Develop Board Programming and Debugging

Content

1 Program the development board

1.1 Preparation of hardware connections

Hardware connection preparation includes:

1. Before flashing, the power, ground and serial port transceiver pins of the USB-to-Serial Port port should be connected to the corresponding pins of the development board respectively (note that RXD and TXD of the USB-to-Serial Port port correspond to UART0_TX and UART0_RX of the development board respectively).

2. Short the PG_EN and adjacent pins on the development board (there are relevant silkscreen on the back of the development board, and you can find the relevant position according to the silkscreen prompts).

1.2 Firmware flashing operation

Open the firmware flashing tool (PACK_UPDATE_TOOL.exe). For foreign developers, please consult our sale person. Select the appropriate chip model, click the firmware upgrade button, and choose the prepared firmware file. Identify the USB-to-Serial Port port number on your computer. After completing these steps, short-circuit PG_EN and its adjacent pin during power-on to enter programming mode, allowing firmware download. If the USB-to-Serial Port tool is unrecognized on your computer, install the required driver. The upgrade interface is shown below.

Figure 1: firmware flashing tool

2. Function debugging

2.1 Power on and start the development baseboard

After the firmware is flashed successfully, the function debugging of the development board can be performed to verify whether the firmware is flashed successfully. Function debugging steps:

1. Develop the baseboard by inserting the microphone and speaker, and input the power supply to the development baseboard through the power socket,

2. The development board will be started after being powered on. When the power is normal, the speaker will broadcast the prompt audio, and the printing information will appear at UART0 port. Users can use the USB serial debugging tool to debug the computer with this UART0 interface, and the printing information can be seen in the serial debugging software on the computer.

3. Use wake word and command word to test whether it can wake up and recognize correctly. The printing and recognition are correct, indicating that the development board firmware is flashed successfully.

2.2 Serial port connection and sample viewing

Connect the module baseboard and the computer through the USB port tool, and open the serial port printing assistant

First, find the corresponding serial port in the opened page. The initial interface is as follows:

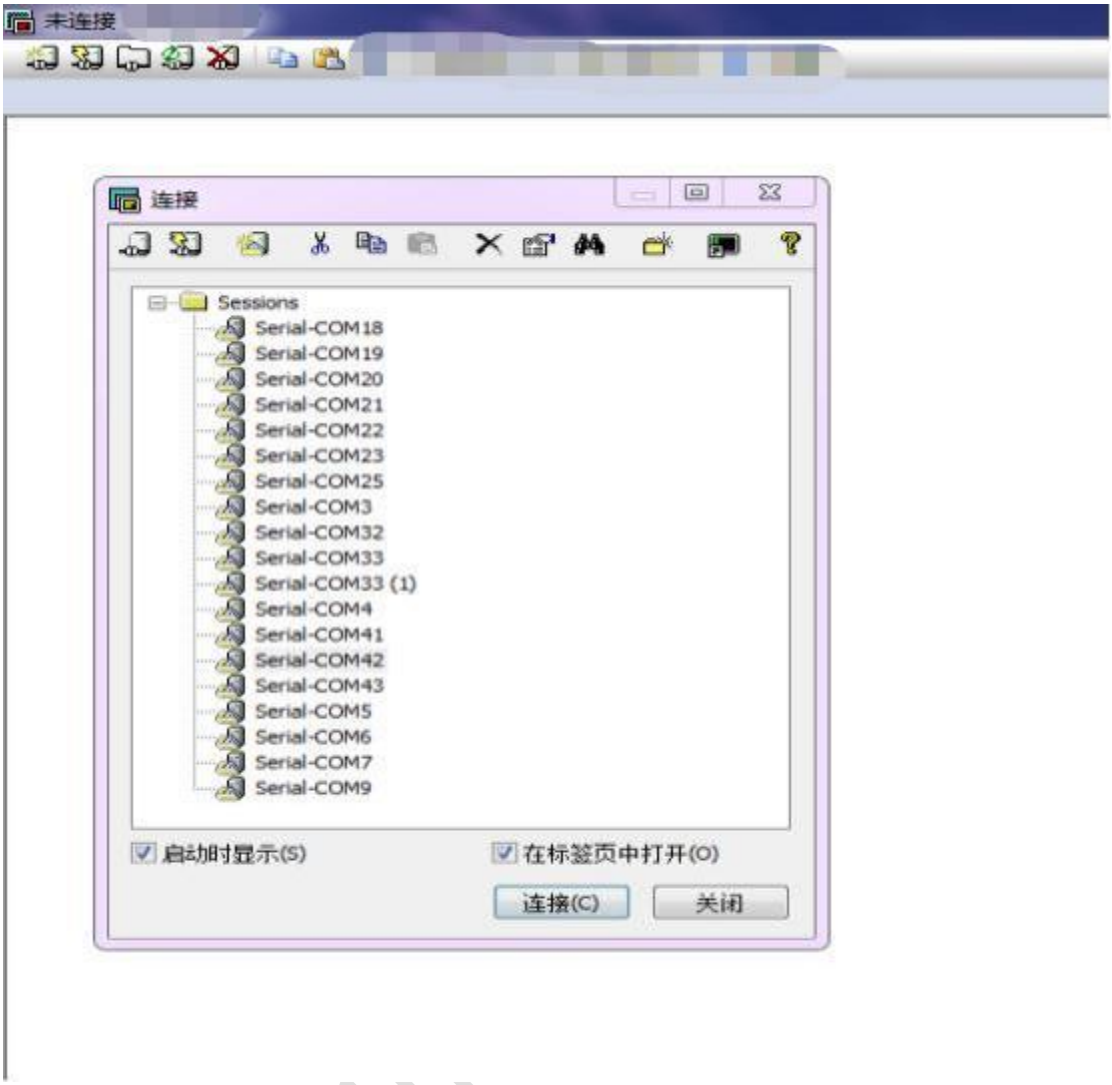

Figure 2: Initial serial port printing interface

If the initial page opened does not have the corresponding serial port number, you can view the corresponding serial port number on the computer (right-click "Computer" properties, and you can view the corresponding serial port number in the port section under device manager), and then manually add it (that is, find the quick connection button in the serial port printer assistant, and add the corresponding serial port).

Figure 3: Serial port view

The serial port connection options are shown in the figure below. The baud rate of the specific software version is different. If the printed information is wrong, please consult our technical support personnel to determine the baud rate.

Figure 4: Serial port parameter configuration

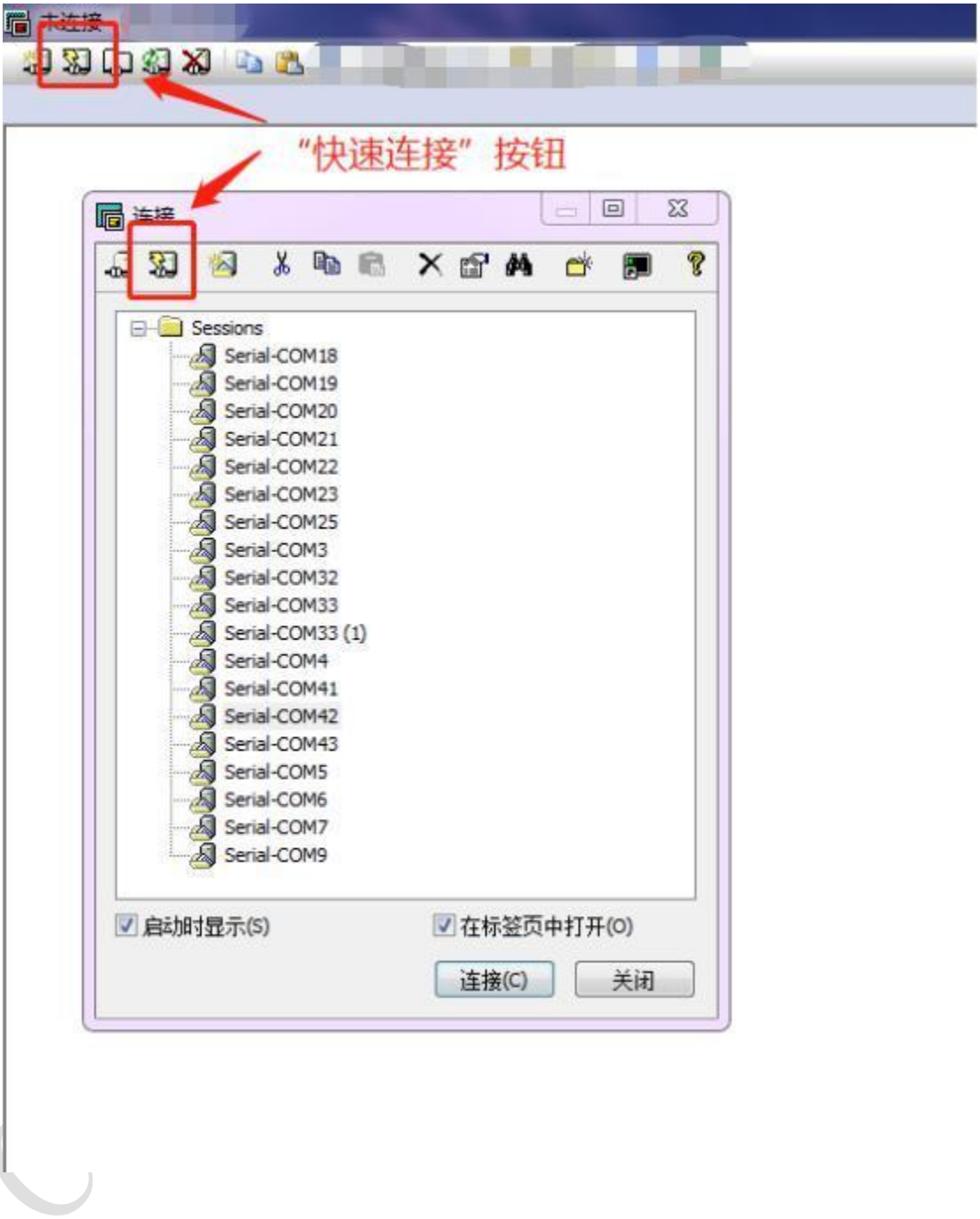

Figure 5: Quick connection is configured in series

After the development board starts up, the serial port printing assistant has relevant printing content, as shown in the figure below:

Figure 6: CI1103 printing information

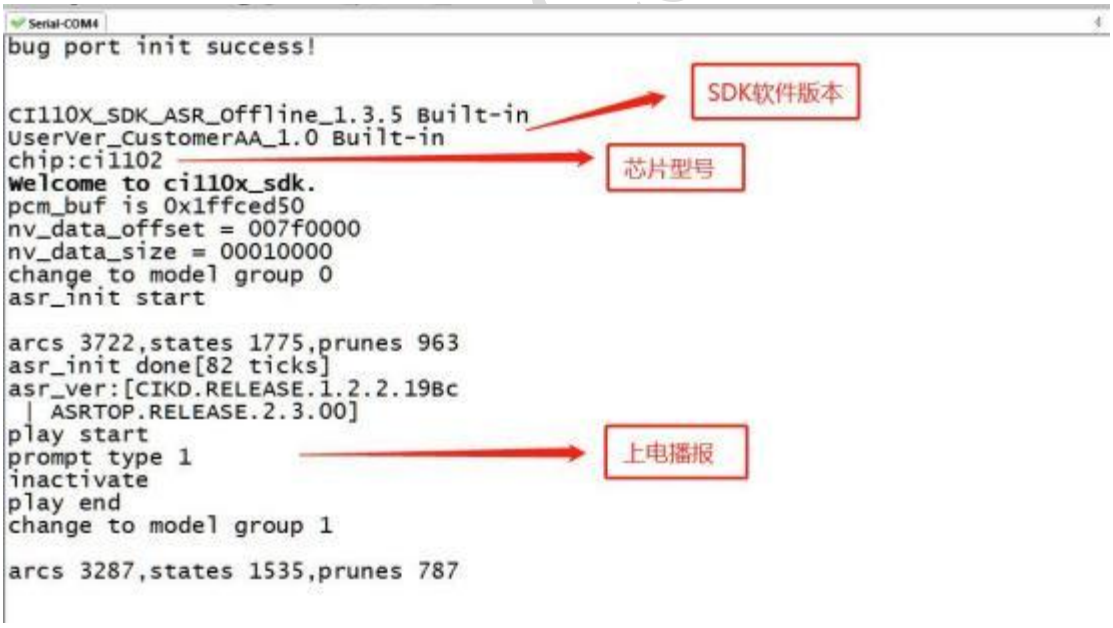

Figure 7: CI1102 print information

3. Develop default command words for the baseboard

If the baseboard is developed for mass production of users, the firmware with user-specified command entries will be flashed before delivery

If the customer does not specify, the development board will have its own default firmware, which has default command words for users to test and use.

4. The development baseboard has a default serial port communication protocol

The firmware of the development baseboard supports serial communication protocol by default, which is used for communication with the MCU. The serial communication protocol can be expanded and has the following characteristics:

Complete transmission packet, including: header and tail, length, check, message type, message sequence number.

Supports variable length commands for easy extension.

Message type (command, notification, reply).

Command messages can be configured and reply ACK. Notification messages have no ACK.

The message format will be the same as the bootloader upgrade and will be distinguished from the bootloader protocol by the header.

The default baud rate is 9600.

Note: The development board only reserves UART0 interface, and UART0 interface is the default printing output interface. If UART0 is to be used as the serial protocol interface described above, the source code must be modified.Refer to Serial Protocol section in the SDK Documentation Center of our Voice AI platform:https://platform.chipintelli.com/

- Supported commands: query the protocol version number, query the system version number, set the volume (volume classification is defined in user_config.h), play local broadcast sound, reset command, etc. The specific protocol format is shown in the figure below:

Name	Length	Description
Head	2	Frame identification head, fixed position 0xA5,0xFC
Length	2	Data length
Msg_type	1	Message type (command 0xA0/0xA1), reply 0xA2, notify 0xA3)
Msg_cmd	1	command
Msg_seq	1	Message serial number, each CMD should be different, and ACK is the same as the corresponding CMD for data retransmission
Data	length	data
Check_sum	2	Frame check, including Msg_ type，Msg_ cmd，Msg_ Seq, Data accumulation and calculation results
Tail	1	End of frame, fixed to 0xFB

Figure 8 Serial port protocol format

A5 FC 07 00 A0 91 18 01 55 E0 01 00 00 1B 9B 02 FB is resolved as follows:,

A5 FC：head

07 00: Valid data is 7byte

A0: This is the command word information

91: The command number is 0x91 (this data content is command word data)

18: Packet serial number, the 0x08th outgoing data of this UART, which is continuously accumulated

01 55 E0 01 00 00: unique data of the current command word

1B: Command word threshold

9B 02: Cumulative Sum

FB: End data

Note: If the application only focuses on the command word and threshold, only the 7 valid data in the blue part are focused o

Example 2:

A5 FC 02 00 A3 9A 17 00 B1 05 02 FB is resolved as follows:

A5 FC ： head

02 00: Valid data 2byte

A3: currently notification data

9A: The command number is 0X9A (the data content this time is the voice module content change)

17: This UART sends data for the 0x07th time, and the value is continuously accumulated

00 B1: Valid data. (This data indicates entering the wake-up state)

05 02: Cumulative Sum

FB: End data

Note: The data is changed to notification data, and the user can choose to use the information according to the situation.

More content analysis data can be found on our voice platform https://platform.chipintelli.com/ After login, go to view the CI110X serial protocol section in the CI110X SDK documentation on the platform.

The following figure shows a screenshot of an agreement data reference:

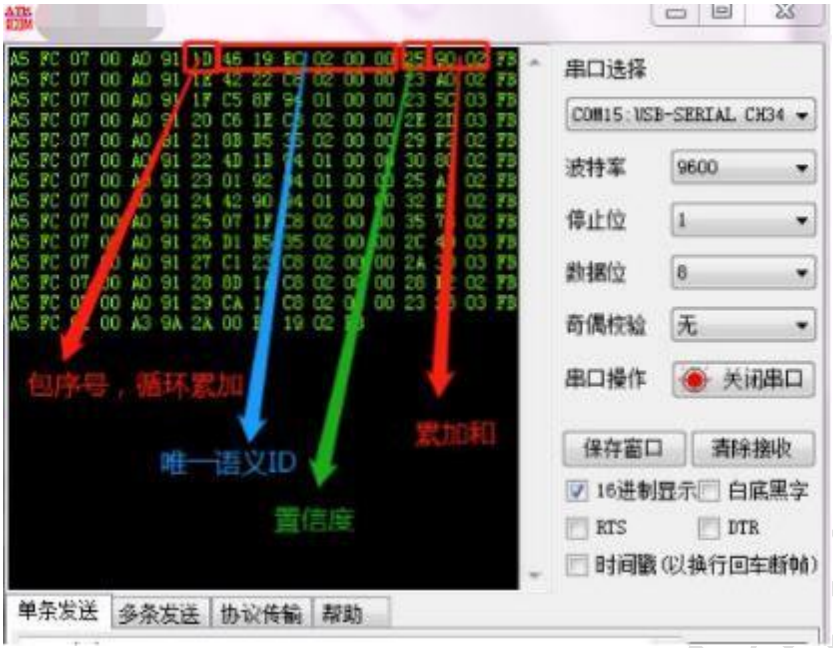

Figure 9 Screenshot of serial port protocol data reference

5. Software development

If the default firmware pre-installed on the development board fails to meet user requirements, users can develop custom software to modify the command words, broadcast audio, serial communication protocols, and other features of the development board. Below is an example of modifying voice command words to illustrate the basic workflow for developing board software.

The software development process mainly includes the following steps:

- SDK development package data download
- Model development (language model + acoustic model)
- speech synthesis
- The command word information table is associated with the audio file
- Firmware packing

The following points out the specific operation method of each step.

5.1 SDK development package software data download

To develop software, users need to use our voice AI platform (hereinafter referred to as the "Platform"), located at https://platform.chipintelli.com/. The login page is shown in the figure below

If you do not have an account, please read the text information on the registration and login page carefully, and complete the relevant information filling and account registration according to the prompts of the platform.

Figure 10 Login page of Qiyintelun Voice AI platform

After logging in to the platform, users can download SDK development package from menu window → Development data → Software and firmware column.