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Fragrance Module functional guidebook (Controller Type)

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The story of the Revision History

Version No.	Changes to the description/Revision Description	Revised Date	Revised by
1.0	Initial Version	2021.09.28	Chen Ruojun Jiang Tongxing
1.1	Sub-modules added to Chapter 3	2021.11.18	Chen Ruojun Jiang Tongxing

Notes:

1) The method of compilation of the version sequence is to increase the initial version to 1.0 in sequence. When the version is sequential to 1.9 and then changed again, the version sequence is changed to 2.0, and the subsequent sequence sequence is moved accordingly.

2) Date names in the year-month-day order, specific format see examples in the table above.

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1 Overview

1.1 Purpose

This instruction is intended for the development of the Fragrance Module system and contains functional, operational and operational requirements for Fragrange Module.

1.2 Scope

This instruction applies to vehicles in the Fragrance Module system.

1.3 Abbreviations and definitions

1.3.1 Abbreviations

Table 1 Abbreviations

Abbreviation	Description

1.3.2 Definition of the

Table 2 Definitions

Term	Description
Must	Gateway design and production legislative or regulatory requirements
Shall	refers to a mandatory requirement to be followed and deviation is only allowed after discussion with project responsibility from costumer.
Should Should	refers to recommendation or advice on implementing a requirement to achieve a specific requirement

1.4 Reference documents/standards

The following reference document forms part of a special description of this instruction. Unless otherwise specified, refers to the latest version of the reference document.

Table 3 Reference Documents/Standards

Document	Description
TBD	Matrix files
TBD	Technological development agreements

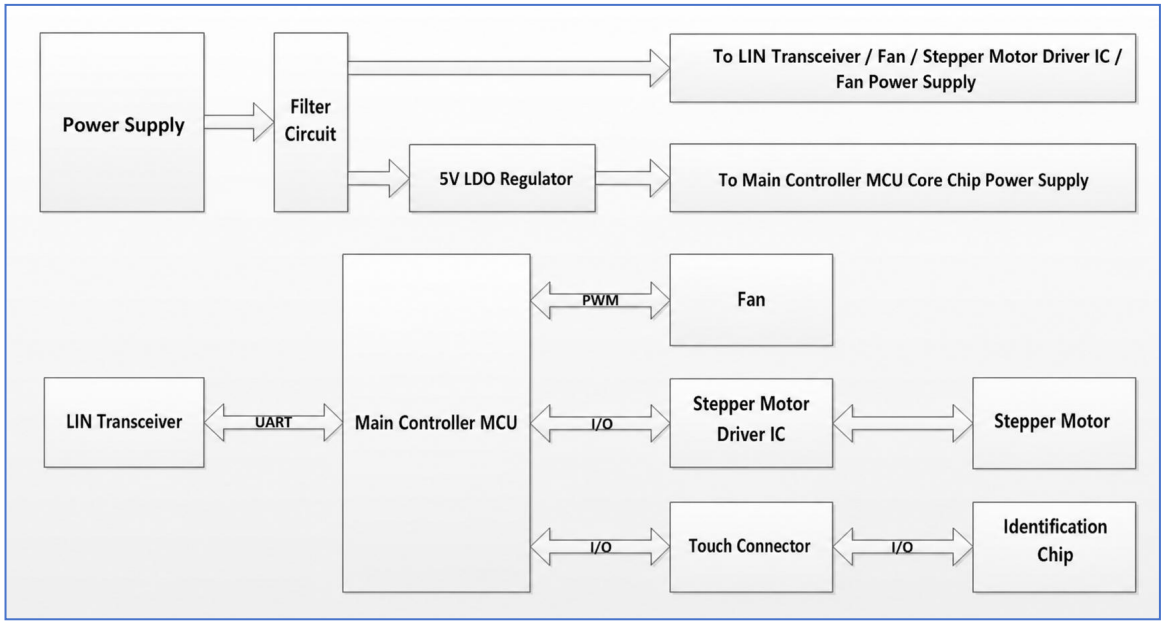
2 Fragrance System summary

2.1 Product overview and system frameworks

2.1.1 Product description

The Fragrance System is first inhaled by the drum blower, which then enters the fragrance cartridge through a rotary valve device, which is then sent to the exhaust pipe by the drum blower. The valve device is driven by a stepper motor. The valve device, in turn, produces a position signal through a Photoelectric Switch, which achieves precise positioning and determination of the valve.
Each Fragrance Cartridge has a fixed ID card, which records the relevant information about the atmosphere, and each ID card is linked to the main control panel through the card, thus enabling the identification of the currently loaded atmosphere.

2.1.2、 System Box



2.2 Technical parameters

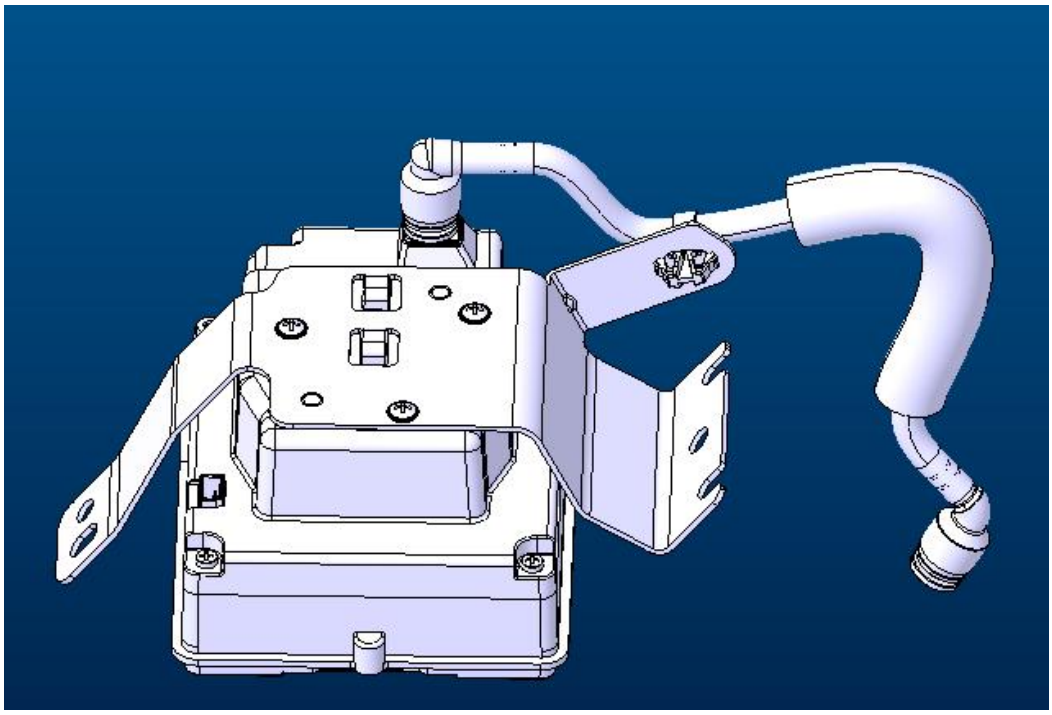
Organizing voltage	DV：9~16V
Organizing Current	≤200mA
Static current	≤0.1mA
Noise	A) 30 cm distance from the test
Operation Temperature	- 40°C to 85°C (-40°C to 10°C and 60°C to 85°C functional grade C, limited to the physical properties of the fragrance itself, without evaluating the actual car fragrance grade)
Storage Temperature	-40℃-85℃
Work Humidity	0%-95%RH
Power management	12V/1 to 100mA, maximum rated power of 1.2W
Compunication Output	LIN2.1
Equipment lifetime	＞10000h
Life of spices	＞180h

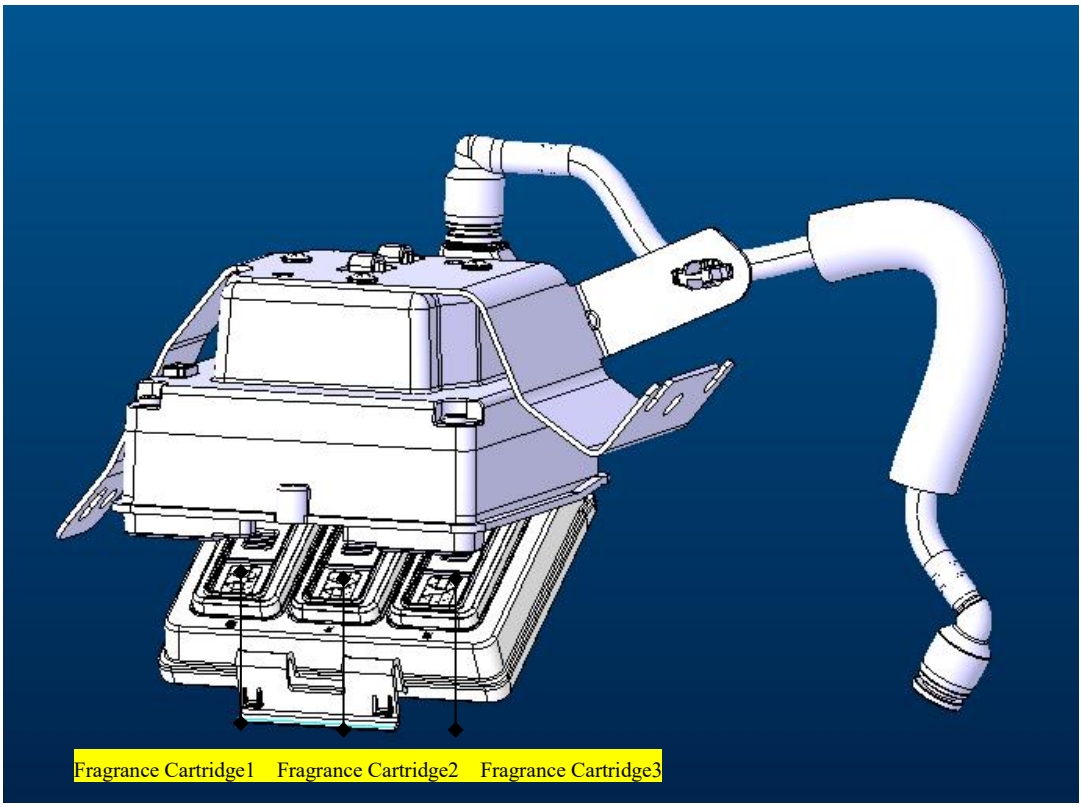
List of key components

Item	Manufacturer	Model	Quantity
Main MCU	Microchip	PIC18F57Q84	1
LIN receiver	NXP	TJA1028	1
Stepper Motor	The RIAA	MS4989	1

driven IC			
Stepper Motor	Da-jin.	DZ-24BYJ48-A03-1	1
Power supply LDO	Leung Jie.	SA21345A	1
Blower	Wonshan!	5015	1
Photoelectrich Switch	ROHM	RPI-0352E	1
Contact IC Card Module	The newest	FM4442	3

2.3 3D effects and fragrance cartridges for fragrance products





2.4 Product Operating Modes

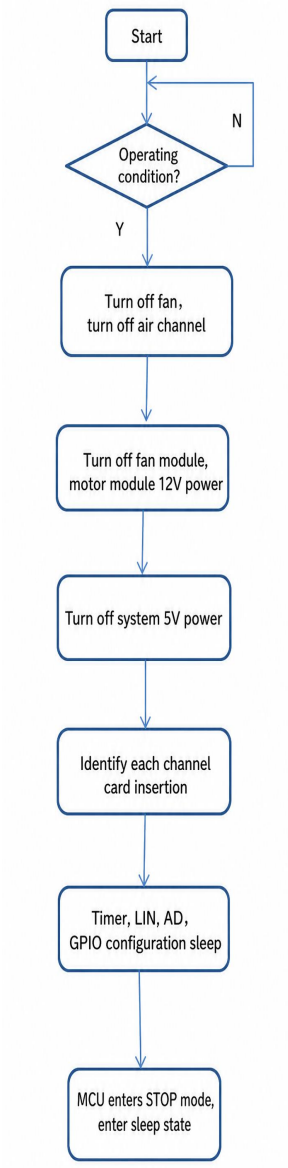
2. 4. 1 Sleep Mode

When the A/C Controller sends a dormant instruction, the Fragrance Generator will stop working after 4 seconds and turn off all power to sleep mode after the channel is turned off.

When the Fragrance Generator is turned on, no instructions from the A/C Controller are received, and it automatically enters sleep mode after 4 seconds; in sleep mode, the Communication instructions from the A/C Controller can be received at any time and the sensor can be turned on;

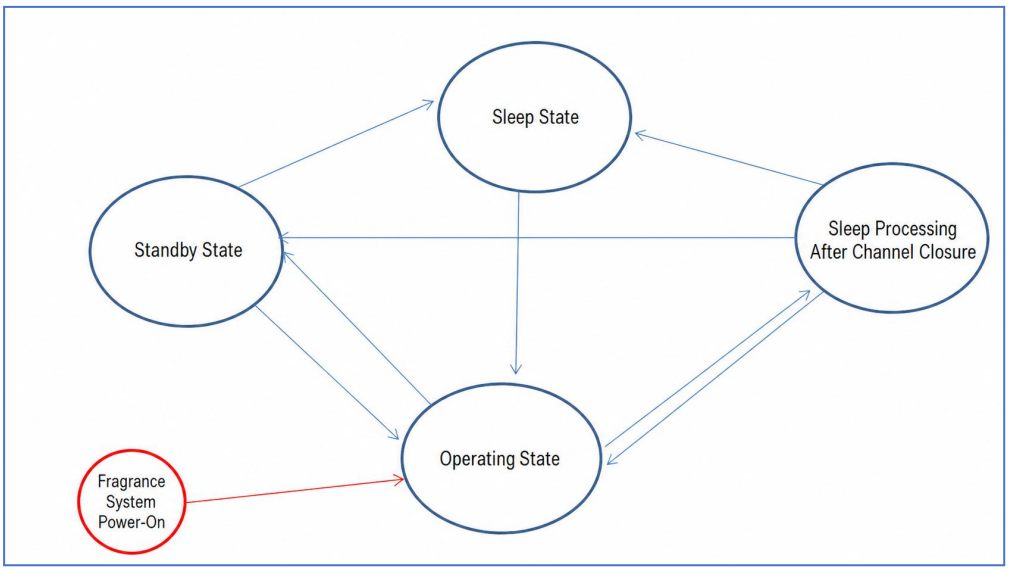
Simplified Sleep Timing:

Operating mode Off channel Off motor Blower 12V power supply/SYS_5V power supply MCU GPIO configuration Sleep mode Off all interruptions Open LIN external interruptions→→→→→

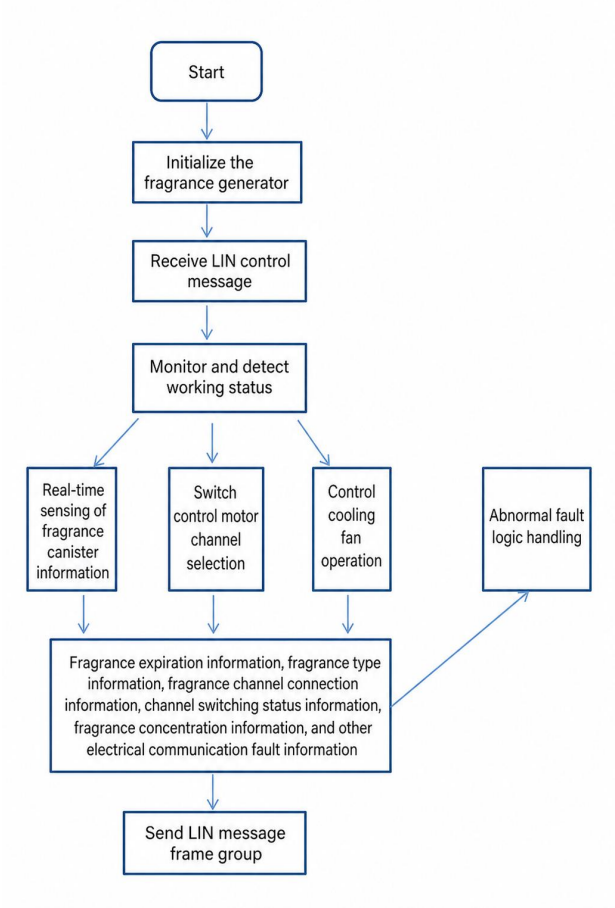


2. 4. 2 Operating Mode

The Fragrance Module receives the Master Node activation instructions, the product starts working, the product switches to the corresponding Fragrance Channel and wind file, and stabilizes the smell.



2. 4. 3 Program Control Logic Diagram



3 The fragrance system description

3.1 LinCommunication section

3. 1. 1 LIN IC features

The scent product uses a LINCommunicationIC from NXP, model TJA1028.

- Compatible with LIN 2.0/2.1 (maximum downward compatibility to version 1.3) – SAE J2602 protocol
- 5V/3.3V, 70mA flat output with voltage output accuracy of ±2%
- It has good EMI/EME properties and strong electromagnetic interference resistance.
- Typical standby current is less than 45uA and typical dormant current is less than 12uA
- Self-contained LIN wake-up function
- Certified by AEC-Q100

This internal IC system frame is as follows:

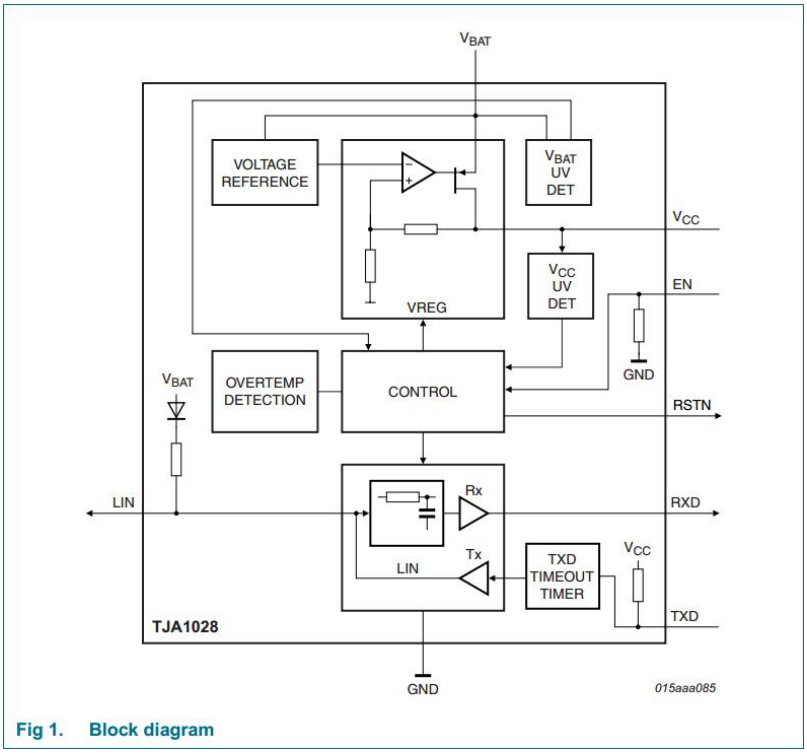
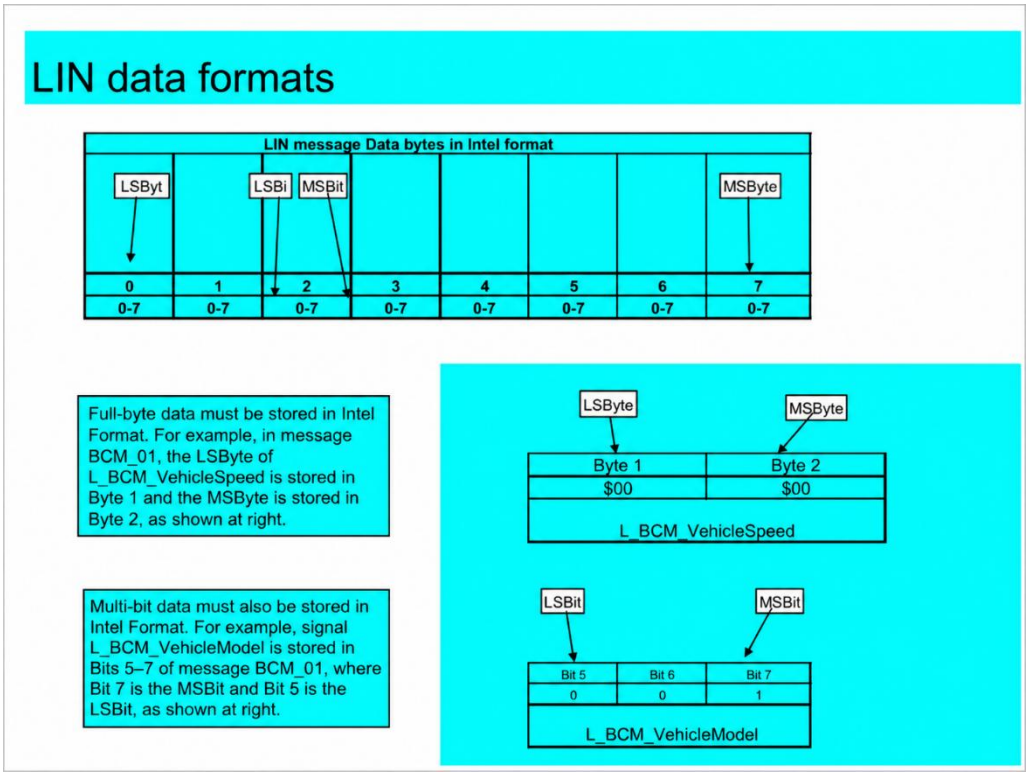


Fig 1. Block diagram

3. 1. 2 Network Regulation Note

This module LIN equipment is a Slave Node device. The package protocol format is based on the LIN bus Master Node device. The protocol format is described below:



3.2 **Blower Module**

The Fragrance System is a straight-line brushless blower with the following characteristics:

Item	Specifications
Operating Voltage Range	8--16V
Maximum rated Operating Current	0.18A/12V
Maximum rated power	2.16W
Speed	7200RPM +20%/-5%
Service Life	＞30000h @85℃
Operational Temperature Range	-40~85℃
Scope	-40~90℃
Locked-Rotor Protection	1、 Rated voltage locks 1s, automatically disconnects 2、 After automatic power outages, 2-6s automatically try to start.
Frequency range of drive	10~30KHz

The blower's interface and function are as follows:

Pin	Pin Function
VCC	Blower Power Pin
PWM	PWM controls adjust the size of the gear
FB	Feedback Pin

GND	Blower Ground Pin

The Blower uses PWM signals to adjust the Blower's speed, and also uses Blower's feedback signal to detect the normal speed and to use the Blower's steady-state adjustment.

The current set of Blower's default turn speeds are three levels:

Level	25°C Ambient	Corresponds to the size of the wind (without fragrance)
Low	2600 RPM	0.67L/min
Medium	3800 RPM	1.16L/min
High	5500 RPM	1.81L/min

The specific Blower rotation is determined by a physical test in conjunction with Fragrance Cartridge.

3.3 **Motor Module**

The motor modules include the Stepper Motor and the Stepper Motor drive IC, and the Main MCU to control the switch to the Stepper Motor by driving the IC.

3. 3. 1 Motor Characteristics

Fragrance System uses Stepper Motor for Fragrance Channel Switches. The relevant electrical characteristics are as follows:

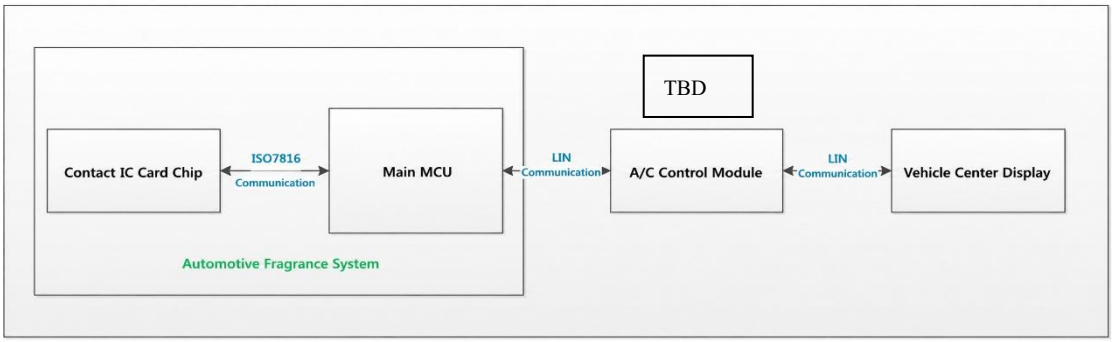
No.	Parameter	Specifications
1	Number of Phases	2
2	Gear Ratio	1/64
3	Step Angle	5.625°/64
5	Excitation Mode	1-2
6	Drive Pulse Rate	100pps
7	Step versus rotational step angles	1:1

3. 3. 2 Electrically driven IC electrical properties

No.	Item	Specifications
1	Operating Voltage Range	-0.3~47V
2	Operational Temperature Range	-40~150℃
3	Scope	-60~150℃
5	Max. Continuous driver current	1.6A
6	Maximum Organizing Current	8mA
7	Maximum Sleep Current	20uA
8	Drive Frequency	≤250KHz

3.4 **Fragrance Cartridge**

3. 4. 1 Fragrance Cartridge interaction process map with user terminal (in-car)



Specific identification process

- To write the scent information into the embedded Memory Chip of the Fragrance Cartridge, see Table 3.4.2.
- Load Fragrance Cartridge into Fragrance General
- When Fragrance Generator opens, the corresponding Fragrance Type message will be transmitted to Master Node through the Lin signal line, which is Center Display.
- Center Display displays the corresponding fragrance information on screen based on the information received.
- Users can operate through Center Display, choose Fragrance Type, the product switch to the corresponding Fragrance Channel, and use Blower to bring out the atmosphere

Comment: If there is no need to connect to air conditioning, skip the A/C Controller module, otherwise Fragrance Generator returns only when A/C Controller opens.

Memoory Chip parameters are as follows:

The IC card chip selected is an EEPROM with logic encryption capability of 256×8 bits, with the PIN information as follows:

Pin	Symbol	Function
C1	VCC	Operating voltage 2.5V ~ 5V
C2	RST	Reset signal
C3	CLK	Clock signal
C4	I/O	Data line (open-drain output)
C5	NC	No connection
C6	GND	Ground

3. 4. 2 Fragrance Cartridge writes type of information

Item	Bytes Used	Read/Write Interval
Fragrance Type	1Byte	Read it once every 1 s.
Elapsed Usage Time	4Byte	Every four minutes.
Manufacture Date	3Byte	Factory-Programmed

		Cartridge Data
Fragrance Cartridge ID	1Byte	Factory-Programmed Cartridge Data
Total Space Used	9 Byte	------

The IC actually has 256*8 bits of EEPROM, which is fully satisfied with the storage space requirements.

3. 4. 3 Identify the logic of data interaction between the storage chip and the Main MCU:

ISO7816 Communication protocol is an industry-wide contact-reading card protocol that follows the protocol for data transmission.

4.4.1 The steps for IC card chips to perform data reading operations are as follows:

1、The main MCU sends a reset signal to the IC card chip.

2、IC card chips respond to reset signals.

3、The MCU sends a read-only start signal.

4、The MCU sends an address signal to find the physical storage addresses inside the IC card chip.

5、The IC card responds to the location signal, when the atmosphere information stored is read by Main MMU.

6、After the read is completed, the Main MCU stops reading operations.

4.4.2 The steps to perform data writing operations on IC card chips are as follows:

1、The main MCU sends a reset signal to the IC card chip.

2、The main MCU also certified PCC chips for IC cards.

3、After the certification was successful, the Main MCU again sent a reset signal to the IC card chips.

4、The MCU sends a write-in signal and performs write-in operations on the IC card.

5、After writing, the Main MCU stopped reading.

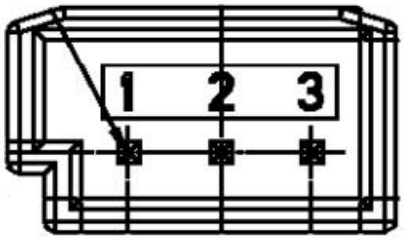
The main MCU and Contact IC Card chips are used to transmit data through the above workflow (s) (s) (s).

3. 4. 4 Unauthorized Cartridge Warning

Fragrance System reads the ID code to a non-company ID and sends a reminder that it is an unofficial Fragrance Cartridge.

4 Contractor's definition table

No.	Symbol	Function
1	POWER	Power
2	LIN	LIN Communication Line (max. 19.2 kbit/s)
3	GND	Ground



The connector model states:

PCB-Side Part No.	TE 1743156-2
Harness-Side Part No.	TE 1743164-2