated Speed Percentage	Resolution:0.4%/Bit increment，Calculated from 0% Data Range: 0% to 100% 255: invalid					
Byte4	Condenser Fan Estimated Speed Percentage	Resolution:0.4%/Bit increment，Calculated from 0% Data Range: 0% to 100% 255: invalid					
Byte5	Compressor operating percentage	Resolution:0.4%/Bit increment，Calculated from 0% Data Range: 0% to 100% 255: invalid					
Byte6	Current setting temperature	Resolution：1℃/bit， Offset：-40 ℃， Range：-40 ℃~210 ℃ Type: Measurement 255: invalid					
Byte7	Current inside temperature	Resolution：1℃/bit， Offset：-40 ℃， Range：-40 ℃~210 ℃ Type: Measurement 255: invalid					
Byte8	Current outside temperature	Resolution：1℃/bit， Offset：-40 ℃， Range：-40 ℃~210 ℃ Type: Measurement 255: invalid					

Message 2： Air conditioning system working status (send from air conditioner panel)

OUT	IN	ID					Period (ms)
A/C system	Bus Instrument	P	R	DP	PGN	SA	1000
		6	0	0	FFC2 (65474)	19 (25)	
DATA							
Location	Date definition	Date description					
Byte1	Evaporator temperature (left core)	Resolution：1℃/bit, Offset： - 40 ℃, Range： - 40 ℃~210 ℃ Type: Measurement 255: invalid					
Byte2	Condensing core temperature	Resolution：1℃/bit, Offset： - 40 ℃, Range： - 40 ℃~210 ℃ Type: Measurement 255: invalid					
Byte3	Compressor discharge port refrigerant pressure	Resolution 16kpa/Bit, Offset：0, Range: 0~4000kpa Type: Measurement 255: invalid					
Byte4	Retain						

Byte5	Air conditioning voltage (low byte)	Resolution: 0.05V ／ Bit，0 Offset, data length 2 bytes Range: 0~3212.75V 65535：invalid
Byte6	Air conditioning voltage (high byte)	
Byte7	Evaporator temperature (right core)	Resolution：1℃/bit, Offset： - 40 ℃, Range： - 40 ℃~210 ℃ Type: Measurement 255: invalid
Byte8	AC system on/off state	bit 7~6 00：AC system off 01:AC system on 10: retain 11: invalid
	Compressor on/off state	bit 5~4 00：compressor off 01:compressor on 10: retain 11: invalid
	Compressor electric heating on/off state	bit 3~2 00：electric heating off 01:electric heating on 10：retain 11: invalid
	Retain	bit 1~0

Message 3: Air conditioning system failure information send from air conditioning panel 0x18FFC319

OUT	IN	ID					Period (ms)
AC system	Bus controller	P	R	DP	PGN	SA	300/1000
		6	0	0	FFC4 (65475)	19 (25)	
DATA							
Location	Date definition	Date description					
Byte1	air conditioning system low voltage	bit 7~6 00： Normal voltage 01:low voltage 10: retain 11: invalid					
	air conditioning system high voltage	bit 5~4 00： Normal voltage 01:low voltage 10: retain 11: invalid					
	Cooling system low pressure switch（Left pressure)	bit 3~2 00:Normal voltage 01:low pressure,compressor and the clutch may stop working 10: retain 11: invalid					
Byte2	Evaporation fan failure	bit 7~6 00:Evaporation fan normal 01:Evaporation fan failure 10: retain 11: invalid					
	Condensing fan failure	bit 5~4 00:Condensing fan normal 01:Condensing fan failure 10: retain 11: invalid					
	Evaporator temperature sensor failure（Right core)	bit 3~2 00: sensor normal 01: sensor failure 10: retain 11: invalid					
	retain	bit 1~0					
Byte3	Evaporator temperature sensor failure（left core	bit 7~6 00: sensor normal 01: sensor failure 10: retain 11: invalid					
	Condenser temperature sensor failure	bit 5~4 00: sensor normal 01: sensor failure 10: retain 11: invalid					
	Vehicle Outside temperature sensor failure	bit 3~2 00: sensor normal 01: sensor failure 10: retain 11: invalid					

	Air return temperature sensor failure	bit 1~0 00: sensor normal 01: sensor failure 10: retain 11: invalid
Byte4	Pressure sensor failure	bit 7~6 00: sensor normal 01: sensor failure 10: retain 11: invalid
	retain	bit 5~0
Byte5	Compressor Under voltage failure	bit 7~6 00: compressor normal 01: Compressor Under voltage 10: 10: retain 11: invalid
	Compressor over voltage failure	bit 5~4 00: compressor normal 01: Compressor over voltage 10: retain 11: invalid
	compressor communication feedback abnormal	bit 3~2 00: compressor normal 01: compressor communication feedback abnormal 10: Compressor does not respond to operation instructions for a long time 11: invalid
	compressor communication lose	bit 1~0 00: compressor normal 01: No compressor message detected 10: retain 11: invalid
Byte6	retain	
Byte7	retain	
Byte8	Failure conditions	bit7~6 00：no failure；01：First failure；10：Secondary failure；11：invalid bit6~0 Retain Temporarily

Message 4: Air conditioning system power consumption information send from air conditioning panel send 0x18FFC519

OUT	IN	ID					Period (ms)
AC system	Bus controller	P	R	DP	PGN	SA	300/1000
		6	0	0	FFC4 (65475)	19 (25)	
DATA							
3-1	Total accumulated power Consumption			24bit; Resolution: 0.1KWH/bit;			

			Range：0 to1 million KWH；	
4-6	Retain			
8-7	8.8~8.5	Retain		
	8.4~8.1	Single cumulative power Consumption	12bit;Resolution: 0.1KWH/bit; Range ： 0 to400 KWH；	
	7			

Message 5 : Information sent by the air conditioning system to the vehicle controller

OUT	IN	ID					Period (ms)
AC system	Bus controller	P	R	DP	PGN	SA	300/1000
		6	0	0	FFC4 (65475)	19 (25)	

DATA		
Location	Date definition	Date description
Byte1	set temperature	Resolution：1℃/bit, Offset： - 40 ℃, Range： - 40 ℃~210 ℃ Type: Measurement 255: invalid
Byte2	air Return temperature	Resolution：1℃/bit, Offset： - 40 ℃, Range： - 40 ℃~210 ℃ Type: Measurement 255: invalid
Byte3	Retain	
Byte4	Bus outside temperature	Resolution：1℃/bit, Offset： - 40 ℃, Range： - 40 ℃~210 ℃ Type: Measurement 255: invalid
Byte5	Retain	
Byte6	The actual speed of the compressor	Resolution:100rpm/bit 0 :Off ， 255：invalid
Byte7	Retain	
Byte8	Error code	cycle sent if occur more than one error code (pls check as below)

Byte 8 Error code details

Error code NO.	Description（left side ）	Error code NO.	Description （（right side ）

1	Bus CAN signal line have problem (temporary retention)	2	Manipulator and electronic control box communication failure ER-C1
3	Manipulator and electronic control box communication failure ER00/C1	4	Low voltage under voltage failure ER11
5	Low voltage undervoltage failure ER01	6	Low voltage over voltage failure ER12
7	Low voltage over voltage failure ER02	8	System low pressure failure ER13
9	System low pressure failure ER03	10	System high pressure failureER14
11 B	System high pressure failure ER04	12	high temperature failure of Evaporator core when heat pump working ER17
13 D	high temperature failure of Evaporator core when heat pump working ER22/ER07	14	Retain
15 F	Electric heating alarm ER09	16 10	The temperature sensor failure in driver area ERH1、ERL1
17 11	Evaporator sensor failure ER16	18	Evaporator sensor failure ER32
19	Retain	20	Retain
21 15	Compressor CAN communication failure C20、F20、20	22	Compressor CAN communication failure C30、30
23 17	high pressure under voltage failure ER21	24	high pressure under voltage failure ER31
25 19	high pressure over voltage failure ER23	26	high pressure over voltage failure ER33
27 1B	Compressor discharge port over-temperature failure ER27	28	Compressor discharge port over-temperature failureER37
29 1D	Four-way valve failure ER26	30	Four-way valve failure ER36
31 1F	Return air temperature sensor failure H、L	32	Return air temperature sensor failure H1、L1
33 21	Bus Outside temperature sensor failure H、L	34	Bus Outside temperature sensor failure H1、L1
35 23	Condensing core temperature sensor failure H4、L4	36	Condensing core temperature sensor failure H5、L5
37	Retain	38	Retain
39	Retain	40	Retain
41	Retain	42	Retain
43	Retain	44	Retain
45	Retain	46	Retain
47	Retain	48	Retain
49	Retain	50	Retain

Message 7: Bus control information (the info send from the instrument, and read by the air conditioner system .

According the new request for new energy , we add the message of air conditioning ON/OFF .ID=0x18FF1724, in the second byte, bit 1~2 means the AC off .

<table>
<tr><td>OUT</td><td colspan="2">IN</td><td>ID</td><td>Period (ms)</td></tr>
<tr><td>Vehicle Controller</td><td colspan="2">Instrument</td><td>0x18FF1724
(P:6, PF:255, PS:23, SA:36)</td><td>100</td></tr>
<tr><td colspan="5">DATA</td></tr>
<tr><td>Byte position</td><td colspan="2">Parameter definition</td><td>Parameter Description</td><td>Remark</td></tr>
<tr><td>1</td><td colspan="2">Capacitor SOC</td><td>8bit;0.4%/bit; Offset :0;

Range: 0～100%</td><td>Dual-source trolleybus capacitor SOC</td></tr>
<tr><td rowspan="2">2</td><td colspan="2">8-3</td><td>Retain</td><td></td></tr>
<tr><td>2-1</td><td>Working mode</td><td>bit 1~0 01 (off) ;

10 (on)

Other (invalid)</td><td>Stop the working once get the off command;

It will working once get the on command, According to the ambient temperature automatic judgment mode.</td></tr>
<tr><td>3</td><td colspan="2">Set AC temperature</td><td>Resolution: 1℃/bit,
Offset: - 40 ℃,
Range: - 40 ℃~210 ℃
Type: Measurement
255: invalid</td><td></td></tr>
<tr><td>4-8</td><td colspan="2">Retain</td><td></td><td></td></tr>
</table>