ROHDE&SCHWARZ

Test and Measurement
Division

Manual

Access Board for CDMA Signalling Units CMU-B81 and CMU-B83

CMU-B82

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Contents

Introduction

Hardware Option CMU-B82 for the CMU200 is the *Access Board for CDMA Signalling Units CMU-B81 and CMU-B83*.

The CMU200 (with Option CMU-B82) is equipped with a 68-pin SCSI-3 style interface connector at the rear of the instrument (labeled „DIGITAL IQ CMU-B82"). The connector provides an interface to the Option CMU-B81 and CMU-B83 CDMA Signalling Units. The interface provides the following capabilities while in the Non-Signalling mode:

- Access to the baseband digital Rx and Tx I/Q data and timing signals

- Use of all of the CMU200's calibrated front end, attenuators, and measurement capabilities

NOTE: *Option CMU-B82 is only available with hardware option CMU-B81 (or CMU-B83). Software options CMU-K81 (CDMA800-MS) and/or CMU-K82 (CDMA1900-MS) must also be installed and enabled (or one of CMU-K83, CMU-K84, CMU-K85, CMU-K86).*

Caution!

Please make sure that the instrument is properly connected and put into operation according to the instructions given in chapter 1 of the CMU operating manual.

Caution!

Do not use open or unshielded cables. Shielded cables must be used to comply with EMC directives.

Activation

The I/Q Interface option can only be activated via remote control using the GPIB command:
`CONFigure:IQACcess`

CONFigure:IQACcess: <Enable>, <Rx_IQ_Swap>, <Gain_Multiplier>					
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enables Option CMU-B82 Disables Option CMU-B82	OFF	–	
<Rx_IQ_Swap>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Swaps the Rx I and Q data paths No swap of I and Q Rx data	OFF	–	
<Gain_Multiplier>	Description of parameters	Def. value	Def. unit	Unit ring
0, 1, 2, 4, 8, 16	Sets the gain multiplier value for Tx I/Q data supplied to the access board.	1	–	
Description of command				FW vers.
When set to ON, this command enables the Digital Baseband I/Q Signal Interface providing the Rx I/Q data out and Tx I/Q data in (via the SCSI connector). The values set by the Rx_IQ_Swap and Gain_Multiplier parameters are active.				2X53_xxx or above
When the Enable parameter is set to *OFF*, the values set by the Rx_IQ_Swap and Gain_Multiplier parameters are masked and have an effective value of *OFF* and *x0*, respectively. The query version of the command is not affected by the Enable setting; the values returned for Rx_IQ Swap and Gain are always non-masked.				
The parameters set by this command are volatile; they always return to their default values when the CMU is restarted.				
This command can only be used in the Non-Signalling mode. This command must be set to OFF before changing to the Signalling mode.				
Note: *Setting Enable to ON disables all code domain channel power settings. Disabling the interface with the OFF command does not re-enable the power settings. You must manually turn the generators off and then back on.*				
The Digital Baseband I/Q Signal Interface option only functions while in the non-signalling mode. Once the option is turned on (via the GPIB command), it must be explicitly set to off before switching to the signalling mode.				

Signal Requirements

The TXA_I<1..0> and TXA_Q<1..0> signals must be aligned with the PP2S signal. The timing relation of the TXA_I<1..0> and TXA_Q<1..0> and the PP2S must be the same as shown in the following timing diagram.

All interface signals are to be +3.3 V CMOS (5 V tolerant) logic. All times are relative to the rising edge of the CHIPX16 clock unless otherwise specified.
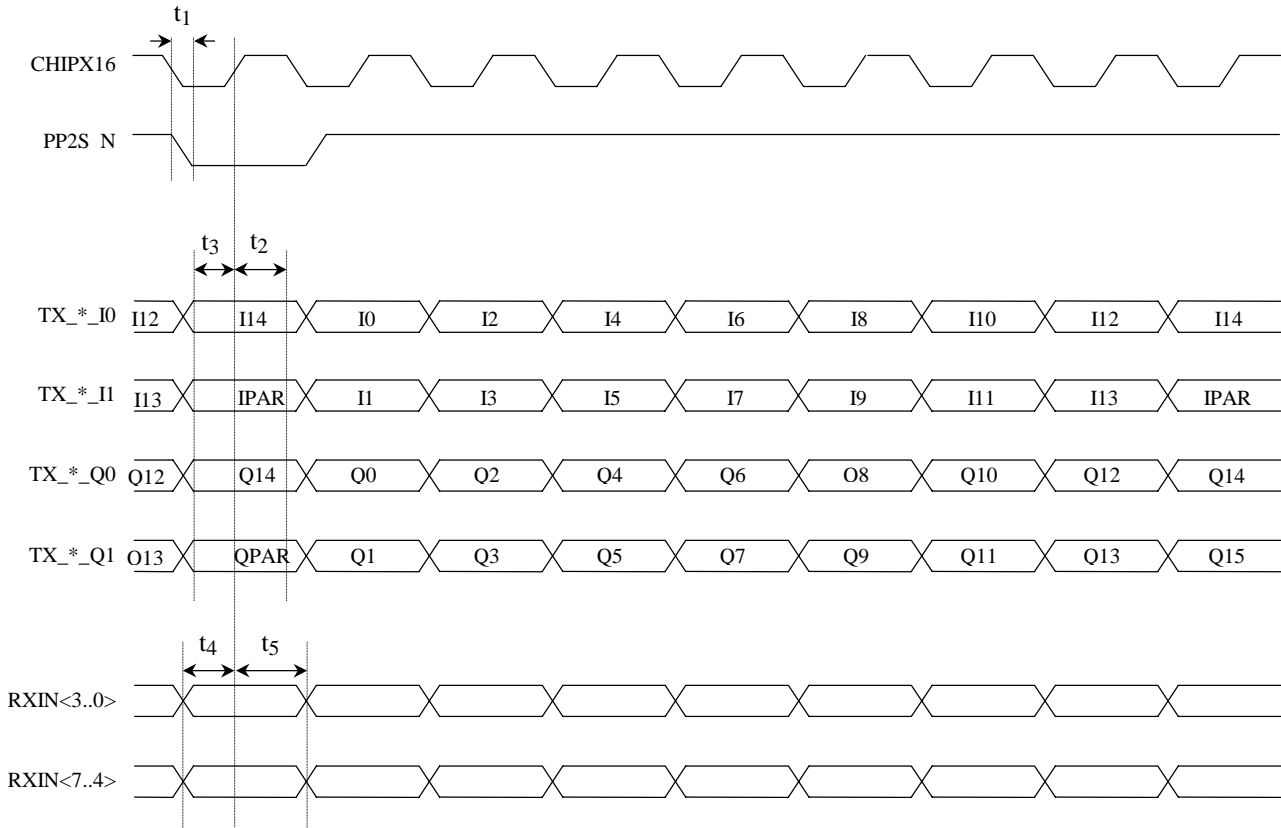
Timing Diagram Values

Specification	Timing Diagram Identifier	Minimum Value	Maximum Value
PP2S Delay from CHIP16X clock	T_1	3 nS	13 nS
TX_*_I0, TX_*_I1, TX_*_Q0, TX_*_Q1 data hold time	T_2	2 nS	35 nS
TX_*_I0, TX_*_I1, TX_*_Q0, TX_*_Q1 data setup time	T_3	15 nS	48 nS
RXIN data setup time	T_4	10 nS	25 nS
RXIN data hold time	T_5	25 nS	40 nS

The received signal has an automatic level control that attempts to keep the received signal within the dynamic range of the CMU A/D system. When this mode is enabled (ANALYZER LEVEL→RF MODE→AUTO), any sample that exceeds the maximum range of the A/D system results in a decrease of the Rx path gain by 1 dB. If the received average power is more than 25 dB below full power (all samples at maximum value), then the Rx path gain is increased by 1 dB. This process repeats approximately every 0.5 seconds.

If the automatic level control is disabled (ANALYZER LEVEL→RF MODE→MANUAL), then the Rx path gain is set based on the ANALYZER LEVEL→RF MAXLEVEL setting. The MAXLEVEL is the peak power level which corresponds to the maximum signal that can be digitized by the A/D system. Signal peaks exceeding the MAXLEVEL setting results in an overrange indication "---" of the CMU display. For a typical cdma signal, a MAXLEVEL setting of 0 dBm would correspond to a cdma RMS power level of −6 dBm to −9 dBm. The A/D system has approximately 25 dB of dynamic range from the peak maximum to the minimum digitized signal. With the MAXLEVEL set to 0 dBm, the minimum cdma signal power would be approximately −25 dBm RMS.

If the MANUAL mode is used, the MAXLEVEL should be set with the following guideline:

MAXLEVEL = expected cdma power (RMS, dBm) + expected Peak-to-Average ratio (dB) + 2 dB.

This provides a dynamic range for the cdma signal of at least 10 to 12 dB.

Signals for CMU200 Digital Baseband I/Q Signal Interface

The following table provides a brief description of each signal and the pin number of the SCSI CMU-B82 connector.

SCSI Connector Pin Number	Pin Name	Signal Description	Signal Source
2	RX_IN0	Data for Rx using ChipX2 33 Ω series termination, ±1%	CMU200
4	PP2S	PP2S signal 33 Ω series termination, ±1%	CMU200
10	CK_EXT_SRC_CX16	ChipX16 clock from CMU 33 Ω series termination, ±1%	CMU200
16	EXT _TXA_I0	LSB of I data for Tx sector α using ChipX2	External Source
17	EXT _TXA_Q0	LSB of Q data for Tx sector α using ChipX2	External Source
21	EXT _TXB_I1	MSB of I data for Tx sector β using ChipX2	External Source
22	EXT _TXB_Q0	LSB of Q data for Tx sector β using ChipX2	External Source
23	EXT _TXB_Q1	MSB of Q data for Tx sector β using ChipX2	External Source
25	EXT _TXC_I1	MSB of I data for Tx sector γ using ChipX2	External Source
26	EXT _TXC_Q0	LSB of Q data for Tx sector γ using ChipX2	External Source
51	EXT _TXA_I1	MSB of I data for Tx sector α using ChipX2	External Source
52	EXT _TXA_Q1	MSB of Q data for Tx sector α using ChipX2	External Source
54	EXT _TXB_I0	LSB of I data for Tx sector β using ChipX2	External Source
58	EXT _TXC_I0	LSB of I data for Tx sector γ using ChipX2	External Source
60	EXT _TXC_Q1	MSB of Q data for Tx sector γ using ChipX2	External Source
1, 8, 9, 12, 13, 15, 28, 29, 31, 32, 34, 38, 40, 44, 45, 47, 48, 53, 57, 61, 63, 64, 66, 67	NC	No Connection	
3, 5, 6, 7, 11, 14, 18, 19, 20, 24, 27, 30, 33, 35, 36, 37, 39, 41, 42, 43, 46, 49, 50, 55, 56, 59, 62, 65, 68	GND	GND	
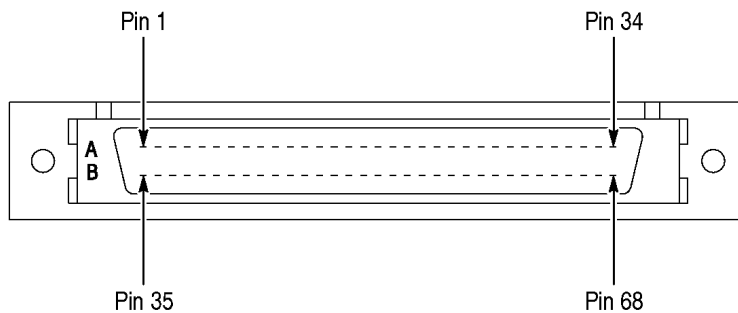
DIGITAL IQ CMU-B82 Connector

Operation

With the I/Q Interface installed, the CMU provides baseband I and Q samples of the Rx signal on a single pin of the SCSI connector representing one sector. Four bit I and four bit Q samples are multiplexed onto the single RX_IN<0> signal line. This signal provides I and Q samples of the received signal at a Chipx2 rate.
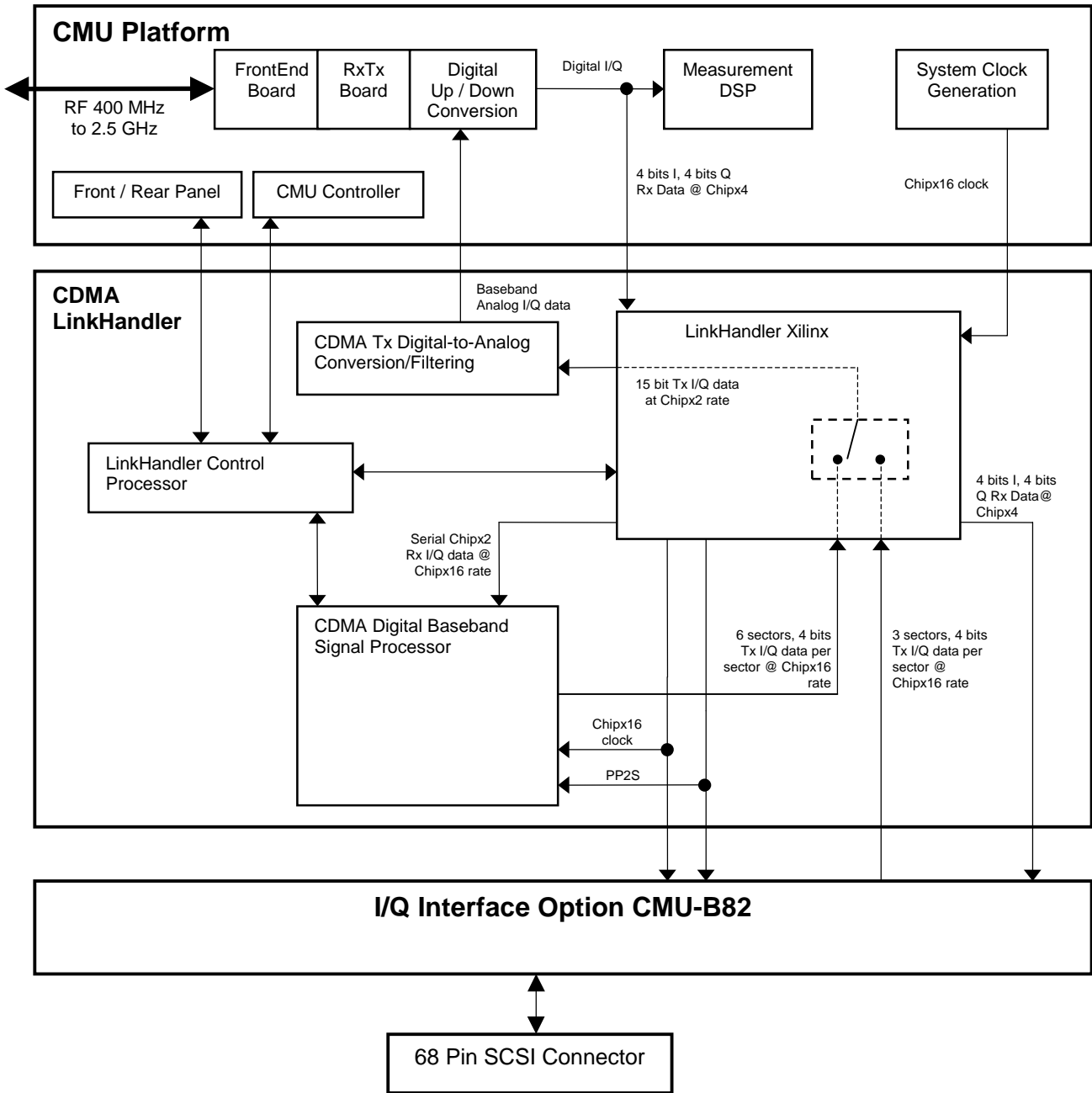
The PP2S and the Chipx16 clock signals are also routed to the SCSI connector.

When the I/Q Interface is enabled (via GPIB), the CMU200 receives the transmit baseband I and Q samples on twelve pins from the SCSI connector. TX_*_I[1:0] and TX_*_Q[1:0] are the sample streams and include four pins for each sector. Each I and Q sample is divided into even and odd bits, so two wires are used for I bits and two for Q bits. Each sample consists of a 15 bit 2's complement value and a parity bit. Input signal samples are limited to a signed 12 bit full scale.

- I0, I2, ..., I14, I0, ... (one pin)

- I1, I3, ..., I13, Ipar, I1, … (one pin)

- Q0, Q2, …, Q14, Q0, … (one pin)

- Q1, Q3, …, Q13, Qpar, Q1, … (one pin)

Refer to the previous table for the pin numbers for all signals.

NOTE: *The Digital Baseband I/Q Signal Interface option only functions while in the non-signalling mode. Once the option is turned on (via the GPIB command), it must be explicitly set to off before switching to the signalling mode.*

CMU Platform

RF 400 MHz to 2.5 GHz

FrontEnd Board

RxTx Board

Digital Up / Down Conversion

Digital I/Q

Measurement DSP

System Clock Generation

Front / Rear Panel

CMU Controller

4 bits I, 4 bits Q
Rx Data @ Chipx4

Chipx16 clock

CDMA LinkHandler

Baseband Analog I/Q data

CDMA Tx Digital-to-Analog Conversion/Filtering

LinkHandler Xilinx

15 bit Tx I/Q data at Chipx2 rate

LinkHandler Control Processor

4 bits I, 4 bits Q Rx Data@ Chipx4

Serial Chipx2 Rx I/Q data @ Chipx16 rate

CDMA Digital Baseband Signal Processor

6 sectors, 4 bits Tx I/Q data per sector @ Chipx16 rate

3 sectors, 4 bits Tx I/Q data per sector @ Chipx16 rate

Chipx16 clock

PP2S

I/Q Interface Option CMU-B82

68 Pin SCSI Connector

I/Q Signal Interface Diagram

Typical Application

The following diagram shows a typical setup using the Access Option (Option B-82) installed in a CMU200. A description of each block follows the diagram.
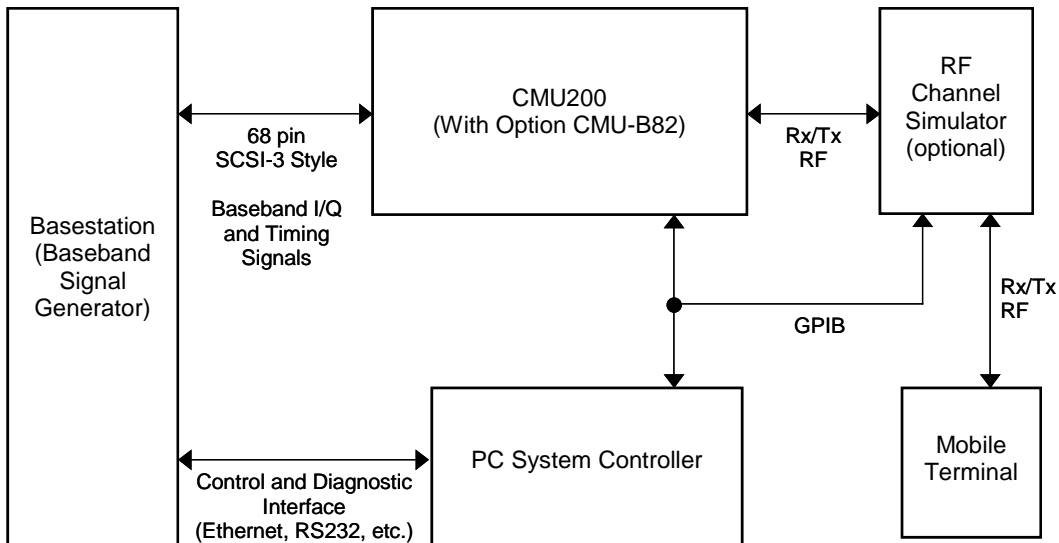
Basestation (Baseband Signal Generator)

The Basestation Baseband Signal Generator generates all signals needed for basestation operation at baseband. The signals are I and Q signals in a digital format. All baseband signal processing and protocol functions (both Tx and Rx) are handled by this unit.

CMU200 w/Option CMU-B82

The CMU200 (with Option CMU-B82) handles all of the conversion from digital baseband signals up to (Tx) and down from (Rx) the carrier frequency of interest. The carrier frequency and level can be programmed over the entire frequency and level range available through the CMU200. In addition, the CMU200 allows performing RF measurements on the Rx RF signal. The CMU200 provides analog processing of the digital baseband Tx signal with filtering compliant with the IS-95A CDMA standard (CDMA2000 uses the same requirements).

RF Channel Simulator

The RF Channel Simulator provides simulation of RF path impairments such as fading and/or multipath.

PC System Controller

The PC System Controller controls the operation of all the system components through appropriate control interfaces. The CMU200 can be controlled either through GPIB or RS232. The basestation signal generator may have multiple control interfaces and may use both Ethernet and RS232.

This system allows the testing of the mobile terminal under a variety of situations. The signal frequency and level can be accurately adjusted through the CMU200. The type and severity of impairments can be controlled through the Channel Simulator. The configuration for the entire system can be maintained within the PC System Controller, allowing for very repeatable testing.

Using the Access Option to provide a baseband interface allows for complete RF frequency and level coverage without having to wait for the development of precise RF hardware.