WMD 1x FCC Documentation

FCC Part 22 & 24 Certification	
FCC ID:	**J9CWMD1X**
Model:	**WMD1x**

STATEMENT OF CERTIFICATION

The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the measurements of the sample's radio frequency interference emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

Report Prepared by:	QUALCOMM Incorporated 5775 Morehouse Drive San Diego, CA 92121-1714
Tests that required an OATS site were performed by Nemko USA, Inc.	

QUALCOMM®

Table of Contents

1   Introduction

The Qualcomm Wearable Mobile Device (WMD) module is a very small Wireless Wide Area Network (WWAN) module that incorporates gpsOne technology. It is fully compatible with the CDMA2000 standard. The module design is optimized for minimal cost, minimum size, maximum battery life and positioning location performance.

The module will have the following features:

- CDMA2000 1x at 850 MHz and 1900 MHz

- GPS at 1575 MHz

- USB 2.0 high-speed interface

2   Operational Description

2.1   Device Description

The Wearable Mobile Device (WMD) 1x is an ultra small, 21 x 22 x 4.5 mm WWAN module that can be integrated into a multitude of host devices. The WMD 1x module operates on the 800/1900 MHz CDMA2000 1x networks. The module uses Qualcomm's QSC 6055 chip set and has stand alone GPS, AGPS and gpsOneXTRA-tm. Interfaces for the module include USB 2.0, I2C, RUIM support, LCD, camera, keypad, 2 LED control lines, vibrator control, audio and primary RF coax. HTT is designed to be placed in a user's bag or attached to a belt or other article of clothing.   The WMD design is optimized for minimal cost, minimal size, maximum battery life and superb position location performance. The WMD 1x device meets the following standards: IS-2000 for CDMA 1xRTT, IS-707-A Data, IS-637-B SMS, IS-683-A Service provisioning, gpsOne and IS-98 CDMA Minimum Performance.

Only 850 MHz (Cellular) and 1900 MHz (PCS) bands are used for operation. The DUT is a pre-production sample.
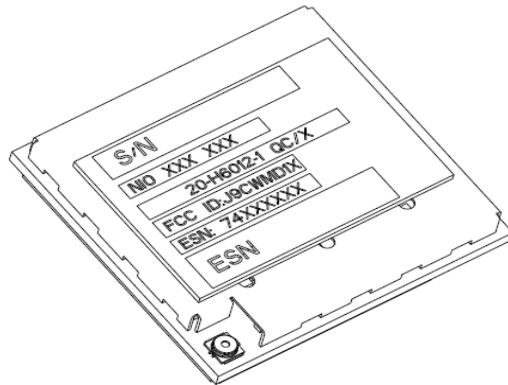
The main on-board Qualcomm chipsets include:

- **Single chip solution (Baseband + RF + Power Management):** QSC6055™

Key connectivity support includes:

■ Generic 80-pin connector providing USB 2.0 high-speed, power, GPIOs and serial interfaces, audio and battery connection.

■ Antenna connector

2.2   *Technologies Supported*

Table 2-1 describes the technology and bands supported. Section 3 contains additional information on device capabilities and equipment categories
.

Table 2-1 Technology and Bands Supported

Mode	Band Name	Transmitter Range (MHz)	Receiver Range (MHz)	Duplex Separation (MHz)
CDMA2000	850 MHz - US Cellular	824-849	869-894	45
	1900 MHz - US PCS	1850-1910	1930-1990	80
GPS	GPS		1570-1590	N/A

2.3   *Module/Host Electrical Interfaces*

The WMD 1x module supports the following interfaces.

■ **Primary Data Interfaces:**

USB Interface: Supports USB 2.0 in all three modes (Low Speed, Full Speed, and High Speed).
LED: Provide device ON/OFF indication, cellular coverage and battery status.

3   Device Equipment Category Declarations

3.1   *CDMA Throughput*

■ CDMA 1xRTT (IS-2000)
   o   Simultaneous forward and reverse channel data rates up to 153.6 kbps

4   FCC CFR 47 §2.1033 Requirement Documentation

Requirement: §2.1033 (c) Applications for equipment other than that operating under parts 15 and 18 of the rules shall be accompanied by a technical report containing the following information:

4.1   *§2.1033 (c) (1) Manufacture Information*

Requirement: §2.1033 (c) (1) The full name and mailing address of the manufacturer of the device and the applicant for certification.

Qualcomm information:

Manufacturer:

AnyData Corporation

18902 Bardine Ave.

Irvine, CA   92612

Charles Napier

770 360-9203

Applicant:

Qualcomm Incorporated
5775 Morehouse Drive
San Diego, CA 92121

4.2   *§2.1033 (c) (2) FCC identifier*

Requirement: §2.1033 (c) (2) FCC identifier

Qualcomm information:

The FCC ID of the equipment is J9CWMD1X. A separate attachment shows the detail of FCC label information.

4.3   *§2.1033 (c) (3) User Manual*

Requirement: 2.1033 (c) (3) A copy of the installation and operating instructions to be furnished the user. A draft copy of the instructions may be submitted if the actual document is not available. The actual document shall be furnished to the FCC when it becomes available.

Qualcomm information:

Please see User's Guide in separate attachment.

4.4   *§2.1033 (c) (4) Emissions Designators*

Requirement: 2.1033 (c) (4) Type or types of emission.

Qualcomm information:

Mode	Tx Frequency Range (MHz)	Emission Designator
CDMA	824.7 – 848.31	1M28F9W
	1851.25 – 1908.75	1M28F9W

4.5   *§2.1033 (c) (5) Frequency range.*

Requirement: 2.1033 (c) (5) Frequency range.

Qualcomm information:

The frequency ranges that the module supports are listed in Table 2-1 of this document.

4.6   *§2.1033 (c) (6) Range of Transmit Power*

Requirement: 2.1033 (c) (6) Range of operating power values or specific operating power levels, and description of any means provided for variation of operating power.

Qualcomm information:

In CDMA 1x, the transmitter output power is independent of whether the equipment operates in the cellular system or PCS system. The WMD 1x module supports Class 3 cellular mobile station Power Class, and Class 2 PCS mobile station power class. Its power output capability is reported to the land station via Station Class Mark. The mobile station will respond to commands from the land station to change power levels as defined in the EIA/TIA/IS-98 Specification.

4.7   §2.1033 (c) (7) Maximum Transmit Power

Requirement: 2.1033 (c) (7) Maximum power rating as defined in the applicable part(s) of the rules.

Qualcomm information:

The WMD 1x module supports the maximum output power as defined by relevant 3GPP and 3GPP2 standards for

- Class 3 cellular mobile station in a CDMA mode, i.e. -7dBW (0.2W) to 0 dBW (1.0W) of ERP

- Class 2 PCS mobile station in a CDMA mode, i.e. -7 dBW (0.2W) to 0 dBW (1.0W) of EIRP

All meet the 7 W ERP (+8.45 dBW) maximum power limitation of CFR 47 §22.913 and 2 watts E.I.R.P. peak power of CFR 47 Part §24.232 (b). The equipment is able to limit the output power to the minimum necessary for successful communications.

- Maximum transmission of 0 dBW (1.0W) conducted power with a +6 dBi antenna gain.

4.8   §2.1033 (c) (8) DC Voltages

Requirement: §2.1033 (c) (8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

Qualcomm information:

The dc voltage and current for the final RF amplifying device is 3.8 Vdc and 500 mA.

4.9   §2.1033 (c) (9) Tune-up procedure

Requirement: §2.1033(c) (9) Tune-up procedure over the power range, or at specific operating power levels.

Qualcomm information:

All frequency and power adjustments are set at the factory and there are no 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

4.10   §2.1033 (c) (10) Schematic

Requirement: §2.1033(c)(10) A schematic diagram and a description of all circuitry and devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation, and for limiting power.

Qualcomm information:

- **Schematic:**
  The schematic and block diagram are sent in separate attachments.

- **Stabilizing Frequency:**
  The circuit provided for determining and stabilizing frequency is shown in the schematic attachments..

  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 all modes, the WMD 1x module receiver monitors the received signal and adjusts the frequency of the VCTCXO, this corrects any errors between the WMD 1x module frequency and the base station transmitter. The WMD 1x module frequency is locked to the base station.

■ **Suppression of Spurious Radiation:**
The circuit provided for suppression of spurious radiation is in the schematic attachment..

The transmitter front end provides filtering of the RF signal in order to meet FCC specifications. For radiated spurious suppression, proper design techniques and the use of proper shielding techniques reduced the emission levels well below the permissible FCC limit.

■ **Limiting Modulation:**
It will be addressed along with ***Modulation Description*** in Section 4.13 of this document.

■ **Limiting Power**
Transmitted power is monitored by a RF detector diode which is coupled from the Power Amplifier (PA) output. The detected DC voltage is fed into a microprocessor 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.

4.11   *§2.1033 (c) (11) FCC Identifier Drawing.*

Requirement: §2.1033 (c) (11) A photograph or drawing of the equipment identification plate or label showing the information to be placed thereon.

Qualcomm information:

See separate attachment for FCC label information.

4.12   *§2.1033 (c) (12) Photographs*

Requirement: §2.1033 (c) (12) Photographs (8x10) of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, if any, and labels for controls and meters and sufficient views of the internal construction to define component placement and chassis assembly. Insofar as these requirements are met by photographs or drawings contained in instruction manuals supplied with the certification request, additional photographs are necessary only to complete the required showing.

Qualcomm information:

See Exhibit separate attachments for the external and internal photos.

4.13   *§2.1033 (c) (13) Modulation Description*

Requirement: §2.1033 (c) (13) For equipment employing digital modulation techniques, a detailed description of the modulation system to be used, including the response characteristics (frequency, phase and amplitude) of any filters provided, and a description of the modulating wavetrain, shall be submitted for the maximum rated conditions under which the equipment will be operated.

Qualcomm information:

4.13.1   CDMA2000 (1x)

The CDMA 1x mode described here is limited to what the Castra module supports. The provided information is from 3GPP2 C.S0002-D , Version 1.0.

1. ***Reverse Channel Structure:*** Figure 4-1 shows the structure of the code channels transmitted by the Castra module. Term RC stands for Radio Configuration. By crossing out the non-supported items, the figure clearly demonstrates which types of channels that the Castra module is not capable of generating on the reverse link.
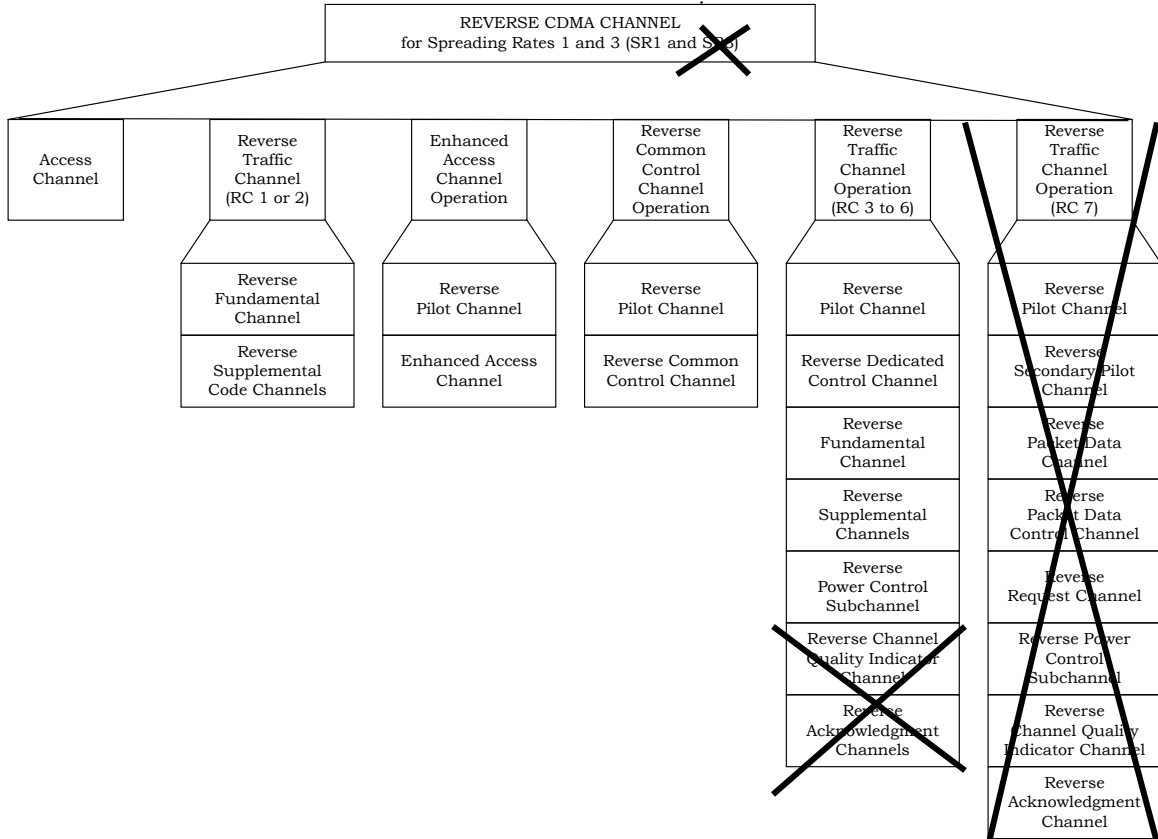
2.
    Figure 4-1. Reverse CDMA Channels Received at the Base Station

The following pictures details the channel creating structures of the reverse access channel for SR1, reverse dedicated control channel for RC3, and reverse fundamental and reverse supplemental channel for RC3. For RC1 and 2, the creation of s(t) nets an identical waveform to the waveform created in the legacy IS95B system/standard. Thus, backwards compatible is insured.
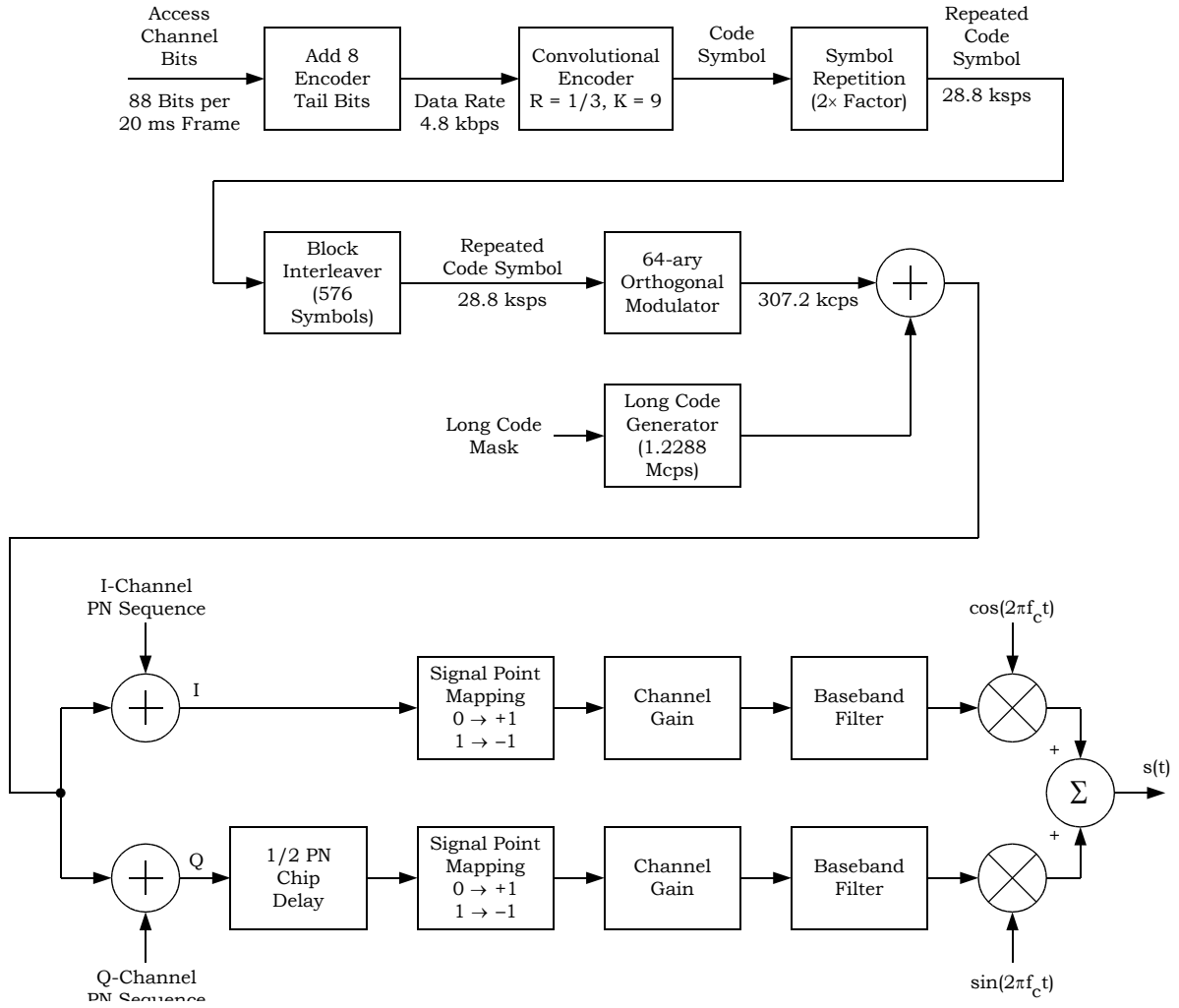
Figure 4-2 Access Channel Structure for Spreading Rate 1

Bits/Frame	Bits	Data Rate (kbps)	Symbols	Rate (ksps)
24 Bits/5 ms	16	9.6	384	76.8
172 Bits/20 ms	12	9.6	1,536	76.8
1 to 171 Bits/20 ms	12 or 16	1.05 to 9.55	1,536	76.8
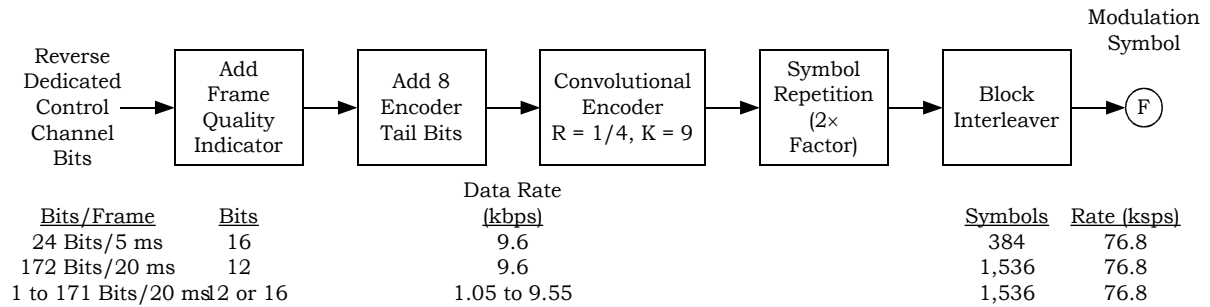
Note: If flexible data rates are supported, there can be 1 to 171 channel bits in a 20 ms frame and the encoded symbols will be repeated and then punctured to provide a 76.8 ksps modulation symbol rate.

Figure 4-3 Reverse Dedicated Control Channel Structure for Radio Configuration 3

Modulation
Symbol

```
Channel  →  [Add        ]  →  [Add 8      ]  →  [Convolutional]  →  [Symbol     ]  →  [Symbol    ]  →  [Block       ]  →  (J)
Bits        [Frame      ]     [Reserved/   ]     [or Turbo     ]     [Repetition ]     [Puncture  ]     [Interleaver ]
            [Quality    ]     [Encoder     ]     [Encoder      ]
            [Indicator  ]     [Tail Bits   ]
```

		Data Rate					
Bits/Frame	Bits	(kbps)	R	Factor	Deletion	Symbols	Rate (ksps)
24 Bits/5 ms	16	9.6	1/4	2×	None	384	76.8
16 Bits/20 ms	6	1.5	1/4	16×	1 of 5	1,536	76.8
40 Bits/20n ms	6	2.7/n	1/4	8×	1 of 9	1,536	76.8/n
80 Bits/20n ms	8	4.8/n	1/4	4×	None	1,536	76.8/n
172 Bits/20n ms	12	9.6/n	1/4	2×	None	1,536	76.8/n
360 Bits/20n ms	16	19.2/n	1/4	1×	None	1,536	76.8/n
744 Bits/20n ms	16	38.4/n	1/4	1×	None	3,072	153.6/n
1,512 Bits/20n ms	16	76.8/n	1/4	1×	None	6,144	307.2/n
3,048 Bits/20n ms	16	153.6/n	1/4	1×	None	12,288	614.4/n
6,120 Bits/20n ms	16	307.2/n	1/2	1×	None	12,288	614.4/n

1 to 6,119 Bits/20n ms

Notes:

1. n is the length of the frame in multiples of 20 ms. For 31 to 54 encoder input bits per frame, n = 1 or 2. For more than 54 encoder input bits per frame, n = 1, 2, or 4.
2. The 5 ms frame is only used for the Reverse Fundamental Channel.
3. The Reverse Fundamental Channel only uses 15 to 192 encoder input bits per frame with n = 1.
4. Turbo coding may be used for the Reverse Supplemental Channels with 384 or more encoder input bits per frame; otherwise, K = 9 convolutional coding is used.
5. With convolutional coding, the Reserved/Encoder Tail bits provide an encoder tail. With turbo coding, the first two of these bits are reserved bits that are encoded and the last six bits are replaced by an internally generated tail.
6. If variable-rate Reverse Supplemental Channel operation, flexible reverse link data rates, or both are supported, the parameters are determined from the specified number of channel bits per frame, the maximum assigned number of channel bits per frame for the Reverse Fundamental Channel or the Reverse Supplemental Channel, and the specified frame quality indicator length.
   - The frame quality indicator length is 16 for more than 192 encoder input bits per frame; 12 or 16 for 97 to 192 encoder input bits per frame; 8, 12, or 16 for 55 to 96 encoder input bits per frame; and 6, 8, 12, or 16 otherwise.
   - The code rate is 1/2 for more than 3,072 encoder input bits per frame; otherwise, it is 1/4. If the number of encoder input bits per frame is less than 384, the type of encoding is convolutional; otherwise, it is the same as that of the maximum assigned data rate for the channel.
   - If the specified number of channel bits per frame is equal to the maximum assigned number of channel bits per frame and that number and the specified frame quality indicator length match one of the listed cases, the symbol repetition factor and symbol puncturing from that listed case are used. Otherwise, the symbol repetition factor and puncturing are calculated to achieve the same interleaver block size as for the maximum assigned data rate for the channel.
   - If the maximum assigned data rate matches one of the data rates listed in the figure, the interleaver block size for that listed data rate is used. Otherwise, the interleaver block size of the next higher listed data rate is used.

Figure 4-4 R-FCH and R-SCH Channel Structure for Radio Configuration 3

3. *Modulation Parameters:* Table 7-4 to 7-6 from C.S0002-D lists the modulation parameters of the reverse access channel, R-DCCH, R-FCH and R-SCH.

Table 4-1 Access Channel Modulation Parameters for Spreading Rate 1

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

Table 4-2 Reverse Dedicated Control Channel Modulation Parameters for Radio Configuration 3

Parameter	Data Rate (bps) 9,600	Units
PN Chip Rate	1.2288	Mcps
Code Rate	1/4	bits/code symbol
Code Symbol Repetition	2	repeated code symbols/code symbol
Modulation Symbol Rate	76,800	sps
Walsh Length	16	PN chips
Number of Walsh Function Repetitions per Modulation Symbol	1	Walsh functions/ modulation symbol
Transmit Duty Cycle	100.0	%
Processing Gain	128	PN chips/bit

Note: If flexible data rates are supported, repetition and puncturing can be used to support data rates not specified in this table.

Table 4-3 R-FCH and R-SCH Modulation Parameters for 20 ms Frames for Radio Configuration 3

| Parameter	Data Rate (bps) 9,600 × N	4,800	2,700	1,500	Units
PN Chip Rate	1.2288	1.2288	1.2288	1.2288	Mcps
Code Rate	1/4 (N < 32) 1/2 (N = 32)	1/4	1/4	1/4	bits/code symbol
Code Symbol Repetition	2 (N = 1) 1 (N > 1)	4	8	16	repeated code symbols/code symbol
Puncturing Rate	1	1	8/9	4/5	interleaver symbols/repeated code symbol
Modulation Symbol Rate	76,800 (N ≤ 2) 38,400 × N (N = 4 or 8) 614,400 (N ≥ 16)	76,800	76,800	76,800	sps
Walsh Length	For Reverse Fundamental Channel: 16 For Reverse Supplemental Channel: 8, 4, or 2 (N ≤ 4) 4 or 2 (N = 8) 2 (N ≥ 16)	16 (Reverse Fundamental Channel) 8, 4, or 2 (Reverse Supplemental Channel)			PN chips
Number of Walsh Function Repetitions per Modulation Symbol	For Reverse Fundamental Channel: 1 For Reverse Supplemental Channel: 2, 4, or 8 (N ≤ 2) 1, 2, or 4 (N = 4) 1 or 2 (N = 8) 1 (N ≥ 16)	1 (Reverse Fundamental Channel) 2, 4, or 8 (Reverse Supplemental Channel)			Walsh functions/ modulation symbol
Transmit Duty Cycle	100.0	100.0	100.0	100.0 or 50.0	%
Processing Gain	128/N	256	455.1	819.2	PN chips/bit

Notes:
1. N = 1, 2, 4, 8, 16, or 32, which yields data rates of 9600, 19200, 38400, 76800, 153600, or 307200 bps, respectively.
2. If variable-rate Reverse Supplemental Channel operation, flexible reverse link data rates, or both are supported, the parameters are determined from the specified number of channel bits per frame, the maximum assigned number of channel bits per frame for the Reverse Fundamental Channel or the Reverse Supplemental Channel, and the specified frame quality indicator length.
3. The 50% transmit duty cycle at 1500 bps data rate corresponds to the Reverse Fundamental Channel gating.

4. ***Data Rate:*** The data rates for channels operating with SR1 is specified in Table 4-4 from 0002-D.

Table 4-4 Data Rates for Spreading Rate 1

Channel Type		Data Rates (bps)
Access Channel		4800
Enhanced Access Channel	Header	9600
	Data	38400 (5, 10, or 20 ms frames), 19200 (10 or 20 ms frames), or 9600 (20 ms frames)
Reverse Common Control Channel		38400 (5, 10, or 20 ms frames), 19200 (10 or 20 ms frames), or 9600 (20 ms frames)
Reverse Packet Data Control Channel		700 (10 ms frames)
Reverse Request Channel		3200 (10 ms frames)
Reverse Dedicated Control Channel	RC 3	9600
	RC 4	14400 (20 ms frames) or 9600 (5 ms frames)
Reverse Acknowledgment Channel		800
Reverse Channel Quality Indicator Channel		3200 or 800
Reverse Fundamental Channel	RC 1	9600, 4800, 2400, or 1200
	RC 2	14400, 7200, 3600, or 1800
	RC 3	9600, 4800, 2700, or 1500 (20 ms frames) or 9600 (5 ms frames)
	RC 4	14400, 7200, 3600, or 1800 (20 ms frames) or 9600 (5 ms frames)
Reverse Supplemental Code Channel	RC 1	9600
	RC 2	14400
Reverse Supplemental Channel	RC 3	307200, 153600, 76800, 38400, 19200, 9600, 4800, 2700, or 1500 (20 ms frames)
		153600, 76800, 38400, 19200, 9600, 4800, 2400, or 1350 (40 ms frames)
		76800, 38400, 19200, 9600, 4800, 2400, or 1200 (80 ms frames)
	RC 4	230400, 115200, 57600, 28800, 14400, 7200, 3600, or 1800 (20 ms frames)
		115200, 57600, 28800, 14400, 7200, 3600, or 1800 (40 ms frames)
		57600, 28800, 14400, 7200, 3600, or 1800 (80 ms frames)
Reverse Packet Data Channel	RC 7	19200, 40800, 79200, 156000, 309600, 463200, 616800, 924000, 1231200, 1538400, 1845600 (10 ms frames)

5. ***Baseband Filtering:*** Following the spreading operation when operating in SR1, the I and Q impulse are applied to the input of the I and Q baseband filters. The frequency response s(f) of the recommended filter is shown in Figure 7-10 and its coefficients is given in table 7-7, both are from C.S0002-D.
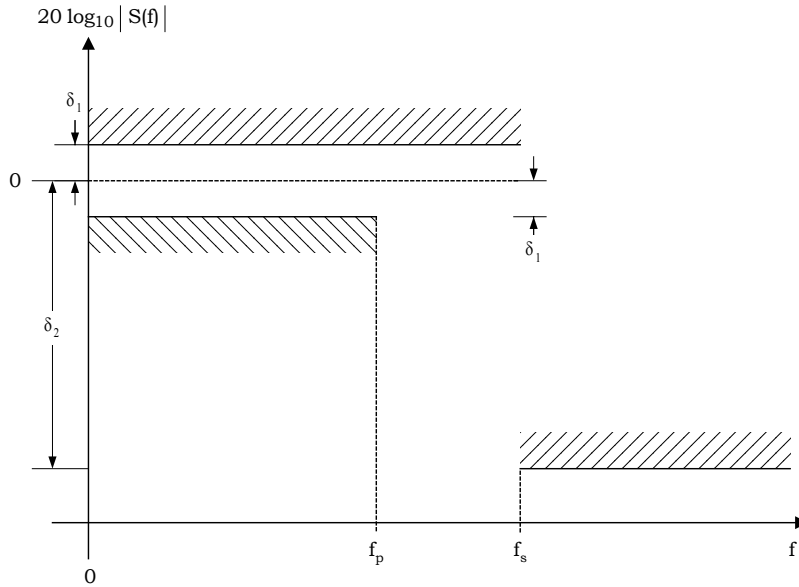
Mean Squared Error =

$$\sum_{k=0}^{\infty}[\alpha s(kT_s - \tau) - h(k)]^2$$

≤ 0.03

Figure 7-10 Baseband

Filters Frequency

Response Limits

Table 4-5 Coefficients of h(k) for Spreading Rate 1

k	h(k)
0, 47	−0.025288315
1, 46	−0.034167931
2, 45	−0.035752323
3, 44	−0.016733702
4, 43	0.021602514
5, 42	0.064938487
6, 41	0.091002137
7, 40	0.081894974
8, 39	0.037071157
9, 38	−0.021998074
10, 37	−0.060716277
11, 36	−0.051178658
12, 35	0.007874526
13, 34	0.084368728
14, 33	0.126869306
15, 32	0.094528345
16, 31	−0.012839661
17, 30	−0.143477028
18, 29	−0.211829088
19, 28	−0.140513128
20, 27	0.094601918
21, 26	0.441387140
22, 25	0.785875640
23, 24	1.0

These values yield the "necessary bandwidth" of 1.25 MHz based on optimal detection and channel capacity theory.