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1 General Information and Product Overview 2.1033

1.1 Grant Information

Power Information

	Conducted Power as Measured at Antenna Connector		Radiated EIRP		Radiated ERP	
	dBm	Watts	dBm	Watts	dBm	Watts
FM Grant Power	26	0.398	28.2	0.661	26.0	0.398
CDMA Grant Power	24	0.251	24.2	0.263	24.0	0.251
FM SAR Power	27.0	0.501	29.2	0.832	27.0	0.501

FCC Identification

J9CQSEC800

Emissions Designators, Frequency range, and Output Power

Mode	Emissions Designator	Frequency Range (MHz)	ERP Output (Watts)
FM AMPS	40K0F8W	824.02-848.98	0.398
FM AMPS	40K0F1D	824.02-848.98	0.398
CDMA	1M25F9W	824.02-848.98	0.251

1.2 Address of Manufacturer and Applicant 2.1033 (c) (1)

Manufacturer:

Qualcomm Incorporated
5775 Morehouse Drive
San Diego, CA 92121
Telephone: (858) 587-1121

Applicant:
QUALCOMM, INC.

5775 Morehouse Dr.
San Diego, CA 92121
Telephone: (858) 587-1121

1.3 Technical Description

The Dual Mode Cellular Phone consists of an Analog FM mode and a Code Division Multiple Access (CDMA) mode that both operate in the 800 MHz cellular frequency band. The analog and CDMA transmitter is only for use in the Cellular Radiotelephone Service Part 22 of the CFR. The Portable Phone is designed to meet the requirements of TIA/EIA/IS-98-A standards for Dual-Mode Wideband Spread Spectrum Cellular Mobile Stations.

The QSEC 800 has the capability to operate in a push-to-talk mode. When the PTT (pus-to-talk) button is pressed, the phone operates similar to a 2-way radio on a cellular channel.

The QSEC has the capability of providing secure communications through digital encryption when operating in CDMA mode. There is one hardware design for both commercial and secure cellular communications. The secure communication feature is achieved through a special version of software. The transmitted RF spectrum and interoperability of the phone with service providers is identical in both secure and non-secure modes of operation.

1.4 FCC Identifier 2.1033 (c) (2)

The FCC identifier for the QSEC 800 is: J9CQSEC800

See Exhibit 5: FCC Identification Label 2.1033 (c) (11)

1.5 User Manual 2.1033 (c) (3)

See Exhibit 12: QSEC 800 User Guide 2.1033 (c) (3)

1.6 Types of Emissions 2.1033 (c) (4)

40K0F8W	F3E voice
40K0F1D	F3D supervisory audio tones, signaling tones
1M25F9W	F1D wideband data signal

1.7 Frequency Range 2.1033 (c) (5)

The frequency range of the equipment in Domestic Public Cellular Radio Telecommunications Service bands, 824 - 849 MHz for transmit and 869 - 894 MHz for receive in both CDMA and FM. The channel spacing is 30 kHz for FM, and channel spacing for CDMA is 1.25 MHz.

1.8 Operating Power Levels 2.1033 (c) (6)

The transmitter output power is independent of whether the equipment operates in the cellular system FM or CDMA mode. The equipment supports Class 3 Mobile Station Power Class, and its power output capability is reported to the Land Station via Station Class Mark. The equipment will respond to commands from the Land Station to change power levels as defined in the EIA/TIA/IS-98 Specification.

1.9 Maximum Output Power 2.1033 (c) (7)

The equipment supports the maximum output power for Class 3 Mobile Station which is -2 dBW ERP, and meets the 7 W ERP (+8 dBW) maximum power limitation of Section 22.904.

1.10 DC Supply and Current Range 2.1033 (c) (8)

The QSEC 800 operates by using a 4 Vdc lithium-ion battery. The operational battery voltage ranges from 3.2 to 4.2 Vdc.

1.11 Modulation Limiting

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 detect for received data, and audio signal filtering for signals.

1.12 Power Limiting

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 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

1.13 List of Semiconductor Active Devices 2.1033 (c) (10)

See exhibit 15: Parts List 2.1033 (c) (10)

1.14 Circuit Diagram 2.1033 (c) (10)

See exhibit 14: Schematics 2.1033 (c) (10)

1.15 Transmitter Adjustment Procedure

All frequency adjustments are set at the factory and there are no frequency field adjustments for this product. Under digital mode, frequency is locked to the base station and controlled by VCTCXO adjustments to offset any possible errors.

1.16 Frequency Stability Device 2.1033 (c) (10)

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 +/- 2.5 ppm 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 modes, 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.

1.17 Spurious Radiation Suppression Devices 2.1033 (c) (10)

Reference Designator	Part Name	Function
FL6	Duplexer	Provides protection against FM transmitter spurious emissions and receiver local oscillator leakage.
FL3	TX SAW filter	Provides protection against FM transmitter spurious emissions.
FL5	Ceramic filter	Provides suppression of spurious energy and transmitter harmonics.
FL4	RX SAW filter	Provides protection against FM transmitter spurious emissions.

1.18 Drawing of Equipment Identification Plate or Label 2.1033 (c) (11)

See Exhibit 5: FCC Identification Label 2.1033 (c) (11)

1.19 Photographs 2.1033 (c) (12)

See Exhibits 16 through 18.

1.20 Modulation Techniques 2.1033 (c) (13)

1.20.1 Amps Mode

The F3E audio modulation is accomplished through the use of Digital Signal Processor (DSP). The audio signal is converted to digital samples at 8 kHz sample rate. The samples are filtered, integrated, interpolated, and phase modulated at a 40 kHz rate. The resulting signal is then decomposed into I and Q signals, over-sampled again at 160 kHz rate, and then sent to the digital-to-analog converter after proper filtering. The transmit audio modulation limiting function is performed digitally in the DSP. The pre-emphasis is performed through an IIR filter and the filtering of audio frequencies is performed through a FIR filter in DSP. The combined performance of these filters is shown in Exhibit 6 along with the actual audio frequency response of the modulated carrier signal. The DSP clocks are locked to the reference VCTCXO output signal, and maintained within ± 2.5 ppm tolerance.

1.20.2 CDMA Mode

The CDMA mode is described in the following pages from the TIA/EIA /IS-95 Standard. The justification for the CDMA bandwidth of 1.25 MHz is that the chip rate is 1.228 MHz (see page 6-10 of IS-95). When we look 3 dB 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) for filtering frequency response limits.

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 Reverse CDMA Channel has the overall structure 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.

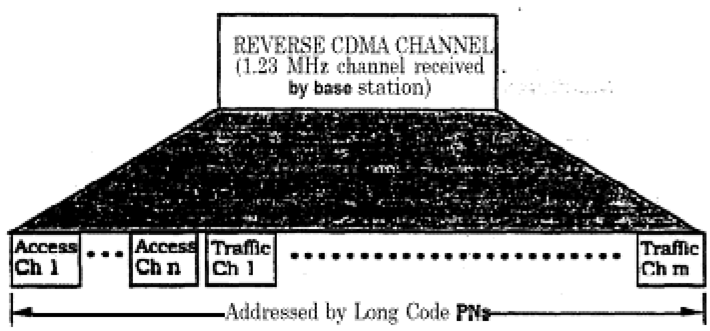

Figure 6.1.3.1-1. Example of Logical Reverse CDMA Channels Received at a Base Station

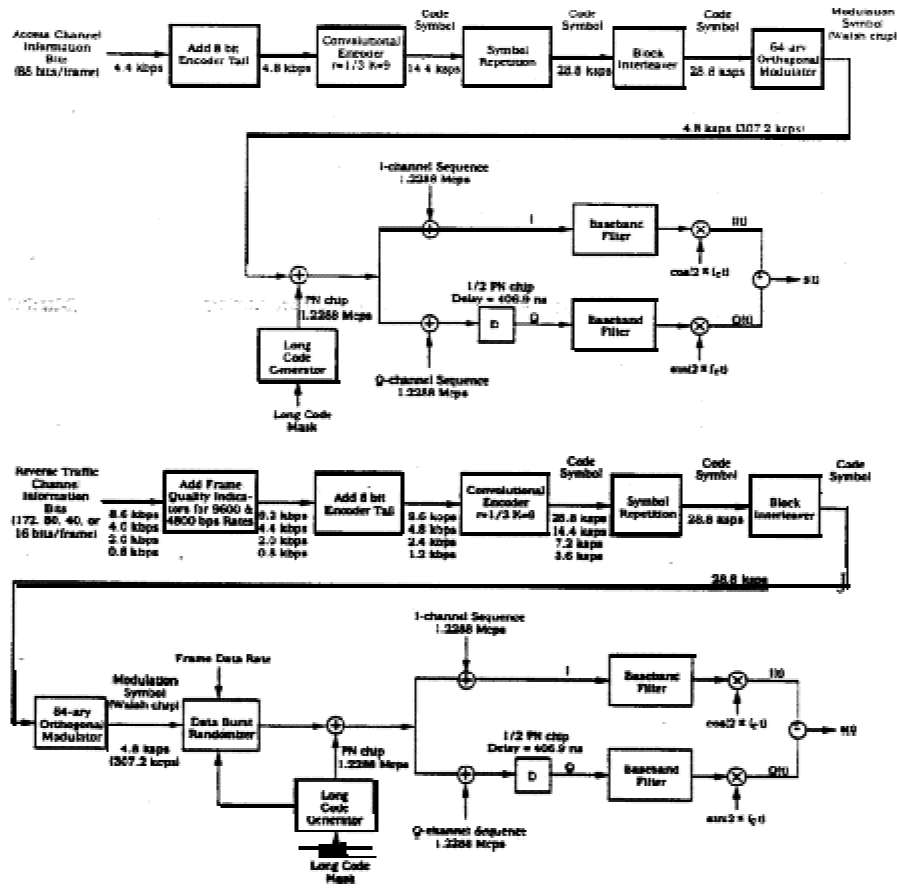

Figure 6.1.3.1-2. Reverse CDMA Channel Structure

After adding frame quality indicators for both the 9600 bps and 4800 bps rates (see 6.1.3.3.2.1) and adding eight Encoder Tail Bits (see 6.1.3.3.2.2), data frames may be transmitted on the Reverse Traffic Channel at data rates of 9600, 4800, 2400, and 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 defmes 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 after adding eight Encoder Tail Bits (see 6.1.3.2.2). 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.

6.1.3.1.1 Modulation Parameters

The modulation parameters for the Reverse Traffic Channel and the Access Channel are shown in Table 6.1.3-1.1- 1 and Table 6.1.3.1.1-2, respectively.

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

1.21 Test Data 2.1033 (3) (14)

See Exhibits 6 through 8.

1.22 RF Block Diagram

See Exhibit 13: RF Block Diagram.