AnyDATA

AnyTime AnyPlace Any Wireless Data Solutions

SERVICE MANUAL

CDMA Wireless Kit

EMIII-DUAL

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Introduction

The EMIII-DUAL is designed for the test and simulation of the CDMA wireless data communications. User can connect the EMIII-DUAL to your PC or Notebook and easily test the wireless communications. User can use this to develop your applications software even before user's own hardware is ready. It also can be used as a debugging during user's hardware test.

Disclaimer and Limitation of Liability

AnyDATA.NET Inc. assumes no responsibility for any damage or loss resulting from the misuse of its products. AnyDATA.NET Inc. assumes no responsibility for any loss or claims by third parties, which may arise through the use of its products. AnyDATA.NET Inc. assumes no responsibility for any damage or loss caused by the deletion or loss of data as a result of malfunctions or repairs.

FCC RF Exposure Information

Warning! Read this information before using this device.

In August 1996 the Federal Communications Commission (FCC) of the United States with its action in Report and Order FCC 96-326 adopted an updated safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated transmitters. Those guidelines are consistent with the safety standard previously set by both U.S. and international standards bodies. The design of this device complies with the FCC guidelines and these international standards.

CAUTION

▪ *Operating Requirements*

- The user can not make any changes or modifications not expressly approved by the party responsible for compliance, otherwise it could void the user's authority to operate the equipment.
- To satisfy FCC RF exposure compliance requirements for a mobile transmitting device, this device and its antenna should generally maintain a separation distance of 20cm or more from a person's body.

Special accessories

In order to ensure this device in compliance with FCC regulation, the special accessories are provided with this device and must be used with the device only. The user is not allowed to use any other accessories than the special accessories given with this device

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General Introduction

The EMIII-DUAL functions digital cellular module worked in CDMA (Code Division Multiple Access) mode. CDMA type digital mode applies DSSS (Direct Sequence Spread Spectrum) mode , which is used in military.

This feature enables the phone to keep communication from being crossed and use one frequency channel by multiple users in the same specific area, resulting that it increases the capacity 10 times more compared with that in the analog mode currently used.

Soft/Softer Handoff, Hard Handoff, and Dynamic RF power Control technologies are combined into this phone to reduce the call being interrupted in a middle of talking over phone.

CDMA digital cellular network consists of MSC (Mobile Switching Office), BSC (Base Station Controller), BTS (Base station Transmission System), and MS (Mobile Station). Communication between MS and BTS is designed to meet the specification of IS-95A (Common Air Interface). MS meets the specifications of the below :

- IS-95A/B/C (Common Air Interface) : Protocol between MS and BTS
- IS-96A (Vocoder) : Voice signal coding
- IS-98 : Basic MS functions
- IS-126 : Voice loopback
- IS-99 : Short Message Service, Async Data Service, and G3 Fax Service

EMIII-DUAL is digital mode is designed to be operated in full duplex.

CHAPTER 1. System Introduction

1. System Introduction

1.1 CDMA Abstract

The cellular system has a channel hand-off function that is used for collecting the information on the locations and movements of radio mobile telephones from the cell site by automatically controlling several cell site through the setup of data transmission routes and thus, enabling one switching system to carry out the automatic remote adjustment. This is to maintain continuously the call state through the automatic location confirmation and automatic radio channel conversion when the busy subscriber moves from the service area of one cell site to that of another by using automatic location confirmation and automatic radio channel conversion functions. The call state can be maintained continuously by the information exchange between switching systems when the busy subscriber moves from one cellular system area to the other cellular system area.

In the cellular system, the cell site is a small-sized low output type and utilizes a frequency allocation system that considers mutual interference, in an effort to enable the re-use of corresponding frequency from a cell site separated more than a certain distance. The analog cellular systems are classified further into an AMPS system, E-AMPS System, NMT system, ETACS system, and JTACS system depending on technologies used.

Unlike the time division multiple access (TDMA) or frequency division multiple access (FDMA) used in the band limited environment, the Code Division Multiple Access(CDMA) system which is one of digital cellular systems is a multi-access technology under the interference limited environment. It can process more number of subscribers compared to other systems (TDMA system has the processing capacity three times greater than the existing FDMA system whereas CDMA system, about 12~15 times of that of the existing system).
CDMA system can be explained as follows: TDMA or SDMA can be used to enable each person to talk alternately or provide a separate room for each person when two persons desire to talk with each other at the same time, whereas FDMA can be used to enable one person to talk in soprano, whereas the other in bass (one of the two talkers can carry out synchronization for hearing in case there is a bandpass filter function in the area of the hearer).

Another method available is to make two persons to sing in different languages at the same time, space, and frequency when wishing to let the audience hear the singing without being confused. This is the characteristics of CDMA.

On the other hand, when employing the CDMA technology, each signal has a different pseudo-random binary sequence used to spread the spectrum of carrier. A great number of CDMA signals share the same frequency spectrum. In the perspective of frequency area or time area, several CDMA signals are overlapped. Among these types of signals, only desired signal energy is selected and received through the use of pre-determined binary sequence; desired signals can be separated and then, received with the correlator used for recovering the spectrum into its original state. At this time, the spectrums of other signals that have different codes are not recovered into its original state and instead, processed as noise and appears as the self-interference of the system.

2. Features and Advantages of CDMA Module

2.1 Various Types of Diversities

In the CDMA broadband modulation(1.25MHz band), three types of diversities (time, frequency, and space) are used to reduce serious fading problems generated from radio channels in order to obtain high-quality calls.
Time diversity can be obtained through the use of code interleaving and error correction code whereas frequency diversity can be obtained by spreading signal energy to more wider frequency band. The fading related to normal frequency can affect the normal 200~300kHz among signal bands and accordingly, serious affect can be avoided. Moreover, space diversity (also called path diversity) can be realized with the following three types of methods.
First, it can be obtained by the duplication of cell site receive antenna. Second, it can be obtained through the use of multi-signal processing device that receives a transmit signal having each different transmission delay time and then, combines them. Third, it can be obtained through the multiple cell site connection (Soft Handoff) that connects the mobile station and more than two cell sites at the same time.

2.2 Power Control

The CDMA system utilizes the forward (from a base station to mobile stations) and backward (from the mobile station to the base station) power control in order to increase the call processing capacity and obtain high-quality calls. In case the originating signals of mobile stations are received by the cell site in the minimum call quality level (signal to interference) through the use of transmit power control on all the mobile stations, the system capacity can be maximized.
If the signal of mobile station is received too strong, the performance of that mobile station is improved. However, because of this, the interference on other mobile stations using the same channel is increased and accordingly, the call quality of other subscribers is reduced unless the maximum accommodation capacity is reduced.
In the CDMA system, forward power control, backward open loop power control, and closed loop power control methods are used. The forward power control is carried out in the cell site to reduce the transmit power on mobile stations less affected by the multi-path fading and shadow phenomenon and the interference of other cell sites when the mobile station is not engaged in the call or is relatively nearer to the corresponding cell site. This is also used to provide additional power to mobile stations having high call error rates, located in bad reception areas or far away from the cell site.
The backward open loop power control is carried out in a corresponding mobile station; the mobile station measures power received from the cell site and then, reversely increases/decreases transmit power in order to compensate channel changes caused by the forward link path loss and terrain characteristics in relation to the mobile station in the cell site. By doing so, all the mobile office transmit signals in the cells are received by the cell site in the same strength.
Moreover, the backward closed loop power control used by the mobile station to control power with the commands issued out by the cell site. The cell site receives the signal of each corresponding mobile station and compares this with the pre-set threshold value and then, issues out power increase/decrease commands to the corresponding mobile station every 1.25 msec (800 times per second).
By doing so, the gain tolerance and the different radio propagation loss on the forward/backward link are complemented.

2.3 Voice Encoder and Variable Data Speed

The bi-directional voice service having variable data speed provides voice communication which employs voice encoder algorithm having power variable data rate between the mobile telephone cell site and mobile station. On the other hand, the transmit voice encoder performs voice sampling and then, creates encoded voice packets to be sent out to the receive voice encoder, whereas the receive voice encoder demodulates the received voice packets into voice samples.

One of the two voice encoders described in the above is selected for use depending on inputted automatic conditions and message/data; both of them utilize four-stage frames of 9600, 4800, 2400, and 1200 bits per second. In addition, this type of variable voice encoder utilizes adaptive threshold values when selecting required data rate. It is adjusted in accordance with the size of background noise and the data rate is increased to high rate only when the voice of caller is inputted.

Therefore, background noise is suppressed and high-quality voice transmission is possible under the environment experiencing serious noise. In addition, in case the caller does not talk, data transmission rate is reduced so that the transmission is carried out in low energy. This will reduce the interference on other CDMA signals and as a result, improve system performance (capacity, increased by about two times).

2.4 Protecting Call Confidentiality

CDMA signals have the function of effectively protecting call confidentiality by spreading and interleaving call information in broad bandwidth. This makes the unauthorized use of crosstalk, search receiver, and radio very hard substantially. Also included is the encryption function on various authentication and calls specified in IS-95 for the double protection of call confidentiality.

2.5 Soft Handoff

During the soft hand, the cell site already in the busy state and the cell site to be engaged in the call later participate in the call conversion. The call conversion is carried out through the original call connection cell site, both cell sites, and then, new cell site. This method can minimize call disconnection and prevent the user from detecting the hand-off.

2.6 Frequency Re-Use and Sector Segmentation

Unlike the existing analog cellular system, the CDMA system can reuse the same frequency at the adjacent cell and accordingly, there is no need to prepare a separate frequency plan. Total interference generated on mobile station signals received from the cell site is the sum of interference generated from other mobile stations in the same cell site and interference generated from the mobile station of adjacent cell site. That is, each mobile station signal generates interference in relation to the signals of all the other mobile signals.

Total interference from all the adjacent cell sites is the ratio of interference from all the cell sites versus total interference from other mobile stations in the same cell site (about 65%). In the case of directional cell site, one cell normally uses a 120° sector antenna in order to divide the sector into three. In this case, each antenna is used only for 1/3 of mobile stations in the cell site and accordingly, interference is reduced by 1/3 on the average and the capacity that can be supported by the entire system is increased by three times.

2.7 Soft Capacity

The subscriber capacity of CDMA system is flexible depending on the relation between the number of users and service classes. For example, the system operator can increase the number of channels available for use during the busy hour despite the drop in call quality. This type of function requires 40% of normal call channels in the standby mode during the handoff support, in an effort to avoid call disconnection resulting from the lack of channels.

In addition, in the CDMA system, services and service charges are classified further into different classes so that more transmit power can be allocated to high class service users for easier call set-up; they can also be given higher priority of using hand-off function than the general users.

3. Structure and Functions of CDMA Module

The mobile station of CDMA system is made up of a radio frequency part and logic/control (digital) part. The mobile station is fully compatible with the existing analog FM system. The mobile station antenna is connected with the transmitter/receiver via a duplexer filter so that it can carry out the transmit/receive function at the same time.

The transmit frequency are the 25MHz band of 824~849MHz(CDMA)and 60MHz band of 1850~1910MHz(US_PCS) , whereas the receive frequency are the 25MHz band of 869~894MHz(CDMA) and 60MHz band of 1930~1990MHz(US_PCS). The transmit/receive frequency are separated by 45MHz in CDMA, and by 80MHz in US_PCS. The RF signal from the antenna is converted into intermediate frequency(IF) band by the frequency synthesizer and frequency down converter and then, passes the bandpass SAW filter having the 1.25MHz band. IF output signals that have been filtered from spurious signal are converted into digital signals via an analog-to-digital converters(ADC) and then, sent out respectively to 5 correlators in each CDMA de-modulator. Of these, one is called a searcher whereas the remaining 4 are called data receiver(finger). Digitalized IF signals include a great number of call signals that have been sent out by the adjacent cells. These signals are detected with pseudo-noise sequence (PN Sequence). Signal to interference ratio (C/I) on signals that match the desired PN sequence are increased through this type of correlation detection process. Then, other signals obtain processing gain by not increasing the ratio. The carrier wave of pilot channel from the cell site most adjacently located is demodulated in order to obtain the sequence of encoded data symbols. During the operation with one cell site, the searcher searches out multi-paths in accordance with terrain and building reflections. On three data receivers, the most powerful four paths are allocated for the parallel tracing and receiving. Fading resistance can be improved a great deal by obtaining the diversity combined output for de-modulation. Moreover, the searcher can be used to determine the most powerful path from the cell sites even during the soft handoff during the two cell sites. Moreover, four data receivers are allocated in order to carry out the de-modulation of these paths. Data output that has been demodulated change the data string in the combined data row as in the case of original signals(deinterleaving), and then, are de-modulated by the forward error correction decoder which uses the Viterbi algorithm.

On the other hand, mobile station user information sent out from the mobile station to the cell site pass through the digital voice encoder via a mike. Then, they are encoded and forward errors are corrected through the use of convolution encoder. Then, the order of code rows is changed in accordance with a certain regulation in order to remove any errors in the interleaver. Symbols made through the above process are spread after being loaded onto PN carrier waves. At this time, PN sequence is selected by each address designated in each call.

Signals that have been code spread as above are digital modulated (QPSK) and then, power controlled at the automatic gain control amplifier (AGC Amp). Then, they are converted into RF band by the frequency synthesizer synchronizing these signals to proper output frequencies.

Transmit signals obtained pass through the duplexer filter and then, are sent out to the cell site via the antenna.

4. Specification

4.1 General Specification

4.1.1 Transmit/Receive Frequency Interval : 45 MHz (CDMA), 80MHz(US_PCS)

4.1.2 Number of Channels (Channel Bandwidth)

CDMA : 20 CH (BW: 1.23MHz)

US_PCS : 42CH(BW:1.23MHz)

41.3 Operating Voltage : DC 6~12V

4.1.4 Operating Temperature : -30° ~ +60°

4.1.5 Frequency Stability :CDMA : ±300 Hz, US_PCS : ±150 Hz

4.1.6 Antenna : Whip Type, 50 W

4.1.7 Size and Weight

1) **Size : 121mm x 57mm x 24mm (L x W x D) with case**
2) **Weight : 110g**

4.1.8 Channel Spacing : CDMA : 1.25MHz, US_PCS: 1.25MHz

4.2 Receive Specification

4.2.1 Frequency Range

CDMA : 869.04 MHz ~ 893.97 MHz

US_PCS : 1931.25 MHz ~ 1988.75 MHz

4.2.2 Local Oscillating Frequency Range : 966.88MHz±12.5MHz(CDMA), 1749.62MHz ±30MHz(US_PCS)

4.2.3 Intermediate Frequency : 85.38MHz(CDMA), 210.38MHz(US_PCS)

4.2.4 Sensitivity : Less than -104dBm

4.2.5 Selectivity

CDMA : 3dB C/N Degration (With Fch±1.25 kHz : -30dBm)

4.2.6 Spurious Wave Suppression : Maximum of -80dBc

4.2.7 CDMA Input Signal Range

· **Dynamic area of more than -104~ -25 dBm : 80dB range.**

4.3 Transmit Specification

4.3.1 Frequency Range

824.04 MHz ~ 848.97 MHz (CDMA)

1851.25MHz ~ 1908.75MHz (US_PCS)

4.3.2 Local Oscillating Frequency Range : 966.88 MHz ± 12.5 MHz(CDMA)
1749.62MHz ± 30MHz (US_PCS)

4.3.3 Intermediate Frequency : 130.38 MHz

4.3.4 Output Power: 0.32W(CDMA), 0.3W(US_PCS)

4.3.5 Interference Rejection

1) Single Tone : -30dBm at 900 kHz (CDMA), -30dBm at 1.25MHz

2) Two Tone : -43dBm at 900 kHz & 1700kHz(CDMA), -43dBm at 1.25MHz & 2.05MHz

4.3.6 CDMA TX Frequency Deviation : ±300Hz or less(CDMA), ±150Hz or less(US_PCS)

4.3.7 CDMA TX Conducted Spurious Emissions

· **900kHz : - 42 dBc/30kHz below(CDMA Only)**

· **1.98MHz : - 54 dBc/30kHz below(CDMA, US_PCS)**

4.3.8 CDMA Minimum TX Power Control : - 50dBm below

4.4 MS (Mobile Station) Transmitter Frequency

CDMA

FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	1011	824.640 MHz	11	404	837.120 MHz
2	29	825.870 MHz	12	445	838.350 MHz
3	70	827.100 MHz	13	486	839.580 MHz
4	111	828.330 MHz	14	527	840.810 MHz
5	152	829.560 MHz	15	568	842.04 MHz
6	193	830.790 MHz	16	609	843.270 MHz
7	234	832.020 MHz	17	650	844.500 MHz
8	275	833.250 MHz	18	697	845.910 MHz
9	316	834.480 MHz	19	738	847.140 MHz
10	363	835.890 MHz	20	779	848.370 MHz

US_PCS

FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	25	1851.25 MHz	22	600	1880.00 MHz
2	50	1852.50MHz	23	625	1881.25 MHz
3	75	1853.75 MHz	24	650	1882.50 MHz
4	100	1855.00 MHz	25	675	1883.75 MHz
5	125	1856.25 MHz	26	725	1886.25 MHz
6	150	1857.50 MHz	27	750	1887.50 MHz
7	175	1858.75 MHz	28	775	1888.75 MHz
8	200	1860.00 MHz	29	825	1891.25 MHz
9	225	1861.25 MHz	30	850	1892.50 MHz
10	250	1862.50 MHz	31	875	1893.75 MHz
11	275	1863.75 MHz	32	925	1896.25 MHz
12	325	1866.25 MHz	33	950	1897.50 MHz
13	350	1867.50 MHz	34	975	1898.75 MHz
14	375	1868.75 MHz	35	1000	1900.00 MHz
15	425	1871.25 MHz	36	1025	1901.25 MHz
16	450	1872.50 MHz	37	1050	1902.50 MHz
17	475	1873.75 MHz	38	1075	1903.75 MHz
18	500	1875.00 MHz	39	1100	1905.00 MHz
19	525	1876.25 MHz	40	1125	1906.25 MHz
20	550	1877.50 MHz	41	1150	1907.50 MHz
21	575	1878.75 MHz	42	1175	1908.75 MHz

4.5 MS (Mobile Station) Receiver Frequency

CDMA

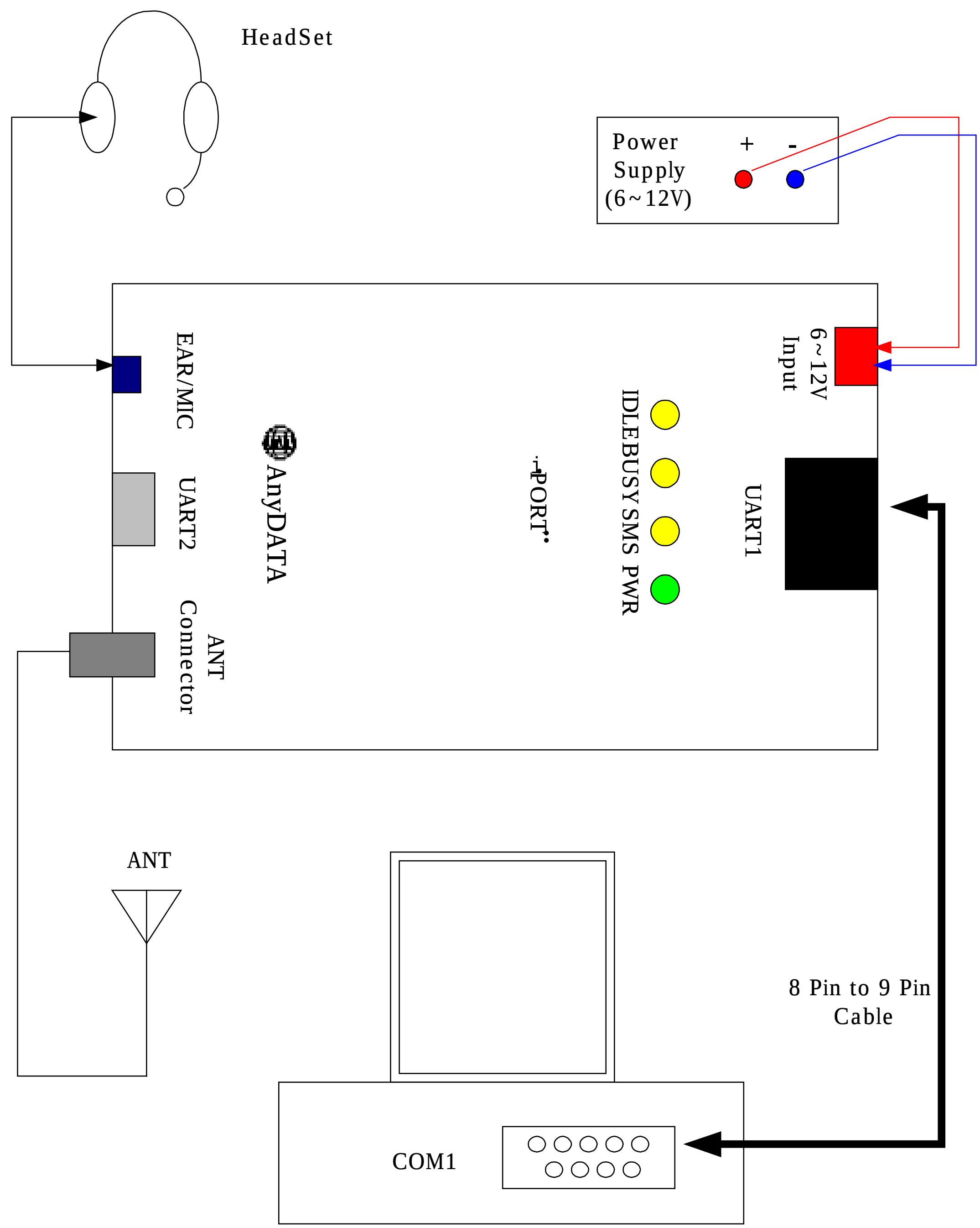
FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	1011	869.640 MHz	11	404	882.120 MHz
2	29	870.870 MHz	12	445	883.350 MHz
3	70	872.100 MHz	13	486	884.580 MHz
4	111	873.330 MHz	14	527	885.810 MHz
5	152	874.560 MHz	15	568	887.04 MHz
6	193	875.790 MHz	16	609	888.270 MHz
7	234	877.020 MHz	17	650	889.500 MHz
8	275	878.250 MHz	18	697	890.910 MHz
9	316	879.480 MHz	19	738	892.140 MHz
10	363	880.890 MHz	20	779	893.370 MHz

US_PCS

FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	25	1931.25 MHz	22	600	1960.00 MHz
2	50	1932.50MHz	23	625	1961.25 MHz
3	75	1933.75 MHz	24	650	1962.50 MHz
4	100	1935.00 MHz	25	675	1963.75 MHz
5	125	1936.25 MHz	26	725	1966.25 MHz
6	150	1937.50 MHz	27	750	1967.50 MHz
7	175	1938.75 MHz	28	775	1968.75 MHz
8	200	1940.00 MHz	29	825	1971.25 MHz
9	225	1941.25 MHz	30	850	1972.50 MHz
10	250	1942.50 MHz	31	875	1973.75 MHz
11	275	1943.75 MHz	32	925	1976.25 MHz
12	325	1946.25 MHz	33	950	1977.50 MHz
13	350	1947.50 MHz	34	975	1978.75 MHz
14	375	1948.75 MHz	35	1000	1980.00 MHz
15	425	1951.25 MHz	36	1025	1981.25 MHz
16	450	1952.50 MHz	37	1050	1982.50 MHz
17	475	1953.75 MHz	38	1075	1983.75 MHz
18	500	1955.00 MHz	39	1100	1985.00 MHz
19	525	1956.25 MHz	40	1125	1986.25 MHz
20	550	1957.50 MHz	41	1150	1987.50 MHz
21	575	1958.75 MHz	42	1175	1988.75 MHz

CHAPTER 2. NAM Input Method

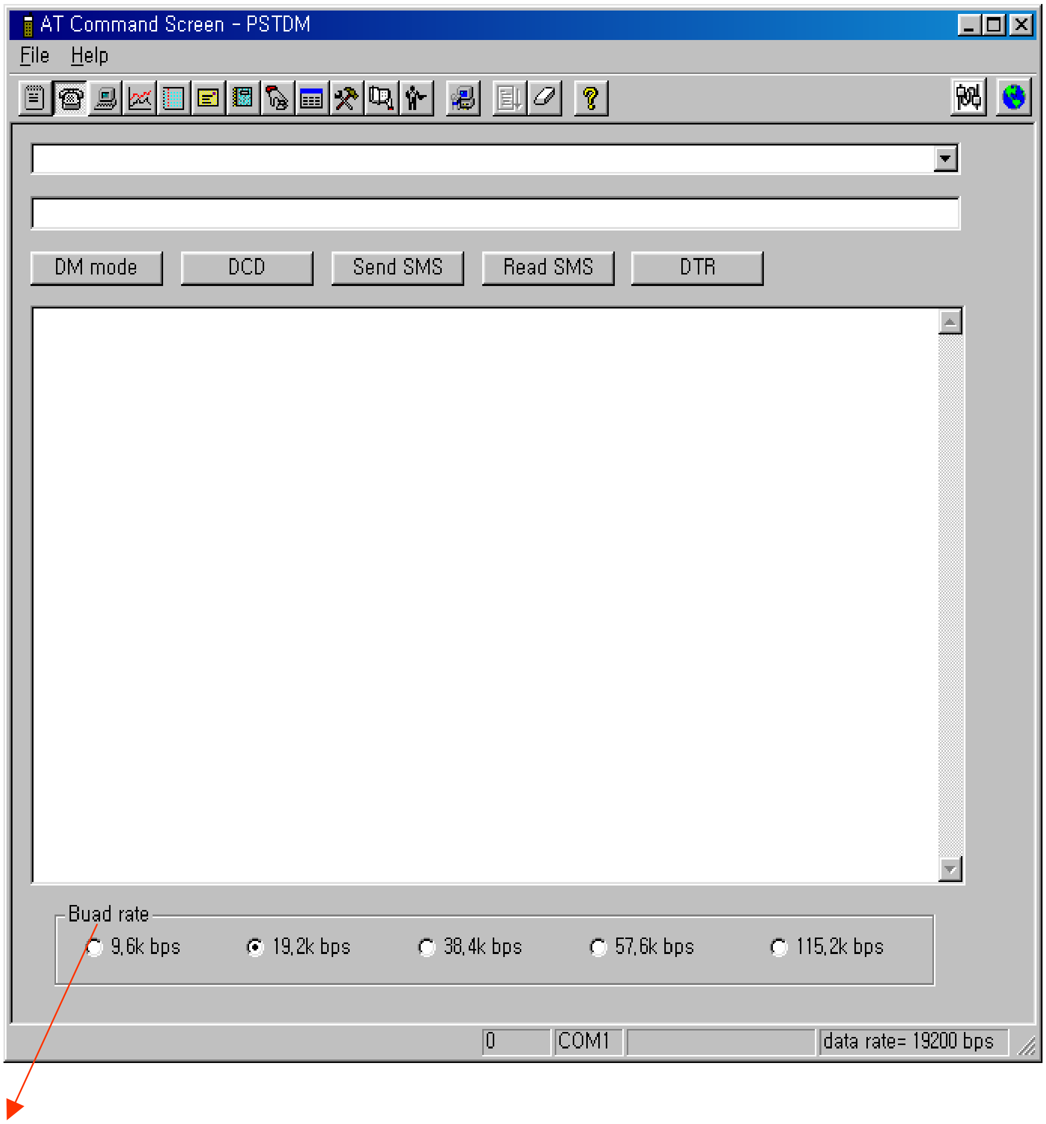
1.INSTALLATION METHOD



1) Supply the voltage of 6~14V to 2pin Connector of the EMIII-DUAL.
2) Connect the UART1 to PC COM1 port with the RS-232C cable.
3) Install the operating program.

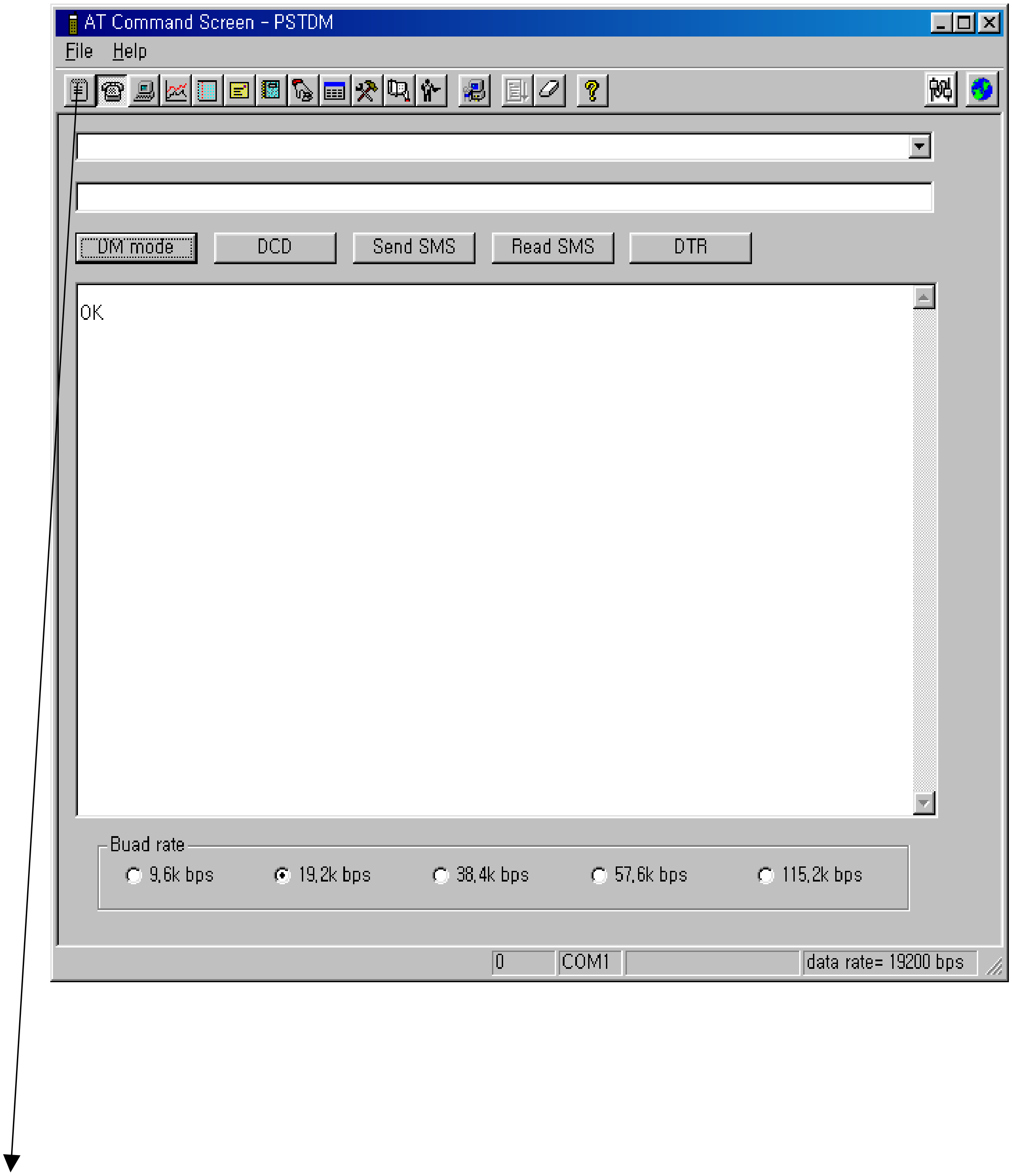
2. OPERATION METHOD

1) Run PSTDM program at Windows95 or Windows98



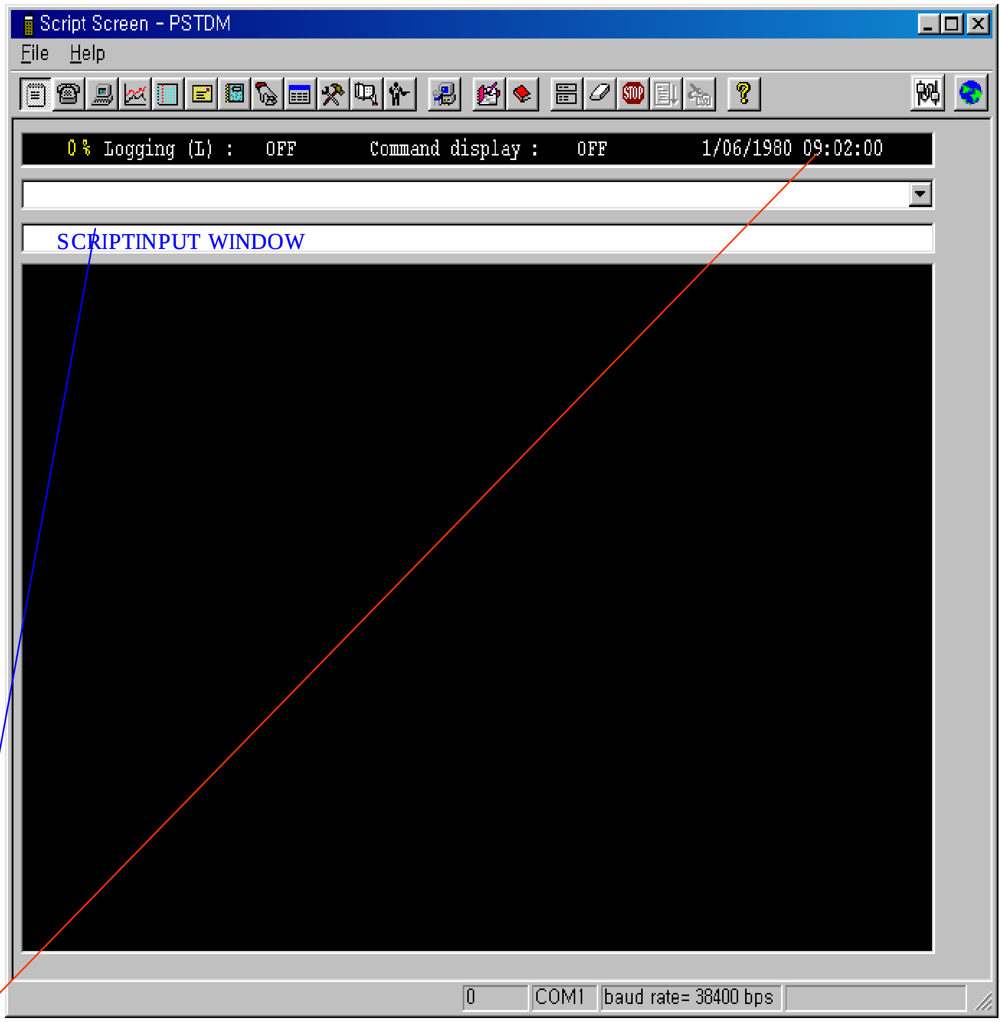
2) Set Buad rate to the modem's.

3) Click [DM mode]



4) If OK is displayed in the message box, modem is now ready for communication with PC.

5) Click MENU BAR icon.



6) As shown in the picture above, service file input plane will be displayed

(See if clock is running. If it isn't, communication with PC is not activated.

Repeat step 1 through 5, or reset the power of modem and repeat step 1 through 5)

7) Type NAM Programming script like the example shown below,

<NAM Programming script example>

Mode offline-d [ENTER]

nv_write name_nam {0," AnyDATA telecom "} [ENTER]

nv_write name_nam {1," AnyDATA telecom "} [ENTER]

Mode reset [ENTER]

CHAPTER 3. Circuit Description

1. Overview

IFR3000 receives modulated digital signals from the MSM of the digital circuit and then, changes them into analog signals by the digital/analog converter (DAC, D/A Converter) in order to create baseband signals. Created baseband signals are changed into IF signals by RFT3100 and then, fed into the Mixer after going through AGC. IF signals that have been fed are mixed with the signals of VCO and changed into the RF signals and then, they are amplified at the Power AMP. Finally, they are sent out to the cell site via the antenna after going through the isolator and duplexer.

2. RF Transmit / Receive Part

2.1 CDMA Transmit End

8 bit I and Q transmit signals are inputted into 2 DACs (DIGITAL-TO-ANALOG CONVERTER) from the output terminal TX_IQDATA0 ~ TX_IQDATA7 of MSM through the input terminals TXD0~TXD7 of BBA. Transmit signal input speed is two times of TXCLK+, TXCLK- which are two transmit/receive reference frequency.

Among transmit signals being inputted, signals are inputted into I signal DAC when the transmit clock is in the rise edge, whereas signals are inputted into Q Signal DAC during the drop edge. I and Q transmit signals are compensated and outputted at MSM in order to compensate the 1/2 clock time difference generated between reference clocks. In the signals coming out from the output terminal of DAC, there are spurious frequency ingredients resulting from DAC output transition edge and parasite ingredients, transmit clock frequencies and harmonics which are unwanted signals. Accordingly, spurious ingredients are removed by passing the signals through LPF of passband 6.30KHz. Unlike the receive end, the transmit end LPF requires no OFFSET adjustment. Analog baseband signals that have passed the CDMA LPF are mixed with I and Q signals of frequency 130.38 MHz (260.76 MHz created in the BBA internal VCO are divided by half into frequency 130.38MHz having the phase difference of 90 degrees) in two mixers. The mixed signals are added again and converted into IF frequency 130.38 MHz ±630 KHz (CDMA Spread Power Density Modulated Signals) and then, outputted.

2.2. Tx IF/Baseband Processors, RFT3100 (U102)

The RFT3100 connects diretly with QUALCOMM's MSM5100 utilizing an analog baseband interface. The basebaand quadrature signals are upconverted to the Cellular or PCS frequency bands and amplified to provide signal drive capability to the PA. The RFT3100 includes an IF mixer for upconverting analog baseband to IF, a programmable PLL for generating Tx IF frequency, single sideband upconversion from IF to RF, two cellular and two PCS driver amplifiers, and Tx power control through an 85 dB VGA. As added benefit, the single sideband upconversion eliminates the need for a bandpass filter normally required between the upconverter and driver amplifier providing overall board area and cost savings. RFT3100 functionality is specifically controlled from the MSM5100 via the three-line serial bus interface (SBI).

Designed to meet the requirements for global CDMA markets, the RFT3100 will operate over the following Tx frequency ranges :

Cellular band	824MHz ~ 925MHz
PCS band	1750MHz ~1910MHz

2.3. Upconverter (U104)

Upconverters made up of a mixer part and Driver AMP part. The mixer part is used to receive double-balanced OUT+ and OUT- of transmit AGC from baseband and mix the output of VCO (U171) with UHF output signal, whereas the Amp part is used to buffer the output of this mixer. U105 has the operation range of RF500MHz~1500MHz and has the conversion gain of 0 dB. In addition, the suppression of spurious signals which are unwanted noise is about 30 dBc when being compared to RF output. The IF input signal range of the mixer is DC~200MHz. The isolation on RF output terminal and LO signal input terminal at the IF input terminal is 30dB. The range of LO signal that can be inputted is 300~1700MHz and power level is -6~0 dBm.

2.4. Transmit Bandpass Filter (FL101)

Transmit signals that have been converted from IF signals into RF signals after passing through the upconverter U105 are inputted into the Power Amp U103 after passing once again through RF BPF F101in order to filter out noise signals amplified during the amplification of RF signals after going through upconverter(U105). This is carried out in order to create power level inputted to the Power AMP via RF BPF FL101 IL of two RF BPFs is 4dB as a maximum, whereas the ripple in the passing band is 2dB(maximum). The degree of the suppression of transmit signals on receive band is at least 20dB or greater. The maximum power that can be inputted is about 25dBm.

2.5. Power Amplifier (U103)

The power amplifier U102 that can be used in the CDMA and FM mode has linear amplification capability, whereas in the FM mode, it has a high efficiency. For higher efficiency, it is made up of one MMIC (Monolithic Microwave Integrated Circuit) for which RF input terminal and internal interface circuit are integrated onto one IC after going through the AlGaAs/GaAs HBT (heterojunction bipolar transistor) process. The module of power amplifier is made up of an output end interface circuit including this MMIC. The maximum power that can be inputted through the input terminal is +17dBm and conversion gain is about 28dB. RF transmit signals that have been amplified through the power amplifier are sent to the duplexer and then, sent out to the cell site through the antenna in order to prevent any damages on circuits, that may be generated by output signals reflected from the duplexer and re-inputted to the power amplifier output end.

2.6. Description of Frequency Synthesizer Circuit

2.6.1 Voltage Control Temperature Compensation Crystal Oscillator(TCX201, VCTCXO)

The temperature range that can be compensated by TCX201 which is the reference frequency generator of mobile terminal is -30 ~ +80 degrees. TCX201 receives frequency tuning signals called TRK_LO_ADJ from MSM as 0.5V~2.5V DC via R and C filters in order to generate the reference frequency of 19.68MHz and input it into the frequency synthesizer of UHF band. Frequency stability depending on temperature is ± 2.0 ppm.

2.6.2 UHF Band Frequency Synthesizer (U202)

Reference frequency that can be inputted to U202 is 3MHz~40MHz. It is the dual mode frequency synthesizer (PLL) that can synthesize the frequencies of UHF band 50MHz~1200MHz and IF band 20MHz~300MHz. U202 that receives the reference frequency of 19.68MHz from U174 creates 30kHz comparison frequency with the use of internal program and then, changes the frequency of 900MHz band inputted from X200 which is the voltage adjustment crystal oscillator into the comparison frequency of 30kHz at the prescaler in U202. Then, two signal differences are calculated from the internal phase comparator. The calculated difference is inputted to DC for adjusting the frequency of U202 through U202 No.2 PIN and external loop filter in order to generate UHF signals. In addition, outputs of other PIN17 are inputted into BBA after going through the VRACTOR diode and tank circuit so that the outputs of BBA internal receive end VCO are adjusted to 170.76MHz.

2.6.3 Voltage Control Crystal Oscillator (U204)

U171 that generates the LO frequency (900MHz) of mobile terminal receives the output voltage of PLL U202 and then, generates the frequency of 954MHz at 0.7V and the frequency of 980MHz at 2.7V. The sensitivity on control voltage is 23MHz/v and the output level is 1dBm(maximum). Since LO frequency signal is very important for the sensitivity of mobile terminal, they must have good spurious characteristics. U174 is -70dBc(maximum).

3. Digital/Voice Processing Part

3.1 Overview

The digital/voice processing part processes the user's commands and processes all the digital and voice signal processing in order to operate in the phone. The digital/voice processing part is made up of a receptacle part, voice processing part, mobile station modem part, memory part, and power supply part.

3.2 Configuration

3.2.1 Voice Processing Part

The voice processing part is made up of an audio codec into digital voice signals and digital voice signals into analog voice signals, amplifying part for amplifying the voice signals and sending them to the ear piece, amplifying part that amplifies ringer signals coming out from MSM5100, and amplifying part that amplifies signals coming out from MIC and transferring them to the audio processor.

3.2.2 MSM (Mobile Station Modem) Part

MSM 5100 is the core elements of CDMA terminal and carries out the functions of CPU, encoder, interleaver, deinterleaver, Viterbi decoder, Mod/Demod, and vocoder.

3.2.3 Memory Part

The memory part is made up of a flash memory, SRAM for storing data, and EEPROM.

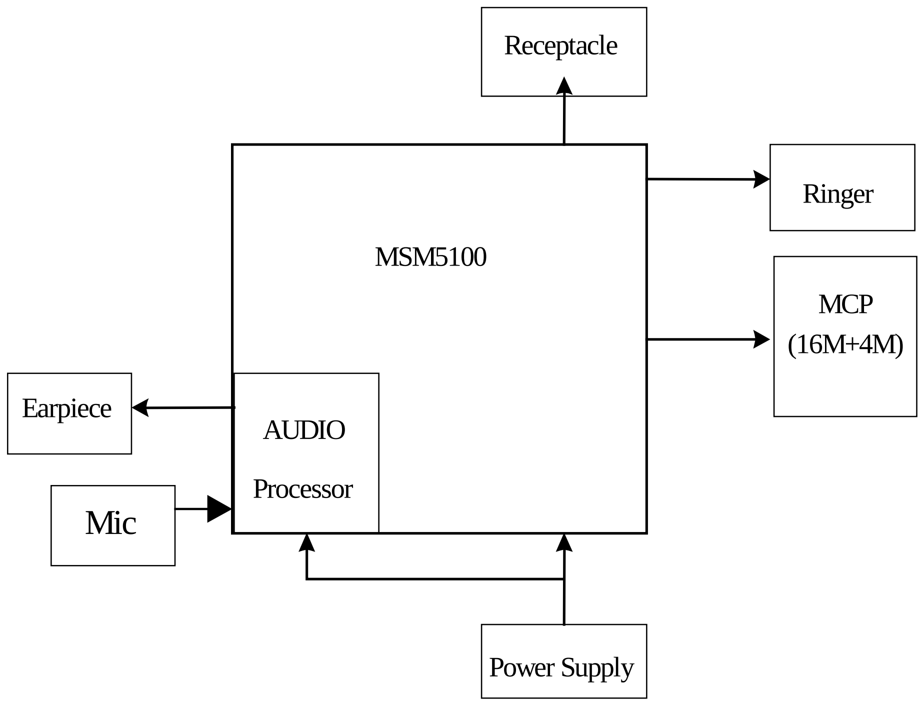
3.2.4 Power Supply Part

The power supply part is made up of circuits for generating various types of power, used for the digital/voice processing part.

+4.0V from external DC (+6V) is fed into five regulators(U605,U603,U602,U604,U606).

The five regulators produces +3.0V for the IFR3000(U204) and for Tx Parts.

3.3 Circuit Description



[Figure 3-1] Block Diagram of Digital/Voice Processing Part

3.3.1 MSM Part

MSM5100, which is U401, is the core element of CDMA system terminal that includes ARM7TDMI microprocessor core. It is made up of a CPU, encoder, interleaver, deinterleaver, Viterbi decoder, MOD/DEM, and vocoder. MSM5100, when operated in the CDMA mode, utilizes CHIPX8 (9.8304MHz) as the reference clock that is received from IFR3000, and uses TCXO (19.68MHz) that is received from TCX201. CPU controls the terminal operation. Digital voice data that have been inputted are voice-encoded and variable-rated. Then, they are convolutionally encoded so that error detection and correction are possible. Coded symbols are interleaved in order to cope with multi-path fading. Each data channel is scrambled by the long code PN sequence of the user in order to ensure the confidentiality of calls.

Moreover, binary quadrature codes are used based on Walsh functions in order to discern each channel. Data created thus are 4-phase modulated by one pair of Pilot PN code and they are used to create I and Q data.

When received, I and Q data are demodulated into symbols by the demodulator and then, de-interleaved in reverse to the case of transmission. Then, the errors of data received from Viterbi decoder are detected and corrected. They are voice decoded at the vocoder in order to output digital voice data.

3.3.2 Memory Part

Memory part, MCP consists of 16M Flash memory and 4M static RAM.
In the MCP, there are programs used for terminal operation. The programs can be changed through down loading after the assembling of terminals and data generated during the terminal operation are stored temporarily and non-volatile data such as unique numbers (ESN) of terminals are stored.

3.3.3 Power Supply Part

When the input voltage (4.0V) in the DTSS-1900 is fed to the five regulators generated +3.0V and the one regular generated +2.7V. The generated voltages are used for MSM5100, RFT3100, IFR3000 and other LOGIC parts. PWR ASIC is operated by the control signal SLEEP/ from MSM5100 and POWER_EN signal.

3.3.4 Logic Part

The Logic part consists of internal CPU of MSM, MCP. The MSM5100 receives TCXO (=19.68Mz) from VC-TCXO and CHIPX8 clock signals from the IFR3000, and then controls the module during the CDMA and the FM mode. The major components are as follows:

CPU : ARM7TDMI core
MEMORY : MCP (MB84VD21182A-85-PBS : U505)

CPU

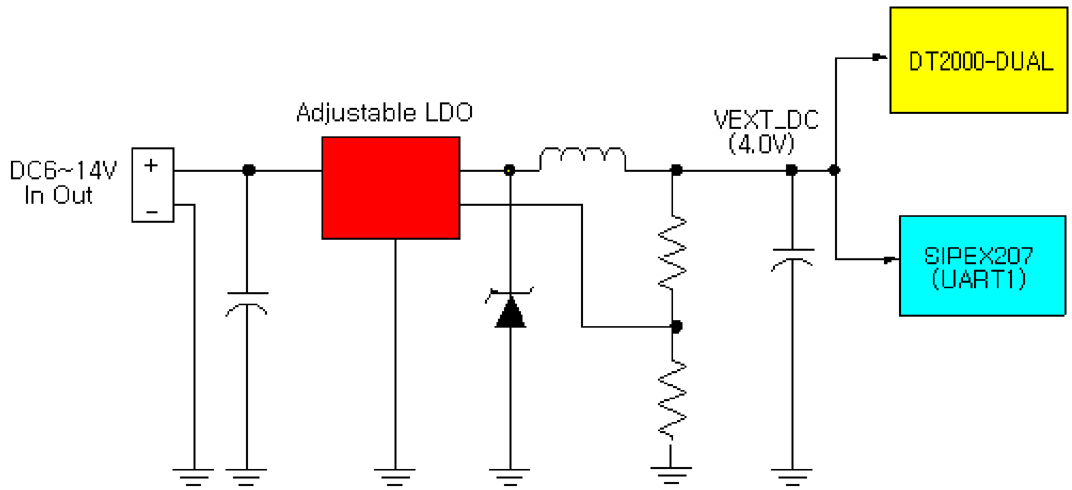
ARM7TDMI CMOS type 16-bit microprocessor is used and CPU controls all the circuitry. For the CPU clock, 32.768KHz is used.

MCP(16M +4M)

MCP is used to store the terminal’s program. Using the down-loading program, the program can be changed even after the terminal is fully assembled.
SRAM is used to store the internal flag information, call processing data, and timer data.

4. Level Translator Part

4.1 EMIII-DUAL supply power to Modem(4.0V).



[Fig 4-1] The Block Diagram of Source (in brief)

4.2 UART Interface

The Universal Asynchronous Receiver Transmitter (UART) communicates with serial data that conforms the RS-232 Interface protocol. The modem provides 3.0V CMOS level outputs and 3.0V CMOS switching input level. And all inputs have 5.0V tolerance but 3.0V or 3.3V CMOS logic compatible signals are highly recommended.
All the control signals of the RS-232 signals are active low, but data signals of RXD, and TXD are active high.

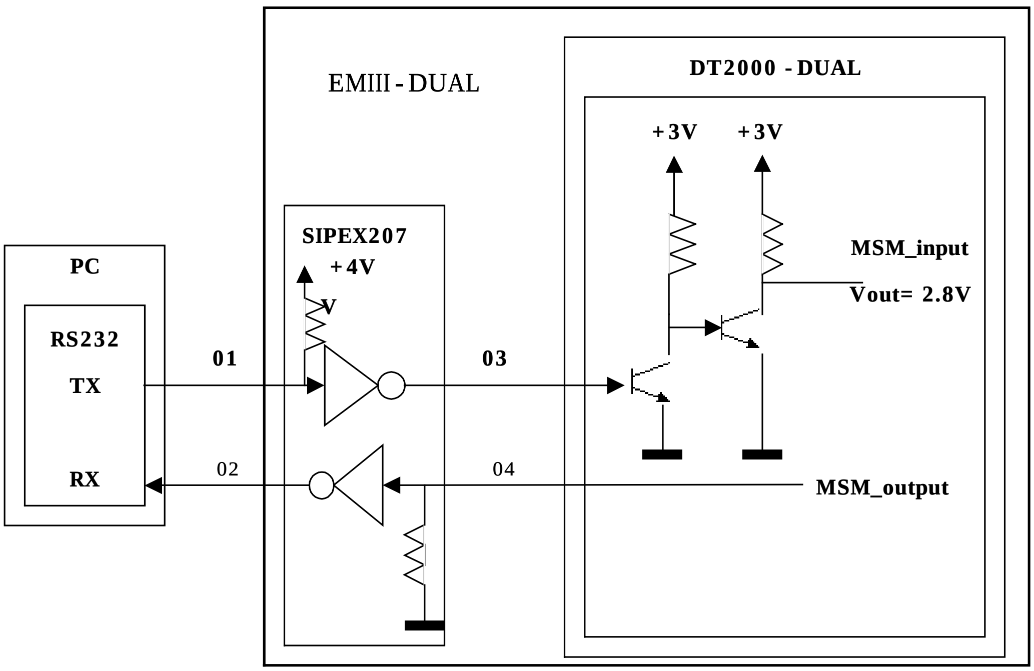
The UART has a 64byte transmit (TX) FIFO and a 64byte receive (RX) FIFO. The UART Features hardware handshaking, programmable data sizes, programmable stop bits, and odd, even, no parity. The UART operates at a 115.2kbps maximum bit rate.

4.2.1 UART Inter Pinouts

NAME	DESCRIPTION	CHARACTERISTIC
DP_DCD/	Data Carrier Detect	Network connected from the modem
DP_RI/	Ring Indicator	Output to host indicating coming call
DP_RTS/	Request to Send	Ready for receive from host
DP_TXD	Transmit Data	Output data from the modem
DP_DTR/	Data Terminal Ready	Host ready signal
DP_RXD	Receive Data	Input data to the modem
DP_CTS/	Clear to Send	Modem output signal

NAME	DESCRIPTION	CHARACTERISTIC
GND	Signal Ground	Signal ground

4.2.2 Signal level of RXD/TXD



RS232		PHONE	
TX01	RX02	TX04	RX03
V_{MAX} = 7.68V V_{MIN} = -7.68V	V_{MAX} = 6.50V V_{MIN} = -6.64V	V_{MAX} = 3.00V V_{MIN} = 0V	V_{MAX} = 3.9V V_{MIN} = 0V

[Figure 4-2] Signal Level of RXD, TXD

4.3 The function of Real Audio Test(including Voice Test)

NAME	TYPE	DESCRIPSION
MIC+	I	Microphone audio input
MIC-	IS	Ear/microphone set detect
EAR	O	Ear audio output
GND_A		Audio ground

CHAPTER 4. FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

APPENDIX

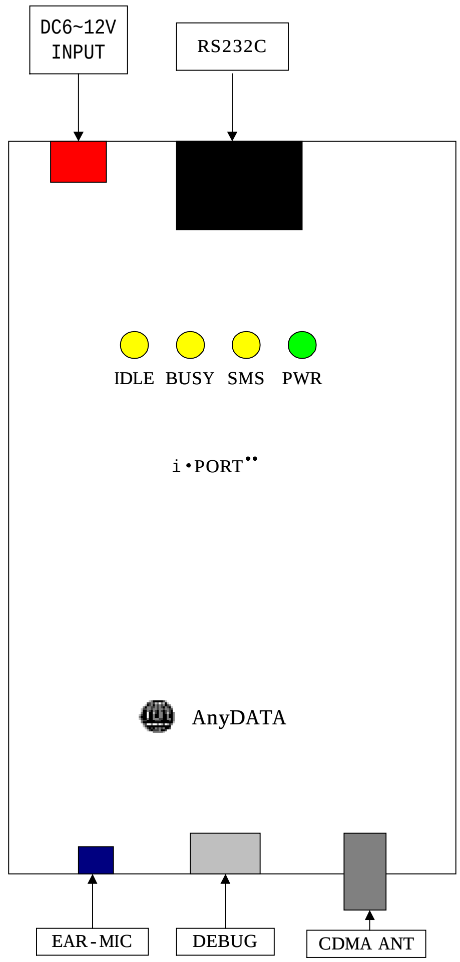
1. Assembly and Disassembly Diagram

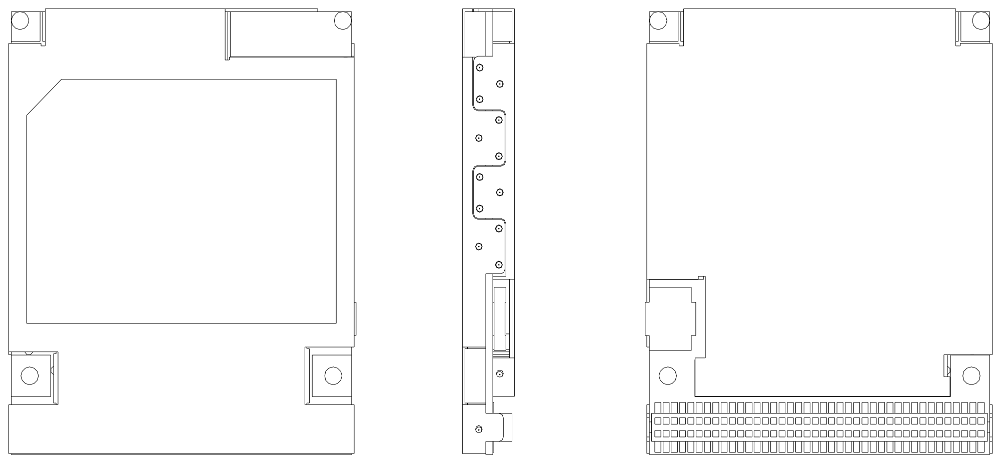
2. Block & Circuit Diagram

3. Part List

4. Component Layout

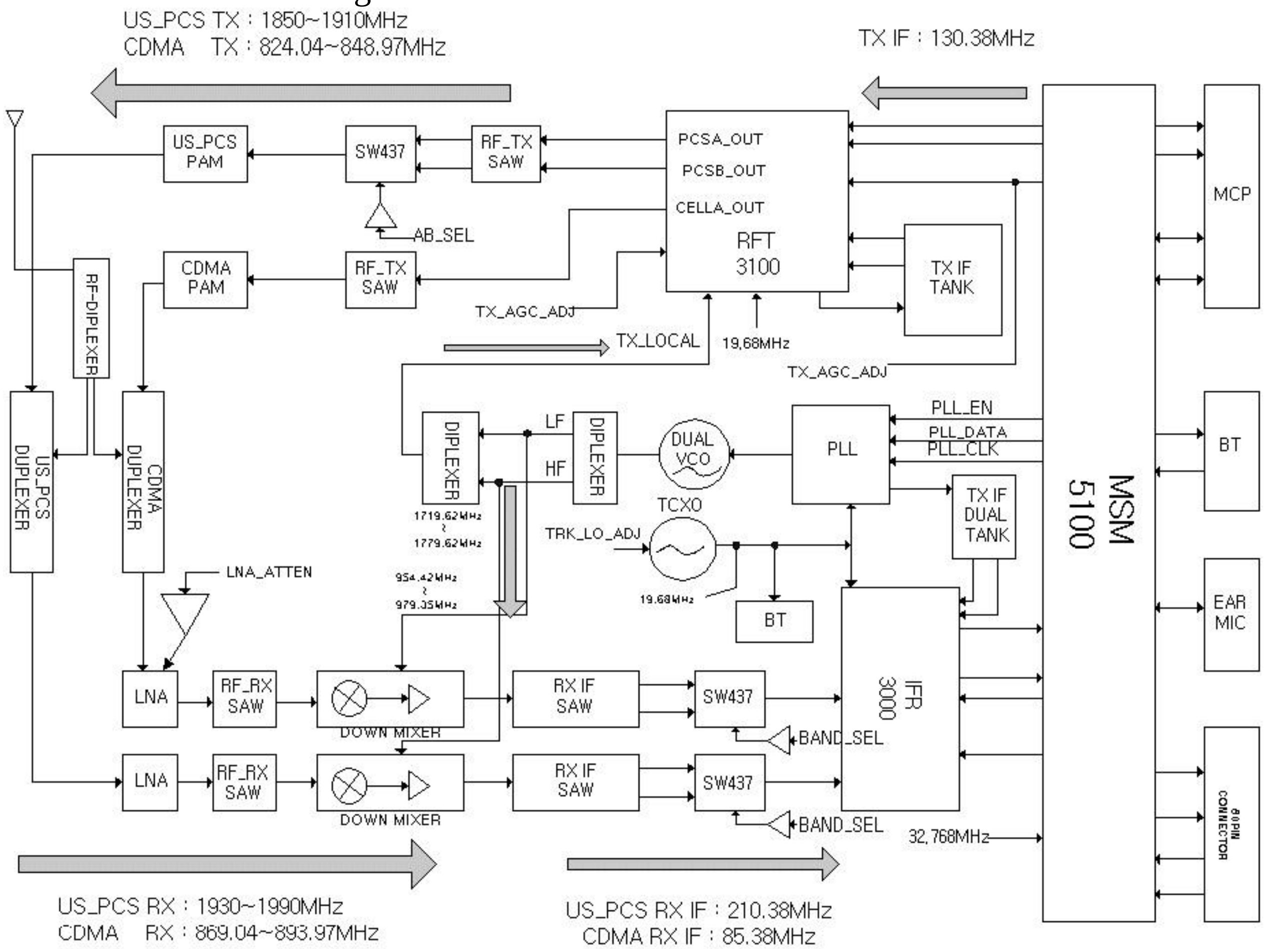
1. Assembly and Disassembly Diagram



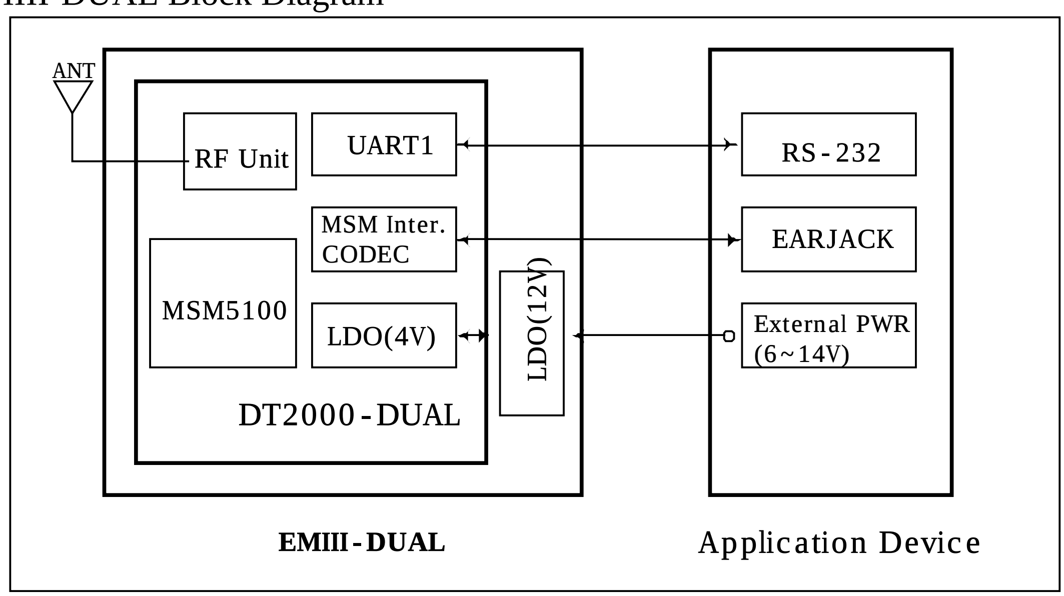


2. Block & Circuit Diagram

2.1. MODEM Block Diagram



2.2. EMIII-DUAL Block Diagram



3. Part List

3-1. MODEM Part List

V0.2 **19, dec ,2001**

NO	COMPONENT NAME	DESCRIPTION	Lay.	DESIGN NUMBER	Q'ty	MAKER
LOGIC						
1	MSM5100-A208FBGA-TR	MSM5100 (208P)	BOT	U301	1	QUALCOMM
2	IFR3000-48BCCF-TR	IFR3000 (48P)	TOP	U102	1	QUALCOMM
3	RFT3100-32BCCP-TR	RFT3100 (32P)	TOP	U203	1	QUALCOMM
4	MB84VD21182A-85-PBS	MCP(16M+4M)	TOP	U302	1	FUJITSU
5	MIC5245-3.0VBM5	LDO (3.0V)	TOP	U404, U409	2	MICREL
			BOT	U402, U406, U407	3	
6	MIC5245-2.7VBM5	LDO (2.7V)	TOP	U408	1	MICREL
7	MIC5245-2.9VBM5	LDO (2.9V)	BOT	U411	1	MICREL
8	TC7SU04FU	INVERTER	BOT	U303, U304	2	TOSHIBA
			TOP	U208, U209	2	
9	FDC634P	P CH-MOSFET(SSOT-6)	BOT	U202	1	FAIRCHILD
10	TP0205AD	DUAL FET	TOP	U405	1	VISHAY
			BOT	U403	1	
11	S-80827ALNP-EDT-T2	RESET IC	TOP	U410, U412	2	SEIKO
12	DTC124EE-TL	DIGITAL TR	BOT	Q201, Q202	2	ROHM
			TOP	Q401, Q402, Q403, Q404, Q405 Q407	6	
13	2SC4617	DIGITAL TR	BOT	Q102	1	ROHM
14	UMC4N-TR	DIGITAL TR	TOP	Q406	1	ROHM
15	UMH2N-TN	DIGITAL TR	TOP	U401	1	ROHM
16	HSMP-389F	PIN DIODE	BOT	VD103, VD104	2	AGILENT
17	UPS5819	SCHOTTKY DIODE	TOP	ZD401	1	MICRO SEMI
18	CON16-AXK6F24345J	BT CONNECTOR	BOT	CON402	1	
19	B06B-4101-606	60PIN CONNECTOR	BOT	CON401	1	SKY
20	1SV281	VARACTOR DIODE	TOP	VD201, VD202	2	TOSHIBA
			BOT	VD101, VD102	2	TOSHIBA
21	NT732ATD683K	THERMISTOR	BOT	TH201	1	KOA
22	F0805B3R00FW	FUSE (1608 Size)	TOP	FUSE1	1	AVX
RF						
1	ACPM7831	PAM(US-PCS)	TOP	U201	1	AGILENT
2	ACPM7812	PAM(CELLULAR)	BOT	U204	1	AGILENT
3	HPMD-7903	1900MHz-DUPLEXER	TOP	DUP101	1	AGILENT
4	FAR-D5CN-881M50-DIN4	800MHz-DUPLEXER	BOT	DUP102	1	PANASONIC
5	LFDP20N0022A	RF - DIPLEXER	TOP	DIP101	1	MURATA
6	LFDP15N0049A	LO - DIPLEXER	BOT	U205, U206	2	MURATA
7	B4934	RX IF SAW FILTER(5X5)	TOP	FL102	1	EPCOS
8	B4943	RX IF SAW FILTER(5X5)	BOT	FL104	1	EPCOS
9	B4135	RX RF SAW FILTER(3X3)	TOP	FL101	1	EPCOS
10	FS0881B1	RX RF SAW FILTER(3X3)	BOT	FL103	1	EPCOS

11	LJ49A	TX RF SAW FILTER(3X3)	TOP	FL201	1	EPCOS
12	FS0836B1	TX RF SAW FILTER(3X3)	BOT	FL202	1	EPCOS
13	VC_3R0A23_09671750A	VCO	TOP	VC201	1	FUJITSU
14	CMY212	DOWN MIXER	TOP	U101	1	INFINEON
			BOT	U103	1	
15	LMX2354SLBX	PLL	BOT	U207	1	N.S
16	HFX323YM19.68C1	VC-TCXO	TOP	TCX201	1	MURATA
17	SSP-T6	X-TAL(32.768K-7.0PF)	BOT	X301	1	SEIKO
18	ATF-38143	RF TR (LNA)	BOT	Q103	1	AGILENT
19	BFP620	RF TR (LNA)	TOP	Q101	1	INFINEON
20	BFP420	RF TR (LOCAL BUFFER)	BOT	Q203, Q204	2	INFINEON
21	SW-437	RF SWITHCH	TOP	SW103, SW104, SW201	3	M/A COM
22	MM8430-2600TB1	RF SWITHCH	TOP	SW102	1	MURATA
23	MCA-ST-00T	MOBLE SWITHCH	TOP	SW101	1	SUNRIDGE
INDUCTOR						
1	0603CS-15NXG-BC	CHIP COIL/15NH(2%)	BOT	L125, L126	2	COILCRFT
2	0603CS-27NXG-BC	CHIP COIL/27NH(2%)	TOP	L207	1	COILCRFT
3	0603CS-39NXG-BC	CHIP COIL/39NH(2%)	TOP	L110	1	COILCRFT
4	0603CS-56NXG-BC	CHIP COIL/56NH(2%)	TOP	L111	1	COILCRFT
5	0603CS-82NXG-BC	CHIP COIL/82NH(2%)	BOT	L123, L124	2	COILCRFT
6	0603CS-181NXG-BC	CHIP COIL/180NH(2%)	BOT	L121	1	COILCRFT
7	0603CS-221NXG-BC	CHIP COIL/220NH(2%)	BOT	L122	1	COILCRFT
8	CI-B1005-22NSJT	IND/2.2N(+-0.3nH)	TOP	L100	1	CERATECH
9	CI-B1005-27NSJT	IND/2.7N(+-0.3nH)	TOP	L203	1	CERATECH
10	CI-B1005-39NSJT	IND/3.9N(+-0.3nH)	TOP	L107, L202, L209	3	CERATECH
11	CI-B1005-47NSJT	IND/4.7N(+-0.3nH)	TOP	L106, C200	2	CERATECH
12	CI-B1005-56NSJT	IND/5.6N (+-5%)	TOP	L105	1	CERATECH
13	CI-B1005-82NSJT	IND/8.2N (+-5%)	BOT	L204	1	CERATECH
14	CI-B1005-100NSJT	IND/10N (+-5%)	BOT	L208	1	CERATECH
15	CI-B1005-120NSJT	IND/12N (+-5%)	BOT	L114, L115	2	CERATECH
16	CI-B1005-150NSJT	IND/15N (+-5%)	BOT	L112, L117, L118	3	CERATECH
17	CI-B1005-180NSJT	IND/18N (+-5%)	BOT	L116	1	CERATECH
18	CI-B1005-101NSJT	IND/100N (+-5%)	TOP	L102	1	CERATECH
			BOT	L113	1	
19	CI-B1608-150NJJT	IND/15N (+-5%)	TOP	L101	1	CERATECH
20	CI-B1608-47NJJT	IND/4.7N (+-5%)	TOP	L103	1	CERATECH
21	CI-B1608-270NJJT	IND/27N (+-5%)	TOP	L205, L206	2	CERATECH
22	CI-B1608-330NJJT	IND/33N (+-5%)	TOP	L104	1	CERATECH
23	CI-B1608-560NJJT	IND/56N (+-5%)	TOP	L109	1	CERATECH
24	CI-B1608-680NJJT	IND/68N (+-5%)	TOP	L108	1	CERATECH
25	CI-B1608-221NJJT	IND/220N (+-5%)	BOT	L120	1	CERATECH
26	CI-B2012-271NJJT	IND/270N (+-5%)	BOT	L119	1	CERATECH
27	BLM1608A601SPT	FERITE BEAD	TOP	BL201, BL202	2	MURATA
			BOT	BL401	1	MURATA
CAPACITOR						
1	GRM36COG0R5C50PT	0.5pF-1005 Cap	TOP	C117	1	MURATA
2	GRM36C0G010C50PT	1pF-1005 Cap	BOT	C152, C159	2	MURATA
3	GRM36C0G1R5C50PT	1.5pF-1005 Cap	BOT	C133	1	MURATA
			TOP	C108	1	MURATA

4	GRM36C0G020C50PT	2pF-1005 Cap	BOT	C142, C253, C258	3	MURATA
5	GRM36COG040D50PT	4pF-1005 Cap	TOP	C112, C115, C208, C209	4	MURATA
			BOT	C241	1	
6	GRM36COG060D50PT	6pF-1005 Cap	BOT	C150, C153, C154	3	MURATA
7	GRM36COG100D50PT	10pF-1005 Cap	TOP	C102, C106, C114, C227, C232	5	MURATA
			BOT	C140, C141	2	
8	GRM36COG120J50PT	12pF-1005 Cap	BOT	C157, C158	2	MURATA
9	GRM36COG150J50PT	15pF-1005 Cap	TOP	C219	1	MURATA
			BOT	C335, C336	2	
10	GRM36COG220J50PT	22pF-1005 Cap	BOT	C111, C135, C149	3	MURATA
11	GRM36COG240J50PT	24pF-1005 Cap	TOP	C218, C220	2	MURATA
12	GRM36C0G390J50PT	39pF-1005 Cap	TOP	C206, C207	2	MURATA
13	GRM36C0G470J50PT	47pF-1005 Cap	BOT	C277, C278, C279	3	MURATA
14	GRM36C0G820J50PT	82pF-1005 Cap	TOP	C230, C231	2	MURATA
15	GRM36COG101J50PT	100pF-1005 Cap	TOP	C100, C118, C119, L200, C226, C254 C260, C264, C267, C322, C501	11	MURATA
			BOT	C121, C122, C134, C145, C240, C259 C275, C333	8	
16	GRM36COG221J50PT	220pF-1005 Cap	TOP	C175, C176, C224, C225	4	MURATA
17	GRM36COG471J50PT	470pF-1005 Cap	TOP	C400, C401, C402, C403, C404 C405, C406, C407, C409, C410 C411, C412, C413, C414, C415 C416, C417, C418, C419, C420 C421, C422, C423, C424, C425 C426, C427, C428, C429, C430 C431, C432, C433, C434, C435 C436, C437, C438, C439, C440 C441, C442, C443, C444, C445, C446	46	MURATA
18	GRM36X7R102K50PT	1nF-1005 Cap	TOP	C109, C166, C177, C178, C228	5	MURATA
			BOT	C144, C269, C303, C334	4	
19	GRM36COG103J50PT	10nF-1005 Cap	TOP	C172, C282, C285, C287, C289 C299, C305, C450, C456, C458	10	MURATA
			BOT	C223, C268, C300, C301, C304 C307, C447, C448, C452, C454, C461	11	
20	GRM36COG123J50PT	12nF-1005 Cap	BOT	C317, C319	2	MURATA
21	GRM36Y5V223Z25PT	22nF-1005 Cap	TOP	C310, C311, C313	3	MURATA
			BOT	C314	1	
22	GRM36Y5V333Z25PT	33nF-1005 Cap	BOT	C179	1	MURATA
23	GRM36Y5V683Z25PT	68nF-1005 Cap	BOT	C290	1	MURATA
24	GRM36Y5V104Z25PT	100nF-1005 Cap	TOP	C110, C113, C116, C160, C162, C163 C164, C165, C167, C168, C169, C170 C203, C210, C211, C212, C214, C215 C216, C217, C221, C222, C229, C255 C256. C262, C263, C270, C286, C306 C308, C337 C338, C339	34	MURATA
			BOT	C138, C139, C143, C147, C148, C161 C213, C239, C271, C272, C273, C274 C276, C280, C281, C288, C315, C316 C318, C320 C340, C341, C342	23	

25	GRM36COG105J50PT	1uF-1005 Cap	TOP	C103, C104, C105, C173	4	MURATA
			BOT	C136, C137, C174, C251, C302	5	
26	GRM39Y5V101Z25PT	100PF-1608 Cap	BOT	C237	1	MURATA
27	GRM39COG102J50PT	1nF-1608 Cap	TOP	C235	1	MURATA
			BOT	C155	1	
28	GRM39Y5V103Z25PT	10nF-1608 Cap	BOT	C266	1	MURATA
29	GRM39Y5V104Z25PT	100nF-1608 Cap	BOT	C156	1	MURATA
30	GRM39Y5V224Z25PT	220nF-1608 Cap	TOP	C265	1	MURATA
			BOT	C284	1	
31	GRM39Y5V684Z25PT	680nF-1608 Cap	TOP	C234	1	MURATA
32	TA-6R3TCMS100M-PR	Tan Cap (10uF/6.3V/P)	TOP	C261, C309, C312, C451, C459, C460 C464	7	MICREL
			BOT	C283, C453	2	
33	TA-6R3TCMS4R7M-PR	Tan Cap (4.7uF/6.3V/P)	TOP	C201, C455, C457	3	MICREL
			BOT	C449, C462	2	
34	TA-010TCR330K-A	Tan Cap (33uF/6.3V/A)	TOP	C321	1	MICREL
35	595D476X0010U2T	Tan Cap(47uF/6.3V/B)	TOP	C202, C463	2	SPRAGUE
			BOT	C238	1	
RESISTOR						
1	0402 J 0R	0R 5%-1005 Resistor	TOP	R102, R122, R119, R212, R463, R302 R312, R313, R318, R421, R458, R464 R467, R466, R468, R469	16	PHILIPS
			BOT	R109, R204, R263, R320, R321, R460 R462, R301	8	
2	1608 J 0R	0R 5%-1608 Resistor	TOP	C198	1	PHILIPS
3	0402 J 18R	18R 5%-1005 Resistor	BOT	R216	1	PHILIPS
4	0402 J 33R	33R 5%-1005 Resistor	BOT	R107, R108	2	PHILIPS
5	0402 F 390R	390R 1%-1005 Resistor	TOP	R201	1	PHILIPS
6	0402 J 10R	10R 5%-1005 Resistor	TOP	R104, R231	2	PHILIPS
7	0402 J 100R	100R 5%-1005 Resistor	TOP	R103, R230, R239	3	PHILIPS
			BOT	R234	1	
8	0402 F 220R	220R 1%-1005 Resistor	BOT	R219	1	PHILIPS
9	0402 J 300R	300R 5%-1005 Resistor	BOT	R217, R218	2	PHILIPS
10	0402 J 330R	330R 5%-1005 Resistor	TOP	R232	1	PHILIPS
			BOT	R227, R314	2	
11	0402 J 470R	470R 5%-1005 Resistor	TOP	R401, R402, R403, R404, R405, R406 R407, R422, R423, R424, R425, R426 R427, R428, R429, R430, R431, R432 R433, R434, R435, R436, R437, R438 R439, R440, R441, R442, R443, R444 R446, R447, R448, R449, R450. R451 R452, R453, R454, R455, R456, R457	42	PHILIPS
12	0402 J 510R	510R 5%-1005 Resistor	TOP	R222	1	PHILIPS
13	0402 J 680R	680R 5%-1005 Resistor	TOP	R116	1	PHILIPS
14	0402 J 1K	1K 5%-1005 Resistor	BOT	R105, R106, R110, R300, R206, R235 R236, R237, R238	9	PHILIPS
			TOP	R233, R241, R243, R315, R459	5	
15	0402 J 1K5	1.5K 5%-1005 Resistor	TOP	R305	1	PHILIPS

16	0402 J 1K8	1.8K 5%-1005 Resistor	TOP	R213	1	PHILIPS
17	0402 J 2K	2K 5%-1005 Resistor	TOP	R465	1	
			BOT	R123	1	PHILIPS
18	0402 J 2K2	2.2K 5%-1005 Resistor	TOP	R303, R304, R306	3	PHILIPS
			BOT	R226	1	
19	0402 J 3K3	3.3K 5%-1005 Resistor	BOT	R111	1	PHILIPS
20	0404 F 4K7	4.7K 1%-1005 Resistor	TOP	C204	1	
			BOT	R317, C239	2	PHILIPS
21	0402 J 5K1	5.1K 5%-1005 Resistor	TOP	R225	1	PHILIPS
			BOT	R221	1	
22	0402 J 8K2	8.2K 5%-1005 Resistor	TOP	R120	1	PHILIPS
23	0402 J 10K	10K 5%-1005 Resistor	BOT	R112, R113, R200, R202, R220 R309, R310, R114 R115, R316	10	PHILIPS
			TOP	R117, R118, R210, R211, R319, R410 R412, R408, R414, R415, R416, R418 R419	13	
24	0402 J 22K	22K 5%-1005 Resistor	TOP	R409, R411, R413, R417	4	PHILIPS
25	0402 J 27K	27K 5%-1005 Resistor	TOP	R101	1	PHILIPS
26	0402 J 36K	36K 5%-1005 Resistor	TOP	R121	1	PHILIPS
27	0402 J 100K	100K 5%-1005 Resistor	TOP	R209, R242	2	PHILIPS
			BOT	R244	1	
28	0402 J 150K	150K 5%-1005 Resistor	BOT	R245	1	PHILIPS
29	0402 J 180K	180K 5%-1005 Resistor	BOT	R307, R308	2	PHILIPS
30	0402 J 470K	470K 5%-1005 Resistor	BOT	R311	1	PHILIPS
30	0402 F 12K1	12.1K 1%-1005 Resistor	TOP	R207	1	PHILIPS
31	0402 F 1M	1M 1%-1005 Resistor	BOT	R246, R247	2	PHILIPS
기타						
1	DTSS-DUAL PCB	Main PCB				
2	DTSS-DUAL TOP COVER	기구 TOP COVER				
3	DTSS-DUAL TOP FRAME	기구 TOP FRAME				
4	DTSS-DUAL BOT COVER	기구 BOT COVER				
5	DTSS-DUAL BOT FRAME	기구 BOT FRAME				
6	DTSS-DUAL LABEL	LABEL				
7		정전기 비닐팩				
8		포장 BOX				
9		생산비용				
DNI						
1		RESISTOR	TOP	R124, R125, R126, R127, R205, R208 R240, R420, R445	9	
			BOT	R203, R262	2	
2		CAPACITOR	TOP	C101, C107, C120, C171, C233 C257 C352	7	
			BOT	C146, C151, C250, C252	4	

3-2. EM Main Board Partlist

28. Jan. 2002

No	Commponent Name	Description	Lay	DESIGN NO		Vendor
LOGIC					1	
1	SMA R/A(F)+ MCA Cable	SMA(F) + MCA	TOP	CDMA	1	LINK Tec.
2	PH127-60SMD-16H-2.0	60pin connetor	BOT	CN1	1	SKY Elec.
3	TC7SHU04F	inverter	TOP	U19	3	TOSHIBA
4	UMT2907A	PNP TR	TOP	U14,16,17	1	ROHM
5	SP207-EA	Tranceiver IC	TOP	U2	1	SIPEX
6	MIC4576BU	LDO (TO-263)	TOP	U3	1	MICREL
7	MBRS360T3	Schottky Diode	TOP	ZD1	1	MOTOROLA
8	657PL8	8pin Modular Housing	TOP	J2	1	ARIN
9	BL-2141N	LED(Green)	TOP	D4	1	BRT
10	BL-3141N	LED(Yellow)	TOP	D1,D2,D3	3	BRT
11	HSJ1621-019011	EARJACK	TOP	U15	1	HOSIDEN
12	53047-0310	1.25mm male 3pin	TOP	CN10	1	MOLEX
13	5268	2.5mm male 3pin®	TOP	CN2	1	MOLEX
14	5268	2.5mm male 2pin®	TOP	J1	1	MOLEX
RESISTOR						
15	MCR03MZSJX000	RESISTOR(1608) 0R	TOP	R30,R31,R44,R45, R46,R47	6	ROHM
16	MCR03MZSJX101	RESISTOR(1608) 100R	TOP	R7,R8,R9,R34,R35, R36,R37	7	ROHM
17	MCR03MZSJX332	RESISTOR(1608) 3.3K	TOP	R1,R2,R3	3	ROHM
18	MCR03MZSJX472	RESISTOR(1608) 4.7K	TOP	R6	3	ROHM
19	MCR03MZSJX103	RESISTOR(1608) 10K	TOP	R5	3	ROHM
CAPACITOR						
20	GR39COG471J50PT	470pF -1608 -capacitor	TOP	C9	1	MURATA
21	TA-035TCMR10M-AR	TANTAL 0.1uF/35V	TOP	C5,C6,C7,C8	3	TOWA
22	470uF/16V(10x10.5) "MVK" 85°C	Elec. Cap (chip type)	TOP	C1	1	SAMYANG
23	1000uF/6.3V(10x10.5) "RGV"85°C	Elec. Cap (chip type)	TOP	C2	1	RUBYCON
INDUCTOR						
24	PL52C-33-1000	COIL INDUCTOR (33uH)	TOP	L2	1	COOPER
The Others						

25	EM(II)_PCB _V0.1	EM(II)_PCB_MAIN_ V0.1				UNIC Elec.
26	EM-BODY-00	BODY				TOSUNG
27	EM-FRONT-00	FRONT				TOSUNG
28	EM-REAR-00	REAR				TOSUNG
DNI						
29	DNI	RESISTOR	TOP	R4,R13,R14,R15, R16, R17,R18,R19, R20,R21,R22,R23, R24,R25,R26,R27, R40,R41,R42,R43	20	
30	DNI	CAPACITOR	TOP	C3,C4	2	
31	DNI	DA114	TOP	D5	1	
32	DNI	INDUCTOR	TOP	L1	1	
33	DNI	MIC5205-3.0V	TOP	U4	1	
34	DNI	TC74HC07AF(SOP-14)	TOP	U6	1	
35	DNI	TC74HC4052AFT(SOP-16)	TOP	U5	1	
36	DNI	53047-0810(8PIN)	TOP	U7	1	
37	DNI	5268(3PIN)	TOP	CN3, CN4	2	

4. Component Layout