Fenway FCC Documentation

FCC Part 22, 24 & 27 Certification	
FCC ID:	**J9CFENWAY-1**
Model:	**Fenway**

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.	

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1 Introduction

The Fenway module solution delivers WWAN connectivity for the CDMA2000 1x/1x-EVDO, WCDMA/HSPA and GSM/GPRS/EDGE protocols, WLAN, BT, plus GPS position location, in a single package. The complete Fenway module solution includes all hardware and software necessary for embedded wireless connectivity in devices.

The module will have the following features:

- CDMA2000 1xEV-DO data at 850 MHz and 1900 MHz with diversity support for both bands
- UMTS HSDPA and HSUPA data at 850 MHz, 1900 MHz, and 2100 MHz with diversity support for all three bands
- GSM/GPRS/EDGE data at 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz
- GPS (switched into diversity path) at 1575 MHz
- WLAN 802.11b&g
- BT
- Service-provider skins (Windows® application)
- Microsoft® Windows Mobile 6.1 Professional
- Connectivity for an off-board SIM integrated circuit card
- Connectivity for 5 off-board antennas (WWAN primary and diversity, 802.11, BT and GPS)
- USB 2.0 high-speed interface

2 Operational Description

2.1 Device Description

Fenway is a ruggedized Win Mobile PDA device for the Vertical and Enterprise markets. Fenway will deliver WWAN connectivity solutions for the CDMA2000 1xEVDO, UMTS HSDPA and HSUPA, and GSM/GPRS/EDGE protocols in one hardware configuration. In addition to WWAN, it will provide GPS, 802.11 and Bluetooth in the same hardware device.

Fenway consists of the following key engine components, in addition to the required front-end RF and other discrete components.

Cellular engine

- Baseband: MSM7601
- RF: RFR6500, RTR6285
- Power: PM7540

Connectivity engine

- USB 2.0 high-speed
- GPS
- 5 Antenna connectors for the off-board antennas

- Connectivity for an off-board SIM integrated circuit card
- Status LED driver output

- DC power supply input and enable/disable control

Five Hirose antenna connectors are provided: 1) the primary connector supports transmission and reception by the active CDMA, UMTA, or GSM transceiver; and 2) the secondary connector supports diversity reception by the active CDMA or UMTS link, 3) for GPS reception, 4) for BT and the 5) for WLAN. The antenna elements are typically integrated into the device and connected to the Fenway module via flexible RF coaxial cables.

The primary antenna is connected to its RF front-end circuits (a switch module, CDMA and UMTS duplexers, etc). In the transmit direction, those front-end circuits are driven by the transmit output chains: two chains support GSM low and high bands (GSM850 + GSM900 and GSM1800 + GSM1900); three chains support CDMA (Cell + PCS) and UMTS (Cell + PCS + IMT) operation. All baseband-to-RF processing for all supported bands is performed within the RTR6285.

The four GSM receive paths are filtered, then routed to the RTR6285 for processing. The CDMA and UMTS primary receive filtering is achieved within the front-end duplexers; the signals are then rounted to either the RTR6285 (UMTS IMT) or the RFR6500 (CDMA and UMTS Cell + PCS) for RF-to-baseband processing.

Like the primary antenna, the secondary antenna is connected to its own RF front-end circuits (a switch module, CDMA/UMTS filters, GPS filter, etc). The filtered signals are then routed to the appropriate RFIC for RF-to-baseband processing.

The MSM7601 device provides all the digital baseband processing, including modem functions for all the supported airlinks. Integrated MSM7601 functions include the ARM1136-J™ and ARM926EJ-S™ processor cores; two low-power, high-performance digital signal processor (DSP) cores; and 32 MB stacked DDR SDRAM memory.

2.2 Technologies Supported

Table 2-1 describes the technologies and bands supported. Section 5 contains additional information on device capabilities and equipment categories for each technology.

Table 2-1 Technology and Bands Supported

Mode	Band Name	Transmitter Range (MHz)	Receiver Range (MHz)	Duplex Separation (MHz)
GSM/GPRS/EDGE	850 MHz - US Cellular	824-849	869-894	45
	900 MHz - EGSM (Not used in US)	880-915	925-960	45
	1800 MHz - DCS (Not used in US)	1710-1785	1805-1880	95
	1900 MHz - US PCS	1850-1910	1930-1990	80
WCDMA/HSPA	850 MHz - US Cellular	824-849	869-894	45
	1900 MHz - US PCS	1850-1910	1930-1990	80
	2100 MHz - IMT (Not used in US)	1920-1980	2110-2170	190
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
802.11	2400 MHz - ISM	2412-2462	2412-2462	N/A
BT	2400 MHz - ISM	2402-2480	2402-2480	N/A

2.3 Module/Host Electrical Interfaces

The Fenway module supports the following interfaces with a device.

- **Primary Data Interface:**
  - **USB Interface:** Supports USB 2.0 in all three modes (Low Speed, Full Speed, and High Speed).

- **SIM interface:** The Fenway module incorporates support for an off board SIM integrated circuit card used to hold subscriber information.

- **LED/Wireless off support:** Provide device ON/OFF and radio ON/OFF indication.
  - Provides confidentiality for secret data through AES encryption and a 128-bit fused hardware key
  - Provides integrity protection for non-secret data (e.g. Public keys, certificates)

3 Non-Software Defined Radio Statement.

Per the definition of a Software defined radio (SDR) as described in the final CFR 47 2.1 wording released in FCC document number 07-66, UNDP-1 is not a software defined radio.

Per the FCC definition of a SDR FCC CFR 47 § 2.1 (c), "*Software defined radio*. A radio that includes a transmitter in which the operating parameters of frequency range, modulation type or maximum output power (either radiated or conducted), or the circumstances under which the transmitter operates in accordance with Commission rules, can be altered by making a change in software without making any changes to hardware components that affect the radio frequency emissions. In accordance with § 2.944 of this part, only radios in which the software is designed or expected to be modified by a party other than the manufacturer and would affect the above-listed operating parameters or circumstances under which the radio transmits must be certified as software defined radios".

Only Qualcomm will design or modify the software affecting radio frequency emissions.

4 Modular Requirements

FCC Modular Requirement	Product Statement
1. The modular transmitter must have its own RF shielding.	Complies. The Fenway module is fully shielded to prevent interference between the device and the module (See external photos in Exhibit 10).
2. The modular transmitter must have buffered modulation/data inputs	Complies. The buffer is provided through USB connection. See Exhibit 5 for details.
3. The modular transmitter must have its own power supply regulation.	Complies. The Fenway module has it's own power supply regulation through the PMIC chip.
4. The modular transmitter must comply with the antenna requirements of Section 15.203 and 15.204(c). .	Complies. The Fenway module employees unique antenna connectors. Antenna gain information is listed in the user's manual and shall not be exceeded.
5. The modular transmitter must be tested in a stand-alone configuration, i.e., the module must not be inside another device during testing.	Complies. All tests reported in this application were performed on a stand-alone basis.
6. The modular transmitter must be labeled with its own FCC ID number, and, if the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module.	Complies. Please refer to the FCC ID information in Exhibit 8.
7. The modular transmitter must comply with any specific rule or operating requirements applicable to the transmitter and the manufacturer must provide adequate instructions along with the module to explain any such requirements.	Complies. The Fenway module complies with all of relevant FCC requirements (See Exhibit 2, 3 and 4 for the test results and MPE analysis report), and the adequate instructions to keep the compliance have been provided in the User's Guide (See Exhibit 11).
8. The modular transmitter must comply with any applicable RF exposure requirements	Complies. The Fenway module will be installed in a host product where the transmitting antenna can provide 20 cm separation distance to the body of user. Installation of this module in a portable configuration is not allowed unless proper equipment authorization has been obtained. See Exhibit 4 for MPE analysis

5 Device Equipment Category Declarations

5.1 WCDMA Equipment Category

Fenway module is a HSDPA Category 8 (7.2 Mbps) as defined in 3GPP TS 25.306

Fenway module is a HSUPA category 5 (2.0 Mbps) as defined in 3GPP TS 25.306.

5.2 GSM Class

The Fenway module is being certified as a multislot class 10 device. It can be operated to support all coding schemes CS1 to CS4 and MSC1 to MSC9. The peak data rates for GSM, GPRS and EDGE are 14.4 kbps, 115 kbps and 384 kbps, respectively, for both forward and reverse link data rate.

5.3 CDMA Throughput

- CDMA 1xEVDO Revision A (IS-856-A)
  - Forward link up to 3.1 Mbps
  - Reverse link up to 1.8 Mbps
- CDMA 1xEVDO Rel 0 (IS-856)
  - Forward link up to 2.4 Mbps
  - Reverse link up to 153.6 kbps
- CDMA 1xRTT (IS-2000)
  - Simultaneous forward and reverse channel data rates up to 153.6 kbps

5.4 WLAN Throughput

- 802.11b
  - Simultaneous forward and reverse channel data rates up to 11Mbits/s

- 802.11g
  - Simultaneous forward and reverse channel data rates up to 54Mbits/s

- BT Class 2 V2.1
  - Simultaneous forward and reverse channel data rates up to 2.1Mbits/s

6 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:

6.1 §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:

Qualcomm Incorporated
5775 Morehouse Drive
San Diego, CA 92121

6.2 §2.1033 (c) (2) FCC identifier

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

Qualcomm information:

The FCC ID of the equipment is J9CFENWAY-1. Exhibit 8 has the detail of FCC label information.

6.3 §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 Exhibit 11.

6.4 §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
GSM \GPRS \EDGE	GMSK	824.2 – 848.8	248KGXW
		1850.2 – 1909.8	250KG7W
	8PSK	824.2 – 848.8	248KGXW
		1850.2 – 1909.8	245KG7W
WCDMA		826.4 – 846.6	4M18F9W
		1712.4-1752.6	4M18F9W
		1852.4 – 1907.5	4M19F9W
		1922.6-1977.4	4M18F9W
CDMA		824.7 – 848.31	1M28F9W
		1851.25 – 1908.75	1M28F9W

6.5 §2.1033 (c) (5) Frequency range.

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

Qualcomm information:

The frequency ranges that Fenway-1 supports are listed in Table 2-1 of this document. In the US and Canada, only 850 MHz (Cellular), 1700 MHz (AWS) and 1900 MHz (PCS) bands are used for CDMA and UMTS transceivers.

6.6 §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 / 1xEVDO mode, the transmitter output power is independent of whether the equipment operates in the cellular system, AWS or PCS system. The Fenway 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, 856 and 856A Specification.

The power control in WCDMA/HSPA mode is similar as in CDMA mode. The Fenway module is a Power Class 3 UE. The output power dynamic operation is defined in 3GGP TS 25.101 section 6.2.

For GMSK modulation, the UNDP-1 supports Class 4 GSM850 and Class 1 PCS1900 mobile station power class. For 8PSK modulation, it supports Class E2 GSM850 and PCS1900 mobile station power class. In GSM CS operations, the transmitted power of the mobile station is controlled from the uplink level and quality of the mobile station transmission received at the BTS. For GPRS the mobile station adjusts its transmitted power based on:

1. The received power measured on the downlink.
2. The dynamic control parameters sent by the GPRS sub-network on the PACCH. These dynamic control parameters are based on the uplink received level of the mobile station at the BTS.

The detail of the output level dynamic operation is defined in 3GPP TS 45 008 Section 10.

6.7 §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 Fenway 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
- Class 3 mobile station for a WCDMA mode, i.e. +24 dBm (+1/-3 dB) at the antenna connector
- Class 4 GSM850 mobile station for a GMSK modulation, i.e. 2W (33 dBm) at the antenna connector
- Class 1 PCS1900 mobile station for a GMSK modulation, i.e. 1W (30 dBm) at the antenna connector
- Class E2 GSM850 and PCS1900 mobile station for a 8PSK modulation, i.e 27 dBm (±3dB normal; ±4dB extreme) at the antenna connector for GSM850; 26 dBm (-4/+3dB normal, -4.5/+4dB extreme) at the antenna connector for PCS1900

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.

6.8 §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 Fenway module RF amplifier is powered by 3.2 – 4.2v PMIC IC regulated power supply. Following table shows the maximum power consumption of the final stage RF amplifier for normal operation over the power range:

Table 7-1 RF Amplifier Power Consumption

Mode	DC Voltage	Max Power Consumption
CDMA Cellular	3.2-4.2V	33.7 dBm
CDMA PCS	3.2-4.2V	33.7 dBm
WCDMA band I	3.2-4.2V	33.7 dBm
WCDMA band IV	3.2-4.2V	33.7 dBm
WCDMA band V	3.2-4.2V	33.7 dBm
WCDMA band II	3.2-4.2V	33.7 dBm
GSM850	3.2-4.2V	38.5 dBm
GSM900	3.2-4.2V	38.5 dBm
GSMDCS	3.2-4.2V	37.7 dBm
GSM1900	3.2-4.2V	36.7 dBm

6.9 §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

6.10 §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:**

  See Exhibit 5 for the schematic and Exhibit 7 for the block diagram.

- **Stabilizing Frequency:**

  The circuit provided for determining and stabilizing frequency is in Exhibit 5.

  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 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.

- **Suppression of Spurious Radiation:**

  The circuit provided for suppression of spurious radiation is in Exhibit 5.

  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 7.13 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.

6.11 §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 Exhibit 8 for FCC label information.

6.12 §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 9 and 10 for the external and internal photos.

6.13 §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:

6.13.1 WCDMA (Release 99, HSDPA, HSUPA)

The description here is limited to only what the UNDP-1 supports in a WCDMA operational mode.

The access scheme is Direct-Sequence Code Division Multiple Access (DS-CDMA) with information spread over approximately 5 MHz bandwidth. The operational mode of the equipment is Frequency Division Duplex (FDD).

The characteristics of the spreading and modulation in the FDD mode is described in 3GPP TS 25.213. Figure 7-1 from 25.213 illustrates the principle of the spreading of uplink dedicated physical channels.

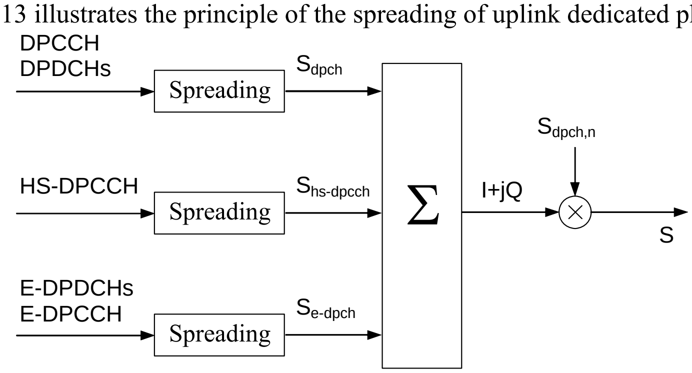


Figure 7-1: Spreading for uplink dedicated channels

Spreading is applied to the physical channels. It consists of two operations. The first is the channelisation operation, which transforms every data symbol into a number of chips, thus increasing the bandwidth of the signal. The number of chips per data symbol is called the Spreading Factor (SF). The second operation is the scrambling operation, where a scrambling code is applied to the spread signal.

With the channelisation, data symbols on so-called I- and Q-branches are independently multiplied with an OVSF code. With the scrambling operation, the resultant signals on the I- and Q-branches are further multiplied by complex-valued scrambling code, where I and Q denote real and imaginary parts, respectively.

Channelisation: The channelisation codes are Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between a user's different physical channels. The OVSF code tree from 25.213 is expressed as Figure 7-2.

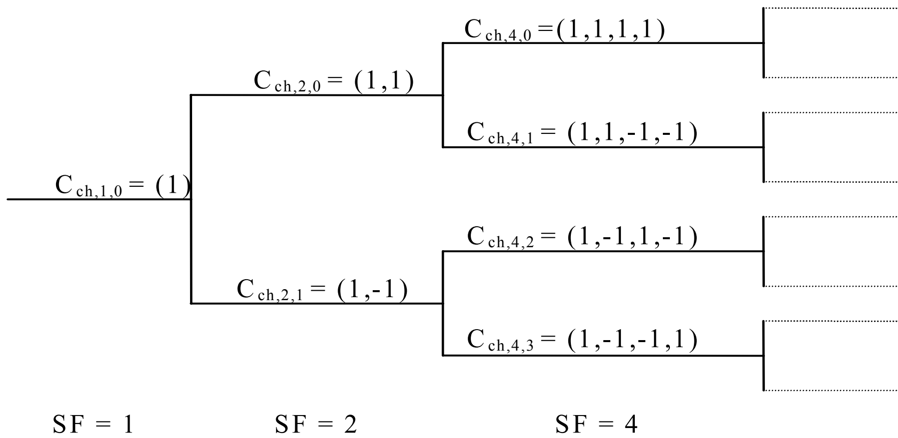


Figure 7-2: Code-tree for generation of OVSF codes

The spreading factor can vary from 2-256. The summary of spread factor for DPCCH/DPDCH, HS-DPCCH, E-DPCCH/E-DPDCH is listed in the table 7-2.

Table 7-2 Spread Factor

	DPDCH	DPCCH	HS-DPCCH	E-DPDCH	E-DPCCH
Spreading Factor	4 to 256	256	256	2 to 256	256

Note: DPDCH and E-DPDCH spreading factors are dependent on data rate and number of channels

Scrambling operation: All uplink physical channels shall be scrambled with a complex-valued scrambling code. There are 2^{24} long and 2^{24} short uplink scrambling codes, whose sequences are described in the Section 4.3.2.2 and 4.3.2.3 of TS 25.213. The dedicated physical channels may be scrambled by either a long or a short scrambling code, defined in the Section 4.3.2.4. Uplink scrambling codes are assigned by higher layers.

Modulation: The modulation scheme is BPSK and the modulating chip rate is 3.84 Mcps. The uplink modulation of the complex-valued chip sequence generated by the spreading process is shown in Figure 7-3 below.

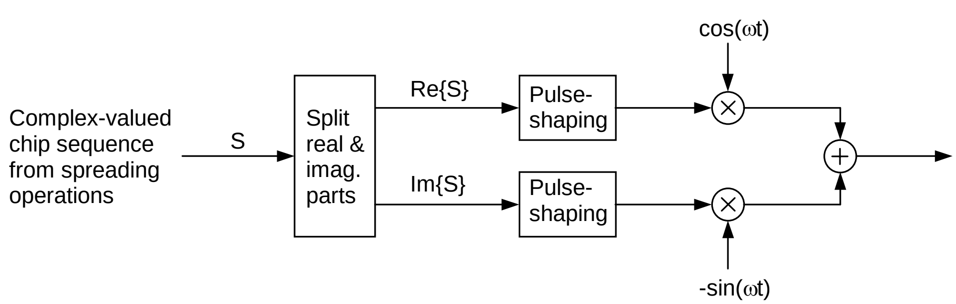


Figure 7-3: Uplink modulation

Pulse Shape Filter: The pulse shape characteristics described here is from 3GPP TS 25.101 standard. Transmit modulation defines the modulation quality for expected in-channel RF transmissions from the UE. The used transmit pulse shaping filter is a root-raised cosine (RRC) with roll-off α=0.22 in the frequency domain. The impulse response of the chip impulse filter $RC_0(t)$ is:

$$RC_0(t) = \frac{\sin\left(\pi \frac{t}{T_C}(1-\alpha)\right) + 4\alpha \frac{t}{T_C}\cos\left(\pi \frac{t}{T_C}(1+\alpha)\right)}{\pi \frac{t}{T_C}\left(1-\left(4\alpha \frac{t}{T_C}\right)^2\right)}$$

Where the roll-off factor α =0.22 and the chip duration is

$$T = \frac{1}{chiprate} \approx 0.26042 \ \mu s$$

The minimum requirements for the modulation characteristics are specified in the Section 6.8 of TS 25.101, including error vector magnitude, peak code domain error, relative code domain error, phase discontinuity for uplink DPCH and phase discontinuity for HS-DPCCH.

6.13.2 GSM (GSM, GPRS, EDGE)

The GSM modulation characteristics described in the following pages is from 3GPP TS 05.01, V8.9.0 (2004-11) and 3GPP TS 05.04 V8.4.0 (2001-11).

In a GSM mode, the access scheme is Time Division Multiple Access (TDMA) with eight basic physical channels per carrier. The carrier spacing is 200 kHz. A physical channel is defined as a sequence of TDMA frames, a time slot number (modulo 8) and a frequency hopping sequence as described in Section 5, 05.01.

The basic radio resource is a time slot lasting ≈ 576,9 µs (15/26 ms) and transmitting information at a modulation rate of ≈ 270.833 kbit/s (1 625/6 kbit/s).

The modulation scheme may be either Gaussian MSK (GMSK) or 8-PSK, depending on the type of channel. Section 2 in TS 05.01 defines all applicable traffic channels (TCH) and signaling channels.

The channel coding for GPRS PDTCH has four coding schemes, CS-1 to CS-4, listed in the table below.

Scheme	Code rate	USF	Pre-coded USF	Radio Block excl. USF and BCS	BCS	Tail	Coded bits	Punctured bits
CS-1	1/2	3	3	181	40	4	456	0
CS-2	≈2/3	3	6	268	16	4	588	132
CS-3	≈3/4	3	6	312	16	4	676	220
CS-4	1	3	12	428	16	-	456	-

The channel coding for EGPRS PDTCH has nine modulation and coding schemes, MCS-1 to MCS-9. The coding parameters are shown in the table below.

Scheme	Code rate	Header Code rate	Modulation	RLC blocks per Radio Block (20ms)	Raw Data within one Radio Block	Family	BCS	Tail payload	HCS	Data rate kb/s
MCS-9	1.0	0.36	8PSK	2	2x592	A	2x12	2x6	8	59.2
MCS-8	0.92	0.36		2	2x544	A				54.4
MCS-7	0.76	0.36		2	2x448	B				44.8
MCS-6	0.49	1/3		1	592 *48*+544	A	12	6		29.6 27.2
MCS-5	0.37	1/3		1	448	B				22.4
MCS-4	1.0	0.53	GMSK	1	352	C				17.6
MCS-3	0.85	0.53		1	296 *48*+248 and 296	A				14.8 13.6
MCS-2	0.66	0.53		1	224	B				11.2
MCS-1	0.53	0.53		1	176	C				8.8

Note: The italic captions indicate the 6 octets of padding when retransmitting MCS-8 block with MCS-3 or MCS-6. For MCS-3, the 6 octets of padding are sent every second block (see 3GPP TS 04.60).

The modulation format from the Section 2 and 3 of TS 05.04 is:

For GMSK:

1. ***Modulating symbol rate:*** 1/T = 1 625/6 ksymb/s (i.e. approximately 270.833 ksymb/s), which corresponds to 1 625/6 kbit/s (i.e. 270.833 kbit/s). T is the symbol period.

2. ***Start and stop of the burst:*** The illustration in Figure 7-4 defines the start and stop of the active and the useful part of the burst.

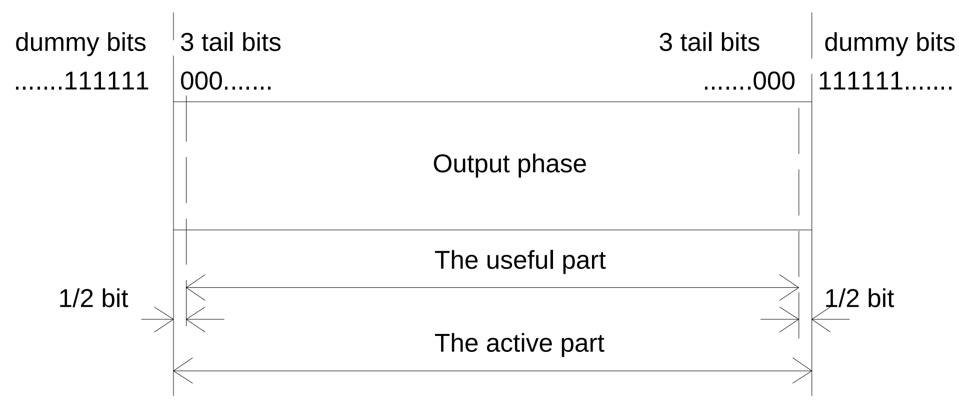


Figure 7-4: Relation between active part of burst, tail bits and dummy bits. For the normal burst the useful part lasts for 147 modulating bits

3. ***Differential encoding:*** Each data value *di = [0,1]* is differentially encoded. The output of the differential encoder is:

$$\hat{d}_i = d_i \oplus d_{i-1} \qquad (d_i \in \{0,1\})$$

where ⊕ denotes modulo 2 addition.

The modulating data value αi input to the modulator is:

$$\alpha_i = 1 - 2\hat{d}_i \qquad (\alpha_i \in \{-1,+1\})$$

4. ***Filtering:*** The impulse response of a linear filter used is defined by:

$$g(t) = h(t) * rect\left(\frac{t}{T}\right)$$

where the function *rect(x)* is defined by:

$$rect\left(\frac{t}{T}\right) = \frac{1}{T} \qquad for\ |t| < \frac{T}{2}$$

$$rect\left(\frac{t}{T}\right) = 0 \qquad otherwise$$

and * means convolution. *h(t)* is defined by:

$$h(t) = \frac{\exp\left(\frac{-t^2}{2\delta^2 T^2}\right)}{\sqrt{(2\pi)}\ .\ \delta T}$$

where

$$\delta = \frac{\sqrt{\ln(2)}}{2\pi BT} \qquad and\ BT = 0.3$$

B is the 3 dB bandwidth of the filter with impulse response *h(t)*.

5. ***Output phase:*** The phase of the modulated signal is:

$$\varphi(t') = \sum_i \alpha_i \pi h \int_{-\infty}^{t'-iT} g(u)du$$

where the modulating index *h* is ½. The time reference *t' = 0* is the start of the active part of the burst as shown in figure 7-4.

6. ***Modulation:*** The modulated RF carrier, except for start and stop of the TDMA burst may therefore be expressed as:

$$x(t') = \sqrt{\frac{2E_c}{T}}\ .\ \cos(2\pi f_0 t' + \varphi(t') + \varphi_0)$$

where E_c is the energy per modulating bit, f_0 is the centre frequency and φ_0 is a random phase and is constant during one burst.

<u>*For 8PSK:*</u>

1. ***Modulating symbol rate:*** 1/T = 1 625/6 ksymb/s (i.e. approximately 270.833 ksymb/s), which corresponds to 1 625/6 kbit/s (i.e. 270.833 kbit/s). T is the symbol period.

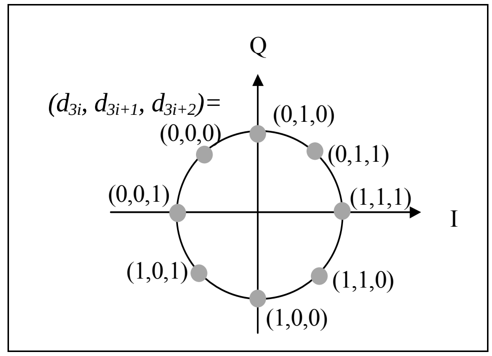
2. ***Symbol mapping:*** The modulating bits are Gray mapped in groups of three to 8PSK symbols by the rule

$$s_i = e^{j2\pi l/8}$$

where *l* is given by Table 7-3.

Table 7-3: Mapping between modulating bits and the 8PSK symbol parameter *l*.

Modulating bits d_{3i}, d_{3i+1}, d_{3i+2}	Symbol parameter l
(1,1,1)	0
(0,1,1)	1
(0,1,0)	2
(0,0,0)	3
(0,0,1)	4
(1,0,1)	5
(1,0,0)	6
(1,1,0)	7



3. ***Start and stop of the burst:*** illustrated in Figure 7-5.

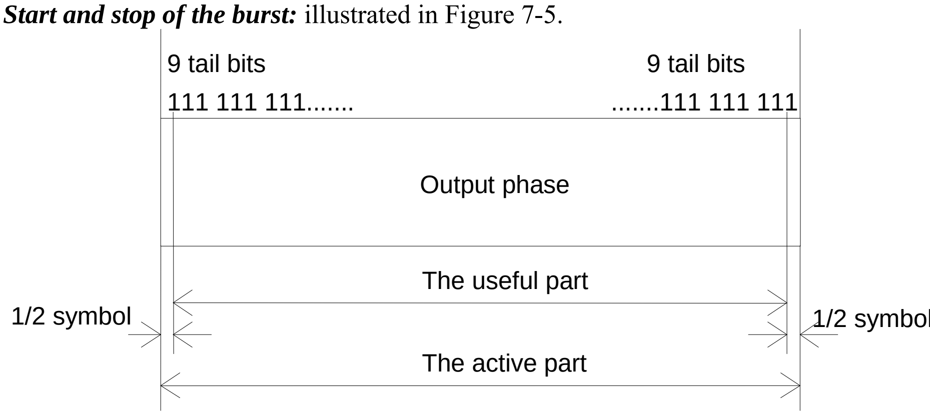


Figure 7-5: Relation between active part of burst and tail bits. For the normal burst the useful part lasts for 147 modulating symbols

4. ***Symbol rotation:*** The 8PSK symbols are continuously rotated with 3π/8 radians per symbol before pulse shaping. The rotated symbols are defined as

$$\hat{s}_i = s_i \cdot e^{ji3\pi/8}$$

5. ***Pulse shaping:*** The modulating 8PSK symbols excite a linear pulse shaping filter. This filter is a linearised GMSK pulse. The impulse response is defined by:

$$c_0(t) = \begin{cases} \prod_{i=0}^{3} S(t+iT), \ for\ 0 \le t \le 5T \\ 0,\ else \end{cases}$$

where

$$S(t) = \begin{cases} \sin(\pi \int_0^t g(t')dt'),\ for\ 0 \le t \le 4T \\ \sin(\frac{\pi}{2} - \pi \int_0^{t-4T} g(t')dt'),\ for\ 4T < t \le 8T \\ 0,\ else \end{cases}$$

$$g(t) = \frac{1}{2T}\left(Q(2\pi \cdot 0.3 \frac{t-5T/2}{T\sqrt{\log_e(2)}}) - Q(2\pi \cdot 0.3 \frac{t-3T/2}{T\sqrt{\log_e(2)}}) \right)$$

and

$$Q(t) = \frac{1}{\sqrt{2\pi}} \int_t^{\infty} e^{-\frac{\tau^2}{2}} d\tau$$

The base band signal is

$$y(t') = \sum_i \hat{s}_i \cdot c_0(t' - iT + 2T)$$

The time reference $t' = 0$ is the start of the active part of the burst as shown in figure 7-5.

6. ***Modulation:*** The modulated RF carrier during the useful part of the burst can be expressed as

$$x(t') = \sqrt{\frac{2E_s}{T}} \operatorname{Re}\left[y(t') \cdot e^{j(2\pi f_0 t' + \varphi_0)}\right]$$

where E_s is the energy per modulating symbol, f_0 is the centre frequency and φ_0 is a random phase and is constant during one burst.

6.13.3 CDMA2000 (1x, EVDO Release 0, EVDO Revision A)

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

The Fenway module can only invoke a Spread Rate (SR) 1 operation mode. SR 1 is defined as a 1.2288 Mcps chip rate-based system using a direct-spread single carrier. The 1.25MHz is measured at the 3dB down bandwidth. Channel spacing is normally set at this 1.25 MHz. The modulation characteristics of CDMA 1x from Section 2.1.3are presented as follows.

1. ***Reverse Channel Structure:*** Figure 7-6 shows the structure of the code channels transmitted by a mobile station. Term RC stands for Radio Configuration. By crossing out the non-supported items, the figure clearly demonstrates which types of channels that Fenway module is not capable of generating on the reverse link.

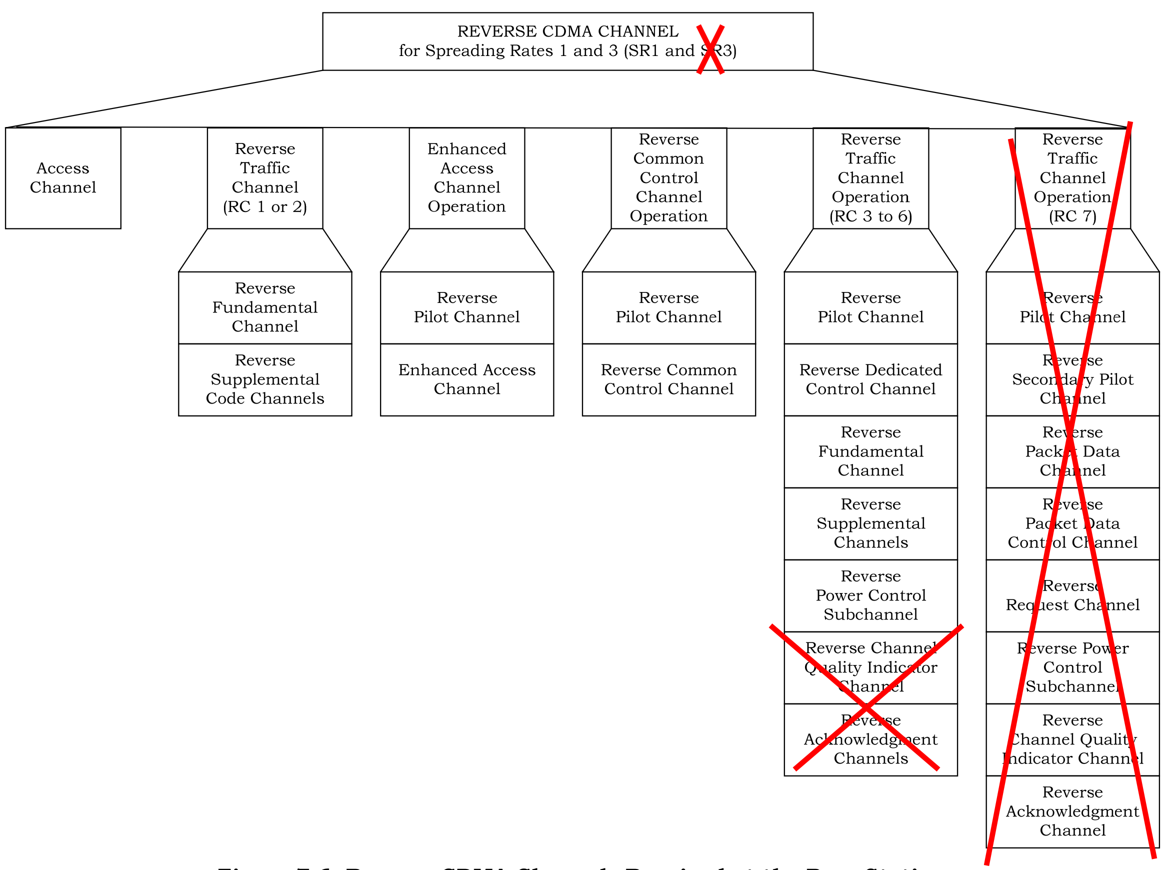


Figure 7-6. Reverse CDMA Channels Received at the Base Station

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.

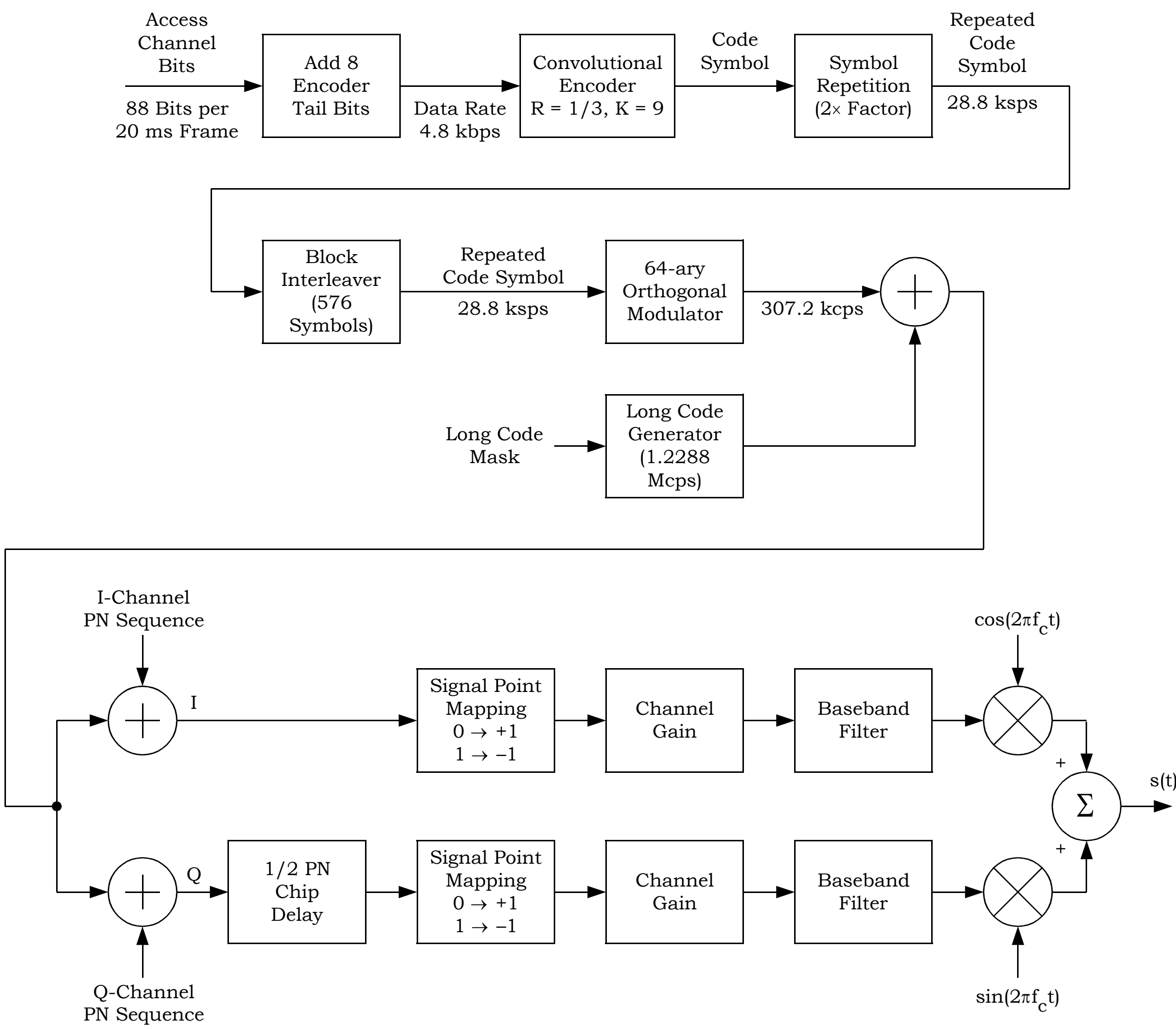
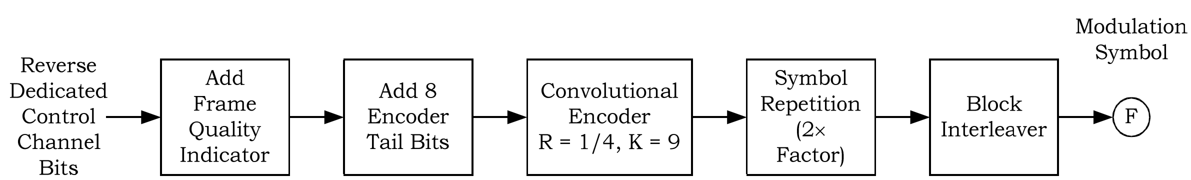


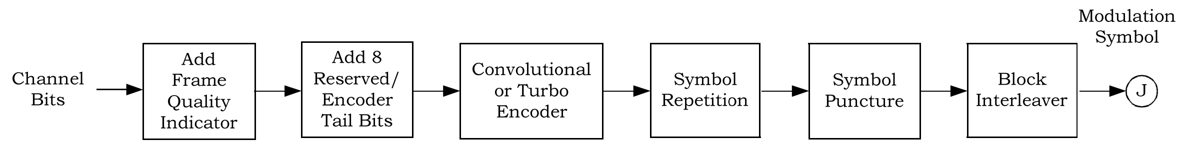
Figure 7-7 Access Channel Structure for Spreading Rate 1



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 7-8 Reverse Dedicated Control Channel Structure for Radio Configuration 3



Bits/Frame	Bits	Data Rate (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 7-9 R-FCH and R-SCH Channel Structure for Radio Configuration 3

2. ***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 7-4 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 7-5 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 7-6 R-FCH and R-SCH Modulation Parameters for 20 ms Frames for Radio Configuration 3

	Data Rate (bps)				
Parameter	**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:

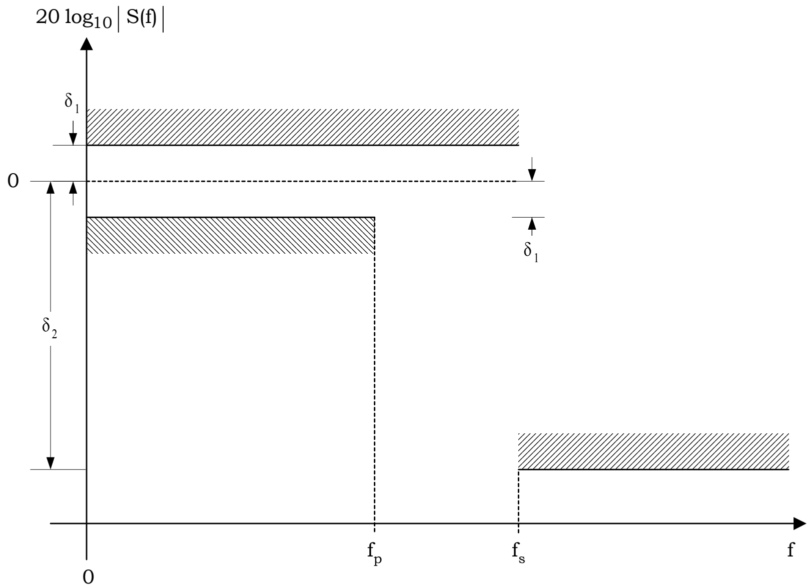
1. N = 1, 2, 4, 8, 16, or 32, which yields data rates of 9600, 19200, 38400, 76800, 153600, or 307200 bps, respectively.
2. If variable-rate Reverse Supplemental Channel operation, flexible reverse link data rates, or both are supported, the parameters are determined from the specified number of channel 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.

3. ***Data Rate:*** The data rates for channels operating with SR1 is specified in Table 7-7 from 0002-D.

Table 7-7 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)

4. ***Baseband Filting:*** 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 =

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

≤ 0.03

Figure 7-10 Baseband Filters Frequency Response Limits

Table 7-8 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.

<u>The 1xEVDO Rel 0 mode</u> described here is from 3GPP2 C.S0024-A, Version 1.0. As the Fenway module only operates in SR1 mode, the bandwidth for Rel0 limits to the 1.25MHz bandwidth as in 1x systems. In addition, the reference baseband filtering requirements and the associated filter coefficients shown in C.S0024-A are identical to those listed in C.S0002-D. Thus, for SR1in 1xEVDO Rel 0, the frequency response is identical to the 1x system standard, where it was shown that these values yield the "necessary bandwidth" of 1.25MHz based upon optimal detection and channel capacity theory.

1xEVDO Rel 0 is expressed as Subtype 0 (default) and Subtype 1 in 0024-A. Section 13.2.1.3 Modulation Characteristics details the reverse channel structure and modulation parameters.

1. Reverse Channel structure: Reverse access channel and traffic channel structure from 0024-A

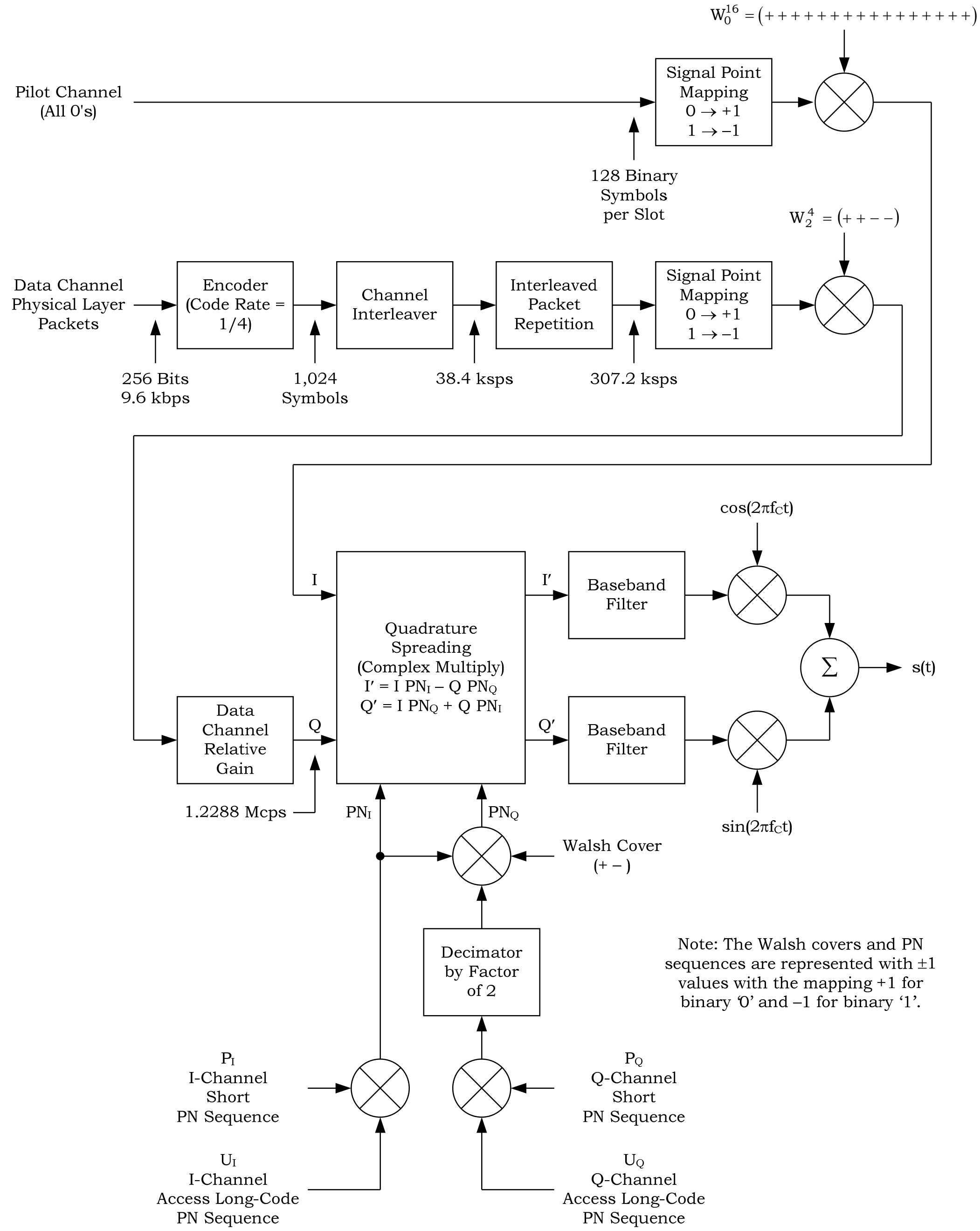


Figure 7-11 Subtype 0 Physical Layer Protocol Reverse Channel Structure for the Access Channel

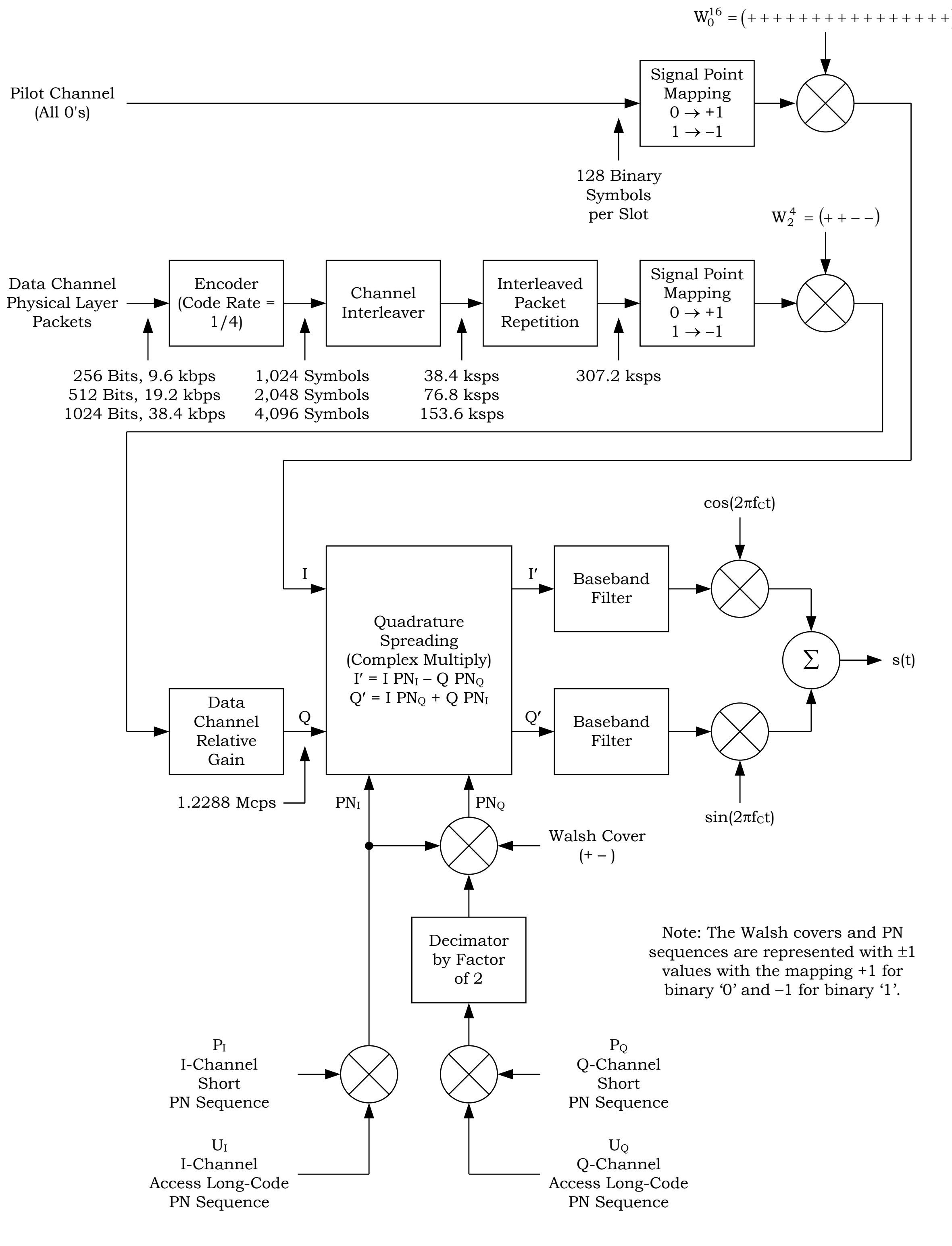
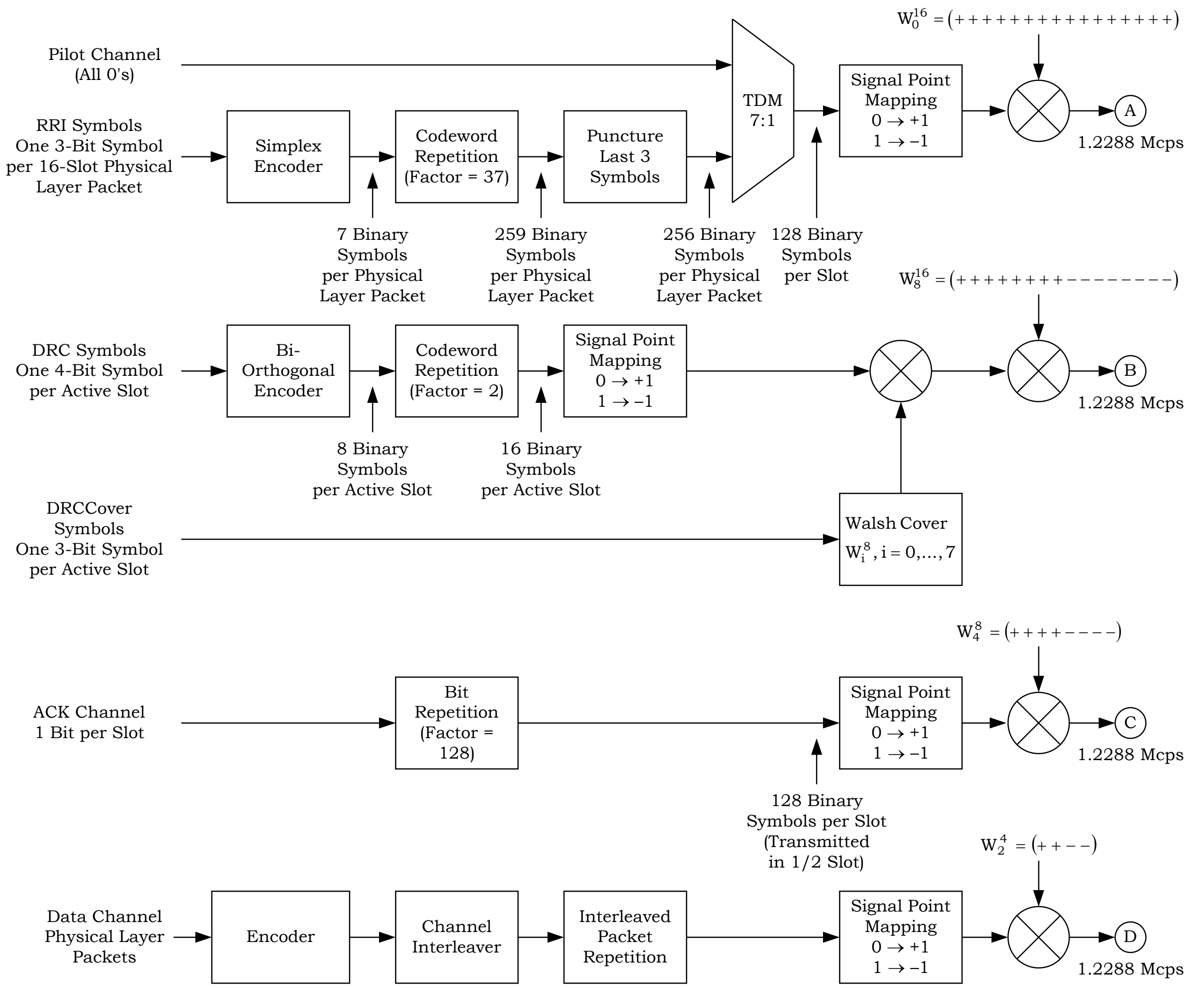


Figure 7-12 Subtype 1 Physical Layer Protocol Reverse Channel Structure for the Access Channel



Physical Layer Packets		Code			
Bits	Rate (kbps)	Rate	Symbols	Rate (ksps)	Rate (ksps)
256	9.6	1/4	1,024	38.4	307.2
512	19.2	1/4	2,048	76.8	307.2
1,024	38.4	1/4	4,096	153.6	307.2
2,048	76.8	1/4	8,192	307.2	307.2
4,096	153.6	1/2	8,192	307.2	307.2

Note: The Walsh covers are represented with ±1 values with the mapping +1 for '0' and −1 for '1'.

Figure 7-13 Reverse Channel Structure for the Reverse Traffic Channel (Part 1 of 2)

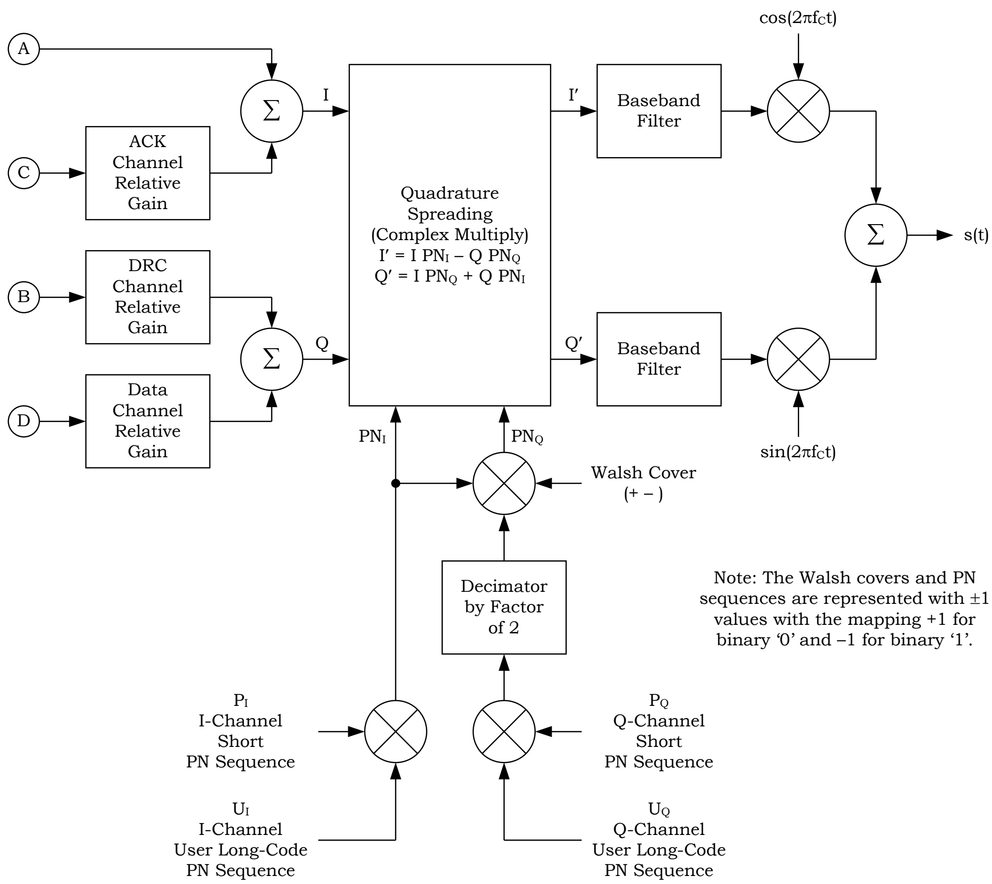


Figure 7-14 Reverse Channel Structure for the Reverse Traffic Channel (Part 2 of 2)

2. ***Modulation parameters:*** listed in the table 7-9

Table 7-9 Modulation Parameters for the Access Channel and the Reverse Traffic Channel

	Data Rate (kbps)				
Parameter	**9.6**	**19.2**	**38.4**	**76.8**	**153.6**
Reverse Rate Index	1	2	3	4	5
Bits per Physical Layer Packet	256	512	1,024	2,048	4,096
Physical Layer Packet Duration (ms)	26.66…	26.66…	26.66…	26.66…	26.66…
Code Rate	1/4	1/4	1/4	1/4	1/2
Code Symbols per Physical Layer Packet	1,024	2,048	4,096	8,192	8,192
Code Symbol Rate (ksps)	38.4	76.8	153.6	307.2	307.2
Interleaved Packet Repeats	8	4	2	1	1
Modulation Symbol Rate (ksps)	307.2	307.2	307.2	307.2	307.2
Modulation Type	BPSK	BPSK	BPSK	BPSK	BPSK
PN Chips per Physical Layer Packet Bit	128	64	32	16	8

3. ***Data Rate:*** The access terminal transmits information on the Access Channel a) at a fixed data rate of 9.6 kbps if using the Subtype 0; b) at a variable data rate of 9.6, 19.2, or 38.4 kbps, according to the Access Channel MAC Protocol if using the Subtype 1.

The access terminal transmits information on the Reverse Traffic Channel at a variable data rate of 9.6, 19.2, 38.4, 76.8 or 153.6 kbps, according to the Reverse Traffic Channel MAC Protocol.

The 1xEVDO Rev A mode described in the following pages is also from 3GPP2 C.S0024-A, Version 1.0. In the standard, Rev A is expressed as Subtype 2. The reference baseband filtering requirements and the associated filter defined in Section 14.2.1.4.12.3 for Rev A are identical to those specified for Rel 0 and 1x system. Thus, the Rev A system also has the "necessary bandwidth" of 1.25MHz.

Section 14.2.1.3 details reverse channel structures and modulation parameters in a RevA operating mode.

1. Reverse Channel Structure: Reverse access channel and traffic channel structures are as follows.

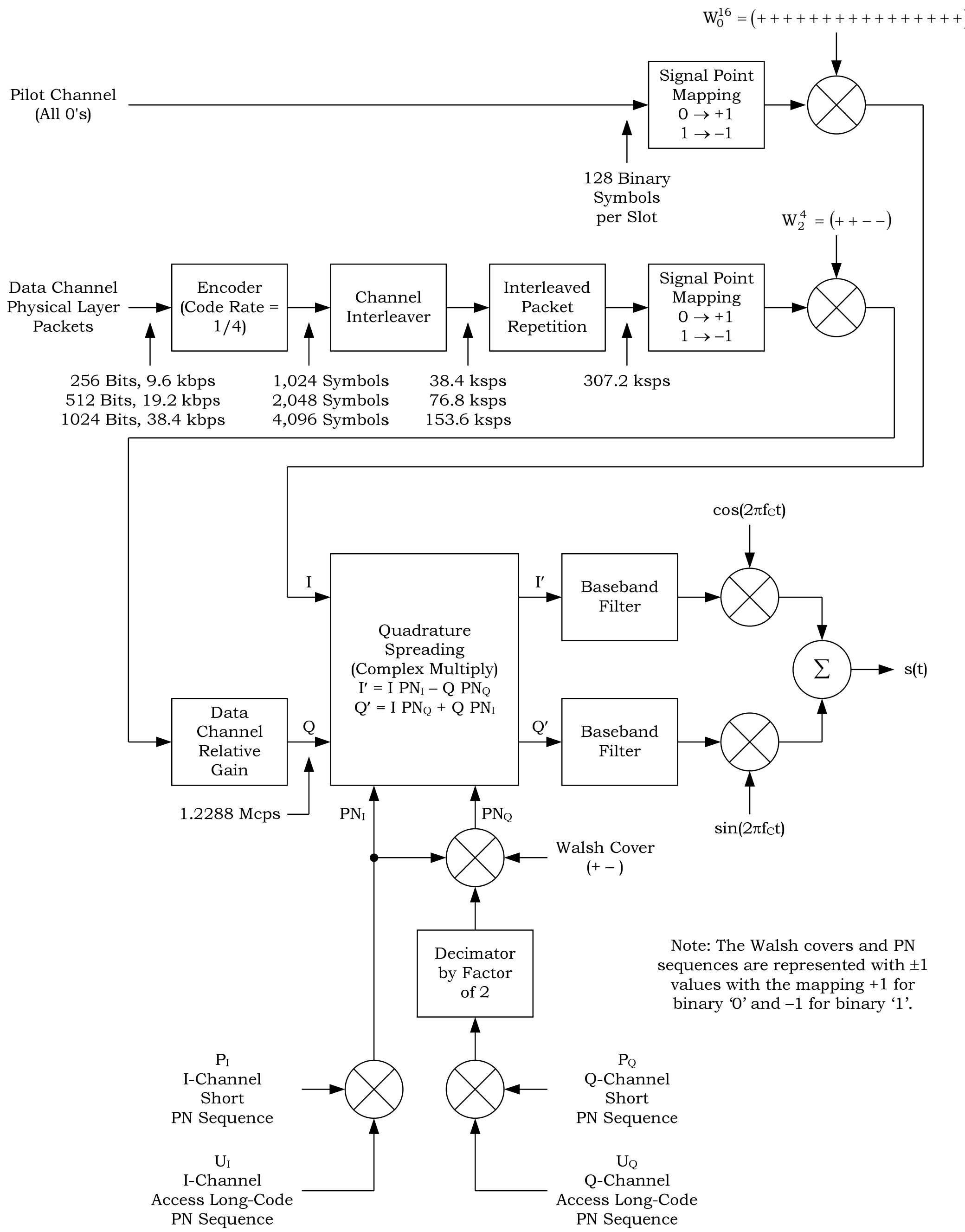


Figure 7-15 Reverse Channel Structure for the Access Channel

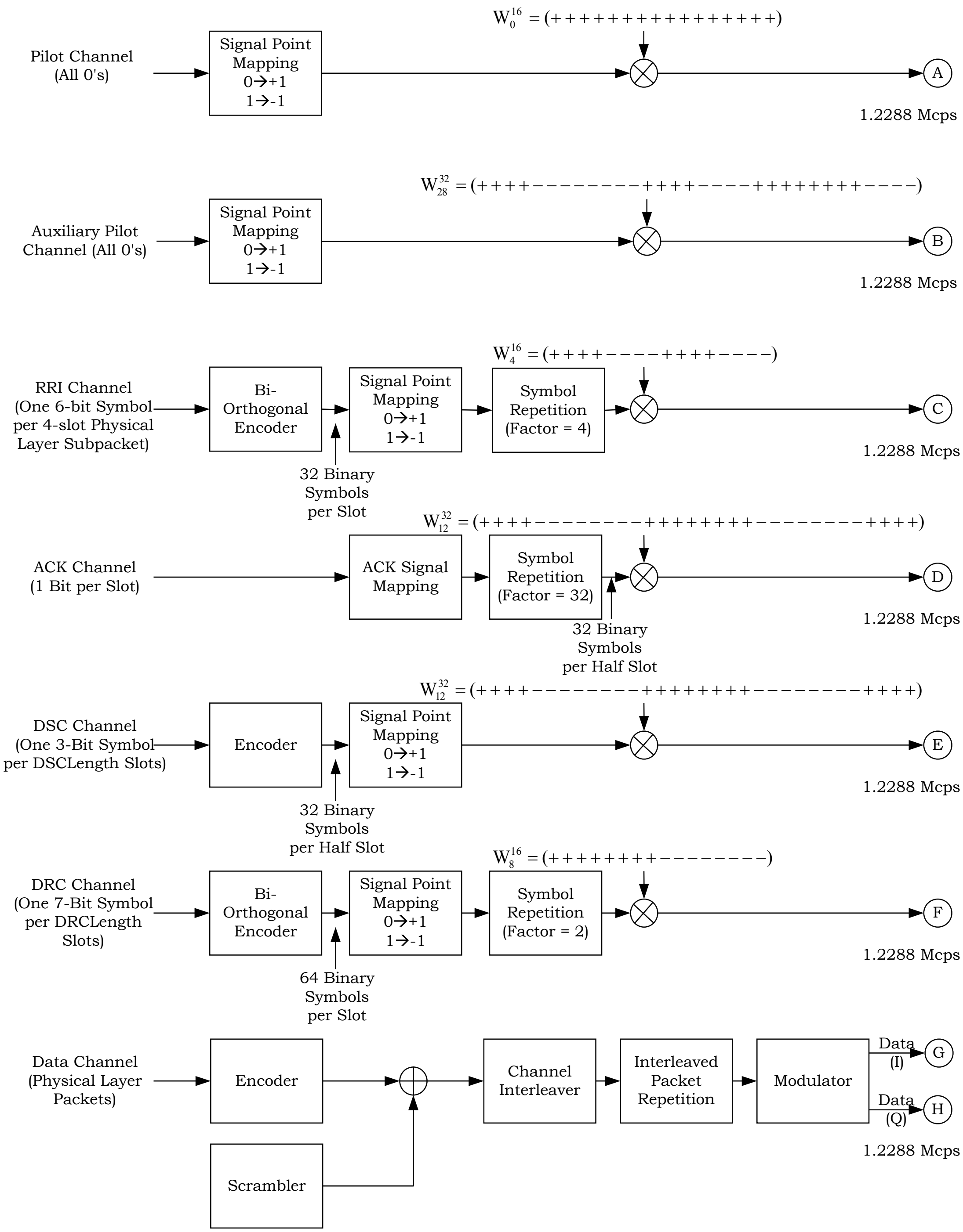


Figure 7-16 Reverse Channel Structure for the Reverse Traffic Channel (Part 1 of 5)

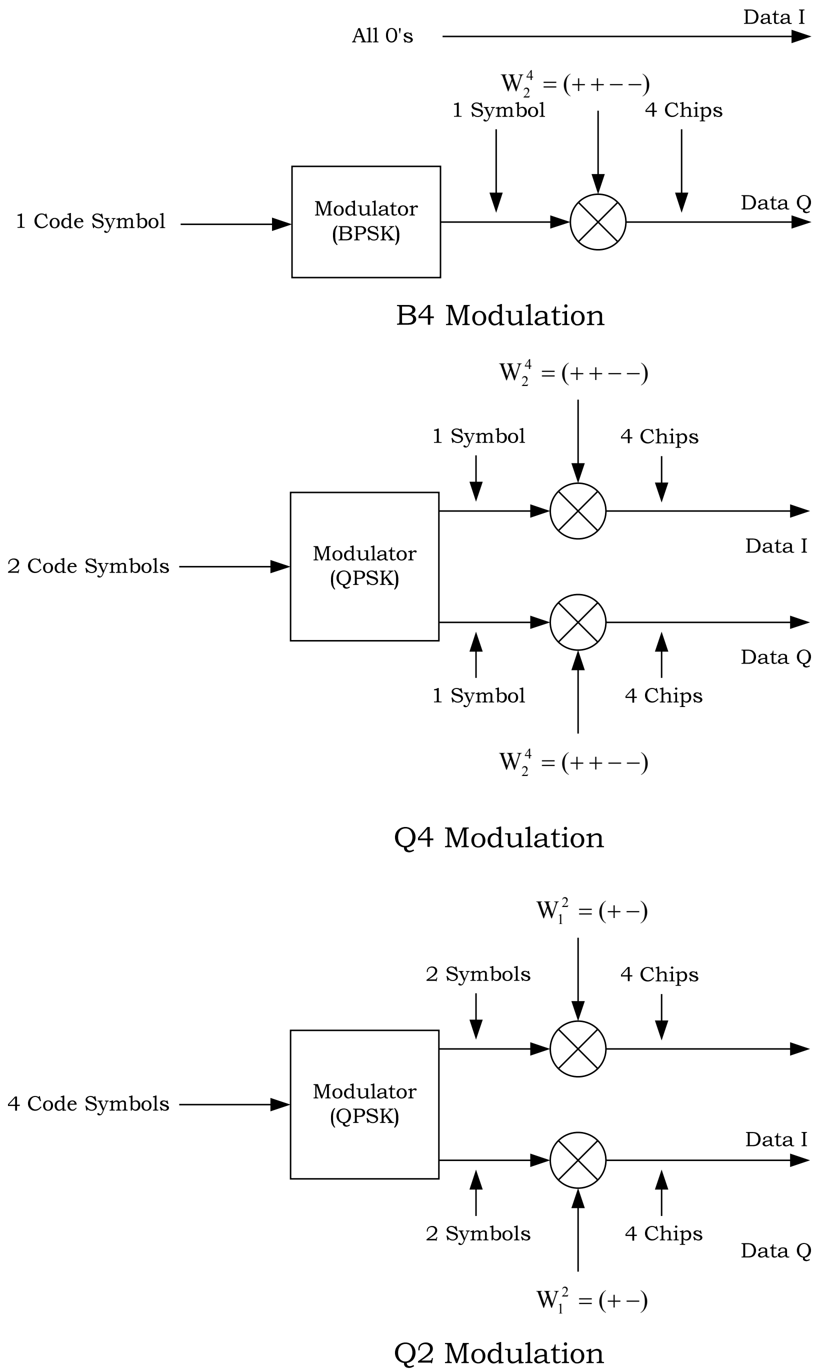


Figure 7-17 Reverse Channel Structure for the Reverse Traffic Channel (Part 2 of 5)

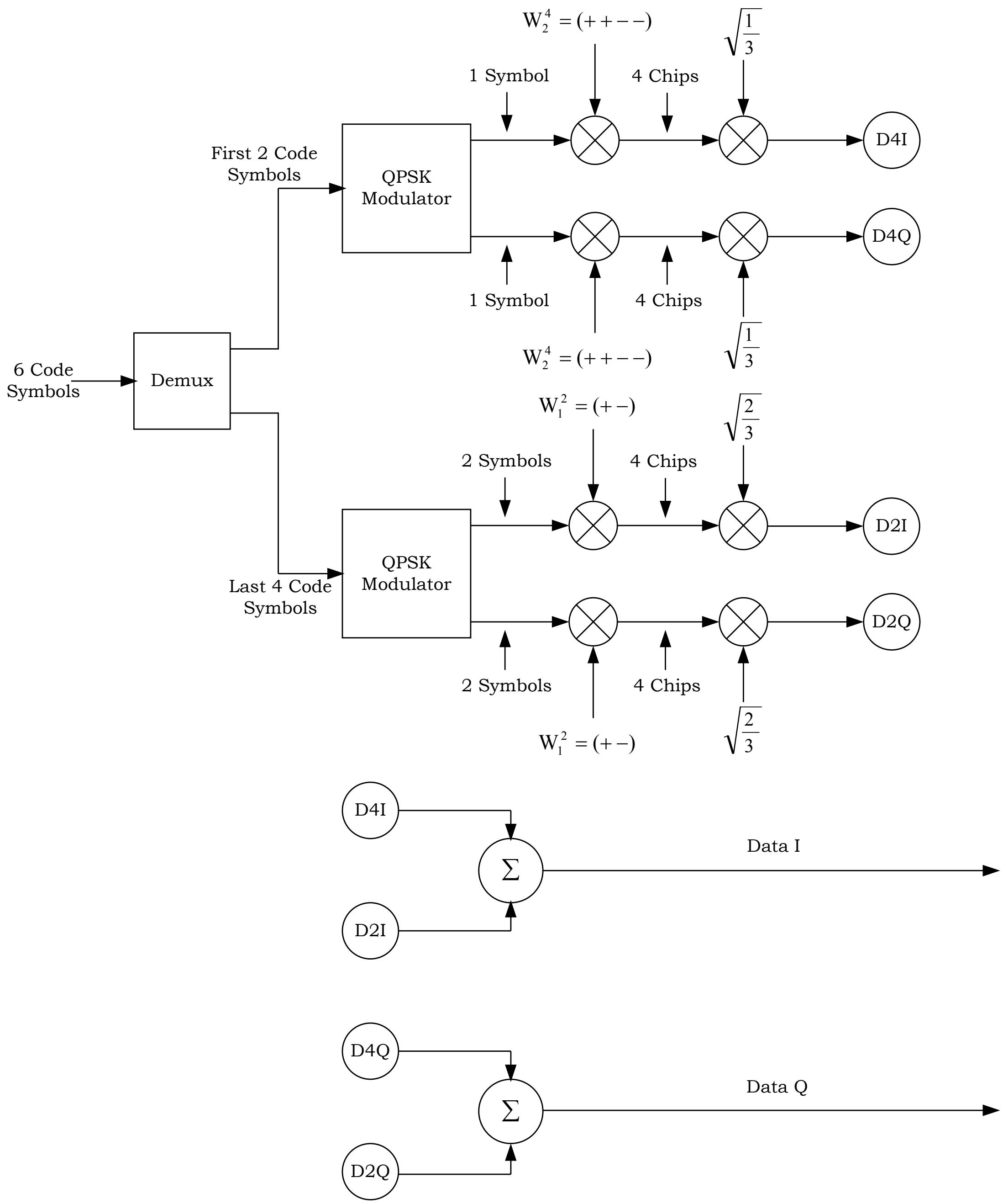


Figure 7-18 Reverse Channel Structure for the Reverse Traffic Channel (Part 3 of 5)

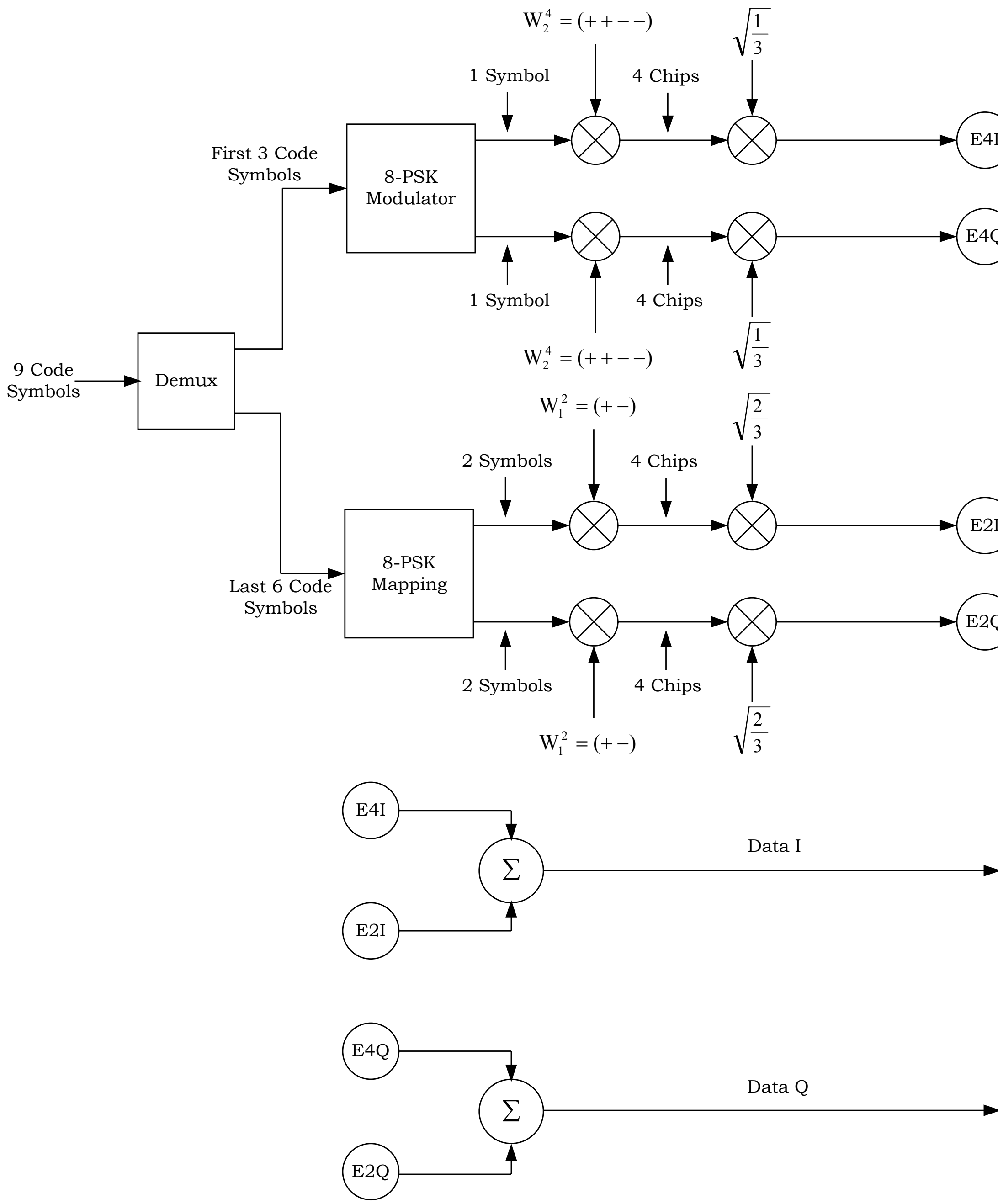


Figure 7-19 Reverse Channel Structure for the Reverse Traffic Channel (Part 4 of 5)

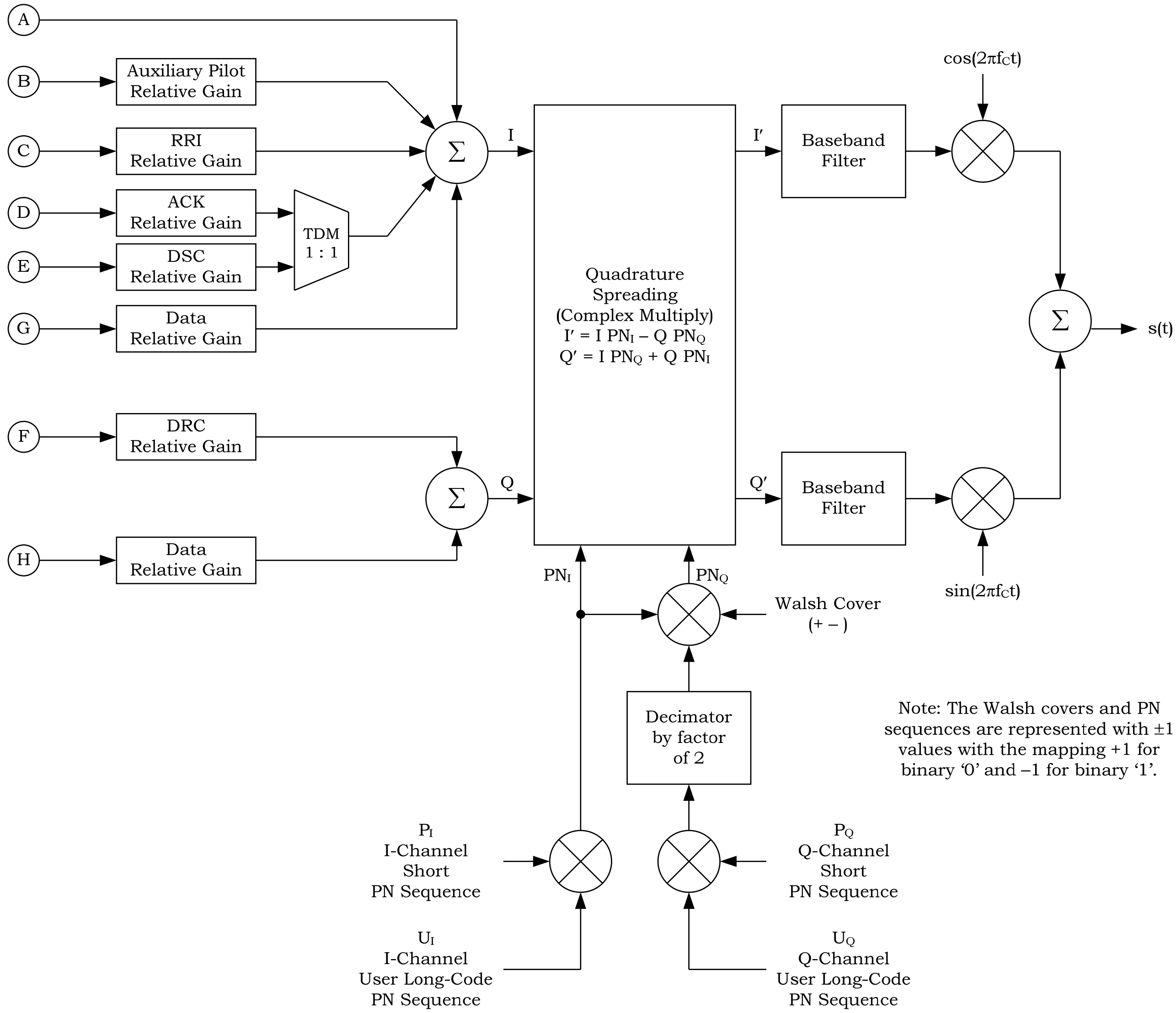


Figure 7-20 Reverse Channel Structure for the Reverse Traffic Channel (Part 5 of 5)

2. ***Modulation Parameters:*** For the reverse access channel, listed in the first 3 columns, corresponding to data rate of 9.6, 19.2 and 38.4 kbps, in table 7-9. For the reverse traffic channel, listed below.

Table 7-9 Modulation Parameters for the Reverse Traffic Channel

Payload Size (bits)	Modulation	Effective Data Rate (kbps)				Code Rate [Repetition]			
		After 4 Slots	After 8 Slots	After 12 Slots	After 16 Slots	After 4 Slots	After 8 Slots	After 12 Slots	After 16 Slots
128	B4	19.2	9.6	6.4	4.8	1/5[3.2]	1/5[6.4]	1/5[9.6]	1/5[12.8]
256	B4	38.4	19.2	12.8	9.6	1/5[1.6]	1/5[3.2]	1/5[4.8]	1/5 [6.4]
512	B4	76.8	38.4	25.6	19.2	1/4 [1]	1/5[1.6]	1/5[2.4]	1/5 [3.2]
768	B4	115.2	57.6	38.4	28.8	3/8 [1]	1/5[1.07]	1/5[1.6]	1/5 [2.13]
1024	B4	153.6	76.8	51.2	38.4	1/2 [1]	1/4 [1]	1/5[1.2]	1/5 [1.6]
1536	Q4	230.4	115.2	76.8	57.6	3/8 [1]	1/5 [1.07]	1/5[1.6]	1/5 [2.13]
2048	Q4	307.2	153.6	102.4	76.8	1/2 [1]	1/4 [1]	1/5[1.2]	1/5 [1.6]
3072	Q2	460.8	230.4	153.6	115.2	3/8 [1]	1/5 [1.07]	1/5[1.6]	1/5 [2.13]
4096	Q2	614.4	307.2	204.8	153.6	1/2 [1]	1/4 [1]	1/5[1.2]	1/5 [1.6]
6144	Q4Q2	921.6	460.8	307.2	230.4	1/2 [1]	1/4 [1]	1/5[1.2]	1/5 [1.6]
8192	Q4Q2	1228.8	614.4	409.6	307.2	2/3 [1]	1/3 [1]	2/9 [1]	1/5 [1.2]
12288	E4E2	1843.2	921.6	614.4	460.8	2/3[1]	1/3[1]	1/3[1.5]	1/3[2]

3. ***Data Rate:*** The access terminal transmits information on the Access Channel at a data rate of 9.6, 19.2 or 38.4 kbps.

   The access terminal transmits information on the Reverse Traffic Channel at a variable data rate ranging from 4.8 kbps to 1228.8 kbps as shown in Table 7-9, according to the Reverse Traffic Channel MAC Protocol.

6.14 2.1033 (c) (14) Test Data

2.1033 (c) (14) The data required by Sec. Sec. 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in Sec. 2.1041.

Qualcomm information:

See Exhibit 2, 3 and 4

6.15 2.1033 (c) (18) Software Defined Radio Statement.

Requirement: 2.1033 (c) (18) An application for certification of a software defined radio must include the information required by Sec. 2.944.

Qualcomm information:

The Fenway module is not a software defined radio (SDR). See Section 4 of this document for the justification.