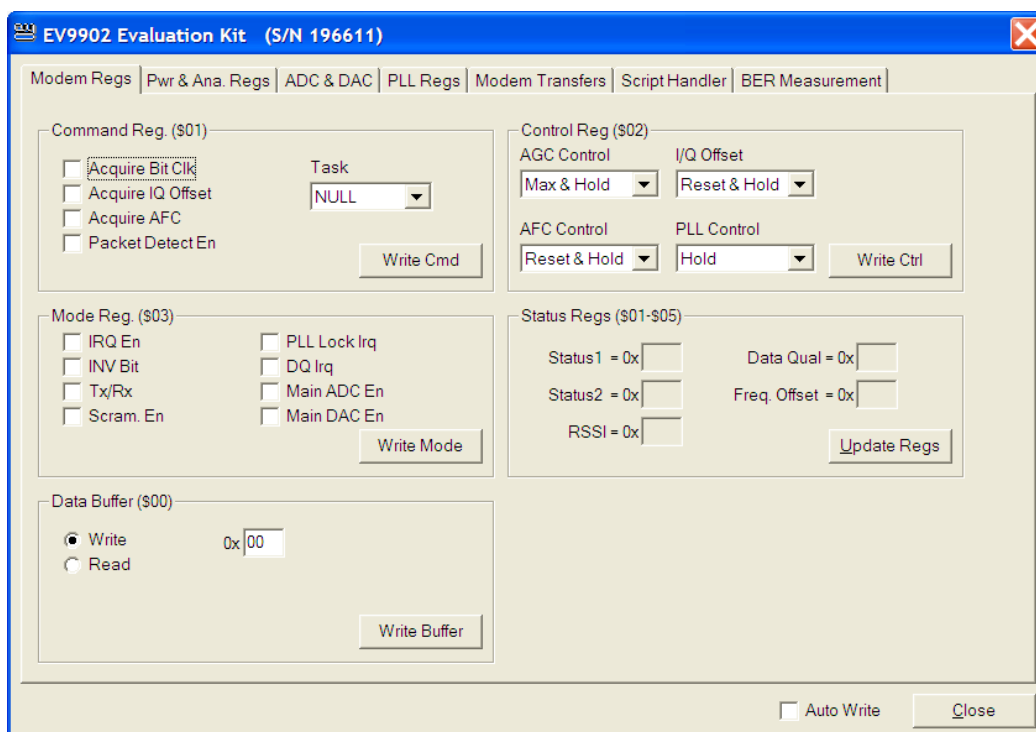


Features

- Provides Immediate Evaluation and Experimentation with the CMX990 via the EV9900A EvKit
- Performs the Transfer of Single Mobitex or Custom Frames Over a RF Link
- Calculates the Register Values to Control the CMX990 PLLs and Bit Rate for the User
- Measures Bit Error Rate performance in Mobitex or raw data modes



1. Brief Description

The EV9902 Interface Kit forms part of the CMX990 GMSK Packet Data Modem and RF Transceiver IC evaluation and investigation resource. The EV9902 Interface Kit provides a graphical user interface (GUI) for the EV9900A (CMX990) EvKit. The EV9902 is supplied as a Hyperstone hyBoard-XS evaluation board plus an interface card, together with GUI software for a PC. This kit connects simply to a Windows-based PC via a standard USB cable. The connection to the EV9900A EvKit is via the supplied ribbon cable.

The supplied EV9902 GUI software allows users to directly write to and read from the CMX990 registers and perform real-time tasks for Mobitex or free-format frame transfers live over a RF link. The GUI software will calculate the CMX990 register values required to generate the user's desired PLL frequencies and bit rates. The hyBoard-XS evaluation board is supplied pre-loaded with firmware that allows the real-time operations to be performed. Please note that this kit is not suitable for use with the EV9900 EvKit. Users requiring support for this older kit should contact techsupport@cmlmicro.com.

CONTENTS

<u>Section</u>	<u>Page</u>
1. Brief Description	1
2. Preliminary Information	5
2.1. Laboratory Equipment	5
2.2. Handling Precautions	5
2.2.1. Static Protection	5
2.2.2. Contents - Unpacking	5
2.3. Approvals	5
2.4. Important Information	5
3. Quick Start	6
3.1. Setting-Up	6
3.2. Operation	6
3.2.1. Applying Power	6
3.2.2. Running the Software	6
4. Signal Lists	7
4.1. The EV9902 Interface Card	7
4.2. hyBoard-XS Jumper Settings	8
5. Circuit Schematics and Board Layouts	9
6. Detailed Description	10
6.1. Software Description	10
6.1.1. The Modem Registers Tab	10
6.1.2. The Power and Analogue Registers Tab	11
6.1.3. The ADC and DAC Registers Tab	11
6.1.4. The PLL Registers Tab	12
6.1.5. The Modem Transfers Tab	13
6.1.6. The Script Handler Tab	15
6.1.7. The BER Measurement Tab	16
6.2. Firmware Description	19
6.2.1. Updating the Firmware	19
6.3. Hardware Description	20
6.4. Troubleshooting	20
7. Performance Specification	21
7.1. Electrical Performance	21
7.1.1. Absolute Maximum Ratings	21
7.1.2. Operating Limits	21
7.1.3. Operating Characteristics	22

<u>Table</u>	<u>Page</u>
Table 1 – EV9902 Interface Card Connector Pinout	8
Table 2 – hyBoard-XS Jumper Settings.....	8
Table 3 – Possible Errors.....	20

<u>Figure</u>	<u>Page</u>
Figure 1 – System Layout Diagram	4
Figure 2 – EV9902 Interface Card - Layout	9
Figure 3 – The Modem Registers Tab	10
Figure 4 – The Power and Analogue Registers Tab.....	11
Figure 5 – The ADC and DAC Registers Tab.....	12
Figure 6 – The PLL Registers Tab.....	13
Figure 7 – The Modem Transfers Tab	14
Figure 8 – The Script Handler Tab.....	15
Figure 9 – The BER Measurement Tab	17

It is always recommended that you check for the latest product datasheet version from the Datasheets page of the CML website: [www.cmlmicro.com].

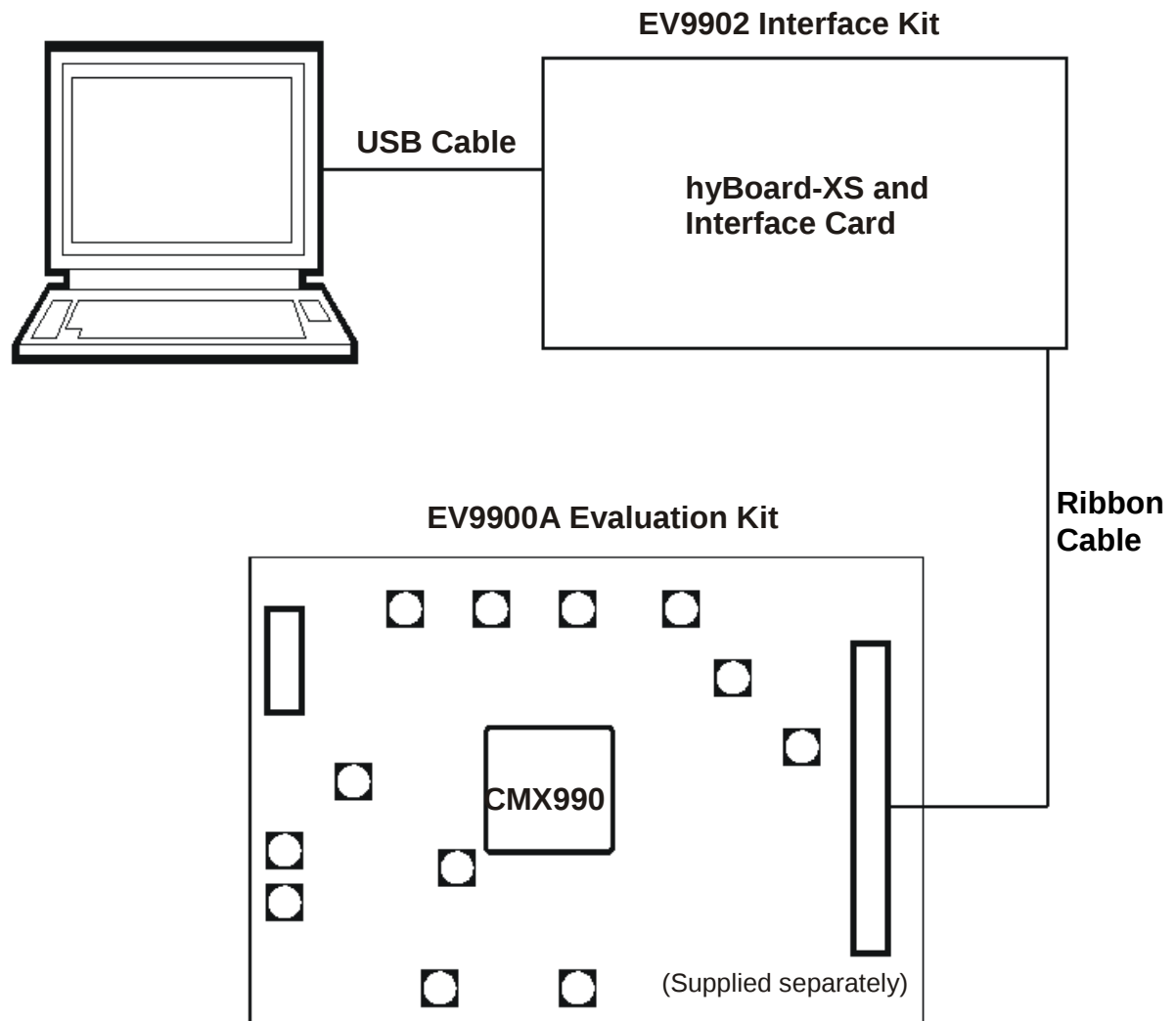


Figure 1 – System Layout Diagram

2. Preliminary Information

2.1. Laboratory Equipment

The following laboratory equipment is needed to use this evaluation kit:

- A 5.0V D.C. power supply rated at 1A
- A USB cable, to connect the PC to the EV9902
- A PC running Microsoft Windows 2000/XP with a spare USB port
- A EV9900A Evaluation Kit (which also requires):
 - o A RF attenuator
 - o RF test equipment, for example a Spectrum Analyser and RF signal generator
 - o A 7.2V D.C. power supply rated at 1A
 - o A 3.6V D.C. power supply rated at 2A

2.2. Handling Precautions

Like most evaluation kits, this product is designed for use in office and laboratory environments. The following practices will help ensure its proper operation.

2.2.1. Static Protection

This product uses low power CMOS circuits that can be damaged by electrostatic discharge. Partially damaged circuits can function erroneously, leading to misleading results. Observe ESD precautions at all times when handling this product.

2.2.2. Contents - Unpacking

Please ensure that you have received all of the items on the separate information sheet (EK9902) and notify CML within 7 working days if the delivery is incomplete.

2.3. Approvals

This product is not approved to any EMC or other regulatory standard. Users are advised to observe local statutory requirements which may apply to this product and the radio frequency signals which may emanate from it.

2.4. Important Information

- Following power up, or between operations, the CMX990 should be reset using the Reset checkbox in the Power and Analogue Registers tab.
- DAC0 provides the control voltage for the PA. At power up, or following a reset of the CMX990, DAC0 is tri-state, which gives near full-power from the PA. Write DAC0 with \$0000 in the ADC and DAC tab, to switch off the PA.
- The EV9900A is fitted with an IF at 45MHz. Set the TxIF to 45MHz in the PLL Registers tab before using transmit functions.
- Operations from the Modem Transfers and BER Measurement tabs use a fixed, low power, PA setting. This cannot be altered. Other settings may be necessarily altered automatically to permit the data transfer. It is advised that the CMX990 is reset after using these operations.

3. Quick Start

This section provides instructions for users who wish to experiment immediately with the EV9900A evaluation kit, by controlling it from a PC via the EV9902 Interface Kit. A fuller description of the Interface Kit and its use appears later in this document. Before using this kit, it is recommended that the user read the datasheets for the CMX990, the EV9900A and the hyBoard-XS. The latest versions of these documents, together with the "ES9902xx.exe" software, can be found at <http://www.cmlmicro.com/> and at <http://www.hyperstone.com/> for the hyBoard-XS documentation.

3.1. Setting-Up

Before the kit can be powered-up, the hyBoard-XS jumpers must be set to their default values (see Table 2) and the following connections must be made:

- The EV9902 Interface Card, J1, J2 and J4, to the hyBoard-XS, X1, X2 and X3
- The EV9902 Interface Card, J3, to the EV9900A Evaluation Kit, J13 – using the supplied ribbon cable
- The hyBoard-XS, J4, to a spare USB port on the PC via a USB cable (not supplied)
- The hyBoard-XS, via the supplied power cable, to the 5.0V D.C. power supply
- The EV9900A main supply to the 7.2V D.C. power supply
- The EV9900A PA supply to the 3.6V D.C. power supply
- The EV9900A RF output, TXOUT (J9), must be connected to a suitable 50Ω load

NOTE: Before power is applied to the EV9900A PA supply, a suitable 50Ω load must be connected to the PA output, TXOUT (J9), in the default configuration. Failure to do so may result in permanent damage to the PA device. See the EV9900A datasheet for full details.

3.2. Operation

3.2.1. Applying Power

Before applying power, refer to section 2.4, Important Information, above.

Once the connections detailed in section 3.1 have been made, the kits should be powered-up in the following sequence:

1. The 5.0V D.C. power supply
2. The 7.2V D.C. power supply
3. The 3.6V D.C. power supply

On application of the 5.0V supply the hyBoard-XS LED, LED6, will flicker momentarily and then remain constantly on.

3.2.2. Running the Software

To start the software, run the executable "ES9902xx.exe" (where xx is the version number). This software is included in the EV9902 software zip file, which can be downloaded from the CML website.

For a detailed description on using the ES9902 application, see section 6.1.

4. Signal Lists

This section details the connectors of the EV9902 Interface Card and the required jumper settings of the hyBoard-XS for this kit to operate successfully. For a more detailed description of the EV9900A or the hyBoard-XS refer to the relevant datasheet.

4.1. The EV9902 Interface Card

CONNECTOR PINOUT				
Connector Ref.	Connector Pin No.	Signal Name	Signal Type	Description
J1	1, 3, 5, 7, 9, 11	A[5:0]	I/P	CMX990 Parallel Interface Address Bus
	49, 50, 51, 53, 56, 55, 57, 59	D[7:0]	BI	CMX990 Parallel Interface Data Bus
	4, 6, 8, 10, 14, 16, 18, 22, 24, 26, 28, 30, 34, 36, 40, 52, 54, 58	GND	PWR	Ground
	2, 12, 13, 15, 17, 19, 20, 21, 23, 25, 27, 29, 31-33, 35, 37-39, 41-48, 60	-	N/C	Unconnected pins
J2	2	IRQN	O/P	CMX990 IRQN
	6	WAITN	O/P	hyBoard-XS WAITN
	12	READN	I/P	CMX990 Parallel Interface READN
	14	WRITEN	I/P	CMX990 Parallel Interface WRITEN
	53	+3V3	PWR	Power Supply from the hyBoard-XS
	29, 33, 37, 39, 43, 47, 51, 55, 57, 59	GND	PWR	Ground
	1, 3-5, 7-11, 13, 15-28, 30-32, 34-36, 38, 40-42, 44-46, 48-50, 52, 54, 56, 58, 60	-	N/C	Unconnected pins
J3	3-8	A[5:0]	O/P	CMX990 Parallel Interface Address Bus
	11	READN	O/P	CMX990 Parallel Interface READN
	12	WRITEN	O/P	CMX990 Parallel Interface WRITEN
	13	CSN	O/P	CMX990 Parallel Interface CSN
	14	IRQN	I/P	CMX990 Parallel Interface IRQN
	17-24	D[7:0]	BI	CMX990 Parallel Interface Data Bus
	1, 2, 9, 10, 15, 16, 25, 26	GND	PWR	Ground

Table continued...

CONNECTOR PINOUT				
Connector Ref.	Connector Pin No.	Signal Name	Signal Type	Description
J3	27-40	-	N/C	Unconnected pins
J4	11	GND	PWR	Ground
	24	CSN	I/P	CMX990 Parallel Interface CSN
	1-10, 12-23	-	N/C	Unconnected pins

Table 1 – EV9902 Interface Card Connector Pinout

Notes: I/P = Input
O/P = Output
BI = Bidirectional
N/C = Not connected
PWR = Power

4.2. hyBoard-XS Jumper Settings

JUMPERS			
Link Ref.	Positions	Default Position	Description
ST3	1-2, 3-4, 5-6	1-2	Ethernet CS Select
ST4	1-2, 3-4, 5-6	1-2	Flash Memory Address
ST5	1-2, 3-4, 5-6	1-2	USB CS Select (Must be 1-2)
ST6	1-2	S/C	Red LED Enable
	3-4	S/C	Green LED Enable
ST7	1-2, 3-4, 5-6	5-6	Ethernet INT Output Select (Must not be 3-4)
ST8	1-2, 3-4, 5-6	3-4	USB INT Output Select (Must be 3-4)
ST9	1-2, 2-3	1-2	USB Suspend (Must be 1-2)
ST10	1-2, 5-6	5-6	ICE INT Output Select
ST11	1-2, 3-4, 5-6, 7-8	7-8	PLD INT O/P Select (Must be 7-8)
ST12	S/C,O/C	S/C	ICE CS Select
ST13	1-2, 3-4, 5-6	1-2	Flash Memory Address (Must be 1-2, except when programming)
ST14			JTAG connector for Xilinx CPLD

Table 2 – hyBoard-XS Jumper Settings

Notes: S/C = Short Circuit
O/P = Open Circuit

5. Circuit Schematics and Board Layouts

Please refer to the relevant datasheets for the hyBoard and EV9900A circuit schematics and layout. For clarity, the EV9902 Interface Card circuit schematics are available as separate high resolution files. These can be obtained via the CML website.

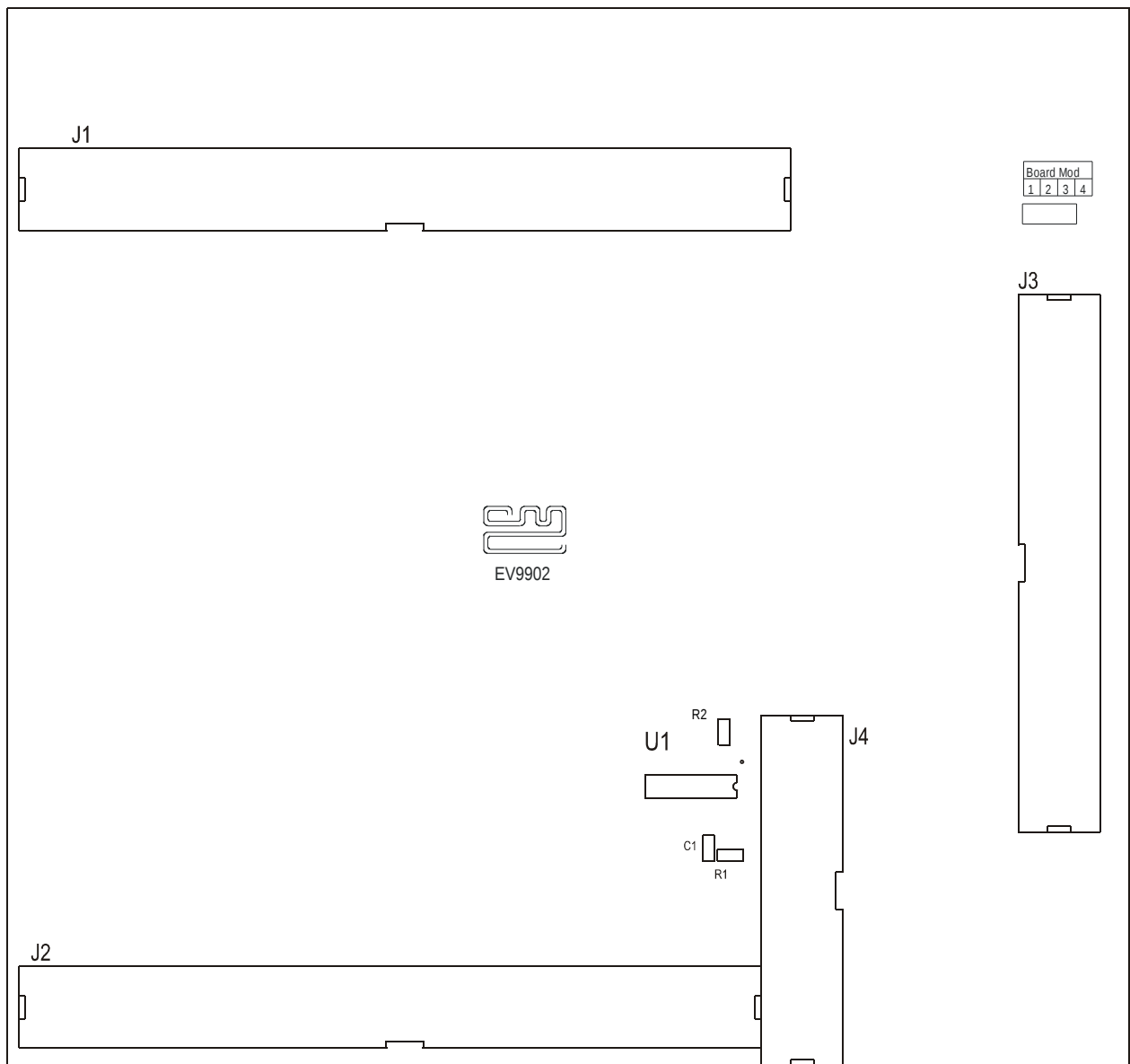


Figure 2 – EV9902 Interface Card - Layout

6. Detailed Description

6.1. Software Description

The ES9902 application allows the user to interact with the EV9900A via an easy to use graphical interface. It consists of a number of tabs: each one representing a particular set of registers or a particular function of the CMX990. Displayed in the title bar of the program window is the serial number of the EV9902 kit being interfaced by the software.

To select a tab simply click on the corresponding name in the row at the top of the program window. Setting or clearing the check box associated with a bit of a register will cause that bit to be set or cleared when the register is next written to. If the 'Auto Write' check box is set a register will be written whenever a check box or list box associated with it is modified. This removes the need to click the 'Write' button associated with that register. The program can be closed at any time by clicking the 'Close' button or by pressing 'Alt' and 'F4' keys simultaneously.

6.1.1. The Modem Registers Tab

The Modem Registers tab gives access to the CMX990 baseband modem registers, see Figure 3.

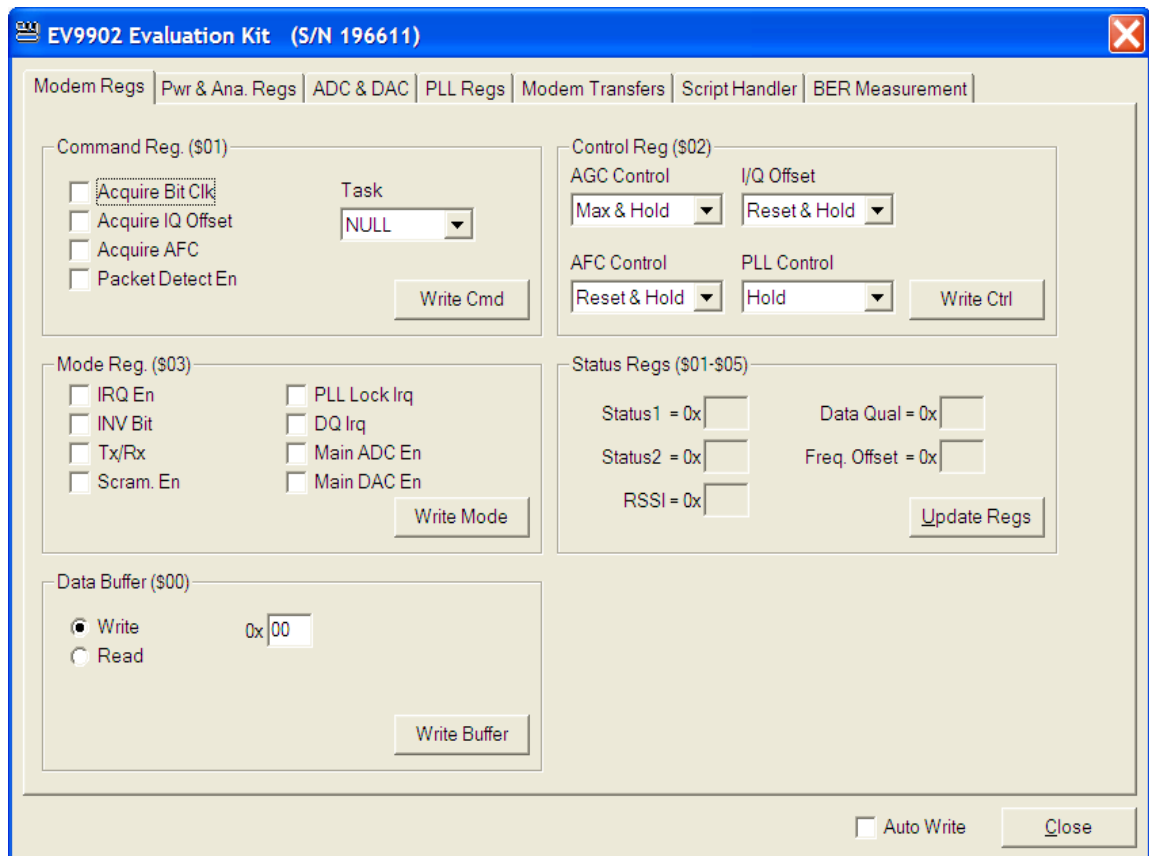


Figure 3 – The Modem Registers Tab

The Command register task drop-down list allows the selection of the various CMX990 modem tasks. The selection shown is dependant on the displayed value of the Mode register bit 'Tx/Rx', showing either the receive mode or the transmit mode tasks. The Data Buffer register can be either written to or read by selecting the appropriate option.

6.1.2. The Power and Analogue Registers Tab

The Power and Analogue registers tab gives access to the CMX990 Power Up and Analogue Setup registers, see Figure 4.

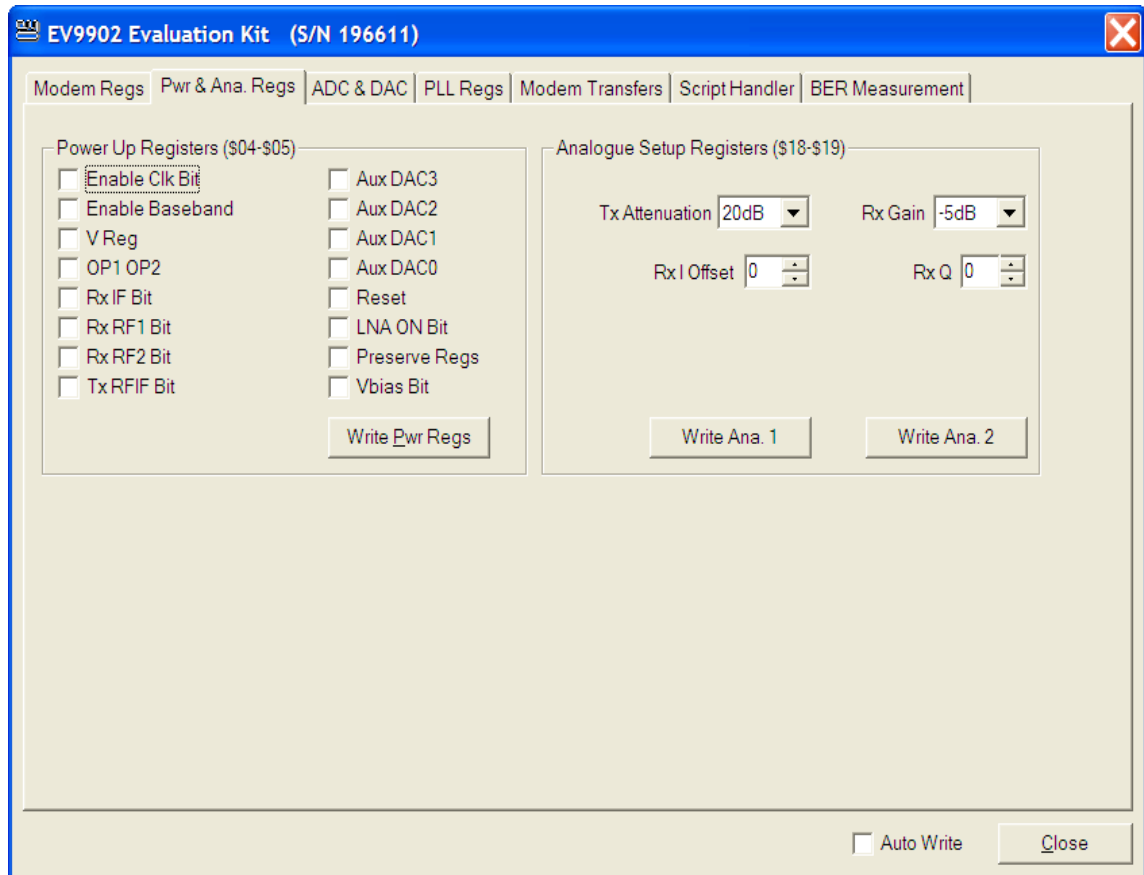


Figure 4 – The Power and Analogue Registers Tab

Writing to the Power Up registers with the 'Reset' bit of the Power Up 2 register set will cause the displayed values of all the CMX990 registers to be changed to their reset values.

6.1.3. The ADC and DAC Registers Tab

The ADC and DAC registers tab gives access to the CMX990 Auxiliary ADC and DAC registers, see Figure 5.

To use the Auxiliary ADCs or DACs, the Aux Control registers or Power Up 2 register, respectively, must be written with the appropriate enable bits set. To read the current value of an ADC, select the ADC to read, ADC0-ADC5, from the list and click the 'Read ADC' button. To write a new value to a DAC, select the DAC to write, DAC0-DAC4, from the list and click the 'Write DAC' button.

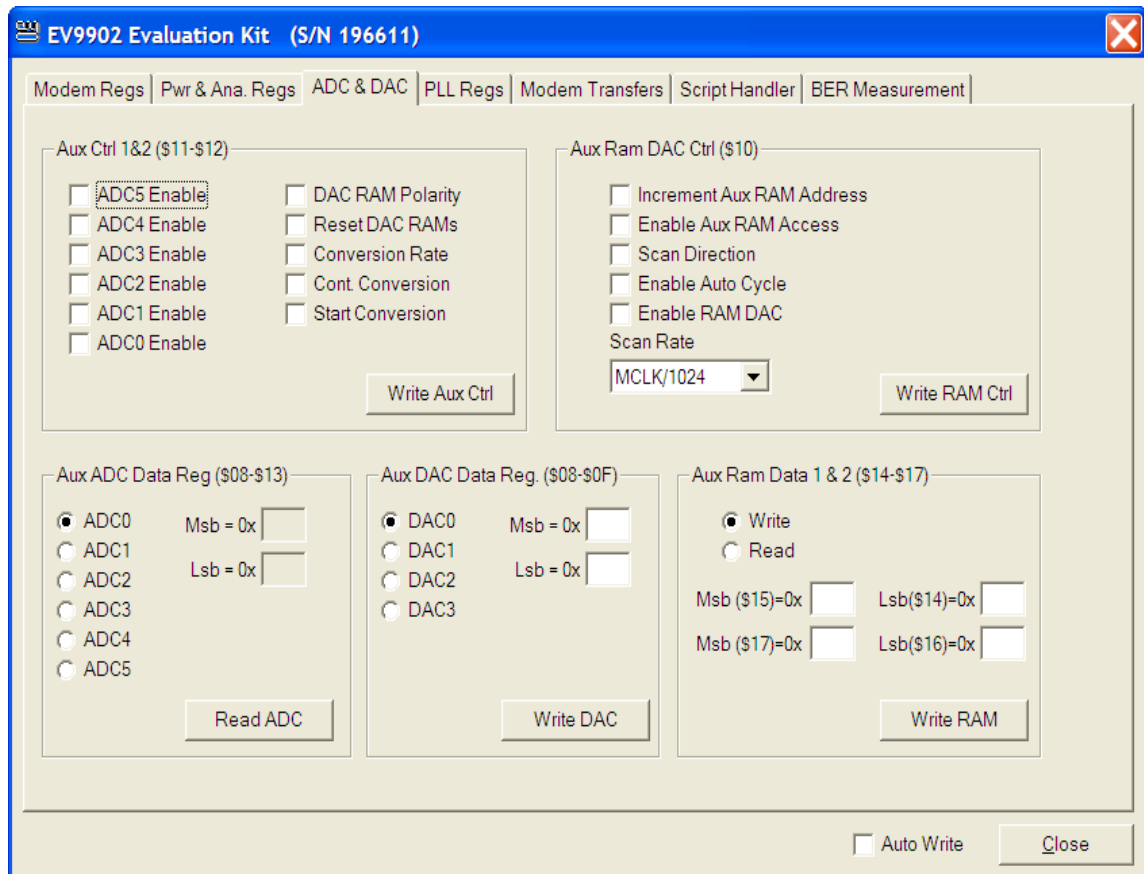


Figure 5 – The ADC and DAC Registers Tab

6.1.4. The PLL Registers Tab

The PLL registers tab gives access to the CMX990 PLL and Clock Control registers and can calculate the register values required to generate a desired frequency or bit rate, see Figure 6.

To calculate the Main or Aux PLL divider values to synthesise a desired frequency:

1. Enter the reference clock frequency, in MHz, which for the default configuration of the EV9900A is 14.4MHz
2. Enter the PLL frequency, in MHz, and the comparison frequency, in kHz.
3. Select either the Main or Aux PLL
4. Click the 'Calculate Reg Values' button

The displayed values of the Main PLL or Aux PLL divider registers will then be updated to those required to synthesise the desired frequency. To cause the EV9900A to generate the desired frequency, click the Main or Aux PLL write button with the Main or Aux PLL enable bit set.

If the EV9900A is unable to synthesise the desired frequency, the user will have the option to use the closest frequency that can be synthesised. Otherwise, it may be possible for the CMX990 to synthesise the desired frequency by adjusting the comparison frequency, see the CMX990 datasheet for further details.

Figure 6 – The PLL Registers Tab

To calculate the value of the Clock Control register to generate a desired bit rate:

1. Enter the reference clock frequency, in MHz, which for the default configuration of the EV9900A is 14.4MHz
2. Enter the desired bit rate, in bps
3. Click the 'Calculate Reg Value' button

The value displayed for Clock Control register will then be updated to that required to generate the desired bit rate. A pop-up window will appear, if the desired bit rate can not be generated by the CMX990 with the current reference clock frequency. It may be possible to achieve the desired bit rate by adjusting the reference clock frequency, see the CMX990 and EV9900A datasheets for more information.

6.1.5. The Modem Transfers Tab

The Modem Transfers tab allows the EV9900A to transmit or receive single frames over a RF link, see Figure 7. Two different types of frames can be transferred:

- Mobitex Frames consisting of a Mobitex frame header followed by 0-32 Mobitex 240 bit data block(s)
- Unformatted data frames consisting of a small header (16 bits of bit synchronisation and 16 bits of frame synchronisation) followed by 0-255 byte(s).

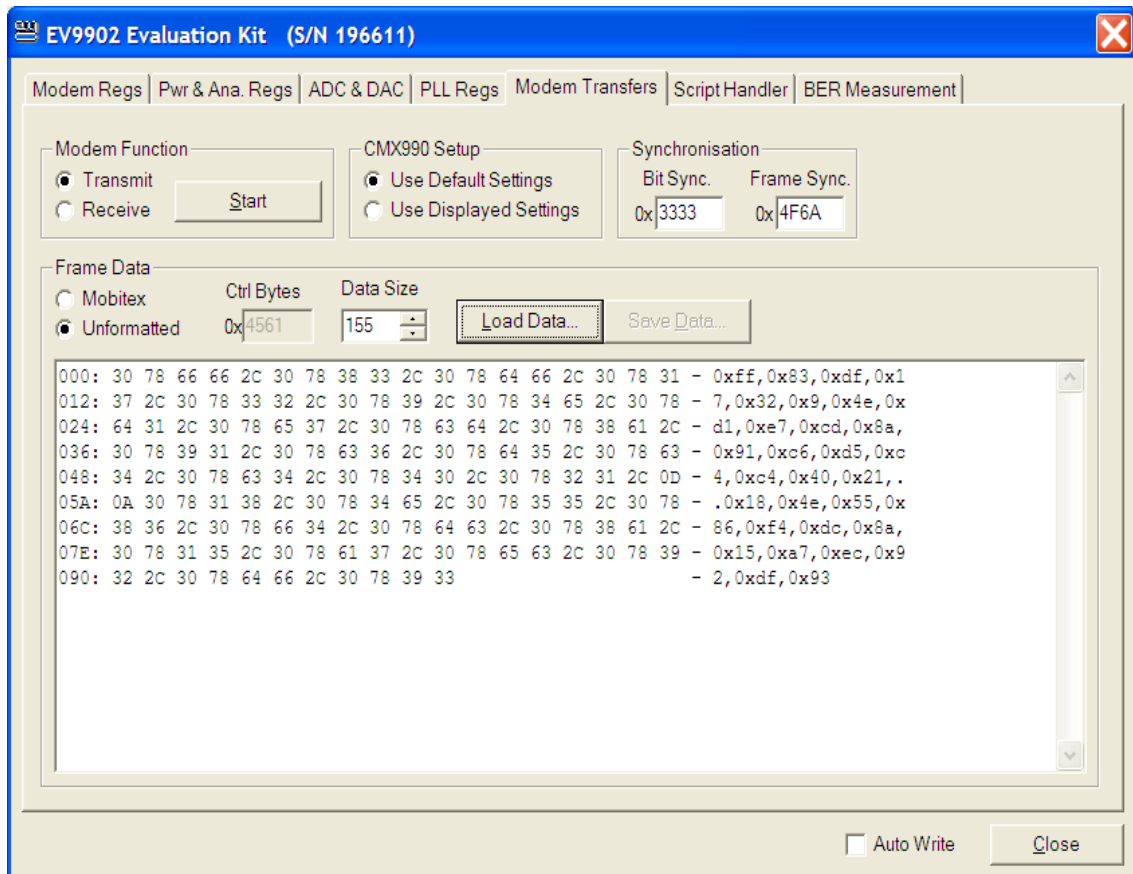


Figure 7 – The Modem Transfers Tab

To transmit or receive a frame:

1. Enter the bit synchronisation and frame synchronisation words, in hexadecimal
2. Select the type of the frame data, Mobitex or Unformatted
3. Enter the frame's data size as the number of Mobitex data blocks or bytes, for Mobitex frame data or Unformatted frame data, respectively
4. When transmitting, the frame data is loaded from a file, by clicking the 'Load Data' button and selecting the file. Any type of file can be used, the raw data from it will be sent as the data blocks/bytes of the frame. For transmission of Mobitex frames only, it is also necessary to enter the control bytes, in hexadecimal, to transmit.
5. Start the frame transfer by clicking the 'Start' button, which will then become the 'Stop' button

A pop-up window will appear once the frame transfer has completed. The data received by a receive operation can be saved to a file by clicking the 'Save Data' button. When the frame transfer is being performed the other tabs can not be selected. The frame transfer can be halted by clicking the 'Stop' button. The bit synchronisation, frame synchronisation and control bytes are all transferred in the order bit 7 of the MSB to bit 0 of the LSB.

When the 'Use Default Settings' option is selected, each time a frame transfer is performed the CMX990 is reset and loaded with the default values required to perform the transfer. When the 'Use Displayed Settings' option is selected the CMX990 is still reset but the following registers are set to the current values displayed by the application and not the default values:

- the Main and Aux PLL divider registers
- the Analogue Setup registers
- the Control register
- the 'INV' and 'Scram En.' bits of the Mode register.
- the Clock Control register

The value of all the other CMX990 registers will be set to the default regardless of the selected option. Each time a frame transfer is performed the ES9902 application will update the displayed register values to reflect those written to the CMX990.

NOTE: If the default reference clock is not to be used for the modem transfers, it is important to set the 'Reference Clock (MHz)' value, shown in the 'PLL Regs' tab, to that of the reference clock to be used.

6.1.6. The Script Handler Tab

The Script Handler tab allows the execution of script files consisting of register write and read, delay and wait on IRQ commands, see Figure 8.

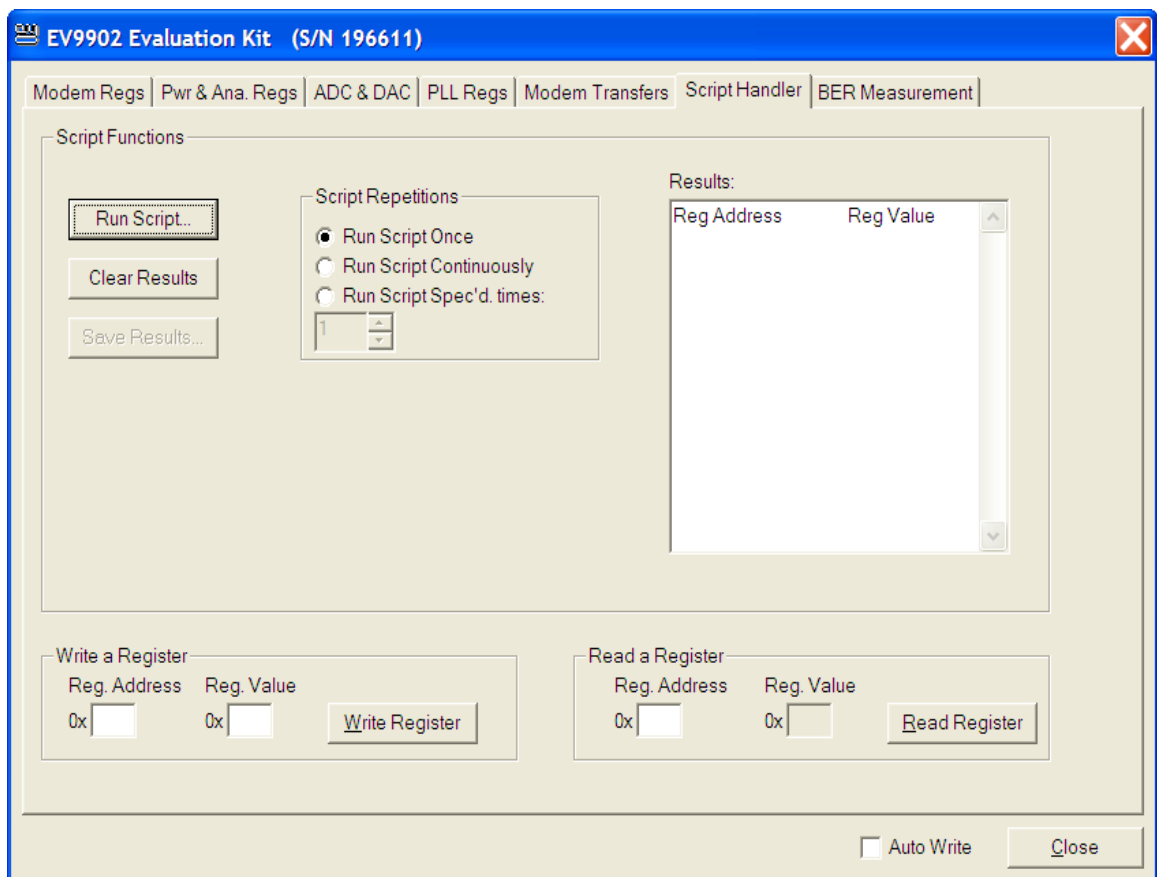


Figure 8 – The Script Handler Tab

The script files should be ASCII text files with each line containing one of the following commands:

- Register write - *AA_DD*
- Register read - *AA*
- Delay - *DELAY_X..X*
- IRQ - *IRQ*
- IRQ with time-out - *IRQTO_X..X*
- Comment line - *//C..C*

Where *AA* is the 2 digit (one byte) register address in hexadecimal, *_* is a single space character, *DD* is the 2 digit (one byte) register value in hexadecimal, *X..X* is a time to delay by in 10ms units and *C..C* is an ASCII string. The delay and IRQ commands stop any following script commands from being executed until the delay or time-out period has passed or an IRQ has been detected.

The script files can also contain jump commands that cause the execution of the script to branch forward the specified number of lines. There are two types of jump commands, unconditional and conditional. When an unconditional jump command is executed, the branch is always performed. For conditional jumps, the branch is only performed if the condition is true. The jump commands must be in the following format:

- Unconditional Jump - *JMP_L..L*
- Jump if equal - *JEQ_AA_VV_L..L*
- Jump if < - *JLT_AA_VV_L..L*
- Jump if > - *JGT_AA_VV_L..L*
- Jump if bit set - *JBS_AA_MM_L..L*

Where *L..L* is a decimal number representing the number of lines to branch forward in the script. For the conditional jump commands, *AA* is the 2 digit (one byte) register address, in hexadecimal, of the register to be read and the value used to calculate the jump condition and *VV* is the 2 digit (one byte) hexadecimal value to be compared. In the "jump if bit set" command (JBS), *MM* is a 2 digit (one byte) hexadecimal value used as a mask; a logical 'AND' is performed with it and the value of the register with the address *AA*. If the result of the logical 'AND' is non-zero then the branch is performed.

Each line must contain only one command and no other characters.

The results window will display the value returned by register read commands and 'IRQ Detected' when an IRQ has occurred after an IRQ command. These results can be saved to an ASCII text file, by clicking on the 'Save Results..' button, or discarded, by clicking on 'Clear Results' button.

The ES9902 application will update the displayed register values to reflect those of any register read or write commands contained in an executed script file. When script file is being executed the 'Run Script...' button will change to be the 'Stop' button, the rest of the tab will be disabled and the other tabs can not be selected. A script file can be executed once, repeatedly until the 'Stop' button is pressed or a specified number of times. The execution of a script file can be stopped or paused at any time by clicking the appropriate button.

6.1.7. The BER Measurement Tab

To measure Bit Error Rate performance, a specific tab is provided in the GUI application. By duplicating the hardware, i.e. 2 x hyBoard-XS, 2 x EV9902 and 2 x EV9900A, one set of hardware can function as the transmitter and the other as the receiver. Receiving and transmitting boards are controlled by two instances of the ES9902 application: both instances can be run on the same host PC or each instance can be run on separate PCs. If both instances of the software are run on the same host machine then that machine must be equipped with two USB ports.

Figure 9 – The BER Measurement Tab

A 511-bit pseudo random bit sequence (PRBS) generated at the transmitting and receiving ends is used to calculate the bit error rate. Each byte received is compared with the corresponding byte in the locally generated PRBS and from this the number of bits/blocks received in error is calculated.

It is assumed that prior to beginning a bit error rate measurement that the various CMX990 registers have been written with the values for the required modem and RF settings. This can be done with the individual tabs or with a script using the Script Handler tab. The various controls on the BER Measurement tab are described below.

Transmit radio button – Select transmit mode.

Receive radio button – Select receive mode.

Unit measurement radio button – Transmit or receive a specified number of bits/blocks.

Continuous measurement radio button – Transmit or receive bits/blocks until Stop button is pressed.

Bit sync. edit box – Specify 2 byte bit sync. pattern. Default pattern is 0xCCCC.

Frm. sync. edit box – Specify 2 byte frame sync. pattern. Default pattern is 0x4567.

Ctrl. data edit box – Specify 2 byte control data pattern. Default pattern is 0xA63F.

Raw data radio button – Select transmit or receive in raw data mode. Raw data mode is 2 bytes of bit sync., 2 bytes of frame sync. followed by a repeating 511-bit pseudo random bit sequence transmitted a byte at a time.

Mobitex radio button – Select transmit or receive in Mobitex mode. Mobitex mode is 2 bytes of bit sync., 2 bytes of frame sync., 2 bytes of control data, 1 byte of FEC for the preceding 6 bytes, followed by a repeating 511-bit pseudo random bit sequence transmitted in blocks of 18 bytes.

Bit count drop down box – Select the number of bits to transmit or receive. Selectable values are 10000, 100000 and 1000000 bits. Default selection is 100000 bits. The selected value only applies when unit measurement and raw data mode are selected.

Block count drop down box – Select the number of blocks (1 block = 18 bytes) to transmit or receive. Selectable values are 1000, 10000 and 1000000 blocks. Default selection is 1000 blocks. The selected value only applies when unit measurement and Mobitex mode are selected.

Frame size drop down box – Select the number of blocks per frame. Selectable values are 1, 5, 10 and 25. Default selection is 25 blocks per frame. The selected value only applies when Mobitex mode is selected.

bps drop down box – Select the programmed bit rate. Selectable values are 4000, 4800, 8000, 9600 and 16000bps. Default selection is 9600bps. The setting of this control does not write to the Clock Control register on the CMX990. The value selected with this control is used by the firmware to calculate timings for completing various tasks. Therefore, the setting of this control should be identical to the current bit rate setting programmed into the CMX990.

Bits transmitted box – This box is continually updated with the number of bits transmitted, whilst a measurement is ongoing. The box is only updated when transmitting in raw data mode. In other modes it will display zero. This box is read only.

Bits received box – This box is continually updated with the number of bits received, whilst a measurement is ongoing. The box is only updated when receiving in raw data mode. In other modes it will display zero. This box is read only.

Bits received in error box – This box is continually updated with the number of bits received in error, whilst a measurement is ongoing. The box is only updated when receiving in raw data mode and when errors occur. In other modes, or if no errors occur then the box will display zero. This box is read only.

Bits received in error (%) box – This box is continually updated with the number of bits received in error, expressed as a percentage of the total number of bits received, whilst a measurement is ongoing. The box is only updated when receiving in raw data mode and when errors occur. In other modes, or if no errors occur then the box will display zero. This box is read only.

Blocks transmitted box – This box is continually updated with the number of blocks transmitted, whilst a measurement is ongoing. The box is only updated when transmitting in Mobitex mode. In other modes it will display zero. This box is read only.

Blocks received box – This box is continually updated with the number of blocks received, whilst a measurement is ongoing. The box is only updated when receiving in Mobitex mode. In other modes it will display zero. This box is read only.

Blocks received in error box – This box is continually updated with the number of blocks received in error, whilst a measurement is ongoing. The box is only updated when receiving in Mobitex mode and when errors occur. In other modes, or if no errors occur then the box will display zero. This box is read only.

Blocks received in error (%) box – This box is continually updated with the number of blocks received in error, expressed as a percentage of the total number of blocks received, whilst a measurement is ongoing. The box is updated when receiving in Mobitex mode and when errors occur. In other modes, or if no errors occur then the box will display zero. This box is read only.

Measurement status box – This box will indicate when a measurement is running or stopped or when the receiving modem is searching for frame sync. This box is read only.

Start button – Starts measurement. This button is disabled once it has been clicked. It will only be re-enabled after the Stop button has been pressed or a unit based measurement has completed.

Stop Button - Stops an ongoing measurement and re-enables the Start button.

Before starting a measurement check the software settings to ensure that:

- The Tx tab is set to transmit and the Rx tab is set to receive.
- Tx/Rx tabs have the same measurement type, i.e. unit based or continuous measurement.
- Bit sync., frame sync., and control data bytes are the same on Tx/Rx tabs.
- Tx/Rx tabs have the same formatting, i.e. raw data or Mobitex mode.
- The selected bit count is the same for Tx/Rx tabs if carrying out a unit based measurement in raw data mode.
- The selected block count is the same for Tx/Rx tabs if carrying out a unit based measurement in Mobitex mode.
- The selected frame size is the same for Tx/Rx tabs if carrying out a measurement in Mobitex mode.
- The selected bit rate setting is the same on Tx/Rx tabs and also that the setting is the same as the bit rate setting programmed into the CMX990.

Once all settings have been made and checked for transmit and receive tabs then the procedure for starting the measurement is as follows:

- Press the Start button on the receive tab. The Measurement status box will display the text 'Searching for frame sync'.
- Press the Start button on the transmit tab. The Measurement status box should display the text 'Measurement running'. The bit/block count will be updated continuously with the number of bits/blocks transmitted. If the receive board detects the transmitted frame sync. then the Measurement status box on the receive tab will change to 'Measurement running' and the bit/block count will be continuously updated with the number of bits/blocks received. If receive errors occur then the error count and error percentage will be updated accordingly.

6.2. Firmware Description

The hyBoard-XS included with this kit is supplied preloaded with the latest version of the EF9900 firmware. The firmware acts as an interface between the ES9902 application and the EV9900A evaluation board. It receives commands from the ES9902 application, via the USB port, and performs the appropriate actions. All the modem transfer and bit error rate measurement operations are performed by the firmware in real-time and the results reported back to the ES9902 application.

6.2.1. Updating the Firmware

The EF9902 firmware loaded onto the hyBoard-XS can be updated via the USB port using the supplied ESFlash application. To re-program the hyBoard-XS flash:

1. Run the ESFlashxx.exe (where xx is the version number) executable
2. Select EV9902 as the target type
3. Select the required '.bin' file by clicking on the 'Load File' button
4. Click the 'Program' button
5. When prompted, set the position of the hyBoard-XS jumper, ST13, to 5-6 and press the reset button, S1
6. Wait for the hyBoard-XS LED, LED6, to flicker and then remain on
7. When prompted, set the position of the hyBoard-XS jumper, ST13, to 1-2

Once the hyBoard-XS flash has been reprogrammed, it can be run by pressing the reset button, S1, or by cycling the power supply to the hyBoard-XS.

6.3. Hardware Description

The EV9902 kit contains two boards: the hyBoard-XS and the EV9902 Interface Card. These are intended for use with the EV9900A Evaluation Kit only. For a detailed description of the EV9900A Evaluation Kit and the hyBoard-XS hardware, please refer to the relevant datasheet.

The EV9902 Interface Card allows communication between the EV9900A and hyBoard-XS to occur. It connects the EV9900A parallel interface to the hyBoard-XS, address and data buses, and provides the necessary signals for successful communication.

6.4. Troubleshooting

The CMX990 is a complex RF and Baseband system. If incorrectly programmed or modified, results will be at variance from those expected. Please study the CMX990 and EV9900A datasheets, this manual and the associated schematics and layout drawings carefully when troubleshooting.

Error Observed	Possible Cause	Remedy
The ES9902 application is unable to establish a connection to the hyBoard-XS and the LED, LED6, is off.	1 - Bad USB connection	Check the USB cable is connected properly at both the PC and hyBoard-XS. Ensure the USB cable is certified to the USB specifications
	2 – Firmware is not running	Check the hyBoard-XS jumper settings against those in Table 2 and cycle the power supply
The EV9900A is not behaving as expected	1 – Bad connection between the hyBoard-XS and the EV9900A	Check the EV9902 Interface Card connections
	2 – Device setup issue	Please refer to the CMX990 and EV9900A datasheets

Table 3 – Possible Errors

7. Performance Specification

7.1. Electrical Performance

7.1.1. Absolute Maximum Ratings

Exceeding these maximum ratings can result in damage to the Evaluation Kit.

	Min.	Max.	Units
hyBoard Supply ($V_{CC} - G_{ND}$)	0.0	5.5	V
Voltage on any connector pin (excluding power supply pins) to G_{ND} / V_{SS}	-0.3	+3.6	V
Current into or out of hyBoard V_{CC} and G_{ND} pins	0.0	2.0	A
Current into or out of any other connector pin (excluding power supply pins)	-20	+20	mA

7.1.2. Operating Limits

Correct operation of the Evaluation Kit outside these limits is not implied.

	Notes	Min.	Max.	Units
Supply ($V_{CC} - G_{ND}$)		4.75	5.25	V

7.1.3. Operating Characteristics

For the following conditions unless otherwise specified:

hyBoard Supply ($V_{CC} - G_{ND}$) = 5.0V

	Notes	Min.	Typ.	Max.	Units
DC Parameters					
I_{CC} (operating)			800		mA

Notes:

Operating Characteristics - Timing Diagrams

Please refer to CMX990 Datasheet for details.

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 CML Microcircuits (UK) Ltd COMMUNICATION SEMICONDUCTORS	 CML Microcircuits (USA) Inc. COMMUNICATION SEMICONDUCTORS	 CML Microcircuits (Singapore) Pte Ltd COMMUNICATION SEMICONDUCTORS
Tel: +44 (0)1621 875500 Fax: +44 (0)1621 875600 Sales: sales@cmlmicro.com Tech Support: techsupport@cmlmicro.com	Tel: +1 336 744 5050 800 638 5577 Fax: +1 336 744 5054 Sales: us.sales@cmlmicro.com Tech Support: us.techsupport@cmlmicro.com	Tel: +65 67450426 Fax: +65 67452917 Sales: sg.sales@cmlmicro.com Tech Support: sg.techsupport@cmlmicro.com
- www.cmlmicro.com -		