G20_User Guide_V1.04

Solution

Application Note

Datasheet

Document Title:	G20_User Guide_V1.04
Version:	1.04
Date:	2013-5-20
Status:	Release
Document Control ID:	G20_User Guide_V1.04

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Version History

Date	Version	Description of Change	Author
2012-11-18	V1.01	Add reset	Joe Chen
2012-12-5	V1.02	Add GPIOs	Joe Chen
2012-12-15	V1.03	Add short circuit protection	Joe Chen
2013-5-20	V1.04	Modify accessory information	Monya Li

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1 Introduction

This document describes features, functions and interfaces of G20 modem in great detail. G20 is a Quad-band GSM/GPRS modem that works on frequencies of GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz, which is a ideal solution for wireless M2M application, the modem features GPRS multi-slot class 10/8(optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With the help of this document user can understand G20 interface specifications, electrical and mechanical quickly.

Figure 1: G20 overview

Note: The G20 Modem is fully complying with RoHS requirements of European standards.

2 Key Features

G20 modem has the following features:

1. Standard AT commands set
2. SIM900 proprietary AT commands set

3. Watch-dog function
4. Voice call
5. GPIOs
6. ADC function
7. Short circuit protection

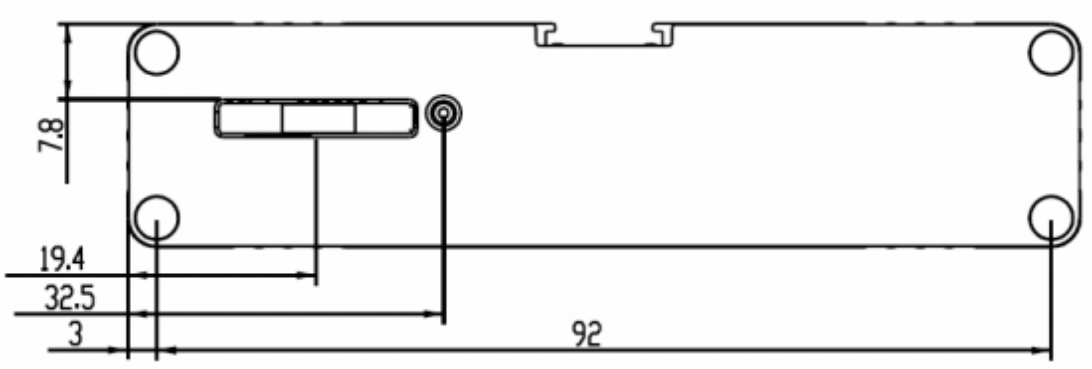
Table 1: G20 key features

Feature	Implementation
Power supply	5V ～ 16V
Power saving	Typical power consumption in sleep mode is 70mW(BS-PA-MFRMS=9)
Frequency bands	● G20 Quad-band: GSM 850, EGSM 900, DCS 1800, PCS 1900. G20 can search the 4 frequency bands automatically. The frequency bands also can be set by AT command "AT+CBAND". ● Compliant to GSM Phase 2/2+
Transmitting Power	● Class 4(2W) at GSM 850 and EGSM 900 ● Class 1(1W) at DCS 1800 and PCS 1900
GPRS connectivity	● GPRS multi-slot class 10 (default) ● GPRS multi-slot class 8 (option)
Temperature range	● Normal operation: -30℃～+80℃ ● Restricted operation: -40℃～-30℃ and +80℃～+85℃ * ● Storage temperature: -45℃～+90℃
Data GPRS	● GPRS data downlink transfer: max.85.6kbps ● GPRS data uplink transfer: max.42.8kbps ● Coding scheme: CS-1, CS-2, CS-3 and CS-4 ● Integrate the TCP/IP protocol ● Support Packet Broadcast Control Channel (PBCCH)
CSD	● Support CSD transmission
USSD	● Unstructured Supplementary Services Data (USSD) support
SMS	● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card
FAX	Group 3 Class 1
SIM interface	Support SIM card: 1.8V, 3V
External antenna	SMA type RF connector
Audio features	Speech codec modes: ● Half Rate (ETS 06.20) ● Full Rate (ETS 06.10) ● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80) ● Adaptive multi rate (AMR) ● Echo Cancellation

	● Noise Suppression
RS232 serial port	Serial port ● Full modem interface with status and control lines, unbalanced, asynchronous. ● 1200bps to 115200bps. ● Can be used for AT commands data stream. ● Support RTS/CTS hardware handshake and software flow control. ● Multiplex ability according to GSM 07.10 Multiplexer Protocol. ● Autobauding supports baud rate from 1200 bps to 57600 bps.
SIM Toolkit	GSM 11.14 Release 99
Physical characteristics	Size: 98*60*22mm Weight: 125g
Firmware upgrade	Firmware upgradeable by RS232 interface

* G20 does work at this temperature, but some radio frequency characteristics may deviate from the GSM specification.

3 Modem Dimensions



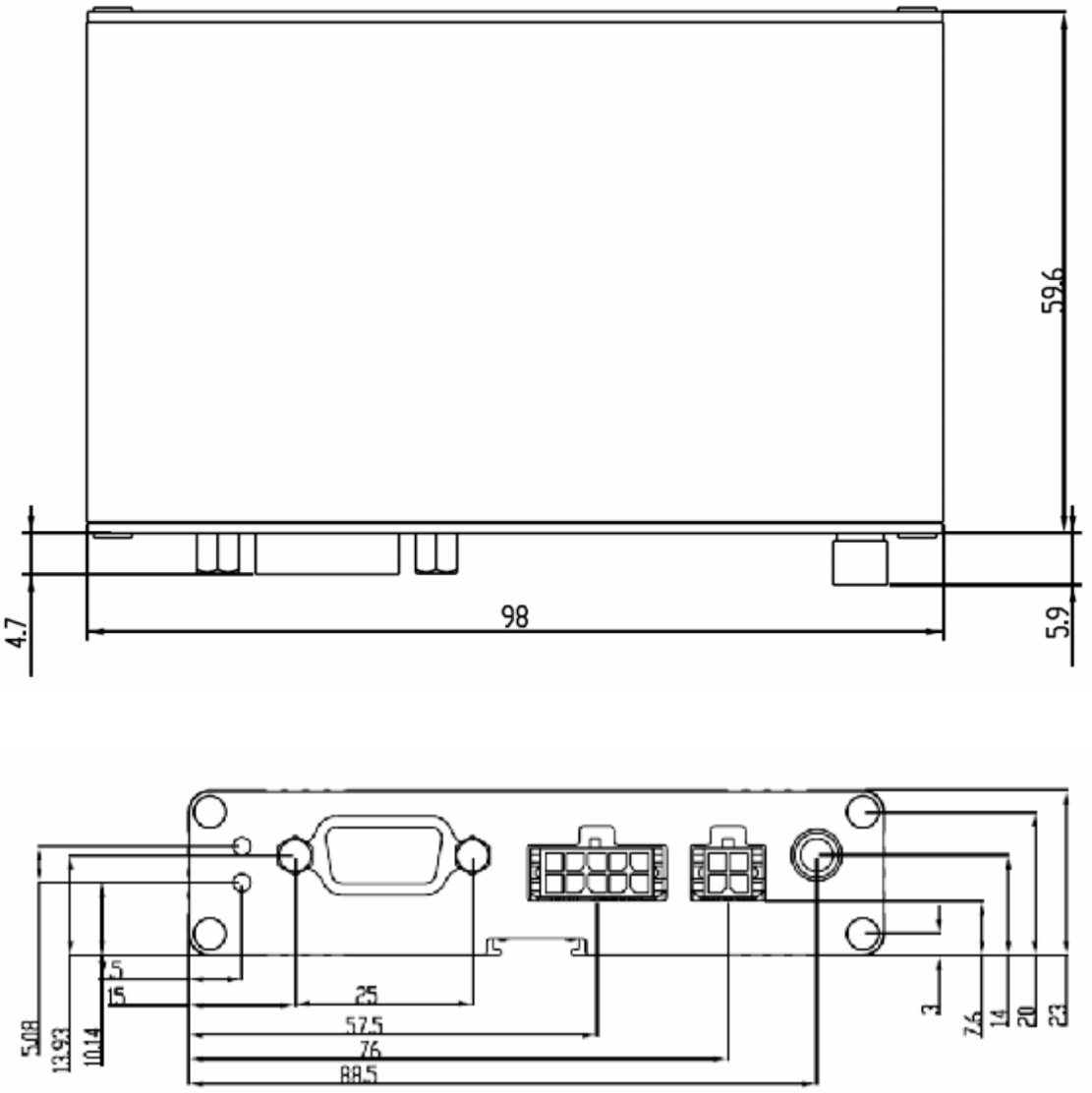


Figure 2: Mechanical dimensions of G20 (Unit: mm)

4 Installation

The modem can be fixed by two kickstands (Optional) that provided by SYSTECH, the following figure is the illustration.

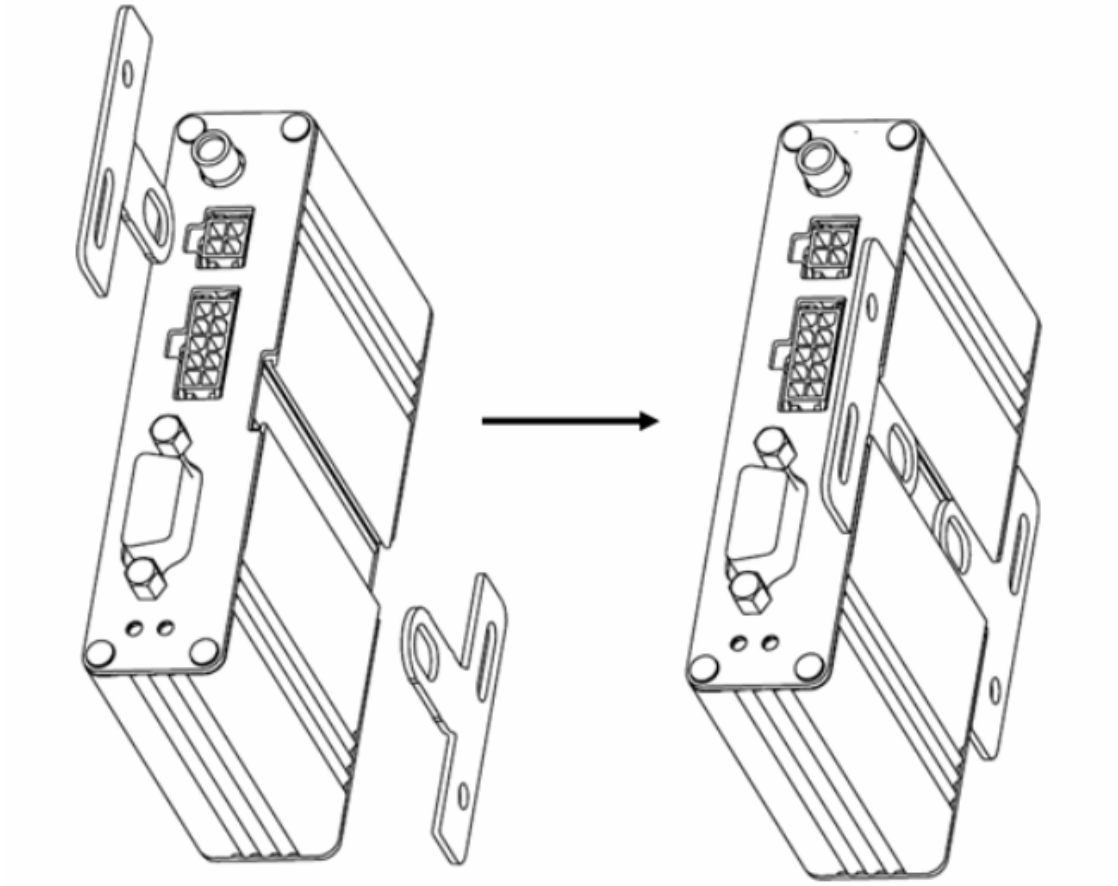


Figure 3: Installation of the modem

5 Interface Introduction

5.1 Overview

G20 Modem provides the following connectors for power supply, GPIOs, Audio, ADC, Serial port and antenna:

- The GSM antenna interface(SMA type female connector)
- The 4 PIN I/O port for power supply
- The 10 PIN I/O port for audio, GPIOs and ADC
- The standard RS232 interface
- LED indicator for power(RED) and GSM netlight(Green)
- SIM card holder
- Reset button

Figure 4: G20 interface Front view

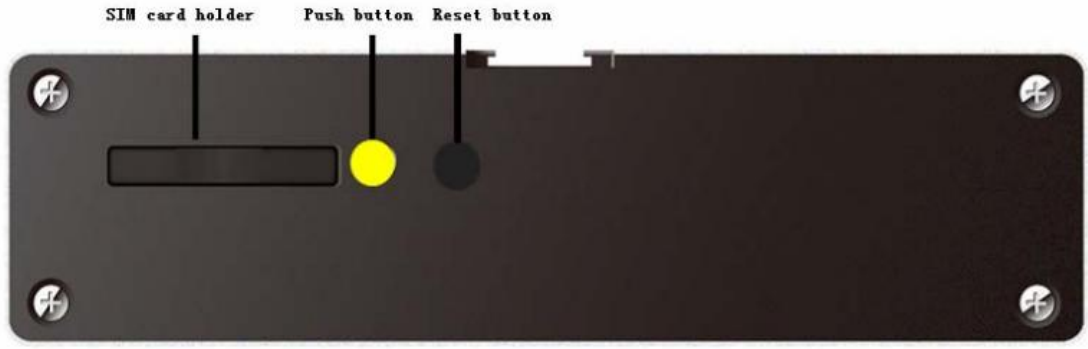


Figure 5: G20 interface Back view

Note: For the I/O interface, SYSTECH could provide 4-line cable and 10-line cable (optional) to assist developers; it will be introduced at the following chapter.

5.2 G20 functional diagram

The following figure shows a functional diagram of G20 and typical accessories.

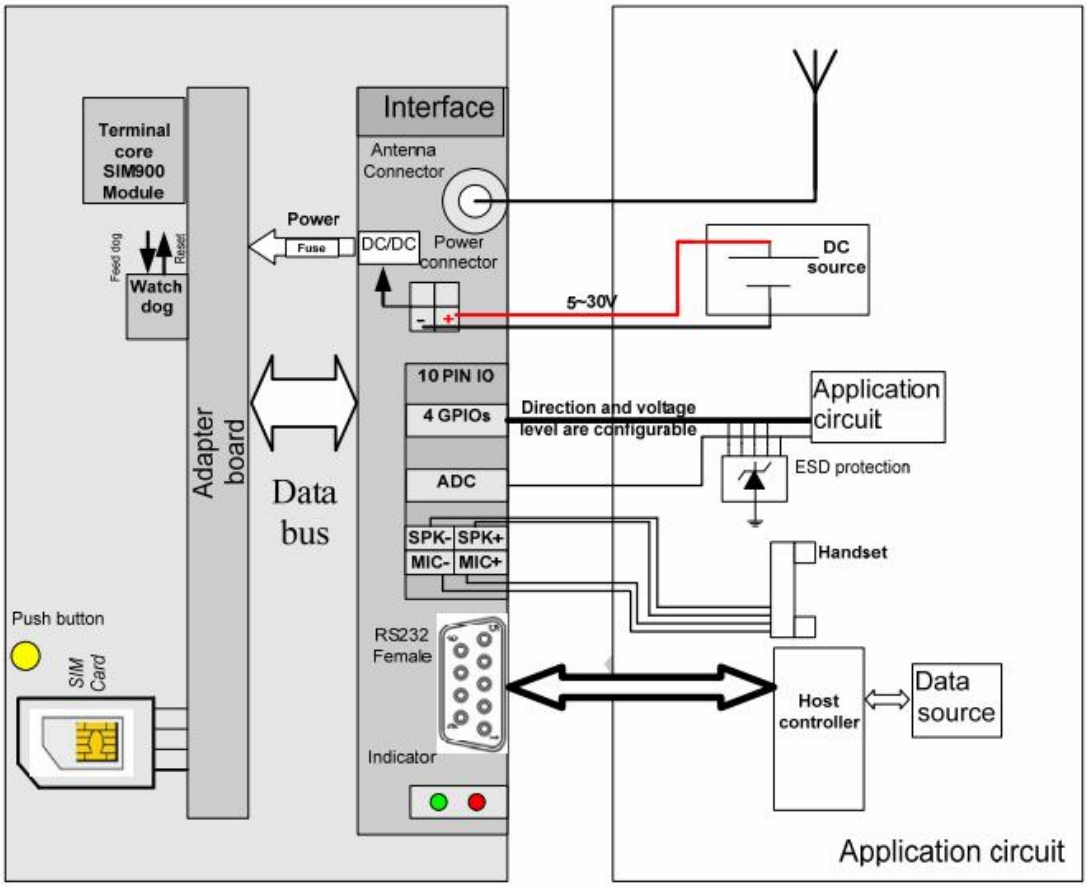


Figure 6: G20 functional diagram

5.3 Accessory information

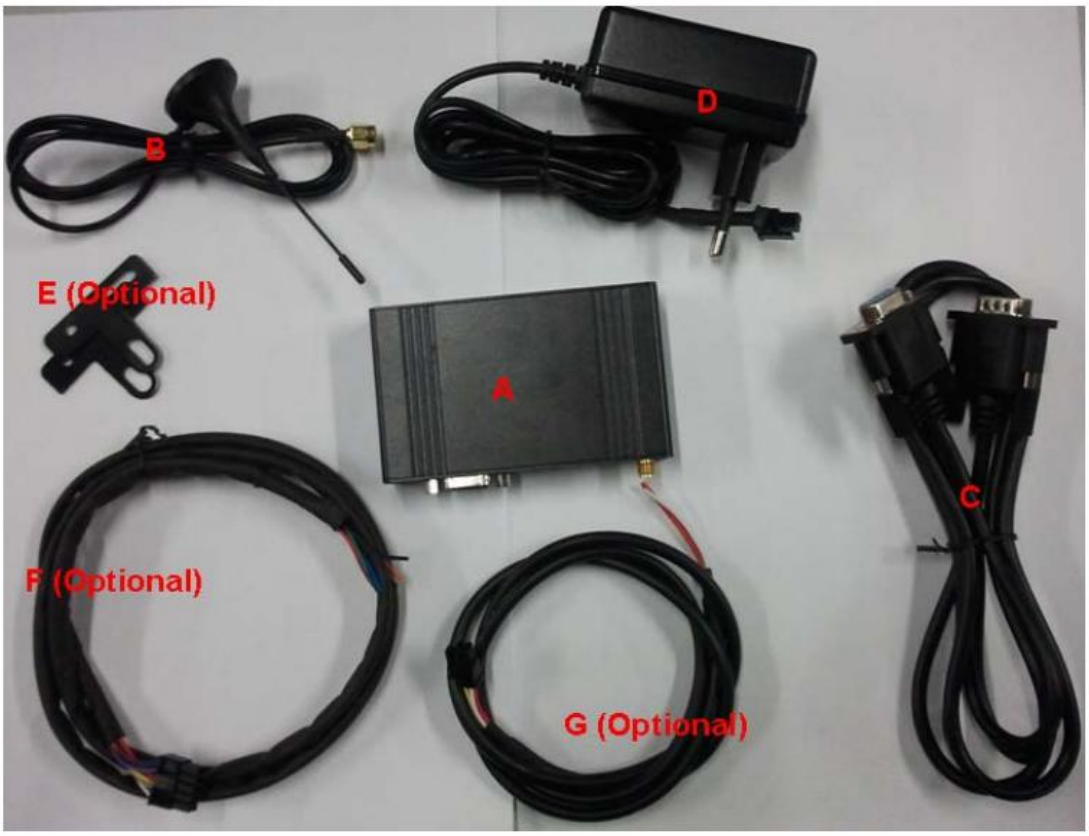


Figure 7: Accessory information

A: G20 Modem
B: GSM Antenna
C: Male to Female DB9 Line
D: 6V Adapter
E: Two kickstands (Optional)
F: 10-line cable （Optional）
G: 4-line power line (Optional)

6 Application Interface

6.1 Power supply

Customer can use the DC adapter that SYSTECH provides as the power source.
If customer does not use the adapter, then DC source should be satisfied with the following requirements.

- Input voltage range 5～16V
- Normal voltage 6V
- Current ability 2A

Table 2: The consumption in sleep mode

G20	@5V	@12V	@15V
Sleep current	14.5mA	7.75mA	5.02mA

The following chapter introduces the power line that SYSTECH provides to customers, customer can power the modem by connect the modem to the DC source via this line.
The power line includes four lines as the following figure shows, and table 3 gives a detailed description.

Table 3: The power line assignment

PIN Number	Color	Item
1	white	NC
2	red	Power
3	yellow	NC
4	black	Ground

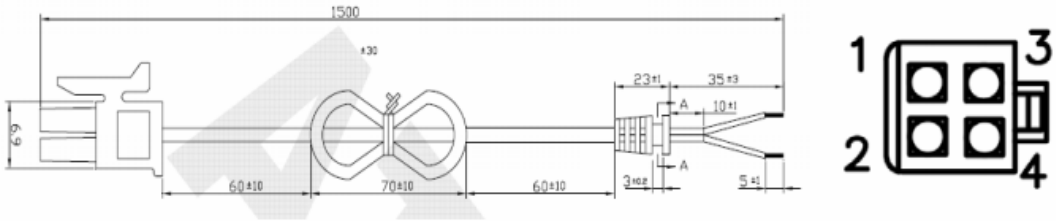


Figure 8: Dimensions of power line (Unit: mm)

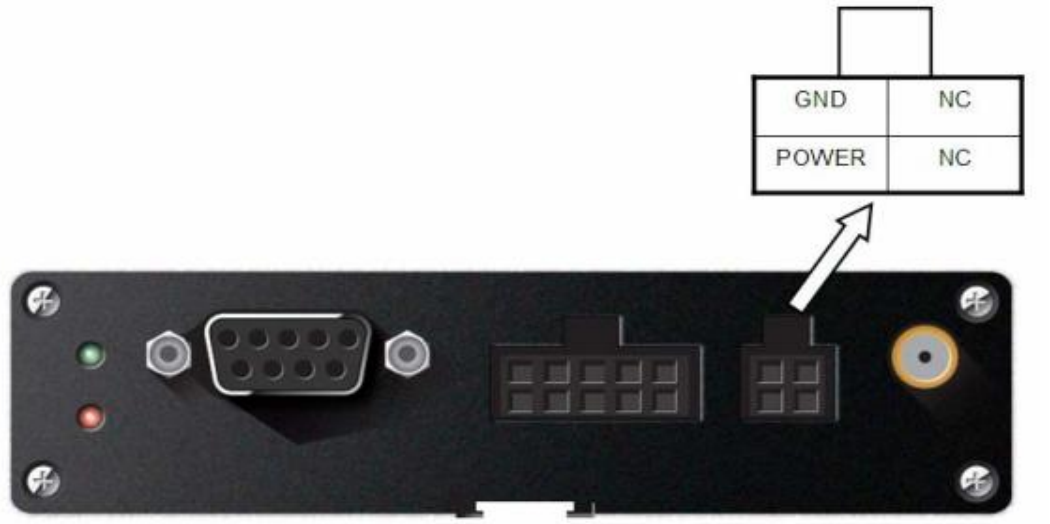


Figure 9: Power interface

When a valid power appears the modem will power up automatic, for the MCU that inside the modem processed the power up part, MCU also acts as a Watch Dog, when the modem runs wrong, MCU will cut off the power and recover it immediately to restart the modem.

6.2 Serial interface

G20 provides one asynchronous RS232 serial port (female). The RS232 standard interface serves to connect a PC, Data Terminal Equipment (DTE) or other application, which acts as host controller of the G20 modem with all its functions. Through the RS232 interface it can be used as GSM/GPRS modem for sending and receiving of SMS, Data and Fax calls.

Figure 10: Pin assignment RS232 (D-sub 9-pole female)

Table 4: 9-pole D-sub (female) RS232

Pin no.	Signal name	I/O	Function
1	DCD	O	Data Carrier Detected
2	RXD	O	Receive Data
3	TXD	I	Transmit Data
4	DTR	I	Data Terminal Ready Attention: The ignition of G20 modem is activated via a rising edge of high potential (+3 … +15V)
5	GND	-	Ground
6	DSR	O	Data Set Ready
7	RTS	I	Request To Send
8	CTS	O	Clear To Send
9	RI	O	Ring Indication

Note: G20 supports autobauding, autobauding allows G20 to automatically detect the baud rate of the host device. User can use AT command "AT+IPR=x" to set a fixed baud rate and the setting will be saved to non-volatile flash memory automatically. After the configuration is set as fixed baud rate, the URC such as "RDY", "+CFUN: 1" and "+CPIN: READY" will be reported when G20 is powered on.

Hyper terminal usually as the PC software tool to operate G20; customer can set up a connection between PC and modem, configure the port properties as the figure 11 shows.

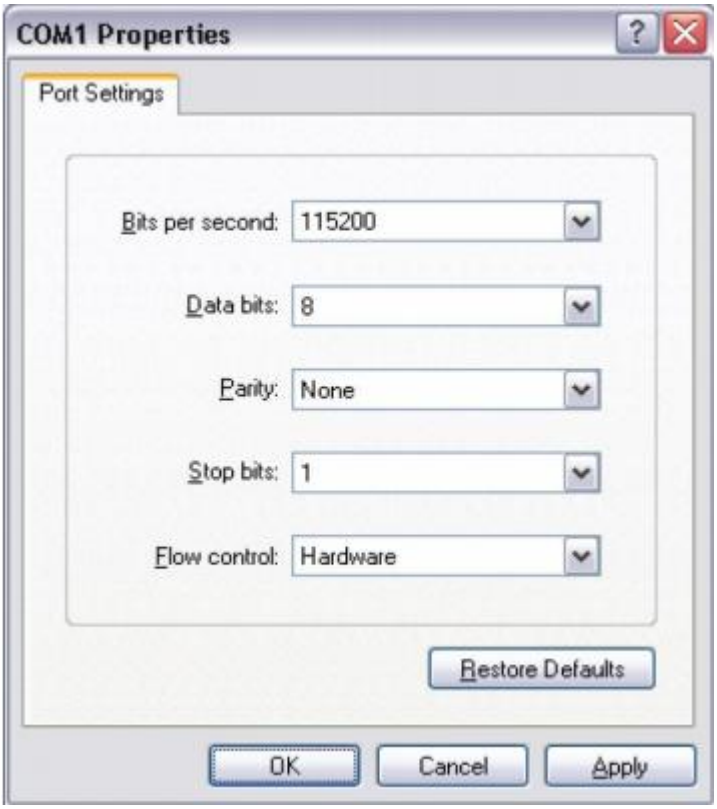


Figure 11: COM port properties of the hyper terminal

6.3 10 PIN I/O interface

G20 provides a 10 PIN I/O interface for customer use, including Audio, GPIOs and 1 ADC channel. The following figure gives a brief view of signal assignment.

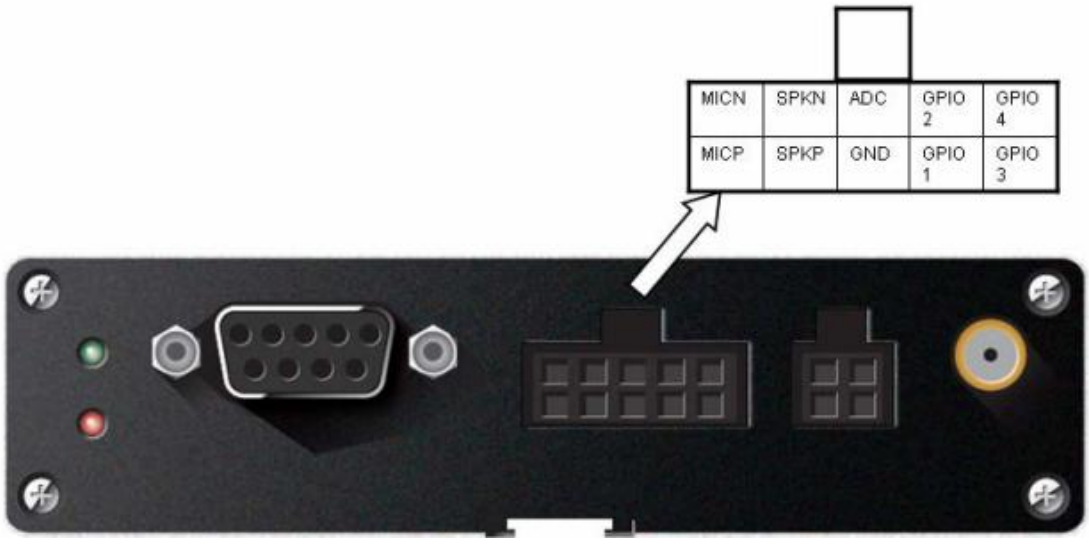


Figure 12: Signal assignment of 10 PIN I/O port

To make the usage conveniently, G20 provides a cable for customer, it can be inserted to the 10

PIN I/O port so customer can develop their application by connecting some devices.

Figure 13 shows the specification of the cable.

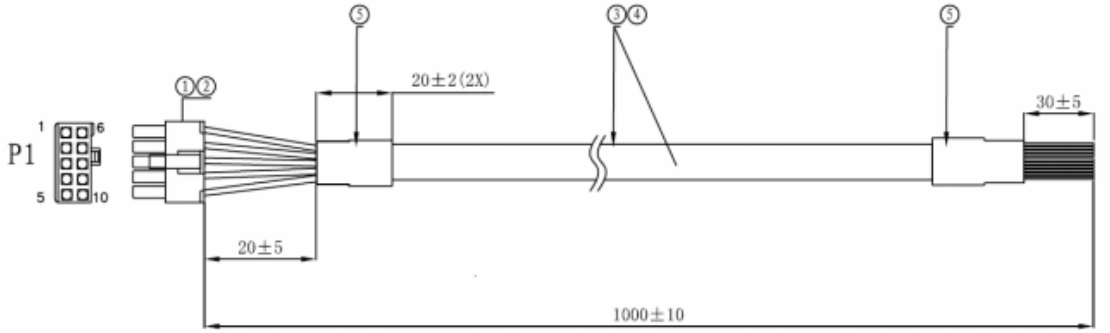


Figure 13: Dimension of 10-line cable

Table 5: Signal assignment of 10-line cable

Connecting diagram					
P1	**Wire color and cutting length**		**Modem signal**		
			Signal name	**I/O**	**Command**
1	Green	1007 26#	MIC+	I	
2	Yellow		SPK+	O	
3	Black		GND		Ground
4	Orange		GPIO1	I/O	Configurable by AT commands
5	Brown		GPIO3	I/O	
6	White		MIC-	I	
7	Gray		SPK-	O	
8	Red		ADC	I	
9	Purple		GPIO2	I/O	Configurable by AT commands
10	Blue		GPIO4	I/O	

6.3.1 Audio interface

G20 has one pair of audio input and audio output; it can be connected to a handset directly.

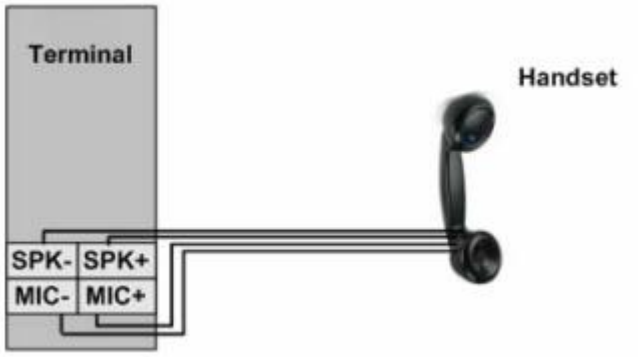


Figure 14: Audio reference circuit

Table 6: Audio output characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Normal Output(SPK)	RL=32 Ω THD=0.1%	-	91	-	mW
	RL=32 Ω THD=1%	-	96	-	mW
	Output swing Voltage (single ended)			1.1	Vpp
	Output swing Voltage (differential)			2.2	Vpp

Customer can set the modem MIC gain level to make the sounds louder so that the listener can hear more clearly. And if the sound a little lower on the modem side, customer can use the "AT+CLVL" to make the sound higher so that customer can hear clearly.

The AT commands should be send to the modem by RS232 interface, and the following table shows the detail commands.

Table 7: AT+CMIC Change the Microphone Gain Level

AT+CMIC Change the Microphone Gain Level	
Test Command **AT+CMIC=?**	Response **+CMIC:**(list of supported<**channel**>s),(list of supported<**gainlevel**>s) **OK**
	Parameters See Write Command

Read Command **AT+CMIC?**	Response **+CMIC:(<channel0>,<gainlevel0>),…,(<channel*n*>,<gainlevel*n*>)** **OK**
	Parameters See Write Command
Write Command **AT+CMIC=<channel>,<gain level>**	Response **OK** **ERROR**
	Parameters <**channel**> 0 Main audio handset channel <**gain level**>Int: 0 – 15 0 0dB 1 +1.5dB 2 +3.0dB 3 +4.5dB 4 +6.0dB 5 +7.5dB 6 +9.0dB 7 +10.5dB 8 +12.0dB 9 +13.5dB 10 +15.0dB 11 +16.5dB 12 +18.0dB 13 +19.5dB 14 +21.0dB 15 +22.5dB
Example:	**AT+CMIC=0,10** This command used to set the modem MIC gain level to +15.0dB.

Table 8: AT+CLVL Change the Speaker Volume Level

AT+CLVL Loud Speaker Volume Level	
Test Command **AT+CLVL=?**	Response **+CLVL:**(list of supported<**level**>s) **OK** If error is related to ME functionality:

	+CME ERROR: <err>
	Parameter See Write Command
Read Command **AT+CLVL?**	Response **+CLVL:**<**level**> **OK** If error is related to ME functionality: **+CME ERROR: <err>**
	Parameter See Write Command
Write Command **AT+CLVL=** **<level>**	Response **OK** If error is related to ME functionality: **+CME ERROR: <err>**
	Parameter <**level**> 0 – 100 Integer type value with manufacturer specific range (smallest value represents the lowest sound level)
Reference GSM 07.07[13]	Note

6.3.2 ADC channel

G20 provides an auxiliary ADC, which can be used to measure the voltage. User can use AT command "AT+CADC" to read the voltage value.

Table 9: ADC specification

Parameter	Min	Typ	Max	Unit
Voltage range	0	-	2.8	V
ADC Resolution	-	10	-	bits
Sampling rate	-	-	200K	Hz

Note: The maximum voltage that the ADC can gather is 2.8V

Table 10: AT+CADC Read ADC

AT+CADC Read ADC	
Test Command	Response

AT+CADC=?	**+CADC:**(list of supported<**status**>s), (list of supported<**value**>s) **OK**
	Parameters <**status**> 1 Success 0 Fail <**value**> Integer 0 - 2800
Read Command **AT+CADC?**	Response **+CADC:**<**status**>,<**value**> **OK**
	Parameters See Test Command

6.3.3 GPIO interfaces

G20 provides 4 GPIO pins. The output voltage level of the GPIO can be set by the AT command "AT+SGPIO". The input voltage level of the GPIO can also be read by the AT command "AT+SGPIO". The following table shows the detail commands about GPIO.

Table 11: AT+SGPIO Control the GPIO

AT+SGPIO Control the GPIO	
Test Command **AT+SGPIO=?**	Response **+SGPIO:** (**0-1**),(**1-12**),(**0-2**),(**0-1**) **OK**
	Parameters See Write Command
Write Command **AT+SGPIO=<operation>,<GPIO>,<function>,<level>**	Response **OK** **ERROR**
	Parameters <**operation**> 0 Set the GPIO function including the GPIO output and GPIO as the keypad. 1 Read the GPIO level. Please note that only when the GPIO is set as input, user can use parameter 1 to read the GPIO level, otherwise the module will return "ERROR". <**GPIO**> The GPIO you want to be set. (It has relations with the hardware, please refer to the hardware manual)

	<**function**>	Only when <operation> is set to 0,this option takes effect.	
		0	Set the GPIO to input
		1	Set the GPIO to output.
		2	Set the GPIO to keypad
	<**level**>	0	Set the GPIO low level
		1	Set the GPIO high level

6.4 Antenna interface

6.4.1 Antenna connector

Antenna connector allows transmission of radio frequency (RF) signals between the modem and the external supplied antenna. The G20 modem is fitted with a 50Ω male SMA connector.

Figure 15: Antenna interface

6.4.2 Antenna specifications

The antenna is a very important component in the system. Since the antenna transmits and receives electromagnetic signal, and its efficiency depends on the antenna's type, placement and the environment of the antenna operating.

The recommended antenna specifications are showed in Table 12:

Table 12: Antenna specifications

Frequency range	**GSM 850/900/1800/1900 MHz**
Impedance	50 ohm
Input power	＞33dBm (2W) peak power in GSM

VSWR recommended	≤2:1
VSWR absolute max	≤10:1
Gain	≤3dBi

6.4.3 Antenna placement

The antenna performance is very easily influenced by other electronic devices. So the antenna placement should be considered carefully as follow.

1. Place away from other electronic devices or other antennas.
2. Place far away from metal material.
3. Face the base station antenna directly if the signal strength is very weak.

6.5 LED indicator

A red led indicates the power status, when a valid power appears, the red led will lighten up. But a lighten up red led does not mean that the modem has been powered up.

A green led indicates the modem status and GSM net status, after the modem been powered up and registered to the network, it will blink at a certain frequency.

Figure 16: Indicator LED

Table 13: Status of the NETLIGHT indicator (Green)

Status	G20 behavior
Off	G20 is not running
64ms On/ 800ms Off	G20 not registered the network
64ms On/ 3000ms Off	G20 registered to the network
64ms On/ 300ms Off	GPRS communication is established

6.6 SIM card interface

The SIM interface complies with the GSM Phase 1 specification and the new GSM Phase 2+ specification for FAST 64 kbps SIM card. Both 1.8V and 3.0V SIM card are supported. The SIM interface is powered from an internal regulator inside the modem.

G20 support SIM card "hot" plug, which means that the modem can sense the SIM card inserted in or drawn out when the module is on. AT command "AT+CSDT" is used to enable or disable SIM card detection function. For details of this AT command, please refer to the following table.

Table 14: AT+CSDT Switch On or Off Detecting SIM Card

AT+CSDT	**Switch On or Off Detecting SIM Card**
Test Command **AT+CSDT=?**	Response **+CSDT:(0-1)** **OK**
	Parameter See Write Command
Read Command **AT+CSDT?**	Response **+CSDT:<mode>** **OK**
	Parameter See Write Command
Write Command **AT+CSDT=** **<mode>**	Response **OK** **ERROR**
	Parameter **<mode>** 0 Switch off detecting SIM card 1 Switch on detecting SIM card

Note: When the detecting function is activated, the status of SIM card will auto report via the serial port. The sensing of a hot removal of the SIM is not supported during power saving mode (AT+CFUN=4).

Figure 17: Installation of SIM card

6.7 Reset

The RESET button is used to reset the modem. The function is used as an emergency reset only when the modem has no effect. The RESET button could be pulled down to reset the modem. The reset timing is illustrated in the following figure.

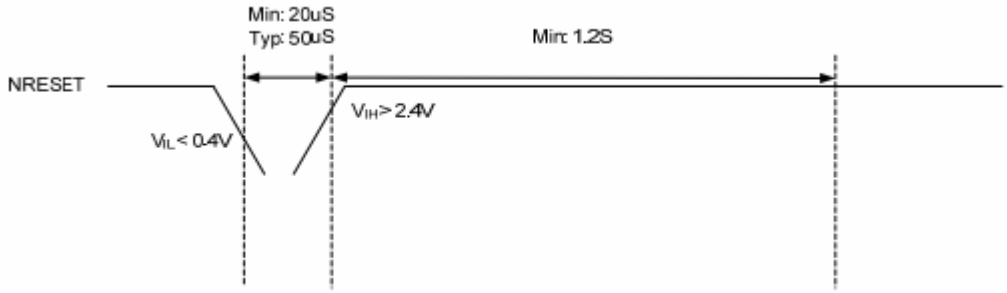


Figure 18: Reset timing

Note: It is recommended to cut off the power supply directly instead of using reset button when the modem can not respond.

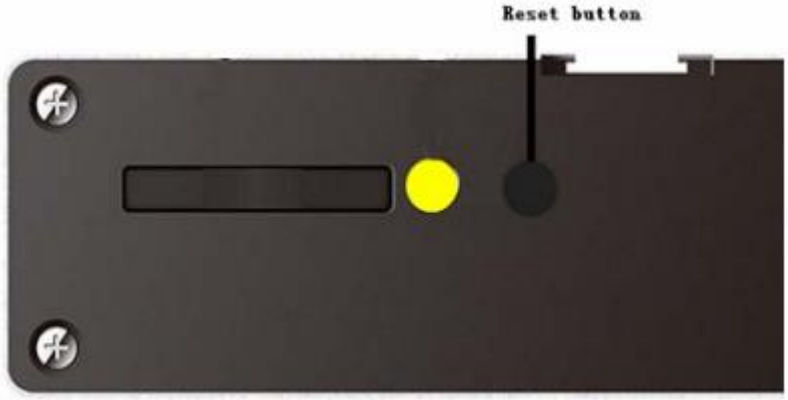


Figure 19: Reset button

7 Electrical, Reliability and Radio Characteristics

7.1 Absolute maximum ratings

The absolute maximum ratings stated in following table are stress ratings under non-operating conditions. Stresses beyond any of these limits will cause permanent damage to G20.

Table 15: Absolute maximum ratings

Symbol	Parameter	Min	Typ	Max	Unit
VBAT	Power supply voltage	4.5	-	16	V
V_I*	Input voltage	-0.3	-	3.1	V
I_I*	Input current	-	-	10	mA
I_O*	Output current	-	-	10	mA

*These parameters are for digital interface pins, such as GPIO, UART and DEBUG.

7.2 Recommended operating conditions

Table 16: Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
VBAT	Power supply voltage	5	6	16	V
T_{OPER}	Operating temperature	-40	+25	+85	℃
T_{STG}	Storage temperature	-45		+90	℃

7.3 Electro-Static discharge

G20 is an ESD sensitive component, so more attention should be paid to the procedure of handling and packaging. The ESD test results are shown in the following table.

Table 17: The ESD characteristics (Temperature: 25℃, Humidity: 45%)

Test item	Contact discharge	Air discharge
Shell	±10KV	±15KV
RF interface	±10KV	±15KV
RS232 interface	±10KV	±15KV
Audio interface	±10KV	±15KV
SIM card holder	±10KV	±15KV

7.4 Operating frequency

The operating frequencies in GSM850, EGSM900, DCS, PCS modes are conform to the GSM Specifications, shown as bellow.

Table 18: Operating frequency

Mode	Freq.TX(MHz)	Freq.RX(MHz)	Channels(A RFC)	TX-RX offset
GSM-850	824-849	869-894	128-251	45MHz
EGSM-900	890-915	935-960	0-124	45MHz
	880-890	925-935	975-1023	45MHz
DCS-1800	1710-1785	1805-1880	512-885	95MHz
PCS-1900	1850-1910	1930-1990	512-810	80MHz

7.5 Transmitter output power and receiver sensitivity

The G20's conducted transmitter output power and receiver sensitivity are shown as bellow:

Table 19: Transmitter output power and receiver sensitivity

Mode	Power(dBm)	Sensitivity(dBm)
GSM-850	+33	-108
EGSM-900	+33	-108
DCS-1800	+30	-107
PCS-1900	+30	-107

8 Software/ Firmware Upgrade

The software can be upgraded via the RS232 interface with the help of tools provided by SYSTECH.

8.1 Tool introduction

The tool name is "*SIM900 Series download Tools Customer 1.6*", which runs on the windows OS, customers can upgrade software conveniently by it.
This tool is a single-road download tool, one modem can be upgraded by it every time. SYSTECH also provides multi-road download tools for customer's factory use. Contact SYSTECH sales for support.

8.2 Illustration of software updating

- Open the tools, the main operation interface as the figure 20 shows:

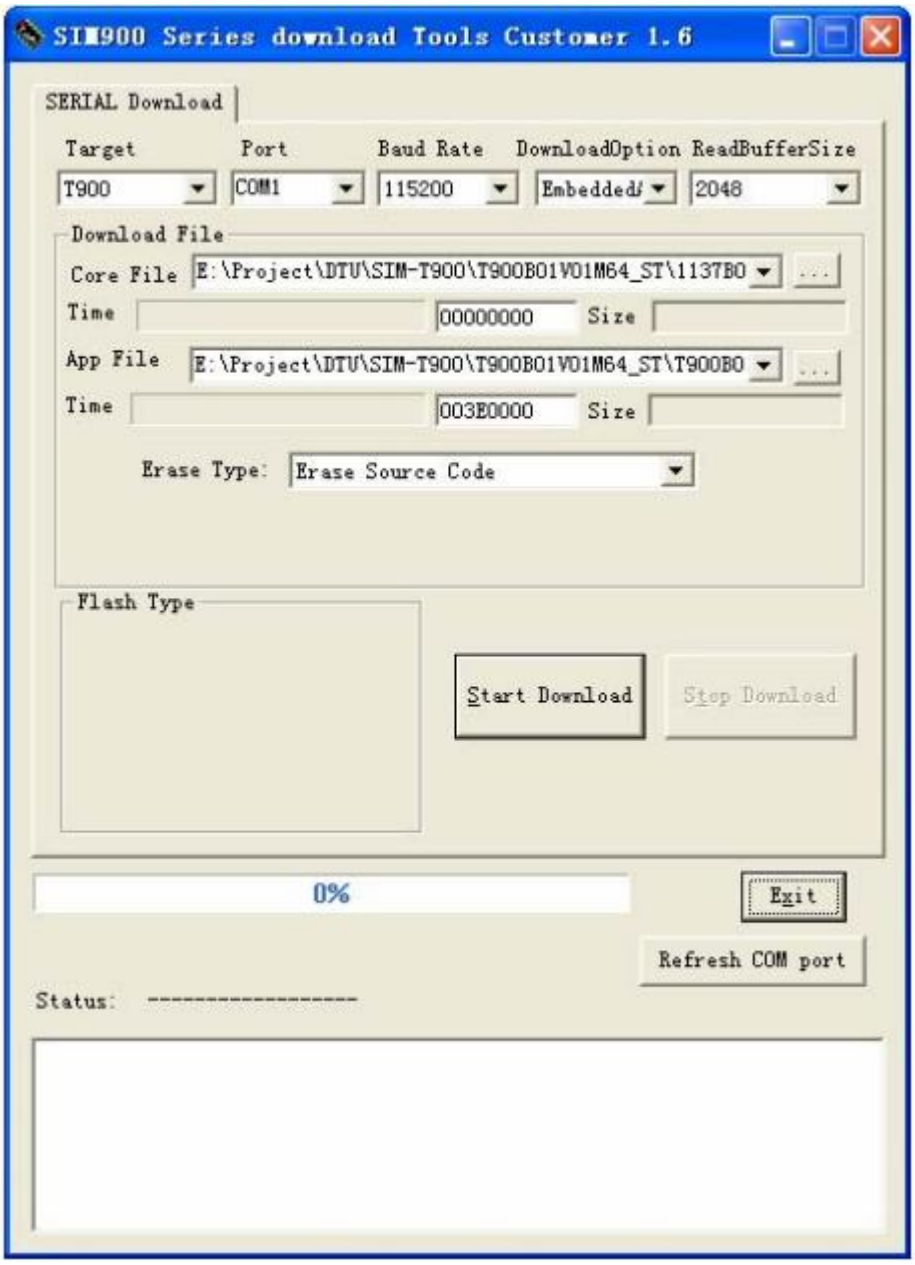


Figure 20: Main UI

- Configure the download parameter

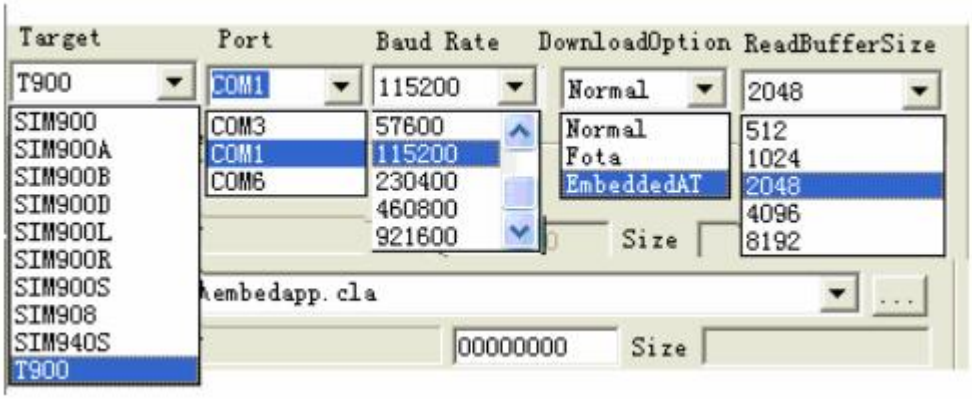


Figure 21: Parameter setting

- Browse the source file

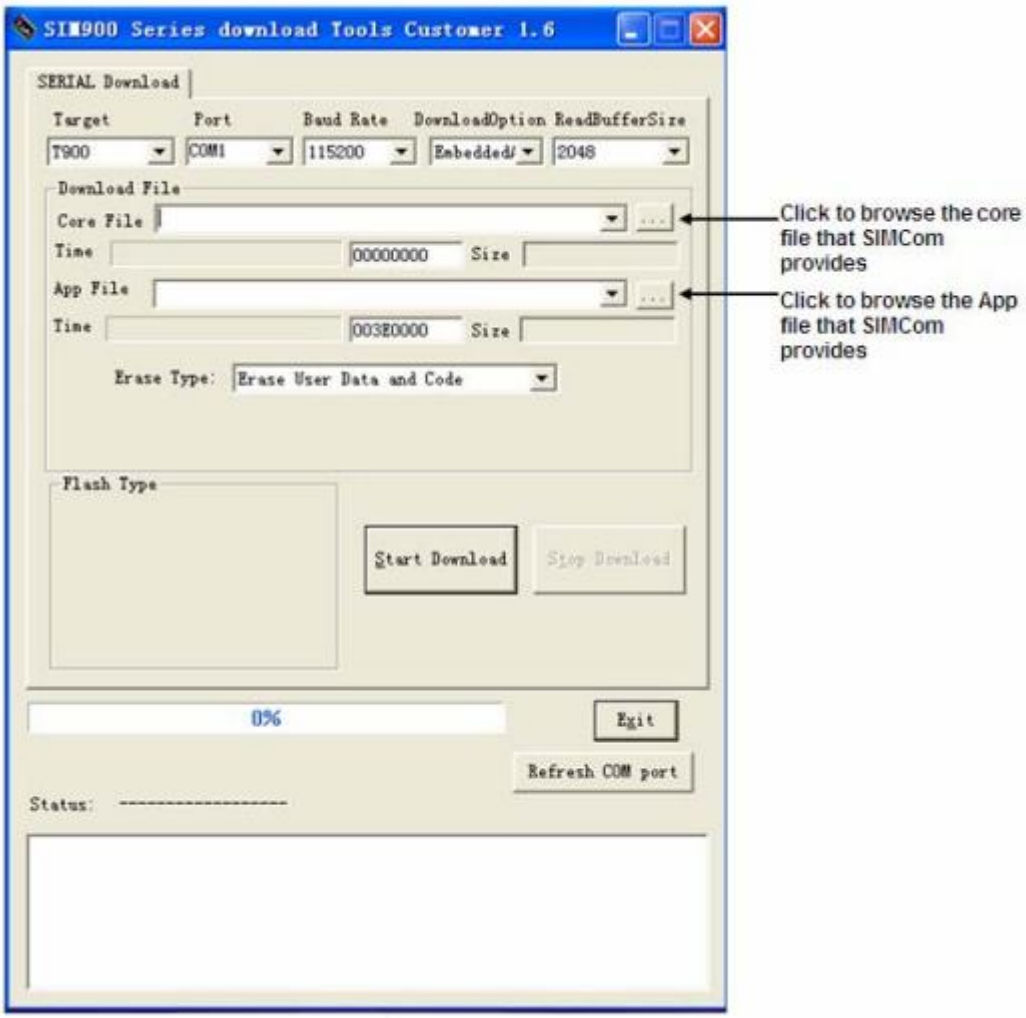


Figure 22: Browse the source file

- Modem setup

  Before click the "Start Download", make sure that the modem is off, and connect the modem

to PC by RS232 interface.

Figure 23: Connect to PC by RS232 interface without power up

- Software download

  Click the button “Start Download”, then the window will change like the following figure shows.

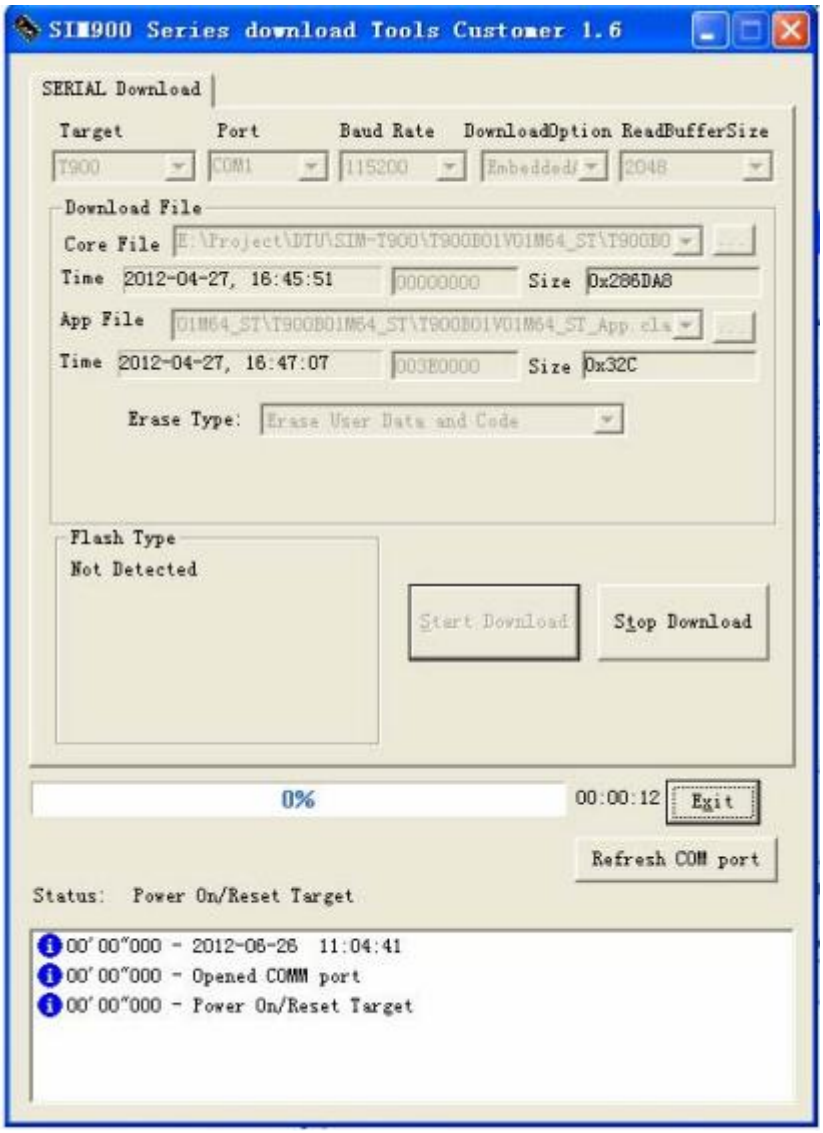


Figure 24: Click download button without power up

When the status window shows “Power On/ Reset Target”, powering up the modem by connecting the DC source.

Figure 25: Power up the modem

- Upgrade in proceeding

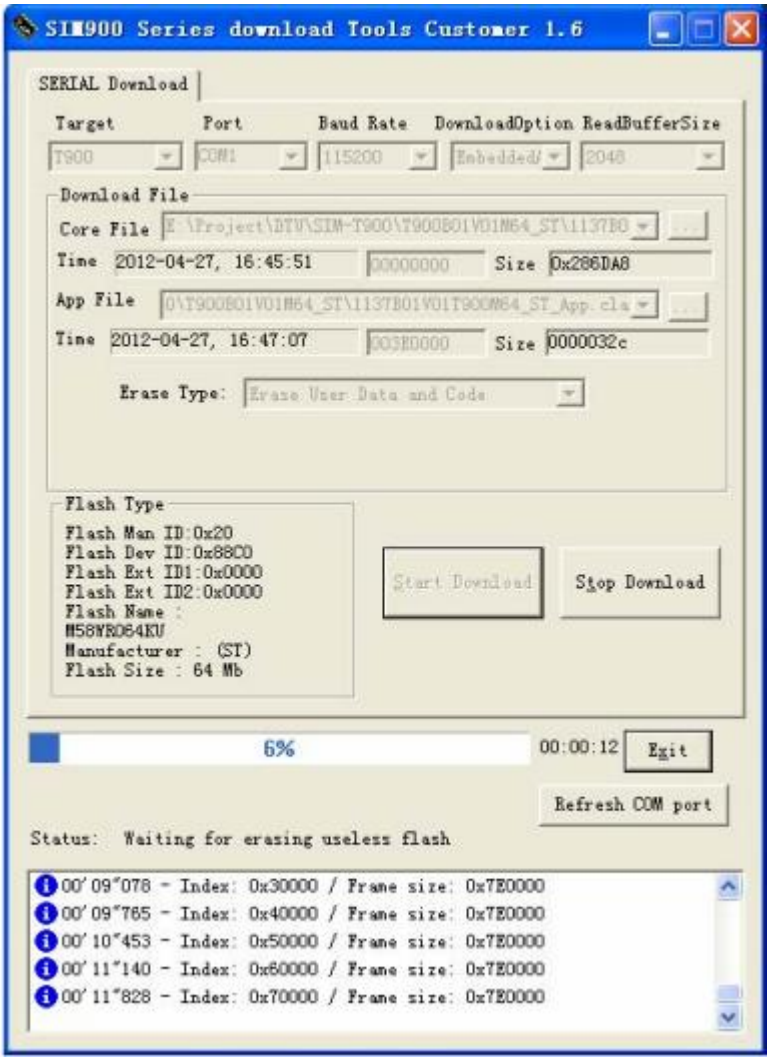


Figure 26: Upgrade in proceeding

- Finish upgrading

  Now the software is the new version, click "Exit" to finish upgrading, customer can check the software version by "AT+GSV".

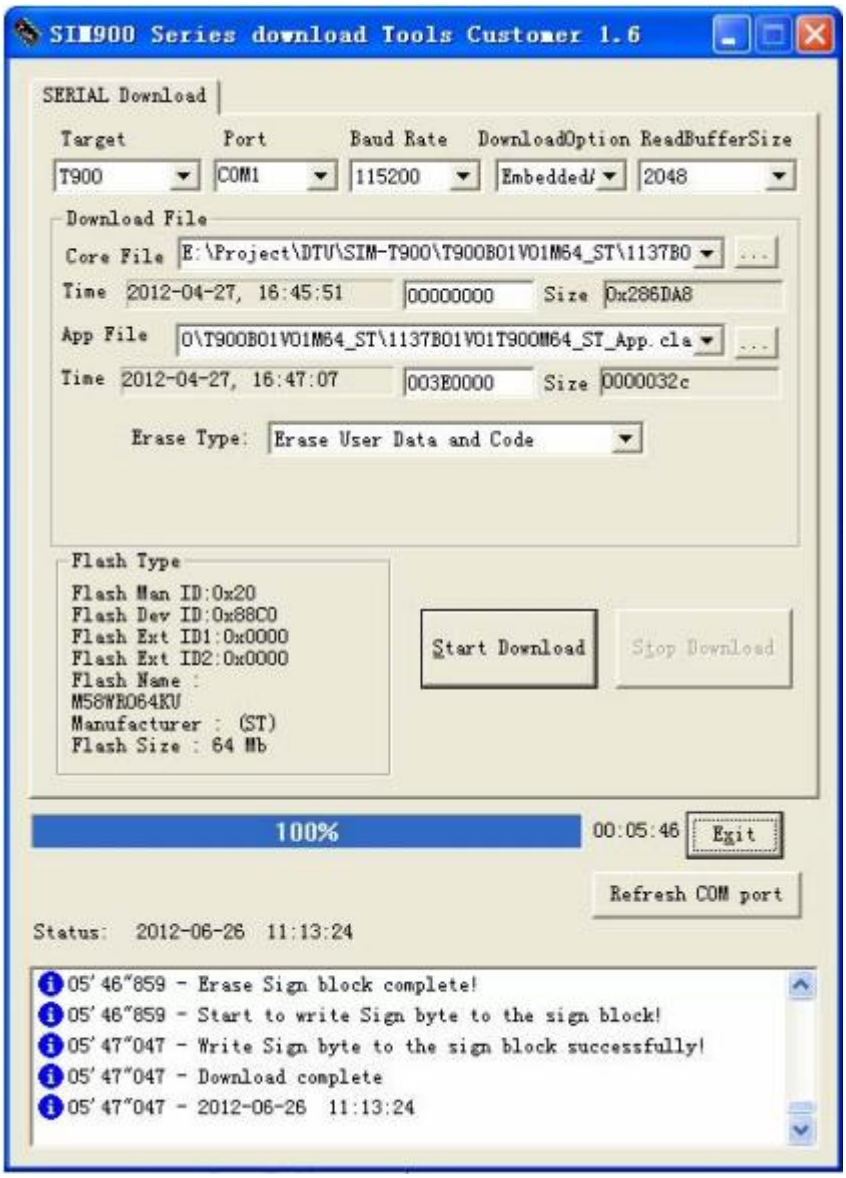


Figure 27: Finish upgrading

Appendix

A. Related Documents

Table 20: Related documents

SN	Document name	Remark
1	SIM900_AT Command Manual	SIM900 AT Command Manual
2	AN_SIM900_TCPIP	TCP/IP Applications User Manual
3	SIM900_Multiplexer User Manual_Application Note	SIM900 Multiplexer User Manual Application Note
4	AN_SIM900_AUDIO	Application Note About SIM900 Audio
5	AN_SIM900_Audio LINE-IN input	Application Note About SIM900 LINE-IN Input
6	SIM900_Embedded AT Application Note	SIM900 Embedded AT Application Note
7	AN_Serial Port	Application Note About Serial Port
8	SIM900_Serial Update Tool UGD	Update Tool User Manual
9	ITU-T Draft new recommendation V.25ter:	Serial asynchronous automatic dialing and control
10	GSM 07.07:	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment(ME)
11	GSM 07.10:	Support GSM 07.10 multiplexing protocol
12	GSM 07.05:	Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment-Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
13	GSM 11.14:	Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module-Mobile Equipment (SIM-ME) interface
14	GSM 11.11:	Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module-Mobile Equipment (SIM-ME) interface
15	GSM 03.38:	Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information
16	GSM 11.10:	Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part1: Conformance specification

B. Terms and Abbreviations

Table 21: Terms and abbreviations

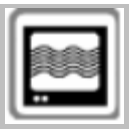
Abbreviation	Description
ADC	Analog-to-Digital Converter
AMR	Adaptive Multi-Rate
AT	Attention commands

CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DTE	Data Terminal Equipment (typically computer, terminal, printer)
DTR	Data Terminal Ready
DTU	Data Transmit Unit
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FR	Full Rate
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
IMEI	International Mobile Equipment Identity
Li-ion	Lithium-Ion
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
NC	NO Connect
NA	Not Access
PAP	Password Authentication Protocol
PBCCH	Packet Broadcast Control Channel
PCB	Printed Circuit Board
PCL	Power Control Level
PCS	Personal Communication System, also referred to as GSM 1900
PDU	Protocol Data Unit
PPP	Point-to-Point Protocol
RF	Radio Frequency
RMS	Root Mean Square (value)
RTC	Real Time Clock
RX	Receive Direction
SIM	Subscriber Identification Module
SMS	Short Message Service
TE	Terminal Equipment, also referred to as DTE
TX	Transmit Direction
UART	Universal Asynchronous Receiver & Transmitter

URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data
phonebook abbreviations	
FD	SIM fix dialing phonebook
LD	SIM last dialing phonebook (list of numbers most recently dialed)
MC	Mobile Equipment list of unanswered MT calls (missed calls)
ON	SIM (or ME) own numbers (MSISDNs) list
RC	Mobile Equipment list of received calls
SM	SIM phonebook
NC	Not connect

C. Safety Caution

Table 22: Safety caution

Marks	Requirements
	When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive to not operate normally for RF energy interference.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forget to think much of these instructions may lead to the flight safety or offend against local legal action, or both.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.
	GSM cellular terminal or mobile operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, for example no mobile fee or a invalid SIM card. While you are in this condition and need emergent help, please remember using emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.

	Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.

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