Voxtel

Repair Manual
Item: W420

1. Foreword

1.1. The purpose of the manual

The manual is just used for the experienced engineer not the general publication, providing basic reference for electric and mechanic repairing.

1.2. General safety notice

For protecting safety of individual and commonality, everybody should pay attention to the items hereinafter:

- The mobile phone should not close too much with exposed body especially face and eye. Don't touch the antenna part(right top of the phone) when using the phone, make sure it is under the best signal condition.
- Don't use mobile phone on the airplane. Lest should disturb communication of aviation and navigation system, lead to accident, endanger flying safety
- Don't use mobile phone in he building site, avoid the contact bomb caused by radio signal. Pay attention to the sign that forbid radio signal around before use mobile phone
- Don't use mobile phone near flammable gas or oil(including fuel section, under the board on the ship, fuel or other transfer and deposited area). For preventing the bomb caused by electromagnetic harmonic
- Don't use the mobile phone in the operating room and other area with electric medical treatment. For protect the electronic treatment from interference and medical accident
- Please don't use mobile phone when driving Connect outer antenna on the car when using hand over
- Don't give the mobile phone to children. Some other people should use the mobile phone cautiously (pregnant woman, neurasthenia sufferer, people with heart pacemaker in body etc.)

2. General character

2.1. Product description

W420 mobile phone is full duplex, using digital demodulation technology, controlled by microprocessor. Support 900MHz/1800MHz/1900MHz cell radio system compatible and GPRS. Handset provide land connect telephone service to user through single base station when using it correct. All the base stations connect to a centre control room.

Primary chips in W420 contain below (according to the way of encapsulation)

BGA encapsulation：OMAP730－DBB(DBB－Digital BaseBand,encapsulate CPU and DSP manage function)、TWL3016B2GQW－ABB(ABB－Analog BaseBand，providing the interface between system analog and digital signal, and power manage function)、K4S51163PF-Y(P)F75 Memory(8M x 16Bit x 4 Banks Mobile-SDRAM); 、－MD4832-D512-V3Q18-X Memory(512Mbit Flash) 、和 BC41B143AXX-IXB-E42－Single Chip Bluetooth；

QFN encapsulation：TRF6151BRGZR－TRANSCEIVER 、BQ24020DRCR-smart charge

Special encapsulation: RF3133－PA、

Radio Frequency and Base band in W420 is isolated by screen, micro SIM card box is protected by the battery

W420 has the same power step as usual

Radio Frequency circuit of antenna on the top of the mobile phone will cut automaticly when W420 using RF accessory plug

2.2. Introduction of character and function

Character:

Supporting trio band：The mobile phone can automatic switch in GSM900 network, DCS1800 network and PCS1900 network. Choose best channel for calling. The mobile phone can also automatic switch during the call without disturbing users. And the ratio of connecting improves with the automatic switch. Using trio method GSM900／DCS1800/PCS1900 networks，not only ease up the high dense radio channel, but also provide wilder users for network operation vendor. Both user and operation vendor gain more benefit. Using of GPRS（General Packet Radio Service）change the mind of GSM network, which can provide more than circuit switch, It can combine mobile communication with digital network together through add corresponding function entities and limited changes about network. Import IP service in wild mobile market, bring wilder and faster message space for mobile phone user too

Function：

- GSM900/1800MHz/PCS1900 automatic switching
- Full-rate/enhanced full-rate/half-rate coders
- GPRS Class 12
- Inter antenna
- 260K color 2.8” TFT display screen, 176×220
- Inter 200，0000 pixel camera
- 64 tones ring bell
- Microsoft operation system
- Enhanced phone number book
- WAP Explorer Ver 1.2.1
- MMS/SMS
- Inter 2Games
- Inter ring bell and wallpaper
- ZI Chinese input
- Blue Tooth
- MP3;MPG4
- STK Service
- Infrared function

3. Technical Reference：

Function	EGSM Technical Reference	DCS Technical Reference	PCS Technical Reference
Frequency Range	Transmit Frequency 880-915 MHz	Transmit Frequency 1710-1785MHz	Transmit Frequency 1850~1910MHz
	Receiver Frequency 925-960 MHz	Receiver Frequency 1805-1880 MHz	Receiver Frequency 1930~1990MHz
Channel Interval	200 KHz	200 KHz	200 KHz
Channel	174channel， Every channel contains 8 short	374channel， Every channel contains 8 short	299channel， Every channel contains 8 short
Modulate	GMSK (BT ＝ 0.3)	GMSK (BT ＝ 0.3)	GMSK (BT ＝ 0.3)
Transfer phase error	RMS<5°, peak<20	RMS<5°, Peak<20	RMS<5°, Peak<°
Full duplex interval	45 MHz	95 MHz	85 MHz
Frequency stabilization	±1ppm	±1ppm	±1ppm
Voltage	Battery voltage：3.7V	Battery voltage：3.7V	Battery voltage：3.7V
	Operation voltage：3.4～4.2V	Operation voltage：3.4～4.2V	Operation voltage：3.4～4.2V
Transmit current	Peak value≤1.5A		
Antenna impedance	50Ω		
RF export power	most 2W	most 1W	most 1W
SIM	Insert only	Insert only	Insert only
Temperature Range	-10 °C to +55°C	-10 °C to +55°C	-10 °C to +55°C

Table 3.1: basic technique parameter

RF power export	33 dBm +/- 2dBm	30 dBm +/- 2dBm	30 dBm +/- 2dBm
Interference radiation	1GHz should <-36 dBm, (> 1GHz should <-30dBm)		

Table 3.2: Transmitter

RF voltage	< -102 dBm	< -100 dBm	< -100 dBm
Receive error ratio (100 kbits)	< 2%	< 2%	< 2%
Channel jump time	500us		
Insert time	around10 s		

Table 3.3: Receiver

Sound coding style	Regular Pulse Excited-Long Term Predition-Linear Predictive Coding (RPE of LTP)	Regular Pulse Excited-Long Term Predition-Linear Predictive Coding (RPE of LTP)	Regular Pulse Excited-Long Term Predition-Linear Predictive Coding (RPE of LTP)
Ratio	13.0 kbps	13.0 kbps	13.0 kbps

Frame duration	20 ms	20 ms	20 ms
Code length	260 bit	260 bit	260 bit
Kind	kind 1 为 182 bit，kind 2 为 78 bit	kind 1 为 182 bit，kind 2 为 78 bit	kind 1 为 182 bit，kind 2 为 78 bit
forward errata coding	22.8 kbps	22.8 kbps	22.8 kbps

Table 3.4: Sound Coding

4. Marking and Security:

4.1 Marking:

In order to protecting legitimate rights and interests of user, economic profit of manufacturer, and attacking smuggles and counterfeit, the domestic and foreign mobile phone manufacturers (according to the regulation of government department) should paste series of security marks on the production when after producing, for distinguishing and protection. There are two among them is the most important:

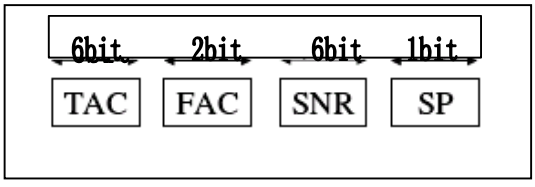
1） CMII

The abbreviation of CMII is the license issued by the information industries department. Both the domestic and foreign productions factory must apply this license to the information industries department if there mobile phone will sells in China (besides HongKong, Macao and Taiwan). The productions must paste the mark that accesses the net when they leave factory after acquiring the license. The actual mark (use after 1st Feb.1999) could be identified from these aspects as follow:

- The symbol is the rectangle, the bottom grain for the light blue net grain.
- Four Chinese character ‘the permit of access the net’ are printed on right side relative to the middle. The symbol is the only group of Chinese characters.
- “CMII” is printed on the left side of the symbol "The permit of access the net ". There are three lines of contents under the symbol "The permit of access the net": The first line permit number (each production factory homogeneous model handset access net card number is only), its form is 02-XXXX-XXXXXX, 3-6th common representative factory serial number, second line handset model: Form like V998, N5110 and so on. The third line of form is group of numerical codes (each access net symbol not to be all same).
- The typeface on the true symbol usually printed by the needle printer, the number is clear, and the color is shallower. It is can be seen that hits by needle if carefully look on it. The imitate symbol usually printed by common spray-ink printer, the number is unclear, the color is darker, and no hits by needle
- The symbol uses the safety line to guard against false paper printing. This kind of paper touches different, there is obvious convex-concave feeling on the safety line place, There is vertical lines obviously under the ultraviolet lamp. Simultaneously, red fluorescence typeface ‘CMII’ appears on the right side of the symbol (which is can not see with naked eye). There is non on the imitate one.

2）IMEI：

IMEI is the abbreviation of International Mobile Equipment Identification. The IMEI code is a kind of electrical character code made up of 15 digit number. Every code is unique in the world corresponds only one mobile phone. Every mobile phone will be match a unique IMEI code after assembly. This code will be recorded by manufacturer in the whole production. Its composition is as follows:



The first 6 digit (TAC) is the "model approves code", standing for the type of a mobile phone. The follow 2 digit (FAC) is "final assembly number", standing for the production factory or the final assembly place. The afterwards 6 digit (SNR) is "bunch number", standing for the production sequence number. The last 1 digit (SP) is set to "0" which is the examination code that standby temporarily usually now.

The IMEI code is pasted on the symbol at the back of the mobile phone, and saved in the memory. It is also the "file" and "ID card number" of the mobile phone in factory. The IMEI code can be read by pressing

"*#06#" on the keyboard. The IMEI code will be changed when displace new main board. It is necessary to refresh new symbol for the equipment.

4.2 SIM card：

1）Brief introduction of SIM card

SIM is the abbreviation of Subscriber Identity Model (customer recognition module). SIM card is also called smart card, ID card of user. The GSM digital mobile phone can be used when inserting this card only. There are three kind of materials in the SIM card: Surface metallic circuit board, IC integrated circuit, black protective hard glue. The work of surface metallic circuit board is transmitting information between IC and the mobile phone. The black protective hard glue purely for protects IC. And IC is the important part in SIM card. IC saved user's information, encryption key and other information in the SIM card. It identify user for GSM network and encrypte voice information for user during the call. The work of the six blocks on the metallic circuit is record input information, voice, instruction of network operation business respectively and so on. The using of SIM card prevent simultaneous calling and wire tapping. Facture of SIM card is according to GSM international standard and criterion strictly. It ensure common communication for user reliably. The using of SIM card divides card and mobile phone in the GSM system. One SIM card marks one user. SIM card can be inserted in every GSM mobile phone, and the fee of communication can be recorded to the marked account of the user. SIM card contain personal data of accessing GSM service that must be needed, they are:

- International mobile subscriber recognition
- Temporarily mobile subscriber recognition
- Main system
- Registration service
- The PIN reconciliation locks the code
- The call limits the code
- The user stores individual data. For instance, the short news, the fixed digit dialing, shrink the position digit dialing, the performance parameter, the speech spends the register and so on
- Will access the net the numeral mobile phone, otherwise will have the possibility to cause the card to receive the damage.

2）Security function

There is mobile phone SIM card lock function to prevent other people use the SIM card random. To unblocking it, just input PIN code easily. The PIN code (personal Identity Number) is called individual identification code. It is 4digit long, established by user himself. It belongs to the password of SIM card that protect security of SIM card. Its original estate is not activating. After its starting up, GSM system will identify the mobile phone automatically after turn on the phone every time. It will estimate validity of the SIM card, in other words, it will check password with mobile phone. It provides services to user after approving by the system only. There are 3 times of opportunities for input PIN code. It will lock automatically if the 3 times of opportunities failed all. The way of unblocking it is input PUK only. PUK (PIN Unblocking Key) is the master key for unblock the PIN code. Every SIM card has its corresponding PUK code. It is 8digit long, managed by user himself. It is controlled by network operation business too. At present, the domestic motion bureau has opened PUK inquire service that user could manage PUK code by themselves. There are 10 times of opportunities for input PUK code. The SIM card will start up self-destruction program automatically if the 10 of opportunities failed all. Then invalidate the SIM card. In this case, it is necessary to transact a new SIM card. Therefore, please do not decode without correct PUK code

Setting calling restriction is another way of protect the SIM card. The calling restriction is away of restrict call in and call out through establishing password. User could establish or cancel every kind of restriction of the mobile phone at will, preventing call out by mistake, stealing call, especially international long distance call, avoiding unnecessary loss. The password of calling restriction is 4digit long which the original estate is 0000. The user who transacts this service should modify the original password, for improving the security. The calling restriction could be set according to both file way and coding way. These two ways of setting have the same effect. It is noticed that this kind of service is for user only who use international long distance service, and it can not be used with calling diversion service at the same time

5. Introduction of GSM System：

5.1：The history and development of GSM：

1981 Analogue cellular introduced

Franco-German study of digital pan-European cellular system

1987 MoU signed by over 18 countries

1989　GSM was moved into the ETSI organization

GSM name changed to Global System for Mobile communications.

1990　DCS1800(edited GSM900) specification developed

In 1981 analogue cellular was introduced and at about the same time there was a joint Franco-German study looking at digital cellular technology and the possibility of making a pan-European system..

In 1982 a special working committee, Groupe Spécial Mobile (GSM), was formed within the CEPT to look at and continue the Franco-German study. In 1986 the working committee was taken a step further by establishment of a permanent nucleus of people to continue the work and create standards for a digital system of the future. About a year later, the memorandum of understanding, or MoU, as it is referred to, was signed by over 18 countries. It stated that they would participate in the GSM system and get it into operation by 1991.

In 1989 GSM was moved into the ETSI (European Telecommunications Standards Institute) organization. Once under the control of ETSI, the GSM system had it's name changed to Global System for Mobile communications. The committees working on the system changed from GSM to SMG (Special Mobile Group). These changes avoided confusion between the system name (GSM), and the people working the specification (SMG). It also brought the naming in line with the official working language of ETSI (English).

In 1990 the GSM specification developed an offshoot - DCS1800. The Original DCS1800 specifications were developed simply as edited versions of the GSM900 documents. Interest in GSM quickly spread outside Europe. In 1992 Australia became the first non-European country to join the MoU. Since then, many other Asian countries have adopted GSM. There's now a Pan-Asian MoU, investigating international roaming agreements.

The Phase II specification for GSM has now been defined, merging GSM900 and DCS1800 documents, number of new features are added to the system, along with many minor adjustments. The next step, Phase II+ defines the addition of specific new services such as data and fax to GSM and DCS1800.

5.2： GSM Network

This is the GSM system. The Mobile Stations (MS), both hand held (portables) and traditional mobiles in a car, talk to the Base Station System (BSS) over the RF air interface. The Base Station System (BSS) consists of a Base Transceiver Station (BTS), and a Base Station Controller (BSC). It's typical for several BTS to be located at the same site, producing 2 to 4 sectored cells around a common antenna tower. BSC's are often connected to BTS via microwave links.

The BSC to BTS link is called the Abis interface. Typically 20 to 30 BTS will be controlled by one BSC. A number of BSS's would then report back to the Mobile Switching Center (MSC) which controls the traffic among a number of different cells. Each (MSC) will have a Visitors Location Register (VLR) in which mobiles that are out of their home cell will be listed, so that the network will know where to find them. The MSC will also be connected to the Home Location Register (HLR), the Authentication Center (AUC), and the Equipment Identity Register (EIR) so the system can verify that users and equipment are legal subscribers. This helps avoid the use of stolen or fraud mobiles. There are also facilities within the system for Operations and Maintenance (OMC) and Network Management (NMC) organizations. The Mobile Switching Center (MSC) also has the interface to other networks such as Private Land Mobile Networks (PLMN) and Public Switched Telephone Networks (PSTN) and ISDN networks.

5.3 ：GSM Air Interface：

In GSM, the GSM transmission between MS and BS is Radio Communication, let’s introduce the GSM Air Interface.

1)：Channel Plans：

	Phase 1 GSM900	Phase 2 GSM900	Phase 1 DCS1800	Phase 2 DCS1800	PCS1900
Uplink Frequency Range	890 to 915MHz	880 to 915MHz	1710 to 1785MHz	1710 to 1785MHz	1850 to 1910MHz
Downlink Frequency Range	935 to 960MHz	925 to 960MHz	1805 to 1880MHz	1805 to 1880MHz	1930 to 1990MHz
ARFCN Range	1 – 124	0 – 124 and 975 – 1023	512 – 885	512 – 885	512 – 810
Tx/Rx Spacing (MHz)	45	45	95	95	80

Above is a table that shows the relative frequency plans of the three GSM networks: GSM900, DCS1800 and PCS1900.

The frequency range of the Uplink and Downlink show how the two bands are split into the two directions, rather than an uplink being followed by a downlink 200kHz later. Another difference is that the channel numbers are different. Remember this if you write any test control software and want to port from one system to another, as the channel numbers must be changed for correct operation.

2）：GSM FDMA and TDMA：

GSM uses TDMA (Time Division Multiple Access) and FDMA (Frequency Division Multiple Access). The slide shows part of one of these bands. Each band is divided into 200kHz slots called ARFCN's (Absolute Radio Frequency Channel Numbers).

As well as dividing up the frequency, the ARFCN is also divided in time into 8 Timeslots (TS), each TS being used in turn by a different MS. The 8 TS's together are known as a Frame.

3）：Physical Channel：

The combination of a TS number and ARFCN is called a physical channel. The corresponding Number is called ARFCN (Absoluteness RF Channel Number). One ARFCN assert a pair of channels, one is uplink, the other is downlink. This pair of channels is called physical channel.

In GSM system , the frequency interval is 200kHz.

The ARFCN of PGSM is 1~124，the center frequency of CH1 uplink is 890.2MHz. When the value of ARFCN is equal to n, center frequency uplink channel is fn=f1+(n-1) 200kHz。The center frequency of corresponding downlink channel need to add duplex frequency separation, PGSM is 45MHz.

We need declare that, because of the PCD system is only used in North American, and no DCS system used, these two systems can not be exist at the same area, the ARFCN of DCS and PCS system can overlap with each other.

4）：Modulation Mode：

Now the signal can be modulated with a 0.3GMSK modulation scheme.

5）：TDMA Burst：

The burst can be divided into three distinct areas:

• Ramp Up
• Useful Part of the Burst
• Ramp Down

All of these levels are controlled by the GSM standard.

The Useful Part of the Burst is the area where the modulated data is present. There are 148 bits (each bit is represented by a single symbol in 0.3GMSK modulation) which will be examined more closely in a later section.

GSM is part of TDMA system，

6）：Duplex Timing：

Downlink and Uplink

- Uplink Lags Downlink by 3 Timeslot periods
- Uplink and Downlink use same Timeslot Number
- Uplink and Downlink use same Channel Number (ARFCN)

Uplink and Downlink use different bands (45MHz apart for GSM900)

In the previous example we can see that the timeslots are offset by 3 between the downlink and the uplink. We receive information in timeslot two in the downlink we have two timeslots in which to switch to the uplink frequency and be ready to transmit information. Then, we have to get ready to receive our next time slot of information in the next frame.

7）：Power Control：

As the mobile moves around the cell, its transmitter power needs to be varied. When it's close to the base station, power levels are set low to reduce the interference to other users. When the mobile is further from the base station, its power level needs to increase to overcome the increased path loss. However, if too much power is used, the user's battery will run down too quickly. All GSM mobiles are able to control their output power in 2dB steps. The base station commands the mobile to a particular MS TX Level (power level) by watching the power level of the received signal at the BS.

There may be many users in the same cell. If every Mobile phone has the same emission power, ones closer to Base Station can block the ones which are farther; On the other hand, because if closer ones emit more power

Mobile Power Levels

	Phase 1 GSM900	Phase 2 GSM900	Phase 1 DCS1800	Phase 2 DCS1800	PCS1900
Mobile Max Power	20W (8W used) 43dBm/39dBm	8W / 39dBm	1W / 30dBm	4W / 36dBm	2W / 33dBm
Mobile Min Power	20mW /13dBm	3mW / 5dBm	1mW/ 0dBm	1mW / 0dBm	1mW / 0dBm
Mobile Power Control Steps	0 - 15	2 - 19	0 - 13	0 - 15	0-15 ,30,31

The table above shows the maximum and minimum power levels on the mobiles in different systems. The final row shows the power steps, which are all numbered, and how they relate to the max and min powers.

8）：Timing Control：

If the burst arrives at the correct time, it will fit into its physical channel and not disturb any other burst that may follow it in the next timeslot. However, if it is delayed, due to a long distance to travel, it may arrive late and impact the following burst from another user. In this case the mobile is instructed by the BS to burst earlier which will correctly align the burst in the timeslot. The message sent by the BS is called the Timing Advance. The base station monitors the burst to see when it arrives at the base station. If it arrives late or early, the base station will note how many times it has changed since the last Timing Advance adjustment, and if there have been more than 4 x ¼ bit periods change in one direction, the adjustment will be made again.

Main parameter of GSM is showed as follows:

	PGSM	EGSM	DCS	PCS
ARFCN Range	1~124	975~1023, 0, 1~124	512~885	512~810
Uplink Band Range	890MHz~915MHz	880MHz~915MHz	1710MHz~1785MHz	1850MHz~1910MHz
Downlink Band Range	935MHz~960MHz	925MHz~960MHz	1805MHz~1880MHz	1930MHz~1990MHz
Bandwidth	200kHz	200kHz	200kHz	200kHz
duplex Interval Frequency	45MHz	45MHz	95MHz	85MHz
TDMA User Number	8	8	8	8
Modulation Mode	0.3GMSK	0.3GMSK	0.3GMSK	0.3GMSK

Power Grade Range	5~19	5~19	0~15	0~15
Max Power	33dBm	33dBm	30dBm	30dBm
Power Grade Difference	2dBm	2dBm	2dBm	2dBm

5.4：Identity：

If user want to connect to network, GSM need affirm users' legality identity. Users' identity information recorded in SIM. According to these information, network affirm user's validity. Important Digital Identification used in GSM include:

1. IMSI（International Mobile Subscriber Identification）

This number is the exclusive number to indicate user's identity. When user enter network, the system find user's information according to this number. It is composed by three parts:

MCC（Mobile Country Code）Country Number, three digits, indicate user's country.

MNC（Mobile Network Code）Mobile Network, two digits, indicate Network Operator.

MSIN（Mobile Subscriber Identification Number）User Identity Number, eleven digits, indicate Mobile Subscriber in network.

2. TMSI（Temporary Mobile Subscriber Identification）To safeties, we use TMSI instead of IMSI when transmitted IMSI, TMSI is valid only in local area. Its structure is selected by manage department, and the whole size is not more than 4 bits.

3. IMEI（International Mobile Equipment Identity）exclusive number, system also can distinguish validity of equipment by this number.

5.5：GSM Voice Path ：

There needs to be some way to encode the voice into data
Next the data must have error protection added to it
The Data has further error protection
It is modulated
It is bursted
Again, this is very simplistic and other steps will be explored during this section.

5.6：logical channels

TCH ：Mobiles on a call use a Traffic Channel (TCH). The TCH is a two way channel used to exchange speech information between the mobile and base-station.

SACCH ：When the MS is on a call, it is constantly monitoring the Received Signal Quality (a bit error rate measurement known as RxQual) and the Received Signal Level (a power measurement call RxLev). These are constantly being sent back to the BS on a Slow Associated Control Channel (SACCH).

FACCH：The Fast Associated Control Channel is used to pass critical information to the mobile during a call, by taking over the TCH from the callers.

BCH：All BTS produce a Broadcast Channel (BCH). The BCH is like a lighthouse or beacon. It's on all the time and allows mobile to find the GSM network. The network for a variety of user functions also uses the BCH signal strength. It's a useful way of telling which is the closest BTS to the mobile. It also has information coded onto it, such as the identity of the network (e.g. Mannesmann, Detecon, or Optus), paging messages for any mobiles needing to accept a phone call, and a variety of other information. Each mobile will monitor the power of adjacent cell BCH's to aid the network in making hand-off decisions.

FCH：Frequency Correction Channel

SCH：Synchronization Channel

BCCH：Broadcast Control Channel

CCCH：Common Control Channel

The base-station posts a PCH (paging channel) on the CCCH part of the BCH. When the mobile receives the PCH, it responds by sending a RACH. The remainder of the process is identical to the mobile originated case.

AGCH:Access Grant Channel

RACH:Random Access Channel, When the mobile sends out a RACH, to start a call, to avoid collisions with bursts in adjacent TS, RACH bursts, that are shorter than normal are sent.

The Stand-Alone Dedicated Control Channel (SDCCH) is used during call set up as a stepping stone to the Traffic Channel. It is also used to pass signaling when the mobile is in IDLE mode. This is used for example for SMS Point-to-Point messages as well as Location Updates that we will look at later.

5.7 Mobile Turn-On

1)Mobile Searches for Broadcast Channels (BCH)
2)Synchronizes Frequency and Timing
3)Decodes BCH sub-channels (BCCH)
4)Checks if Network Allowed by SIM
5)Location Update
6)Authentication

When a mobile first turns on, it searches all 124 channels in the downlink for signals. It will then order the channels by received signal strengths and check to determine if the channel was a BCH (Broadcast CHannel). Once the MS finds a BCH, it adjusts internal frequency and timing from the FCH and SCH, then checks to determine if the BCH is from its PLMN (Public Land Mobile Network). This involves comparing the allowed network and country codes stored on the SIM card with the information encoded on the BCCH. The mobile repeats this cycle until a good broadcast channel is found. If the mobile recognizes that it's in a different cell from the last time it was used, it needs to tell the network where it is. The network has to keep track of where every mobile is so that it can route calls to the correct cell for any particular mobile. This process of telling the network "here I am" is called a location update. The mobile sends a RACH, gets assigned to an SDCCH, exchanges control information, then ends the call. The user will typically not be aware that this process is taking place.

For Location Updates, this time showing which part of the network is involved in transactions.

The IMSI attach/detach process is a way of forcing all mobiles to inform the network when they have camped and when they have turned off (or just before they turn off!). The SIM stores the last location Area Code (LAC) when it is powered down and it compares this to the camping LAC on Power up and if they are different it will perform an IMSI attach.

Mobile Originated Call

Mobile Sends RACH
Channel Assignment Posted on BCH (AGCH)
Mobile and Base Station communicate on SDCCH
Authentication
Mobile Assigned to Traffic Channel (TCH)
Speech Data sent and received

Once camped, the mobile is ready to send or receive calls.

When a user dials a number, and presses the send button on the mobile, call origination takes place. The mobile transmits a short RACH burst on the uplink, using the same ARFCN as the BCH is using on the downlink. The base station responds to the RACH by posting an AGCH (Access Grant CHannel) on the CCCH. These are logical channels on the BCH physical channel. The mobile listens on the BCH for the AGCH, when it receives it and decodes the instructions, it re-tunes to another ARFCN and/or timeslot and begins a two-way dialogue with the base station on an SDCCH. One of the first things that the mobile will mreceive is the SACCH associated with the SDCCH. Once it receives the SACCH, it will get timing advance and transmitter power information from the base station. The base station will have calculated the correct timing advance from the arrival time of the RACH. Once the mobile gets timing advance information, it can send normal length bursts. The SDCCH is used to send messages back and forth, taking care of alerting (making the mobile ring) and authentication (verifying that this mobile is allowed to use the network). After a short period of time (1 to 2 seconds), the mobile is commanded over the SDCCH to re-tune to a TCH. Once on the TCH, speech data is transferred on the uplink and downlink.

Mobile Terminated Call

Mobile Sees Page
Mobile Sends RACH
Channel Assignment Posted on BCH (AGCH)
Mobile and Base Station communicate on SDCCH
Authentication
Mobile Assigned to Traffic Channel (TCH)
Speech Data sent and received

The process for base station originated calls is very similar. The base-station posts a PCH (paging CHannel) on the CCCH part of the BCH. When the mobile receives the PCH, it responds by sending a RACH. The remainder of the process is identical to the mobile originated case. If you can find a way to translate the GSM bursts into audio tones (AM demodulate), it's interesting to hear the difference between the channel types as a call is set up. A good way to do this is to use a GSM phone near an old TV set or a conventional wired phone.

The interference created in these devices amounts to AM demodulation.
The RACH burst can be heard as a single 'Tick' sound. It's quickly followed by the SDCCH 'Tat, Tat-tattat, tat-tat-tat ...'. After a few seconds, the TCH is connected 'Buzzzzzzzzz'.

Mobile Handoff

We have covered mobile power on and call establishment, but there is one other important area. During a call the mobile may have to change base stations. If the call is between faces of the same base station, this is performed locally. The case shown here is that where the base station is not the same. The mobile reports its measurements and the serving BSC determines that it is time to perform a handoff. It will contact the new base station and get the information on the new channel and timeslot (along with midamble and timing information) and send this to the mobile. It then commends the mobile to switch base stations and then once the new call is established, close down the old link and reallocate it to another user if necessary.

6. Summary introduction of mostly chips used in W420

Chips used in W420 can be divided into flat and application manage according to function. There is the introduction of these two chips

6.1：Flat Chip：

U201: DBB——Digital Base Band, composed of ARM7 TDMIE CPU and TMS320C54X DSP dual inter core. The chip integrate 4Mbit Memory inside、provide multi control interface outside. There is the basic structure as follows:

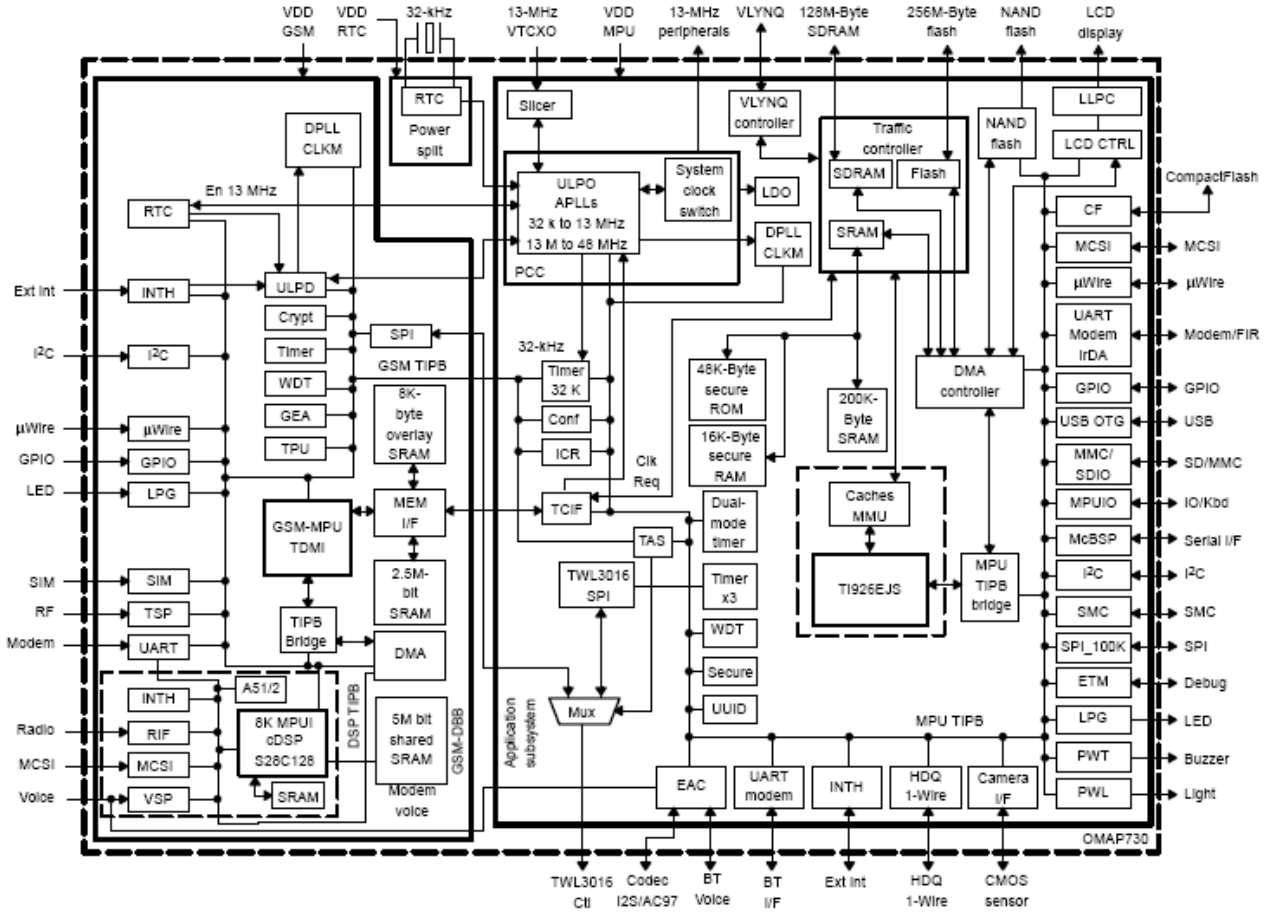


Figure6.1: DBB basic structure

Main structure characteristic and function of DBB (Part Number is D751992AGHHR) including:

Nuclear working voltage 1.5V (1.35-1.65V), IO voltage 2.8V(2.5V-3V)

Working temperature range -40~ +85℃

CPU working at 52MHz, DSP working at 104MHz

Integrate 4Mbit SPAM Memory inside

289 pin uStarBGA encapsulation

U201: ABB——Analog Base Band, is the bridge of digital and analog signal in the system. Audio, IQ and other exterior analog signal can connect with DBB control centre through ABB. ABB controls system clock, A/D D/A conversion, background light of keyboard, provide system power and charge interface etc. There is the basic structure as follows:

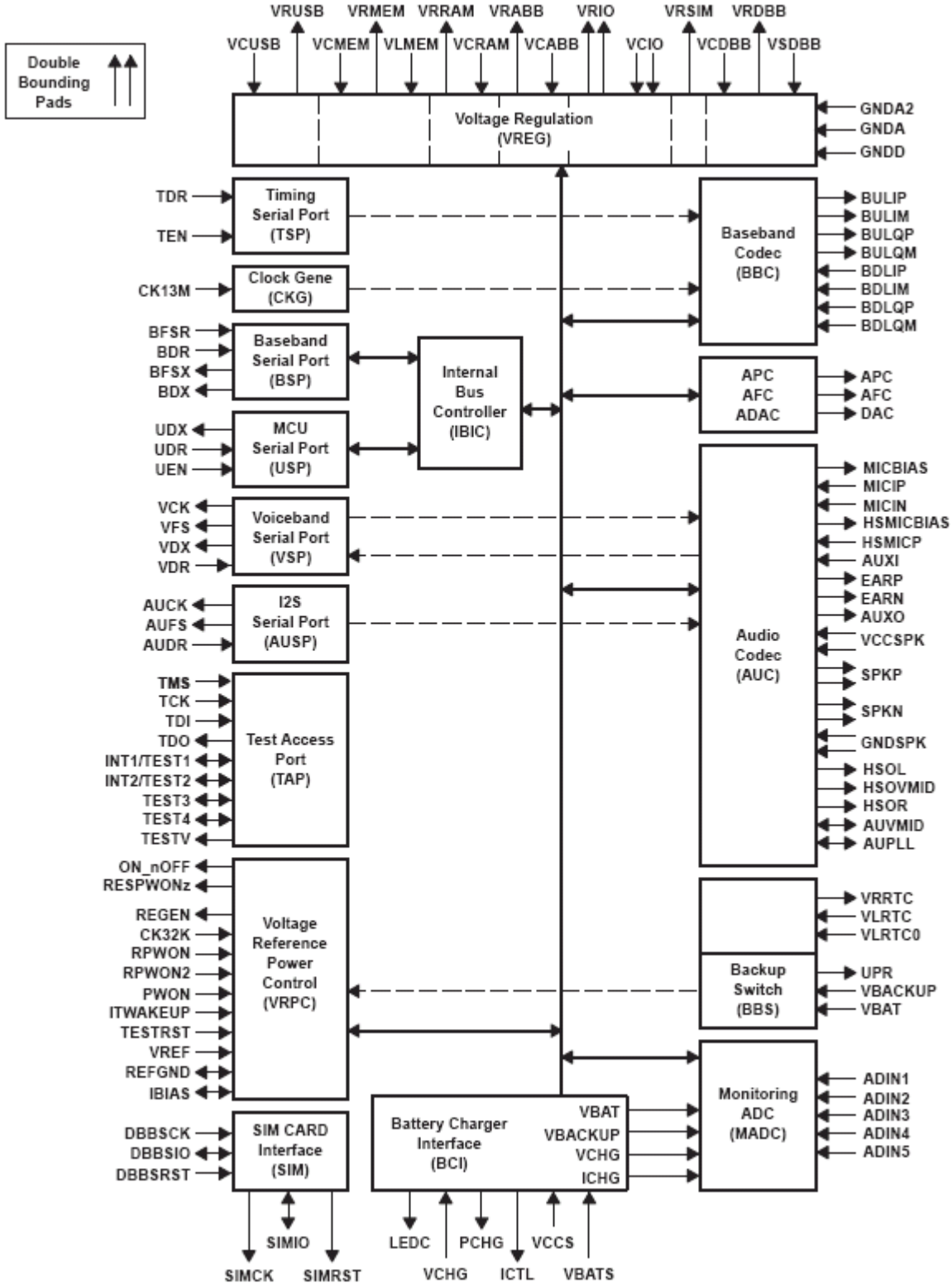


Figure 6.2: ABB basic structure

U602:Transceiver: is a high integrated multi frequency low power cost transceiver, there is the structure as follows:

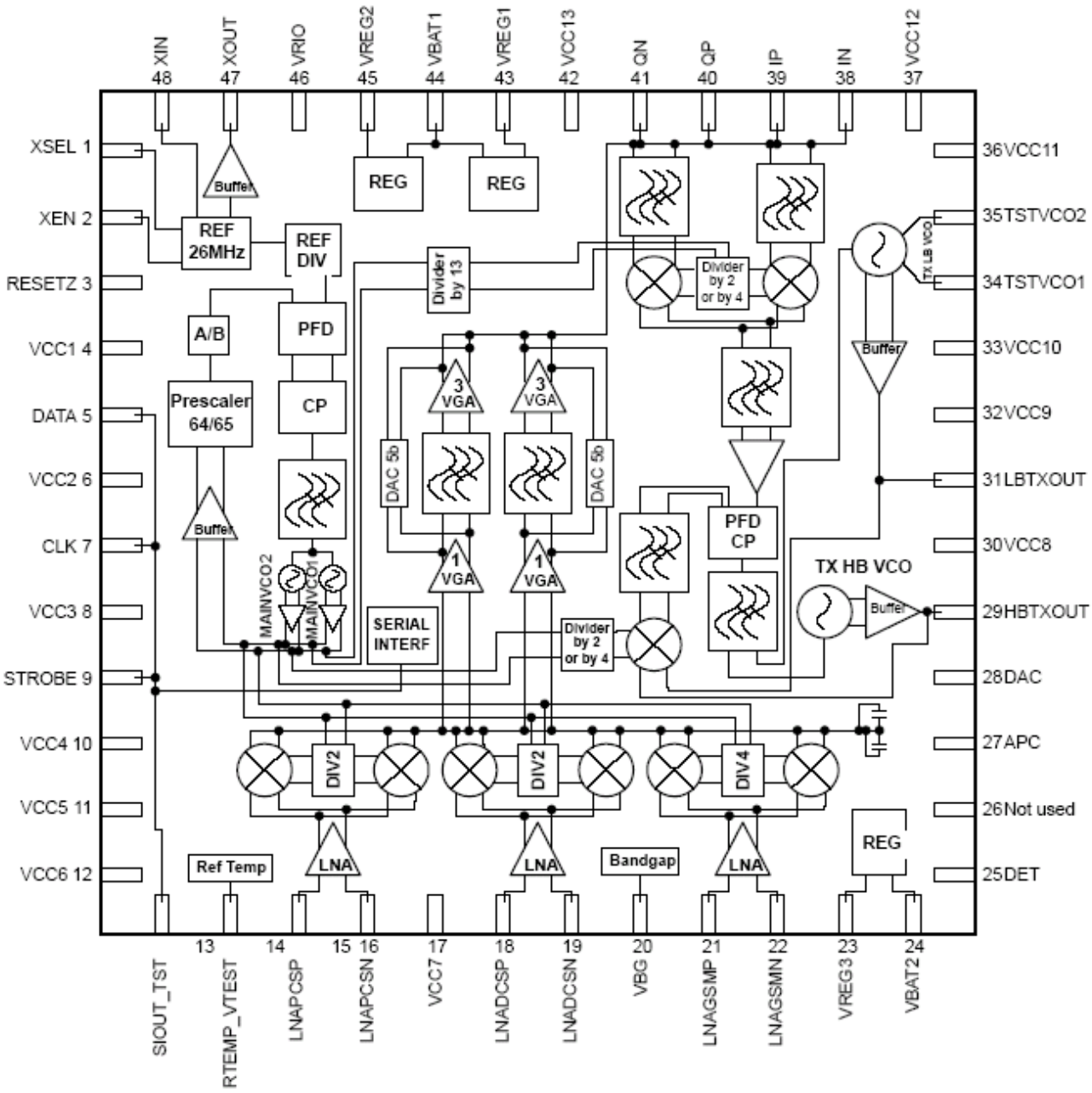


Figure 6.3: Transceiver structure

Main function and characteristic of U602:

Support GSM, DCS, PCS multi frequency cell system
Support GPRS Class 12 and EDGE operation
Contained a synthesizer, 4 fully compositive VCO, 3 regulator and PA controller
3 bios serial interface
48pin QFN48 encapsulation
IO working voltage 2.8V(2.7-2.9V)
Working temperature -25℃~ +85℃

U603: U603（RF3133）,is a 3 band power amplifier module integration with power control function. With its control part, signal's amplify and signal's power control can be made by itself only. It is divided to low frequency band(EGSM900) and high frequency band(DCS1800/PCS1900). Every part of the amplifier is combined with 3 sect amplifier. Export power is controlled by a inter power control module, which realize the control function through changing 3 sect amplifier's deflection set. Power export of low frequency band could reach 35dB, power export of high frequency band could reach 33dB. Spec value of working voltage is 3.5V, in/out impedance is 50 ohm. There is the structure as follows:

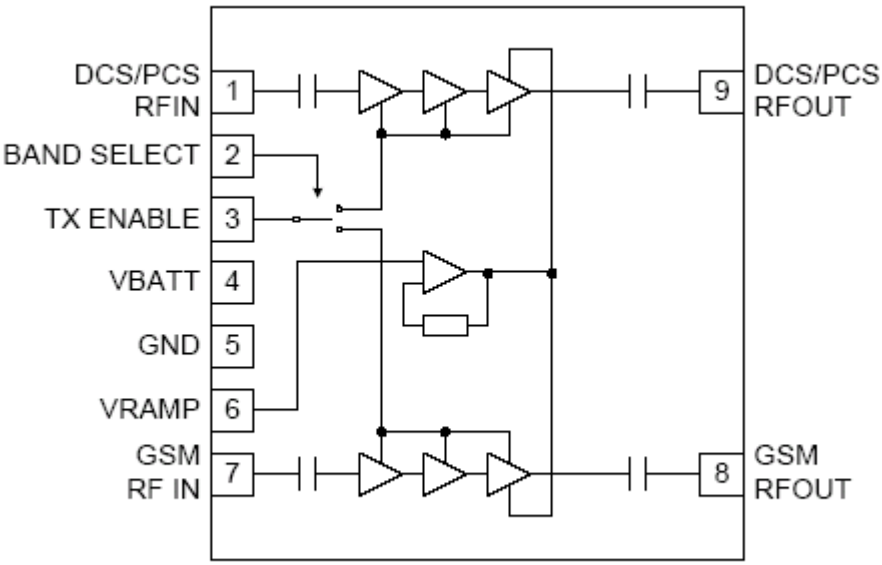


Figure 6.4: PA structure

Definition of main pin: spec value of working voltage VBAT1、VBAT2 is 3.5V, provided by battery of mobile phone. TX-EN is the power set of amplifier, at high level is (1.9V～3.0V，spec level 2.0V), at low level is (0V～0.5V，spec value 0V). GSM band select pass, at high level（1.9V～3.0V，spec value 2.0V）, DCS band select pass. VRAMP is frequency modulate control level, around 0.2V-1.8V

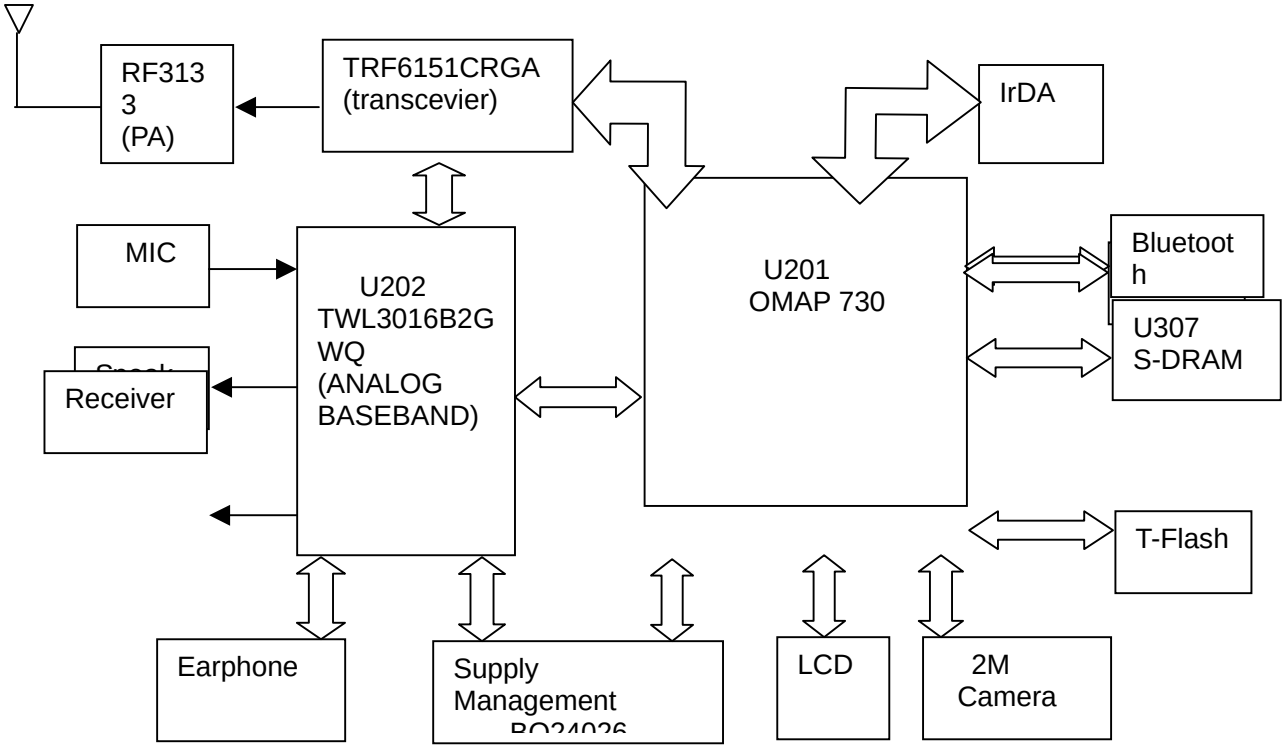


Figure 7.1: W420 base band circuit structure

Figure 7.1 shows basic control flow of W420 mobile phone

It is shown in the picture that U201 is the core of control in the whole system. It carries out all programs storage in U307, and control the whole system through U202, U304 and U302

According to the difference of function, W420 can be divided as: RF process circuit (including receiver part and transmit part), audio interface circuit (Mic、Receiver、ear phone Mic and ear phone Receiver) and charge

circuit, Sim card interface circuit, backlight control circuit, display circuit and camera process circuit etc.

Before introduce these circuit cell, it is necessary to know clock circuit and power management in the system——because these two are the base or working

7.2 System clock circuit introduction:

Clock is the base of system control in every control system. So, it is necessary to know the output and control theory of clock in W420 mobile phone.

There are 2 kind of clock in the system: one is 32.768KHz for display time——provided by Y201(32.768KHz crystal); the other is work clock for system working——provided by(26MHz crystal)

1. RTC——Real Time Clock

Y201 connect to U200 through the matching network combined with C201, C204, C203, C204 and R201, provide RTC for U200

Power supply of Y203 is provided by H1 in U202, it is V-RTC in the theory structure

V-RTC can be defined as 1.8V, 1.5V and 1.3V by software (There is 1.5V in W420)

Power supply of RTC circuit provided by main battery VBAT usually, and provided by standby battery (standby battery provide V-RTC only) when main battery lack of electric power or take off the main battery (e.g. when changing Sim card) . Electric power provided by standby battery is limited (support RTC circuit for only a few hours). Therefore, it is necessary to keep power supply provided by VBAT in sure time interval that prevent RTC information missing.

2. System clock circuit

Y202 (26MHz crystal) provide base value for system clock

C206, R201, D201, C202, R220 and C205 provide matching circuit for Y202. One side of this circuit connect to pin C12 of U202, which provide AFC (AFC： Automatic Frequency Control) for 26MHz crystal; the other side of this circuit pass through a more complicated path to provide system working clock:

a: first, input 48pin on U602, provide working clock for U602

b: then, processed in U602, pass through 47pin on U602 input Y9 on U200——provide 26MHz working clock for DBB

c: and then, processed in U201, pass through N1 output 13MHz clock for other exterior equipments:
pass through E1 on U202 provide ABB clock

7.3: System power management introduction:

In the mobile phone system, because of using many equipment and interface, lead to considering many kinds of power is necessary (generally 6 or 7). As the technology improved, now, most of these electrical source are provided by flat chip. Using power management provide additional power only when the flat chip can not match design conditions

According to the classify principle above, introduce power management of W420 follows:

a: Source from flat

Source from flat is provided by U202(ABB), its power and use are in the table:

Title	Pin	voltage	Current	Benefited Chip
V_DBB	J1、H2	1.5V	170mA	U201：main working voltage
V_ABB	H10	2.8V	80mA	U202：analog circuit working voltage
V_IO	B1、B2	2.8V	100mA	U104、U200、U301、U302 和 U305：system digital IO interface working voltage
V_FLASH	G1	2.8V	60mA	U300：Flash working voltage
V_SRAM	F1	2.8V	50mA	U300：RAM working voltage
V_SIM	B4	2.9V	10mA	U201：Sim interface working voltage
V_RTC	D1	1.5/1.3V		U203：RTC circuit working voltage

Table 7.1: A19 system flat power distribute

b: Source outside the flat

W420 use U309,U301,U303——LDO(Low Dropout) provide system additional power needing 2.8V, 1.8V and 1.578V, for prevent lack of power in system

U309 (V-1O-2)	**1**	U200(CPU)	VDDSHV9,VDDSHV2,VDDSHV6,VDDSHV4,VDDSHV8
	2	U310(LDO enable)	
	3	U307(SDRAM)	U490,VCC,2.8V
			U491,VCC,2.8V
	4	J403(T-FLASH)	
	5	Q430(EARPHONE)	R481,SDMC-DAT0,SDMC-DAT1,SDMC-DAT2,SDMC-DAT3
	6	U500(IRDA)	VIO,VCC
	7	CN1(LCD)	CN700
	8	J740(KEYPAD)	KBR0,KBR1,KBR2,KBR3,KBR4
	9	SW720(UP)	
		SW721(DOWN)	
		SW723(CAMERA)	

U301 (MEMARY)	**1**	OMAP(CPU)	VDDSH1,VDDSH3
	2	U302(SDRAM)	
	3	U307(M-DOC)	
	4	U402(CHARGE)	

U303(V-CORD)	**1**	U200(OMAP730)	VDDOMPE,VDD

Note: This LDO encapsulation is very small, it may weld unstable when jointing, then lead system working abnormally. Therefore, make sure this LDO output normally first before adjusting hardware

7.4: RF process circuit----receiver circuit

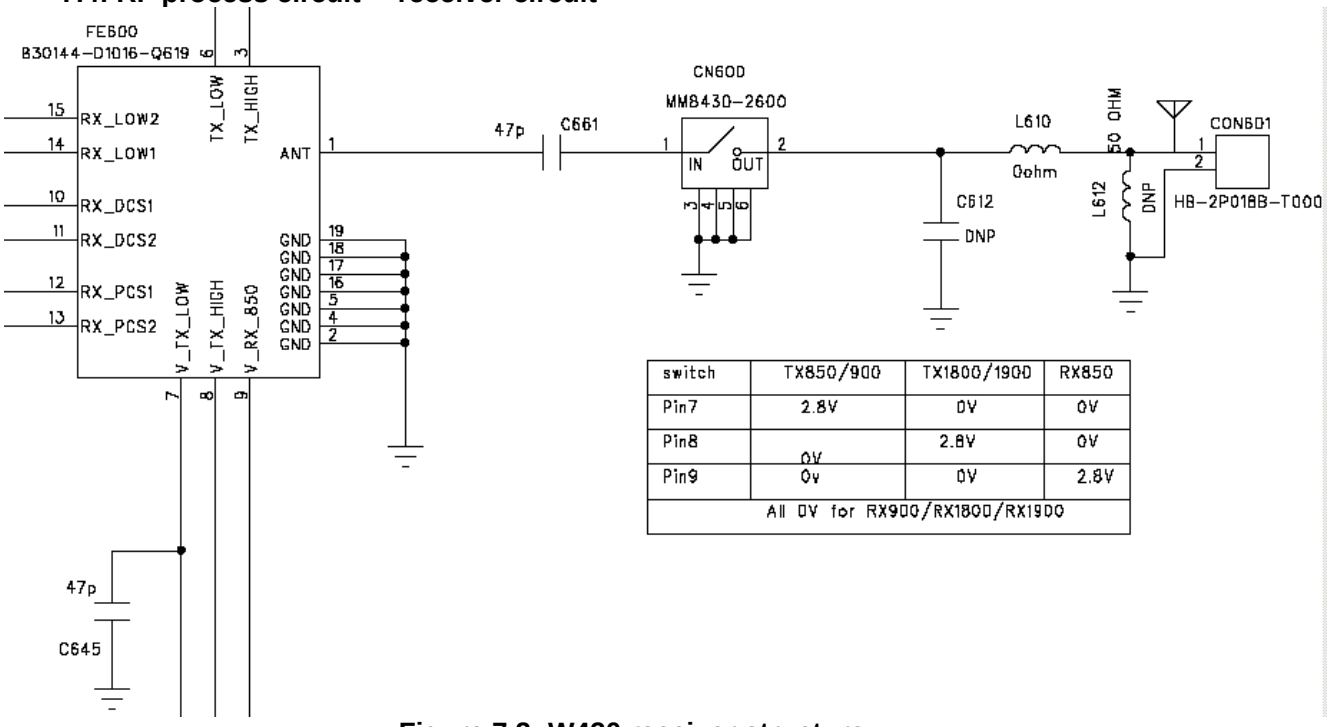


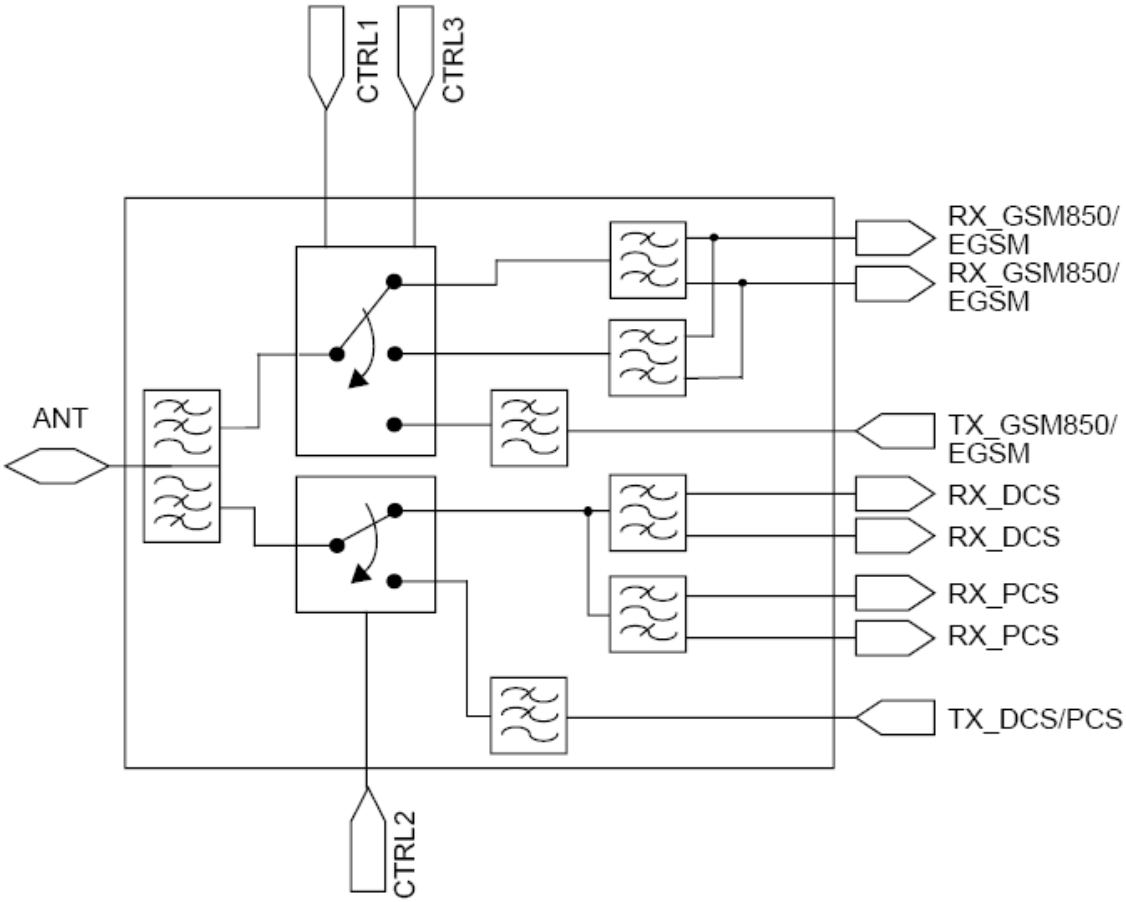
Figure 7.2: W420 receiver structure

As the figure shows: downlink from base station to mobile phone leaded into receiver circuit by antenna. The receiver circuit mainly contains Antenna, RF-Connector(CN600), RF-Switch(FE600), Transceiver(U602), DBB(U201) and ABB(U202) etc.

W420 use inter antenna. The antenna is paste on back cover of the mobile phone in the antenna area through glue on back of antenna. After main board's assemble, feed point of antenna must be pressed well with input of antenna on main board. Signal intension rest with connecting between antenna and main board, so make sure of the two contacts well

CN600 is test jack match with factory when calibrating RF. The switching inside is mechanical, break up when the test probe insert, signal input to mobile phone or output from mobile phone through probe. After probe exiting, switching close up, signal output from antenna. The max impedance of CN600 is 50 ohm, max insert loss is 0.1dB

FE600 is a RD-switch controlled by DBB(U200), its working band is GSM, DCS and PCS, structure as follows:



DDB(U201) set voltage for V_TX_LOW and V_TX_HIGH which is two control unit of FE600 through external gate circuit Q600_A and Q601_A indirect. Control signal TSPACT01 and TSPACT02 from U200 control if set high to V_TX_lOW and V_TX_HIGH for RF source through estate (connect/cut off) of Q600-A and Q601-A. Then realize to control working estate of U101

Logic of control is as follows:

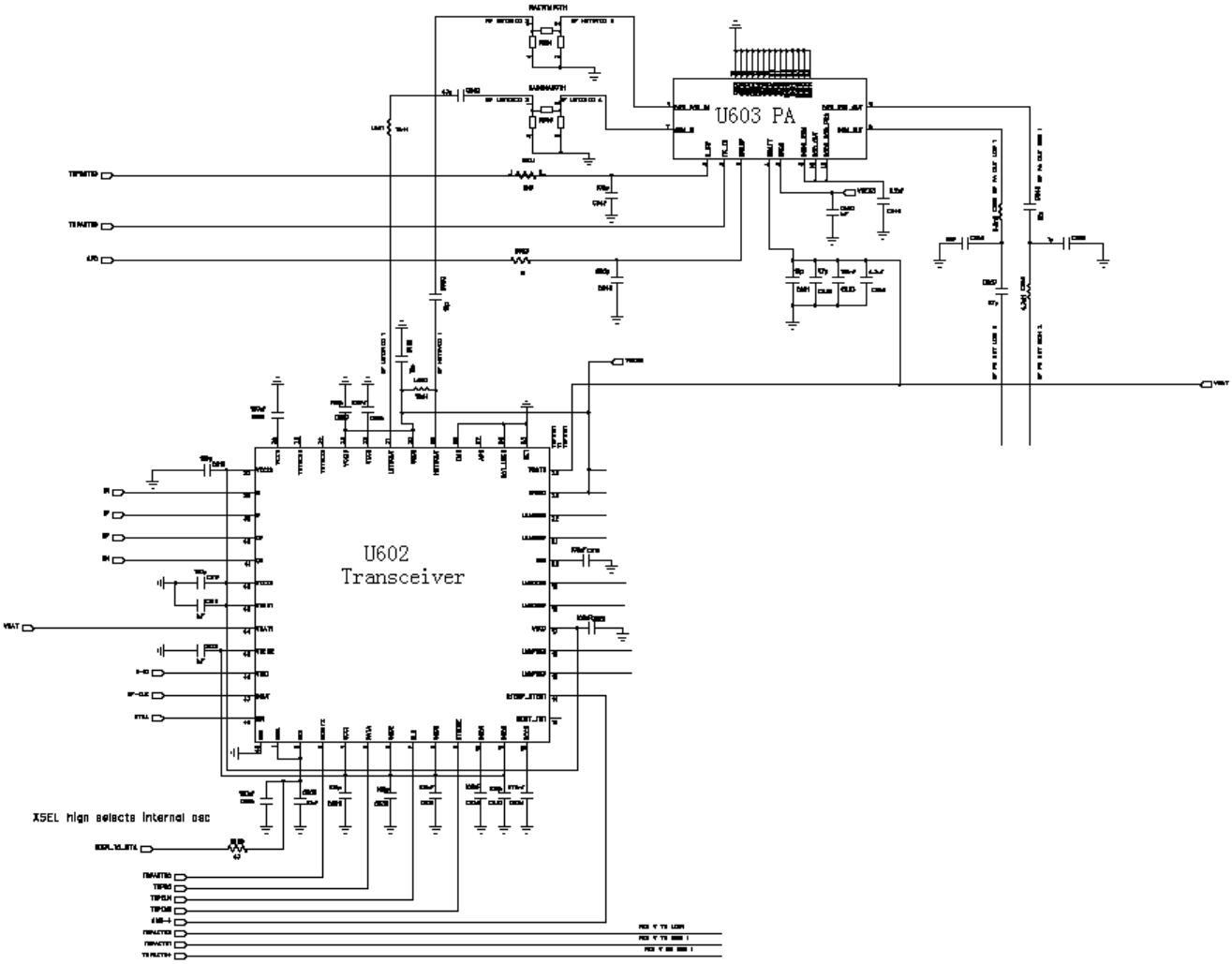
EGSM RX	Low	Low
PCS/DCS RX	Low	Low
PCS/DCS TX	Low	High

When the mobile working, high frequency signals are divided into two paths balanceable output by FE600 after received by antenna. These two paths of signals input U602 from pin LNAGSMP and LNAGSMN (or LNADCSP and LNADCSN or LNAPCSP and LNAPCSN) respective. First, do low noise magnify, after magnify

input I.Q mixer (which contains high/low paratactic two mixer part), mix with surge signal caused by local oscillator in U104, these surge signals must match the currently working frequency of mobile phone. Modulate them into four low frequency I.Q signal around 100KHz after mix (there is phase relation in these four paths of signal). Second, I.Q must input in low pass filter for eliminate syntonic interfere. After this process, input signals into channel filter. Channel filter is a five-class belt passes filter with self adjust function. Its center frequency is 100KHz. For avoid leading distortion caused by signal attenuated too much after many times sieve, before sieve, it should match 8dB step magnify for each class. Signals after sieve match 4dB step magnify for compensate direct current excursion. Finally, these signals input intermediate frequency buffer waiting for input U201 ABB which will manage them.

I.Q signal is transfer into digital signal by ADC when input in ABB, then output from ABB to U201 DBB. DBB do farther digital sieve to these signals, GMSK demodulating, complect removing, decoding, channel decoding, PCM decoding etc. voice decode arithmetic manage. Then the signals passes VSP port (Voiceband serial port) between U201 and U202 into U202 and managed by DAC in U202. Finally, analogy signal are sent to earphone or headphone and transfer them into voice signal.

7.5: RF manage circuit----transmit circuit:



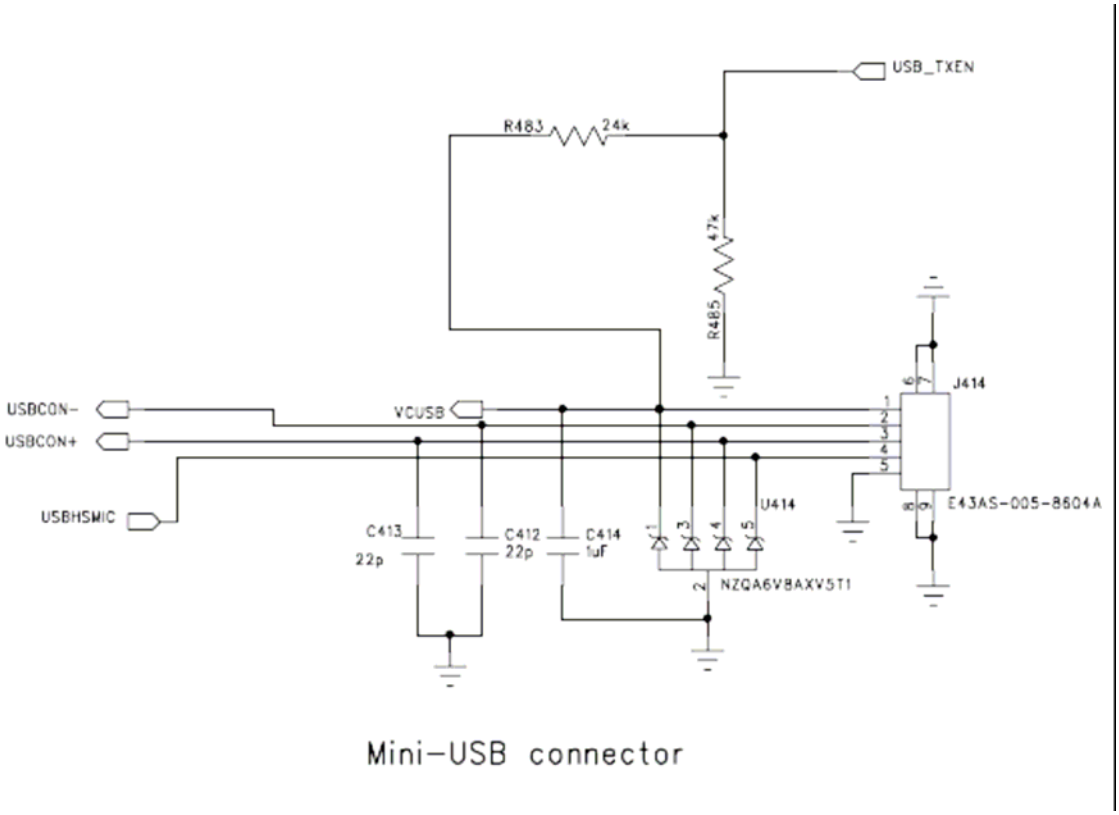
As the picture shows: transmit circuit is made up of: DBB(U201)、ABB(U202)、Transceiver(U602)、PA(U603)，RF-Switch(FE600)，RF-Connector(CN600)，Antenna etc.

Voice signal from user is transmit into analogy electronic signal, and then input in ABB U202. After transferred by ADC in U202, pass VSP port into DBB U201. In U201, signals will be impulse sampling, PCM coding, channel coding, coding, complecting, GMSK modulating etc. voice demodulating manage, and then pass BSP path into ABB U202. Managed signals by DAC in ABB, divided into four paths of analogy base band I.Q signal after passing low frequency filter. Finally, input these signals into transceiver U602

In U602, base band signal is modulated to transmit intermediate frequency by I.Q modulation. This I.Q modulation with low harmonic wave distortion, low carrier wave divulge, high syntonic interference restrain etc. can reduce phase error furthest. Then pass high frequency modulate, signal are modulated to final frequency needed. Finally, the signals are sent to PA for magnifying.

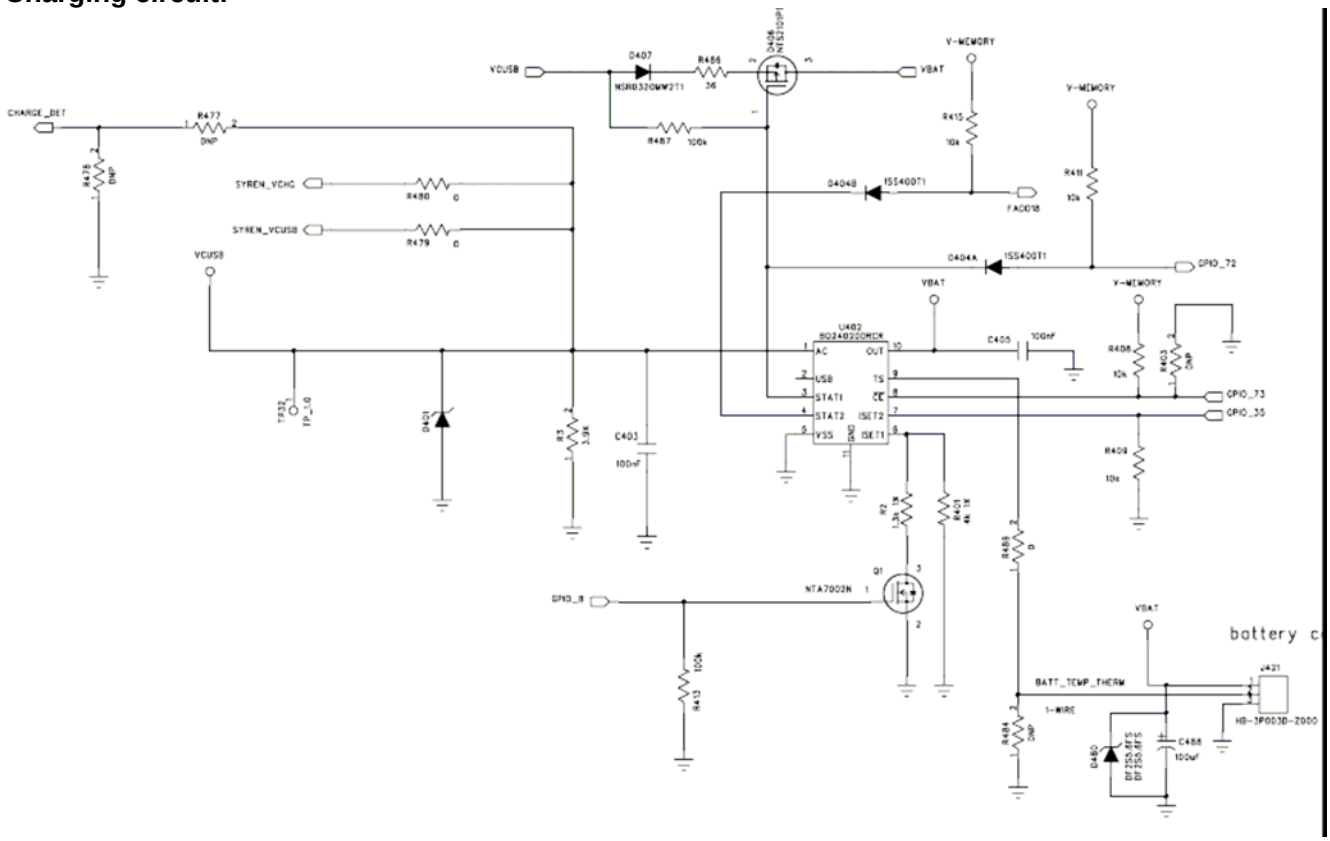
RF signal after PA magnifying pass RF-Switch (Now RF-Switch should be transmit elect connect estate) to antenna then send out.

Mini USB connector:

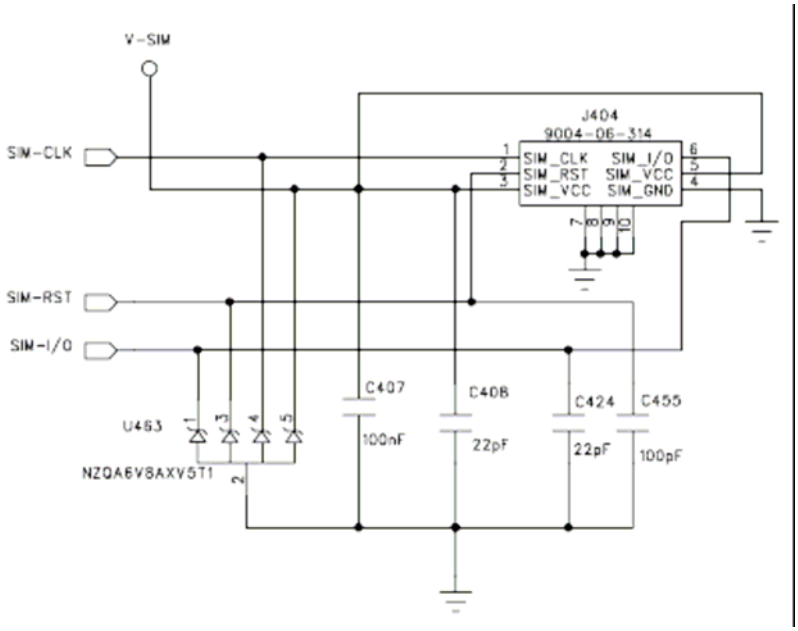


Mini-USB connector

Charging circuit:



SIM card interface circuit:



Definition of SiM card reader pin is as follows:

GND: grounding port

SIM_Vcc: SIM card power supply, normally 3V (U202 can supply two mode that 2.9V/1.8V)

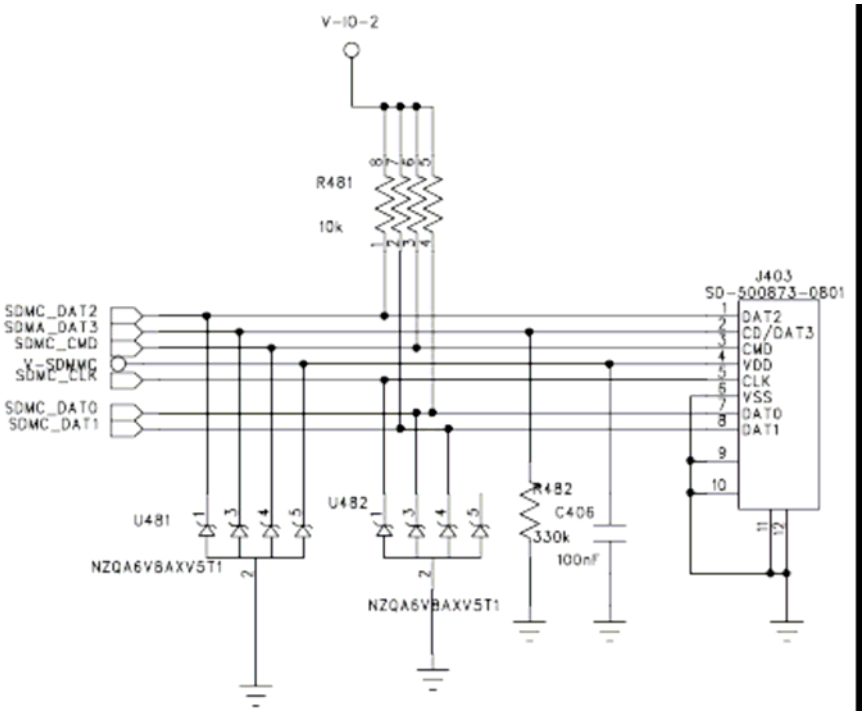
RST: SIM card reset signal

I/O: Input/Output port of user's information in SIM card, signal should be square wave

CLK: clock in SIM card

SIM card is voucher of network of a mobile phone. Mobile will display 'please insert a SIM card' when there is no SIM card in mobile phone. Only if the user's information in SIM card is legal, could the mobile phone do networking, finish user's operation, and record other kinds of information. U201 as interface circuit and management circuit, provide working voltage, clock, reset spring for SIM card, and connect its BSP to U201, achieve operation of input/output user's information in SIM card

SD card circuit:



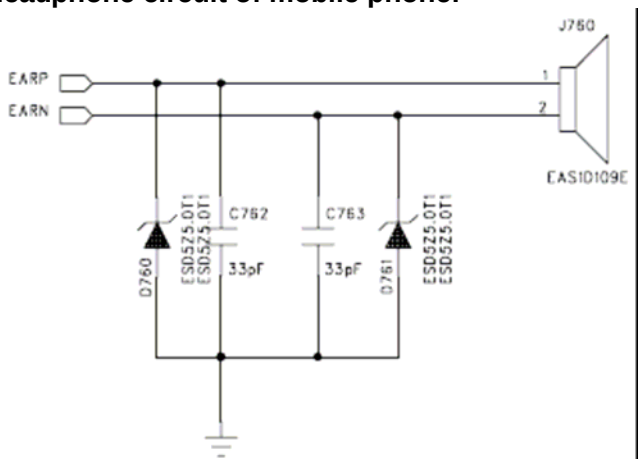
As the picture shows, pins of SD card I/O circuit are:

1. SDMC_DAT0, SDMC_DAT1, SDMC_DAT2, SDMC_DAT3 are 4 data line of SD card
2. SDMC_CMD is control line of SD card
3. V_SDMMC is power source
4. SDMC_CLK is transmission clock signal

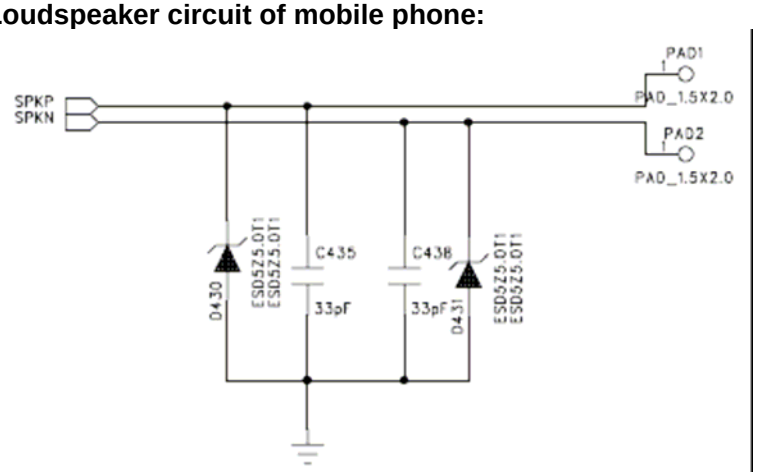
5. VSS is voltage of zero

There are two modes of SD card data transmission, 1digit and 4digit. This mobile phone use 1digit mode

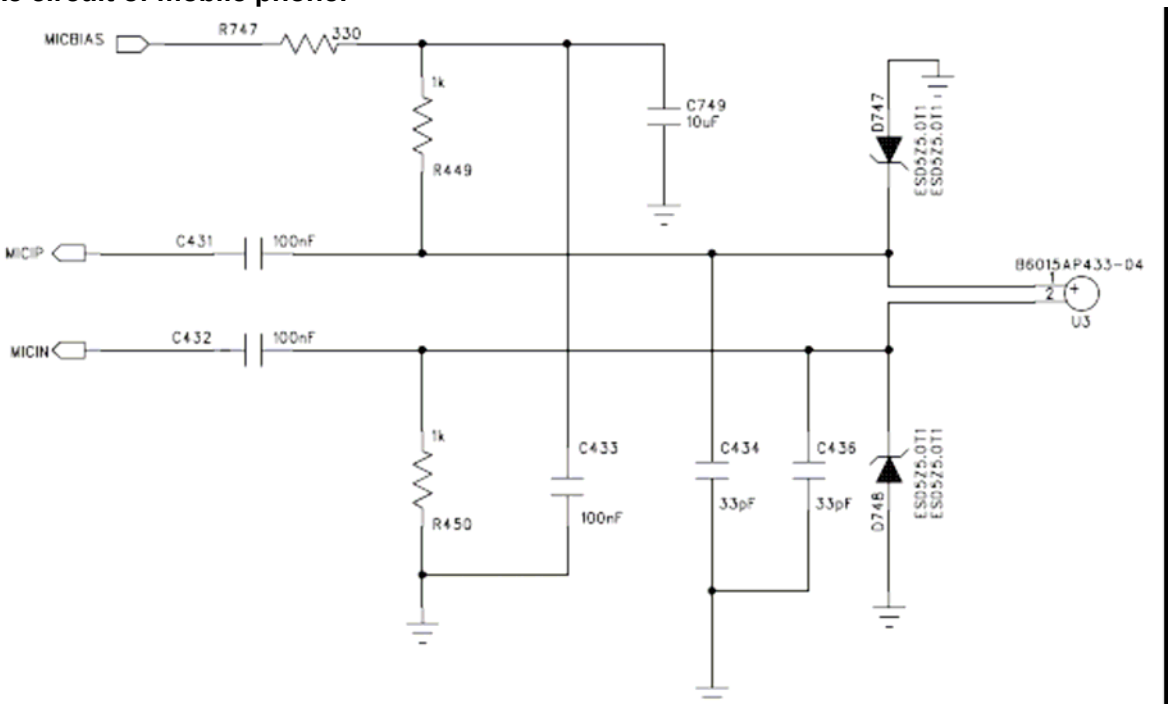
Headphone circuit of mobile phone:



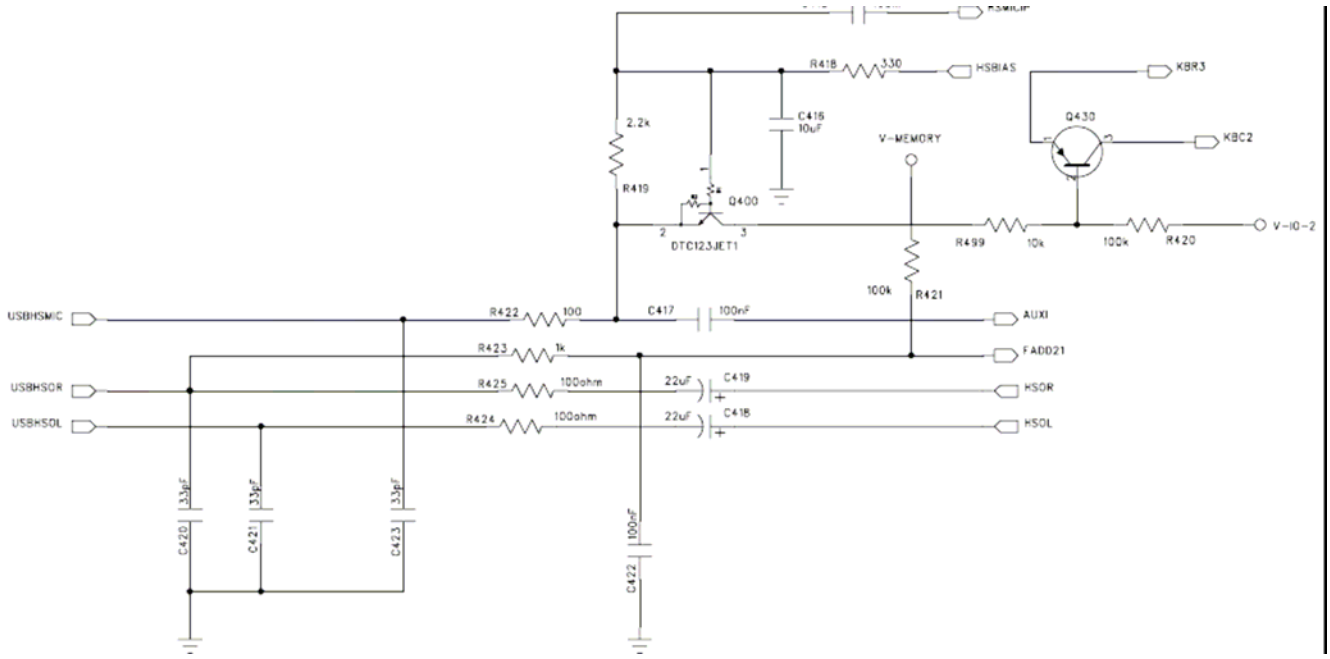
Loudspeaker circuit of mobile phone:



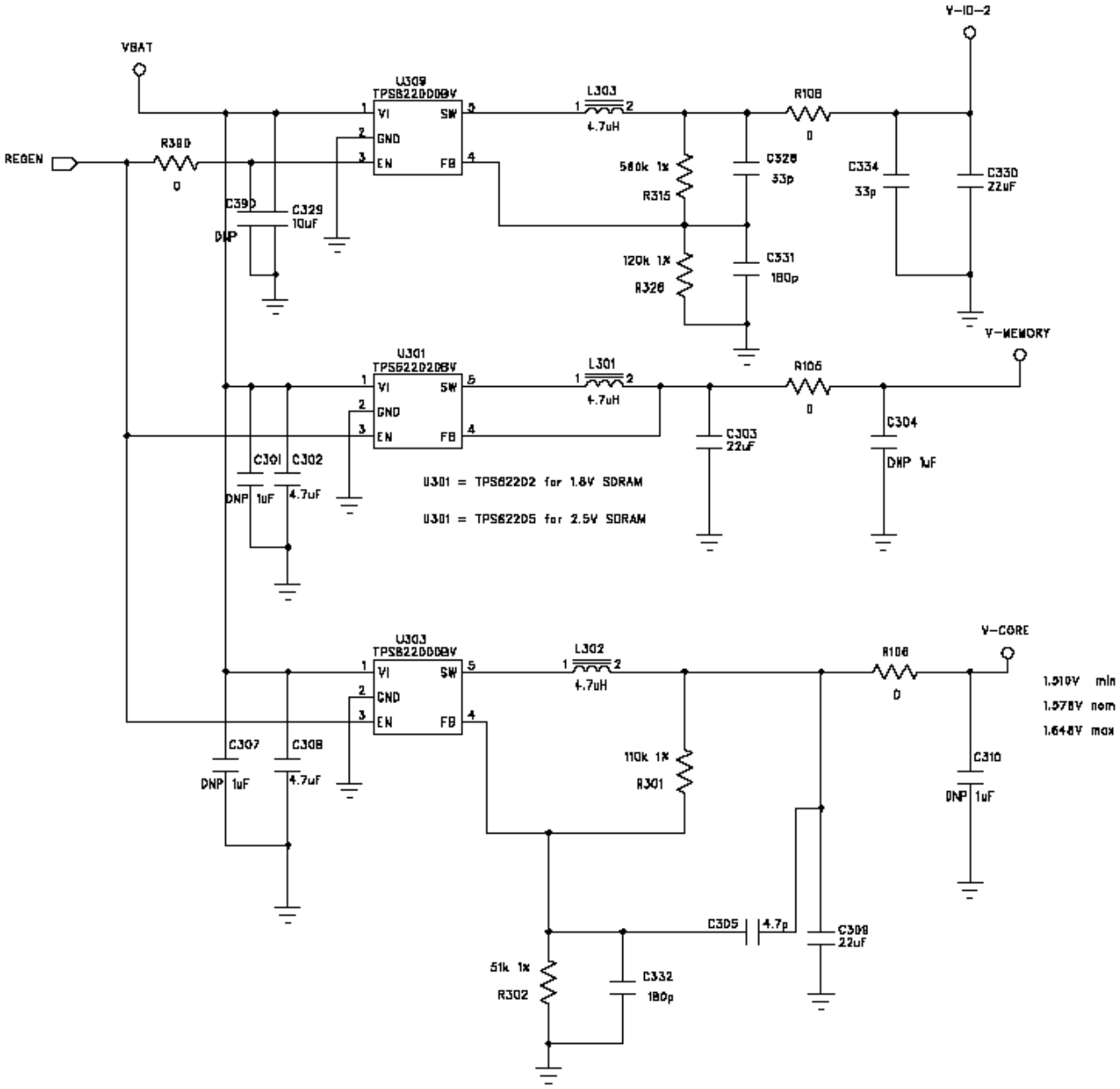
Mike circuit of mobile phone:



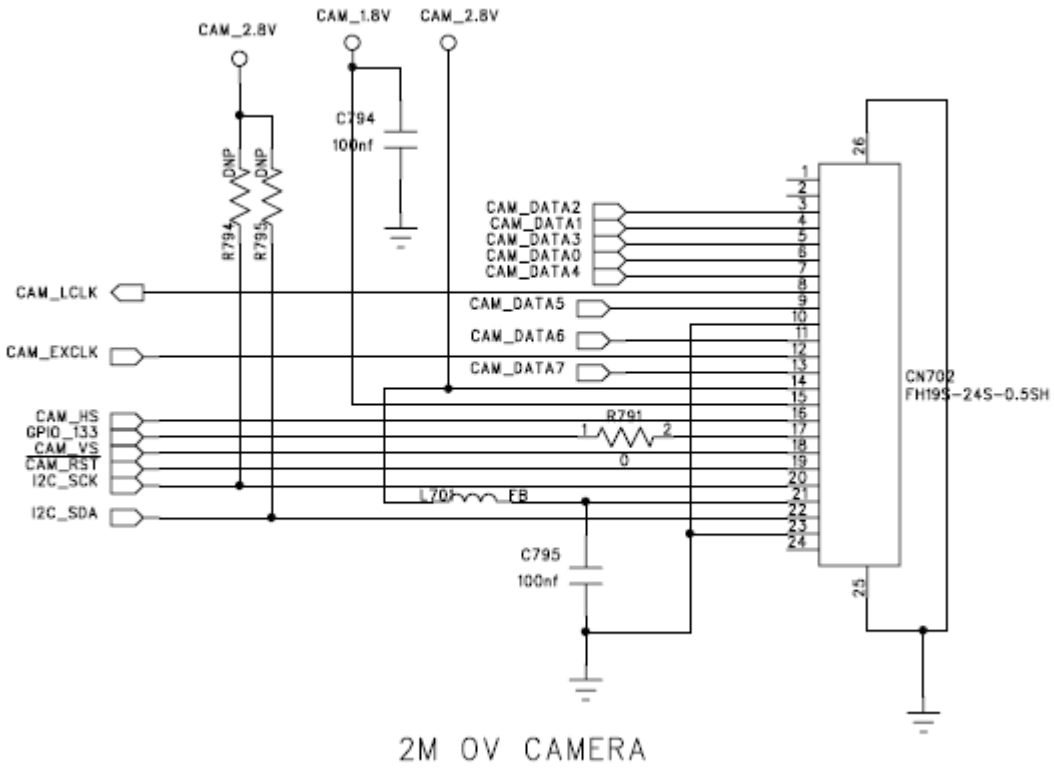
Earphone circuit of mobile phone:



3 LDO circuit:



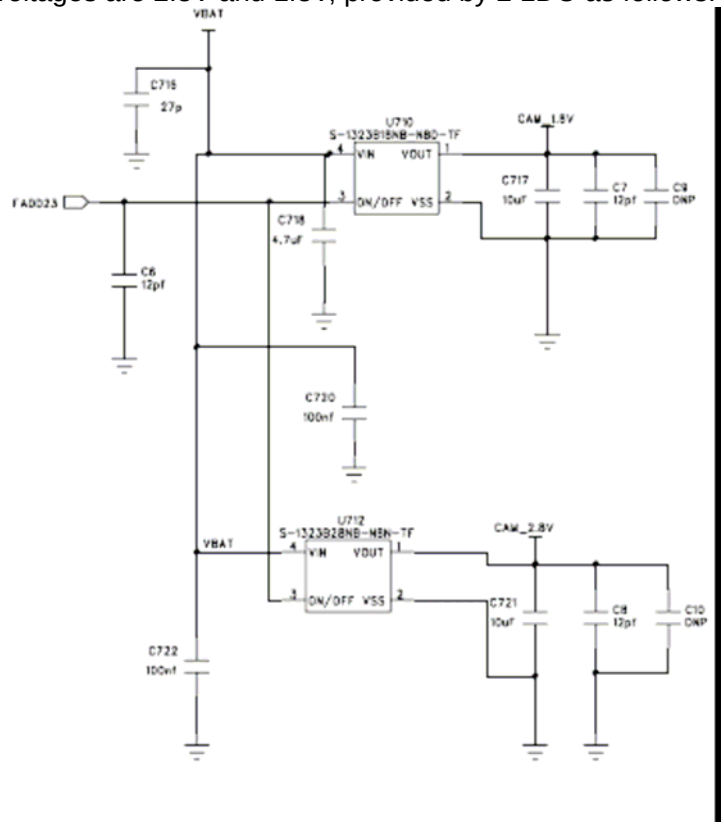
Cameramodule control circuit:



2M OV CAMERA

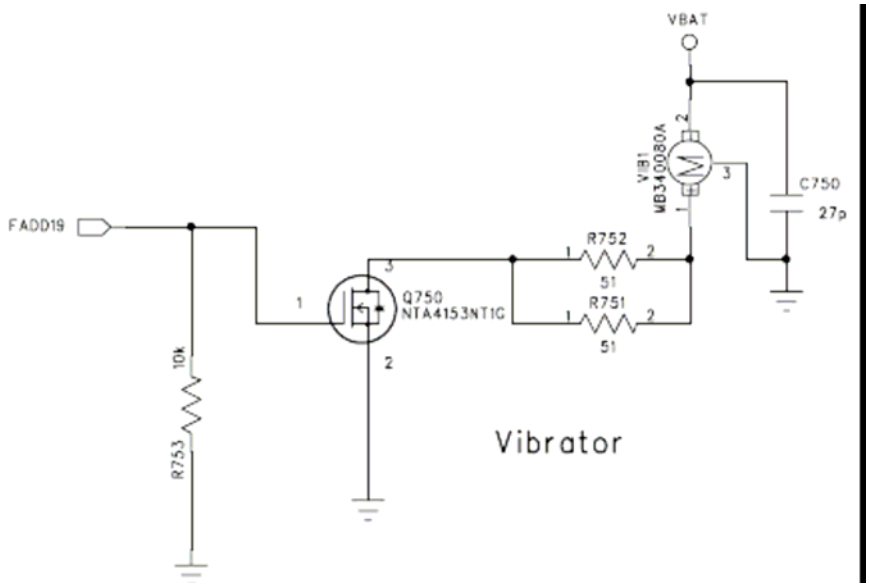
As figure 7.1 shows: cameramodule control circuit is achieved Preview and take photo function through U302

W420's inter cameramodule is 200，0000 pixel. It is connected to main board through CN702. The working voltages are 2.8V and 1.8V, provided by 2 LDO as follows:



Data from cameramodule is paste up on LCD display indirect when Previewing. Base band processor controls simple task only. After taking photo, it is need base band processor to move data from U201 to U302 for saving, if user saves the photo

Vibrator circuit control structure:



W420 use SMT motor pasted on the main board. SMT motor is propitious to mass production, and connect with main board well, provide optimal shake effect. Drive voltage of Motor is provided by VBAT. The use of Motor can be controlled by FADD19 in the system: source pole and drip pole of Q750 will connect when FADD19 is set at high level, then the Vibrator begin to work; source pole and drip pole cut off when FADD19 is set at low level, then Vibrator stop working. Resistance R751 and R752 are use to limit current when Vibrator working

8. Frequently malfunction analyse

It is needed to connect TP38, TP39 and TP2, TP3. USB line should add VBAT and GND. BlueTooth should pass two path that both MPU-RX and MPR-TX1, connect to BASEBAND, add VBAT and GND.

8.1: Can not download program

1. First check U201 and U307, is there weld connective or weld weakly between them

2. Check voltage, 5V at VCUSB, 1.2V at USB-VM in U201, 1.8V at USB-VP. Check R416A, R146B, R330, R331, R334 normal or not and if U420 disabled when the voltage above getting normal. If all of them getting normal, then weld U201 again.

8.2: Can not turn on

1. Check battery. If the battery voltage is under 3.5V, then it is needed to charge. On the contray, it may be connect weakly between battery and battery seat

2. Check if there is weld weakly on the battery seat

3. Check U201, U202, U603, U402 and the resistances and capacitance around, is them weld weakly or excursion, and is there weld connective on PCB board

4. Connect an external power source (set at 3.8V) to +/- pole of the battery seat. If there is current passing the powermeter before ON, it is illuminated that the mobile is creepaged. Check voltage for power supply LDO when turn on the mobile, the voltage value of U309 (V-IO-2), U301(V-MEMORY), U303 (V-CORD) should be 2.8V, 1.8V, 1.5V respectively. Check creepaged or not after extirpating the abnormal one

5. Check VRUSB, if there is no voltage on it or abnormol with it, then the malfunction may be at U202

6. Check V-SIM, if there is no voltage on it or abnormol with it, then the malfunction may be at U202

7. Check V-RTC, if there is no voltage on it or abnormol with it, then the malfunction may be at U202

8. Check V-IO, if there is no voltage on it or abnormol with it, then the malfunction may be at U202

9. Check VABB, if there is no voltage on it or abnormol with it, then the malfunction may be at U202

10. Check 26MHz clock output, if it is normal, may be malfunction is caused by U202

11. Measure 32.768 clock, check C201, C203, C204, R212, if all of them getting normal, may be malfunction is caused by U202

12. Validate download software normal or not again

8.3: No display, No background light

1. Check connection between main board and LCD. Refix it if the connection failed

2. Install a new LCD instead of the old one. If it getting normal, then the old one must be damaged

3. Check the pin of the connector. Reweld if there is weld connective or weakly

4. No background light. Check U730 and D730, D731, L730, C731, C732, R731, R732, Q730 around, the voltage at LED+ pole should be 10V, if the voltage is abnormal, then the malfunction may be at U730, then it must be displaced

8.4: Can not identify the SIM card

1. Check the weld of SIM card, reweld if it weakly
2. Displace an eligible SIM card instead, affirm the malfunction that is caused by SIM card or not
3. Measure the voltage of V-SIM after insert SIM card, if the value is not 2.8V, then the malfunction may be at U202, then it must be displaced
4. Check and measure spring low level for V-RST, if there is no spring low level, then the malfunction may be at U202, then it must be displaced
5. Measure SIM-I/O signal, if the signal is not square wave, then the malfunction may be at U202, then it must be displaced
6. Download the software again, if the problem occurs still, then the malfunction may be at U201, then it must be displaced

8.5: Can not charge

1. Displace an eligible battery with the voltage higher than 3.6V instead. If it charge normal, maybe the charge response is slow caused by lower voltage in the battery, or the battery is damaged
2. Check the charger. Displace another charger if the light down, affirm the charger is not disabled
3. Check U402 and elements around, is there weld weakly exist
4. Check the voltage for V-MEMORY. If the output value is not 2.8V, then displace another V-MEMORY
5. Check output voltage for GPIO73. STATE1 in U402 denotes charge or not. If GPIO output none, then the malfunction may be at U201

8.6: No bell or bell abnormal

1. Check the setting of the mobile, if the bell is set at close, then turn it on
2. Test it after download software again. If it gets normal, then the malfunction may be at software
3. Check weld for Speaker, reweld if it weakly
4. Measure the resistance of Speaker. If the value is not 8ohm, then displace the Speaker----Speaker is damaged, or its line is break off

8.7: The motor can not vibrate

1. Check the setting of the mobile, if the vibrate is set at close, then turn it on
2. Check weld for R751, R752, Q750, reweld if it weakly
3. Measure the voltage of Pin1 on Q750 when the vibrator working. If its value is not high level----2.8V, then displace U201

8.8: Can not take photo or abnormal

1. Check the installation of the cameramodule, installate it again if the installation failed
2. Check the installation of the side key, installate it again if the installation failed
3. Download software again. If it gets normal, then the malfunction may be at the version of software
4. Installate an eligible cameramodule. If it gets normal, then the former one must be damaged
5. Check the weld for CON702. Reweld if it weld weakly
6. Check the pin of CON702. Displace it if pins are damaged: weld new CON702 on the board
7. Check input voltage of U710 and U712 under the photographic mode. If the value is not 2.8V, then U201 may be damaged. On the contray, check output voltage of U710 and U712. The value should be 1.8V and 2.8V respectively. The one failed that the one damaged
8. Displace an eligible U202. If it gets normal, then maybe the U202 is damaged or weld weakly

8.9: Keyboard function error or no function (especially the side key)

1. Check the installation of the side key FPC, installate it again if the installation failed
2. Check the pasted position of Dome, appropriated with PCB board and the elasticity of it. Cleanout it with alcohol and wipe off the goo, then displace Dome
3. Check weld for D740, D741, D742. Exchange or adjust the polarity of diode if it is welded reverse or damaged
4. Check short circuit for keyboard. Wipe out eyewinker cause to short circuit
5. Displace U201. If it gets normal, then maybe the U201 is damaged----caused by ESD maybe

8.10: Signal weakly

1. Choose a no impedient environment for testing signal estate. If it gets normal, then it maybe the envirment that infect the communication condition

2. Switch to another network to check the signal estate. If it gets normal, then the problem is caused by the coverage of network

3. Check receiver access of the mobile phone. If it gets abnormal, please consult 8.16

8.11: Can not deliver voice signal (Receive call is able)

1. Check connection of Mic. Or else connect it again
2. Check weld for Mic and elements around. Or else weld again
3. Check conducting of D747 and D748. Displace new if the conduction is reverse
4. Measure deflection voltage of Mic. If it get abnormal, then maybe the U202 is damaged
5. Displace an eligible Mic. The former Mic maybe damaged if the new one get normal
6. Check transmitter access of the mobile phone. If it get abnormal, please consult 8.15
7. Displace an eligible U202. The former one maybe damaged if the new one gets normal, or the interface of Mic is damaged

8.12: Drop call

1. Check inserted estate of SIM card. Insert it again if it is abnormal
2. Check the contact estate of interfaces on the mobile. Installate them if they are abnormal
3. Tune electric capability again. The reason is tune windaged or the data missin If it gets normal
4. Check transmitter and receiver access for the mobile phone. If it gets abnormal, please consult 8.15--8.16

8.13: Transmit abnormally

1): Antenna part

1. Measure the output power of antenna. Test again if it gets normal
2. Measure the output power of RF Switch. Check connection estate between antenna and main board if the power is normal, or else, please consult RF Switch part

2): RF Switch part

1. Measure the input power of RF Switch. Please consult PA part if it is abnormal
2. Measure the voltage of VREG. It may be mulfunction at Transceiver or the capacitance is damaged if the voltage value is not 2.8V
3. Measure the logic of TSPACT00 and TSPACT04. it may be mulfunction at DBB if the logic is abnormal. Or else, displace new RF Switch

3): PA part

1. Measure the input power of PA. Please consult Transceiver if it is abnormal
2. Measure VBAT. It may be mulfunction at ABB or the capacitance is damaged if VBAT gets abnormal
3. Measure level of TX-EN, and Band select that under GSM mode and DCS mode. The value of TX-EN should be high level, the one of Band select under GSM mode should be low and under DCS mode should be high. It may be mulfunction at DBB or capacitance is damaged
4. Measure APC signal. It should be analogous square wave with occupation/unoccupied is 1/8, and the changes with power's change. It may be mulfunction at ABB if the wave and is abnormal. Or else, diplace new PA

4): Transceiver part

1. Measure VBAT and V_IO. It may be mulfunction at ABB or capacitance is damaged if they are abnormal
2. Measure 26MHz. It may be damaged of Transceiver if 26MHz is abnormal. Please consult Can not turn on
3. Measure STROBE. It is mulfunction at DBB if STROBE is normal, or else, just caused by DBB maybe

8.14: Receive abnormal

1. Check the element connection among antenna to Switch. Weld missing ones if there is absent
2. Measure input signal of RF Switch. If there is none, please check elements' absent
3. Measure VREG. It may be mulfunction at ABB if VREG is abnormal
4. Measure the logic of TSPACT00 and TSPACT04. it may be mulfunction at DBB if the logic is abnormal
5. Measure output of RF Switch. Displace RF Switch if it is normal
6. Measure output of filter. Displace it if its attenuation too much or no signal
7. Measure signal IA, IB, QA and QB. Displace Transceiver if they are normal, or else, displace DBB

Note: RF/Logic element that used to displace mulfunction one during the maintain process must

be test and melody in addvance

9. Introdution of each station test item

1.BT station

Accomplish initialization of mobile phone (as file system, parameter insert etc.), test of base band (as battery adjust, all kinds of current test) and RF test mainly.

1	*Scan Serial Number*	
2	Initialize System	Test initialize system
3	Off Current	Test off current
4	Run Mini Kernel	Run mini kernel
5	*Enter Test Mode*	
6	Power On Current	Test power on current
7	Check MS SW Version	Check MS software version
8	Set MS Date/Time	Set MS date/time
9	Create Directories	Create directories
10	Save Batt/Chg Files	Save batt/chg files
11	Save RF Files	Save RF initialize files
12	Save BlueTooth Address	Save Bluetooth address
13	Save Setting Files	Save setting files
14	Check vibrator current	Check vibrator current
15	Read ADC value at 3.4v	Read ADC value at 3.4v
16	Read ADC value at 4.2v	Read ADC value at 4.2v
17	Calculate battery coefficients	Calculate battery coefficients
18	Charger OFF Flag	Check Charger OFF Flag
19	Start Charger	Start Charger
20	Charger ON Flag	Charger ON Flag
21	Charge Current	Test Charge Current
22	Stop-Charge	Stop-Charge
23	Check SIM Card	Check SIM Card
24	*AFC Calibration*	
25	Initialize Test set	Initialize Test set
26	Switch to GSM900 NSIG Mode	Switch to GSM900 NSIG Mode
27	Switch RF Path to connector	Switch RF Path to connector
28	Config to BCH+TCH Mode	Config to BCH+TCH Mode
29	Initialize AFC	Initialize AFC
30	Measure FreqError at 2048	Measure FreqError at 2048
31	Calculate F1&F2	Calculate F1&F2
32	Check DAC Low Limit	Check DAC Low Limit
33	Check DAC Up Limit	Check DAC Up Limit
34	Measure FreqError at 100	Measure FreqError at 100
35	Calculate F3&F4	Calculate F3&F4
36	Save AFC Parameters	Save AFC Parameters
37	Check AFC	Check AFC error
38	*AGC Calibration*	
39	Switch GSM Measure Object	Switch GSM Measure Object
40	Config Test set to CW Mode	Config Test set to CW Mode
41	Initialize GSM AGC	Initialize GSM AGC
42	Measure GSM Rx Level	Measure GSM Rx Level

43	CalSavAGC	CalSavAGC
44	Check Rx Level	Check Rx Level
45	*GSM850*	
46	Switch to GSM850 NSIG Mode	Switch to GSM850 NSIG Mode
47	Initialize GSM AGC	Initialize GSM AGC
48	Measure GSM850 Rx Level	Measure GSM850 Rx Level
49	Calculate & Save GSM850 G-Magic	Calculate & Save GSM850 G-Magic
50	Check Rx Level	Check Rx Level
51	*DCS*	
52	Switch to DCS NSIG Mode	Switch to DCS NSIG Mode
53	Initialize DCS AGC	Initialize DCS AGC
54	Measure DCS Rx Level	Measure DCS Rx Level
55	Calculate & Save DCS G-Magic	Calculate & Save DCS G-Magic
56	Check Rx Level	Check Rx Level
57	*PCS*	
58	Switch to PCS NSIG Mode	Switch to PCS NSIG Mode
59	Initialize PCS AGC	Initialize PCS Auto Gain Control
60	Measure PCS Rx Level	Measure PCS Rx Level
61	Calculate & Save PCS G-Magic	Calculate & Save PCS G-Magic
62	Check Rx Level	Check Rx Level
63	*GSM900*	
64	Switch to GSM900 NSIG Mode	Switch to GSM900 NSIG Mode
65	Init GSM AGC vs Channel	Init GSM AGC vs Channel
66	GSM Rx Compensation at Ch1	
67	GSM Rx Compensation at Ch20	
68	GSM Rx Compensation at Ch40	
69	GSM Rx Compensation at Ch62	
70	GSM Rx Compensation at Ch80	
71	GSM Rx Compensation at Ch100	GSM Rx Compensation
72	GSM Rx Compensation at Ch124	
73	GSM Rx Compensation at Ch975	
74	GSM Rx Compensation at Ch1000	
75	GSM Rx Compensation at Ch1017	
76	Save GSM Rx vs Chan Compensation	
77	*GSM850*	
78	Switch to GSM850 NSIG Mode	Switch to GSM850 NSIG Mode
79	Init GSM AGC vs Channel	Init GSM AGC vs Channel
80	GSM Rx Compensation at Ch128	
81	GSM Rx Compensation at Ch148	
82	GSM Rx Compensation at Ch168	GSM Rx Compensation
83	GSM Rx Compensation at Ch190	
84	GSM Rx Compensation at Ch208	
85	GSM Rx Compensation at Ch228	
86	GSM Rx Compensation at Ch251	
87	Save GSM Rx vs Chan Compensation	Save GSM Rx vs Chan Compensation
88	*DCS*	
89	Switch to DCS NSIG Node	Switch to DCS NSIG Node
90	Init DCS AGC vs Channel	Init DCS AGC vs Channel
91	DCS Rx Compensation at Ch512	DCS Rx Compensation

92	DCS Rx Compensation at Ch585	
93	DCS Rx Compensation at Ch660	
94	DCS Rx Compensation at Ch700	
95	DCS Rx Compensation at Ch790	
96	DCS Rx Compensation at Ch835	
97	DCS Rx Compensation at Ch885	
98	Save DCS Rx vs Chan Compensation	Save DCS Rx vs Chan Compensation
99	*PCS*	
100	Switch to PCS NSIG Node	Switch to PCS NSIG Node
101	Init PCS AGC vs Channel	Init PCS AGC vs Channel
102	PCS Rx Compensation at Ch512	
103	PCS Rx Compensation at Ch585	
104	PCS Rx Compensation at Ch660	PCS Rx Compensation
105	PCS Rx Compensation at Ch700	
106	PCS Rx Compensation at Ch780	
107	Save PCS Rx vs Chan Compensation	Save PCS Rx vs Chan Compensation
108	*APC Calibration*	
109	Switch GSM900 NSIG Mode	Switch GSM900 NSIG Mode
110	Config to BCH+TCH Mode	Config to BCH+TCH Mode
111	Initial GSM APC Calibration	Initial GSM APC Calibration
112	Get GSM900 APC Power	Get GSM900 APC Power
113	Calculate & save GSM APC table	Calculate & save GSM APC table
114	Switch GSM850 NSIG Mode	Switch GSM850 NSIG Mode
115	Initial GSM APC Calibration	Initial GSM APC Calibration
116	Get GSM850 APC Power	Get GSM850 APC Power
117	Calculate & save GSM APC table	Calculate & save GSM APC table
118	Switch DCS NSIG Mode	Switch DCS NSIG Mode
119	Initial DCS APC Calibration	Initial DCS APC Calibration
120	Get DCS APC Power	Get DCS APC Power
121	Calculate & save DCS APC table	Calculate & save DCS APC table
122	Switch PCS NSIG Mode	Switch PCS NSIG Mode
123	Initial PCS APC Calibration	Initial PCS APC Calibration
124	Get PCS APC Power	Get PCS APC Power
125	Calculate & save PCS APC table	Calculate & save PCS APC table
126	*Tx vs Channel Calibration*	
127	Switch to GSM900 NSIG Mode	Switch to GSM900 NSIG Mode
128	Initial GSM Tx vs Channel	Initial GSM Tx vs Channel
129	GSM Tx Compensation at Ch14	
130	GSM Tx Compensation at Ch40	
131	GSM Tx Compensation at Ch57	
132	GSM Tx Compensation at Ch76	GSM Tx Compensation
133	GSM Tx Compensation at Ch95	
134	GSM Tx Compensation at Ch114	
135	GSM Tx Compensation at Ch985	
136	GSM Tx Compensation at Ch1009	
137	Save GSM Tx vs Chan Compensation	Save GSM Tx vs Chan Compensation
138	*GSM850*	
139	Switch to GSM850 NSIG Mode	Switch to GSM850 NSIG Mode
140	Initial GSM Tx vs Channel	Initial GSM Tx vs Channel

141	GSM Tx Compensation at Ch128	
142	GSM Tx Compensation at Ch143	
143	GSM Tx Compensation at Ch159	
144	GSM Tx Compensation at Ch175	GSM Tx Compensation
145	GSM Tx Compensation at Ch190	
146	GSM Tx Compensation at Ch206	
147	GSM Tx Compensation at Ch222	
148	GSM Tx Compensation at Ch241	
149	Save GSM Tx vs Chan Compensation	Save GSM Tx vs Chan Compensation
150	*DCS*	
151	Switch to DCS NSIG Mode	Switch to DCS NSIG Mode
152	Initial DCS Tx vs Channel	Initial DCS Tx vs Channel
153	DCS Tx Compensation at Ch533	
154	DCS Tx Compensation at Ch574	
155	DCS Tx Compensation at Ch615	
156	DCS Tx Compensation at Ch657	DCS Tx Compensation
157	DCS Tx Compensation at Ch700	
158	DCS Tx Compensation at Ch740	
159	DCS Tx Compensation at Ch781	
160	DCS Tx Compensation at Ch844	
161	Save DCS Tx vs Chan Compensation	Save DCS Tx vs Chan Compensation
162	*PCS*	
163	Switch to PCS NSIG Mode	Switch to PCS NSIG Mode
164	Initial PCS Tx vs Channel	Initial PCS Tx vs Channel
165	PCS Tx Compensation at Ch531	
166	PCS Tx Compensation at Ch568	
167	PCS Tx Compensation at Ch605	PCS Tx Compensation
168	PCS Tx Compensation at Ch660	
169	PCS Tx Compensation at Ch712	
170	PCS Tx Compensation at Ch740	
171	PCS Tx Compensation at Ch768	
172	PCS Tx Compensation at Ch796	
173	Save PCS Tx vs Chan Compensation	Save PCS Tx vs Chan Compensation
174	*Rx Check*	
175	Switch to GSM900 NSIG Mode	Switch to GSM900 NSIG Mode
176	Config to BCH+TCH Mode	Config to BCH+TCH Mode
177	Initial GSM Rx Check	Initial GSM Rx Check
178	Check GSM Rx Ch976	
179	Check GSM Rx Ch1023	Check GSM Rx
180	Check GSM Rx Ch80	
181	Check GSM Rx Ch124	
182	Switch to GSM850 NSIG Mode	Switch to GSM850 NSIG Mode
183	Initial GSM Rx Check	Initial GSM Rx Check
184	Check GSM Rx Ch128	
185	Check GSM Rx Ch178	Check GSM Rx
186	Check GSM Rx Ch208	
187	Check GSM Rx Ch251	
188	Switch to DCS NSIG Mode	Switch to DCS NSIG Mode
189	Initial DCS Rx Check	Initial DCS Rx Check
190	Check DCS Rx Ch512	
191	Check DCS Rx Ch606	Check DCS Rx
192	Check DCS Rx Ch794	
193	Check DCSRx Ch885	
194	Switch to PCS NSIG Mode	Switch to PCS NSIG Mode
195	Initial PCS Rx Check	Initial PCS Rx Check
196	Check PCS Rx Ch512	Check PCS Rx
197	Check PCS Rx Ch586	

198	Check PCS Rx Ch735	
199	Check PCS Rx Ch810	
200	*Tx Check*	
201	Switch to GSM900 NSIG Mode	Switch to GSM900 NSIG Mode
202	Config to BCH+TCH Mode	Config to BCH+TCH Mode
203	GSM Tx Check(976,5)	GSM Tx Check(976,5)
204	Tx Power(976,5)	Check Tx Power(976,5)
205	Time Mask(976,5)	Check Time Mask(976,5)
206	Peak Phase Error(976,5)	Check Peak Phase Error(976,5)
207	RMS Phase Error(976,5)	Check RMS Phase Error(976,5)
208	GSM Tx Check(976,19)	GSM Tx Check(976,19)
209	Tx Power(976,19)	Check Tx Power(976,19)
210	Time Mask(976,19)	Check Time Mask(976,19)
211	Peak Phase Error(976,19)	Check Peak Phase Error(976,19)
212	RMS Phase Error(976,19)	Check RMS Phase Error(976,19)
213	GSM Tx Check(124,5)	GSM Tx Check(124,5)
214	Tx Power(124,5)	Check Tx Power(124,5)
215	Time Mask(124,5)	Check Time Mask(124,5)
216	Peak Phase Error(124,5)	Check Peak Phase Error(124,5)
217	RMS Phase Error(124,5)	Check RMS Phase Error(124,5)
218	GSM Tx Check(124,19)	GSM Tx Check(124,19)
219	Tx Power(124,19)	Check Tx Power(124,19)
220	Time Mask(124,19)	Check Time Mask(124,19)
221	Peak Phase Error(124,19)	Check Peak Phase Error(124,19)
222	RMS Phase Error(124,19)	Check RMS Phase Error(124,19)
223	*GSM850*	
224	Switch to GSM850 NSIG Mode	Switch to GSM850 NSIG Mode
225	GSM Tx Check(128,5)	Check GSM Tx Check(128,5)
226	Tx Power(128,5)	Check Tx Power(128,5)
227	Time Mask(128,5)	Check Time Mask(128,5)
228	Peak Phase Error(128,5)	Check Peak Phase Error(128,5)
229	RMS Phase Error(128,5)	Check RMS Phase Error(128,5)
230	GSM Tx Check(128,19)	GSM Tx Check(128,19)
231	Tx Power(128,19)	Check Tx Power(128,19)
232	Time Mask(128,19)	Check Time Mask(128,19)
233	Peak Phase Error(128,19)	Check Peak Phase Error(128,19)
234	RMS Phase Error(128,19)	Check RMS Phase Error(128,19)
235	GSM Tx Check(251,5)	GSM Tx Check(251,5)
236	Tx Power(251,5)	Check Tx Power(251,5)
237	Time Mask(251,5)	Check Time Mask(251,5)
238	Peak Phase Error(251,5)	Check Peak Phase Error(251,5)
239	RMS Phase Error(251,5)	Check RMS Phase Error(251,5)
240	GSM Tx Check(251,19)	GSM Tx Check(251,19)
241	Tx Power(251,19)	Check Tx Power(251,19)
242	Time Mask(251,19)	Check Time Mask(251,19)
243	Peak Phase Error(251,19)	Check Peak Phase Error(251,19)
244	RMS Phase Error(251,19)	Check RMS Phase Error(251,19)
245	*DCS*	
246	Switch to DCS NSIG Mode	Switch to DCS NSIG Mode
247	DCS Tx Check(512,0)	DCS Tx Check(512,0)
248	Tx Power(512,0)	Check Tx Power(512,0)
249	Time Mask(512,0)	Check Time Mask(512,0)
250	Peak Phase Error(512,0)	Check Peak Phase Error(512,0)
251	RMS Phase Error(512,0)	Check RMS Phase Error(512,0)
252	DCS Tx Check(512,15)	DCS Tx Check(512,15)
253	Tx Power(512,15)	Check Tx Power(512,15)
254	Time Mask(512,15)	Check Time Mask(512,15)

255	Peak Phase Error(512,15)	Check Peak Phase Error(512,15)
256	RMS Phase Error(512,15)	Check RMS Phase Error(512,15)
257	DCS Tx Check(885,0)	DCS Tx Check(885,0)
258	Tx Power(885,0)	Check Tx Power(885,0)
259	Time Mask(885,0)	Check Time Mask(885,0)
260	Peak Phase Error(885,0)	Check Peak Phase Error(885,0)
261	RMS Phase Error(885,0)	Check RMS Phase Error(885,0)
262	DCS Tx Check(885,15)	DCS Tx Check(885,15)
263	Tx Power(885,15)	Check Tx Power(885,15)
264	Time Mask(885,15)	Check Time Mask(885,15)
265	Peak Phase Error(885,15)	Check Peak Phase Error(885,15)
266	RMS Phase Error(885,15)	Check RMS Phase Error(885,15)
267	*PCS*	
268	Switch to PCS NSIG Mode	Switch to PCS NSIG Mode
269	PCS Tx Check(512,0)	PCS Tx Check(512,0)
270	Tx Power(512,0)	Check Tx Power(512,0)
271	Time Mask(512,0)	Check Time Mask(512,0)
272	Peak Phase Error(512,0)	Check Peak Phase Error(512,0)
273	RMS Phase Error(512,0)	Check RMS Phase Error(512,0)
274	PCS Tx Check(512,15)	PCS Tx Check(512,15)
275	Tx Power(512,15)	Check Tx Power(512,15)
276	Time Mask(512,15)	Check Time Mask(512,15)
277	Peak Phase Error(512,15)	Check Peak Phase Error(512,15)
278	RMS Phase Error(512,15)	Check RMS Phase Error(512,15)
279	PCS Tx Check(810,0)	PCS Tx Check(810,0)
280	Tx Power(810,0)	Check Tx Power(810,0)
281	Time Mask(810,0)	Check Time Mask(810,0)
282	Peak Phase Error(810,0)	Check Peak Phase Error(810,0)
283	RMS Phase Error(810,0)	Check RMS Phase Error(810,0)
284	PCS Tx Check(810,15)	Check PCS Tx Check(810,15)
285	Tx Power(810,15)	Check Tx Power(810,15)
286	Time Mask(810,15)	Check Time Mask(810,15)
287	Peak Phase Error(810,15)	Check Peak Phase Error(810,15)
288	RMS Phase Error(810,15)	Check RMS Phase Error(810,15)
289	*End Of Test*	*End Of Test*
290	Check RTC	Check RTC
291	Set Phase Version	Set Phase Version
292	Write FFS to Flash	Write FFS to Flash
293		

2. FT station

1	*Init*	
2	Initialize System	Initialize System
3	Off Current	Off Current
4	Run Mini Kernel	Run Mini Kernel
5	Check Phase Version	Check Phase Version
6	*Call Test*	
7	Initialize GSM Test set	Initialize GSM Test set
8	Switch to GSM900 signalling mode	Switch to GSM900 signalling mode
9	Switch RF Path to connector	Switch RF Path to connector
10	Setup BCCH	Setup BCCH
11	Setup TCH	Setup TCH

12	Wait for MS Registering	Wait for MS Registering
13	Ms call to BS	Ms call to BS
14	Check Call connection	Check Call connection
15	Change PLC(975,19)	Change PLC(975,19)
16	Start Tx Measurement(975,19)	Start Tx Measurement(975,19)
17	Average Power(975,19)	Check Average Power(975,19)
18	Peak Phs Error(975,19)	Check Peak Phs Error(975,19)
19	RMS Phs Error(975,19)	Check RMS Phs Error(975,19)
20	Frequency Error(975,19)	Check Frequency Error(975,19)
21	Time Mask(975,19)	Check Time Mask(975,19)
22	Change PCL(975,5)	Change PCL(975,5)
23	Start Tx Measurement(975,5)	Start Tx Measurement(975,5)
24	Average Power(975,5)	Check Average Power(975,5)
25	Peak Phs Error(975,5)	Check Peak Phs Error(975,5)
26	RMS Phs Error(975,5)	Check RMS Phs Error(975,5)
27	Frequency Error(975,5)	Check Frequency Error(975,5)
28	Time Mask(975,5)	Check Time Mask(975,5)
29	Switching spectrum(975,5)	Check Switching spectrum(975,5)
30	ORFS Offset -1200Khz(975,5)	
31	ORFS Offset - 800Khz(975,5)	
32	ORFS Offset - 400Khz(975,5)	
33	ORFS Offset - 400Khz(975,5)	Check Switching spectrum(975,5)
34	ORFS Offset + 400Khz(975,5)	
35	ORFS Offset + 600Khz(975,5)	
36	ORFS Offset + 800Khz(975,5)	
37	ORFS Offset + 1200Khz(975,5)	
38	Start BER Measurement(975,-106)	Start BER Measurement(975,-106)
39	RBER ClassII(975,-106)	RBER ClassII(975,-106)
40	FER(975,-106)	FER(975,-106)
41	Rx Level(975,-106)	Rx Level(975,-106)
42	Rx Quality(975,-106)	Rx Quality(975,-106)
43	Change TCH(40,19)	Change TCH(40,19)
44	Start Tx Measurement(40,19)	Start Tx Measurement(40,19)
45	Average Power(40,19)	Measurement Average Power(40,19)
46	Peak Phs Error(40,19)	Measurement Peak Phs Error(40,19)
47	RMS Phs Error(40,19)	Measurement RMS Phs Error(40,19)
48	Frequency Error(40,19)	Measurement Frequency Error(40,19)
49	Time Mask(40,19)	Measurement Time Mask(40,19)
50	Change PCL(40,5)	Change PCL(40,5)
51	Start Tx Measurement(40,5)	Start Tx Measurement(40,5)
52	Average Power(40,5)	Measurement Average Power(40,5)
53	Peak Phs Error(40,5)	Measurement Peak Phs Error(40,5)
54	RMS Phs Error(40,5)	Measurement RMS Phs Error(40,5)
55	Frequency Error(40,5)	Measurement Frequency Error(40,5)
56	Time Mask(40,5)	Measurement Time Mask(40,5)
57	Switching spectrum(40,5)	Switching spectrum(40,5)

58	ORFS Offset -1200Khz(40,5)	
59	ORFS Offset - 800Khz(40,5)	
60	ORFS Offset - 400Khz(40,5)	
61	ORFS Offset - 400Khz(40,5)	Check ORFS Offset at 40channel
62	ORFS Offset + 400Khz(40,5)	
63	ORFS Offset + 600Khz(40,5)	
64	ORFS Offset + 800Khz(40,5)	
65	ORFS Offset + 1200Khz(40,5)	
66	Tx Max current(GSM)	Tx Max current(GSM)
67	Start BER Measurement(40,-106)	Start BER Measurement(40,-106)
68	RBER ClassII(40,-106)	RBER ClassII(40,-106)
69	FER(40,-106)	FER(40,-106)
70	Rx Level(40,-106)	Rx Level(40,-106)
71	Rx Quality(40,-106)	Rx Quality(40,-106)
72	Change TCH(124,19)	Change TCH(124,19)
73	Start Tx Measurement(124,19)	Start Tx Measurement(124,19)
74	Average Power(124,19)	Measurement Average Power(124,19)
75	Peak Phs Error(124,19)	Measurement Peak Phs Error(124,19)
76	RMS Phs Error(124,19)	Measurement RMS Phs Error(124,19)
77	Frequency Error(124,19)	Measurement Frequency Error(124,19)
78	Time Mask(124,19)	vTime Mask(124,19)
79	Change PCL(124,5)	Measurement Change PCL(124,5)
80	Start Tx Measurement(124,5)	Start Tx Measurement(124,5)
81	Average Power(124,5)	Measurement Average Power(124,5)
82	Peak Phs Error(124,5)	Measurement Peak Phs Error(124,5)
83	RMS Phs Error(124,5)	Measurement RMS Phs Error(124,5)
84	Frequency Error(124,5)	Measurement Frequency Error(124,5)
85	Time Mask(124,5)	Measurement Time Mask(124,5)
86	Switching spectrum(124,5)	Switching spectrum(124,5)
87	ORFS Offset -1200Khz(124,5)	
88	ORFS Offset - 800Khz(124,5)	
89	ORFS Offset - 400Khz(124,5)	
90	ORFS Offset - 400Khz(124,5)	Check ORFS Offset at 124channel
91	ORFS Offset + 400Khz(124,5)	
92	ORFS Offset + 600Khz(124,5)	
93	ORFS Offset + 800Khz(124,5)	
94	ORFS Offset + 1200Khz(124,5)	
95	Start BER Measurement(124,-106)	Start BER Measurement(124,-106)
96	RBER ClassII(124,-106)	RBER ClassII(124,-106)
97	FER(124,-106)	FER(124,-106)
98	Rx Level(124,-106)	Rx Level(124,-106)
99	Rx Quality(124,-106)	Rx Quality(124,-106)
100	*DCS measurement*	
101	Handover to DCS band	Handover to DCS band
102	Check Call connected(DCS)	Check Call connected(DCS)
103	Change TCH(512,15)	Change TCH(512,15)
104	Start Tx Measurement(512,15)	Start Tx Measurement(512,15)

105	Average Power(512,15)	Measurement Average Power(512,15)
106	Peak Phs Error(512,15)	Measurement Peak Phs Error(512,15)
107	RMS Phs Error(512,15)	Measurement RMS Phs Error(512,15)
108	Frequency Error(512,15)	Measurement Frequency Error(512,15)
109	Time Mask(512,15)	Measurement Time Mask(512,15)
110	Change PCL(512,0)	Measurement Change PCL(512,0)
111	Start Tx Measurement(512,0)	Start Tx Measurement(512,0)
112	Average Power(512,0)	Measurement Average Power(512,0)
113	Peak Phs Error(512,0)	Measurement Peak Phs Error(512,0)
114	RMS Phs Error(512,0)	Measurement RMS Phs Error(512,0)
115	Frequency Error(512,0)	Measurement Frequency Error(512,0)
116	Time Mask(512,0)	Measurement Time Mask(512,0)
117	Switching spectrum(512,0)	Switching spectrum(512,0)
118	ORFS Offset -1200Khz(512,0)	
119	ORFS Offset - 800Khz(512,0)	
120	ORFS Offset - 400Khz(512,0)	
121	ORFS Offset - 400Khz(512,0)	Check ORFS Offset at 512channel
122	ORFS Offset + 400Khz(512,0)	
123	ORFS Offset + 600Khz(512,0)	
124	ORFS Offset + 800Khz(512,0)	
125	ORFS Offset + 1200Khz(512,0)	
126	Start BER Measurement(512,-106)	Start BER Measurement(512,-106)
127	RBER ClassII(512,-106)	RBER ClassII(512,-106)
128	FER(512,-106)	FER(512,-106)
129	Rx Level(512,-106)	Rx Level(512,-106)
130	Rx Quality(512,-106)	Rx Quality(512,-106)
131	Change TCH(698,15)	Change TCH(698,15)
132	Start Tx Measurement(698,15)	Start Tx Measurement(698,15)
133	Average Power(698,15)	Measurement Average Power(698,15)
134	Peak Phs Error(698,15)	Measurement Peak Phs Error(698,15)
135	RMS Phs Error(698,15)	Measurement RMS Phs Error(698,15)
136	Frequency Error(698,15)	Measurement Frequency Error(698,15)
137	Time Mask(698,15)	Measurement Time Mask(698,15)
138	Change PCL(698,0)	Measurement Change PCL(698,0)
139	Start Tx Measurement(698,0)	Start Tx Measurement(698,0)
140	Average Power(698,0)	Measurement Average Power(698,0)
141	Peak Phs Error(698,0)	Measurement Peak Phs Error(698,0)
142	RMS Phs Error(698,0)	Measurement RMS Phs Error(698,0)
143	Frequency Error(698,0)	Measurement Frequency Error(698,0)
144	Time Mask(698,0)	Measurement Time Mask(698,0)
145	Switching spectrum(698,0)	Switching spectrum(698,0)
146	ORFS Offset -1200Khz(698,0)	
147	ORFS Offset - 800Khz(698,0)	
148	ORFS Offset - 400Khz(698,0)	
149	ORFS Offset - 400Khz(698,0)	Check the most power level on-off spectrum at channel698
150	ORFS Offset + 400Khz(698,0)	
151	ORFS Offset + 600Khz(698,0)	
152	ORFS Offset + 800Khz(698,0)	
153	ORFS Offset + 1200Khz(698,0)	
154	Tx Max current(DCS)	Tx Max current(DCS)
155	Start BER Measurement(698,-106)	Start BER Measurement(698,-106)
156	RBER ClassII(698,-106)	RBER ClassII(698,-106)
157	FER(698,-106)	FER(698,-106)
158	Rx Level(698,-106)	Rx Level(698,-106)
159	Rx Quality(698,-106)	Rx Quality(698,-106)
160	Change TCH(885,15)	Change TCH(885,15)

161	Start Tx Measurement(885,15)	Start Tx Measurement(885,15)
162	Average Power(885,15)	Measurement Average Power(885,15)
163	Peak Phs Error(885,15)	Measurement Peak Phs Error(885,15)
164	RMS Phs Error(885,15)	Measurement RMS Phs Error(885,15)
165	Frequency Error(885,15)	Measurement Frequency Error(885,15)
166	Time Mask(885,15)	Measurement Time Mask(885,15)
167	Change PCL(885,0)	Measurement Change PCL(885,0)
168	Start Tx Measurement(885,0)	Start Tx Measurement(885,0)
169	Average Power(885,0)	Measurement Average Power(885,0)
170	Peak Phs Error(885,0)	Measurement Peak Phs Error(885,0)
171	RMS Phs Error(885,0)	Measurement RMS Phs Error(885,0)
172	Frequency Error(885,0)	Measurement Frequency Error(885,0)
173	Time Mask(885,0)	Measurement Time Mask(885,0)
174	Switching spectrum(885,0)	Switching spectrum(885,0)
175	ORFS Offset -1200Khz(885,0)	
176	ORFS Offset - 800Khz(885,0)	
177	ORFS Offset - 400Khz(885,0)	
178	ORFS Offset - 400Khz(885,0)	Check ORFS Offset at 885channel
179	ORFS Offset + 400Khz(885,0)	
180	ORFS Offset + 600Khz(885,0)	
181	ORFS Offset + 800Khz(885,0)	
182	ORFS Offset + 1200Khz(885,0)	
183	Start BER Measurement(885,-106)	Start BER Measurement(885,-106)
184	RBER ClassII(885,-106)	RBER ClassII(885,-106)
185	FER(885,-106)	FER(885,-106)
186	Rx Level(885,-106)	Rx Level(885,-106)
187	Rx Quality(885,-106)	Rx Quality(885,-106)
188	*PCS measurement*	
189	Initialize System	Initialize System
190	Run Mini Kernel	Run Mini Kernel
191	Initialize GSM Test set	Initialize GSM Test set
192	Switch RF Path to connector	Switch RF Path to connector
193	Setup BCCH	Setup BCCH
194	Setup TCH	Setup TCH
195	Wait for MS Registering	Wait for MS Registering
196	Ms call to BS	Ms call to BS
197	Check Call connection	Check Call connection
198	Change TCH(512,15)	Change TCH(512,15)
199	Start Tx Measurement(512,15)	Start Tx Measurement(512,15)
200	Average Power(512,15)	Measurement Average Power(512,15)
201	Peak Phs Error(512,15)	Measurement Peak Phs Error(512,15)
202	RMS Phs Error(512,15)	Measurement RMS Phs Error(512,15)
203	Frequency Error(512,15)	Measurement Frequency Error(512,15)
204	Time Mask(512,15)	Measurement Time Mask(512,15)
205	Change PCL(512,0)	Measurement Change PCL(512,0)
206	Start Tx Measurement(512,0)	Start Tx Measurement(512,0)
207	Average Power(512,0)	Measurement Average Power(512,0)
208	Peak Phs Error(512,0)	Measurement Peak Phs Error(512,0)
209	RMS Phs Error(512,0)	Measurement RMS Phs Error(512,0)
210	Frequency Error(512,0)	Measurement Frequency Error(512,0)
211	Time Mask(512,0)	Measurement Time Mask(512,0)
212	Switching spectrum(512,0)	Switching spectrum(512,0)
213	ORFS Offset -1200Khz(512,0)	Check ORFS Offset at 512channel
214	ORFS Offset - 800Khz(512,0)	
215	ORFS Offset - 400Khz(512,0)	
216	ORFS Offset - 400Khz(512,0)	

217	ORFS Offset + 400Khz(512,0)	
218	ORFS Offset + 600Khz(512,0)	
219	ORFS Offset + 800Khz(512,0)	
220	ORFS Offset + 1200Khz(512,0)	
221	Start BER Measurement(512,-106)	Start BER Measurement(512,-106)
222	RBER ClassII(512,-106)	RBER ClassII(512,-106)
223	FER(512,-106)	FER(512,-106)
224	Rx Level(512,-106)	Rx Level(512,-106)
225	Rx Quality(512,-106)	Rx Quality(512,-106)
226	Change TCH(660,15)	Change TCH(660,15)
227	Start Tx Measurement(660,15)	Start Tx Measurement(660,15)
228	Average Power(660,15)	Measurement Average Power(660,15)
229	Peak Phs Error(660,15)	Measurement Peak Phs Error(660,15)
230	RMS Phs Error(660,15)	Measurement RMS Phs Error(660,15)
231	Frequency Error(660,15)	Measurement Frequency Error(660,15)
232	Time Mask(660,15)	Measurement Time Mask(660,15)
233	Change PCL(660,0)	Measurement Change PCL(660,0)
234	Start Tx Measurement(660,0)	Start Tx Measurement(660,0)
235	Average Power(660,0)	Measurement Average Power(660,0)
236	Peak Phs Error(660,0)	Measurement Peak Phs Error(660,0)
237	RMS Phs Error(660,0)	Measurement RMS Phs Error(660,0)
238	Frequency Error(660,0)	Measurement Frequency Error(660,0)
239	Time Mask(660,0)	Measurement Time Mask(660,0)
240	Switching spectrum(660,0)	Switching spectrum(660,0)
241	ORFS Offset -1200Khz(660,0)	
242	ORFS Offset - 800Khz(660,0)	
243	ORFS Offset - 400Khz(660,0)	
244	ORFS Offset - 400Khz(660,0)	Check ORFS Offset at 660channel
245	ORFS Offset + 400Khz(660,0)	
246	ORFS Offset + 600Khz(660,0)	
247	ORFS Offset + 800Khz(660,0)	
248	ORFS Offset + 1200Khz(660,0)	
249	Tx Max current(PCS)	Tx Max current(PCS)
250	Start BER Measurement(660,-106)	Start BER Measurement(660,-106)
251	RBER ClassII(660,-106)	RBER ClassII(660,-106)
252	FER(660,-106)	FER(660,-106)
253	Rx Level(660,-106)	Rx Level(660,-106)
254	Rx Quality(660,-106)	Rx Quality(660,-106)
255	Change TCH(810,15)	Change TCH(810,15)
256	Start Tx Measurement(810,15)	Start Tx Measurement(810,15)
257	Average Power(810,15)	Measurement Average Power(810,15)
258	Peak Phs Error(810,15)	Measurement Peak Phs Error(810,15)
259	RMS Phs Error(810,15)	Measurement RMS Phs Error(810,15)
260	Frequency Error(810,15)	Measurement Frequency Error(810,15)
261	Time Mask(810,15)	Measurement Time Mask(810,15)
262	Change PCL(810,0)	Measurement Change PCL(810,0)
263	Start Tx Measurement(810,0)	Start Tx Measurement(810,0)
264	Average Power(810,0)	Measurement Average Power(810,0)
265	Peak Phs Error(810,0)	Measurement Peak Phs Error(810,0)
266	RMS Phs Error(810,0)	Measurement RMS Phs Error(810,0)
267	Frequency Error(810,0)	Measurement Frequency Error(810,0)
268	Time Mask(810,0)	Measurement Time Mask(810,0)
269	Switching spectrum(810,0)	Switching spectrum(810,0)
270	ORFS Offset -1200Khz(810,0)	Check ORFS Offset at 810channel
271	ORFS Offset - 800Khz(810,0)	
272	ORFS Offset - 400Khz(810,0)	

273	ORFS Offset - 400Khz(810,0)	
274	ORFS Offset + 400Khz(810,0)	
275	ORFS Offset + 600Khz(810,0)	
276	ORFS Offset + 800Khz(810,0)	
277	ORFS Offset + 1200Khz(810,0)	
278	Start BER Measurement(810,-106)	Start BER Measurement(810,-106)
279	RBER ClassII(810,-106)	RBER ClassII(810,-106)
280	FER(810,-106)	FER(810,-106)
281	Rx Level(810,-106)	Rx Level(810,-106)
282	Rx Quality(810,-106)	Rx Quality(810,-106)
283	End Call	End Call
284	*End of Test*	
285	Re-Enter Test Mode	Re-Enter Test Mode
286	Set Phase Version	Set Phase Version
287	Write FFS to Flash	Write FFS to Flash

3. ANT station

1	*Init*	
2	Initialize System	Initialize System
3	Run Mini Kernel	Run Mini Kernel
4	Enter Test Mode	Enter Test Mode
5	Check Phase Version	Check Phase Version
6	*TX Check*	
7	Switch to GSM900 NSIG Mode	Switch to GSM900 NSIG Mode
8	Switch RF Path to connector	Switch RF Path to connector
9	Config to BCH+TCH Mode	Config to BCH+TCH Mode
10	GSM Tx Check(40,5)	GSM Tx Check(40,5)
11	Tx Power(40,5)	Check Tx Power(40,5)
12	Time Mask(40,5)	Check Time Mask(40,5)
13	Peak Phase Error(40,5)	Check Peak Phase Error(40,5)
14	Switch to DCS NSIG Mode	Switch to DCS NSIG Mode
15	DCS Tx Check(700,0)	DCS Tx Check(700,0)
16	Tx Power(700,0)	Check Tx Power(700,0)
17	Time Mask(700,0)	Check Time Mask(700,0)
18	Peak Phase Error(700,0)	Check Peak Phase Error(700,0)
19	Switch to PCS NSIG Mode	Switch to PCS NSIG Mode
20	PCS Tx Check(660,0)	PCS Tx Check(660,0)
21	Tx Power(660,0)	Check Tx Power(660,0)
22	Time Mask(660,0)	Check Time Mask(660,0)
23	Peak Phase Error(660,0)	Check Peak Phase Error(660,0)
24	*End Test*	
25	SetPhaseVersion	SetPhaseVersion
26	Write FFS to Flash	Write FFS to Flash

10. reference information and notice:

10.1 test reference value:

1: GSM frequency band

The number of Low band channel is 975, transmit frequency of low band channel is 880.2MHz, receive frequency is 925.2MHz

The number of Intermediate band channel is 37, transmit frequency of intermediate band channel is 897.4MHz, receive frequency is 942.4MHz

The number of High band channel is 124, transmit frequency of high band channel is 914.8MHz, receive frequency is 959.8MHz

Test parameter:

Executive EGSM Test	Lower limit	Upper limit
Transmitting average phase error when at min and max power transmit (average root value)	0	5 degree
Transmitting average phase error when at min and max power transmit (peak value)	0	20 degree
Transmitting average frequency error when at min and max power transmit	-91Hz	+91Hz
Transmitting power error at NO.7 power class (29dBm) on CH62	-2db	+2db
Transmitting power error at NO.10 power class (23dBm) on CH62	-3db	+3db
Transmitting power error at NO.15 power class (13dBm) on CH62	-3db	+3db
Transmitting average power error when at min and max power transmit	In GSM technique guideline	
Receive bit error test of RES II (at -103 dBm)	2%	
Receive frame erasure rate of RES II (at -103 dBm)	0.12%	
Indication of RX_LEV at -100 dBm	-104 dB	-96 dB
Indication of RX_LEV at -45 dBm	-49 dB	-41 dB
Quality of RX_LEV (RX_QUAL)	No more than 2	

Table 10.1: GSM frequency band test parameter

2: DCS frequency band

The number of Low band channel is 512, transmit frequency of low band channel is 1710.2MHz, receive frequency is 1805.2MHz

The number of Intermediate band channel is 700, transmit frequency of intermediate band channel is 1747.8MHz, receive frequency is 1842.8MHz

The number of High band channel is 885, transmit frequency of high band channel is 1785MHz, receive frequency is 1880MHz

Test parameter:

Ready to executive EGSM Test	Lower limit	Upper limit
Transmitting average phase error when at min and max power transmit (average root value)		5 degree
Transmitting average phase error when at min and max power transmit (peak value)		20 degree
Transmitting average frequency error when at min and max power transmit	-171Hz	+171Hz
Transmitting power error at NO.5 power class (20dBm) on CH700	-2db	+2db
Transmitting power error at NO.10 power class (10dBm) on CH62	-3db	+3db
Transmitting power error at NO.15 power class (0dBm) on CH62	-3db	+3db
Transmitting average power error when at min and max power transmit	In DCS technique guideline	
Receive bit error test of RES II (at -102 dBm)	2%	
Receive frame erasure rate of RES II (at -102 dBm)	0.12%	

Indication of RX_LEV at -100 dBm	-104 dB	-96 dB
Indication of RX_LEV at -45 dBm	-49 dB	-41 dB
Quality of RX_LEV (RX_QUAL)	No more than 2	

Table 10.2: DCS frequency band test parameter

3: PCS frequency band

The number of Low band channel is 512, transmit frequency of low band channel is 1850MHz, receive frequency is 1930MHz

The number of Intermediate band channel is 665, transmit frequency of intermediate band channel is 1880.6MHz, receive frequency is 1960.6MHz

The number of High band channel is 810, transmit frequency of high band channel is 1910MHz, receive frequency is 1990MHz

Test parameter:

Ready to executive EGSM Test	Lower limit	Upper limit
Transmitting average phase error when at min and max power transmit (average root value)		5 degree
Transmitting average phase error when at min and max power transmit (peak value)		20 degree
Transmitting average frequency error when at min and max power transmit	-171Hz	+171Hz
Transmitting power error at NO.5 power class (20dBm) on CH700	-2db	+2db
Transmitting power error at NO.10 power class (10dBm) on CH62	-3db	+3db
Transmitting power error at NO.15 power class (0dBm) on CH62	-3db	+3db
Transmitting average power error when at min and max power transmit	In PCS technique guideline	
Receive bit error test of RES II (at -102 dBm)	2%	
Receive frame erasure rate of RES II (at -102 dBm)	0.12%	
Indication of RX_LEV at -100 dBm	-104 dB	-96 dB
Indication of RX_LEV at -45 dBm	-49 dB	-41 dB
Quality of RX_LEV (RX_QUAL)	No more than 2	

Table 10.2: PCS frequency band test parameter

10.2: analyse equipment and maintain tool in common use:

CMU200 / HP8960 / CMD55 -- -- signal generator

HP8594E -- -- Spectrum analyzer

HP854810 / HP54520 -- -- oscillograph

HP34410A -- -- multimeter

HP6623A / LPS-105-AMRFL -- -- DC

ERSA 60A / HAKO926 -- -- electric iron

STEINEL-HL2305LCD / HAKO851

10.3：Notice:

- Products with power should be repaired by the experienced engineer, any other person use this manual to repair product nonstandard may cause electric damage or even person wound
- There should be a credible working zone----ESDs (Electro-Static sense discharge), then it could be used safety to avoid danger of Electro-Static discharge. This working zone must be set according to these as follows:

Working flat ---- Each working flat must lay contradict Electro-Static mat. For the safety of equipment with power, it should connect to the commonality ground through a resistance of 1.2M

Hand ring ---- A device made of soft line that can release Electro-Static fast. Hand ring's soft line connect to commonality ground with a resistance of 5.2K to 1.2M inter

Container ---- all of the container must be conductor

- Maintain engineer should take care of self-protect, such as using blinker, glove, avoid inbreathe gas

within plumbum or powder etc.

11.Abbreviation:

ABB：Analog Base Band

AFC：Automatic Frequency Control

APC：Automatic Power Control

BGA：Ball Grid Array：a kind of encapsulation of chip in common

CMII：Ministry of Information Industry, China. Abbreviation of The Information Industries Department which issues permit to enters the net

CPU：Central Process Unit

CSTN：Color Super Twisted Nematic

DBB：Digital Base Band

DNP：Don't Process，as the same meaning with NC, denote element which no need to jointing in the structure figure

DSP：Digital Signal Processor

GSM：Global System for Mobile communications

H/W：HardWare

I2C：Inter IC Control：A bunch communication protocol standard that advanced by Philps, contains two circuitry which are clock and data

IMEI：International Mobile Equipment Identity

IMSI：International Mobile Subscriber Identification

I/O：Input/Output

ISO：International Standards Organization

JTAG：Joint Test Action Group

Flash：Flash E2PROM

LCD：Liquid Crystal Display

LCM：LCD Module：Indicate a module in mobile phone----it not only contain LCD display function, but also contain backlight control function, Speaker, Receiver and Motor (even Sensor) and any other interface commonly. It is an important composing module in mobile phone

MCC：Mobile Country Code：3digit, stand for country code that user in

MCU：Micro-Controller Unit

MNC：Mobile Network Code：2digit, stand for network code user in

MSIN：Mobile Subscriber Identification Number：Use to identify mobile subscriber in mobile communication network

NC：Not Connect：As the same meaning of DNP, denote element which no need to jointing in the structure figure

PLL：Phase Loop Lock

PWL：Pseudo-noise pulse Width Light ：A function module in U201 DBB, output pulse width modulated signal

PWT：Pulse Width Tone Generator：Similar with PWL, output pulse width modulated signal too

RISC：Reduced Instruction Set Computer

RAM：Random Access Memory

ROM：Read Only Memory

RTC：Real Time Clock

SIM：Subscriber Identity Module

S/W：SoftWare

TDMA：Time Division Multiple Access

TMSI：Temporary Mobile Subscriber Identification

TPU：Time Processing Unit——A function processing unit in U200 DBB unit

TSP：Time Serial Port——A function processing unit in U200 DBB unit

USART：Universal Synchronous/Asynchronous Receiver Transmitter

USB：Universal Serial Bus