CML Microcircuits

COMMUNICATION SEMICONDUCTORS

EV8810
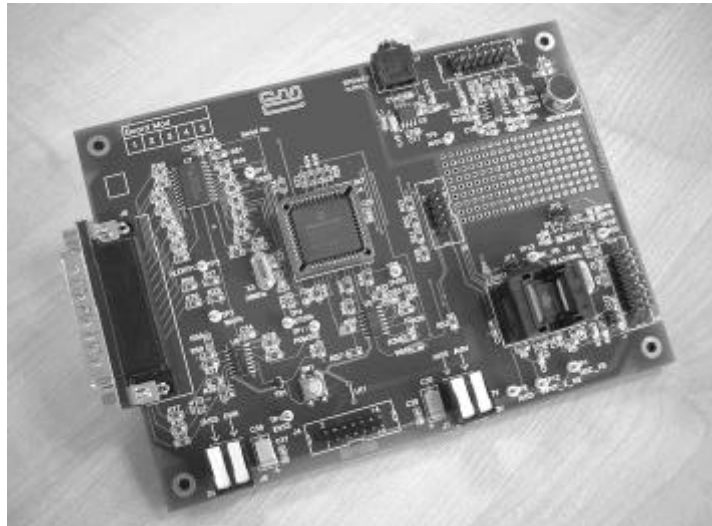# Evaluation Kit
User Manual

1.0   Features

- **CMX881, CMX882 and CMX883 Signalling Processor Evaluation**

- **Evaluate Selcall, CTCSS, XTCSS, DCS, FSK, and Voice functions**

- **TSSOP device socket provided on Board**

- **PC Controlled via Parallel Port Interface**

- **On-board reprogrammable FLASH PIC Microcontroller**

- **PC Software Supplied**

1.1   Brief Description

The EV8810 Evaluation Kit has been designed for the purpose of evaluating the CMX88x family of devices. This family includes the CMX881, CMX882 and CMX883 Signalling Processors. The board interfaces to the parallel port of an IBM compatible PC, running the supplied application software under Windows 95, 98, ME and NT 4.0 operating systems. The on-board PIC Microcontroller is a Flash device and can be reprogrammed via the controlling PC with the included programming software. Both the CMX88x target device and the Flash PIC are socketed, for easy replacement. This evaluation kit is supplied without any CMX88x target device. Samples of these should be obtained separately from your local CML distributor.

The on-board audio power amplifier and 3.5mm jack socket can be used to connect an external loudspeaker, and voice input can be handled via the on-board electret microphone. A user prototyping area is also included.

The board requires a 5Vdc supply rail for the PIC Microcontroller and another supply rail for the device voltage, which can range from 2.7Vdc to 5.5Vdc. These can be provided by one dual rail supply or two single rail supplies.

CONTENTS

Note: This product is in development: Changes and additions will be made to this specification. Items marked TBD or left blank will be included in later issues.

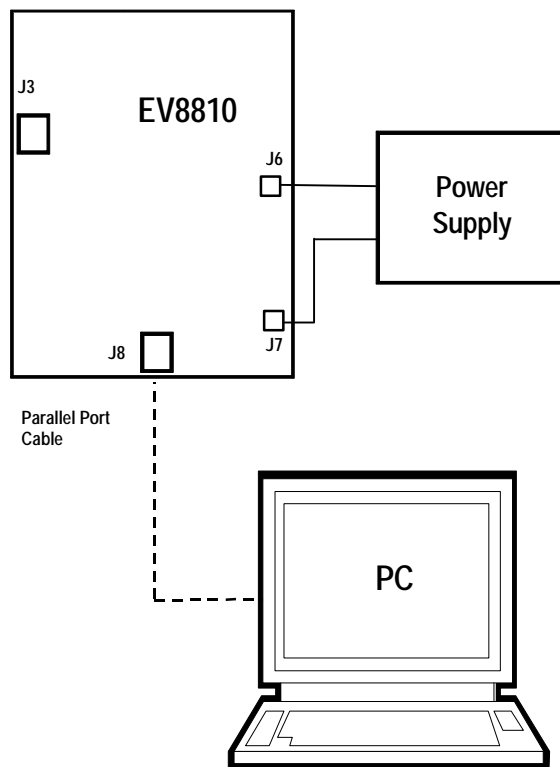**Information in this data sheet should not be relied upon for final product design.**

Figure 1 Interconnection Diagram

1.2   Preliminary Information

1.2.1   Laboratory Equipment

The following equipment is needed to use this evaluation kit:

1.2.1.1 A regulated, multiple output power supply to provide 5Vdc for the PIC Microcontroller and a device voltage in the range 2.7Vdc to 5.5Vdc. Alternatively two regulated, single output supplies with the same output voltage requirements as for the multiple output supply.

1.2.1.2 A PC with the following requirements:

- One of the following operating systems installed - Windows 95, 98, ME or NT 4.0.

- 34Mb hard disk drive space available.

- If using Windows NT, at least Service Pack 3 should be installed. Service Pack 6 is recommended.

- Equipped with an Enhanced Parallel Port (EPP) version 1.9.

- Minimum screen resolution 800 x 600. Recommended resolution 1024 x 768.

1.2.2   Handling Precautions

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

1.2.2.1 Static Protection

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

1.2.2.2 Contents - Unpacking

Please ensure that you have received all of the items detailed on the separate information sheet (EK8810) and notify CML within 7 working days if the delivery is incomplete.

1.3   Quick Start

This section provides instructions for users who wish to experiment immediately with the evaluation kit. A fuller description of the kit and its use appears later in this document.

1.3.1   Setting-Up

▪ The application and PIC programming executables are designed to work with an Enhanced Parallel Port (EPP). The parallel port on the target computer must be configured as an EPP1.9 port, and <u>not be running in any ECP mode</u>. The port type is selected from the BIOS, which can be accessed whilst the PC is booting up.

▪ If a previous version of the ES8810xx application software has been installed it will be necessary to run the uninstall program before upgrading. This is done by running the supplied uninstall program.

▪ The ES8810xx, ESFlashxx and uninstall_xx executables provided with this evaluation kit have been packaged into a single, self-extracting setup file, called either ES8810xx_setup95.exe, ES8810xx_setup98.exe or ES8810xx_setupNT.exe, depending upon whether it has been tailored for Windows 95, Windows 98 (and ME) or Windows NT machines respectively. Run the appropriate version of this setup file (as administrator on Windows NT) and follow the on-screen instructions to begin the installation process on your PC. A command prompt window will appear briefly, though the user can ignore this and it will disappear automatically. Finally, Windows 98 and Windows ME users will be prompted to re-start their machine, Windows 95 and Windows NT users will be allowed to start the application straight away.

▪ Ensure that all jumpers are fitted to the evaluation board in accordance with the settings shown in section 1.4.

▪ Attach a 25-way parallel port cable between connector J8 on the EV8810 board and the parallel port of the PC.

▪ The board is equipped with a TSSOP socket, which is designed to take an E1 packaged device. To insert a device into the socket depress the socket top, and whilst keeping the socket top depressed insert a CMX881, CMX882 or CMX883 IC into the socket. Ensure that the device is inserted with pin 1 oriented with the chamfered corner edge of the socket. The socket top can now be released. To remove a device from the socket depress the socket top, and whilst keeping the socket top depressed remove the device from the socket and release the socket top. The use of a vacuum pick-up tool, designed for handling surface mount components is recommended when inserting or removing a device. Alternatively, a pair of suitably small needle nose pliers can be used.

▪ Connnect the 5Vdc supply to J6 and the device supply (2.7Vdc to 5.5Vdc) to J7.

▪ The evaluation board is now ready to use. For a detailed guide to using the software refer to section 1.6.

1.4   Signal Lists

Connector pinouts				
Connector	**Connector Pin no.**	**Signal Name**	**Signal Type**	**Description**
J1			Output	3.5mm jack socket - Output from the on-board audio power amplifier. Can be used to connect an external loudspeaker.
J2	1	DEMODIN	Input	IDC 16-way male header - Connects to the input of the CMX88x discriminator amplifier. (ac coupled)
	3	INPUT_2	Input	IDC 16-way male header - Connects to the input of the CMX88x input 2 amplifier. (ac coupled)
	5	MIC	Input	IDC 16-way male header - Connects to the input of the CMX88x microphone amplifier. (ac coupled)
	7	SIG_MONITOR	Input	IDC 16-way male header - Connects to the input of the CMX88x signal monitor.
	9	MOD_1	Output	IDC 16-way male header - Connects to the output of the CMX88x modulator 1.
	11	MOD_2	Output	IDC 16-way male header - Connects to the output of the CMX88x modulator 2.
	13	AUDIO	Output	IDC 16-way male header - Connects to the output of the CMX88x audio amplifier.
	15	PK_DETECT	Input	IDC 16-way male header - Connects to the input of the CMX88x signal monitor. This input is only used when connecting an ac signal to the signal monitor input, and is enabled by fitting jumper JP3.
	2, 4, 6, 8, 10, 12, 14, 16	GND	Power	IDC 16-way male header - Connects to the board analogue ground.

Connector pinouts *(continued)*

Connector	Connector Pin no.	Signal Name	Signal Type	Description
J3	1	MICROPHONE	Output	IDC 14-way male header - Connects to the output of the on-board electret microphone.
	3	BUF1IN	Input	IDC 14-way male header - Connects to the non-inverting input of the first on-board op-amp.
	5	BUF1OUT	Output	IDC 14-way male header - Connects to the output of the first on-board op-amp.
	7	BUF2OUT	Output	IDC 14-way male header - Connects to the output of the second on-board op-amp.
	9	BUF2IN	Input	IDC 14-way male header - Connects to the non-inverting input of the second on-board op-amp.
	11	SPKIN	Input	IDC 14-way male header - Connects to the input of the on-board audio power amplifier. (ac coupled)
	2, 4, 6, 8, 10, 12, 13, 14	GND	Power	IDC 14-way male header - Connects to the board analogue ground.
J6	1	DVIN	Power	Snap socket - Connection for external 5Vdc power supply rail.
	2	GNDDIGITAL	Power	Snap socket - Connection for digital ground rail.
J7	1	AVIN	Power	Snap socket - Connection for external dc power supply rail (2.7Vdc to 5.5Vdc).
	2	GND	Power	Snap socket - Conenction for analogue ground rail.
J8			Bi	25-way D type plug - Connects the evaluation board to the parallel port of the controlling PC.

Jumper and Link Settings

Jumper	Positions	Default position	Description
JP1	1 - 2	S/C	Remove and connect multimeter to measure device current consumption (digital supply rail).
JP2	1 - 2	S/C	Remove and connect multimeter to measure device current consumption (analogue supply rail).
JP3	1 - 2	O/C	Fit when feeding an ac signal into the CMX88x signal monitor input, i.e. via the PK_DETECT terminal.
J4	5 - 6	S/C	AVIN is connected to DVDD.
J4	9 - 10	S/C	AVIN is connected to AVDD.
J4	13 - 14	S/C	AVIN is connected to AUXVDD.
J5	1 - 2	S/C	CSN is connected to PICCSN. Disconnect when interfacing to the CMX88x C-BUS directly.
J5	3 - 4	S/C	CDATA is connected to PICCDATA. Disconnect when interfacing to the CMX88x C-BUS directly.
J5	5 - 6	S/C	SCLK is connected to PICSCLK. Disconnect when interfacing to the CMX88x C-BUS directly.
J5	7 - 8	S/C	RDATA is connected to PICDATA. Disconnect when interfacing to the CMX88x C-BUS directly.
J5	9 - 10	S/C	IRQN is connected to PICIRQN. Disconnect when interfacing to the CMX88x C-BUS directly.
LK1		S/C	If this link is not fitted, the two external power supplies must have a connection between their respective ground terminals.
LK2		S/C	If this link is not fitted, the two external power supplies must have a connection between their respective ground terminals.

Test Points		
Test point	**Signal name**	**Description**
TP1	DISC_FB	Feedback taken from the CMX88x discriminator input amplifier.
TP2	ALERTPC	Interrupt line from the PIC to the parallel port. When the CMX88x pulls its IRQN low the PIC produces an interrupt, which comprises a positive (rising) edge transition.
TP3	WAITN	An EPP cycle can be initiated when this signal is low, and completed when high.
TP4	XFERN	This signal is taken low when an EPP data transfer cycle is in progress.
TP5	DVSS	Digital ground connection.
TP6	DVSS	Digital ground connection.
TP7	DVSS	Digital ground connection.
TP8	AVSS	Analogue ground connection.
TP9	AVSS	Analogue ground connection.
TP10	AVSS	Analogue ground connection.
TP11	PGMODE	This signal is taken low to put the PIC microcontroller into low voltage programming mode.
TP12	INPUT_2_FB	Feedback taken from the CMX88x input 2 amplifier.
TP13	MIC_FB	Feedback taken from the CMX88x microphone input amplifier.

Notes: S/C = Short Circuit
O/C = Open circuit
Bi = Bi directional

1.5 Board Layout

For clarity, the circuit schematics are available as separate, high-resolution files.
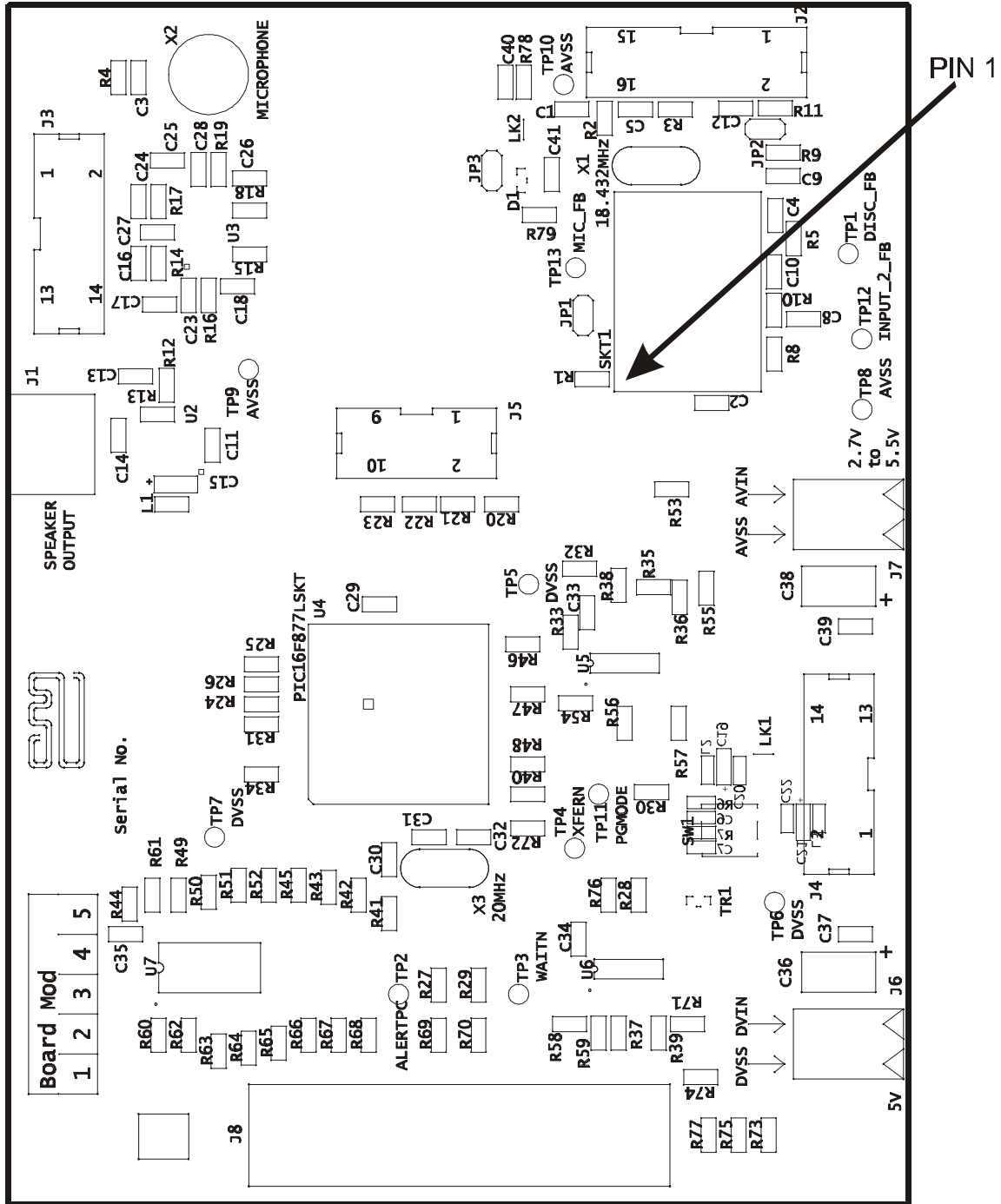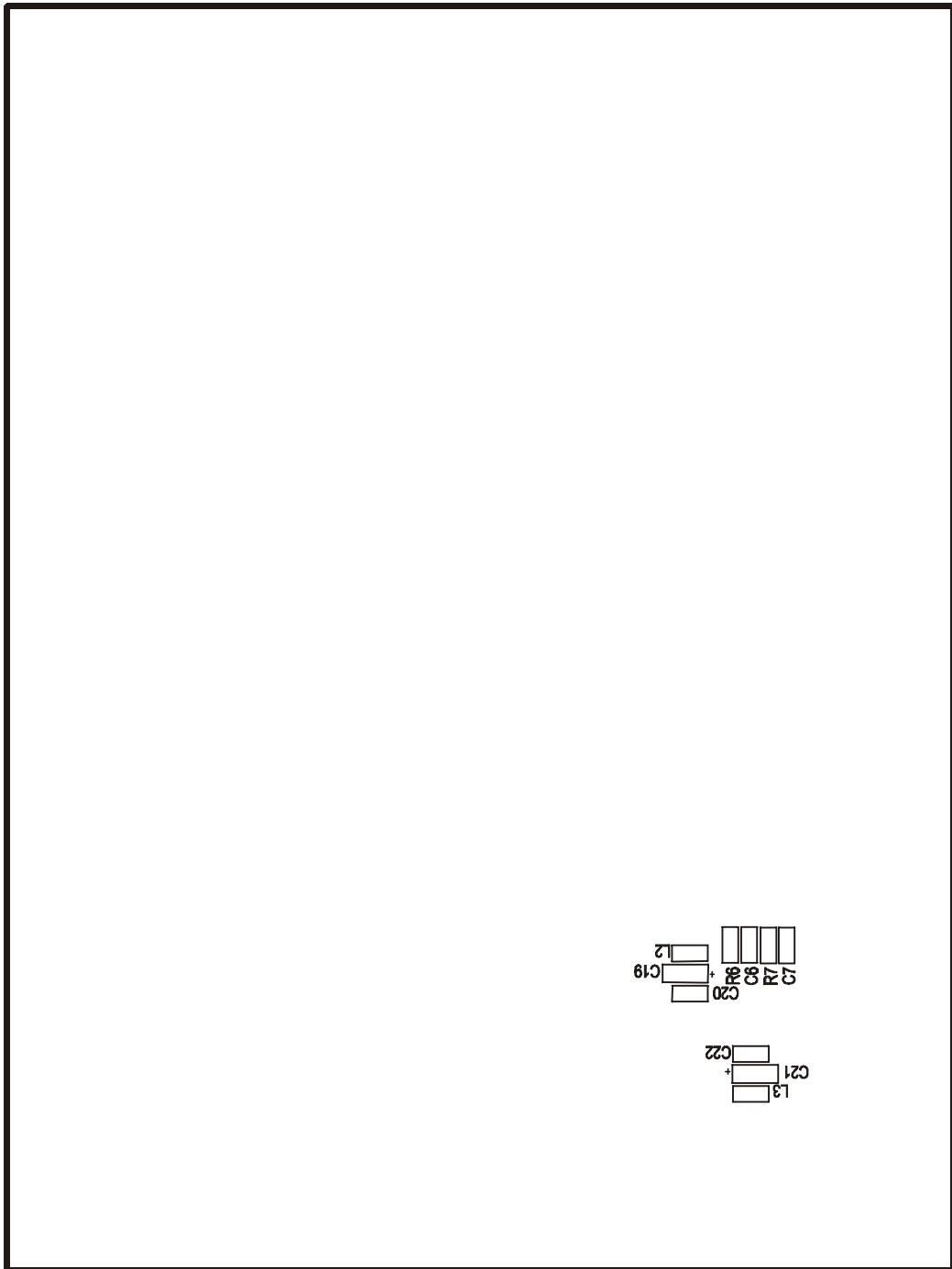

Figure 2 Top Silk Screen

Figure 3 Bottom Silk Screen

1.6   Detailed Description

1.6.1   Hardware Description

1.6.1.1 Operating Voltage

The EV8810 board requires two operating voltages. DVIN is set at 5Vdc and AVIN is set within the range 2.7Vdc to 5.5Vdc.

1.6.1.2 I$_{DD}$ Measurement

Device currents can be measured for both the analogue and digital supplies. To measure the digital supply current remove jumper JP1, connect a multimeter set to meaure dc current across the jumper pins and apply the supply voltages. The analogue supply current can be measured using jumper JP2 in the same manner.

1.6.1.3 Crystals

The PIC microcontroller is clocked with a 20MHz crystal, X3. The delay routines, which form part of the supplied PIC firmware require a 20MHz crystal. The CMX881, CMX882 and CMX883 are clocked at 18.432MHz.

1.6.1.4 Peak Detector

Components C40, C41, D1, R78 and R79 form a peak detector circuit that is used only when it is required to connect ac signals to the signal monitor input of the device. To use the peak detector circuitry fit jumper JP3 and feed the signal to be monitored to pin 15 of connector J2.

The evaluation board as supplied is not populated with components C40, C41, D1, R78 and R79. Refer to the EDS for the CMX881, CMX882 or CMX883, which give recommendations on the values that should be used for these components.

1.6.1.5 On Board Buffering

A MAX4326ESA dual op-amp IC (U3) is fitted to the board. The board is supplied with both of these configured as unity-gain buffers. However several other configurations are available with the addition of extra passive components for which provision has been made on the PCB. All of these components (C16, C17, C18, C23, C24, C25, C26, C28, R14, R15, R16, R17, R18, R19) will take an 0805 or 0603 sized component.

1.6.1.6 Audio Power Amplifier

The board is fitted with a LM4871M audio power amplifier IC (U2). This device has a power output of 3W. Pin 11 (SPKIN) of connector J3 is ac coupled to the input of the amplifier, and the output of the amplifier is connected to a 3.5mm jacket socket, to which an 8 ohm loudspeaker can be connected.

1.6.1.7 Microphone

The board is also fitted with an electret type microphone. The output of the microphone is connected to pin 1 (MICROPHONE) of connector J3.

1.6.1.8 Reset Switch

The reset switch (SW1) fitted to the board will reset the PIC microcontroller when pressed. The PIC will begin executing the first instruction in its program memory.

1.6.2 Low Voltage Programming of the PIC

The PIC16LF877-20/SP Flash Microcontroller that is fitted to the EV8810 kit has been pre-programmed by CML before shipment with the latest version of firmware (EF8810xx.hex, where xx represents the version number). Please read the separate information sheet (EK8810) and check the CML web site (www.cmlmicro.com/products/evkits/) for firmware status. The latest source code and programming file can also be downloaded from the CML web site. The PIC is reprogrammed via the parallel port with the supplied ESFlash_xx application software.

1.6.3 ES8810xx Application Software

The ES8810xx application software is a dialog box based application. When run, a dialog box titled Device Selection is displayed. The device and parallel port base address can be selected from the pull down boxes. Default selections are CMX881 and 378h respectively. Clicking the OK button will display the main dialog box for the selected device. The CMX881 main dialog box is shown in figure 4.

Figure 4 CMX881 main dialog box

Each edit box contained within the Write Only group box corresponds to a write only register within the device. The entered value will be either a 2 or 4 digit hexadecimal value, which is dependent on the length of the register (8 or 16 bit). The check boxes positioned adjacent to each edit box control which registers are written.

Each edit box contained within the Read Only group box corresponds to a read only register within the device. These edit boxes allow no user input, but will display values read from the device. The check box positioned directly below these boxes is enabled only after a valid value is written to the Interrupt Mask register. This is typically the case when the device is put into a receive mode. Ticking the check box enables an automatic update. An automatic update will read and display the current value held in the device's Status register after the device has generated an interrupt.

Each edit box contained within the Program Register group boxes corresponds to a program word within the device. The entered values will be 4 digit hexadecimal values. The Write Program Register check box controls the writing of entered values to the device.

Also positioned on the bottom half of the dialog box is a group box containing a series of radio buttons in addition to an edit box that corresponds to the Mode Control register within the device. The value entered in this box will be written to the device's Mode Control register when the Start Tx/Rx button is pressed. The function of each button is described below.

Load device

Writes to the device with the current values displayed in the Write Only and Program Register edit boxes. A write only register will only be written if its corresponding checkbox is ticked and the Program Register will only be written if the Write Program Register checkbox is ticked.

Read device

Reads all read only registers within the device and displays each read value in the corresponding edit box.

Open configuration

Opens a previously saved text configuration file and displays values read from the file in the corresponding Write Only and Program Register edit boxes. The relevant check boxes are automatically ticked.

Save configuration

Currently displayed values in the Write Only and Program Register edit boxes will be saved to the selected text file.

Reset device

Resets the CMX881, CMX882 or CMX883. The state of all edit boxes and checkboxes is maintained.

Reset & clear dialog

Resets the CMX881, CMX882 or CMX883, clears all edit boxes and checkboxes.

Start Tx/Rx

Writes the currently displayed value in the Mode Control register edit box to the Mode Control register. This puts the device into the programmed transmit or detect mode. All other radio buttons with the exception of the **Stop Tx/Rx** and **Read device** are disabled.

Stop Tx/Rx

Writes a zero value to the Mode Control register. This disables the programmed transmit or detect mode and puts the device into idle mode. Also restores disabled radio buttons to an enabled state.

Close dialog

Closes the dialog. This button is disabled when the device has been put into a transmit or detect mode.

1.6.3.1 Text File Format

Using text files to populate the main dialog box is a quick and easy way to set up the CMX881, CMX882 or CMX883. The format of the text file is described in this section.

Line 1 must contain the expression **881_FORMAT**, **882_FORMAT** or **883_FORMAT**. This is device dependent. Text files created for a particular device cannot be used with another another device, i.e. text files created for the CMX881 cannot be used with the CMX883. This is because the register structures of the three devices are different.

All lines after the first contain a 4 digit hexadecimal value. Each value corresponds to a CMX881, CMX882 or CMX883 register value. The order in which the register values are stored in the text file is important and a value must be assigned to each register. A zero value can be used for registers not being written to. The required order for each device is shown in Table 1.

CMX881		CMX882		CMX883	
Register	**Line No.**	**Register**	**Line No.**	**Register**	**Line No.**
B0	2	B0	2	B0	2
B1	3	B1	3	B1	3
B2	4	B2	4	B2	4
B3	5	B3	5	B3	5
C0	6	C0	6	C0	6
C2	7	C2	7	C2	7
C3	8	C3	8	C3	8
CA	9	C7	9	CB	9
CD	10	CA	10	CD	10
CE	11	CB	11	CE	11
C1	12	CD	12	C1	12
C8 P0.0 - 0.3	13 - 16	CE	13	C8 P1.0 - P1.5	13 - 18
C8 P1.0 - P1.18	17 - 35	C1	14	C8 P2.0 - P2.4	19 - 23
C8 P2.0 - P2.4	36 - 40	C8 P0.0 - P0.7	15 - 22	C8 P4.0 - P4.7	24 - 31
C8 P4.0 - P4.7	41 - 48	C8 P1.0 - P1.5	23 - 28		
		C8 P2.0 - P2.4	29 - 33		
		C8 P4.0 - P4.7	34 - 41		

Table 1 Order in which register values must be stored in the text file

All Write Only register values, with the exception of the Mode Control register have an additional digit appended to the 4 digit register value. This is either a '1' or '0'. The application software uses this extra digit when populating the Write Only edit boxes within the main dialog box. A '1' indicates that the corresponding check box should be ticked and a '0' indicates that the check box should be unticked. Only those edit boxes with the corresponding check box ticked will be actually written to the CMX881, CMX882 or CMX883.

An example of a text file for use with the CMX882 is shown below. This particular file will set up a CMX882 to transmit a 1981Hz Selcall tone. Lines of text starting with '#' are not normally included in the text file. They have been included here for reference.

```
882_FORMAT
770F1                    # Analogue Gain 0xB0 (Check box ticked)
30001                    # Signal Routing 0xB1 (Check box ticked)
00000                    # Auxiliary ADC Thresholds 0xB2
00000                    # Auxiliary ADC Control 0xB3
0F601                    # Power Down Control 0xC0 (Check box ticked)
00000                    # Audio + Device Address 0xC2
80001                    # Tx Tone 0xC3 (Check box ticked)
00000                    # Modem control 0xC7
00000                    # Tx Data 1 0xCA
00000                    # XTCSS + Tx Data 2 0xCB
00000                    # Audio Tone 0xCD
00000                    # Interrupt Mask 0xCE
2002                     # Mode Control 0xC1
C000                     # MSK frame sync LSB - P0.0 0xC8
4000                     # MSK frame sync MSB - P0.1 0xC8
4000                     # Scramble seed 1 LSB - P0.2 0xC8
4000                     # Scramble seed 1 MSB - P0.3 0xC8
4000                     # Scramble seed 2 LSB - P0.4 0xC8
4000                     # Scramble seed 2 MSB - P0.5 0xC8
4000                     # Msk bit sync LSB - P0.6 0xC8
4000                     # MSK bit sync MSB - P0.7 0xC8
D3FF                     # Audio band Tx level - P1.0 0xC8
5000                     # Audio band detect threshold - P1.1 0xC8
5111                     # Programmable in-band tone 0 - P1.2 0xC8
51F8                     # Programmable in-band tone 1 - P1.3 0xC8
54A2                     # Programmable in-band tone 2 - P1.4 0xC8
57F2                     # Programmable in-band tone 3 - P1.5 0xC8
E000                     # CTCSS and DCS Tx level - P2.0 0xC8
6000                     # CTCSS and DCS detect threshold - P2.1 0xC8
6000                     # DCS code bits 11 to 0 - P2.2 0xC8
6000                     # DCS code bits 23/22 to 12 - P2.3 0xC8
6000                     # Sub audio drop out time - P2.4 0xC8
8000                     # Fine input gain - P4.0 0xC8
0000                     # Reserved - P4.1 0xC8
0000                     # Fine output gain 1 - P4.2 0xC8
0000                     # Fine output gain 2 - P4.3 0xC8
0000                     # Output 1 offset control - P4.4 0xC8
0000                     # Output 2 offset control - P4.5 0xC8
0000                     # Ramp rate control - P4.6 0xC8
0000                     # Limiter setting - P4.7 0xC8
```

1.6.4   Generic Device Configurations
This section contains a series of generic register settings for various transmit and receive modes.

Selcall transmit

```
B0 - 0x770F
B1 - 0x3000
C0 - 0x0F60
C1 - 0x2002
C3 - < position of code in tone table >
C8 - 0xD3FF
C8 - 0x5000
C8 - < custom tone 0 - 882 883 > < repeat tone - 881 >
C8 - < custom tone 0 - 881 >
↓
C8 - < custom tone 15 - 881 >
```

Selcall receive

```
B0 - 0x0000
B1 - 0x0030
C0 - 0x3060
C1 - 0x2001
CE - 0xA000
C8 - 0xD000
C8 - 0x5039
C8 - < custom tone 0 - 882 883 > < repeat tone - 881 >
C8 - < custom tone 0 - 881 >
↓
C8 - < custom tone 15 - 881 >
```

CTCSS transmit

```
B0 - 0x770F
B1 - 0x3000
C0 - 0x0F60
C1 - 0x0802
C2 - < device address >
C8 - 0xE3FF
```

CTCSS receive

Predictive detection	*Non-predictive detection (Tone Clone)*
B0 - 0x0000	B0 - 0x0000
B1 - 0x0030	B1 - 0x0030
C0 - 0x3060	C0 - 0x3060
C1 - 0x0801	C1 - 0x0801
C2 - < device address >	C2 - 0x0030
CE - 0x8800	CE - 0x8800
C8 - 0xE000	C8 - 0xE000
C8 - 0x6038	C8 - 0x6038

XTCSS transmit

Maintenance tone disabled   *Maintenance tone enabled*

    B0 - 0x770F   B0 - 0x770F
    B1 - 0x3000   B1 - 0x3000
    C0 - 0x0F60   C0 - 0x0F60
    C1 - 0x6002   C1 - 0x6002
    C2 - *< device address >*   C2 - 0x02 *< device address >*
    CB - *< S1 > < S0 >*   CB - *< S1 > < S0 >*
    C8 - 0xD3FF   C8 - 0xD3FF
    C8 - 0x5 *< XTCSS tone length >* 39   C8 - 0x5 *< XTCSS tone length >* 39

XTCSS receive

    B0 - 0x0000
    B1 - 0x0030
    C0 - 0x3060
    C1 - 0x6801
    C2 - *< device address >*
    CB - *< S1 > < S0 >*
    CE - 0x9800
    C8 - 0xD000
    C8 - 0x5 *< XTCSS tone length >* 39

DCS transmit

23 bit code (non-inverted)   *24 bit code (inverted)*

    B0 - 0x770F   B0 - 0x770F
    B1 - 0x3000   B1 - 0x3000
    C0 - 0x0F60   C0 - 0x0F60
    C1 - 0x0402   C1 - 0x0202
    C8 - 0xE3FF   C8 - 0xE3FF
    C8 - 0x6000   C8 - 0x6800
    C8 - *< DCS data (bits 11 - 0) >*   C8 - *< DCS data (bits 11 - 0) >*
    C8 - *< DCS data (bits 23/22 - 12) >*   C8 - *< DCS data (bits 23/22 - 12) >*

Turn-off tone enabled

    B0 - 0x770F
    B1 - 0x3000
    C0 - 0x0F60
    C1 - 0x0402
    C2 - 0x0100
    C8 - 0xE3FF
    C8 - 0x6000
    C8 - *< DCS data (bits 11 - 0) >*
    C8 - *< DCS data (bits 23/22 - 12) >*

DCS receive

23 bit code (non-inverted)   *24 bit code (inverted)*

>   B0 - 0x0000   B0 - 0x0000
>   B1 - 0x0030   B1 - 0x0030
>   C0 - 0x3060   C0 - 0x3060
>   C1 - 0x0401   C1 - 0x0201
>   CE - 0x8400   CE - 0x8400
>   C8 - 0xE000   C8 - 0xE000
>   C8 - 0x6038   C8 - 0x6838
>   C8 - *< DCS data (bits 11 - 0) >*   C8 - *< DCS data (bits 11 - 0) >*
>   C8 - *< DCS data (bits 23/22 - 12) >*   C8 - *< DCS data (bits 23/22 - 12) >*

Turn-off tone enabled

>   B0 - 0x0000
>   B1 - 0x0030
>   C0 - 0x3060
>   C1 - 0x0C01
>   CE - 0x8400
>   C8 - 0xE000
>   C8 - 0x6038
>   C8 - *< DCS data (bits 11 - 0) >*
>   C8 - *< DCS data (bits 23/22 - 12) >*

1.7   Performance Specification

1.7.1   Electrical Performance

1.7.1.1 Absolute Maximum Ratings
Exceeding these maximum ratings can result in damage to the Evaluation Kit.

	Min.	Max.	Units
Supply DVIN - DVSS	-0.3	7.0	V
Supply AVIN - AVSS	-0.3	7.0	V
Voltage on any pin to DVSS	-0.3	DVIN + 0.3	V
Voltage on any pin to AVSS	-0.3	AVIN + 0.3	V
Current into or out of DVIN, DVSS, AVIN, and AVSS	-30	+130	mA
Current into or out of any other pin	-20	+20	mA
Storage Temperature	-10	+70	°C
Operating Temperature	+10	+35	°C

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

	Notes	Min.	Max.	Units
Supply (DVIN - DVSS)		4.5	5.5	V
Supply (AVIN - AVSS)		2.7	5.5	V
Operating Temperature		+10	+35	°C

1.7.1.3 Operating Characteristics
For the following conditions unless otherwise specified:

> Evaluation Device Xtal Frequency = 18.432MHz ±0.01% (100ppm)
> DVIN = 5.0Vdc, AVIN = 5.0Vdc, Tamb = +25°C.

	Notes	Min.	Typ.	Max.	Units
DC Parameters					
IDD (D)(evaluation board - idle)	1	–	126.0	–	mA
IDD (A)(evaluation board - idle)		–	12.0	–	mA

Notes: 1. 74HC245 Octal Bus Transceiver outputs enabled

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For FAQs see: www.cmlmicro.com/products/faqs/

For a full data sheet listing see: www.cmlmicro.com/products/datasheets/download.htm

For detailed application notes: www.cmlmicro.com/products/applications/

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