ATTACHMENT K – OPERATIONAL DESCRIPTION *Confidential*

ITEM	PCS	CDMA	AMPS
Tx Freq. range	1850 ~ 1910MHz	824 ~ 849MHz	824 ~ 849MHz
Rx Freq. range	1930 ~ 1990MHz	869 ~ 894MHz	869 ~ 894MHz
Channel Bandwidth	1.23MHz	1.23MHz	30KHz
Channel Spacing	50KHz	30KHz	30KHz
Number of Channel	1200	20FA	832
Duplex Separation	80MHz	45MHz	45MHz
Type of Emission	1M25F9W	40K0F8W,40K0F1D	40K0F8W,40K0F1D
In/Output Impedance	50¥Ø	50¥Ø	50¥Ø
Tx Intermediate Freq.	130.38MHz	130.38MHz	130.38MHz
Rx Intermediate Freq.	210.38MHz	85.38MHz	85.38MHz
Tx Local Freq.	1st(F_{TX}-130.38MHz) 2nd(260.76MHz)	1st(F_{TX}+130.38MHz) 2nd(260.76MHz)	1st(F_{TX}+130.38MHz) 2nd(260.76MHz)
Rx Local Freq	1st(F_{TX}-210.38MHz) 2nd(420.76MHz)	1st(F_{RX}+85.38MHz) 2nd(170.76MHz)	1st(F_{RX}+85.38MHz) 2nd(170.76MHz)
TCXO freq.	19.68MHz	19.68MHz	19.68MHz
Freq. Stability	(F_{RX}-80MHz)¡¾150Hz	(F_{RX}-45MHz)¡¾300Hz	¡¾2.5ppm
Operating Temperature	-30¡É ~ +60¡É	-30¡É ~ +60¡É	-30¡É ~ +60¡É
Supply Voltage	3.80V		
Size and Weight	STD : 81mm X 46.5mm X 7.5mm, 33.6 g, 800 mA EXT : 81mm X 46.5mm X 11.4mm, 50.5 g, 1300 mA		

1. 1.9GHz CDMA(US PCS)

1) General

Frequency Range	
. Transmitter	: 1850 ¡- 1910MHz
. Receiver	: 1930 ¡- 1990MHz
Channel Bandwidth	: 1.23MHz
Channel Spacing	: 50kHz
Number of Channels	: 1200
Duplex Seperation	: 80 MHz
Type of Emission	: 1M25F9W
Input/Output Impedance	: 50 ohms
Intermediate Freequency	
. Transmitter	: 130.38MHz
. Receiver	: 210.38MHz
Local Frequency	
. Transmitter	: 1st(F_{TX}-130.38MHz), 2nd(260.76MHz)
. Receiver	: 1st(F_{RX}-210.38MHz), 2nd(420.76MHz)
TCXO Frequency	: 19.68MHz
Frequency Stability	: (F_{RX}-80MHz) ¡¾ 150Hz
Operation Temperature	: -30¡É ¡- 60¡É
Supply Voltage	: +3.8V

2) Transmitter

Waveform Quality	: 0.944 or more
Open Loop Power Control Range	
. -25dBm	: -60.5dBm ¡- -41.5dBm
. -65dBm	: -20.5dBm ¡- +1.5dBm
. -104dBm	: +15.0dBm ¡- +30.0dBm
Minimum Tx Power Control	: below -50dBm
Closed Loop Power Control Range	: ¡¾24dB
Maximum RF Output Power	: 280mW(+24.5dBm)
Occupied Bandwidth	: 1.23MHz
Conducted Spurious Emission @1.25 MHz	: -42dBc/30kHz

3) Receiver

Rx Sensitivity and Dynamic Range : -104dBm, FER=0.5% or less

: -25dBm, FER=0.5% or less

Conducted Spurious Emission

. 1930¡-1990 MHz : <-81dBm

. 1850¡-1910 MHz : <-61dBm

. All Other Frequencies : <-47dBm

Single Tone Desensitization : lower than 1 %

. Rx power level = -101dBm

. Tone power level = -30dBm

. Tone offset from carrier = ¡¾1.25 MHz

Intermodulation Spurious Response Attenuation : lower than 1 %

. Rx power = -101dBm

. Tone 1 power = -43dBm

. Tone 1 power = -43dBm

. Tone 1 offset from carrier = ¡¾1.25 MHz

. Tone 2 offset from carrier = ¡¾2.05 MHz

2. 800MHz CDMA

1) General

Frequency Range	
. Transmitter	: 824 ¡- 849 MHz
. Receiver	: 869 ¡- 894MHz
Channel Bandwidth	: 1.23MHz
Channel Spacing	: 30kHz
Number of Channels	: 20FA
Duplex Seperation	: 45 MHz
Type of Emission	: 40K0F8W,40K0F1D
Input/Output Impedance	: 50 ohms
Intermediate Freequency	
. Transmitter	: 130.38MHz
. Receiver	: 85.38MHz
Local Frequency	
. Transmitter	: 1st(F_{TX}+130.38MHz), 2nd(260.76MHz)
. Receiver	: 1st(F_{RX}+85.38MHz), 2nd(170.76MHz)
TCXO Frequency	: 19.68MHz
Frequency Stability	: (F_{RX}-45MHz) ¡¾ 300Hz
Operation Temperature	: -30¡É ¡- 60¡É
Supply Voltage	: +3.8V

2) Transmitter

Waveform Quality	: 0.944 or more
Open Loop Power Control Range	
. -25dBm	: -57.5dBm ¡- -38.5dBm
. -65dBm	: -17.5dBm ¡- +1.5dBm
. -104dBm	: +18.0dBm ¡- +30dBm
Minimum Tx Power Control	: below -50dBm
Closed Loop Power Control Range	: ¡¾24dB
Maximum RF Output Power	: 400mW(+26dBm)
Occupied Bandwidth	: 1.23MHz
Conducted Spurious Emission @900 KHz	: -42dBc/30kHz
@1.25 MHz	: -54dBc/30kHz

3) Receiver

Rx Sensitivity and Dynamic Range : -104dBm, FER=0.5% or less

: -25dBm, FER=0.5% or less

Conducted Spurious Emission

. 869¡-894 MHz : <-81dBm

. 824¡-849 MHz : <-61dBm

All Other Frequencies : <-47dBm

Single Tone Desensitization : lower than 1 %

. Rx power level = -101dBm

. Tone power level = -30dBm

. Tone offset from carrier = ¡¾900KHz

Intermodulation Spurious Response Attenuation : lower than 1 %

. Tone 1 offset from carrier = ¡¾900KHz

. Tone 2 offset from carrier = ¡¾1.700MHz

- Test 1, 2

  Rx power = -101dBm

  Tone 1 power = -43dBm

  Tone 2 power = -43dBm

- Test 3, 4

  Rx power = -90dBm

  Tone 1 power = -32dBm

  Tone 2 power = -32dBm

- Test 5, 6

  Rx power = -79dBm

  Tone 1 power = -21dBm

  Tone 2 power = -21dBm

3. 800MHz AMPS

1) General

Frequency Range	
. Transmitter	: 824¡-849 MHz
. Receiver	: 869¡-894MHz
Channel Spacing	: 30kHz
Number of Channels	: 832
Duplex Spacing	: 45MHz
Frequency Stability	: ¡¾2.5ppm(-30¡É¡- 60¡É, -22¡£F ¡-140¡£F)
Modulation/Demodulation	
. Voice	: PM
. Data	: FM
Operating Temperature	: -30¡É¡- 60¡É, -22¡£F ¡- 140¡£F
Supply Voltate	: 3.75V

2) Transmitter

RF output power	: 26.8dBm(+0.2/-4dB)
Carrier ON/OFF conditions	
. "ON" Condition	: within ¡¾3dB of specification output(in 2 ms)
. "OFF" Condition	: below -60dBm(in 2ms)
Compresssor	
. Compression Rate	: 2 : 1
. Attack Time	: 3ms
. Recovery Time	: 13.5ms
. Reference Input	: input power level for producing a nominal ¡¾2.9kHz
	: peak frequency deviation of transmitted carrier
Preamphasis	: 6dB/OCT within 0.3 ¡- 3 kHz
Maximum Frequency Deviation	
. F3 of G3	: ¡¿12 kHz
. Supervisory Audio Tone	: ¡¾2 kHz(¡¿10%)
. Signaling Tone	: ¡¾8 kHz(¡¿10%)
. Wideband Data	: ¡¾8 kHz(¡¿10%)
Post Deviation Limiter Filter	
. 3.0 ¡- 5.9 kHz	: above 40 LOG(F/3000)dB

. 5.9 ¡- 6.1 kHz : above 35dB

. 6.1 ¡- 15 kHz : above 40 LOG(F/3000)dB

. Over 15 kHz : above 28 dB

Spectrum Noise Suppression

. For all modulation

fo +20 kHz ¡- fo + 45 kHz : above 26dB

. For modulation by voice and SAT

fo + 45 kHz : above 63dB+10LOG(PY)dB

. For modulation by WBD(without SAT) and ST(with SAT)

fo + 45 kHz ¡- fo + 60 kHz : above 45 dB

fo + 60 kHz ¡- fo + 90 kHz : above 65 dB

fo + 90 kHz ¡- 2 fo : above 63 dB + 10 LOG(PY) dB

(where fo = carrier frequency

PY=mean output power in watts)

Harmonic and conducted Spurious Emissions : below 43 + 10 LOG(PY) dB

3) Receiver

De-emphasis : -6dB/OCT within 0.3 ¡- 3 kHz

Expandor

. Expandor Rate : 1 : 2

. Attack time : within 3 ms

. Recovery Time : within 13.5 ms

. Reference input : output power level to a 1000Hz tone from a carrier within ¡¾2.9 kHz peak frequency deviation

Sensitivity : 12 dB SINAD/-116dBm

Intermodulation Spurious Response Attenuation : above 65dB

RSSI Range : above 60dB

Protection Against Spurious Response Interference : above 60dB

In Band Conducted Spurious Emission

. Transmit Band : below -60 dBm

. Receive Band : below -80 dBm

Out of Band Conducted Spurious Emissions : below -47dBm

. Radiated Spurious Emission

Frequency Range : Maximum Allowable EIRP

25 ¡- 70MHz : -45dBm

70 ¡- 130MHz : -41dBm

130 ¡- 174 MHz : -41 ¡- -32dBm

174 ¡- 260 MHz : -32 dBm

260 ¡- 470 MHz : -32 ¡- -26 dBm

470 ¡- 1G MHz : -21 dBm

2.Circuit Description

1. Logic Section

1-1 Power Supply

To power on the phone, pressing the PWR key with the battery installed will short the V_BAT and ON_SW signal. This will turn on Q221(DTC144) and drives Q220(SI3443) GATE pin to LOW resulting in the voltage(V_RING) applied to the necessary regulators. Regulator outputs, V_MSMP, and V_MSMA are the main power source for the MSM. By applying voltage to the MSM, a reset signal is generated(U221) to "wake-up" the CPU from the shut-down state. In turn, this signal allows the CPU to send out PS_HOLD(HIGH) in order to maintain turn on state for Q221 even after the PWR key is released.

To power off, pressing PWR key of the keypad for a few seconds, the V_BAT voltage is applied to the ON_SW and will drive Q210 to input LOW on the ON_SW_SENSE. The MSM recognizes this and outputs LOW on the PS_HOLD. Thus, turning off the Q221 and main power supply voltage.

The voltage V_MSMP(+2.8V) from U220 is used for the digital block of MSM and other peripherals. The voltage V_MSMA(+2.5V) from U230 is used for analog and audio blocks.

1-2 Logic Part

The logic part consists of MSM, FROM, SRAM, EEPROM, LCD and other input and output peripherals.

MOBILE SYSTEM MODEM(U100:MSM3100)

The MSM3100(U100) is equipped with the ARM7TDMI cpu core, CDMA and DFM block, vocoder, codec, ADC, TX ADC, general purpose interface and other functional blocks. It is one of the most important components of the CDMA cellular phone. The MSM comes in a 208-ball FBGA package and the interface block diagram is shown in Figure. The internal CPU is ARM7TDMI 32bit processor. The interface circuitry consists of reset circuit, address bus (A0-A21), data bus(AD0-AD15), and memory controls. The TCXO clock of 19.68Mhz is used as the clock

FLASH ROM and Static RAM(U110:AM29DL323D, U120:KM616U4110CLZI-7L)

One 32MBIT FROMs(U110) is used to store the cellular phone's executable program and necessary data files. One 4MBIT SRAM(U120) is used as a temporary data space to store the internal flag informations, call processing data, timer data other temporary data.

EEPROM(U131:X84256BI)

A 256KBIT EEPROM(U131) is used to store ESN, NAM information, telephone directory, SMS messages and other important information of the phone.

KEYPAD

For user interface, a key pad is used for that function. For key recognition, key matrix is setup using signals SCAN0-6 and KEY0-3 of the MSM.

LCD MODULE

The LCD module is a 128 X 128 dots 4 grey colored graphic LCD. The LCD contains a controller which will display the information by 8-bit data from the MSM. It also contains a DC-DC converter for contrast adjustment and LCD reflector to improve the display efficiency. An external backlight circuitry is used for easy operation in the dark.

1-3 RF Interface Part

CDMA, FM Data Interface

¡I_OUT, Q_OUT: TX analog signal used during both CDMA and FM mode.

¡C_RX_IDATA0-3 and C_RX_QDATA0-3: RX data bus used during CDMA mode.

¡FM_RX_IDATA and FM_RX_QDATA: RX data bus used during FM mode.

Clock

TCXO_CLK: Reference clock used for generation of CHIPX8. OSC141 : 32.768KHz sleep crystal. Clock used during SLEEP.

ADC Interface

Eight HK ADC are internally placed in the MSM. These ADCs are used to read battery voltage, battery type and temperature.

RF Interface

TX: TX_AGC_ADJ port is used to control the TX power level and PA_ON signal is used to control the power amplifier.

RX: RX_AGC_ADJ port is used to control the RX gain and TRK_LO_ADJ is used to compensate the TCXO module.

Power Down control

When the IDLE/ signal turns LOW, only the TX section is disabled. If both the IDLE/ and SLEEP/ changes to LOW, all the clocks except 32.768KHz crystal are disabled.

1-4 Audio Part

Internal CODEC in the MSM contains software controlled amplifier for both the receiving and transmitting sections. Also, the vocoding schemes used will be 13kbps QCELP or 8K EVRC. Both QCELP and EVRC vocoding are performed by the MSM.

Digital FM Block

The digital FM processor is included in the Mobile Station Modem(MSM) and brief descriptions of each block are as follows :

FM Transmit Processor

Pre-Emphasis Circuit

This part features +6dB/oct to reduce signal loss and noise in Tx path.

Compressor

The compressor features 2:1 level compressor to reduce signal loss and noise in Tx path. The zero crossing level of the compressor is ¡¾2.9 kHz/dev, attack time is 3mS, and release time is 13.5mS.

Limiter

The limiter performs to cut ¡¾0.53 Vp-p or higher audio signal level so that the FM frequency deviation is not over ¡¾12kHz/dev. The function is used to avoid confusion over phone line. LPF is used to reduce a specific high frequency of limited signal.

FM Receive Audio Path

De-Emphasis Circuit

This part features -6dB/oct filter to reduce signal loss and noise in Rx path.

Expandor

The expandor features 1:2 level increaser to reduce signal loss and noise in Rx path. The zero crossing level of the expander is ¡¾2.9kHz/dev, attack time is 3mS, and release time is 13.5mS.

1-5 TX WBD, ST, and SAT

The WBD and ST are generated by the MSM and the SAT is generated by transponding inputed signal. The modulation level of TX WBD and ST is ¡¾8kHz/dev, and SAT is ¡¾2kHz/dev.

1-6 ALERT TONE GERNERATION

A buzzer is a component which converts signals to audio alert tones. The internal buzzer generator in the MSM will generate PWM signal which in turn will drive transistors(Q120, Q130) to generate the tones. The volume of the alert tone is controlled by the width of PWM and the different periods.

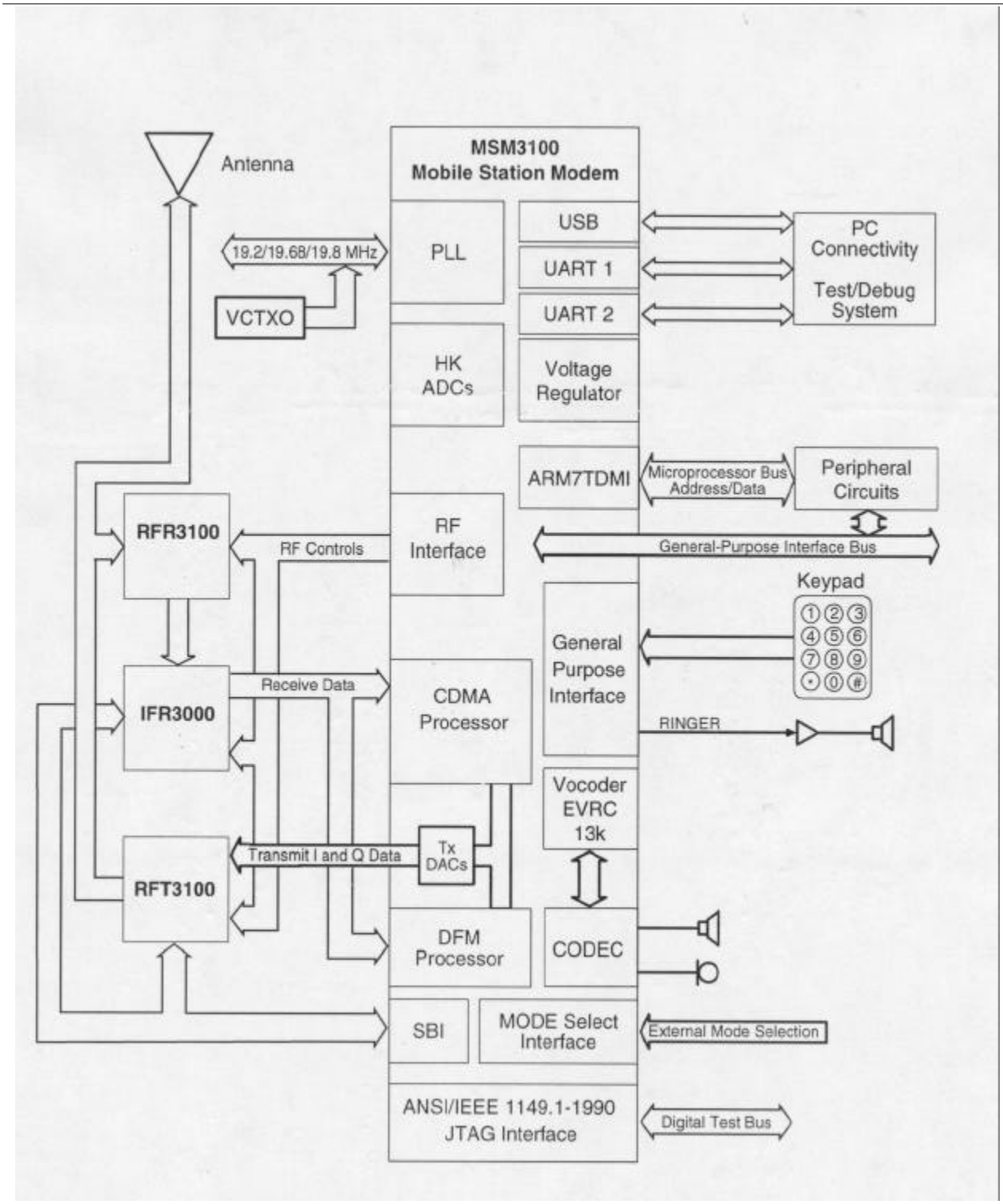

Figure MSM3100 Functional Block Diagram

2. PCS Section

2-1. Receiver

LOW NOISE AMPLIFIER (Q601:BFP540)

The low noise amplifier featuring 1.3dB Noise Figure and 15.5dB gain amplifies a weak signal received from the base station to obtain the optimum signal level.

DOWN CONVERTER (U746:CMY212)

First local signal is applied to this down converter. The down converter transfers the signal amplified at the LNA into 210.38 MHz IF signal. 210.38MHz IF signal is made by subtracting 1960¡¾30MHz RF signal from 1750¡¾30MHz first local signal. The LNA is Q601 and down converter is U746.

RF BAND PASS FILTER (F610:B4135)

The RF BPF accepts only a specific frequency (1960¡¾30MHz)from the signal received from the mobile station.The band width is 60MHz.

IF SAW BAND PASS FILTER FOR PCS (F630:TMXL011)

IF SAW BPF is used for CDMA system having 1.23 MHz wide band and ¡¾630kHz band width. The filter also eliminates the image product generated at the mixer.

PLL MODULE(U700:P05252FB)

U700 includes PLL and VCO.

VOLTAGE CONTROLLED OSCILLATOR

The VCO generates the signal having 1750MHz center frequency and ¡¾30MHz deviation with the voltage control. PLL IC controls this signal.

PHASE LOCKED LOOP (PLL)

Input reference frequency is generated at VCTCXO (U690) and the divided signal is generated at VCO. PLL compares the two signals and generates the desired signal with a pre-programmed counter which controls voltage.

VOLTAGE CONTROLLED TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR (U690:KT16-DCV30L-19.680M-T)

It provides 19.68MHz reference frequency to PLL (U700) and IFR3000(U600). A correct frequency tuning is made by the voltage control.

DUPLEXER (F530:DFX1880J1960P-2)

Duplexer controls to transmit through the antenna only the signals within acceptable TX frequency range (1880¡¾ 30MHz) and to receive through the antenna only the signals within acceptable RX frequency range (1960¡¾30MHz). It also matches LNA(Q601) input in receiving part and Power Amp. output in transmitter part with the antenna.

2-2. Transmitter

RFT3100 (U500)

The RFT3100 contains Up converter, Automatic gain control amplifier(AGC),and Driver Amplifier.
RFT3100 accepts analog data signal, so there is no need for additional Modulation Circuit.
Up Converter and Driver Amplifier's gain are controlled through the Serial Bus Interface(SBI).

RF BAND PASS FILTER (F510:LJ20C)

The Split band Filter contains two filters in one package. One accepts only a specific frequency(1865 ¡¾15Mhz) to send it to next RF stage, the other accepts specific frequency(1895 ¡¾15Mhz) to send it to next RF stage. Each Pass band width is 30Mhz. This Filter's advantage is the High Attenuation of TX Noise in RX Band.

RF SWITCH (U510:SW-437)

The switch combines two RF path into one RF path and send it to next stage.
The Bandpass Filter is controlled by AB select(GPIO).

POWER AMP MODULE (U520:RM913)

Power amp module amplifies RF signal and send it to base station through the antenna.

ISOLATOR (F520:SI-5R 1.880G)

Isolator is used to reduce a reflected signal to protect the power amp module from being demaged.

POWER SUPPLY REGULATOR (U251:MIC5205-3.0BM5/TR)

The power supply regulator supplies a regulated power to each part of transmitter.
V_RING is connected to power AMP Module. Regulator supplies 3.0V to the others.

3. CDMA Section

3-1. Receiver

LOW NOISE AMPLIFIER (U630:RF2361TR13)

The low noise amplifier featuring 1.5dB Noise Figure and 19dB gain amplifies a weak signal received from the base station to obtain the optimum signal level.

DOWN CONVERTER (U640:RF2466TR13)

The first local signal is applied to this down converter. The down converter converts the signal from LNA into 85.38MHz IF signal. 85.38MHz IF signal is made by subtracting 881.49¡¾12.5 MHz from first local signal 966.87 ¡¾12.5 MHz RF signal.

IF AUTOMATIC GAIN CONTROLLER(AGC) AMP

85.38MHz IF signal is applied to IF AGC amplifier(in IFR3000), AGC output level is applied to next stage in IFR3000.. The AGC amp keeps the signal at a constant level by controlling the gain. Dynamic range is 90 dB, and its control voltage varies from 0.2V to 2.5V.

RF BAND PASS FILTER (F640:D881LH)

The RF BPF passes only a specific frequency (881.49¡¾12.5 MHz) from the mobile station. The width is 25 MHz.

IF SAW BAND PASS FILTER (F650:TMXM300)

If SAW BPF is used for CDMA system having 1.23MHz wide band. The filter also climinates the image product generated at the mixer.

VOLTAGE CONTROLED OSCILATOR

The VCO in PLL module generates the signal having 966.87MHz center frequency and ¡¾12.5 MHz deviation with voltage control. PLL in PLL module controls this signal.

PHASE LOCKED LOOP(PLL)

Input reference frequency is generated at VC-TCXO(U690) and RF local signal is generated at VCO. PLL compares the two signals and generates the desired signal with a preprogrammed counter which controls voltage.

VOLTAGE CONTROLLED TEMPERATURE COMPENSATED CRYSTAL OSCILLATOR (U690:KT16-DCV30L-19.680M-T)

It provides 19.68MHz reference frequency to PLL(U700) and IFT3000(U400),IFR3000(U300).

A correct frequency tunning is made by the voltage control.

DUPLEXER(F560:DFY0836H0881F)

Duplexer allows Rx frequency range(881.49¡¾ 12.5 MHz) and Tx frequency range(836.03¡¾ 12.5 MHz) from the antenna to pass through LNA. It also matches LNA input in receiving part and PA(U540) output in transmitter part with the antenna.

3-2. Transmitter

RFT3100 (U500)

The RFT3100 contains Up converter, Automatic gain control amplifier(AGC),and Driver Amplifier.

RFT3100 accepts analog data signal, so there is no need for additional Modulation Circuit.

Up Converter and Driver Amplifier's gain are controlled through the Serial Bus Interface(SBI).

RF BANDPASS FILTER(F540:D836LH)

The Bandpass Filter(BPF) accepts only a specific frequency(836 ¡¾12.5Mhz) to send it to next RF stage.

The band width is 25Mhz.

POWER AMP MODULE (U540:RM912)

Power amp module amplifies RF signal and send it to base station through the antenna.

ISOLATOR (F550:CE053R836DCB-TA2)

Isolator is used to reduce a reflected signal to protect the power amp module from being demaged.

POWER SUPPLY REGULATOR (U251:MIC5205-3.0BM5/TR)

The power supply regulator supplies a regulated power to each part of transmitter.

V_RING is connected to power AMP Module. Regulator supplies 3.0V to the others.

TEMPERATURE TO VOLTAGE CONVERTER (TH581:NTH5G1M33B103J04TH)

The temperature to voltage converter detects temperature.

It is used to compensate active component characteristics due to the temperature difference.

4. AMPS Section

4-1. Receiver

LOW NOISE AMPLIFIER (U630:RF2361TR13)

The low noise amplifier featuring 1.5dB Noise Figure and 19dB gain amplifies a weak signal received from the base station to obtain the optimum signal level.

DOWN CONVERTER (U640:RF2466TR13)

The first local signal is applied to this down converter. The down converter converts the RF signal from LNA into 85.38MHz IF signal. 85.38MHz IF signal is made by subtracting 881.49¡¾12.5 MHz from first local signal 966.87¡¾12.5 MHz RF signal.

IF AUTOMATIC GAIN CONTROLLER(AGC) AMP

85.38MHz IF signal is applied to IF AGC amplifier(in IFR3000), AGC output level is applied to next stage in IFR3000.. The AGC amp keeps the signal at a constant level by controlling the gain. Dynamic range is 90 dB, and its control voltage varies from 0.2V to 2.5V.

RF BAND PASS FILTER (F640:D881LH)

The RF BPF passes only a specific frequency (881.49¡¾12.5 MHz) from the mobile station. The width is 25 MHz.

IF SAW Band Pass Filter (F660:SAFC850380ME35X-TC11)

If SAW BPF is used for AMPS system having 30KHz narrow band. The filter also climinates the image product generated at the mixer.

Voltage Controlled Oscillator

The VCO in PLL module generates the signal having 966.87MHz center frequency and ¡¾12.5 MHz deviation with voltage control. PLL in PLL module controls this signal.

Phase Locked Loop(PLL)

Input reference frequency is generated at VC-TCXO(U690) and RF local signal is generated at VCO. PLL compares the two signals and generates the desired signal with a preprogrammed counter which controls voltage.

Voltage Controlled Temperature Compensated Crystal Oscillator

It provides 19.68MHz reference frequency to PLL(U700) and IFT3000, IFR3000. A correct frequency tunning is made by the voltage control.

Duplexer

Duplexer(F560) allows Rx frequency range(881.49¡¾ 12.5 MHz) and Tx frequency range(836.49¡¾ 12.5 MHz) from the antenna to pass through LNA. It also matches LNA (U630;RF2361) input in receiving part and PA(U540) output in transmitter part with the antenna.

4-2. Transmitter

AMPS Transmitter section is the same as CDMA Transmitter section.

1. Frequency Synthesizer Circuit

Description of Frequency Synthesizer Circuit, Spurious Radiation Suppression Circuit.

Frequency Synthesizer Circuit

The PLL(Phased Locked Loop) block consists of VC-TCXO(U690), PLL-Module(U700)

VC-TCXO

The VC-TCXO is a reference source of the frequency synthesizer. It provides 19.68MHz reference frequency to PLL-IC. It is a voltage controlled temperature compensated crystal oscillator having 19.68MHz ¡¾2.5ppm frequency stability over all useful temperature range. A correct frequency tunning is made by the control voltage.

PLL Module

The PLL Module consists of dual VCO and PLL IC. VCO for PCS generates the RF local signal having 1750 ¡¾ 30 MHz frequency range with the voltage control. VCO for CDMA and AMPS generates the signal having 954 ¡-980 MHz frequency range with the voltage control. The PLL IC includes prescalers, dividers and charge pump. The reference divider in the PLL IC divides the frequency of VC-TCXO into 10kHz and 30kHz. This reference frequency is supplied to one of the inputs of phase detector. The signal generated at VCO goes into another input stage of the phase detector through a prescaler and a programmable divider. At this point the error proportional to the phase difference of the two inputs occurs. This phase error is applied to the frequency control input stage of VCO through the loop filter which consists of resistors and capacitors.

2. Suppression of Spurious Radiation

The spurious signal from antenna is suppressed at the duplexer. The duplexer has flat characteristics to the receiving signal and high attenuation characteristics to the hamonic signals of transmission. So it suppresses the spurious radiation.

Table 1. The characteristics of duplexer(PCS) filter

Parameter	Specification	Typical Variation
TX		
Center Frequency	1880MHz	
Passband	1850 ~ 1910MHz	
Insertion Loss at Passband	3.5dB(max)	
Return Loss	10.0dB(min)	
Attenuation Absolute Value Relative Value	1930¡-1990MHz 45dB(min) 2039.8¡-2099.8MHz 38dB(min)	
Isolation	1930~1990MHz 49.0dB(min)	
RX		
Center Frequency	1960 MHz	
Passband	1930 ~ 1990 MHz	
Insertion Loss at Passband	4.0dB(max)	
Return Loss	10.0 dB(min)	
Attenuation	1850¡-1910MHz 50dB(min) 2039.8¡-2099.8MHz 10dB(min) 2149.6¡-2209.6MHz 30dB(min)	
Isolation	1850~1910MHz 53.5dB(min)	

Table 2. The characteristics of duplexer(CDMA) filter

Parameter	Specification	Typical Variation
TX		
Center Frequency	836.5MHz	
Passband	824 - 849 MHz	
Insertion Loss at Passband	3.0dB(max)	2.7dB
VSWR at Passband	1.8(min)	
Input Power	3W(max)	
Attenuation	869¡-894MHz 40(43)dB(Min.)	
Ripple at Passband	1.6dB(Max.)	1.0dB
RX		
Center Frequency	881.5MHz	
Passband	869¡-894MHz	
Insertion Loss at Passband	4.0 dB(max)	3.6dB
VSWR at Passband	1.8dB(min)	
Input Power	1W	
Attenuation	824¡-849MHz 56dB(Min)	58dB
Ripple at Passband	2.0dB(Max.)	1.5dB