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Product Overview

2.983 Technical Description:

The Dual Band Portable Phone consists of an Analog FM mode and Code Division Multiple Access (CDMA) mode. The analog transmitter is only for use in the Cellular Radiotelephone Service Part 22 of the CFR. The CDMA band of the product is for use in the Personal Communications Services, Part 24 of the CFR. The Portable Phone is designed to meet the requirements of IS standards for Portable Station - Base Station compatibility Standards for Wideband Spread Spectrum Cellular Systems.

CDMA Frequency Range of operation: 1851.25 - 1908.75 MHz Transmitter. Max RF power output is .2W Max Digital.

Analog Frequency Range of operation: 824.04 - 848.97 MHz Transmitter and 869.04-893.07 Receiver. Max RF power output is .6W max.

Power Supply requirements: 7.2V Li-Ion (supplied with phone)

Frequency Range of operation: 1851.25 - 1908.75 MHz Transmitter. Max RF power output is 0.2 W Max Digital.

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2.983 Devices and circuitry provided for determining and stabilizing frequency:

A voltage controlled, temperature compensated, crystal oscillator (VCTCXO) is employed as a frequency reference for all of the Transceiver local oscillators. This crystal oscillator is specified to remain within +/- 2.5pmm over temperature and voltage variations. The lock status indicator of all synthesizers is monitored by the microprocessor and an out of lock condition will inhibit transmission. In FM and CDMA mode the mobile receiver monitors the received signal and adjusts the frequency of the VCTCXO, this corrects any errors between the mobile frequency and the base station transmitter. The mobile is locked to the base station.

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Suppression of spurious radiation:

Spurious and harmonic suppression is obtained by design and proper use of shielding techniques. Continued compliance is ensured by Quality Control guidelines during all phase of manufacturing.

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Limiting Modulation:

The audio input is sampled, digitally limited, and then filtered to amplitude and frequency limit the signal applied to the modulator. The device supports the AMPS standard . The device has an operating temperature range of -30 to +60 C. The functions include Compandor, PLL lock detector for received SAT, filtering of received data, audio signal filtering for signals.

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Limiting power:

Transmitted power is monitored by an RF detector diode which is coupled from the Power Amplifier (PA) output. The detected DC voltage is fed into a processor which uses a calibration lookup table along with an offset correction and temperature correction table to control power limits. When the RF power exceeds a predetermined limit the gain of the stage preceding the PA is reduced.

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Justification for CDMA bandwidth of 1.25 MHz:

Reference: TIA/EIA/IS-95

Chip rate is 1.228 MHz (see page 6 -10 of IS-95 {attached}). When we look 3dB down from the signal we find 1.25 MHz. Channel spacing is normally set at this 1.25 MHz. Also, one can reference baseband filtering requirements (page 6-27 TIA/EIA/IS-95 {attached}) for filtering frequency response limits.

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Table 6.1.3.1.1-1. Reverse Traffic Channel Modulation Parameters

	Data Rate (bps)				
Parameter	9600	4800	2400	1200	Units
PN Chip Rate	1.2288	1.2288	1.2288	1.2288	Mcps
Code Rate	1/3	1/3	1/3	1/3	bits/code sym
Transmit Duty Cycle	100.0	50.0	25.0	12.5	%
Code Symbol Rate	28.800	28.800	28.800	28.800	sps
Modulation	6	6	6	6	code sym/mod symbol
Modulation Symbol Rate	4800	4800	4800	4800	sps
Walsh Chip Rate	307.20	307.20	307.20	307.20	kcps
Mod Symbol Duration	208.33	208.33	208.33	208.33	μs
PN Chips/Code Symbol	42.67	42.67	42.67	42.67	PN chip/code symbol
PN Chips/Mod symbol	256	256	256	256	PN chip/mod symbol
PN Chips/Walsh Chip	4	4	4	4	PN chips/Walsh chip

Table 6.1.3.1.1-2. Access Channel Modulation Parameters

	Data Rate (bps)	
Parameter	4800	Units
PN Chip Rate	1.2288	Mcps
Code Rate	1/3	bits/code sym
Code Symbol Repetition	2	symbols/code sym
Transmit Duty Cycle	100.0	%
Code Symbol Rate	28,800	sps
Modulation	6	code sym/mod symbol
Modulation Symbol Rate	4800	sps
Walsh Chip Rate	307.20	kcps
Mod Symbol Duration	208.33	μs
PN Chips/Code Symbol	42.67	PN chip/code sym
PN Chips/Mod symbol	256	PN chip/mod symbol
PN Chips/Walsh Chip	4	PN chips/Walsh chip

6.1.3.1.10 Baseband Filtering

Following the spreading operation, the I and Q impulses are applied to the inputs of the I and Q baseband filters as shown in Figure 6.1.3.1-2. The baseband filters shall have a frequency response S(f) that satisfies the limits given in Figure 6.1.3.1.10-1. Specifically, the normalized frequency response of the filter shall be contained within $\pm\delta_1$ in the passband $0 \le f \le f_p$ and shall be less than or equal to $-\delta_2$ in the stopband $f \ge f_s$. The numerical values for the parameters are $\delta_1 = 1.5$ dB, $\delta_2 = 40$ dB, $f_p = 590$ kHz, and $f_s = 740$ kHz.

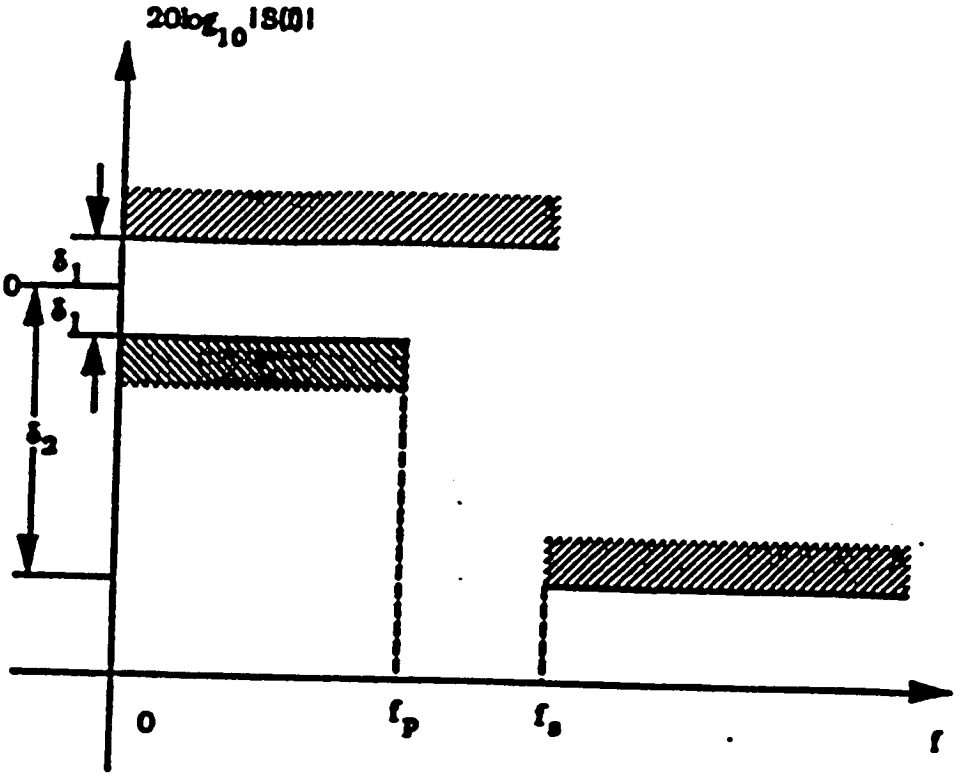

Figure 6.1.3.1.10-1. Baseband Filters Frequency Response Limits

Let s(t) be the impulse response of the baseband filter. Then s(t) shall satisfy the following equation:

$$\text{Mean Squared Error} = \sum_{k=0}^{\infty} [\alpha s(kT_s - \tau) - h(k)]^2 \le 0.03,$$

where the constants α and τ are used to minimize the mean squared error. The constant T_s is equal to 203.451... ns, which equals one quarter of a PN chip. The values of the coefficients h(k), for $k < 48$, are given in Table 6.1.3.1.10-1; $h(k) = 0$ for $k \ge 48$. Note that h(k) equals h(47 - k).

6.1.3 Modulation Characteristics

6.1.3.1 Reverse CDMA Channel Signals

The Reverse CDMA Channel is composed of Access Channels and Reverse Traffic Channels. These channels shall share the same CDMA frequency assignment using direct-sequence CDMA techniques. Figure 6.1.3.1-1 shows an example of all of the signals received by a base station on the Reverse CDMA Channel. Each Traffic Channel is identified by a distinct user long code sequence; each Access Channel is identified by a distinct Access Channel long code sequence. Multiple Reverse CDMA Channels may be used by a base station in a frequency division multiplexed manner.

The modulation process for the Reverse CDMA Channel is as shown in Figure 6.1.3.1-2. Data transmitted on the Reverse CDMA Channel is grouped into 20 ms frames. All data transmitted on the Reverse CDMA Channel is convolutionally encoded, block interleaved, modulated by the 64-ary orthogonal modulation, and direct-sequence spread prior to transmission.

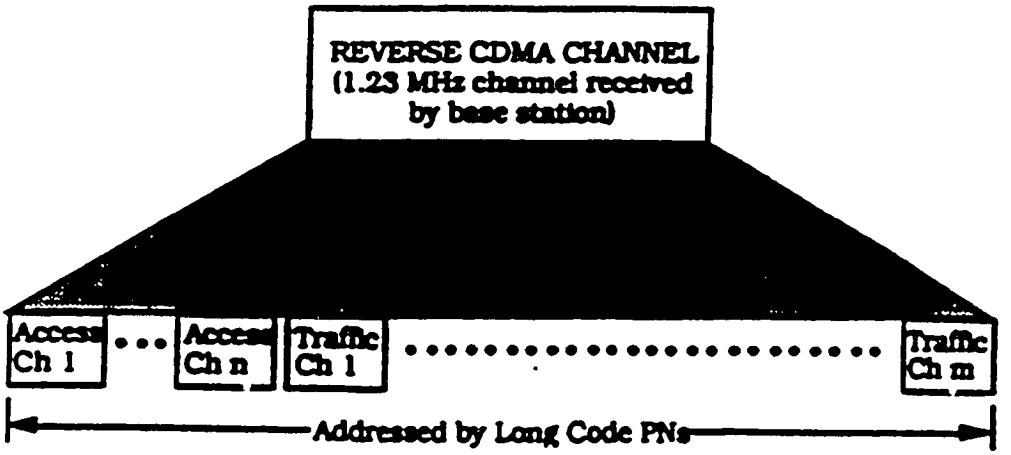

Figure 6.1.3.1-1. Example of Logical Reverse CDMA Channels Received at a Base Station

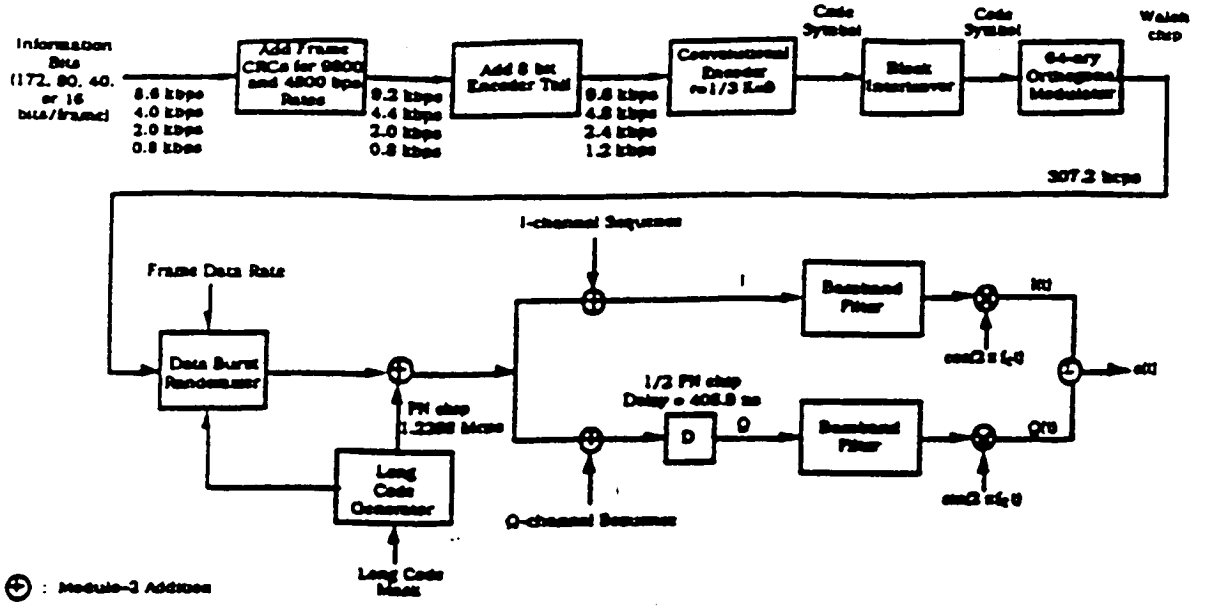

Figure 6.1.3.1-2. Reverse CDMA Channel Modulation Process

Data frames may be transmitted on the Reverse CDMA Channel at a data rate of 9600, 4800, 2400, or 1200 bps. The Reverse Traffic Channel may use any of these data rates for transmission. The transmission duty cycle on the Reverse Traffic Channel varies with the transmission data rate. Specifically, the transmission duty cycle for 9600 bps frames is 100 percent, the transmission duty cycle for 4800 bps frames is 50 percent, the transmission duty cycle for 2400 bps frames is 25 percent, and the transmission duty cycle for 1200 bps frames is 12.5 percent as shown in Table 6.1.3.1.1-1. As the duty cycle for transmission varies proportionately with the data rate, the actual burst transmission rate is fixed at 28,800 code symbols per second. Since six code symbols are modulated as one of 64 modulation symbols for transmission, the modulation symbol transmission rate is fixed at 4800 modulation symbols per second. This results in a fixed Walsh chip rate of 307.2 kcps. The rate of the spreading PN sequence is fixed at 1.2288 Mcps, so that each Walsh chip is spread by four PN chips. Table 6.1.3.1.1-1 defines the signal rates and their relationship for the various transmission rates on the Reverse Traffic Channel.

The numerology is identical for the Access Channel except that the transmission rate is fixed at 4800 bps, each code symbol is repeated once, and the transmission duty cycle is 100 percent. Table 6.1.3.1.1-2 defines the signal rates and their relationship on the Access Channel.