Consumer Microcircuits Limited

COMMUNICATION SEMICONDUCTORS

EV9000
Evaluation Kit
User Manual

CMX909B, CMX969, FX919B, FX929B

Modem Evaluation Kit

USER MANUAL CONTENTS

1.0   General Information

1.1   Introduction

This manual provides general information to support the installation and operation of the EV9000 Modem Evaluation Kit, a complete test platform to demonstrate and test the CMX909B, CMX969, FX919B, and FX929B components.

All trademarks and service marks are held by their respective owners.

1.2   Warranty

The EV9000 hardware and software have been developed and are being provided to help designers develop designs based on the CMX909B, CMX969 FX919B, and FX929B modem data pump ICs. Every reasonable effort has been made to provide high quality and performance in pursuit of that goal.

Toward that end, CML is happy to answer questions and provide general assistance concerning the EV9000's use. Our greatest desire is to help the user to succeed. Section 5.4 contains details of how to contact CML.

Since experiments and designs are the responsibility of the EV9000 user, CML's liability regarding the use of the EV9000 is in all cases limited to the EV9000 purchase price.

No other warranty is expressed or implied.

1.3   EV9000 Features

The EV9000 Modem Evaluation Kit includes many useful features including those highlighted in Table 1.

• Two complete modem channels easily configured to the user's selection of CMX909B, CMX969, FX919B, or FX929B components	• Windows based PC software provides virtual pushbutton control of all modem parameters
• Exposed hardware interface supports the connection of modem circuits to end-system designs	• Software selection of on-board signal biasing and off-board noise signals for convenient and repeatable multivariable testing
• Display the state of each modem's internal registers	• Parallel port connection to a PC
• Software controlled test sequences with result logs	• User selectable baud rates and choice of two crystal clock rates
• Prebuilt plug-in personality boards for narrow bandwidth 8kb/s GMSK, wider bandwidth 38.4kb/s GMSK, MDC4800 (4800bps) and 19.2kb/s 4 Level FSK operation	• Blank plug-in personality boards for user customised configurations

Table 1: EV9000 Features

1.4   CMX909B, CMX969, FX919B, FX929B Modem Features

The CMX909B, CMX969, FX919B, and FX929B components include Gaussian filtered minimum shift keying (GMSK) and four level frequency shift keying (4 Level FSK) modems. They execute a rich set of communication protocol tasks to maximize performance and minimize end product power consumption and cost. Well suited to portable wireless applications, these modems include the following automated functions:

- Bit or symbol synchronisation
- Frame synchronisation
- Forward error correction (FEC)
- Data interleaving for FEC enhancement
- Cyclic redundancy checking (CRC)
- Block transmit and receive tasks:
  Header, Intermediate, and Last block formats
- Support for protocols such as MDC4800, Mobitex™ and RD-LAP™.

1.5   Handling Precautions

Like most evaluation boards, the EV9000 is designed for use in office and laboratory environments.   The following practices will help ensure its proper operation.

1.5.1   Unpacking
Ensure that all of the items mentioned in the separate Information Sheet (EK9000) are present in the correct quantities. Notify CML (via your distributor) within 7 working days if the delivery is incomplete.

1.5.2   Static Protection
The EV9000 uses low power CMOS circuits which can be partially or completely damaged by electrostatic discharge. Partially damaged circuits can erroneously function and provide misleading test results which can be time consuming (and extremely frustrating) to resolve.

Before handling the EV9000, discharge your body by touching a grounded connection or by using a wrist strap. Work surfaces and tools (e.g. a soldering iron) should also be grounded before they contact the EV9000.

1.5.3   Cleanliness
Because some EV9000 circuits are very high impedance, it is important to maintain their cleanliness. All flux and other contaminants should be thoroughly removed after making any modifications.

1.6 Compatibility

Compatibility between different versions of EV9000 hardware and software, and the "9x9" series devices is as shown in Table 2.

Device	Personality Card Type	Rx Filter C1	Tx Filter C2	DOC1 C3	DOC2 C4	Data Rate	Software	Revision
CMX909B	A or 909-8	-	470pF	15nF	15nF	8kb/s	ES9090xx.EXE	N/A
FX919B or FX929B	B or 919/29	82pF	82pF	4.7nF	4.7nF	9.6ks/s	ES9000xx.EXE	2
CMX969	969	100pF	100pF	-	-	9.6ks/s or 4.8kb/s	ES9690xx.EXE	N/A
CMX909B	909-38	-	82pF	3.3nF	3.3nF	38.4kb/s	ES9090xx.EXE	N/A
FX909A	A or 909-8	-	470pF	15nF	15nF	8kb/s	ES9000xx.EXE	1

Table 2: Compatibility

Notes:

1. Customers using the revision 002 motherboard (PCB) should note that jumpers E13 to E18 inclusive, which are mentioned in the EV9000 User Manual, only exist on the revision 003 PCB. Customers should retain their copy of the DB900 User Manual for the description of the revision 002 PCB, but should use the EV9000 User Manual for a description of the latest software.

2. Customers evaluating FX909A may use the FX919B/929B software (ES9000xx.EXE) with the "FX909A" chip selected. Customers should also remember to set the chip type and driver revision select button (Figure 4) to the "Rev 1" position when evaluating the FX909A.

3. Customers wishing to evaluate FX919A or FX929A devices may use either revision 002 or 003 motherboard (PCB), but should continue to use the DB900 User Manual and "DB" software (variously described as DB900.EXE v1.11 or CML Rev 4), available separately from CML.

   Releases of EV9000 executable software marked Rev 4.1 or later should not be used as they exercise features only available on the FX919B and FX929B devices.

4. FX909, FX919 and FX929 devices are not supported with the EV9000 Evaluation Kit.

5. Older personality boards had identification tags marked "A", "B", etc. The latest personality boards have a mark placed against the device type with which they are to be used (eg. "909-38" for a CMX909B operating at 38.4kb/s, etc). The layout of the latest blank personality board is shown in Figure 2: when configured for a particular device, surface mount capacitors are soldered to the appropriate locations and the board is marked, as described above.

1.7 Specifications

The EV9000 supports the following devices: CMX909B, CMX969, FX919B, and FX929B. All voltages are referenced to GND. Connections provided on the EV9000 hardware have the characteristics shown in Tables 3 and 4.

EV9000 Characteristic		Min	Typical	Max	Units
+5V (=Vs)	power				
voltage		4.5	5.0	5.5	V
current			50		mA
-5V (=-Vs)	power				
voltage		-5.5	-5.0	0	V
current			20		mA
+5VM (=Vm)	modem power				
voltage		3.0	5.0	5.5	V
current			30		mA
AGND	power	0	0	0	V
RXINA	I/P				
voltage		-Vs		Vs	V
impedance		22		222	kΩ
TXOUTA	O/P		1		Vp-p
NSA1	I/P				
voltage		-Vs		Vs	V
impedance		22		222	kΩ
NSA2	I/P				
voltage		-Vs		Vs	V
impedance		22		222	kΩ
RXINB	I/P				
voltage		-Vs		Vs	V
impedance		22		222	kΩ
TXOUTB	O/P		1		Vp-p
NSB	I/P				
voltage		-Vs		Vs	V
impedance		22		222	kΩ
PTT (open collector)	O/P				
collector voltage		0		20	V
collector current (PTT < 0.5V)				25	mA
CS	I/P	0		Vm	V

EV9000 Characteristic	Min	Typical	Max	Units
Temperature				
operating	20	25	30	°C
storage	-40		80	°C
Relative Humidity (non-condensing)	0		95	%
PC Interface	Centronics compatible			

Table 3: Wire Connector Interface Specifications

Vm = "+5VM", Vs = "+5V", and -Vs = "-5V" as per Table 6.

Characteristic	Min	Typical	Max	Units
input voltage				
AO0-AO5	0		Vm	V
CO0-CO7	0		Vm	V
DO4, DO5	0		Vm	V
BO2, BO3, BO4	0		Vs	V
output load				
CO0-CO7	consult modem data sheet			

Table 4: P1/P2 Header Interface Specifications

Vm = "+5VM", Vs = "+5V", and -Vs = "-5V" as per Table 6.

1.8   Prerequisites and Required Equipment

1.8.1   Prerequisites
In order to effectively use the EV9000 Modem Evaluation Kit software, the user must have a working knowledge of Microsoft Windows™ and be familiar with the operation of typical Windows compatible applications.

1.8.2   Power Supply
A user provided power supply is required for +5V and -5V power. An additional supply may be required for modem IC operation at other supply voltages.

1.8.3   Personal Computer
An IBM compatible PC is required which meets the following description:

Item	Specifications/Performance
CPU	20MHz 386 or better. Lower performance PCs may operate successfully at lower modem data rates.
Operating System	Windows 3.x, Windows '95 or Windows '98
Parallel Port	LPT1, LPT2 or LPT3

Table 5: Personal Computer Requirements

1.8.4 Parallel Port Cable
A 25 conductor parallel port cable is supplied having male DB25 connectors at both ends.

1.9 Limitations

1.9.1 Software
The EV9000 software uses Microsoft Windows to ease setup and operation while providing flexibility and power. However, the high sustained throughput required of the parallel port connection to the EV9000 Evaluation Kit cannot be supported by Windows. As a result, the EV9000 software bypasses some DOS and Windows conventions. Please note that concurrent tasks will be suspended during execution of the EV9000 sofware. Network software may have to be restarted after using this evaluation kit. The EV9000 software will also stop the PC's clock, so timestamps when saving files may not be accurate.

The EV9000 software will occupy all the PC's resources during various tests. This prevents keyboard activity from being recognized during test execution. Any tests which wait until a modem produces a specific logic output signal (e.g. BFREE becomes logic 1) will execute indefinitely if the test setup is inappropriate. The program may appear to be stuck in such a case. The EV9000 HALT switch must be pressed to terminate the test. Please note that traditional Windows commands such as Alt-Tab and Alt-Ctl-Del may not work when the software is busy. Trying to use the software without an evaluation kit connected to the PC parallel port may cause the software to hang if a test is executed. If this happens, pressing the Alt-Ctl-Del keys on the PC keyboard may enable you to quit from the application. Otherwise, a hard reset of the PC will have to be performed.

Please note that the EV9000 software is **NOT** suitable for use under Linux, OS2, Windows '2000 or Windows NT operating systems.

In addition, some atypical PC's may have software and/or hardware incompatibilities with the EV9000 Modem Evaluation Kit.

1.9.2 Hardware

1.9.2.1 Initialising
There is no hardware reset switch or function in the EV9000 hardware design. The HALT switch (SW1) produces a signal used by the EV9000 software to indicate that a test should be terminated. In order to be sure of the state of the hardware, the EV9000 software must be started after the EV9000 is powered and the parallel port connection has been made between the PC and EV9000. Failure to follow this procedure could produce spurious commands which affect the hardware state. Upon being started, the EV9000 software will initialise all of the EV9000 hardware.

1.9.2.2 Parallel Port Compatibility
The EV9000 parallel interface design is compatible with most PC parallel ports. However, the integral pull-up resistors provided with certain PC parallel ports are too high in value to support the required digital signal speeds. Accordingly, the EV9000 parallel port interface circuit includes supplementary 560Ω pull-up (to +5V) resistors on pins 1, 14, 16, and 17 of the DB25 parallel port connector. These may not be needed when interfacing to certain types of PC and may be disconnected by removing jumpers E13, E14, E15 and E16 if the PC has insufficient drive capability on its parallel port. One should also use a parallel port cable less than, or equal to, 1.5 metre long because the capacitance of longer cables limits signaling speed. Nonetheless, in some cases a PC's parallel port may still not operate quickly enough.

2.0   Quick Start

2.1   Introduction

This section provides instructions for users who wish to rapidly start experimenting with the EV9000 using 8kb/s GMSK modulation with the CMX909B - and without reading all of the detailed instructions. Brief instructions for reconfiguring the EV9000 to evaluate FX919B, FX929B or CMX969 products are also included. The "quick start" setup connects the two modem channels so that each channel's Tx output is connected to the other channel's Rx input. These instructions *assume* that the EV9000's factory adjustments have not been altered. If they have, the EV9000 jumper positions and Rx / Tx signal gain and bias controls must be adjusted for the "quick start" procedure to be successful. If the EV9000's jumpers or gain and bias controls have been altered, refer to Section 3.3.

2.2   First...

Review Sections 1.5 to 1.9 above. Don't worry, those sections are very short and will help you to avoid damaging the EV9000 or your equipment.

2.3   Second - Setup

1.   Select which type of modem to test. The EV9000 comes with CMX909B modems installed along with their appropriate personality plug-in boards. If you want to use a different modem, *carefully* remove the installed modems with an IC extraction tool and install a matching pair of modems. (If you do not have an extraction tool, a small flat bladed screwdriver can be very carefully inserted between the IC and its socket at each end. Do this a little bit at a time, twisting the screwdriver blade and alternating between each end of the IC until it lifts free of its socket. Take care not to lever against other components or the PC board as they may be damaged.) *Make sure* you properly orient the ICs to ensure pin 1 is in the proper socket location, as shown in Figure 1.

mark indicates pin 1 end of IC and its socket

Top View
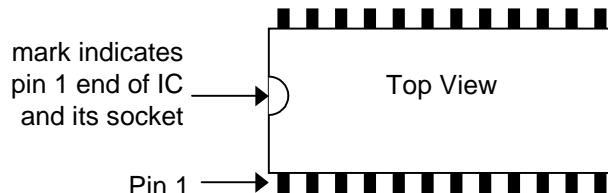
Pin 1

Figure 1: IC Pin 1 Identification

2.   Connect the appropriate crystal into the circuit according to the following directions:

  • IF CMX909B modems are installed, change jumpers E5, E6, E10 and E11 to position A.

  • IF CMX969, FX919B or FX929B modems are installed, change jumpers E5, E6, E10 and E11 to position B. (For more information, see Table 12 and Figure 10).

3.   Select and carefully install the appropriate pair of personality plug-ins to match the selected modem according to Table 2. The layout of a blank personality board is shown in Figure 2.
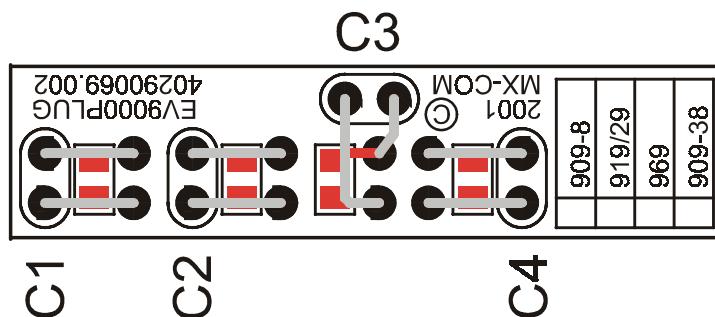
Figure 2: Blank Plug-In Personality Board

4. Make the following supply connections *with power off* to the EV9000 motherboard:

   - 5V power to +5V and +5VM connector
   - supply ground to GND connector
   - signal ground to AGND connector (any of the several AGND connectors is ok)
   - -5V power to -5V connector

   Check that these connections are correct, as connecting up the wrong supplies could destroy circuits on the motherboard.

5. Make the following signal connections on the EV9000 motherboard:

   - TXOUTA to RXINB
   - TXOUTB to RXINA

6. Connect your PC's parallel port to the EV9000 motherboard DB25 connector.

7. Copy the appropriate applications software from the Evaluation Kit CD-ROM to a hard disk on the PC.

   - For CMX909B evaluation, use the file ES9090xx.EXE

   - For CMX969 evaluation, use the file ES9690xx.EXE

   - For FX919/929B evaluation, use the file ES9000xx.EXE
     (where xx is the version number).

8. Turn on power to the EV9000.

9. On the PC, start Windows and run the appropriate applications software by double-clicking on its name as seen in a File Manager window. (You can also create a program icon in the Program Manager for more convenient program launching.)

10. Select the desired PC parallel port and its base address from the pull-down list shown in Figure 3. Base addresses automatically default to typical values so changes to them are usually not required.
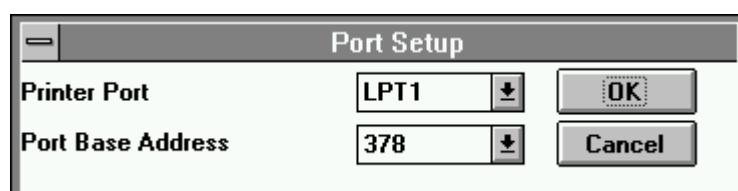
Figure 3: Parallel Port Configuration

11. Referring to Table 2, select the chip type (where available) and driver revision (where available) using the buttons and pull-down list shown in Figure 4. (Note that the "Rev 1" position should be used for FX909A and the "Rev 2" position (default) should be used for FX919B and FX929B, if using the ES9000xx.EXE software).
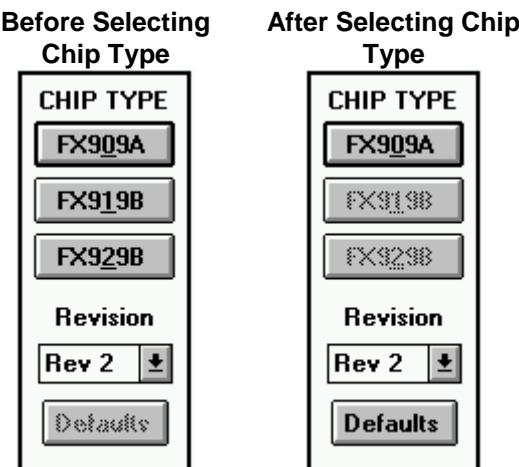
Figure 4: Chip Type and Driver Revision Select (ES9000xx.EXE software only)

The EV9000 motherboard's two modem channels are now wired to 'talk' to each other and the software is ready to execute modem operations.

12. Using the pull-down list near the bottom of the window, select Test 1: "PC Interface Test" to initiate a test of the connection between the PC and the EV9000. This test continuously reads IRQN A, IRQN B, Carrier Detect, and the HALT switch and logs any state changes to the scrolling log area. Slowly press and release the EV9000 HALT switch and observe the changes reported in the log. When you have verified the operation of the PC interface by confirming the logging of HALT switch activity, click the `Stop` button to stop the test.

If HALT switch pressing and releasing actions are not logged on the PC, the PC to EV9000 connection is not operating properly. If this is the case, recheck your setup and review Section 1.9. This test must be successful in order to operate the EV9000.

13. Click on the `Default` button to set default values for both channels' Command, Control, and Mode registers. The default Xtal frequency value is also entered. (The Xtal frequency value which is displayed in the EV9000 software is simply a calculation aid for on screen display of the configured data rate. The displayed data rate is calculated from the entered Xtal frequency and the channel's selected CKDIV value in the Control Register area. Changing this value does not actually change EV9000 operation in any way. The modem Xtal frequency is set by the user's jumper selection of installed crystals.)

The EV9000 is now ready to execute a test.

2.4 Third - Select and Execute a Test

1. Use the Test Selection list box to select Test 7: "Tx user defined packet from B to A driving PTT and starting acquire on CS". This test will exercise the two modem channels to transfer a complete message from channel B to channel A. The message makes use of realistic block types (e.g. Header, Intermediate, and Last blocks) to expose the transmit parameters and receive information which are involved in a message transfer. In addition, other information such as the state of the modems' data quality outputs are observed and recorded during the course of the experiment. See Section 4.6.6 for a more detailed description of this test. Please note that this test does not exist in the EV9690xx.EXE software.

   Probes may also be attached to the modem circuits to observe the sequence of hardware events involved in the transmit and receive process. Test 7 asserts PTT on transmit and uses CS to trigger the reception process on the receive channel (A). These are important signals in most wireless systems: Push To Talk is used to key on a radio transmitter and Carrier Sense is asserted by a radio receiver to trigger a receive modem's receive process.

2. Click on the GO button. A window containing various transmit message parameters will appear. These parameters are set to defaults which should be retained for the Quick Start procedure to avoid inadvertently selecting inappropriate values which could cause the test to fail. (After the test is operating successfully, go ahead and experiment with modifications.)

3. Click on the OK button to accept the displayed transmit message parameters and execute the test. The test should finish within a few seconds, displaying a new window containing receive message information. (If there is no response, the message transfer has failed. Push and release the HALT switch to abort the test. Check your steps and repeat them if necessary to make sure they were executed correctly. If the test still will not pass, it is likely that the motherboard gain and bias adjustments may have been changed from the factory settings. Refer to Section 3.3 for a description of the adjustment procedure.)

4. The receive message information window reports received data and other important information e.g. CRC received error check indications. After examining it, click on the OK button to proceed. A window will appear presenting you with the opportunity to save the complete test results to a disk file. If desired, click OK to save your results and select a file name and location.

2.5 Fourth - Explore

Now that you have successfully set up and operated the EV9000 to transfer complete messages, you can perform many other experiments using your own configurations. Some possibilities are: measure bit error rates, develop Rx eye diagrams, and determine the affects of noise and dc offset. You can even integrate the EV9000 with your own rf system.

Read Section 3 Hardware and Section 4 Software to learn more details to support your own designs.

3.0   Hardware

3.1   Introduction

This section describes the hardware and its adjustment.

3.2   Description

3.2.1   Functional Layout
The EV9000 motherboard is divided into functional areas as indicated in Figure 5.
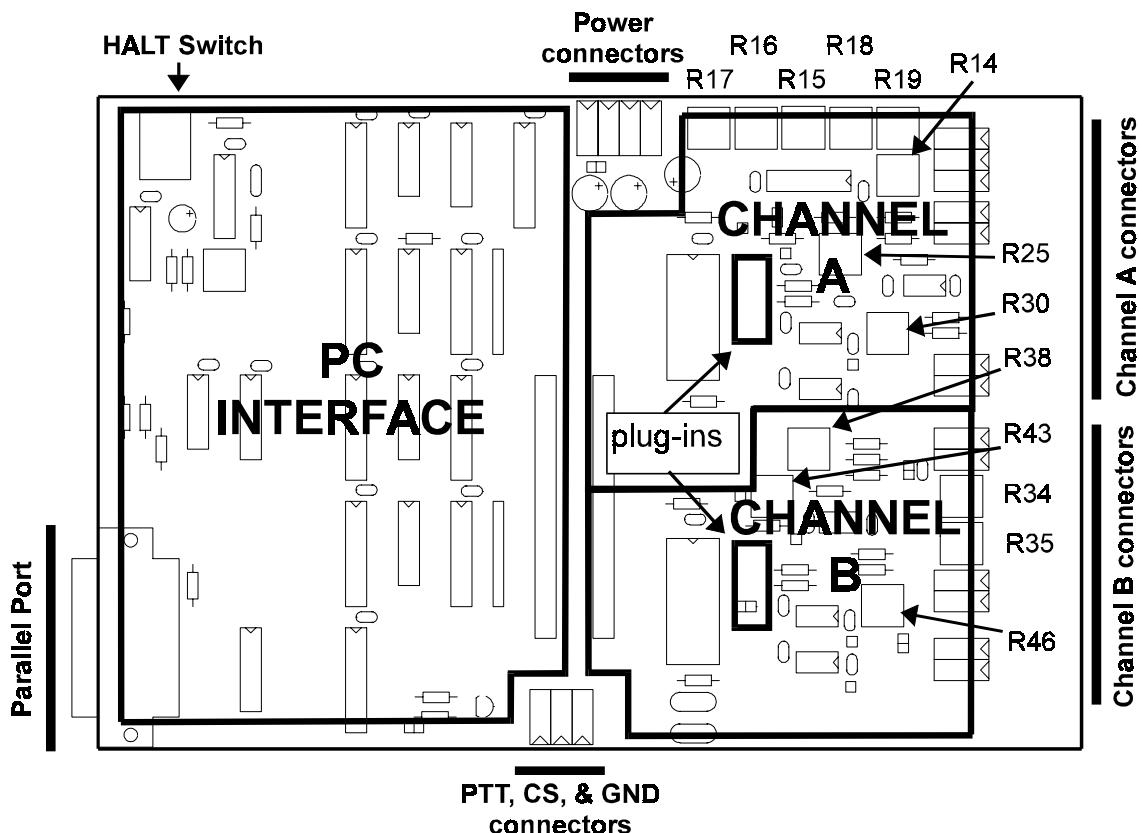

Figure 5: Motherboard Functional Layout

3.2.2   Personality Plug-In Boards
The EV9000 motherboard has two complete modem circuits. Each circuit includes a modem IC and an accompanying personality plug-in board. There are up to four capacitors on the plug-in board which must be altered for different modem types and data rates. These four capacitors are used in: Rx filtering, Tx filtering, and two for Rx level measurement. (The Rx level measurement capacitors are referred to as DOC1 and DOC2 in the modem data sheets.) The locations of these plug-ins are shown in Figure 5.

Blank plug-ins are also provided and may be populated with user selected components depending upon desired baud rates and other circuit characteristics.   Figure 2 shows the plug-in layout and indicates each component's function. Both through-hole and surface mount pads are provided in each component location. For an explanation of how to make component selections, refer to the relevant modem data sheets.

3.2.3   Connectors

Clamping connectors are distributed around the perimeter of the EV9000 motherboard as shown in Figure 5. Silkscreen labels on the motherboard identify these connectors, listed in Table 6.

Name	Type	Description
Supply		
+5V	power	Positive digital supply voltage for the motherboard. Used to supply most components used in the parallel port interface as well as buffering and amplifier circuits in the modem circuits.
-5V	power	Interface circuit negative supply
GND	power	Routed separate from the modem circuits' signal grounds to reduce the amount of ground noise which is injected (from the PC interface circuits) into the modem circuits.
+5VM	power	The positive supply for both Channel A and B modem ICs. It may be set independent of the +5V positive supply to support modem experiments over realistic supply voltage ranges.
AGND	power	The analogue ground for analogue signals including Rx, Tx, and injected noise. Several connectors are provided with access to this node.
Channel A		
RXINA	input	Receive input modem channel A
TXOUTA	output	Transmit output modem channel A
NSA1	input	Noise source input #1 modem channel A
NSA2	input	Noise source input #2 modem channel A
Channel B		
RXINB	input	Receive input modem channel B
TXOUTB	output	Transmit output modem channel B
NSB	input	Noise source input modem channel B
Radio Control		
PTT	output	Push to talk, used to key an attached transceiver
CS	input	Carrier sense input indicates that Rx data is (or will soon be) valid

Table 6: Connector Signal Descriptions

3.2.4   Signal Flow

The following block diagrams (Figures 6 to 9) indicate the modem signal flow paths. These diagrams use coded variables as described in Table 7.

| Key	Meaning		Key	Meaning
K#	adjustable gain via potentiometer		sw#	switch control via software
v#	adjustable bias via potentiometer		E#	jumper

Table 7: Signal Path Block Diagram Key
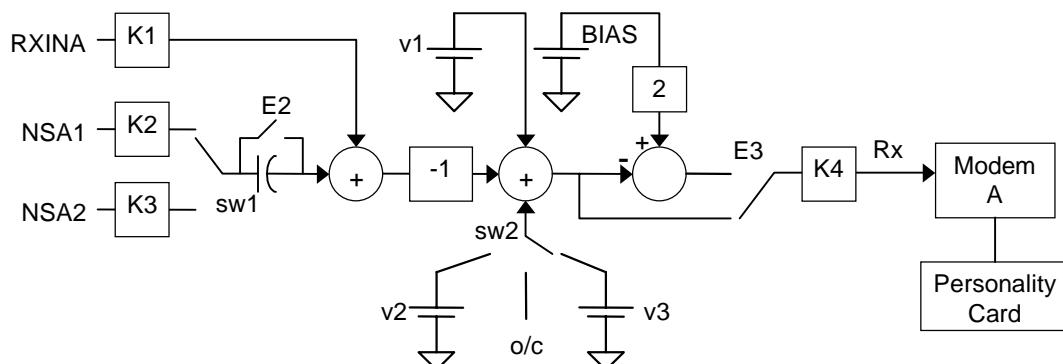
Figure 6: Channel A Receive Path

Element	Purpose	Component Designator	Approximate Range
v1	Used to bias the input signal applied to K4 to a nominal mean dc level of V_{BIAS} (=½ of +5VM).	R17	-5V to 5V
v2	Bias corresponding to DC offset #1 software selection. This allows the user to preset the bias introduced when the software DC offset #1 is activated.	R15	-5V to 5V
v3	Bias corresponding to DC offset #2 software selection. This allows the user to preset the bias introduced when the software DC offset #2 is activated.	R16	-5V to 5V
K1	Gain adjustment on receive data input, RXINA	R14	0.5 to 5
K2	Gain adjustment on noise signal input #1, NSA1	R19	0.5 to 5
K3	Gain adjustment on noise signal input #2, NSA2	R18	0.5 to 5
K4	Gain adjustment on composite receive input to modem. This is generally used to achieve the proper input signal level to the modem.	R25	0.5 to 5
sw1	Software controlled switch which reflects the software selection of which noise source is injected.	not applicable	not applicable
sw2	Software controlled switch which reflects the software selection of DC offset.	not applicable	not applicable
E2	Jumper to select choice of ac or dc injected noise coupling. Jumper installed for dc coupling.	E2	not applicable
E3	Jumper to select whether input signal is inverted. Jumper position A for invert.	E3	not applicable

Table 8: Channel A Receive Path Adjustments and Controls
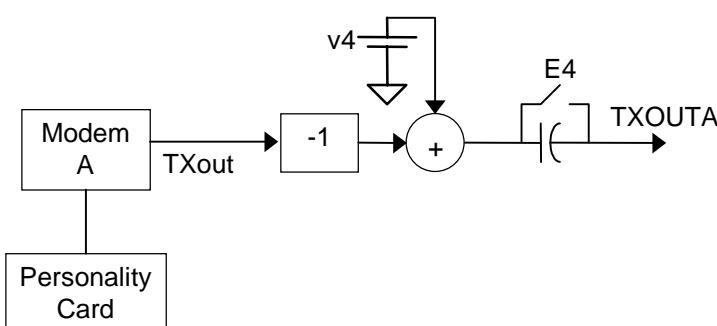
Figure 7: Channel A Transmit Path

Element	Purpose	Component Designator	Approximate Range
v4	Used to bias the output signal to a user desired mean level.	R30	-5V to 5V
E4	Jumper to select choice of ac or dc coupled TXOUTA connector. Jumper installed for dc coupling.	E4	not applicable

Table 9: Channel A Transmit Path Adjustments and Controls
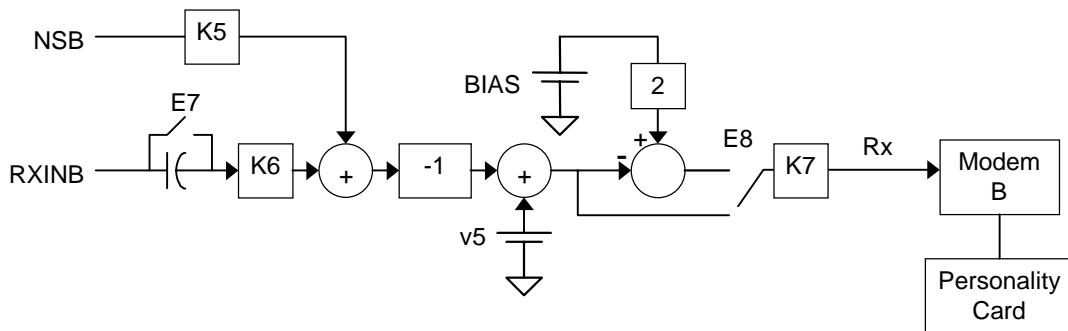
Figure 8: Channel B Receive Path

Element	Purpose	Component Designator	Approximate Range
v5	Used to bias the input signal applied to K7 to a nominal mean dc level of V_{BIAS} (= ½ of +5VM).	R38	-5V to 5V
K5	Gain adjustment on noise signal input, NSB	R35	0.5 to 5
K6	Gain adjustment on receive data input, RXINB	R34	0.5 to 5
K7	Gain adjustment on composite receive input to modem. This is generally used to achieve the proper input signal level to the modem.	R43	0.5 to 5
E7	Jumper to select choice of ac or dc receive signal input coupling. Jumper installed for dc coupling.	E7	not applicable
E8	Jumper to select whether input signal is inverted. Jumper position A for invert.	E8	not applicable

**Table 10: Channel B Receive Path Adjustments and Controls**
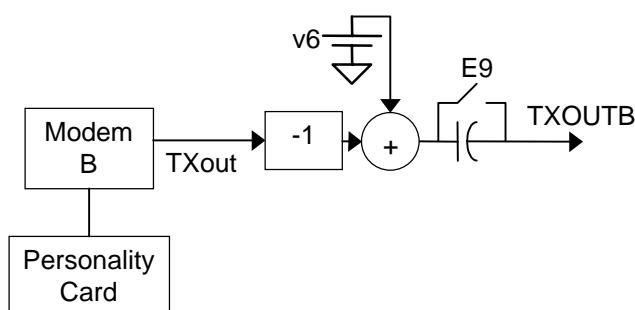
Figure 9: Channel B Transmit Path

Element	Purpose	Component Designator	Approximate Range
v6	Used to bias the output signal to a user desired mean level.	R46	-5V to 5V
E9	Jumper to select choice of ac or dc coupled TXOUTB connector. Jumper installed for dc coupling.	E9	not applicable

Table 11: Channel B Transmit Path Adjustments and Controls

3.2.5   Jumpers

Several jumpers are provided to select various functions. They are described in Table 12 and their positions indicated in Figure 10. Section 3.2.4 also indicates jumper functions in schematic form. In setting E5, E6, E10 and E11, it should be noted that crystal settings are application, not device, dependant. If capacitors C3, C7, C12 or C16 are not installed, some of the jumpers will not operate as described.

Name	Function	Positions	Default
E1	Connect PTT and CS signals ***CAUTION: This jumper should not be installed when the +5VM supply is less than the +5V supply. For this case, the header pins may be connected with a 100kΩ resistor without installing the jumper block.***	install	in
E2	Channel A noise injection coupling (see Figure 6)	in = dc out = ac	in
E3	invert channel A Rx path (see Figure 6)	A = invert B = no invert	B
E4	Channel A Tx output coupling (see Figure 7)	in = dc out = ac	in
E5	Channel A Xtal frequency (must match jumper E6 position)	A = 8.192MHz (eg. CMX909B) B = 9.8304 MHz (eg. CMX969, FX919B/929B)	B

| Name	Function	Positions	Default
E6	Channel A Xtal frequency (must match jumper E5 position)	A = 8.192MHz (eg. CMX909B) B = 9.8304 MHz (eg. CMX969, FX919B/929B)	B
E7	Channel B Rx input coupling (see Figure 8)	in = dc out = ac	in
E8	invert channel B Rx path (see Figure 8)	A = invert B = no invert	B
E9	Channel B Tx output coupling (see Figure 9)	in = dc out = ac	in
E10	Channel B Xtal frequency (must match jumper E11 position)	A = 8.192MHz (eg. CMX909B) B = 9.8304 MHz (eg. CMX969, FX919B/929B)	B
E11	Channel B Xtal frequency (must match jumper E10 position)	A = 8.192MHz (eg. CMX909B) B = 9.8304 MHz (eg. CMX969, FX919B/929B)	B
E12	Connects +5V power to +5VM power. **CAUTION: Do not install jumper when supplies are connected to both of the +5V and +5VM connectors.**	in = connected out = separate	out
E13	Pull-up resistor to pin 1 of the DB25 parallel port connector	in = connected out = isolated	in
E14	Pull-up resistor to pin 17 of the DB25 parallel port connector	in = connected out = isolated	in
E15	Pull-up resistor to pin 16 of the DB25 parallel port connector	in = connected out = isolated	in
E16	Pull-up resistor to pin 14 of the DB25 parallel port connector	in = connected out = isolated	in
E17	V_{DD} isolation of Channel B modem IC. Remove to measure I_{DD}	in = connected out = isolated	in
E18	V_{DD} isolation of Channel A modem IC. Remove to measure I_{DD}.	in = connected out = isolated	in

Table 12: Jumpers
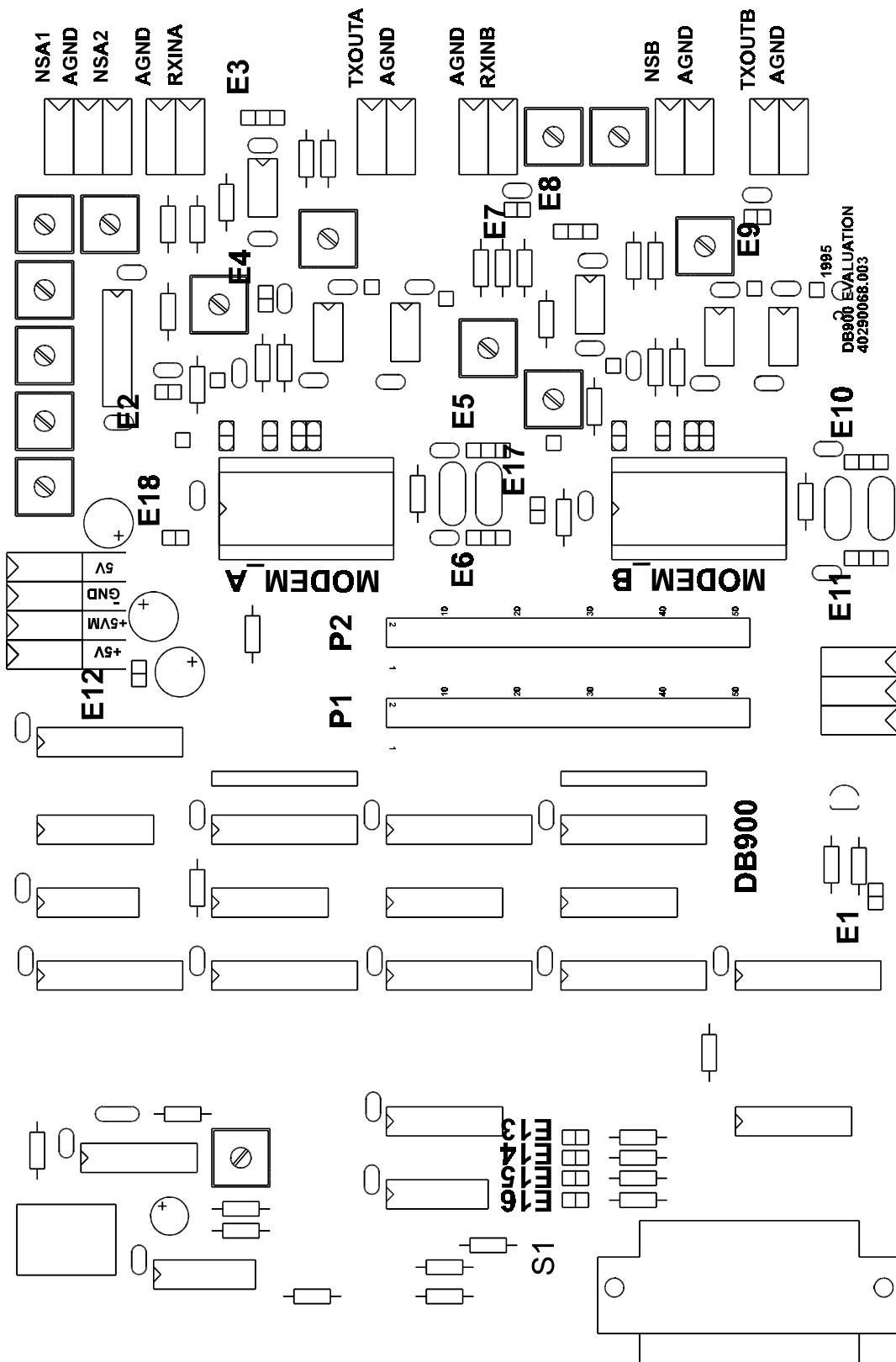
Figure 10: Jumper Locations

3.2.6 Test Points

Test points are provided for easy probe access to important circuit nodes. They are described in Table 13 and their positions indicated in Figure 11. Jumpers, described in Section 3.2.5, also provide convenient probe points. Note that the DOC pins (TP3, TP4, TP7 and TP8) should not be monitored directly as they are high impedance points.

| Name	Channel	Node Description
TP1	A	Rx feedback
TP2	A	V_{BIAS} output level (not buffered)
TP3	A	DOC2 voltage (buffered)
TP4	A	DOC1 voltage (buffered)
TP5	B	Rx feedback
TP6	B	V_{BIAS} output level (not buffered)
TP7	B	DOC2 voltage (buffered)
TP8	B	DOC1 voltage (buffered)

Table 13: Test Points
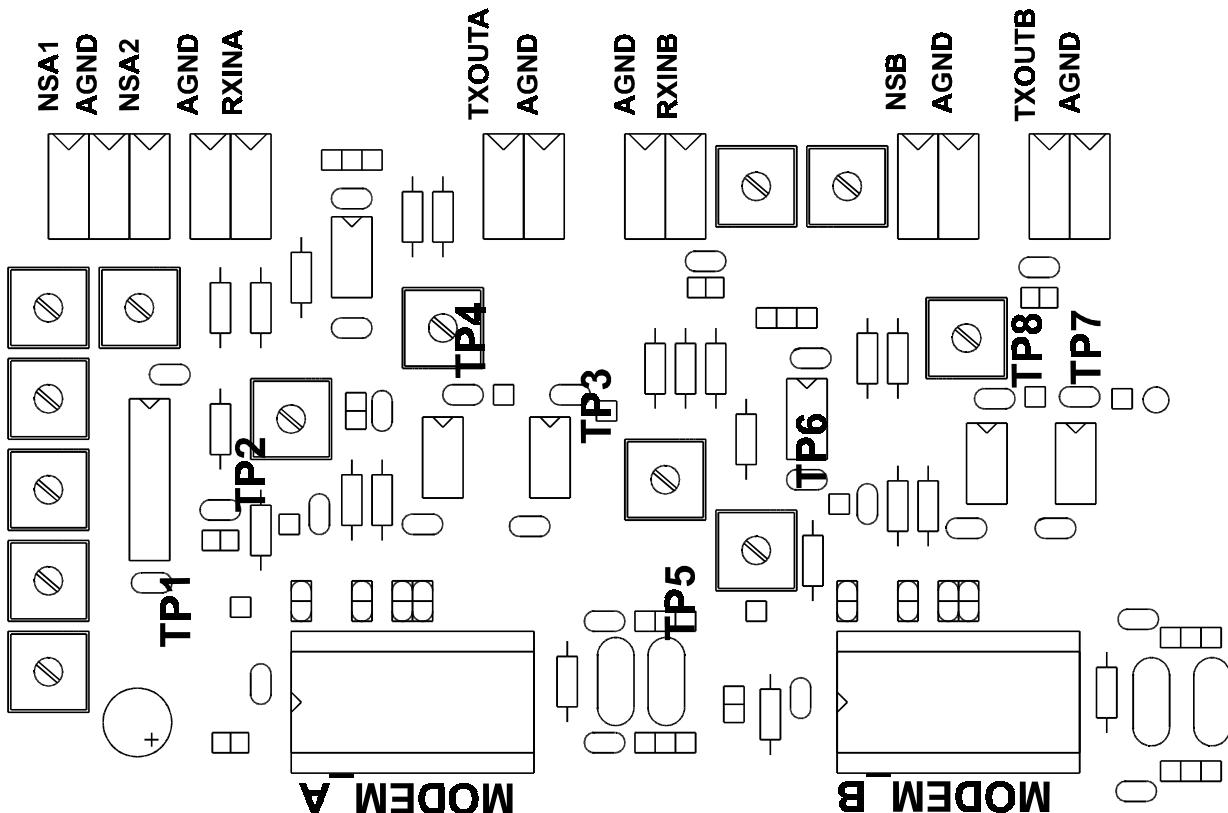
Figure 11: Test Point Locations

3.2.7   PC Parallel Port Interface

The EV9000 parallel port interface is Centronics parallel compatible and provides a DB25 female socket (requires a DB25 male connector on a 25 way cable) to be connected to a suitable PC parallel port. The location of the parallel port interface is shown in Figure 5. For best results, the parallel port cable length should be less than or equal to 1.5m. Refer to Section 1.9.2 for a description of parallel port limitations. Note that pull-up resistors (normally installed on this interface) may be disconnected by removing jumpers E13, E14, E15 and E16.

3.2.8   HALT Switch

The HALT switch produces a signal which indicates to the EV9000 software that an ongoing test should be aborted.

3.2.9   Exposed Modem Interface - 50 Pin Header

The EV9000 motherboard uses a 50 conductor "bridge" of ribbon cable to interconnect its modem circuits and PC parallel interface circuits. This bridge connects P1 and P2 headers and may be removed to support experiments which directly couple external circuits to the EV9000 motherboard.

This interface exposes all logic signals on both modem IC's. It provides analogue switch controls which may be used to switch noise sources into and out of the data signal path. Specific signals are identified along with their pin assignments in the attached EV9000 motherboard schematics.

When the bridge is removed, no control of the EV9000 circuits is possible via the PC parallel port interface. Care should be taken to drive the modem and control lines at this interface according to Table 4 to avoid damaging the EV9000.

3.3   Setup

This section describes the electrical setup and adjustment of the EV9000 hardware. Because the EV9000 hardware supports different modems and configurations, some setup is performed before the application of power. After power is applied, hardware adjustments to gain and bias circuits may be made and verified. If you have not already done so, review Section 1.9 and install the EV9000 software on your PC as described in Section 4.2. In addition, refer to Section 3.2 to gain an understanding of the hardware functions before proceeding.

This section describes and explains the factory hardware adjustment procedure. Similar techniques may be applied for user configured situations. CMX909B, CMX969, FX919B and FX929B are all set up using the same procedure, described below:

3.3.1   Unpowered
1.   Review Section 3.2.5 and install jumpers into their default positions.

2.   Select which type of modem to test. The EV9000 comes with CMX909B modems installed along with their appropriate personality plug-in boards. If you want to use a different modem, *carefully* remove the installed modems with an IC extraction tool and install a matching pair of modems. (If you do not have an extraction tool, a small flat bladed screwdriver can be very carefully inserted between the IC and its socket at each end. Do this a little bit at a time, twisting the screwdriver blade and alternating between each end of the IC until it lifts free of its socket. Take care not to lever against other components or the PC board as they may be damaged.) *Make sure* you properly orient the ICs to ensure pin 1 is in the proper socket location, as per Figure 1.

3.   Connect the appropriate crystal into the circuit according to the following directions:

- If CMX909B modems are installed, change jumpers E5, E6, E10 and E11 to position A.
- If CMX969, FX919B or FX929B modems are installed, change jumpers E5, E6, E10 and E11 to position B. (For more information, see Table 12 and Figure 10)

4.   Select and carefully install the appropriate pair of personality plug-ins to match the selected modem according to Table 2.

5.   Without connecting them to the EV9000, turn on the power supplies and adjust their output voltages to values within the specifications indicated in Table 3. Turn off the supplies and connect them to the appropriate EV9000 connectors.

6.   Turn on the power supplies. If everything seems ok (supply current is within reason), connect the PC to the EV9000 parallel port.

3.3.2   Powered
Execute Test 1: "PC Interface Test", as described in Section 4.6.1, to verify communications between the EV9000 and the PC. The current consumption of each modem can be measured by removing the relevant jumper (E18 for modem A and E17 for modem B) and replacing it with a multimeter.

3.3.2.1 Trim TxB and RxA paths
Table 14 details the procedure for trimming TxB and RxA signal paths. Note that if +5VM is changed then this procedure will have to be repeated. This is because the bias points remain static compared to ½ of +5VM. Also, for best performance, the pk-pk voltage of the signal at the RXFB pin should be set to 20% of +5VM. Care must be exercised in setting the dc levels accurately, as the variable resistors R15, R16, R17, R30 and R46 all swing between +5V and -5V in less than one turn.

	Trim TxB and RxA Procedure	Purpose
1.	Click on the **Default** button.	Set up channel B to transmit and channel A to receive at the same baud rates.
2.	Select Zero channel dc offset.	Removes software controllable RXINA bias injectors from RXINA signal path.
3.	Connect TXOUTB to RXINA.	Use channel B as a reference signal source for channel A.
4.	Enter data values into the channel B data buffer. For the CMX909B, enter $CC. For the CMX969, FX919B and FX929B, enter $F5.	These values will produce full excursions of the channel B transmit output which are useful as a reference signal.
5.	Select Test 2 and click on the GO button.	Repeatedly causes channel B to transmit a signal which is driving channel A's receive path.
6.	Probe TXOUTB and adjust R46, centring TXOUTB around V_{BIAS} as observed at Test Point 2.	Adjust TXOUTB bias for a good nominal operating point.
7.	Move probe to pin B of jumper E3.	Observe channel B Rx path.
8.	Adjust R17 centring the pin B, jumper E3, signal around V_{BIAS} as observed at Test Point 2.	Adjust RXINA bias to a proper dc level (bias equal to modem A's V_{BIAS}).
9.	Adjust R14 to achieve a signal level of 1V pk-pk at E3, pin B.	Adjust RXINA gain to a nominal proper amplitude.
10	Move probe to Test Point 1.	Observe Rx signal directly at the modem receive feedback node. Modem Rx signal levels are specified for this node.
11	Adjust R25 to achieve a signal level of 1V pk-pk at Test Point 1.	Adjust final RXINA gain to the proper amplitude.
12	Disconnect TXOUTB from RXINA and reconnect TXOUTB to NSA1.	Move input signal to Noise 1 input for Noise 1 gain trimming.
13	Press the HALT switch to abort out of the test.	Abort to permit a change to the noise source.
14	Select NSA1 as the noise source.	Switches noise input path NSA1 into Rx A path.
15	Make sure Test 2 is selected and click on the GO button.	Restart Test 2.
16	Adjust R19 to achieve a signal level of 0.5V pk-pk at Test Point 1.	Adjust NSA1 gain to inject 50% of NSA1 noise source into Rx A path.
17	Disconnect TXOUTB from NSA1 and reconnect TXOUTB to NSA2.	Move input signal to Noise 2 input for Noise 2 gain trimming.
18	Press the HALT switch to abort out of the test.	Abort to permit a change to the noise source.

	Trim TxB and RxA Procedure	Purpose
19	Select NSA2 as the noise source.	Switches noise input path NSA2 into Rx A path.
20	Make sure Test 2 is selected and click on the GO button.	Restart Test 2.
21	Adjust R18 to achieve a signal level of 1.0V pk-pk at Test Point 1.	Adjust NSA2 gain to inject 100% of NSA2 noise source into Rx A path.
22	Disconnect NSA2 input signals.	Remove all driven signal sources to observe programmable biases.
23	Press the HALT switch to abort out of the test.	Abort to permit a change to the dc bias.
24	Select DC Offset 1.	Switch dc bias source 1 into Rx A path.
25	Make sure Test 2 is selected and click on the GO button.	Restart Test 2.
26	Probe pin B, jumper E3 and Test Point 2.	Observe buffered, DC Offset 1 biased, Rx signal relative to V_{BIAS}.
27	Adjust R15 to introduce a dc offset with a magnitude of +25% of the intended pk-pk data signal. This offset is on the order of 0.25V because the present setup is using a 1Vpk-pk signal.	Adjust DC Offset 1 to introduce a dc offset of 25% of the intended pk-pk signal amplitude.
28	Press the HALT switch to abort out of the test.	Abort to permit a change to the dc bias.
29	Select DC Offset 2.	Switch dc bias source 2 into Rx A path.
30	Make sure Test 2 is selected and click on the GO button.	Restart Test 2.
31	Adjust R16 to introduce a dc offset with a magnitude of -40% of the intended pk-pk data signal. This offset is of the order of -0.4V because the present setup is using a 1Vpk-pk signal.	Adjust DC Offset 2 to introduce a dc offset of -40% of the intended pk-pk signal amplitude.

Table 14: Trim TxB and RxA Paths

3.3.2.2 Trim TxA and RxB Paths

Table 15 details the procedure for trimming TxA and RxB signal paths. Note that if +5VM is changed then this procedure will have to be repeated. This is because the bias points remain static compared to ½ of +5VM. Also, for best performance, the pk-pk voltage of the signal at the RXFB pin should be set to 20% of +5VM. Care must be exercised in setting the dc levels accurately, as the variable resistors R15, R16, R17, R30 and R46 all swing between +5V and -5V in less than one turn.

	Trim TxA and RxB Procedure	Purpose
1.	Press the HALT switch	Terminate the previous test.
2.	Click on the `Default` button.	Set on screen configuration to default values.
3.	In the channel A Mode register, click TXRXN to mark it as checked.	Change channel A screen configuration to transmit mode.
4.	Enter data values into the channel A data buffer. For the CMX909B, enter $CC. For the CMX969, FX919B and FX929B, enter $F5.	These values will produce full excursions of the channel A transmit output for use as a reference signal.
5.	Click on the channel A Data Buffer `Write` button.	Transfer this configuration change to modem A. Modem A is now prepared to transmit.
6.	Connect TXOUTA to RXINB.	Use channel A Tx as a reference signal source for channel B Rx.
7.	Make sure the selected Test is 2 and click on the `GO` button.	This will repeatedly cause channel A to transmit a signal which drives channel B's receive path.
8.	Probe TXOUTA and Test Point 6.	Observe channel B Rx signal relative to V_{BIAS}.
9.	Adjust R30, centring TXOUTA around V_{BIAS} as observed at Test Point 6.	Adjust TXOUTA bias to a good nominal operating point.
10	Move probe to pin B of jumper E8.	Observe channel B buffered and the inverted signal level.
11	Adjust R38 centring the pin B, jumper E8, signal around V_{BIAS} as observed at Test Point 6.	Adjust the dc bias of the Rx B signal to be equal to modem B's V_{BIAS}.
12	Adjust R34 to achieve a signal level of 1V pk-pk at pin B, E8.	Adjust RXINB gain to a proper nominal amplitude.
13	Move probe to Test Point 5.	Observe Rx signal directly at the modem receive feedback node. Modem Rx signal levels are specified for this node.
14	Adjust R43 to achieve a signal level of 1V pk-pk at Test Point 5.	Adjust final RXINA gain to the proper amplitude.
15	Disconnect TXOUTA from RXINB and connect TXOUTA to NSB.	Connect channel B Rx noise injection path in preparation for its gain adjustment.
16	Adjust R35 to obtain a 1.0 Vpk-pk signal at Test Point 5.	Adjust channel B input noise gain to inject 100% noise signal level.
17	Press the HALT switch.	Terminate the test.

Table 15: Trim TxA and RxB Paths

4.0 Software

4.1 Introduction

This section describes the installation, operation and functions of the EV9000 software.

4.2 Installation

The EV9000 software consists of a single Windows executable file appropriate to the device being evaluated.

- For CMX909B evaluation, use the file ES9090xx.EXE

- For CMX969 evaluation, use the file ES9690xx.EXE

- For FX919B/929B evaluation, use the file ES9000xx.EXE
  (where xx is the version number).

Copy this file from the Evaluation Kit CD-ROM to a hard disk on the PC. Start Windows and run the executable program by double-clicking on its name as seen in a File Manager window. (You can also create a program icon in the Program Manager for more convenient program launching.) Running the executable program will create an initialisation file (ES9000.INI or similar), if one does not already exist.

4.3 Functions

The EV9000 software provides:
- Selection of which PC parallel port to use and the selected port's memory address.
- Direct reading and writing, via on-screen operations, to all parameters in both channel A and B modems.
- Display of all static parameters in both channel A and B modems.
- Automated tests to:

  1. Check the operation of the EV9000 software to hardware connection.
  2. Issue each modem's configured task (the two modems may be configured for different tasks) and continuously reissue those tasks, each upon its own completion.
  3. Transmit continuous random data from A.
  4. Transmit continuous preamble from B.
  5. Measure bit error rate and data quality of data transfer from modem B to modem A using unformatted messages.
  6. Measure bit error rate and data quality of data transfer from modem B to modem A using formatted messages with intervening gaps.
  7. Transmit a user defined packet from B to A and include support for PTT and CS radio control functions. The PTT signal output provided will be automatically asserted when the channel B transmit is initiated. Channel A will start its acquire and receive sequence upon the assertion of the CS signal input.
     (Not available with the ES9690xx.EXE software).
  8. Transmit and receive various types of message which are specific to the types of modem being evaluated.

- Display of all test results
  (and save tests 6, 7 and 8 results to disk with ES9000xx.EXE software).
- Test termination via hardware HALT switch.

4.4   Operation Flow
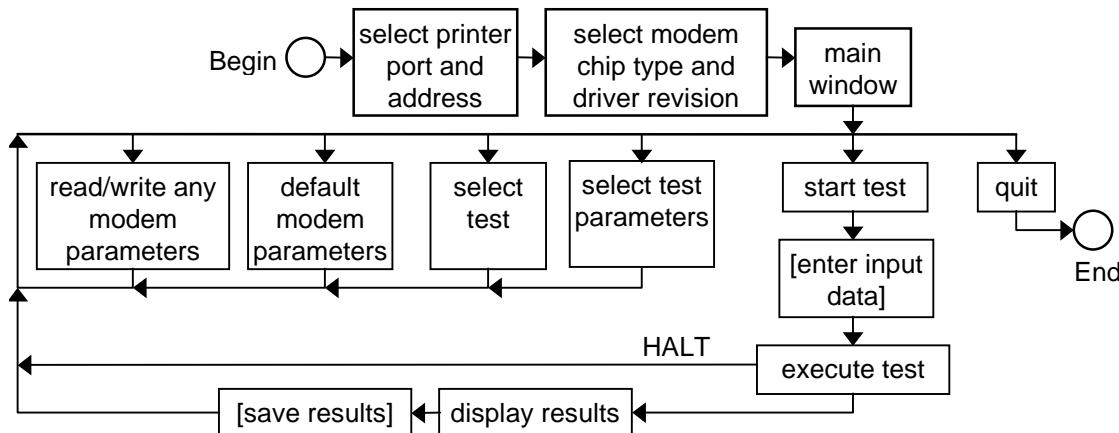
Figure 12: Software Flow

4.5   Screen Layout and Operation

4.5.1   Select Printer Port and Address

Upon starting, the EV9000 software presents a port selection window, shown in Figure 13. Using the pull-down list labelled `Printer Port`, select which of your PC's printer ports you would like the EV9000 to use. Upon selecting a printer port from the list, the `Port Base Address` list will show the default address associated with the selected port. This address is usually correct, however, it may be changed via the `Port Base Address` pull-down list. After you are satisfied with your two selections, click on `OK`. As indicated in Figure 14, this will display a new window, for you to select the modem chip type and driver revision.
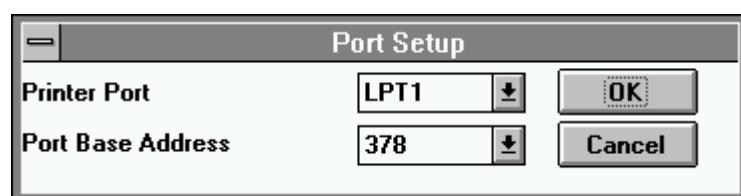

Figure 13: Port Selection

4.5.2   Select Modem Chip Type and Driver Revision

Where available, click on one of the chip type buttons to select the type of modem which will be installed for this session. If you would later like to change your chip type selection, you must quit the program (by clicking in its upper left window corner and selecting close). Refer to Table 2 to determine the required driver revision (where available) and enter it using the pull-down list provided. Selecting the chip type activates the main window, enables the `Default` button, and disables those chip type buttons which were not selected.
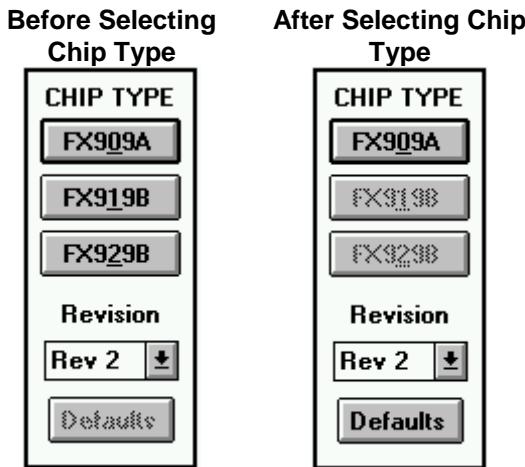
Figure 14: Select Modem Chip Type and Driver Revision (ES9000xx.EXE software only)

4.5.3   Main Window

4.5.3.1 Layout

The main window layout is shown in Figure 15. For a detailed description of the command, control, mode and status registers, data buffer and data quality output parameters, consult the relevant modem data sheets. Note that clicking on the **Default** button will set the on screen display and program the modems' parameters to useful default values.
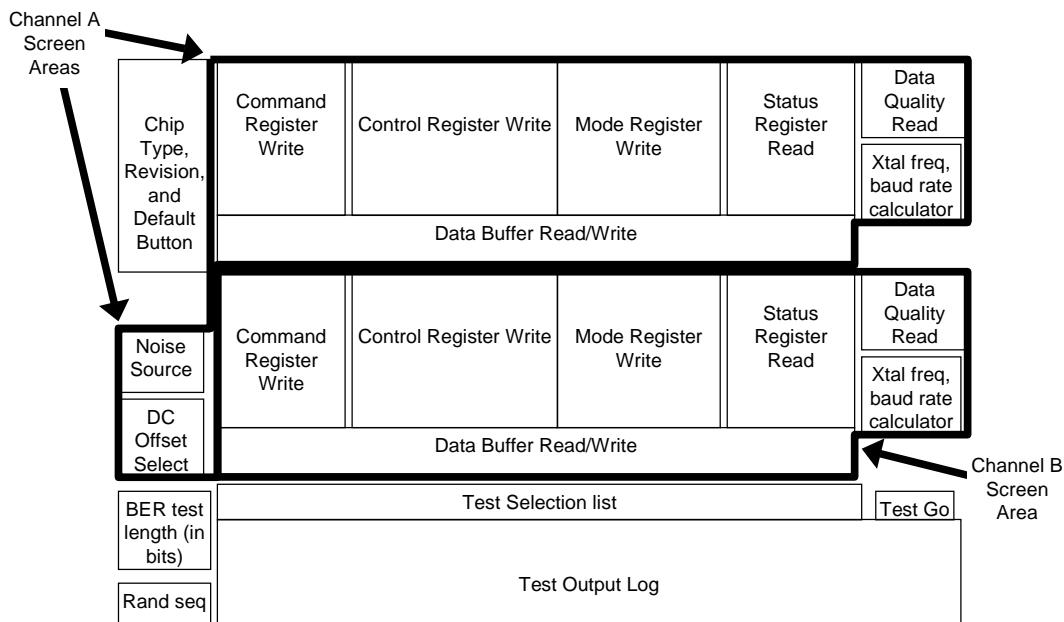

Figure 15: Main Window Layout

4.5.3.2 Controls

The EV9000 software makes use of checkboxes, pull-down lists, and buttons to operate most of its features. A typical operation consists of first setting all of the desired items in a given register block followed by a write operation (clicking on the associated **Write** button) to transfer the configured data to the modem.

4.5.3.2.1 Modem Register

Figure 16 illustrates the default screen controls used to read and write to a CMX909B modem's registers. Figure 17 shows the corresponding controls for the CMX969 and Figure 18 shows the controls for the FX919B and FX929B modem's registers.
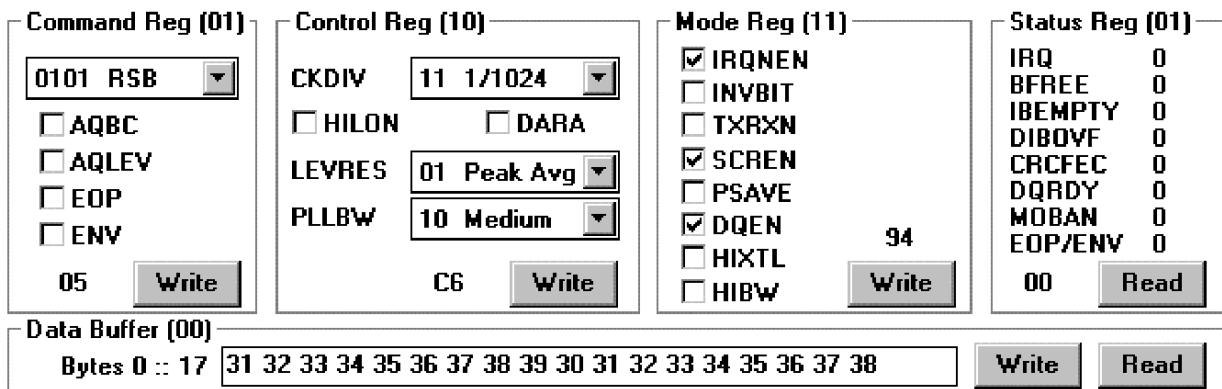
Figure 16: CMX909B Register Controls
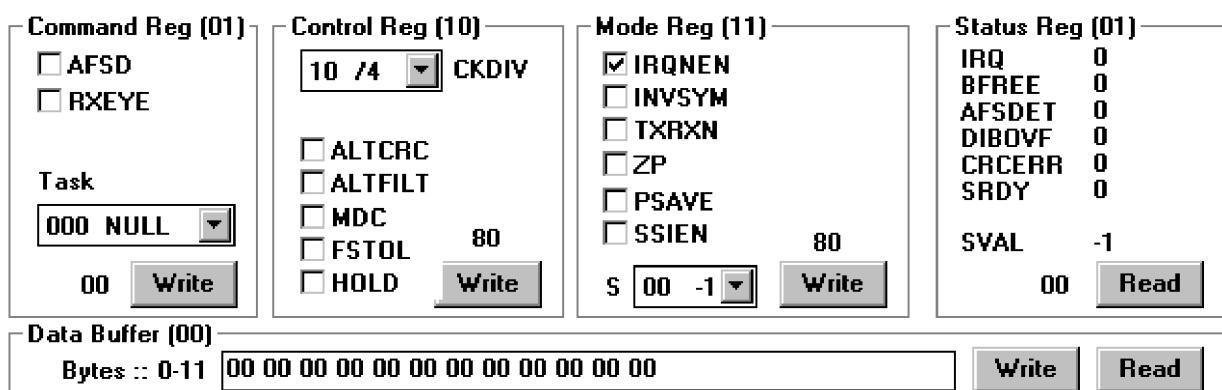
Figure 17: CMX969 Register Controls
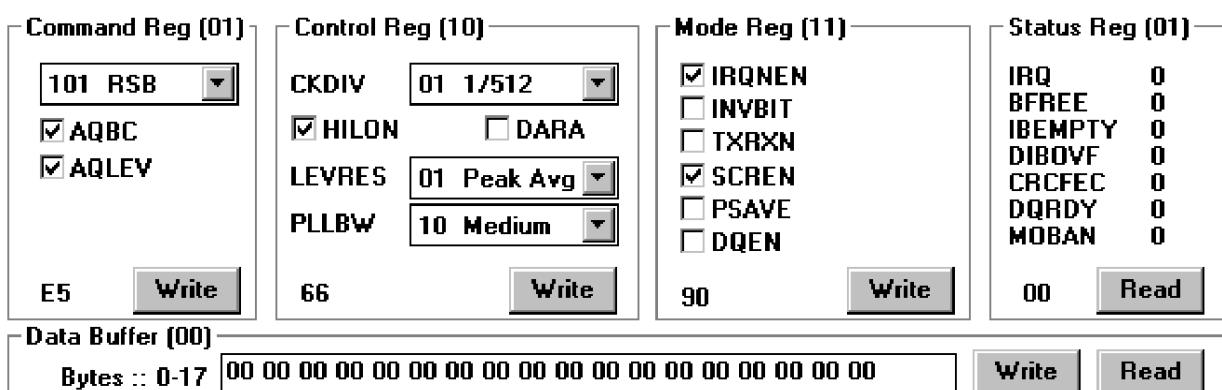
Figure 18: FX919B and FX929B Register Controls

4.5.3.2.2 EV9000 Controls

| Description	Screen Control
The "Xtal MHz" baud rate calculator uses the crystal frequency, entered in MHz, and the CKDIV parameter of the Control Register to calculate and display the resultant baud rate which will be obtained. Note that the CMX969, FX919B and FX929B modems carry two bits per baud. As a result, the bit rate is twice the calculated baud rate. (In this case, the baud rate is stated in symbols per second or s/s.) The CMX909B modem carries one bit per baud, therefore its baud and bit rates are equal.	**Figure 19: Xtal MHz Baud Rate Calculator Control**
Noise selectors apply to the channel A receive path (see Figure 6). Only one selection may be active at a time. If no noise injection is desired, simply disconnect any wires connected to motherboard connectors NSA1 and NSA2.	**Figure 20: Channel A, Noise Control**
DC Offset selectors apply to the Channel A receive path (see Figure 6). Only one selection may be active at a time. Note that the Zero selection can introduce an offset depending upon motherboard hardware adjustment.	**Figure 21: Channel A, DC Offset**
Bit **E**rror **R**ate Test Length selects the number of bits (in exponential notation) to be transferred during a BER test. This selection has a dramatic affect on the time required to perform a BER test with the greater number of bits taking more time. Longer tests produce more accurate results.	**Figure 22: BER Test Length**
Random **seq**uence is the number of bits produced by the pseudorandom sequence generator which is employed to generate nearly random data streams used in tests. It is not perfectly random because the bits are produced in a repeating pattern. The random sequence length is the number of bits produced before the pattern repeats. The larger the random sequence value, the more random the produced bit pattern.	**Figure 23: Rand seq**
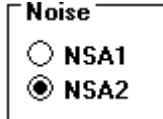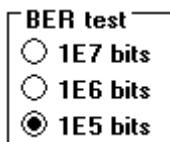
Table 16: EV9000 Controls

4.5.3.2.3 Test Area Controls

Test area controls include a pull-down list for test selection, a `GO` button to start test execution, and a scrolling log window in which test results are displayed (see Figure 24).
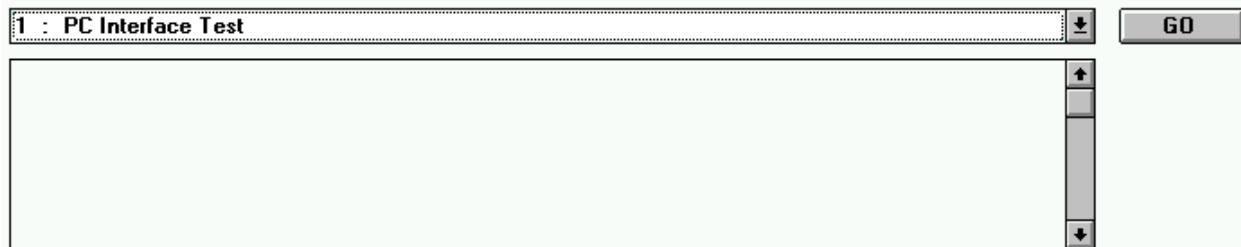
Figure 24: EV9000 Test Controls

4.6   Tests

The EV9000 software includes several automated tests. This section describes their function and operation.

4.6.1   Test 1: PC Interface Test

4.6.1.1 Application
Verifies the proper operation of the PC to EV9000 interface and the ability of each of the modems to respond appropriately to a command.

4.6.1.2 Description
This test operates in two phases. The first phase primarily tests the parallel port interface between the EV9000 and the PC. The second phase tests the ability of each modem to respond appropriately to a command.

The parallel port phase of the test continuously reads IRQN A, IRQN B, HALT Switch, and Carrier Detect and logs any state changes to the scrolling results log window. After starting this test, slowly press and release the EV9000 HALT switch and observe changes in the log window. If pressing and releasing the HALT switch is not logged on the PC, the PC to EV9000 connection has not been successful. In this case, recheck your setup and review Section 1.9. After you have verified the operation of the PC interface by confirming the logging of HALT switch activity, click the `STOP` button to advance to phase two of the test.

The modem response phase of the test:
1. Writes to the mode and control registers of a modem,
2. Writes commands to the modem, and
3. Observes whether an appropriate interrupt response is received in a reasonable time.

Both phases of this test must be successful in order to operate the EV9000.

4.6.2 Test 2: Issue Configured A & B Tasks. Continuously repeat each one as it finishes.

4.6.2.1 Application

This test is useful for observing the signals and timing of a channel. It is also useful to generate a constant stream of predictable activity which can be used as a source of reference signals for making hardware adjustments (see Section 3.3).

4.6.2.2 Description

Upon starting this test, each modem's control, mode, data buffer (if transmitting) and command registers are written (in that order) using the data configured in the main window. Subsequently, this test repeatedly issues the task configured in each modem's command register when the prior task is completed. Command completion is detected in two ways:

1. If the mode register IRQNEN bit is set, the program will read a modem's status register only when IRQN is low otherwise,
2. The program will continuously poll the status register.

A fresh task is written to a modem only when the IRQ and BFREE bits of the status register are both 1 (logic high). Repetition is triggered by completion of the previous task. Modem data buffers are neither read nor written during this test. Each modem's task is independently selectable.

Press the HALT switch to abort this test and update the status and DQ register displays.

4.6.2.3 Screen Controls

There are no windows dedicated to this test. Press the HALT switch to abort this test.

4.6.2.4 Test Sequence

The following sequence is performed upon starting the test. Channel B activity is shown in bold lettering.

1. Write modem A control register
2. **Write modem B control register**
3. Write modem A mode register
4. **Write modem B mode register**
5. Write RESET task to modem A
6. Wait until modem A BFREE is high
7. **Write RESET task to modem B**
8. **Wait until modem B BFREE is high**
9. IF channel A is in transmit mode
10.   Write modem A data buffer
11. **IF channel B is in transmit mode**
12.   **Write modem B data buffer**
13. Write screen configured channel A command to modem
14. **Write screen configured channel B command to modem**
15. WHILE the HALT switch is not pressed
16.   IF channel A IRQNEN is checked
17.   IF channel A hardware IRQ has occurred
18.   read status register A
19.   IF both channel A IRQ and BFREE are set
20.   write screen configured channel A command to modem
21.   ELSE
22.   read status register A
23.   IF both channel A IRQ and BFREE are set
24.   write screen configured channel A command to modem

25. **IF channel B IRQNEN is checked**
26. **IF channel B hardware IRQ has occurred**
27. **read status register B**
28. **IF both channel B IRQ and BFREE are set**
29. **write screen configured channel B command to modem**
30. **ELSE**
31. **read status register B**
32. **IF both channel B IRQ and BFREE are set**
33. **write screen configured channel B command to modem**
34. read status register A
35. **read status register B**
36. read data quality A
37. **read data quality B**
38. Update all main window parameters
39. END.

4.6.2.5 Error Codes
This test has no error codes.

4.6.3 Test 3: Tx continuous random data from A using TSB or TQB (T4S, T8B, T40B or T24S)

4.6.3.1 Application
Test 3 is useful to generate eye diagrams (using an oscilloscope) and output spectra for bandwidth analysis by observing the EV9000 TXOUTA output.

For eye diagrams, the low-going edge of the signal at the modem A IRQN pin should be used as the trigger source and the TXOUTA connector on the EV9000 should be observed or, if an rf system is attached, the radio receiver's discriminator output can be observed (still using the modem A IRQN pin as the oscilloscope trigger source).

Output spectra may be measured in the rf domain when the EV9000 is attached to an rf transmitter.

4.6.3.2 Description
This test repeatedly transmits pseudorandom data from channel A.

The specific transmit command used is either TSB or TQB for CMX909B, or T4S or T24S for CMX969, FX919B and FX929B. (The CMX969 also uses T8B or T40B when in MDC mode - see Appendix B). These choices are made in the main screen, channel A command register section.

The pseudorandom sequence length is also user selected as described in Table 16.

4.6.3.3 Screen Controls
There are no windows dedicated to this test. Press the HALT switch to abort this test.

4.6.3.4 Test Sequence
The following sequence is performed upon starting the test.

1.   Check IRQNEN, TX/RXN boxes and clear PSAVE box in the "on screen" mode register area
2.   IF selected command is illegal, display message and HALT.
3.   Write channel A mode register
4.   Write channel A control register
5.   Write channel A RESET task
6.   Read channel A status register
7.   Clear the channel A data buffer to zero
8.   Write user selected Tx command to A modem
9.   WHILE the HALT switch is not pressed
10.   IF channel A hardware IRQ has occurred
11.   read channel A status register
12.   IF IRQ and BFREE bits are both set
13.   write next portion of pseudorandom data to channel A data buffer
14.   write user selected Tx command to A modem
15.   Read data quality register
16.   Update all main window parameters
17.   END.

4.6.3.5 Error Codes
User selected Tx tasks are checked for their validity. Valid Tx tasks for the CMX909B are TSB and TQB. Valid Tx tasks for the CMX969, FX919B and FX929B are T4S and T24S. If the test is started with an invalid configured Tx task, an error window will be displayed and the test will terminate.

4.6.4 Test 4: Tx continuous preamble from B

4.6.4.1 Application
This test transmits a continuous preamble pattern ('1100…' for CMX909B or '+3+3-3-3..' for CMX969, FX919B and FX929B) from channel B for use in setting up levels and offsets on the EV9000 board. (The pattern '1010..' is generated by CMX969 if in MDC mode, see Appendix B).

4.6.4.2 Description
This test transmits a continuous preamble pattern from channel B.

4.6.4.3 Screen Controls
There are no windows dedicated to this test. Press the HALT switch to end this test.

4.6.4.4 Test Sequence
The following sequence is performed upon starting the test. Channel B activity is shown in bold lettering.

1.	IF chip type is CMX909B
2.	initialise channel A command register variable to RSB
3.	**initialise channel B command register variable to TQB**
4.	**initialise channel B preamble variable to $CC**
5.	ELSE
6.	initialise channel A command register variable to R4S
7.	**initialise channel B command register variable to T24S**
8.	**initialise channel B preamble variable to $F5**
9.	Write channel A control register
10.	**Write channel B control register**
11.	IF chip type is CMX909B
12.	Write channel A mode register with: set: IRQNEN clear: TX/RXN, PSAVE, DQEN
13.	**Write channel B mode register with:** **set: IRQNEN, TX/RXN** **clear: PSAVE**
14.	ELSE
15.	Write channel A mode register with: set: IRQNEN, RXEYE clear: TX/RXN, PSAVE, SSIEN
16.	**Write channel B mode register with:** **set: IRQNEN, TX/RXN** **clear: PSAVE, SSIEN**
17.	Read channel A status register
18.	**Read channel B status register**
19.	Read channel A DQ register
20.	**Read channel B DQ register**
21.	Write RESET to channel A command register
22.	**Write RESET to channel B command register**
23.	**Write preamble variable to channel B data buffer**
24.	**Write channel B command register**
25.	**IF channel B BFREE fails to go high within a wait, abort on error**
26.	**Write channel B command register**
27.	**IF channel B BFREE fails to go high within a wait, abort on error**
28.	**Write channel B command register**
29.	Write channel A command register with AQLEV set and also either of AQBC (for CMX909B) or AQSC set
30.	WHILE the HALT switch is not pressed
31.	IF channel A hardware IRQ has occurred

32.   Read channel A status register
33.   IF channel B hardware IRQ has occurred
34.   Read channel B status register
35.   IF channel B BFREE is set
36.   Write command to channel B command register
37.   Update all main window parameters
38.   END.

Note: For the CMX969, FX919B and FX929B, all commands written to either command register
         include the CRC and TXIMP bit settings from the panel.

4.6.4.5 Error Codes
         Error code '4' and '5' are reported if after writing first or second transmit task to the command
         register and waiting, channel B modem did not produce a high BFREE status.

4.6.5 Test 5: BER & DQ test 'B' to 'A' using unformatted data

4.6.5.1 Application
This test measures the received bit error rate of a continuous pseudorandom data stream without using any of the formatting or error correction features which would normally be used for message transfer. At the end of the test it reports the average BER and Data Quality readings. (Also see Appendix B for further details on the CMX969 test).

4.6.5.2 Description
This test transmits a stream of pseudorandom data from channel B to channel A and calculates the received bit error rate. The length of the stream is configured via the BER Test parameter and a fixed length pseudorandom sequence is used (see Figure 22).

During the test, the Data Quality register is repeatedly read and its average result is reported, providing an indication of the quality of the received signal, as analysed by the receiving modem.

Receive PLL (clock) and level acquisition functions are initiated once only, early in the test sequence, but their execution is not timed for optimal (in terms of acquisition speed and quality) acquisition performance. In order to obtain a high quality of both PLL and level acquisition, an extended '1100..' preamble is transmitted by the CMX909B software, or an extended sequence of random data is transmitted by the CMX969, FX919B and FX929B software prior to the pseudorandom data stream. The received bit error rate measurement uses a self-synchronising algorithm, necessary because the transmitted data stream does not include any form of Frame Synchronisation except for CMX969, FX919B and FX929B tests using the 'Level Track' LEVRES setting, where Frame Synchronisation is sent early in the transmission to activate the AQLEV sequence correctly.

4.6.5.3 Screen Controls
There are no windows dedicated to this test. Press the HALT switch to abort this test.

4.6.5.4 Test Sequence
The following sequence is performed upon starting the test. Channel B activity is shown in bold lettering.

1. Write channel A control register
2. Write channel B control register
3. IF chip type is CMX909B
4. Write channel A mode register with:
   set: IRQNEN, DQEN
   clear: TX/RXN, PSAVE
5. Write channel B mode register with:
   set: IRQNEN, TX/RXN
   clear: PSAVE
6. ELSE
7. Write channel A mode register with:
   set: IRQNEN, RXEYE
   clear: TX/RXN, PSAVE, SSIEN
8. Write channel B mode register with:
   set: IRQNEN, TX/RXN
   clear: PSAVE, SSIEN
9. Read channel A status register
10. Read channel B status register
11. Read channel A DQ register
12. Read channel B DQ register
13. Write RESET to channel A command register
14. Write RESET to channel B command register

15.   IF chip type is CMX909B
16.   initialise channel A command register variable to RSB
17.   initialise channel B command register variable to TQB
18.   initialise channel B preamble variable to $CC
19.   ELSE
20.   initialise channel A command register variable to R4S
21.   initialise channel B command register variable to T24S
22.   initialise channel B preamble variable to random data
23.   Write channel B command register
24.   IF channel B BFREE fails to go high within a wait, abort on error
25.   Write channel B command register
26.   IF channel B BFREE fails to go high within a wait, abort on error
27.   Write channel B command register
28.   Write channel A command register with AQLEV set and also either of AQBC (for CMX909B) or AQSC set
29.   WHILE the number of received bytes on channel A is too few
30.   IF the HALT switch is pressed, abort with error 6
31.   IF channel A hardware IRQ has occurred
32.   Read channel A status register
33.   IF channel A BFREE is set
34.   Read channel A data buffer
35.   Increment error_count variable for each bit in error
36.   Write RSB (for CMX909B) or R4S to channel A command register
37.   IF channel A DQRDY is set
38.   Add current DQ to DQ_running_total variable
39.   Increment number_of_DQ_readings variable
40.   IF channel B hardware IRQ has occurred
41.   Read channel B status register
42.   IF channel B BFREE is set
43.   Write new data block to channel B data buffer
44.   Write TQB (for CMX909B) or T24S to channel B command register
45.   average_DQ = DQ_running_total / number_of_DQ_readings
46.   BER = number_of_bit_errors / number_of_bits_transmitted
47.   Update all main window parameters
48.   END.

Note: For the CMX969, FX919B and FX929B, all commands written to either command register include the CRC and TXIMP bit settings from the panel.

4.6.5.5 Error Codes

Code	Description
4	After writing first transmit task to command register and waiting, channel B modem did not produce a high BFREE status.
5	After writing second transmit task to command register and waiting, channel B modem did not produce a high BFREE status.
6	Test aborted by pressing the HALT switch.

Table 17: Test 5 Error Codes
4.6.6   Test 6: BER & DQ test 'B' to 'A' using formatted messages

4.6.6.1 Application

This test measures the bit error rates of various message structures, depending upon which chip type is selected. A normal receive acquisition bit and level sync. sequence is used for each transferred message. Device B is used as the transmitter, device A as the receiver.

4.6.6.2 Description

Static BER and DQ test 'B' to 'A' using formatted messages. The number of messages is determined by the 'BER Test bits' buttons. CMX909B uses TSB tasks followed by TDB to transmit, SFS followed by RDB to receive. CMX969, FX919B and FX929B use T4S and T24S tasks followed by THB, TIB, TLB or TIB + TLB to Tx, SFS followed by RHB or RILB to Rx. AQLEV and AQBC/AQSC are automatically added to SFS, providing these buttons have been selected. (Also see Appendix B for further details on the CMX969 test).

This test transmits messages containing pseudorandom data from channel B to channel A and calculates the bit error rate based on a comparison of sent and received data. Various message structures are each used to transfer the amount of data configured in the BER Test parameter (see Figure 22). The pseudorandom sequence length is configured via the Rand seq parameter (see Figure 23).

Receive PLL (clock) and level acquisition sequences are initiated with each message, providing the AQSC and AQLEV buttons have been selected.

Where applicable, the following are reported for each message structure tested:

1.   The type of transmit command used.
2.   The number of messages transferred.
3.   The number of blocks in each message.
4.   The number of data bits transferred.
5.   The number of data bits in error.
6.   The number of blocks having CRC errors.
7.   The number of Data Quality register readings taken.
8.   The average Data Quality reading.
9.   The number of frame sync detect aliases.
10. For the latter blocks in the message:

   • The number of data bits transferred.
   • The bit error rate.

Some results are calculated for the latter blocks in the message to quickly indicate whether errors are uniformly distributed among all blocks in a message.

An alert box provides the option to save results to a file (default name ES9000.XLT or similar) upon test completion. When saved, the log file includes totals for data bit errors and CRC errors, grouped according to the block number in which those errors occurred. These totals are accumulated over all messages of a given type and can be helpful in detecting whether a block's cumulative errors are related to the block's position within a message e.g. the start, middle, or end. Table 18 illustrates the block result accumulation method for a hypothetical test having four messages, each message consisting of six blocks.

	Block #					
Message #	1	2	3	4	5	6
1	0	0	0	0	**3**	0
2	0	**1**	0	0	0	0
3	0	0	0	0	0	0
4	0	**1**	0	0	0	0
Totals	0	**2**	0	0	**3**	0

Table 18: Test 6 Cumulative Block Result for One Message Type

Message structures are indicated in Table 19.

IC Type	Transmit Task Sequence	Receive Task Sequence
CMX909B	TSB, TDB	SFS with level and PLL acquire, RDB
CMX969, FX919B and FX929B	T4S and T24S (pream. & frame sync), THB	SFS with level and PLL acquire, RHB
	T4S and T24S (pream. & frame sync), TIB	SFS with level and PLL acquire, RILB
	T4S and T24S (pream. & frame sync), TLB	SFS with level and PLL acquire, RILB
	T4S and T24S (pream. & frame sync), all TIB, except for the final block of TLB.	SFS with level and PLL acquire, all RILB with CRC reported only for the final block.

Table 19: Test 6 Message Structures

4.6.6.3 Screen Controls
There are no windows dedicated to this test. Press the HALT switch to abort this test.

4.6.6.4 Test Sequence
Because of its complexity, it is not practical to document the complete test sequence. Instead, refer to the sequence documented in Test 5: "BER & DQ test 'B' to 'A' using unformatted data" for a representative sequence of modem control.

4.6.6.5 Error Codes

Code	Description
2	After writing RESET task to command register and waiting, channel A or B modem did not produce a high BFREE status.
3	After writing LFSB task to command register and waiting, channel A modem did not produce a high BFREE status.
9	Test aborted by pressing the HALT switch.

Table 20: Test 6 Error Codes

4.6.7   Test 7: Tx user defined packet from B to A driving PTT & starting acquire on CS

4.6.7.1 Application
Execute a one-way, user configured, packet data transfer from channel B to channel A. PTT is actively controlled by channel B and channel A starts its receive procedure upon an indication on the CS input for execution with user provided rf circuits.

This test is different in the ES9690xx.EXE software and is described in Appendix B.

4.6.7.2 Description
This test exercises the two modem channels to execute the transfer of a complete message from channel B to channel A. The predefined message structure makes use of realistic block types (e.g. Header, Intermediate, and Last blocks) to expose the transmit parameters and receive information involved in a message transfer. Transmit parameters are user configurable to support user designed experiments. In addition, other information such as the state of the data quality output is observed and recorded during the course of the test. Upon test completion, gathered data may be saved to disk in a tab-delimited file.

To support 'live' system operation with rf transceivers, this test asserts PTT on transmit and uses CS to trigger the reception process on the receive channel modem. PTT and CS each serve an important role in most wireless systems: Push To Talk is used to key on a radio transmitter and Carrier Sense is asserted by a radio receiver to trigger the start of its modem's receive process.

The test control parameters are provided during test setup to configure timing aspects of the message transfer. They are described below:

Tx Preamble Length: the length of preamble to be sent by channel B.

Post Tx Length: the amount of time, measured in bit or symbol times, for which PTT will persist after channel B BFREE status goes high.

Rx Acquire Delay: the amount of time, measured in bit or symbol times, after CS is recognised until channel A initiates its receive sequence with an SFS task (with AQLEV and AQBC or AQSC set).

4.6.7.3 Screen Control
Execution of this test involves the following steps:

1.   Click on the GO button in the main window.   A Message Parameters window is displayed (see Figures 25 to 30).

2.   Set the desired parameters in the Message Parameters window. Use the pull down lists to select among different data presentation schemes (hex, ASCII, etc.). Click on the OK button to execute the test and display results. If the test does not seem to be executing successfully, press the HALT switch to abort the test.

3.   Results may be viewed in the Rx Message Information window which is displayed. Click on the OK button to advance. An alert box provides the option to save results to a tab-delimited file (default name ES9000.XLT or similar).

4.   After performing the save operation, control is returned to the main window.

Samples of the screen control windows are shown below. For a detailed description of the various modem parameters, refer to that particular modem's data sheet.
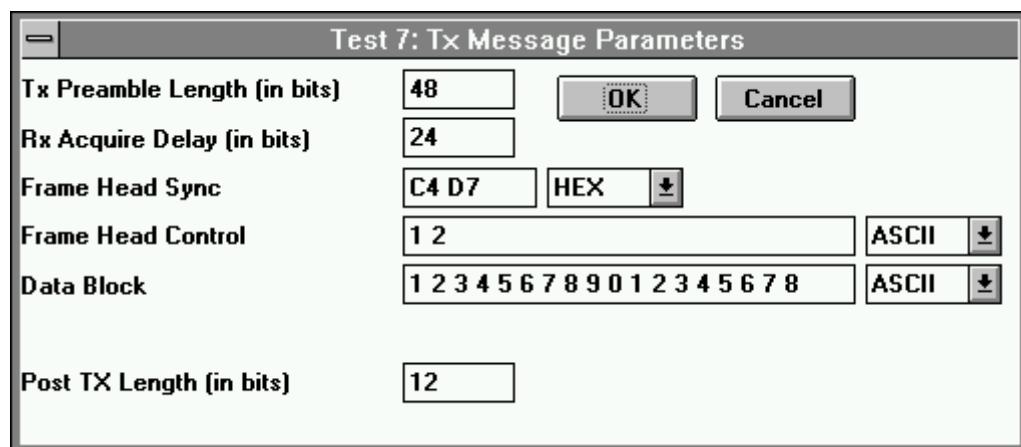
Figure 25: CMX909B (and FX909A) Test 7 Tx Message Control
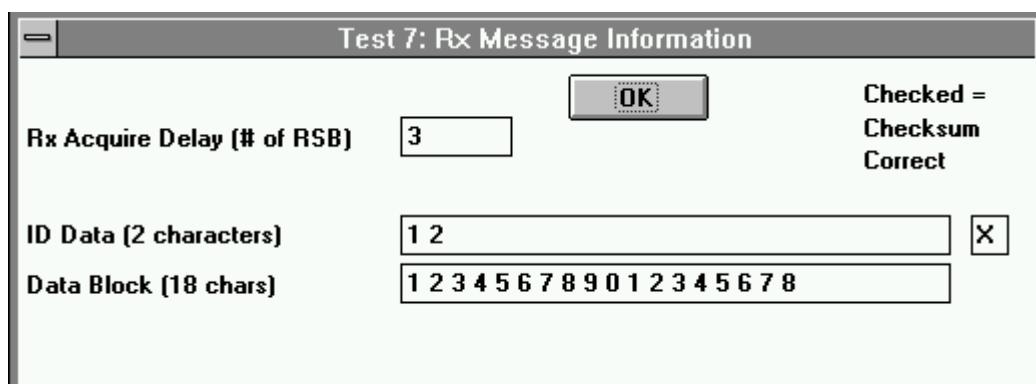
Figure 26: CMX909B (and FX909A) Test 7 Rx Message Information
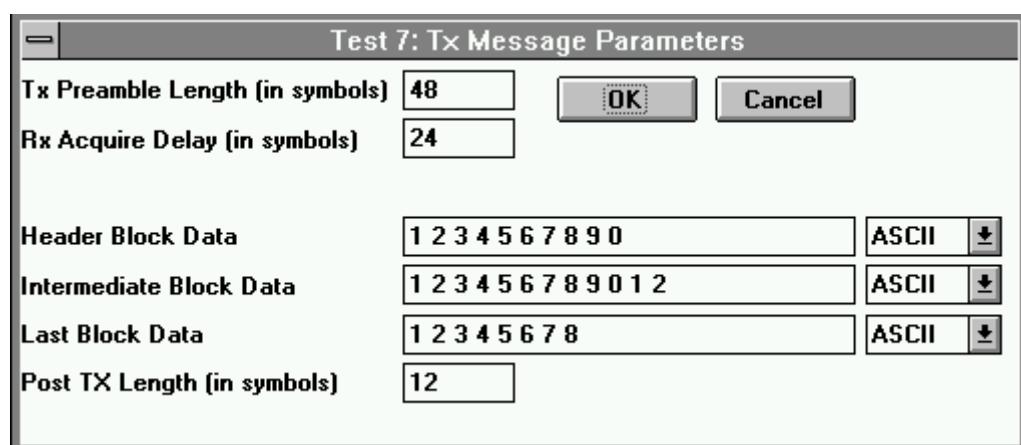
Figure 27: FX919B Test 7 Tx Message Control

Test 7: Rx Message Information

OK

Checked =
Checksum
Correct

Rx Acquire Delay (# of R4S)   6

Header Block Data (10 chars)   1 2 3 4 5 6 7 8 9 0   X

Intermediate Block (12 chars)   1 2 3 4 5 6 7 8 9 0 1 2

Last Block Data (8 chars)   1 2 3 4 5 6 7 8   X

Figure 28: FX919B Test 7 Rx Message Information

Test 7: Tx Message Parameters

Tx Preamble Length (in symbols)   48   OK   Cancel

Rx Acquire Delay (in symbols)   24

ID Data   1 2 3   ASCII

Header Block Data   1 2 3 4 5 6 7 8 9 0   ASCII

Intermediate Block Data   1 2 3 4 5 6 7 8 9 0 1 2   ASCII

Last Block Data   1 2 3 4 5 6 7 8   ASCII

Post TX Length (in symbols)   12

Figure 29: FX929B Test 7 Tx Message Control

Test 7: Rx Message Information

OK

Checked =
Checksum
Correct

Rx Acquire Delay (# of R4S)   6

ID Data (3 characters)   1 2 3   X

Header Block Data (10 chars)   1 2 3 4 5 6 7 8 9 0   X

Intermediate Block (12 chars)   1 2 3 4 5 6 7 8 9 0 1 2

Last Block Data (8 chars)   1 2 3 4 5 6 7 8   X

Figure 30: FX929B Test 7 Rx Message Information

4.6.7.4 Test Sequence

Because of its complexity, it is not practical to document the complete test sequence. Instead, refer to the sequence documented in Section 4.6.5 Test 5: "BER & DQ test 'B' to 'A' using unformatted data" for a representative sequence of modem control.

4.6.7.5 Error Codes

This test has no error codes.

4.6.8 Test 8: Supplementary Tests

Supplementary tests are available which are specific to the device which is to be evaluated. Details of these tests are contained in Appendices A, B and C for the CMX909B, CMX969 and FX919/FX929B respectively.

5.0   Troubleshooting

This section is intended to answer the most common questions and provide some helpful troubleshooting suggestions.

5.1   Common Questions/Situations

1. **How do I quit or exit from the program?**
   Double click the close icon in the upper right corner of the main window OR single click the upper left corner of the main window and select Close from the pull down menu OR type Alt-F4.

2. **Test 1: PC Interface Test fails.**
   This may be a setup or compatibility problem. Review power supply voltages, connections, jumper settings, and Section 1.9.

3. **Test 1: PC Interface Test passes but other tests appear to have problems.**

   - The two modem channels may be mismatched. The following must match on both modem channels (A and B): modem IC chip type, personality plug-in board components, jumper selected clock crystal frequencies, and main window configured data rates. In addition, data inversion for each channel must match. Inversion is determined by the combination of the INVBIT or INVSYM main window parameters and jumpers which enable/bypass hardware inverting amplifiers.

   - The wrong crystal may be connected with jumpers E5, E6, E10 and E11.
     For Mobitex systems (using the CMX909B), these jumpers should be in position A.
     For MDC4800 and RDLAP systems (using the CMX969 or FX919B and FX929B modems), these jumpers should be in position B. (See Table 12 and Figure 10).

   - The wrong modem devices are installed. The EV9000 supports CMX909B, CMX969, FX919B, and FX929B devices. Although the EV9000 may work with other devices, their use is not necessarily supported.

   - The parallel port cable may be too long for the PC to successfully connect with the EV9000. For best results, the parallel port cable length should be less than or equal to 1.5m. Refer to Section 1.9.2 for a description of parallel port limitations. It is also possible the connected PC's parallel port circuit does not have enough drive capacity to successfully support the EV9000. If this is suspected, try using a different PC.

4. **The PC has locked up and will not respond.**
   It is likely a test has been started but the conditions required for its successful completion are not present. Press the HALT switch to abort and check your configuration for a mistake. (After making a change to an on-screen configuration parameter, make sure you click on its associated `Write` button to transfer the parameter's new value to the modem.)

5. **How should components be selected for assembly on the provided blank plug-in boards?**
   Refer to Section 3.2.2 and consult the modem's data sheet.

6. **The EV9000 hardware seems to have spontaneously changed its state (e.g. noise source channel A has changed) without deliberate user action.**
   It is important to power the EV9000 and have it connected to the PC's parallel port *before* starting the software. This ensures that the hardware is properly initialised. Disconnecting and reconnecting the parallel port or power cycling the EV9000 may create phantom

commands which reconfigure the EV9000 hardware. All EV9000 hardware is initialised by software.

7. **The bit error rate performance seems too low.**
    An inadvertent source of noise or distortion is corrupting the signal. Power supplies and nearby circuits should be free of noise and attached rf circuits must provide the appropriate performance to accurately convey the baseband signal. Verify proper signal bias and amplitude at the Rx Feedback pin on the receiving modem IC. Also check for leakage from high impedance nodes (see below).

5.2   Suggestions

- **Use an oscilloscope**
  Because data modems transmit and receive biased ac signals, an oscilloscope is an invaluable troubleshooting tool to probe and verify signal levels.

- **Check for loose connections or jumpers**
  Make sure the power supplies used are sufficiently noise free. Also make sure there are no unintended noise sources radiating into the test setup.

- **Dirty/leaky level acquire circuits**
  The external level acquire nodes (DOC1 and DOC2 pins) are high impedance. If they are dirty or contaminated (e.g. by conductive flux residue), modem error rates or other performance may be adversely affected. Make sure the EV9000 mother board and plug-in boards are kept clean.   Monitoring these nodes with a scope probe (X1 or X10) will reduce the performance of the modems. A high impedance buffer amplifier should be used if measurements are to be made on these nodes.

5.3   Diagrams

Figures 31 to 33 give details of the EV9000 motherboard layout and circuit schematic diagrams.

Figure 31: Motherboard Layout
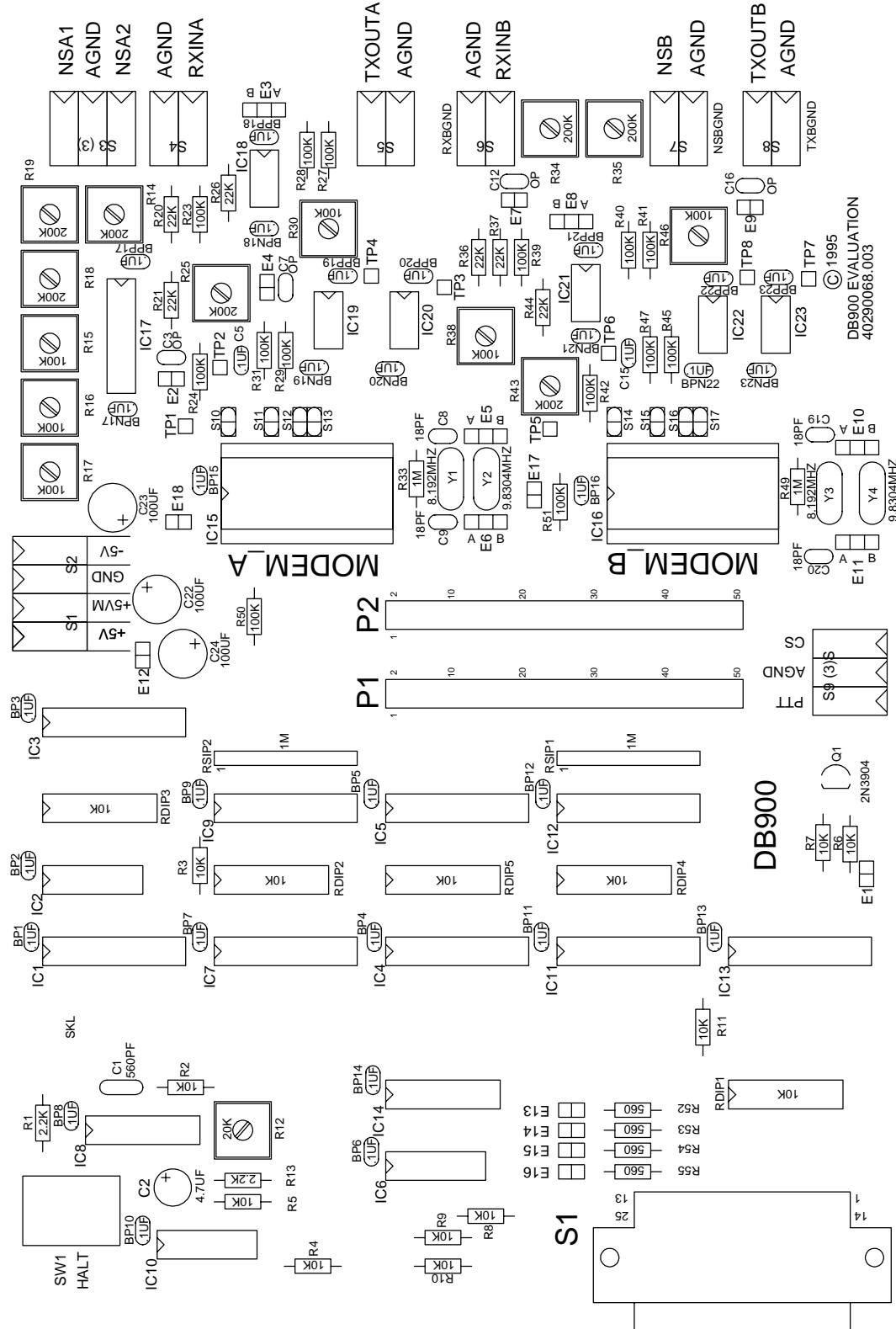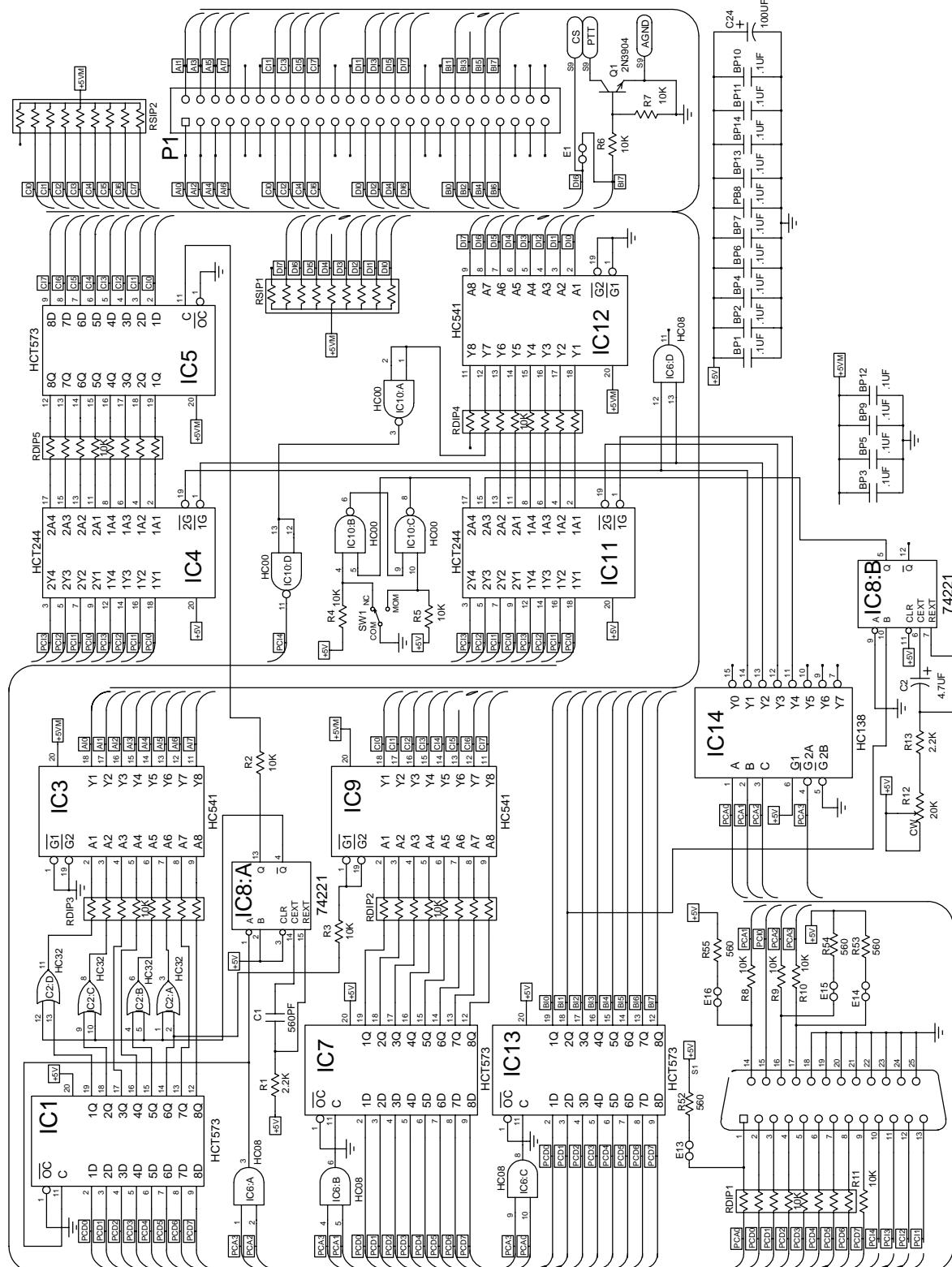
Figure 32: PC Interface Schematic
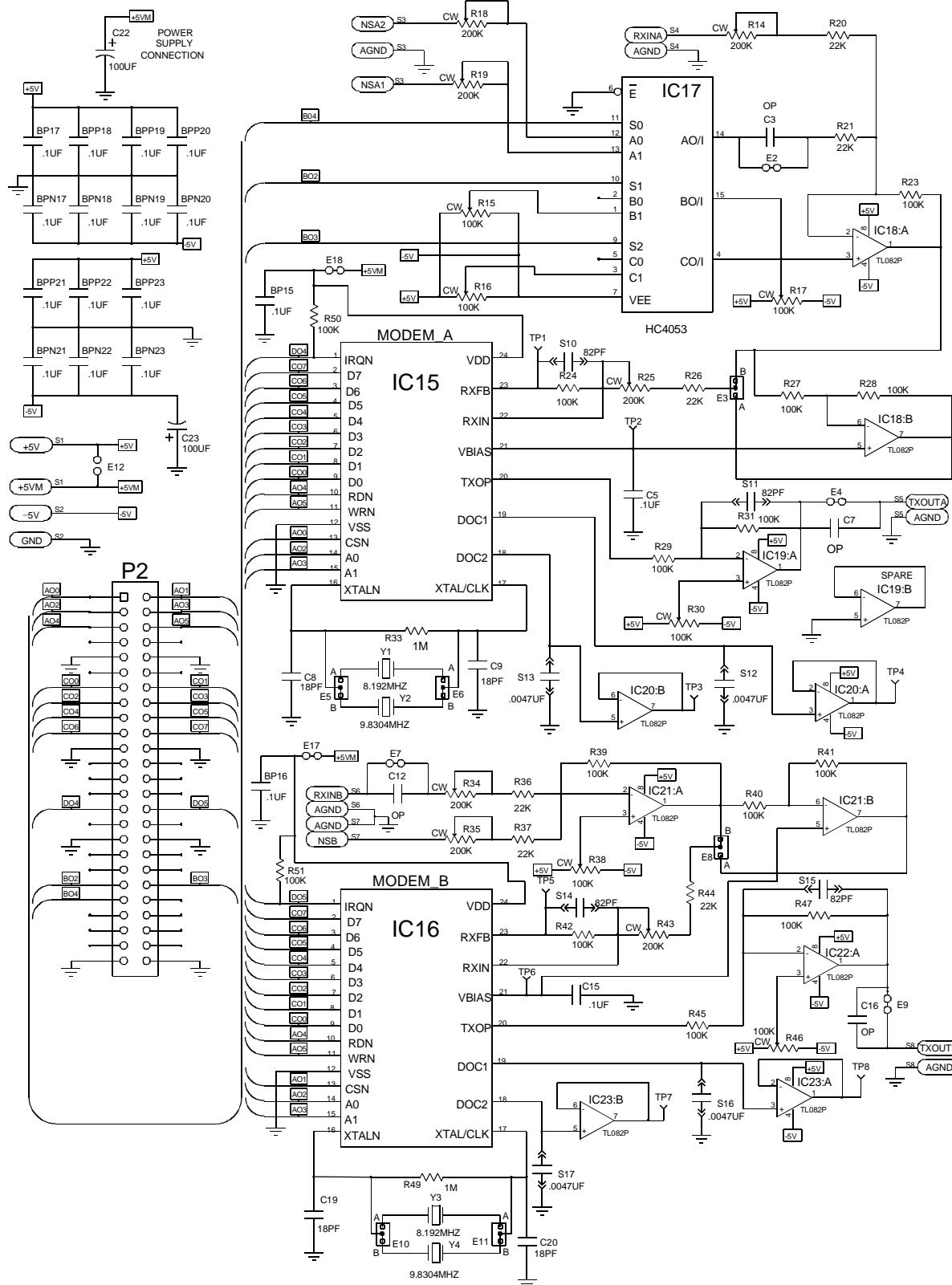
Figure 33: Modem Schematic

Appendix A – Additional Tests for CMX909B

None

Appendix B – Additional Tests for CMX969

Test 3: Tx continuous random data from A using T8B, T40B, T4S or T24S

Additional Information:

The following CMX969 Register bit settings entered in the ES9690xx.EXE software's window for chip A are used during the test:

Command Reg: If the task is set to T8B (MDC) or T4S (RD-LAP) then that task will be used to transmit the data, otherwise T40B (MDC) or T24S (RD-LAP) will be used.

Control Reg: CKDIV, MDC
ALTFILT (RD-LAP mode)

Mode Reg: INVSYM

Test 4: Tx continuous preamble from B

Additional Information:

Transmits continuous preamble ('1010..' in MDC mode, '+3 +3 –3 –3…' for RD-LAP) from chip B using T40B (MDC) or T24S (RD-LAP).

The following CMX969 Register bit settings entered in the ES9690xx.EXE software's window for chip B are used during the test:

Control Reg: CKDIV, MDC
ALTFILT (RD-LAP mode)

Mode Reg: INVSYM

Test 5: BER & DQ test 'B' to 'A' using unformatted data

Additional Information:

The transmitting device uses T40B (MDC) or T24S (RD-LAP) tasks and the receiver uses R8B (MDC) or R4S (RD-LAP) tasks.

The following CMX969 Register bit settings entered in the ES9690xx.EXE software's window for chip B are used during the test:

Command Reg: RXEYE (receive)

Control Reg: CKDIV, MDC, HOLD
ALTCRC, ALTFILT, FSTOL (these apply only to RD-LAP mode)

Mode Reg: INVSYM

The following results are reported at the end of the test:

Number of bits received.
Average BER.
Average receive Data Quality Register reading.

Test 6: BER & DQ test 'B' to 'A' using formatted messages

Additional Information:

Each message consists of about 50 blocks. There are gaps between the messages and both the transmit and receive devices are reset at the start of each message.

In MDC mode a transmitted message comprises 40 bits of preamble followed by Frame Sync, a Header Block, many Intermediate Blocks and a Last Block.

In RD-LAP mode a transmitted message comprises 24 symbols of preamble followed by Frame Sync, a Station ID Block, a Header Block, many Intermediate Blocks and a Last Block.

Each data block (Station ID, Header, Intermediate or Last) is generated from random data.

The following CMX969 Register bit settings entered in the ES9690xx.EXE software's window for chip B are used during the test:

Command Reg:	RXEYE (receive)
Control Reg:	CKDIV, MDC, HOLD
	ALTCRC, ALTFILT, FSTOL (these apply only to RD-LAP mode)
Mode Reg:	INVSYM,
	SSIEN (Rx only)
	The transmit S symbol value (Tx only)

AFSD is used only to detect the Frame Sync pattern at the start of each message.

The following results are reported at the end of the test:

Number of messages sent.
Number of messages detected by the receiver and the
         number of AFSD detects.
Number of inverted Frame Sync patterns detected (MDC only).
Total number of data bits received (after error correction).
Average BER of 'corrected' data.
Average receive Data Quality Register reading.
Number of received data blocks and the
         number in which the 'corrected' data was wrong.
Number of received CRCs and the number flagged as incorrect.
Number of times the receive S symbol was read and the
         number of times that it was incorrect.

Test 7: Concatenated message test

This test is different from the main Test 7, which is used for evaluation of CMX909B, FX919B and FX929B devices. Test 7 for CMX969 devices continually transmits concatenated short messages (without symbol sync) from device B:

RDLAP:	Frame Sync + Station ID block + Header block
MDC:	Frame Sync + 1st Header block + 2nd Header block

The receiving device (A) continually tries to receive messages formatted as the Tx messages. AFSD is set to run all of the time.

Whenever the receiving device's AFSDET flag is set this indicates that a new Frame Sync has been detected. The Rx software then stops whatever it was doing (if anything) and issues a RSID (RDLAP) or RHB (MDC) task. When that task finishes the crc is checked and if it is correct a RHB task is issued.

When that finishes the CRC is checked and the receiving device is left with just AFSD running, waiting for the next Frame Sync.

The following CMX969 Register bit settings entered in the ES9690xx.EXE software's window for chip B are used during the test;

Command Reg:	RXEYE (receive)
Control Reg:	CKDIV, MDC, HOLD
	ALTCRC, ALTFILT, FSTOL (these apply only to RD-LAP mode)
Mode Reg:	INVSYM

Pressing the HALT switch on the evaluation board halts the test. It will then report the following:

Number of messages sent.
Number of messages received correctly (good CRCs on both blocks of the message).
Number of times the AFSDET flag was set.
Number of times the BFREE flag was set (once for each block in a message).
Number of times the CRCERR bit was checked for the first Header block (MDC) or
     Station ID block (RD-LAP) of each message and the number of times it was wrong.
Number of times the CRCERR bit was checked for the second block of each message
     and the number of times it was wrong.
Average Data Quality reading and the number of readings taken.

The receiving device can be connected to a radio receiver, rather than to the output of the transmitting device, in which case it will count the number of Rx messages consisting of at least FS+SID+HB (RDLAP) or FS+HB+HB (MDC). Note that the receiving software does not attempt to interpret the received data in any way other than by monitoring the CRCERR (checksum error) bit in the Status Register.

Appendix C – Additional Tests for FX919B and FX929B

Test 8: Repetitive pattern test B to A

1   Application
         To transmit long formatted messages filled with identical data bytes from channel B and receive
         them in channel A to check for possible pattern sensitivity. If the path from Channel B to channel A
         includes the actual radio circuitry to be used in a system, this test will give an indication of any
         pattern sensitivity problem which may be due to inadequate end to end overall baseband
         frequency and group delay responses.

2   Description
         This test transmits 8 messages for each of the 256 possible data byte values.
         Each transmitted message consists of Symbol Sync, Frame Sync, Station ID Block (FX929B
         only), Header Block, 42 Intermediate Blocks and a Last Block.
         For each byte value the rest reports the average receive data quality and the number of messages
         received without error.
         All commands written to either command register during the test include the CRC and TXIMP bit
         settings from the panel.
         An alert box provides the option to save results to a file (default name ES9000.XLT) upon test
         completion.

3   Screen Controls
         There are no windows dedicated to this test. Press the HALT switch to abort this test.

4   Test Sequence
         Because of its complexity, it is not practical to document the complete test sequence. Instead,
         refer to the sequence documented in Section 4.6.6 Test 6: "BER & DQ test 'B' to 'A' using
         formatted messages" for a representative sequence of modem control.

5   Error Codes
         Similar to the error codes for Test 6, see Table 20.

Test 9: Concatenated message test B to A

1   Application
     To test the ability of a receiving FX919B or FX929B to acquire and read a message when
     switched onto a stream of continuous concatenated messages which do not include Symbol
     Synchronisation patterns.

2   Description
     This test transmits a continuous stream of short concatenated messages without intervening
     Symbol Sync patterns from channel B. The receiving channel A device repeatedly acquires
     messages (using AQSC, AQLEV and SFS tasks) then reads the body of the message and checks
     it for errors before performing another acquire. The test reports the number of messages
     transmitted, the number received and any CRC errors in the received data.

3   Screen Controls
     There are no windows dedicated to this test. Press the HALT switch to abort this test

4   Test Sequence
     Because of its complexity, it is not practical to document the complete test sequence. Instead,
     refer to the sequence documented in Section 4.6.6 Test 6: "BER & DQ test 'B' to 'A' using
     formatted messages" for a representative sequence of modem control.

5   Error Codes
     Similar to the error codes for Test 6 , see Table 20.

Test 10: Concatenated message test B to A with Rx signal monitoring algorithm

This test is similar to Test 9, but also includes the Rx Signal Monitoring Algorithm as described in Section
1.6.6 of the FX919B and FX929B Data Sheets. The report displayed at the end of the test also includes a
count of the number of re-acquisitions forced by the algorithm.

If you still need help .....

If you have read this manual, re-examined your test setup, and still cannot figure out what has gone wrong, feel free to contact us and we'll do our best to help you solve the problem. Please be ready to describe the problem, symptoms and the steps you have taken to try to correct them.

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CML Product Data

In the process of creating a more global image, the three standard product semiconductor companies of CML Microsystems Plc *(Consumer Microcircuits Limited (UK), MX-COM, Inc (USA) and CML Microcircuits (Singapore) Pte Ltd)* have undergone name changes and, whilst maintaining their separate new names *(CML Microcircuits (UK) Ltd, CML Microcircuits (USA) Inc and CML Microcircuits (Singapore) Pte Ltd)*, now operate under the single title **CML Microcircuits**.

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This notification is relevant product information to which it is attached.

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