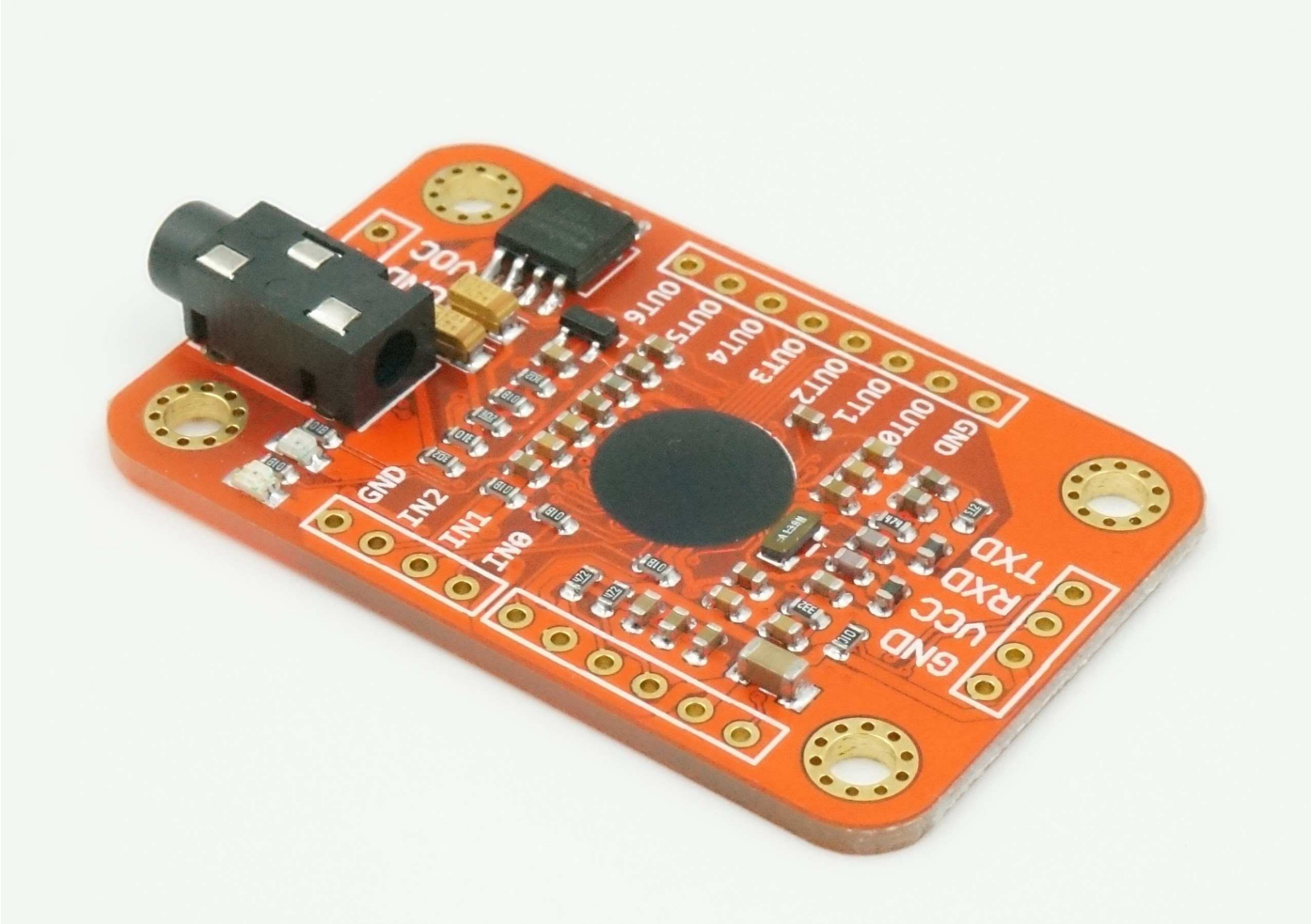
EN: This Datasheet/Document is presented by the manufacturer.

Please visit our website for pricing and availability at www.hestore.hu.

Voice Recognition Module V3

Speak to Control (Arduino compatible)

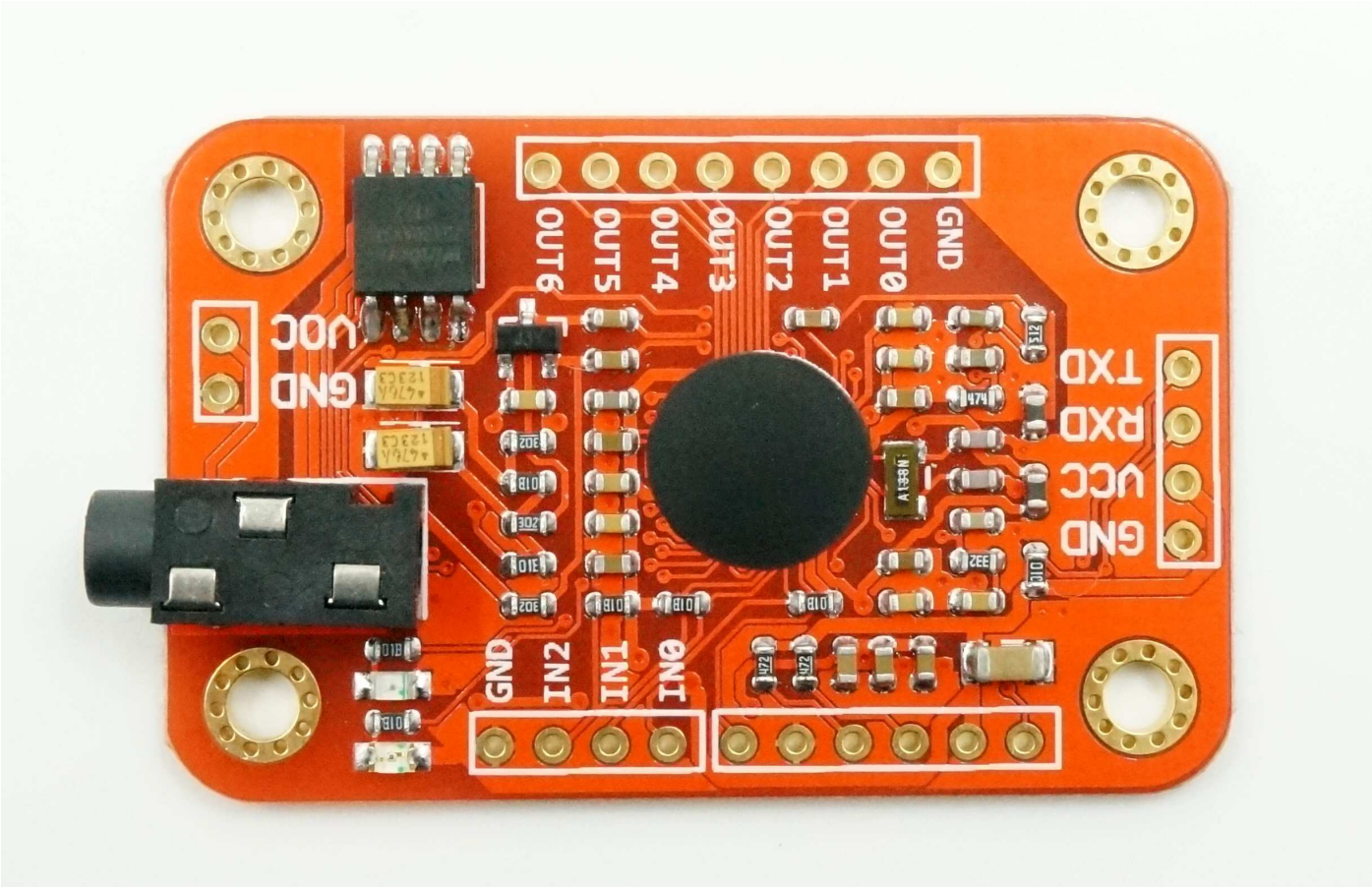


Overview

ELECHOUSE Voice Recognition Module is a compact and easy-control speaking recognition board.

This product is a speaker-dependent voice recognition module. It supports up to 80 voice commands in all. Max 7 voice commands could work at the same time. Any sound could be trained as command. Users need to train the module first before let it recognizing any voice command.

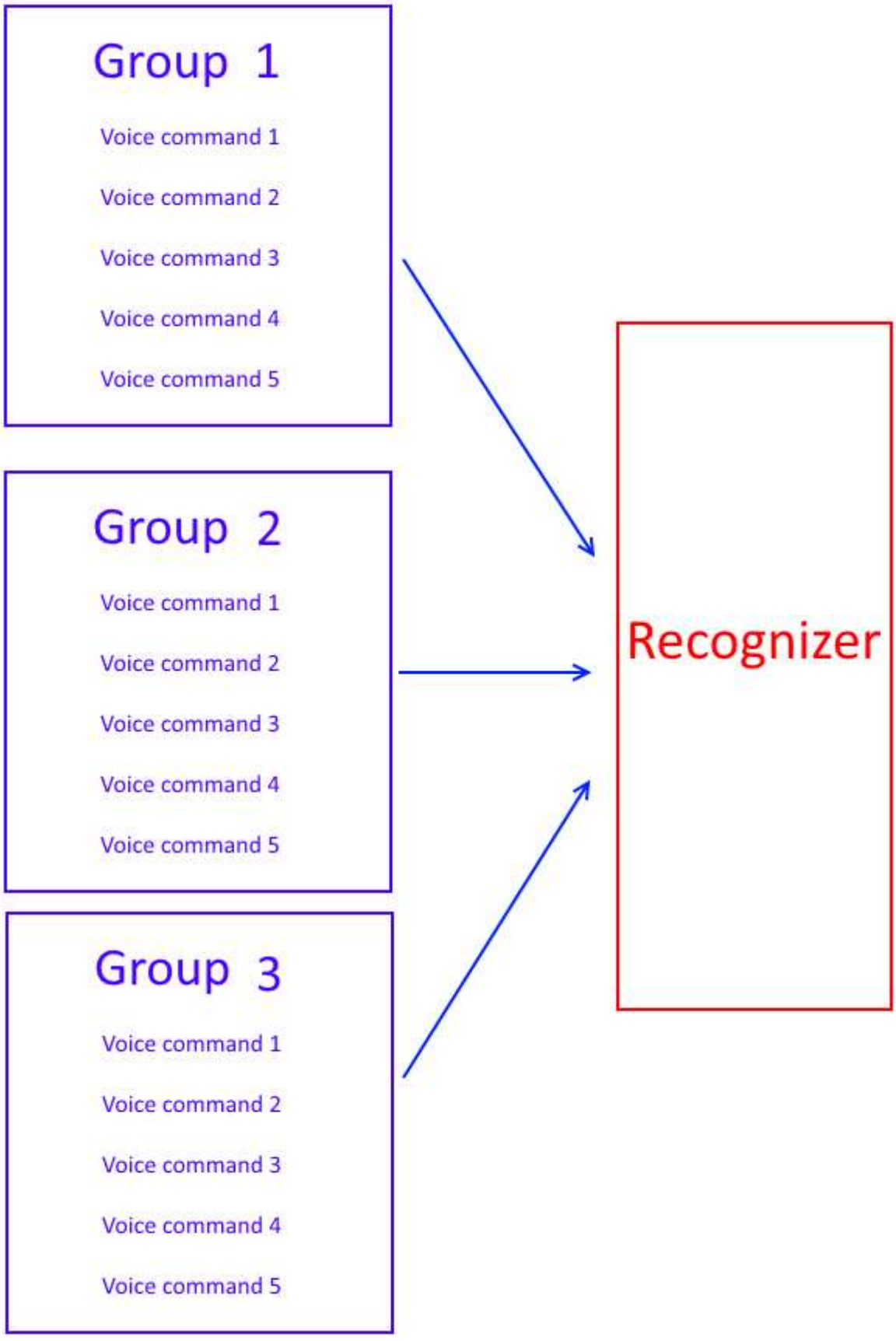
This board has 2 controlling ways: Serial Port (full function), General Input Pins (part of function). General Output Pins on the board could generate several kinds of waves while corresponding voice command was recognized.



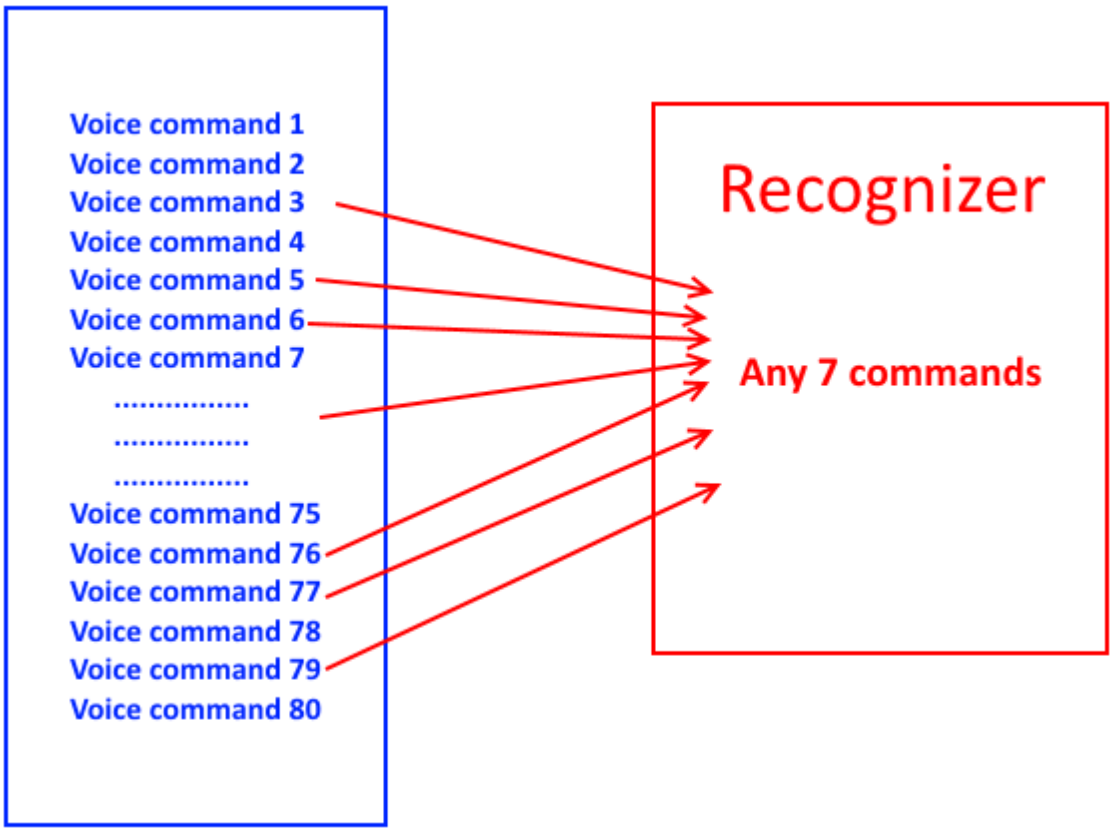
What’s new?

We already have Voice Recognition module V2. It supports 15 commands in all and only 5 commands at the same time.

On V2, voice commands are separated into 3 groups while you training it. And only one group (5 commands) could to be imported into Recognizer. It means only 5 voice commands are effective at the same time.



On V3, voice commands are stored in one large group like a library. Any 7 voice commands in the library could be imported into recognizer. It means 7 commands are effective at the same time.



Parameter

- Voltage: 4.5-5.5V
- Current: <40mA
- Digital Interface: 5V TTL level for UART interface and GPIO
- Analog Interface: 3.5mm mono-channel microphone connector + microphone pin interface
- Size: 31mm x 50mm
- Recognition accuracy: 99% (under ideal environment)

Feature

- Support maximum 80 voice commands, with each voice 1500ms (one or two words speaking)
- Maximum 7 voice commands effective at same time
- Arduino library is supplied
- Easy Control: UART/GPIO
- User-control General Pin Output

Terminology

- VR3 -- Voice Recognition Module V3
- Recognizer -- a container where acting voice commands (max 7) were loaded. It is core part of voice recognition module. For example, it works like “playing balls”. You have 80 players in your team. But you could not let them all play on the court together. The rule only allows 7 players playing on the court. Here the Recognizer is the list which contains names of players working on the court.
- Recognizer index -- max 7 voice commands could be supported in the recognizer. The recognizer has 7 regions for each voice command. One index corresponds to one region: 0~6
- Train -- the process of recording your voice commands
- Load -- copy trained voice to recognizer

- Voice Command Record -- the trained voice command store in flash, number from 0 to 79
- Signature -- text comment for record
- Group -- help to manage records, each group 7 records. System group and user group are supported.

Instruction

Here we will introduce the Arduino Library and VR3 Protocol

For Arduino

Prepare

- Voice Recognition V3 module with microphone
- Arduino board (UNO recommended)
- Arduino Sensor Shield V07 (optional)
- Arduino IDE
- Voice Recognition V3 library (Download zip file)

Hardware and Software Preparation

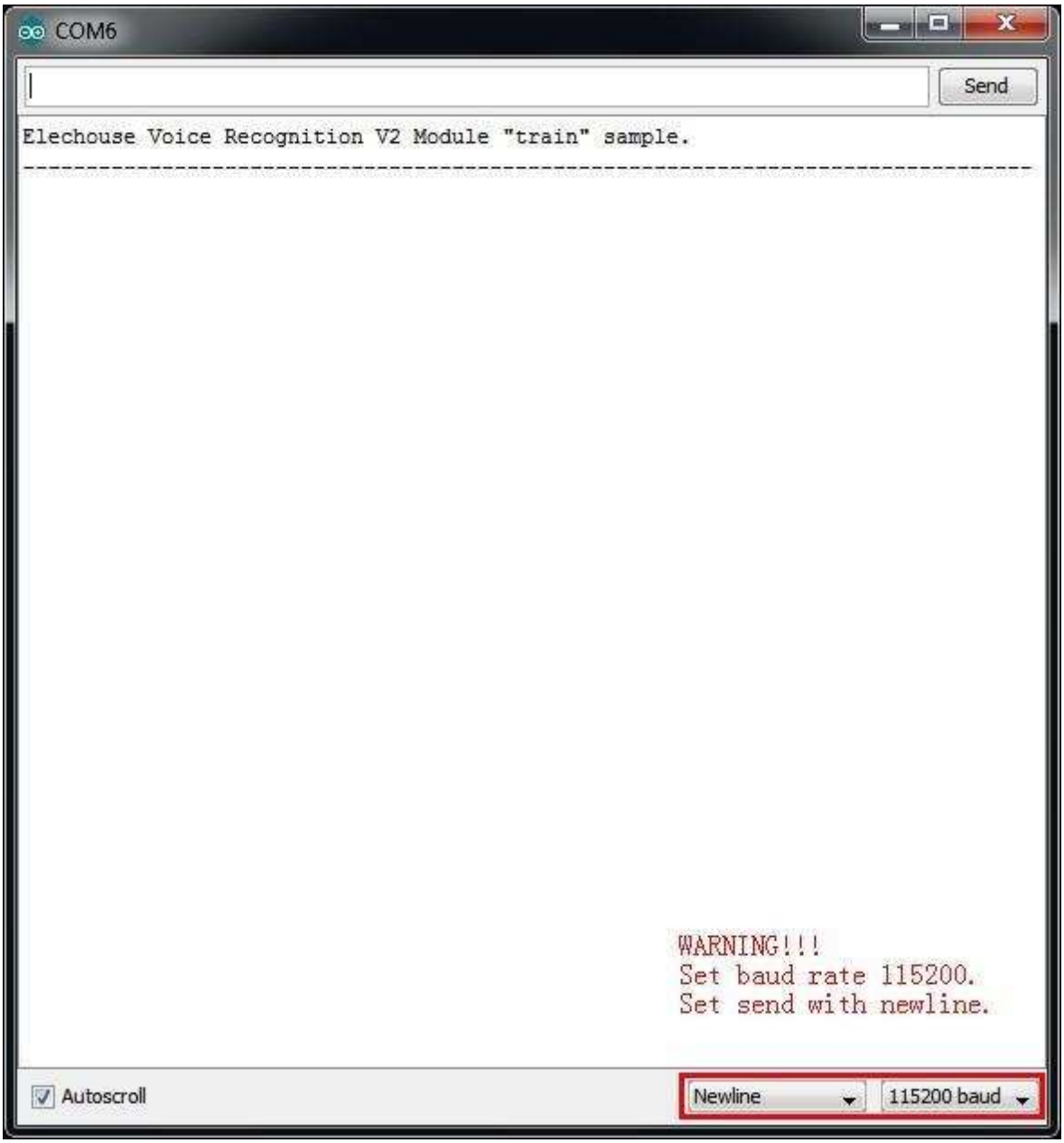
1. Connect your Voice Recognition V3 Module with Arduino, By Default:

Arduino		VR Module
5V	---->	5V
2	---->	TX
3	---->	RX
GND	---->	GND

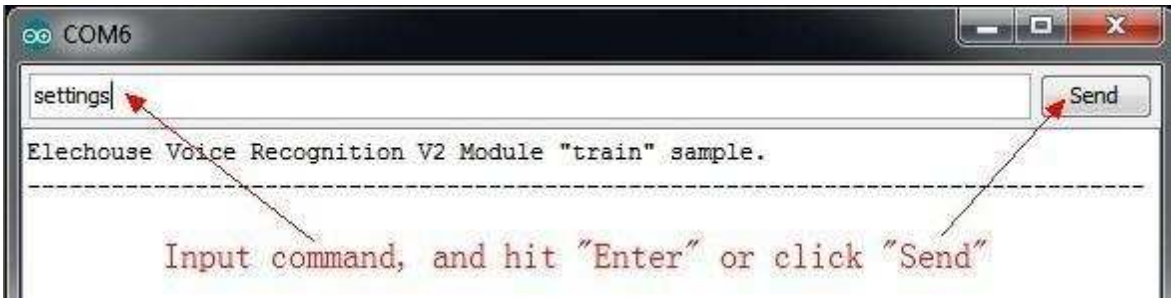
2. Download VoiceRecognitionV3 library. (download zip file or use `git clone https://github.com/elechouse/VoiceRecognitionV3.git` command)
3. If using zip file, extract **VoiceRecognitionV3.zip** to `Arduino Sketch\libraries` folder, or if you use `git clone` command copy **VoiceRecognitionV3** to `Arduino Sketch\libraries .`

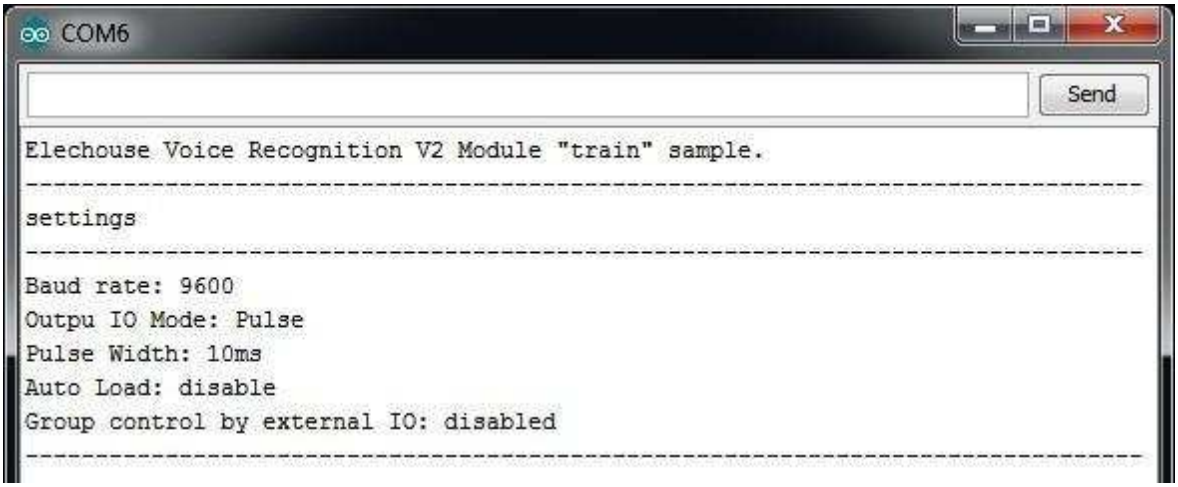
Train

1. Open **vr_sample_train** (File -> Examples -> VoiceRecognitionV3 -> vr_sample_train)
2. Choose right Arduino board(Tool -> Board, UNO recommended), Choose right serial port.
3. Click **Upload** button, wait until Arduino is uploaded.
4. Open **Serial Monitor**. Set baud rate 115200, set send with **Newline** or **Both NL & CR**.



5. Send command `settings`(case insensitive) to check Voice Recognition Module settings. Input `settings`, and hit `Enter` to send.



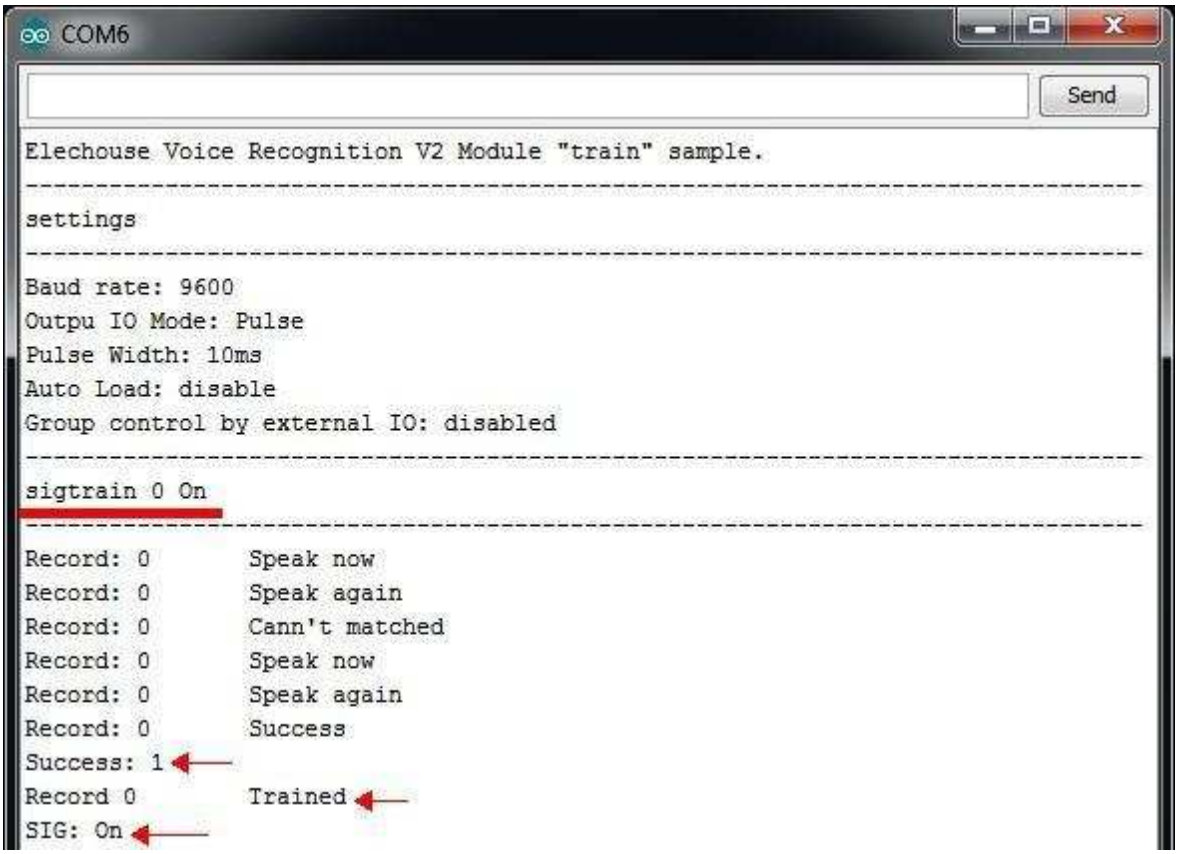


6. Train Voice Recognition Module. Send `sigtrain 0 On` command to train record 0 with signature "On". When Serial Monitor prints "Speak now", you need speak your voice(can be any word, meaningful word recommended, may be 'On' here), and when Serial Monitor prints "Speak again", you need repeat your voice again. If these two voice are matched, Serial Monitor prints "Success", and "record 0" is trained, or if are not matched, repeat speaking until success. What is a signature? Signature is a piece of text description for the voice command. For example, if your 7 voice command are “1, 2, 3, 4, 5, 6, 7”, you could train in the following way:

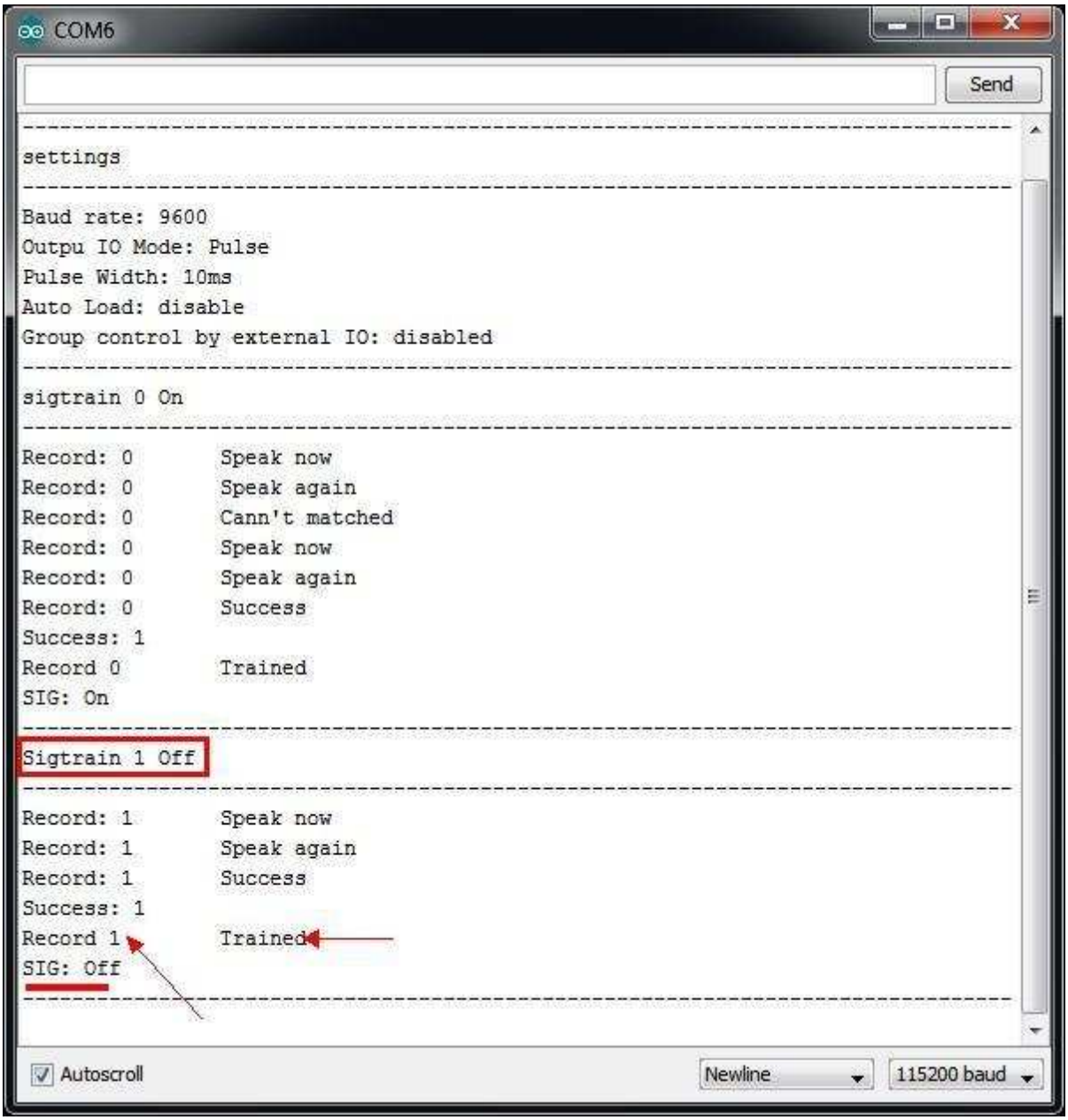
```
sigtrain 0 one
sigtrain 1 two
sigtrain 2 three
sigtrain 3 four
sigtrain 4 five
sigtrain 5 six
sigtrain 6 seven
```

The signature could be displayed if its command was called.

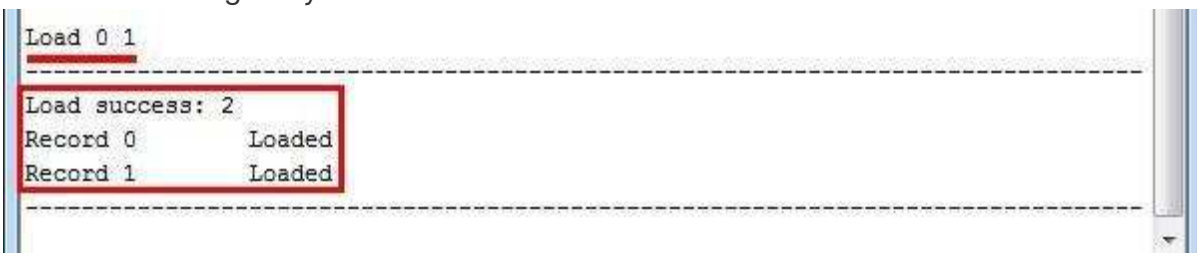
When training, the two led on the Voice Recognition Module can indicate your training process. After sending the training command, the SYS_LED (yellow) is blinking fast which remind you to get ready. Speak your voice command as soon as the STATUS_LED (red) light lights on. The recording process ends once when the STATUS_LED (red) lights off. Then the SYS_LED is blinking again, get ready for next recording process. When the training process ends successful, SYS_LED and STATUS_LED blink together. If the training fails, SYS_LED and STATUS_LED blink together, but quickly.



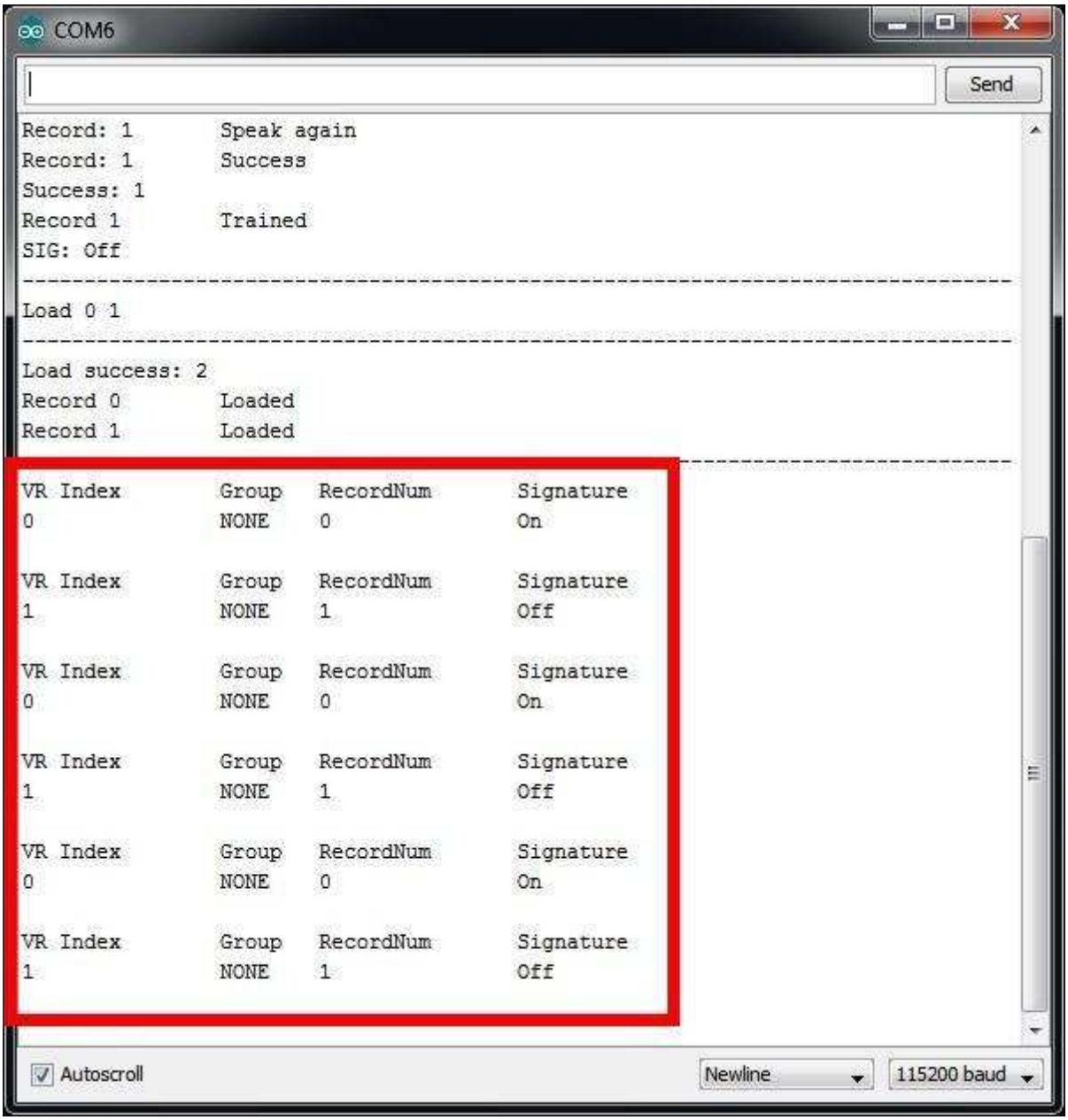
7. Train another record. Send `sigtrain 1 Off` command to train record 1 with signature "Off". Choose your favorite words to train (it can be any word, meaningful word recommended, may be 'Off' here).



8. Send `load 0 1` command to load voice. And say your word to see if the Voice Recognition Module can recognize your words.



If the voice is recognized, you can see.



9. Train finish. Train sample also support several other commands.

COMMAND	FORMAT	EXAMPLE	Comment
train	train (r0) (r1)...	train 0 2 45	Train records
load	load (r0) (r1) ...	load 0 51 2 3	Load records
clear	clear	clear	remove all records in Recognizer
record	record / record (r0) (r1)...	record / record 0 79	Check record train status
vr	vr	vr	Check recognizer status
getsig	getsig (r)	getsig 0	Get signature of record (r)
sigtrain	sigtrain (r) (sig)	sigtrain 0 ZERO	Train one record(r) with signature(sig)
settings	settings	settings	Check current system settings

Control LED Sample

Here we show a simple example showing how to control the LED on Arduino board (connecting to pin13) through voice commands. Before this example, you need to train the VR module first in the way as vr_sample_train shows above. Use the following commands:

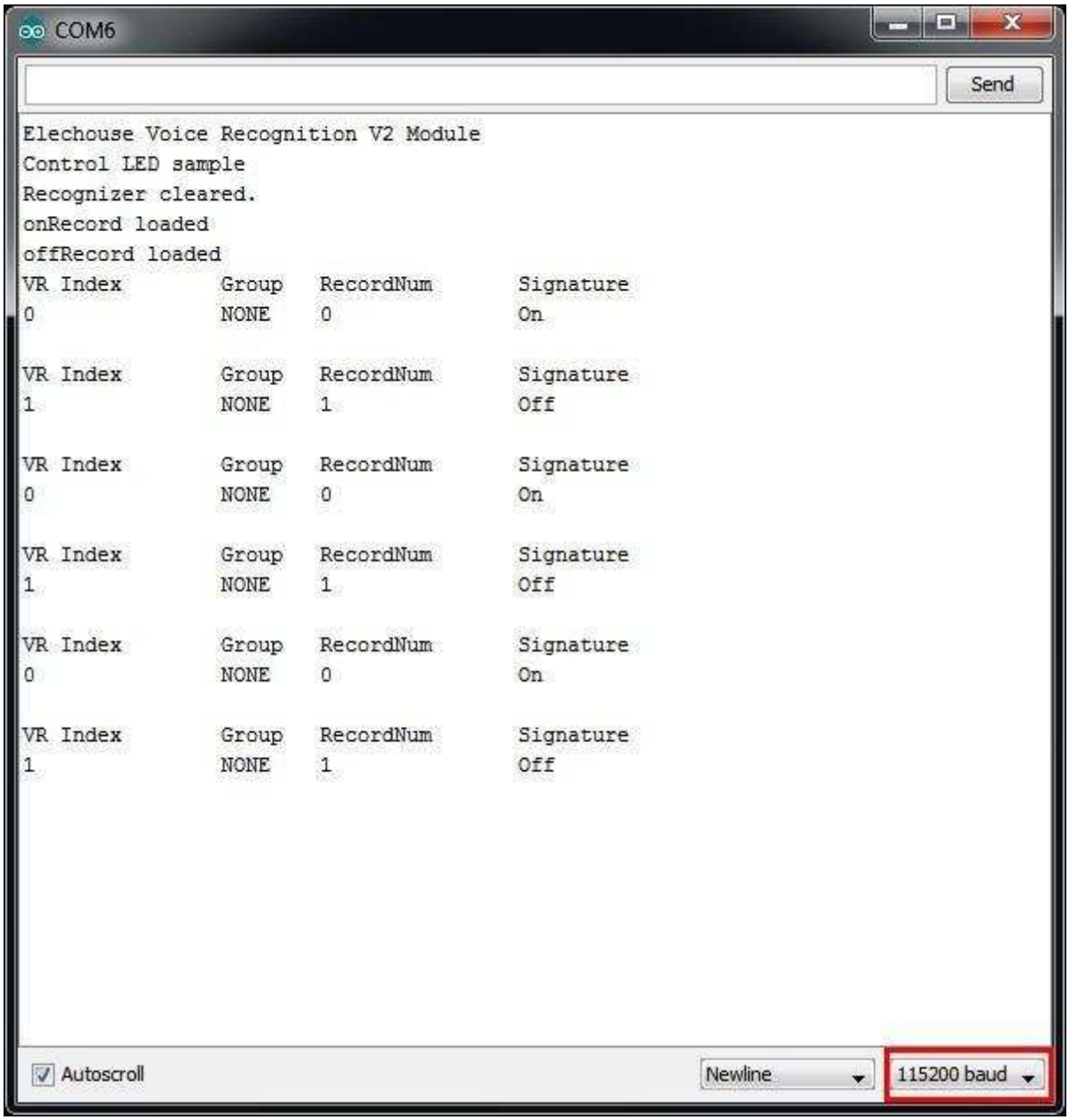
- `sigtrain 0 on` Train the voice command used to light on the LED
- `sigtrain 0 off` Train the voice command used to turn off the LED

Then following the steps:

1. Open **vr_sample_control_led** (File -> Examples -> VoiceRecognitionV3 -> vr_sample_control_led)
2. Choose right Arduino board (Tool -> Board, UNO recommended), Choose right serial port.
3. Click **Upload** button, wait until Arduino is uploaded.
4. Open **Serial Monitor**. Set baud rate 115200.
5. You will see the indication:



Speak the voice commands you train above and check the status of LED on Arduino.



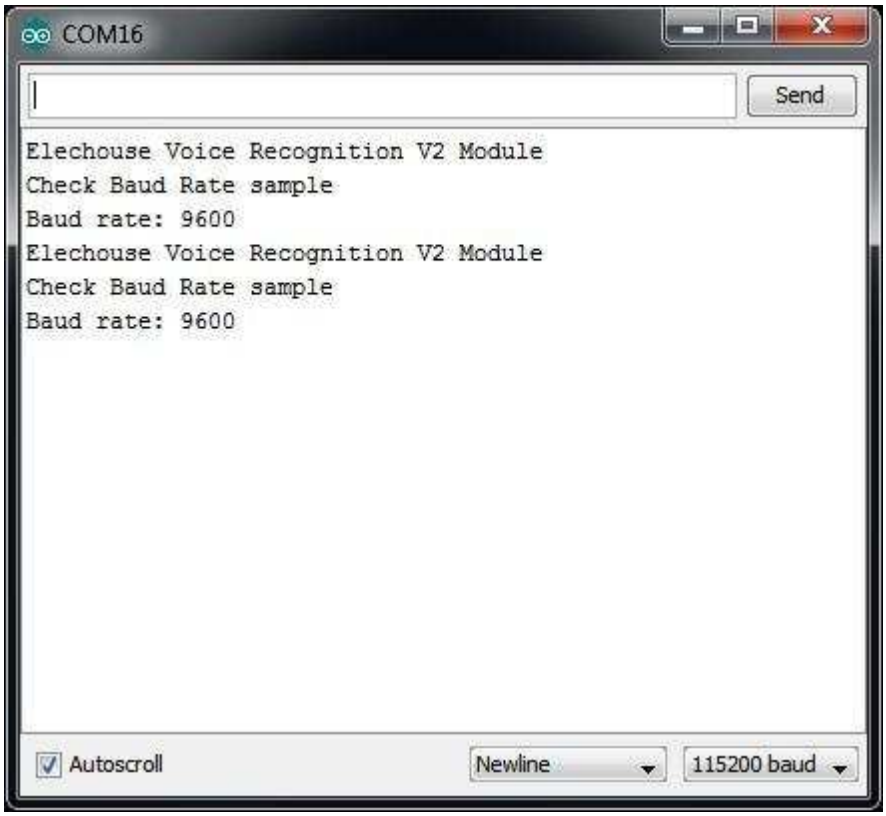
vr_sample_multi_cmd

This sample shows how to use multi commands (more than 7 commands). This sample use **RECORD 0** (the first voice command) to switch between the 2 command 'groups' (not Voice Recognition Group Function). Group 1 is made of **RECORD *0, 1, 2, 3, 4, 5, 6.*** *A*nd second group is made up of **RECORD 0, 7, 8, 9, 10, 11, 12** .

Note: Before start this sample, you need train your Voice Recognition module first, and make sure that all records from 0 to 12 should be trained.

vr_sample_check_baud_rate

This sample is used to check the baud rate, when you forgot your custom settings.

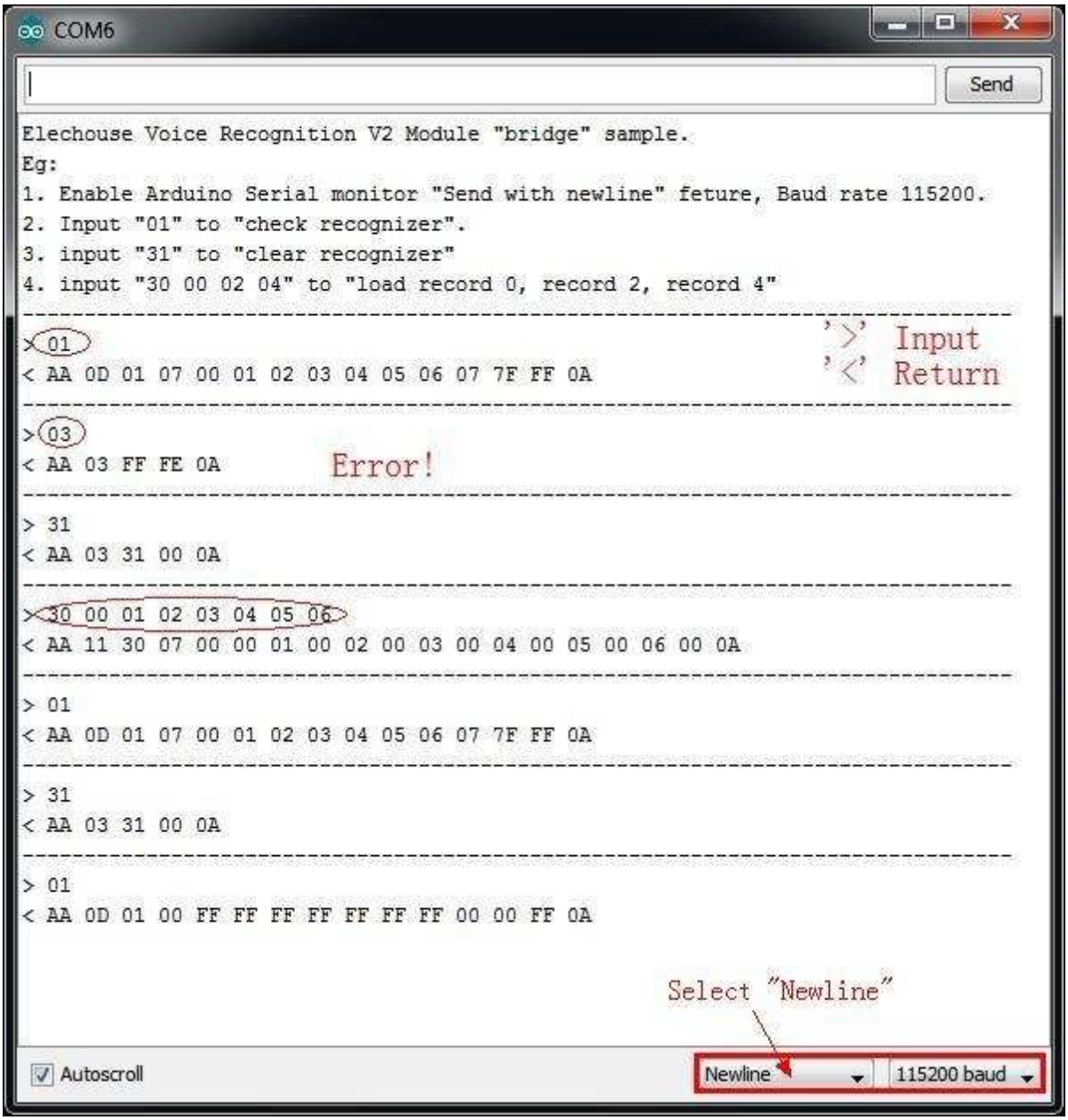


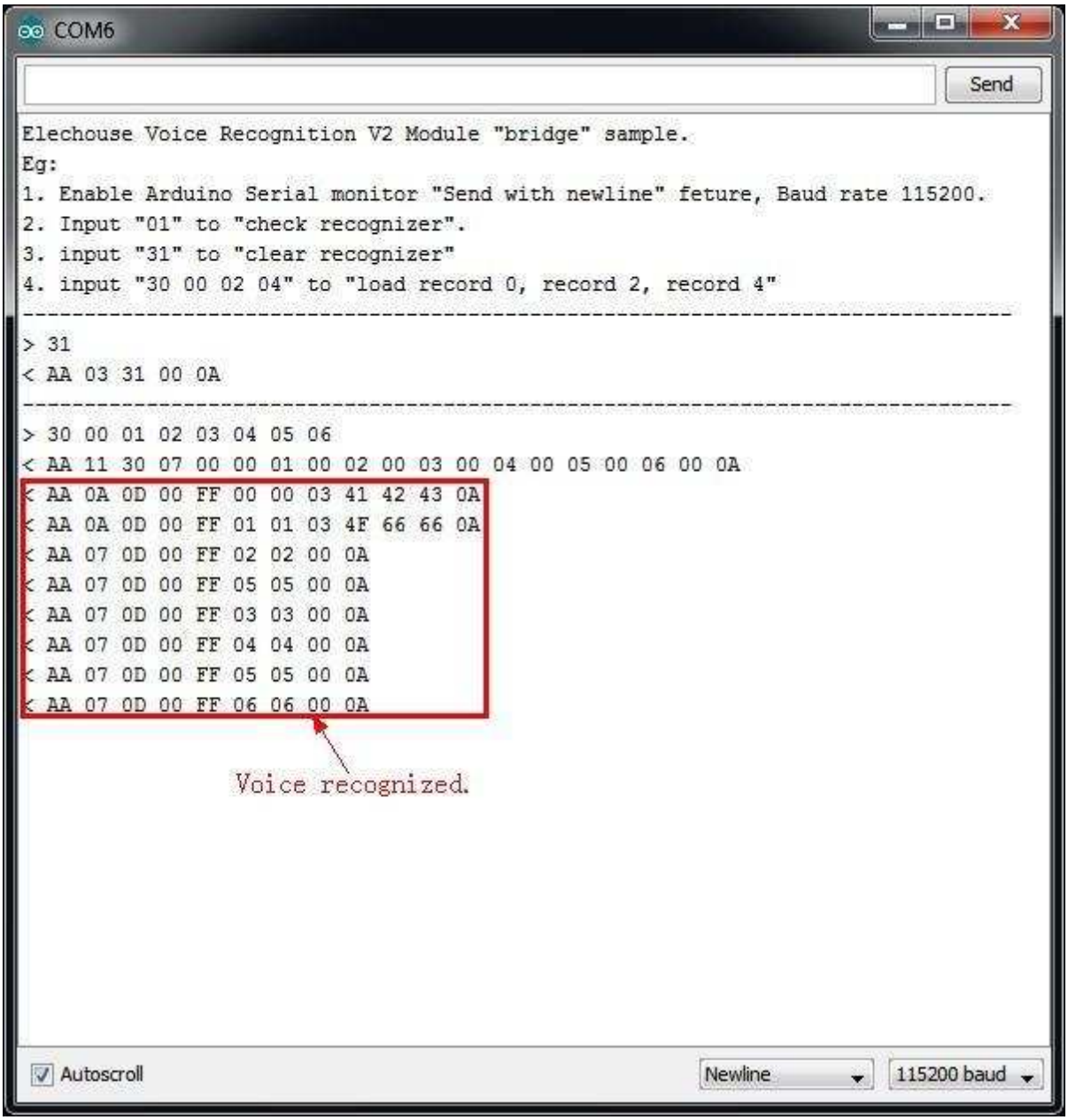
vr_sample_bridge

This example allows you to send VR3 protocol commands to VR3 board. For more detail, please refer to Protocol . Note: do not input **Frame Head**, **Frame Length**, **Frame End**, only need input **Frame Command** and **Frame Data**. For example, Check Recognizer Command is "AA 02 01 0A" for all, here you only need input 01.

Example:

1. Enable Arduino Serial monitor "Send with newline", Baud rate 115200.
2. Input "01" to "check recognizer".
3. input "31" to "clear recognizer"
4. input "30 00 02 04" to "load record 0, record 2, record 4"


COM6
Send
Elechouse Voice Recognition V2 Module "bridge" sample.
Eg:
1. Enable Arduino Serial monitor "Send with newline" feture, Baud rate 115200.
2. Input "01" to "check recognizer".
3. input "31" to "clear recognizer"
4. input "30 00 02 04" to "load record 0, record 2, record 4"
> 01
< AA 0D 01 07 00 01 02 03 04 05 06 07 7F FF 0A
'>' Input
'<' Return
> 03
< AA 03 FF FE 0A
Error!
> 31
< AA 03 31 00 0A
> 30 00 01 02 03 04 05 06
< AA 11 30 07 00 00 01 00 02 00 03 00 04 00 05 00 06 00 0A
> 01
< AA 0D 01 07 00 01 02 03 04 05 06 07 7F FF 0A
> 31
< AA 03 31 00 0A
> 01
< AA 0D 01 00 FF FF FF FF FF FF FF 00 00 FF 0A
Select "Newline"
Autoscroll
Newline
115200 baud



Please refer to libref.pdf to get more information about functions of this library.

VR3 Protocol

VR3 protocol contains basic commands to control VR3 boards. For those who use VR3 with other MUC rather than Arduino, VR3 protocol is very helpful.

All the commands of VR3 are sent through serial port in ***HEXADECIMAL FORMAT.***

Example are supplied with this serial port tool: Access Port

To connect VR3 to PC, this USB-TTL module tool: USB-TTL Module with 5V or 3.3V

Base Format

Control

| Head (AA) | Length| Command | Data | End (0A) |
Length = L(Length + Command + Data)

Return

| Head (AA) | Length| Command | Data | End (0A) |
Length = L(Length + Command + Data)

NOTE: Data area is different with different with commands.

Code

ALL CODE ARE IN HEXADECIMAL FORMAT

FRAME CODE
AA --> Frame Head
0A --> Frame End

CHECK
00 --> Check System Settings
01 --> Check Recognizer
02 --> Check Record Train Status
03 --> Check Signature of One Record

SYSTEM SETTINGS
10 --> Restore System Settings
11 --> Set Baud Rate
12 --> Set Output IO Mode
13 --> Set Output IO Pulse Width
14 --> Reset Output IO
15 --> Set Power On Auto Load

RECORD OPERATION
20 --> Train One Record or Records
21 --> Train One Record and Set Signature
22 --> Set Signature for Record

RECOGNIZER CONTROL
30 --> Load a Record or Records to Recognizer
31 --> Clear Recognizer
32 --> Group Control

THESE 3 CODES ARE ONLY USED IN RETURN MESSAGE
0A --> Prompt
0D --> Voice Recognized
FF --> Error

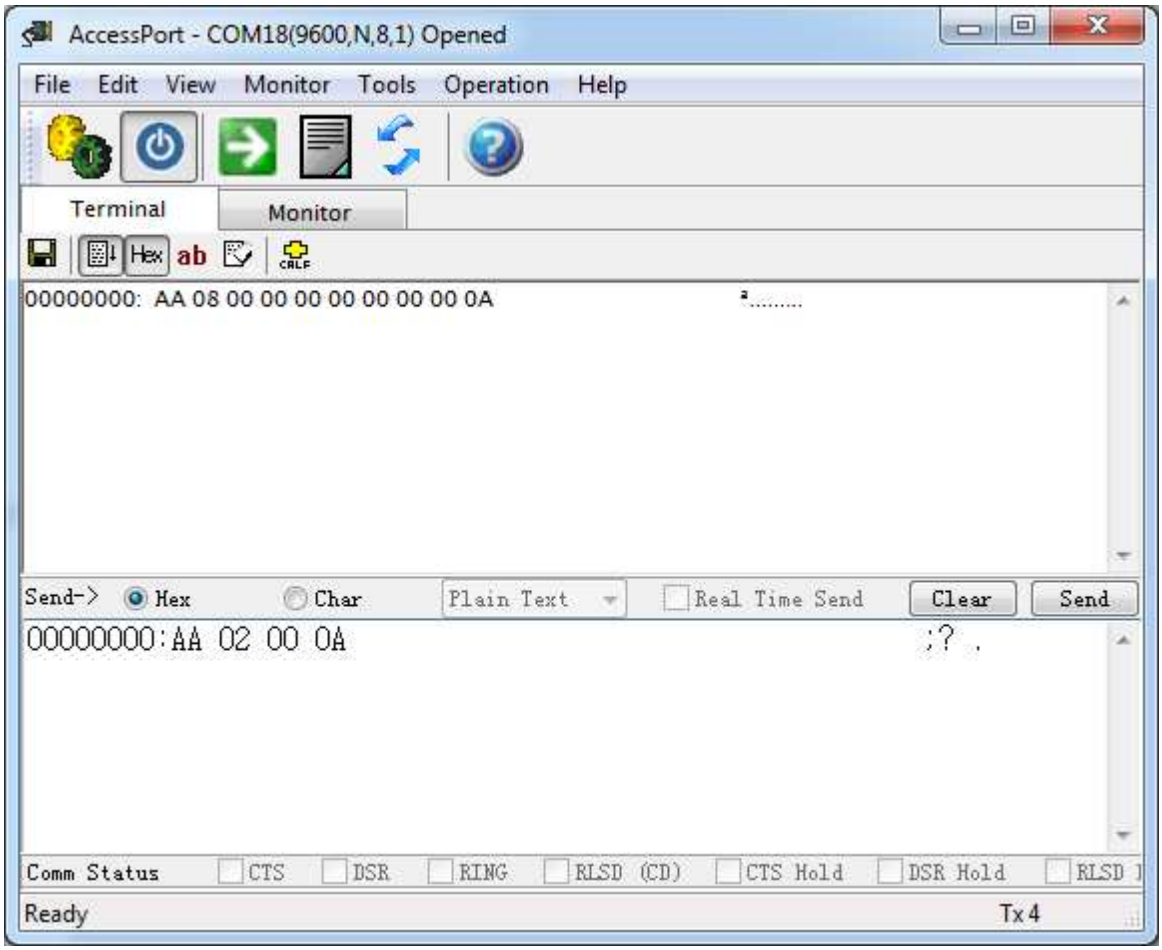
Details

Check System Settings (00)

Use "Check System Settings" command to check current settings of Voice Recognition Module, include serial baud rate, output IO mode, output IO pulse width, auto load and group function.
Format:
| AA | 02 | 00 | 0A |
Return:
| AA | 08 | 00 | STA | BR | IOM | IOPW | AL | GRP | 0A |

	Description
STA	Trained status ● 0-untrained ● 1-trained ● FF-record value out of range
BR	Baud rate ● 0 or 3 -9600 ● 1 -- 2400 ● 2 -- 4800 ● 4 -- 19200 ● 5 -- 38400
IOM	Output IO Mode ● 0 -- Pulse ● 1 -- Toggle ● 2 -- Clear ● 3 -- Set
IOPW	Output IO Pulse Width ● Pulse Mode: 1~15
AL	Power on auto load ● 0 -- disable ● 1 -- enable
GRP	Group control by external IO 0 -- disable 1 -- system group 2 -- user group

Example:

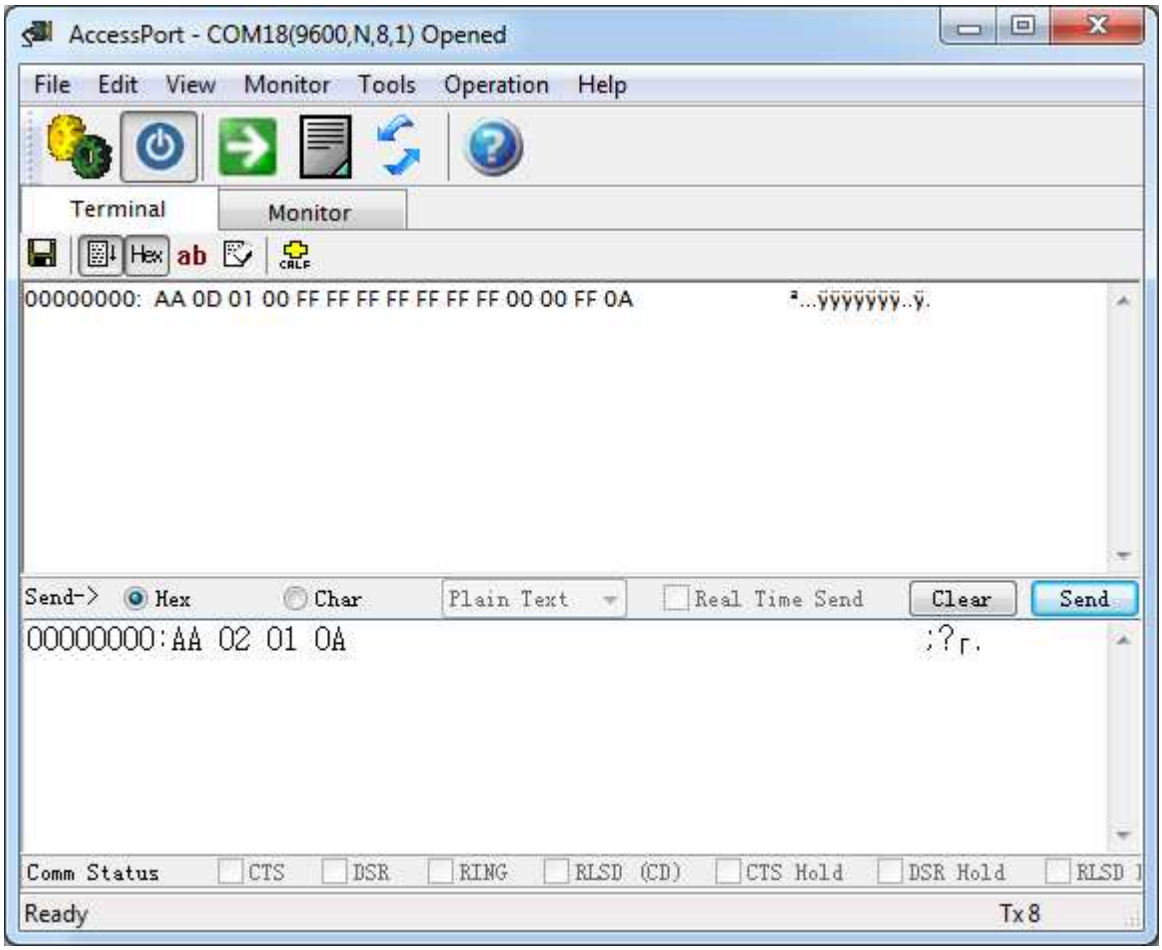


Check Recognizer (01)

Use "Check Recognizer" command to check **recognizer** of Voice Recognition Module.
Format:
| AA | 02 | 01 | 0A |
Return:
| AA | 0D | 01 | RVN | VRI0 | VRI1 | VRI2 | VRI3 | VRI4 | VRI5 | VRI6 | RTN | VRMAP | GRPM | 0A |

	Description
RVN:	The number of valid voice commands in recognizer. MAX 7
VRIn	n=0~6 Voice commands in recognizer, n is recognizer index value
RTN	The number of total records in recognizer.
VRMAP	Valid command bit map for VRI0~VRI6.
GRPM	Group mode • FF -- not in group mode • 00~0A -- system group • 80~87 -- user group mode

Example

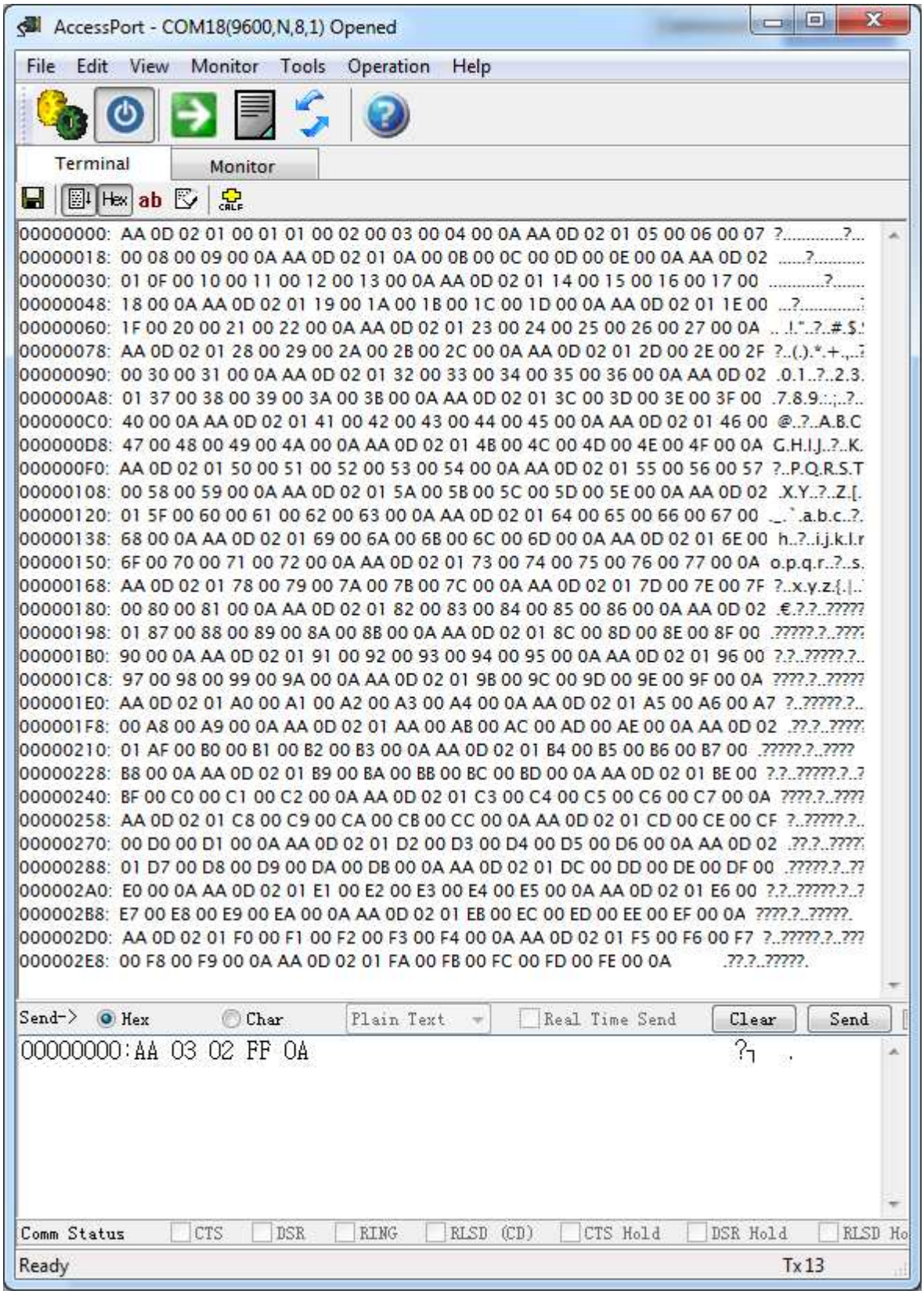


Check Record Train Status (02)

Use "Check Record Train Status" command to check if the record is trained.
Format:
Check all records
| AA | 03 | 02 | FF| 0A |
Check specified records
| AA | 03+n | 02 | R0 | ... | Rn | 0A |
Return:
| AA | 5+2*n | 02 | N | R0 | STA | ... | Rn | STA | 0A |

	Description
N	Number of trained records.
R0 ~ Rn	Voice record.
STA	Trained voice command status • 0 -- untrained • 1 -- trained • FF -- record value out of range

Example:

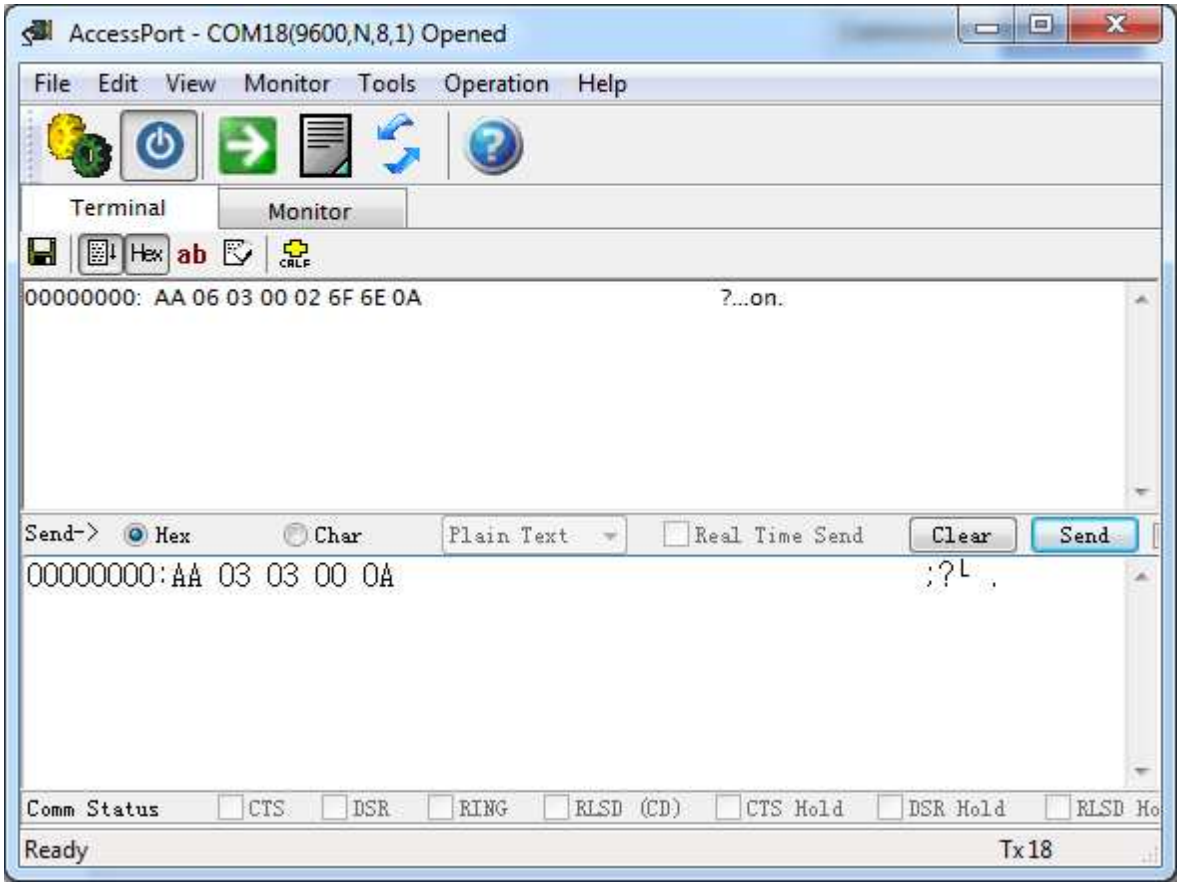


Check Signature of One Record (03)

Use this command to check the signature of one record.
Format:
| AA | 03 | 03 | Record | 0A |
Return:
| AA | 03 | 03 | Record | SIGLEN | SIGNATURE | 0A |

	Description
SIGLEN	signature string length
SIGNATURE	signature string

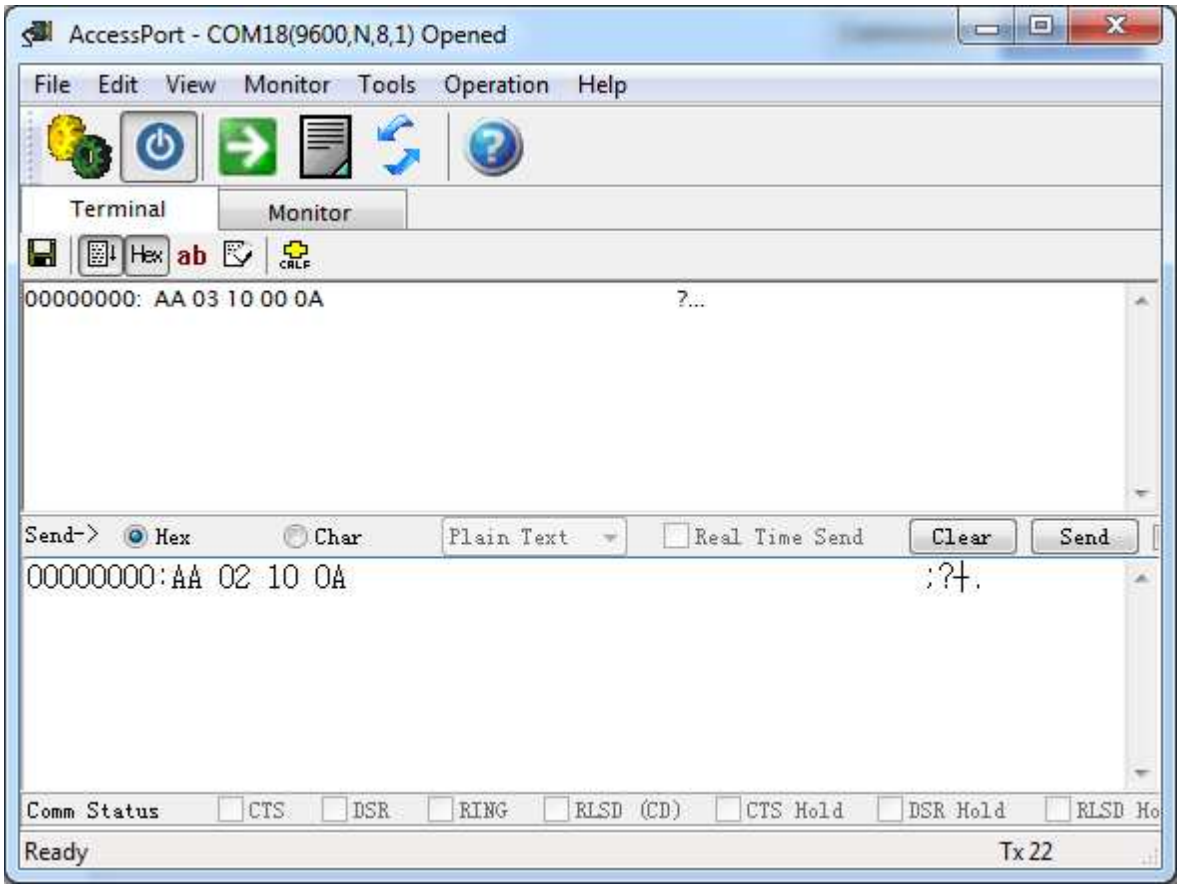
Example:



Restore System Settings (10)

Use this command to restore settings of Voice Recognition Module to default.
Format:
| AA | 02 | 10 | 0A |
Return:
| AA | 03 | 10 | 00 | 0A |

Example:



Set Baud Rate (11)

Use this command to set baud rate of Voice Recognition Module, effect after Voice Recognition Module is restarted.
Format:
| AA | 03 | 11 | BR | 0A |
Return:
| AA | 03 | 11 | 00 | 0A |

	Description
BR	Serial baud rate. • 0 -- 9600 • 1 -- 2400 • 2 -- 4800 • 3 -- 9600 • 4 -- 19200 • 5 -- 38400

Set Output IO Mode (12)

Use this command to set output IO mode of Voice Recognition Module, take effect immediately after the instruction execution.
Format:
| AA | 03 | 12 | MODE | 0A |
Return:
| AA | 03 | 12 | 00 | 0A |

	Description
MODE	Output IO mode. ● 0 -- pulse mode ● 1 -- Flip mode ● 2 -- Up mode ● 3 -- Down mode

Here we will introduce more about the output of O1~O5:

Pulse Mode: Output is negative pulse.

Flip Mode: each time while the module recognizes voice command, it will change the state of the output pin.

Down Mode: The output will become LOW from HIGH once it detects voice command. It will never come back to HIGH again until the module receives output reset command **(14)**.

Up Mode: The output will become HIGH from LOW once it detects voice command. It will never come back to LOW again until the module receives output reset command **(14)**.

There will be an example:

A: Starting point while you import the voice group.

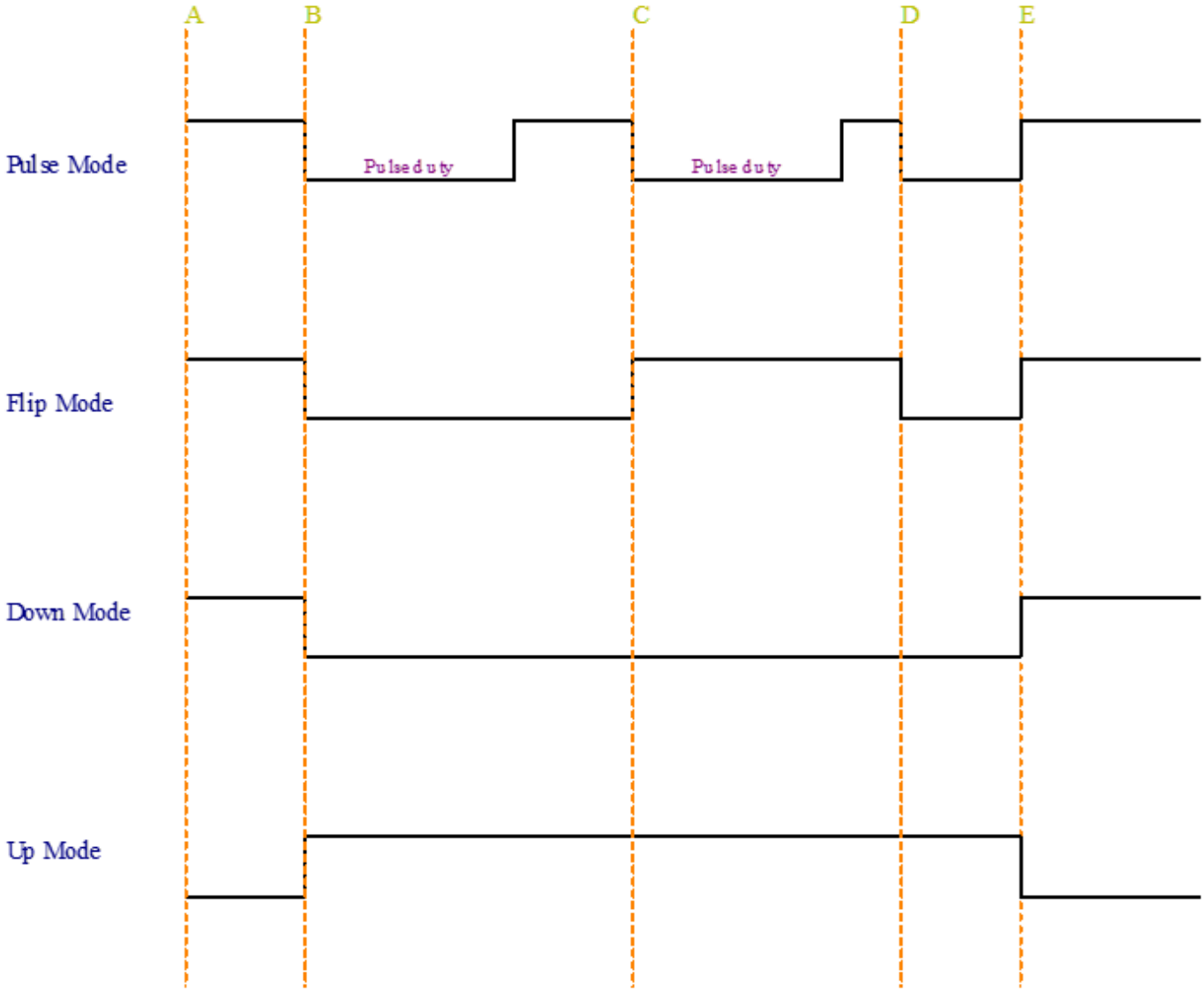
B: The 1st time it recognizes voice command.

C: The 2nd time it recognizes voice command.

D: The 3rd time it recognizes voice command.

E: The time while output reset command is received **(14)**.

The back wire is output wave shape.



Set Output IO Pulse Width (13)

Use this command to set output IO pulse width of Pulse Mode. It takes effect immediately after the instruction execution. Pulse width is used when output IO mode is **"Pulse"**.

Format:

| AA | 03 | 13 | LEVEL | 0A |

Return:

| AA | 03 | 13 | 00 | 0A |

	Description
LEVEL	Pulse width level. Details: - 00 10ms - 01 15ms - 02 20ms - 03 25ms - 04 30ms - 05 35ms - 06 40ms

	- 07 45ms - 08 50ms - 09 75ms - 0A 100ms - 0B 200ms - 0C 300ms - 0D 400ms - 0E 500ms - 0F 1s

Reset Output IO (14)

Use this command to reset output IO. This command can be used in output IO UP/DOWN Mode to generate a user-defined pulse.

Format:

| AA| 03 | 14 | FF | 0A | (reset all output io)

| AA| 03+n | 14 | IO0 | ... | IOn | 0A | (reset output ios)

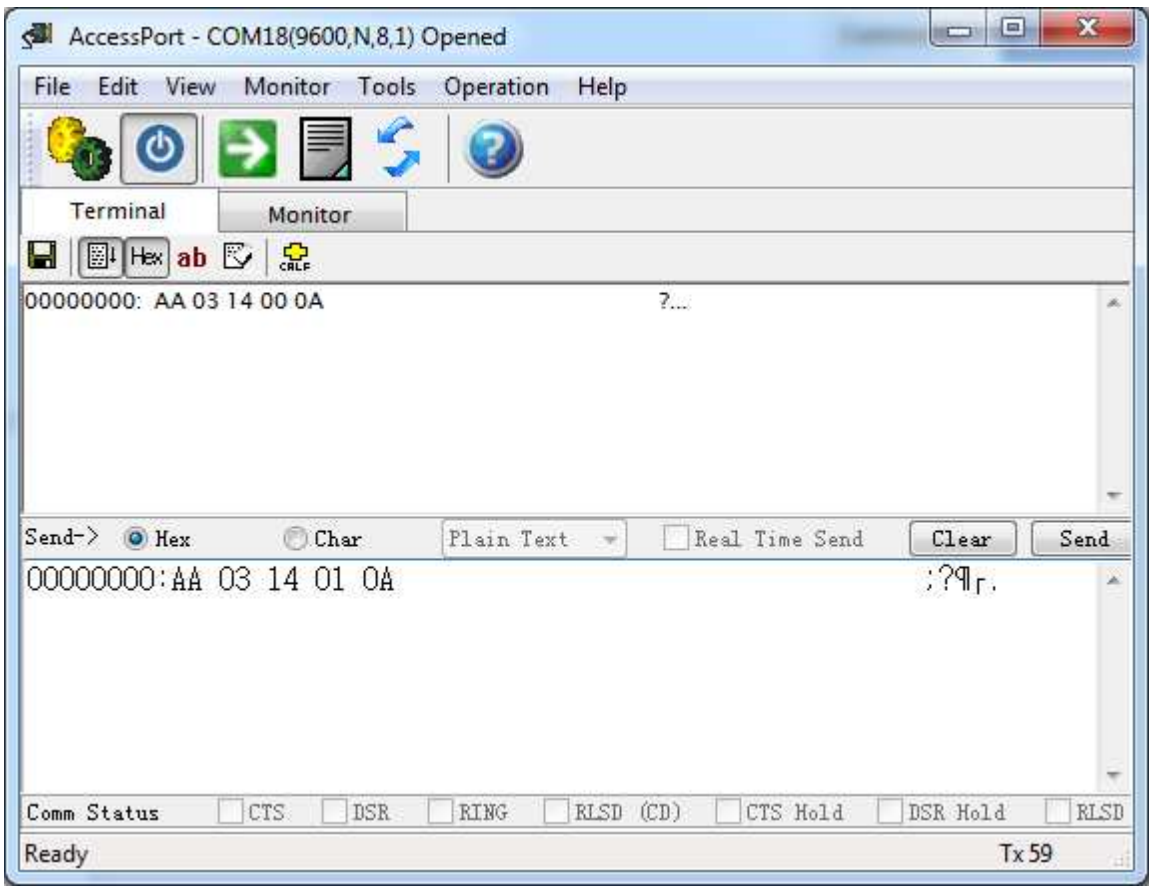
Return:

| AA | 03 | 14 | 00 | 0A |

	Description
IOn	number of output io n: 0~6 IOn: 0~6 (HEX)

Example:

Reset IO1



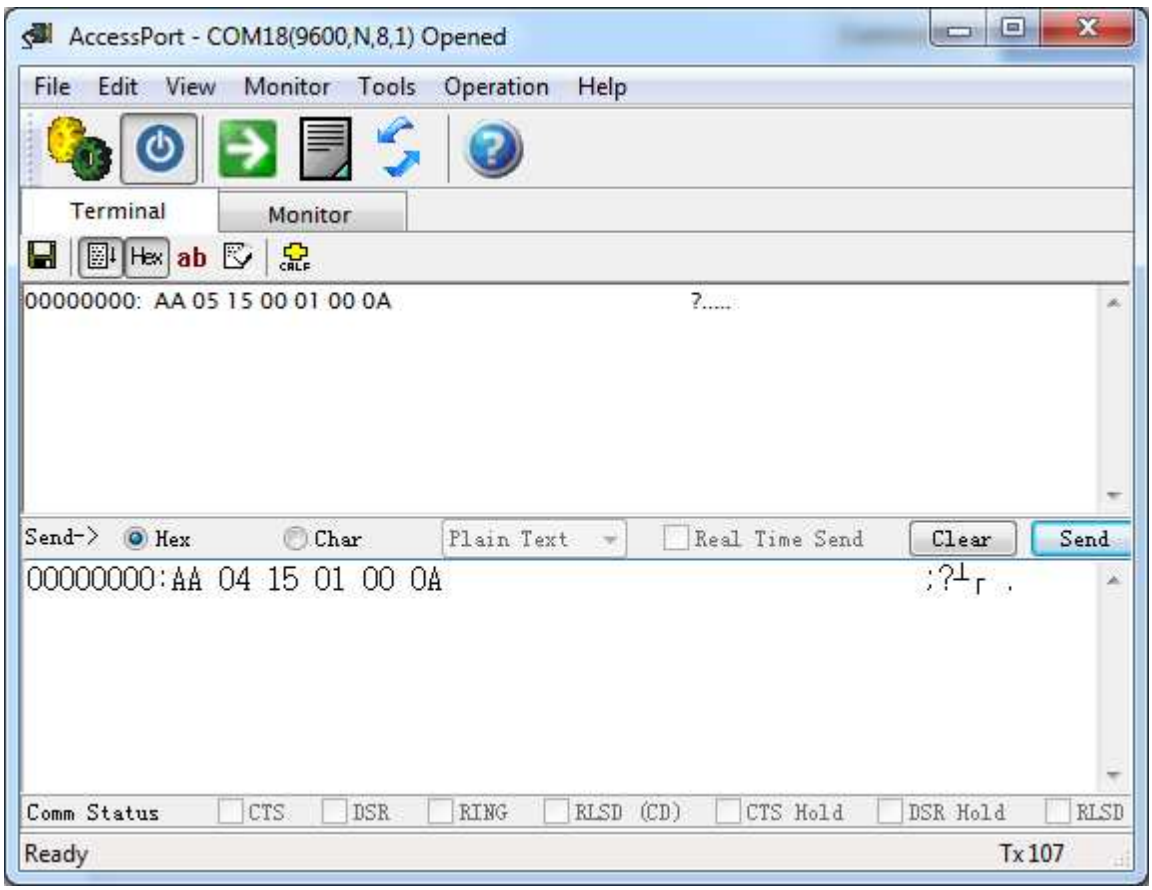
Set Power On Auto Load (15)

Use this command to enable or disable "Power On Auto Load" function.
Format:
| AA| 03 | 15 | 00 | 0A | (disable auto load)
| AA| 04+n | 15 | BITMAP | R0 | ... | Rn | 0A | (set auto load)
Return:
| AA| 05+n | 15 | 00 |BITMAP | R0 | ... | Rn | 0A | (set auto load)

	Description
BITMAP	Record bitmap: • **00** -- zero record, disable auto load • **01** -- one record • **03** -- two records • **07** -- three records • **0F** -- four records • **1F** -- five records • **3F** -- six record • **7F** -- seven records
R0~Rn	Record

Example:

to auto-load the first voice command R0 into recognizer



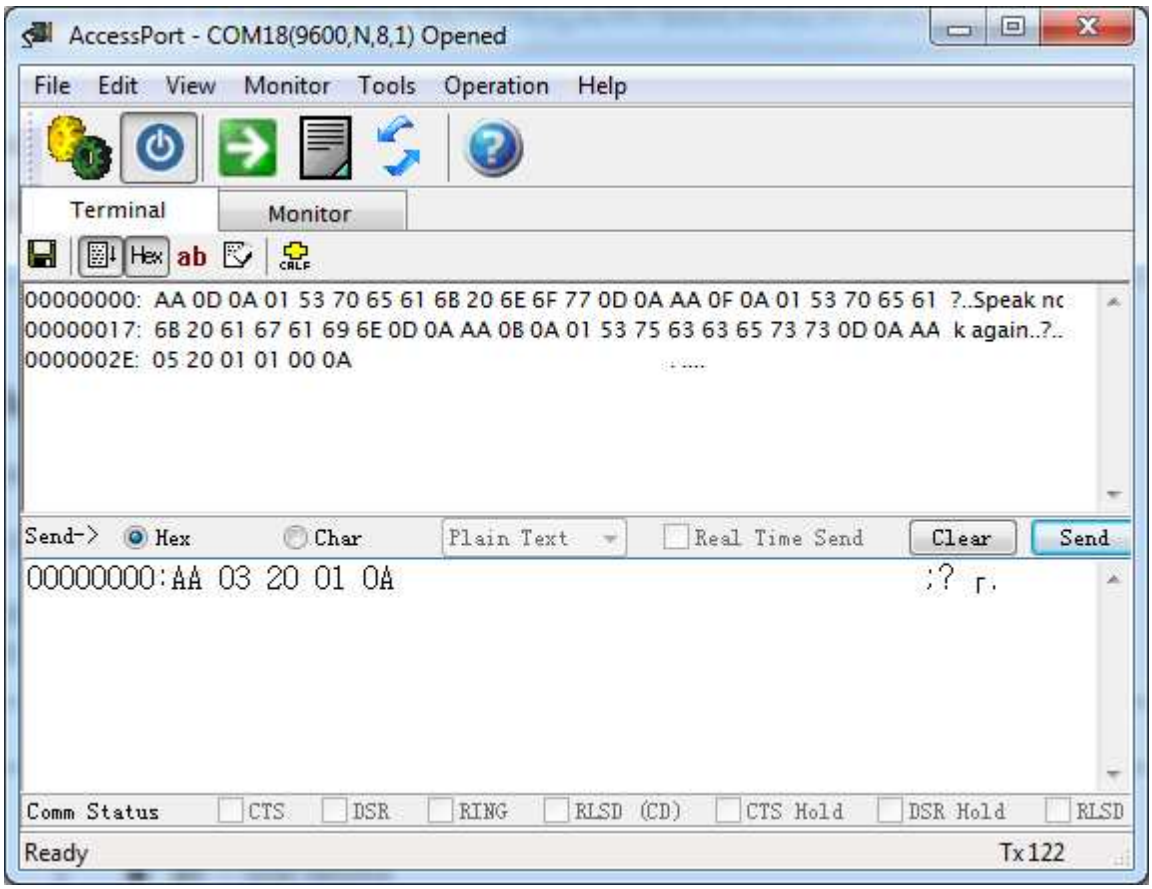
Train One Record or Records (20)

Train records, can train several records one time.
Format:
| AA| 03+n | 20 | R0 | ... | Rn | 0A |
Return:
| AA| LEN | 0A | RECORD | PROMPT | 0A |
| AA| 05+2*n | 20 | N | R0 | STA0 | ... | Rn | STAn | SIG | 0A |

	Description
R0~Rn	Voice command record
STA	train result 0 -- Success 1 -- Timeout 2 -- Record value out of range
n	Number of trained voice command record

Example:

To train voice command 01,



Train One Record and Set Signature (21)

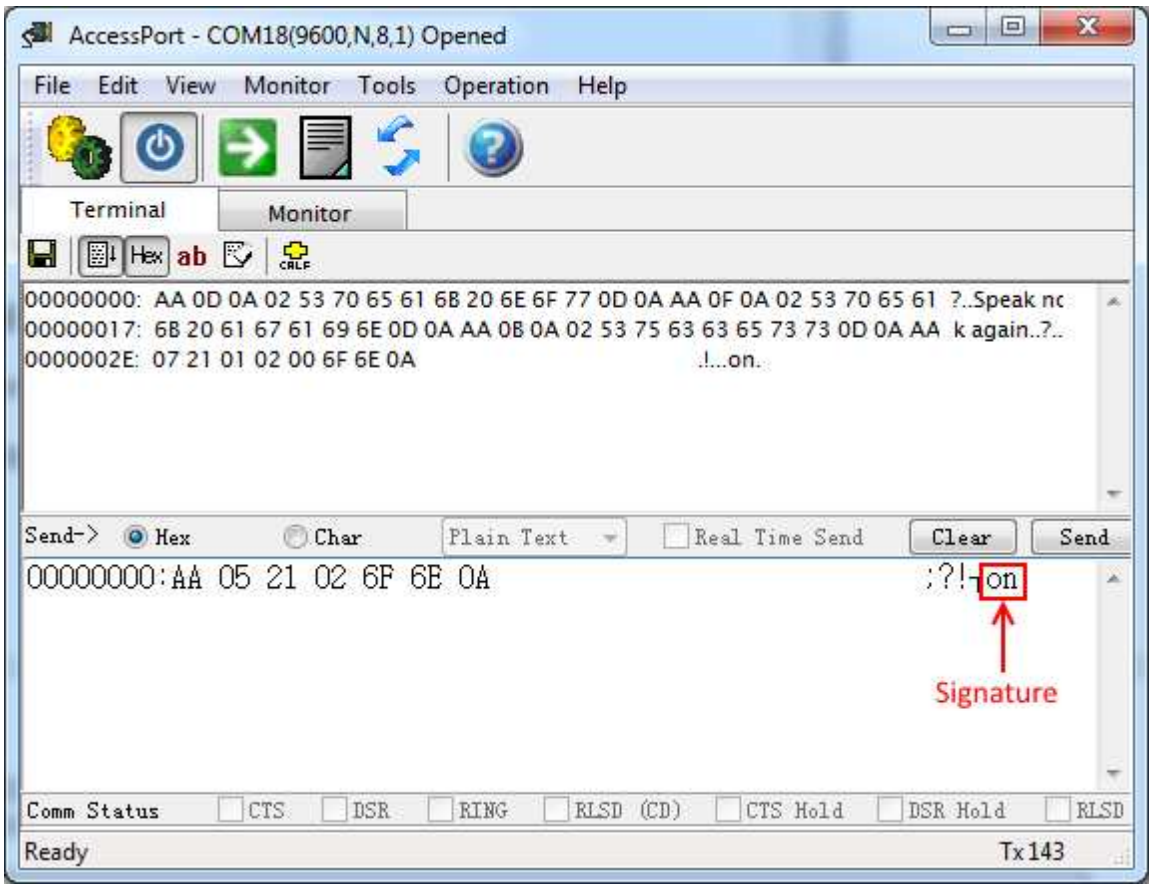
Train one record and set a signature for it, one record one time.
Format:
| AA| 03+SIGLEN | 21 | RECORD | SIG | 0A | (Set signature)
Return:

| AA| LEN | 0A | RECORD | PROMPT | 0A | (train prompt)
| AA| 05+SIGLEN | 21 | N | RECORD | STA | SIG | 0A |

	Description
RECORD	Voice command record index
SIG	Signature string
PROMPT	Prompt string: • Speak now • Speak again • Success
N	Number of successful training voice commands

Example:

Train command 02 with signature “on”



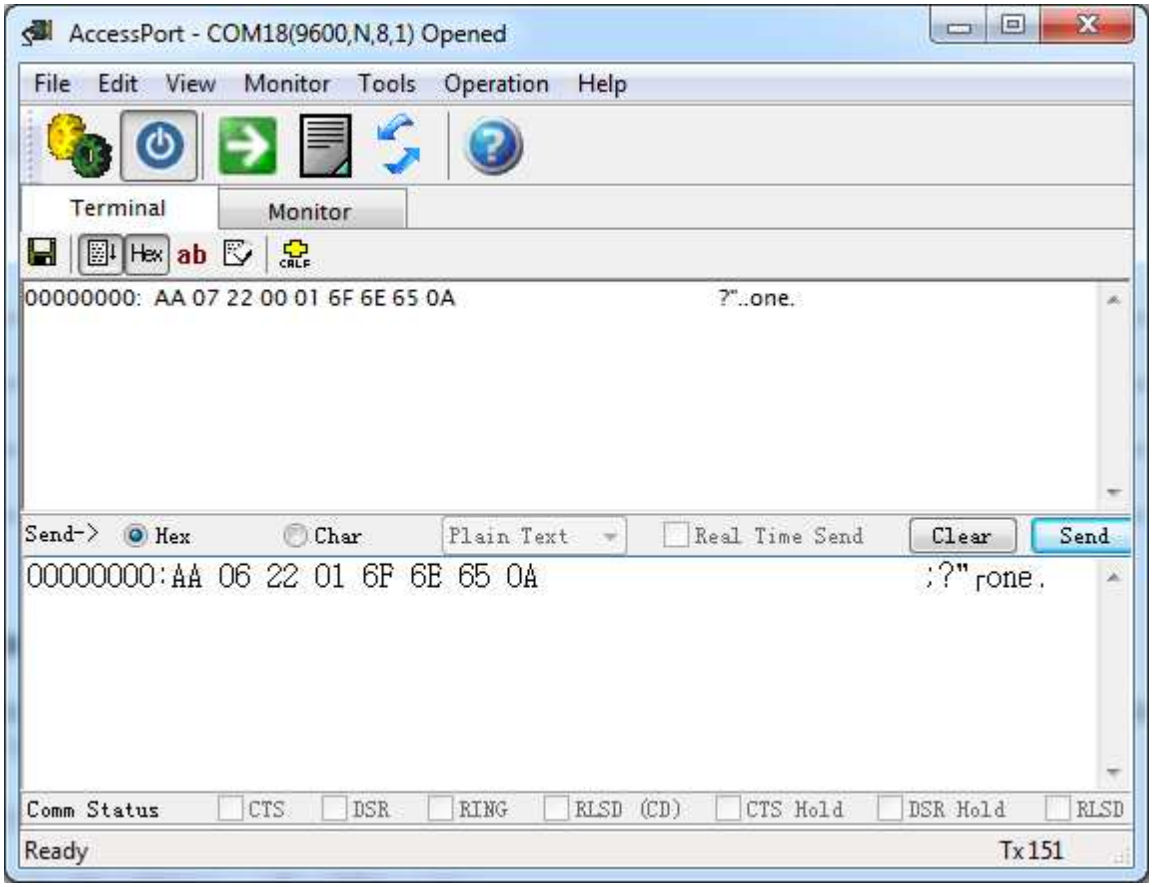
Set/Delete Signature for Record (22)

Set a signature for a record, one record one time.
Format:
| AA | 03+SIGLEN | 22 | RECORD | SIG | 0A | (Set signature)
| AA | 03 | 22 | RECORD | 0A | (Delete signature)
Return:
| AA | 04+SIGLEN | 22 | 00 | RECORD | SIG | 0A | (Set signature return)
| AA | 04 | 22 | 00 | RECORD | 0A | (Delete signature return)

	Description
SIG	signature string
SIGLEN	signature string length

Example:

Set voice recommand 01 with signature “one”.



Load a Voice Record or Records to Recognizer (30)

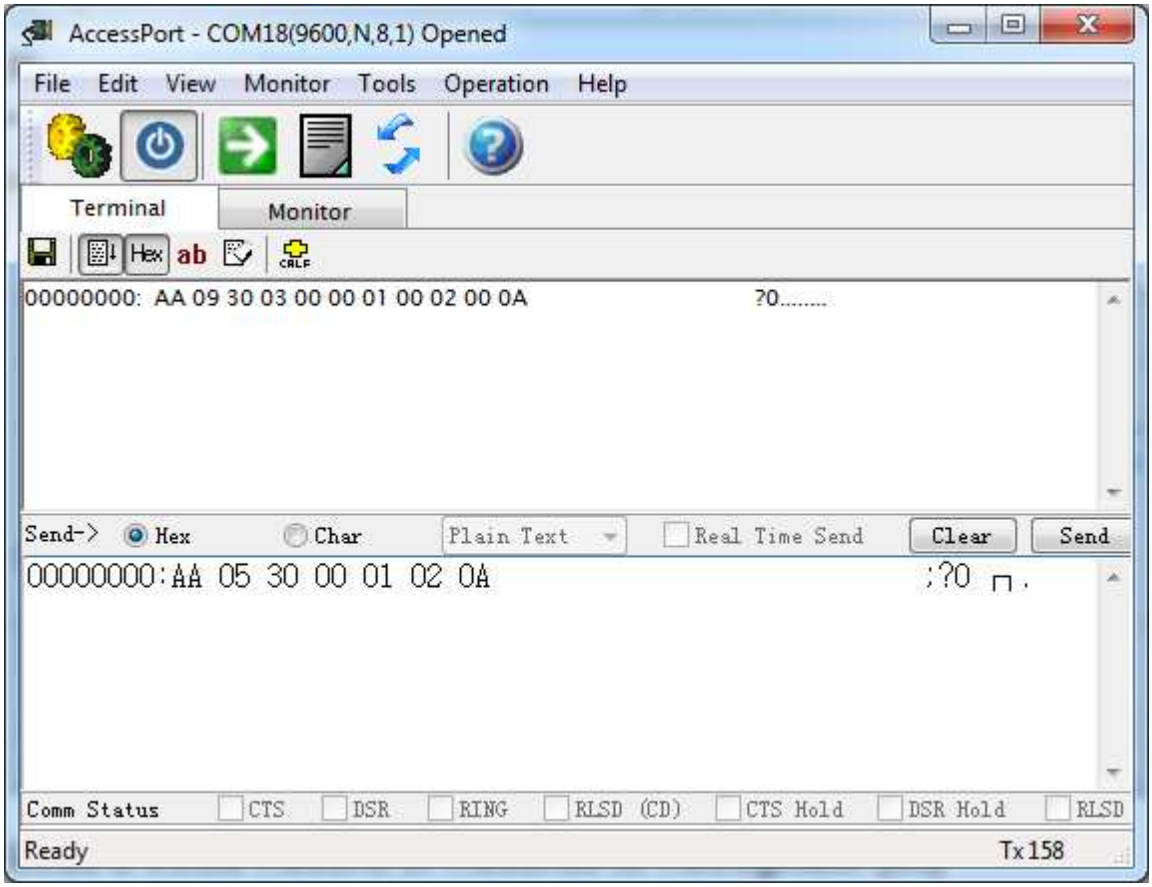
Load records(1~7) to recognizer of VR3, after execution the VR3 starts to recognize immediately.
Format:
| AA| 3+n | 30 | R0 | ... | Rn | 0A |
Return:
| AA| 3+2n | 30 | N | R0 | STA0 | ... | Rn | STAn | 0A |

	Description
R0~Rn	Voice Record index
STA0~STAn	Load result • **00** -- Success • **FF** -- Record value out of range • **FE** -- Record untrained • **FD** -- Recognizer full • **FC** -- Record already in recognizer

N	Number of successful training voice commands

Example:

Load Voice command 00 01 02 to recognizer.

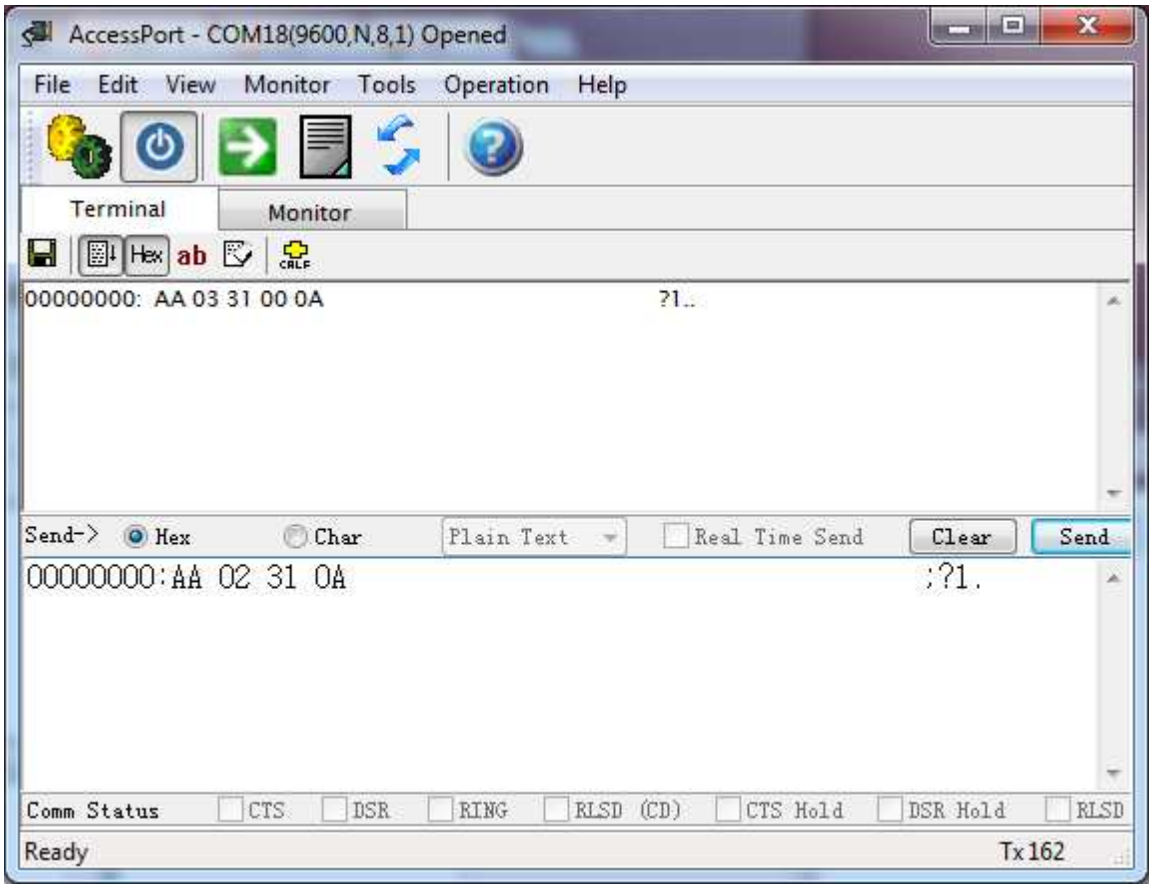


The yellow LED will flash slowly.

Clear Recognizer (31)

Stop recognizing, and empty recognizer of Voice Recognition Module. **Format:**
| AA | 02 | 31 | 0A |
Return:
| AA | 03 | 31 | 00 | 0A |

Example:



Yellow LED will light on.

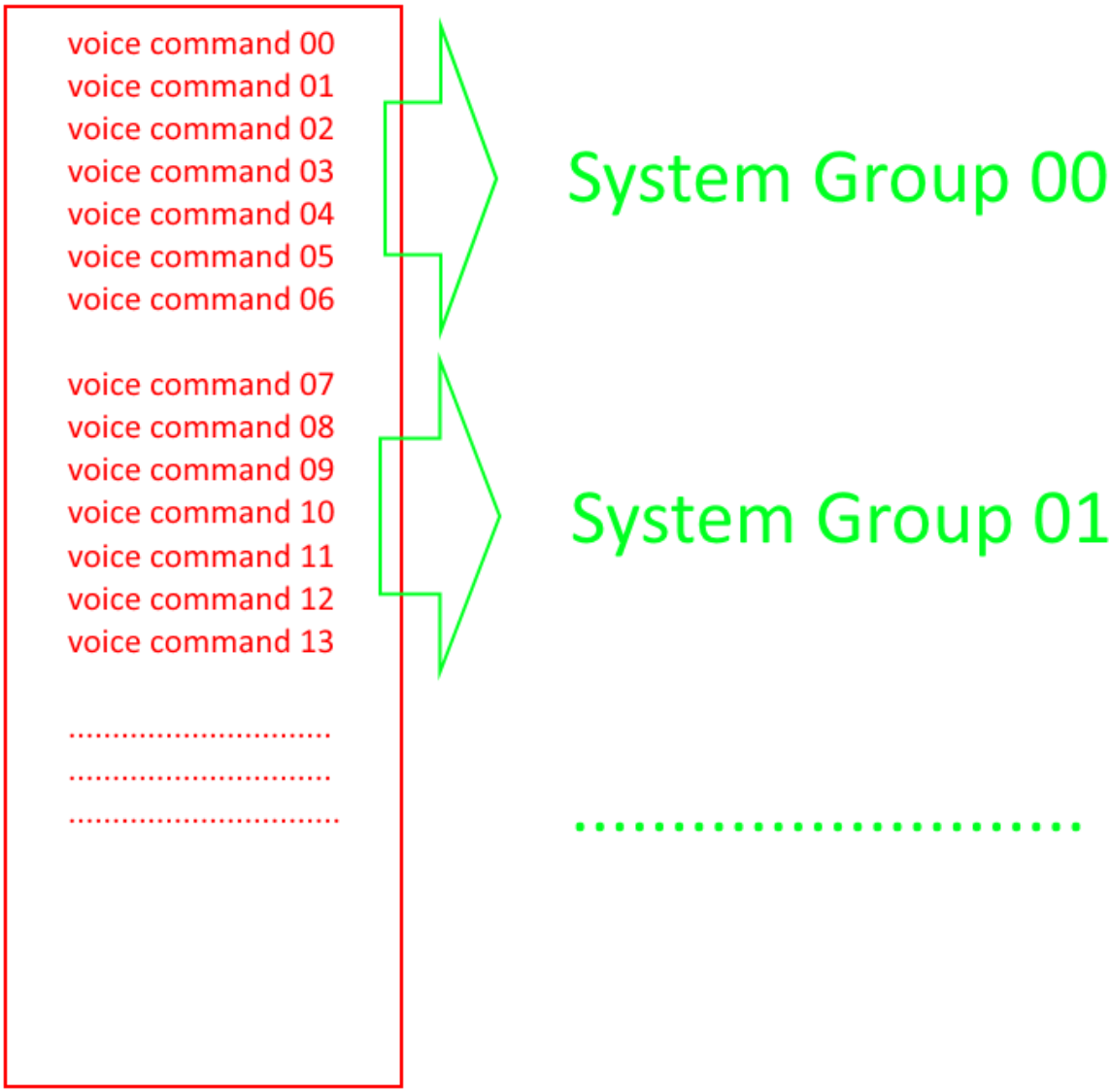
Group Control (32)

Groups are used to load commands into recognizer by external pins.

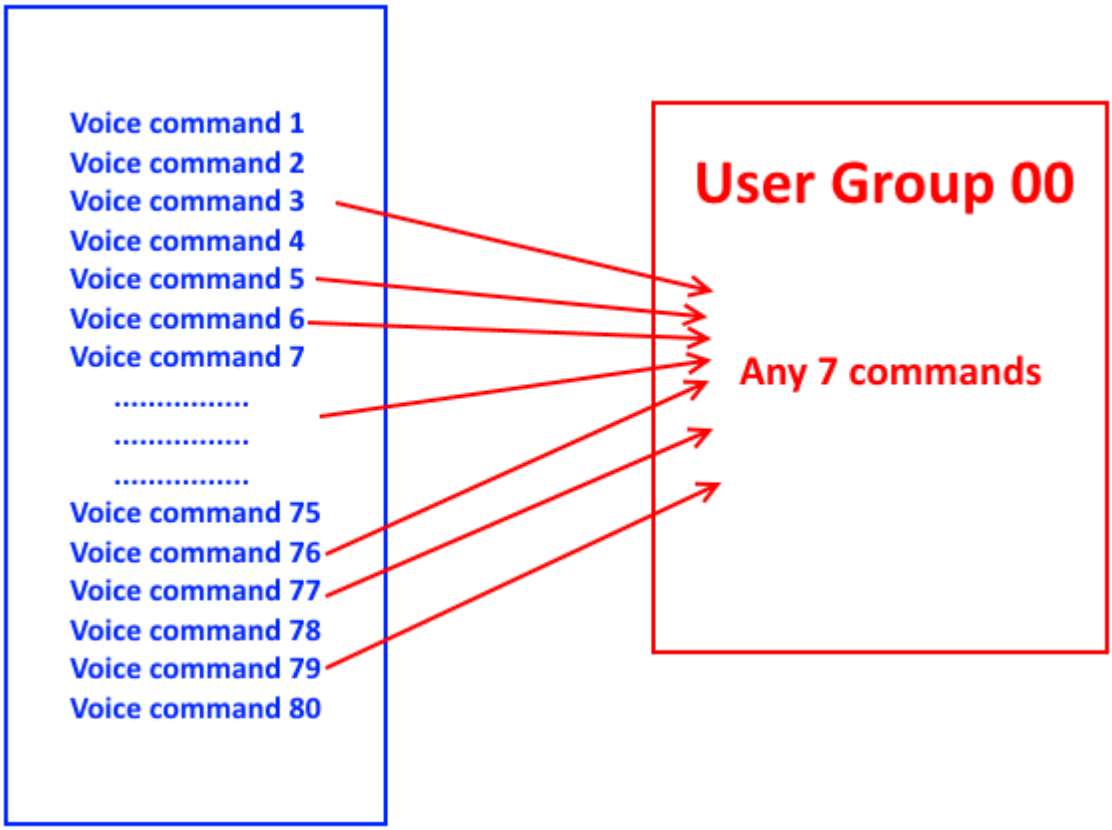
IN0	IN1	IN2	Group loaded
LOW	LOW	LOW	00
HIGH	LOW	LOW	01
LOW	HIGH	LOW	02
HIGH	HIGH	LOW	03
LOW	LOW	HIGH	04
HIGH	LOW	HIGH	05
LOW	HIGH	HIGH	06
HIGH	HIGH	HIGH	07

There are two kinds of groups: System Group and User Group

While you training voice commands, each command has an unique ID. System Groups are divided by those IDs.



However, User Group allows you to set up a group in any way you want.



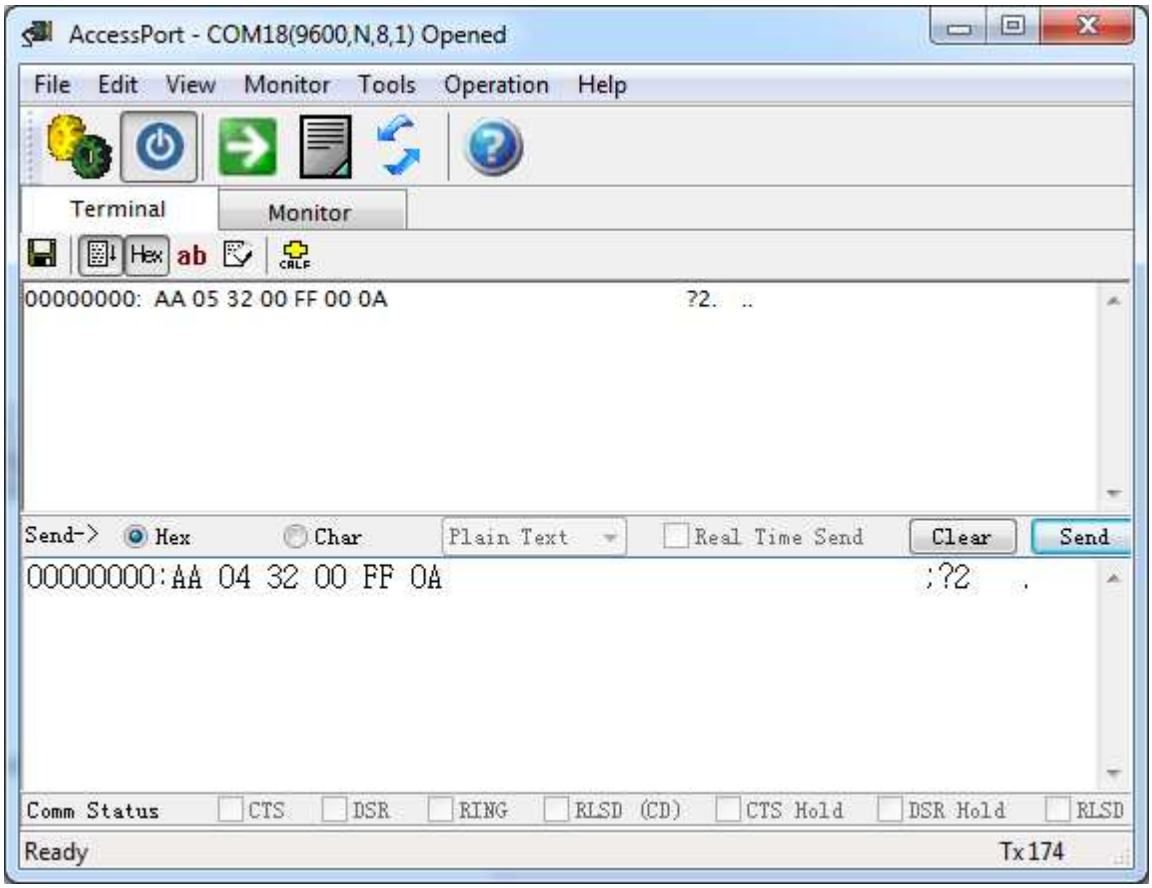
Group select

Set group control mode (disable, system, user), if group control function is enabled (system or user), then voice recognition module is controlled by the external control IO.
Format:
| AA| 04 | 32 | 00 | MODE | 0A |
MODE:
Return:
| AA| 03 | 32 | 00 | 0A |
or
| AA| 05 | 32 | 00 | FF | MODE | 0A | (check command return)

	Description
MODE	New group control mode. • 00-disable • 01-system • 02-user • FF-check

Example:

check the status of group control



Set/Delete user group

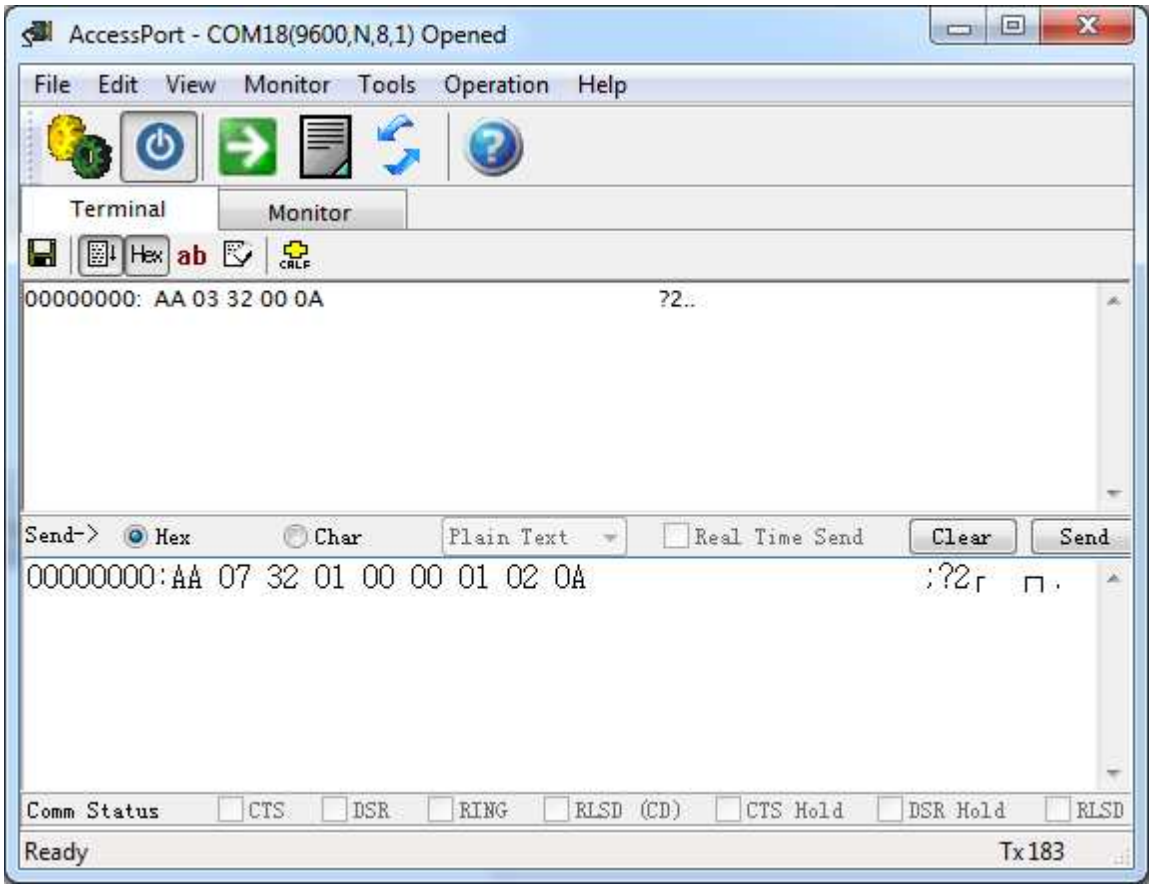
Set user group content(record).
Format:
| AA| 03 | 32 | 01 | UGRP | 0A | (Delete UGRP)
| AA| LEN | 32 | 01 | UGRP | R0 | ... | Rn | 0A | (Set UGRP)

Return:
| AA| 03 | 32 | 00 | 0A | (Success return)

	Description
UGRP	user group number
R0~Rn	record index number n=0,1,... Max 7 voice records

Example:

Set Group 00 with Voice command 00, 01, 02

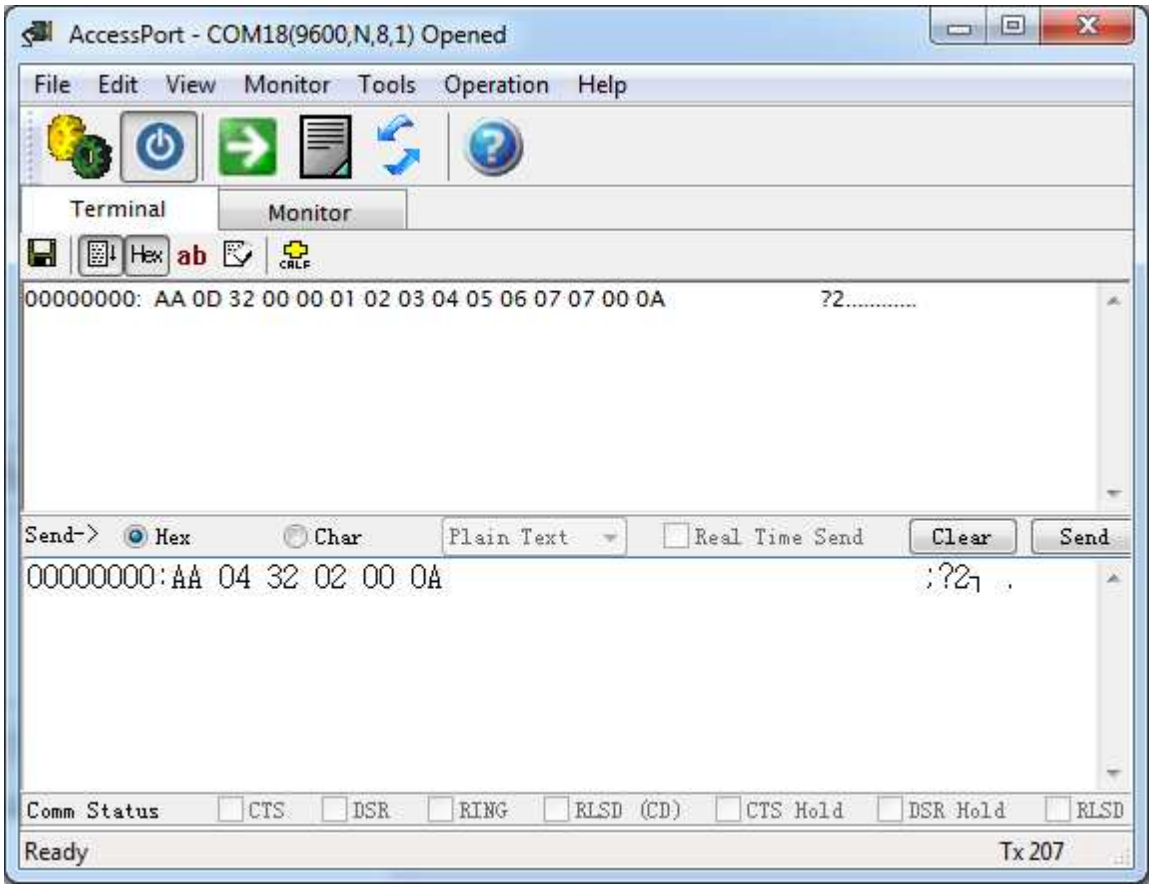


Load system group

Load system group to recognizer, this command would clear recognizer.
Format:
| AA| 04 | 32 | 02 | SGRP | 0A |
Return:
| AA| 0D | 32 | SGRP | VRI0 | VRI1 | VRI2 | VRI3 | VRI4 | VRI5 | VRI6 | RTN | VRMAP | GRPM | 0A |

	Description
SGRP	system group number
VRIn	n=0~6 Record which is in recognizer, n is recognizer index value
RTN	Number of total records in recognizer.
VRMAP	Valid record bit map for VRI0~VRI6
GRPM	Group mode indicate. (00~0A-system group)

Example:



In the example, VRMAP is 0x07. That is 0000111. So command index 00, 01, 02 is valid.

Load user group

Load user group to recognizer, this command would clear recognizer.
Format:
| AA| 04 | 32 | 03 | UGRP | 0A |
Return:
| AA| 04 | 32 | UGRP | VRI0 | VRI1 | VRI2 | VRI3 | VRI4 | VRI5 | VRI6 | RTN | VRMAP | GRPM | | 0A |

	Description
UGRP	user group number
VRIn	n=0~6 Record which is in recognizer, n is recognizer index value
RTN	Number of total records in recognizer.
VRMAP	Valid record bit map for VRI0~VRI6
GRPM	Group mode indicate. (00~0A-system group)

Check user group

Check user group content.
Format:
| AA| 03 | 32 | 04 | 0A | (check all user group)
or
| AA| LEN | 32 | 04 | UGRP0| ... | UGRPn | 0A | (check user group)
Return:
| AA | 0A | 32 | UGRP | R0 | R1 | R2 | R3 | R4 | R5 | R6 | 0A |

	Description
UGRP	user group number
R0~R6	voice command record index.

Prompt (0A)

0A code only occurs in return data for training command.
Format:
NONE
Return:
| AA | 07 | 0A | RECORD | PROMPT | 0A |
RECORD: record which is in training
PROMPT: prompt string

	Description
RECORD	user group number
PROMPT	prompt string

Voice Recognized (0D)

0D code only occurs in the return data while voice command is recognized.
Format:
NONE
Return:
| AA | 07 | 0D | 00 | GRPM | R | RI | SIGLEN | SIG | 0A |

	Description
GRPM	Group mode indicate ● FF: not in group mode ● 00~0A: system group mode ● 80~87: user group mode
R	record which is recognized.
RI	recognizer index value for recognized record.

SIGLEN	signature length of the recognized record, 0 means on signature, on SIG area
SIG	signature content

Error (FF)

Error command is only used for Voice Recognition Module to return error status.
Format:
NONE
Return:
| AA | 03 | FF | ECODE | 0A |

	Description
ECODE	error code ● FF -- command undefined ● FE -- command length error ● FD -- data error ● FC -- subcommand error ● FB -- command usage error

Disclaimer and Revisions

The information in this document may change without notice.
Revision History

Rev.	Date	Author	Description
A	Sep. 29th, 2011	Wilson Shen	Initial version
B	Mar. 4th, 2013	Wilson Shen	V2
C	May.9th, 2014	Wilson Shen	V3