Consumer Microcircuits Limited

COMMUNICATION SEMICONDUCTORS
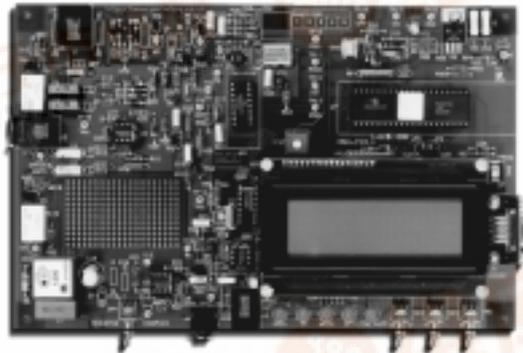
EV6021
Evaluation Kit
User Manual

1.0   Features

- **For CMX602B Product Evaluation**
- **Adjunct Box or Feature Phone Configuration**
- **Single Power Supply Operation**
- **LCD Display or RS232 Link to PC with Software**
- **On-Board Regulator**
- **Socketed Components for Adjustment**

- **User's Prototyping Area**
- **Socketed Space for Optional and Telco-Specific Components**
- **Socketed PIC 16-Series µC**
- **On-Board PIC Programming with Serial Interface and PC Software**
- **2- to 4-Wire Interface with Handset Socket**

1.1   Brief Description

The EV6021 Evaluation Kit comprises a single board containing a CMX602B, line interface components, PIC µController and the option of using either the on-board 4-line LCD module or interfacing to a PC via a serial communications port. For the latter mode of operation Windows software is supplied. When using the LCD module three switches are used to select the EV6021 mode of operation.

The board is powered from a single 8 - 14V dc power supply; an on-board regulator sets V_{DD}. LEDs indicate control, interrupt and detect line status (ZP, MODE, IRQN and DET) and the CMX602B may be driven from an external clock, or from its own crystal oscillator. Important signals can be monitored by test points. The CMX602B is socketed for easy replacement; there is room for the user to fit a ZIF socket. A user prototyping area is provided.

On-board circuitry may be used to implement a wetting pulse and to place an ac or dc load on the line. A hook relay connects the 2- to 4-wire interface/op-amp hybrid for voice communications to the line. An external phone socket for adjunct box demonstration is provided, the connection to which can be disabled with a relay. A mutable local voice input and DTMF generator (for CIDCW acknowledgement tone) are provided. Operation is indicated by LEDs. The CMX602B supply current may be measured by removing a jumper. Where components are telco-specific (line impedance, line protection, ac-load, wetting pulse, etc.) space is provided for the user to add appropriate components.
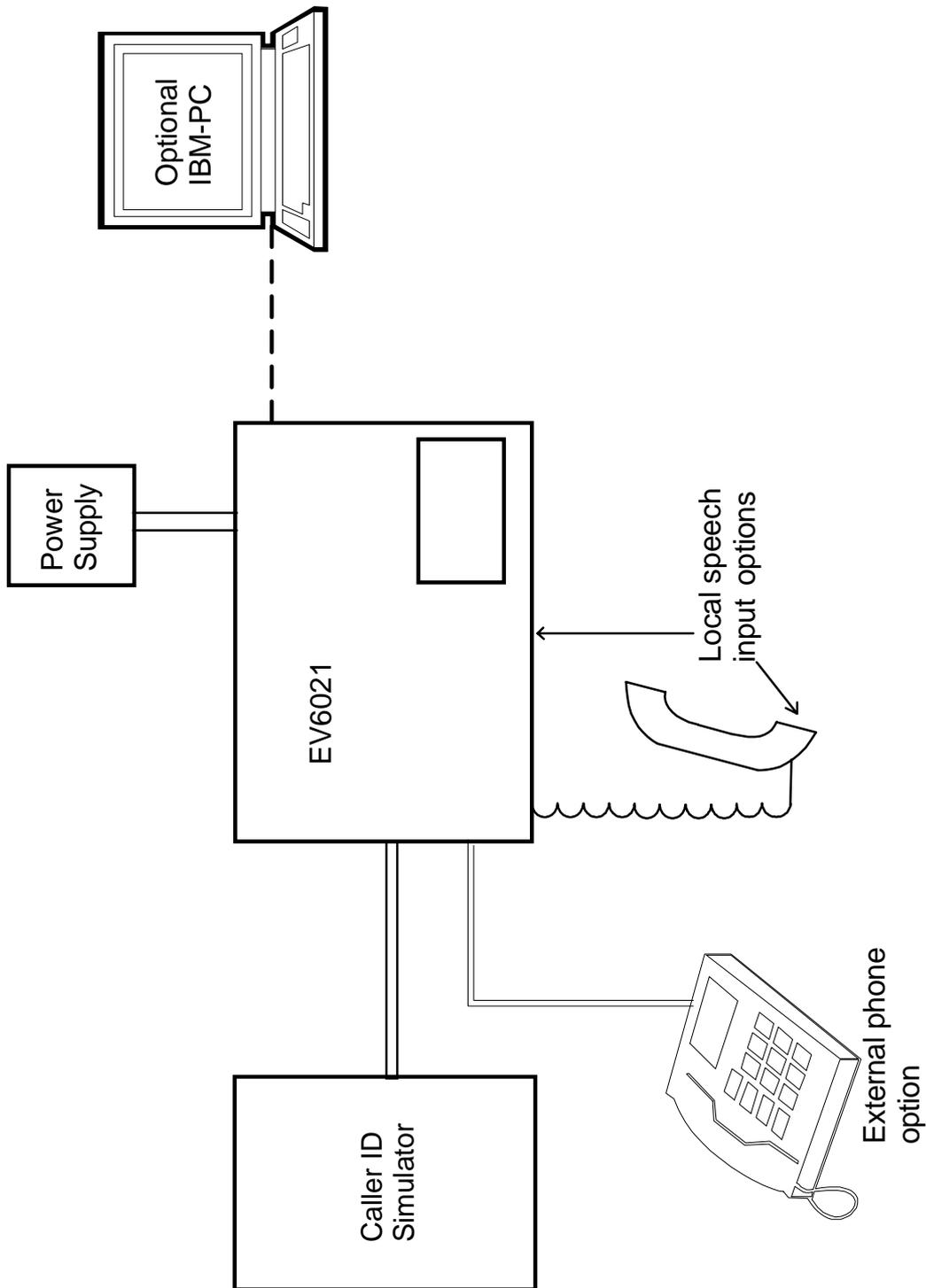
CONTENTS

Block Diagram

Figure 1 Block Diagram

1.2   Preliminary Information

1.2.1   Laboratory Equipment

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

1.2.1.1   8 - 14V DC Power Supply.

1.2.1.2   Caller ID Simulator

1.2.1.3   Speech Source

If the user wishes to control the EV6021 from a PC and/or re-program the PIC on the board.

1.2.1.4   An IBM compatible PC; 20MHz '386 or better, running Microsoft Windows™ 3.11 / '95 /NT. The re-programming software supplied (`PICPROGA.EXE`) runs most efficiently under DOS and cannot be used with Windows NT.

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 may be damaged by electrostatic discharge. Partially damaged circuits may 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 listed on the separate information sheet (EK6021) and notify CML within 7 working days if the delivery is incomplete.

1.2.3   Telephone Line Connection

This Evaluation Kit is not approved for direct or indirect connection to any public telecommunication system. Users are advised to observe local statutory requirements which may apply to this product.

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 linked to a PC appears later in this document.

1.3.1   Setting-Up

THE EV6021 COMES PRE-CONFIGURED FOR OPERATION AT 3.3 VOLTS.

An RJ11 (US style) phone jack is provided for caller ID simulator connection. Power is connected via the two-way socket, J5. No board adjustments are required by the user. Telco-specific components may be added, as required.

1.3.2   Operation

Ensure no connection to serial port connector J6 and switch on the power supply. The message EF6021 Vx.x will be visible on the LCD module plus an indication as to which function option is selected. The three switches, SW2 to SW4, give the options of BT or Bellcore, Type 1 or Type 2 and Adjunct Box or Feature Phone.
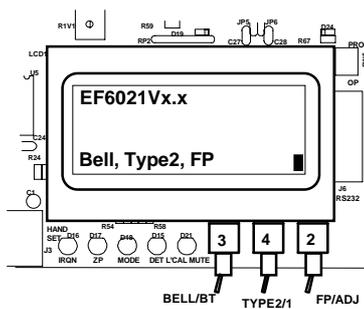

Figure 2 Function Selection

A fuller description of these functions is given later in the document.

If a type 2 demonstration is selected switch SW1 should be set to 'RESISTIVE' which selects a factory-fitted 600Ω line termination, (R21) but an alternative value can be substituted.

If a complex line termination is required, positions C11, R16 and R19 can be used with switch SW1 set to 'COMPLEX'.

An off-hook dc load is provided by R8. The factory-fitted value is 2k2Ω but this may be removed or an alternative value substituted.
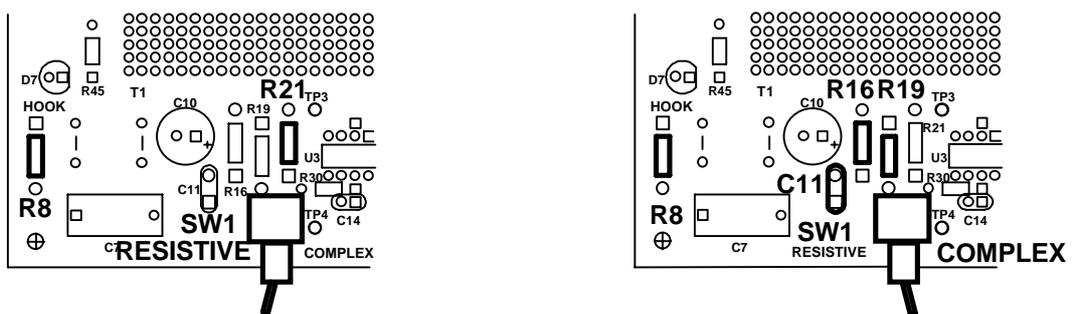

Figure 3 Termination Positions

1.4   Signal Lists

CONNECTOR PINOUT - EVALUATION BOARD				
Connector Ref.	**Connector Pin No.**	**Signal Name**	**Signal Type**	**Description**
J1	1, 2	-	-	Not Used. No connection needed.
	3	A	BI	Bidirectional 'phone line (A = TIP).
	4	B	BI	Bidirectional 'phone line (B = RING).
	5, 6	-	-	Not Used. No connection needed.
J2	1, 2	-	-	Not Used. No connection needed.
	3	B	BI	Bidirectional external 'phone socket (B = RING).
	4	A	BI	Bidirectional external 'phone socket (A = TIP).
	5, 6	-	-	Not Used. No connection needed.
J3	1		Input	Microphone +ve.
	2		Output	Speaker drive.
	3		Output	Speaker drive.
	4		Input	Microphone -ve.
J4	1 tip/pin2	V_{SS} speech	Power Input	) Jack socket for mutable input) from external speech source.
J5	1	V_{IN}	Power	+ve power from external power supply.
	2	V_{SS}	Power	0V power from external power supply.
J6	1	DCD	Output	PC connection (linked to DTR).
	2	RXD	Output	PC data output.
	3	TXD	Input	PC data input.
	4	DTR	Input	PC connection.
	5	V_{SS}	Power	0V common connection to PC.
	6	DSR	Output	PC connection (linked to DTR).
	7	RTS	Input	PC 'RTS' connection.
	8	CTS	Output	PC 'CTS' connection.
	9	-	-	Not used. No connection needed.

TEST POINTS - EVALUATION BOARD		
Test Point Ref.	**Default Measurement**	**Description**
TP1	0V	V_{SS} connection.
TP2	0V	V_{SS} connection.
TP3	$V_{DD}/2$	Line signal after transformer.
TP4	$V_{DD}/2$	Hybrid transmit output (Local Voice).
TP5	$V_{DD}/2$	Hybrid receive output (Remote Voice).
TP6	-	Muteable local speech input.
TP7	-	CMX602B RD input, pin 3.
TP8	-	CMX602B RT signal, pin 4.
TP9	-	CMX602B AOP signal, pin 5.
TP10	-	CMX602B RXD output, pin 15.
TP11	-	CMX602B RXCK input, pin 14.
TP12	-	CMX602B DET output, pin 13.
TP13	-	CMX602B IRQN output, pin 12. A pull-up resistor R11 is included on board.
TP14	0V	V_{SS} connection.
TP15	0V	V_{SS} connection.
TP16	V_{DD}	VPP programming voltage input for PIC16C74A.
TP17	8 - 14V	V_{IN} connection.
TP18	3.3V	V_{DD} connection.

JUMPERS - EVALUATION BOARD			
Link Ref.	Positions	Default Position	Description
JP1	1-2	s/c	Connect handset socket to muteable speech path.
JP2	1-2	s/c	Disconnect to supply an external clock to CMX602B via pin 2.
JP3	1-2	s/c	Disconnect when supplying external clock to CMX602B via JP2 pin 2.
JP4	1-2	s/c	Disconnect to measure I_{DD} of evaluation device.
JP5	1-2	s/c	Disconnect to supply an external clock to PIC16C74A via pin 1.
JP6	1-2	s/c	Disconnect when supplying external clock to PIC16C74A via JP5 pin 1.

s/c = short circuit

SWITCHES - EVALUATION BOARD			
Link Ref.	Positions	Default Position	Description
SW1	1-2/2-3	2-3	Resistive (default) or Complex line termination.
SW2	1-2/2-3	2-3	Feature Phone (default) or Adjunct Box.
SW3	1-2/2-3	2-3	Bellcore (default) or BT.
SW4	1-2/2-3	2-3	Type 2 or Type 1.
SW5	open/closed	open	PIC16C74A reset.
SW6	1-2,6-5/2-3,4-5	2-3,4-5	Operating (default) or programming mode.

1.5   Circuit Schematics and Board Layouts

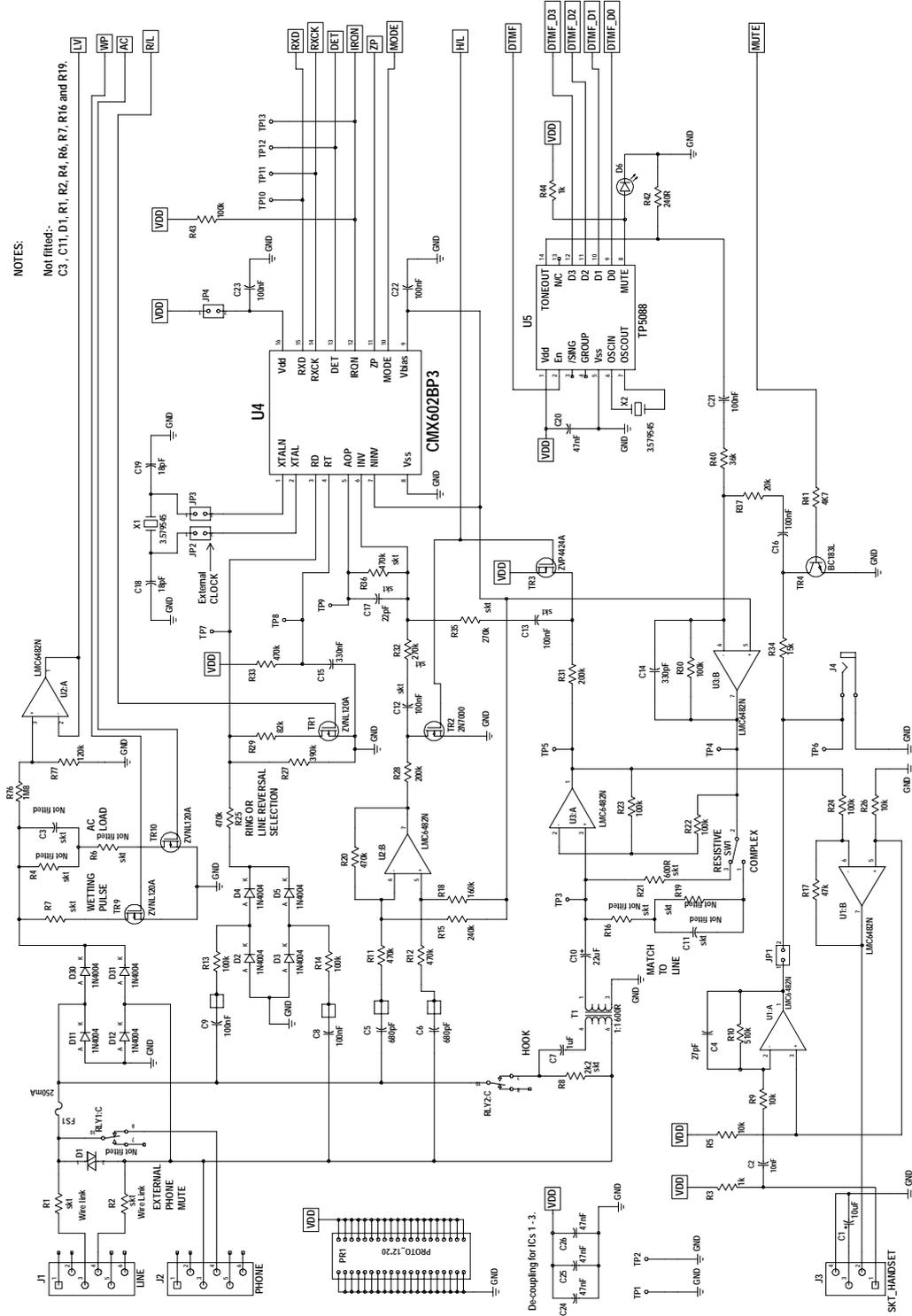**Figure 4   Analogue Section**
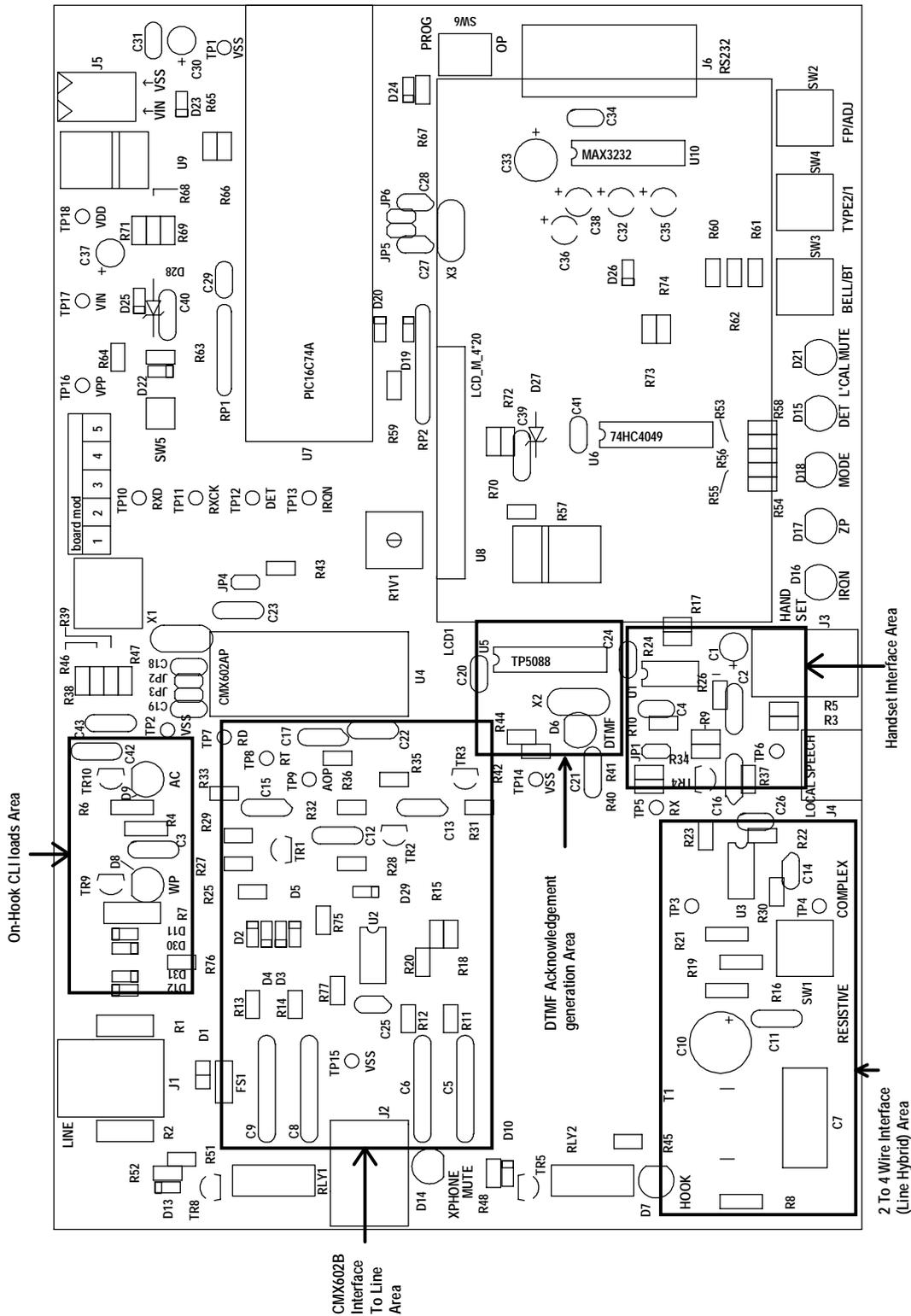
Figure 5 Control Section

Figure 6 Evaluation Board Layout

1.6   Detailed Description

1.6.1   Hardware Description - Evaluation Board

1.6.1.1   Line Protection
Line protection is provided by R1 (47Ω), R2 (47Ω), and D1 (Philips BR211 series 140V). These components are not fitted, but suitable values for UK applications are suggested in brackets. Wire links which bypass R1 and R2 will need to be removed if these resistors are fitted.

1.6.1.2   AC or DC Load
An ac or dc load is provided by R4 (827Ω), R6 (1386Ω) and C3 (139nF). These components are not fitted, but suitable values for UK applications are suggested in brackets. This load is switched in by TRI0. An LED is illuminated when this occurs.

1.6.1.3   Wetting Pulse
A wetting pulse load is provided by R7, which is not fitted. For UK applications, a suitable value may be in the region of 240Ω to 350Ω. The wetting pulse is switched in by TR9. An LED is illuminated when this occurs.

1.6.1.4   External Phone
A second RJ11 socket, J2, is provided for an external telephone when the EV6021 is set to demonstrate adjunct box functions. When muted/disabled an LED marked 'XPHONE MUTE' is illuminated.

Note that this relay is normally closed, so do not connect a telephone to the external phone socket J2 when running feature phone demonstrations.

1.6.1.5   Transformer and Op-Amp Hybrid / 2- to 4-wire interface.
The transformer and op-amp hybrid (formed by U3 A and B) are connected to the phone line by relay RLY2. When energised an adjacent LED is illuminated.

An off-hook dc load, for feature phone mode, is provided by R8, factory set to 2k2Ω.

Line impedance matching is required in order to place signals on the line (acknowledgement tone of type 2 / off-hook / cidcw sequences) and to be able to send and receive speech and other signals (feature phone demonstration).

Two impedance matching options are available, resistive or complex, which can be selected using switch SW1.
For resistive matching R21 is factory set to 600Ω.
For complex matching fit C11 (310nF), R16 (370Ω), R19 (620Ω). Suggested values for BT applications are given in brackets.
R8 and R21 are socketed for easy removal and replacement.
Alternatively, matching components could be fitted across test points TP3 and TP4.

Access to hybrid signals is provided as follows:

> The hybrid receive output (Rx = remote voice) is located on test point TP5.
> The hybrid transmit output (Tx = local voice) is located on test point TP4.

1.6.1.6   Local Speech Paths
When emulating a feature phone, a muteable local speech path is available. A speech signal may be input at either testpoint TP6 or jack socket J4. Alternatively with jumper JP1 fitted the local voice can come from a telephone handset (not provided) connected to socket J3. When muted an LED marked 'L'CAL MUTE' is enabled.

Note that the local speech path has a gain of ≈12dB.

1.6.1.7   Operating Voltage
The operating voltage (V_{DD}) is set to 3.3V. This may be altered by changing components R68 and R69 which are socketed. To select 5.0Volts set R68 = 620Ω and R69 = 100Ω. The formula for calculating the values of R68 and R69 is as follows:-

$$R68 + R69 = \frac{240\,(V_{DD} - 1.25)}{1.25}$$

Where 240 is the value of R71 in ohms and V_{DD} is the required supply voltage.

1.6.1.8   Clock/Oscillator
The CMX602B may use either an external clock or its own xtal oscillator. A 3.58MHz xtal is provided on-board for the latter method. Two jumpers JP2 and JP3, which are normally fitted, select the xtal oscillator. An external clock may be supplied to JP2 pin 2 once the jumpers have been removed.

The PIC16C74A may be provided with an external clock in the same way by removing jumpers JP5 and JP6. Note that PICs programmed by CML are only configured for use with the on-board 4MHz crystal.

The DTMF generator uses its own 3.58MHz xtal because the xtal oscillator is only operational when the generator is active and the CMX602B has a 'zero-power' mode (in which its xtal oscillator is disabled) preventing it from supplying a clock to the DTMF generator.

1.6.1.9   Ring/Line Reversal Detection
Ring/line reversal detection is provided by components C9, C8, R13, R14, R25 and R27 (or R27 in parallel with R29), plus D2-D5 and TR1. The response time is set by components R33 and C15. The evaluation board has been fitted with suitable components for UK applications. See CMX602B data sheet for further details.

1.6.1.10   CMX602B Tone Alert/FSK Receive Path
This part of the CMX602B can be connected directly to the line, via amplifier U2: A, or to the Rx output of the 2- to 4-wire interface.

When TR2 is conducting the signal from the line is disabled. Alternatively when TR3 is conducting the signal from the 2- to 4-wire interface is disabled.

Note that if the signal path chosen is via the 2- to 4-wire interface absolute levels at the CMX602B will depend upon the line impedance of the caller ID simulator in use and on the quality of the termination of that line. This will have a bearing on tone alert decode and not-decode levels.

1.6.1.11   Handset Connection
A telephone handset can be connected via socket J3. The speaker drive is derived from the Rx output of the 2- to 4-wire interface and the microphone output is fed to the muteable speech path via amplifier U1:A and jumper JP1.

1.6.1.12 I_{DD} Measurement
The evaluation device I_{DD} may be measured by removing jumper JP4 and replacing it with a multimeter.

1.6.1.13   DTMF Answerback Code
The DTMF answerback (digit D) for the type2 / off-hook / cidcw demonstrations is generated by U5 (National TP5088) and fed to the Tx input of the 2- to 4-wire interface.

1.6.1.14 Line Voltage Monitoring
An indication of the level of line voltage is provided at the PIC µController port A bit 0 (Pin 2). For a 48 volt line the level at this point is ≈ 3.0V d.c. This pin of the µController can be re-configured as an ADC input and, with appropriate firmware, be used to monitor the line voltage. Note that this feature is not used by the current firmware revision.

1.6.2   Software
This section describes the operation of the EV6021 kit via the RS232 lead and the Windows software supplied. The sequence of events for the demonstrations is covered in the Section 1.6.3 (Firmware).

1.6.2.1   Installation
The ES6021 Windows Application Software consists of a single executable file named ES6021xx.EXE, where xx refers to the version number. Copy this from its 3.5" floppy disk to the hard disk of the user's PC.

Windows NT and '95
For convenient and quick launching of the program create an ES6021 shortcut within the Start menu or Desktop.

Windows 3.11
For convenient and quick launching of the ES6021 software create a new program group and ES6021 icon.

1.6.2.2   Start-up
When the application is run the initialise dialog box will pop-up in front of the applications main window.

At this point ensure the EV6021 is connected to an RS232 serial port of the PC, via connector J6, and turn on the power to the board. If cancel is selected the PC will not make a connection to the EV6021 board.

1.6.2.3   Main Window
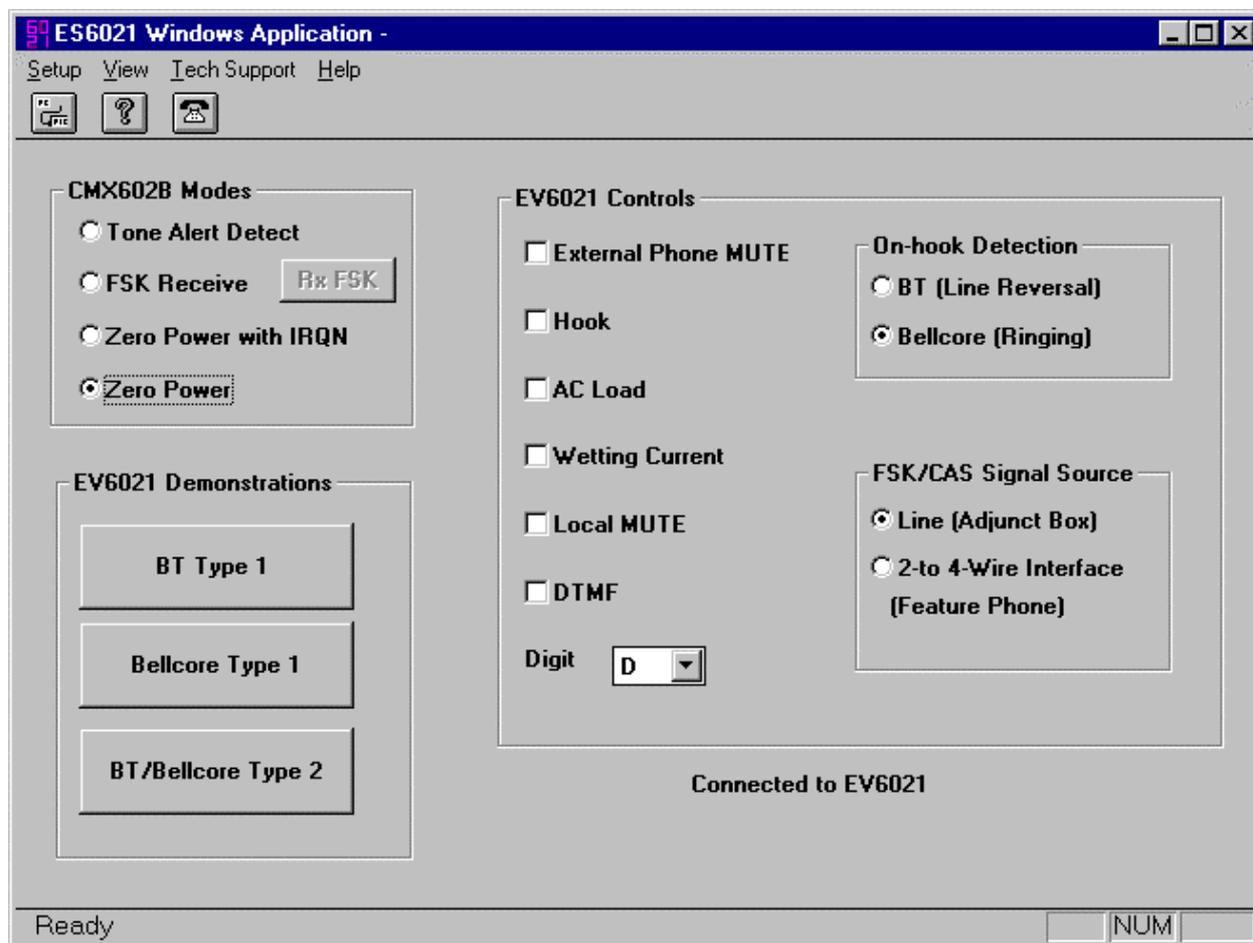
Change the mode of operation of the CMX602B by checking the appropriate radio button in the CMX602B
modes section.

In the controls section checking either of External Phone Mute or Hook will energise the appropriate relay on
the EV6021 board. Checking AC load or Wetting Current will apply the appropriate load to the line.
Checking Local MUTE will disable the speech path via handset socket, J3 or jack socket, J4 or
testpoint TP6. Whenever DTMF is checked the current digit (selected in the combo box labelled
'Digit') will be generated by the EV6021 board (U5, TP5088).

The on-hook detection options override the setting of switch SW3 and control the level at the CMX602B pin 3.

The FSK/CAS source options override the setting of switches SW2 and SW4, selecting the path these signals
take from the line to the CMX602B.

The EV6021 Demonstrations buttons will run the functions or demonstrations described in the following
sections.

An indication will be made of the state of the RS232 communications link to the EV6021 board in the bottom
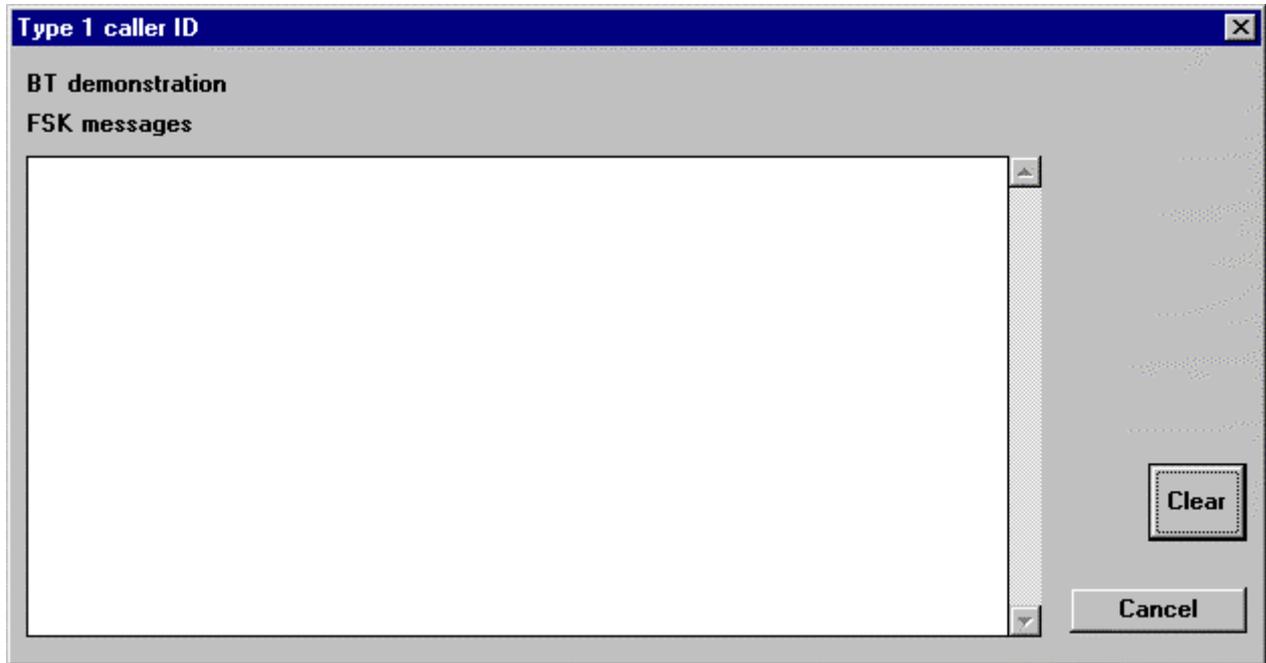right of the panel.

1.6.2.4   RxFSK dialog box
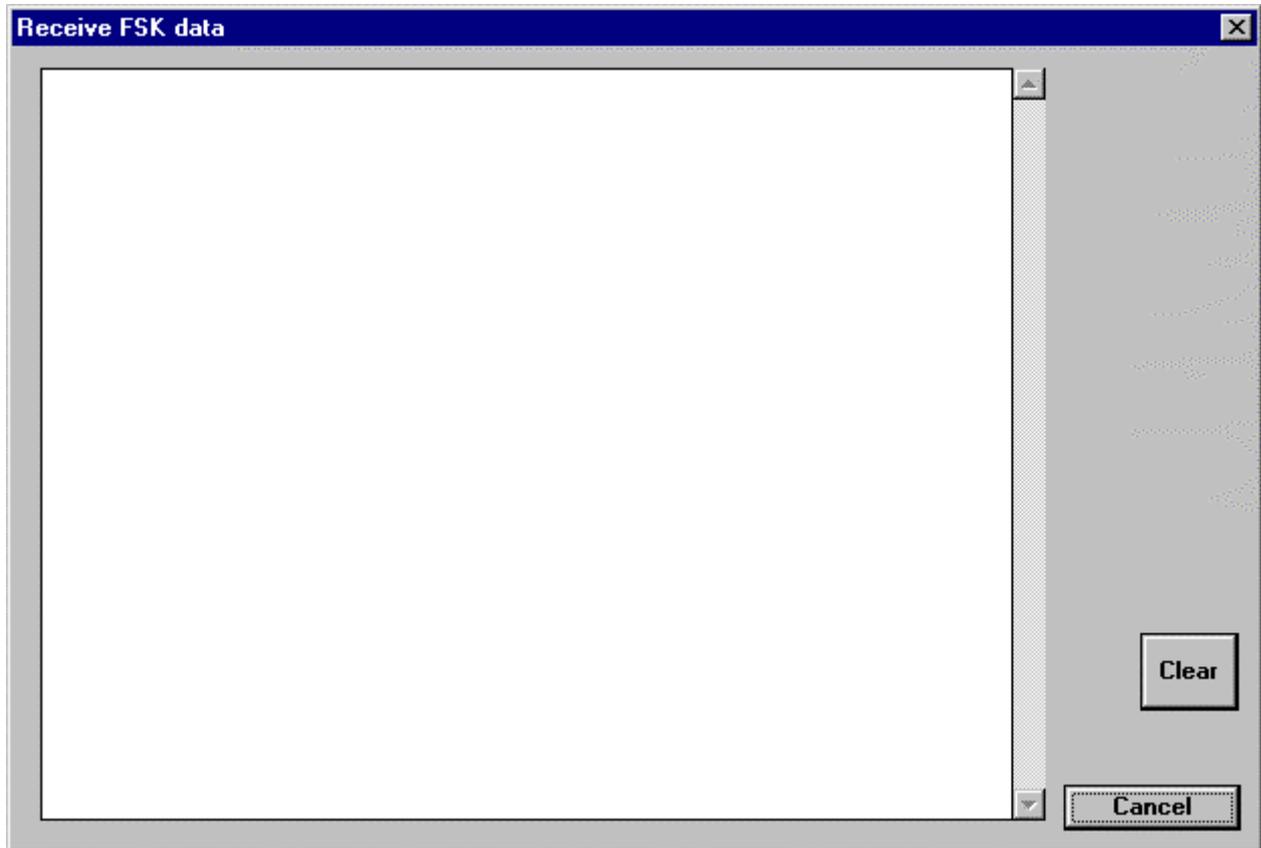
The EV6021 board is instructed to operate the CMX602B in receive mode with data re-timing selected.

Characters received by the CMX602B will be displayed in the main read-only edit box. The display is limited to 20,000 characters and will be cleared when this limit is exceeded.

The display can be cleared by the user by clicking the 'Clear' button. Click cancel to return to the main window.

1.6.2.5   Type 1/on-hook demonstration dialog box

> This dialog pops up when either the BT or Bellcore type 1 demonstrations are selected. The precise selection is displayed in the top left of the panel, in this case the BT demonstration is selected.
>
> The EV6021 is instructed to perform the appropriate caller ID demonstration and the message data is sent back to the PC and appears in the main read-only edit box.
>
> The display and controls work as described for the RxFSK dialog box.

1.6.2.6   Type 2/off-hook demonstration dialog box
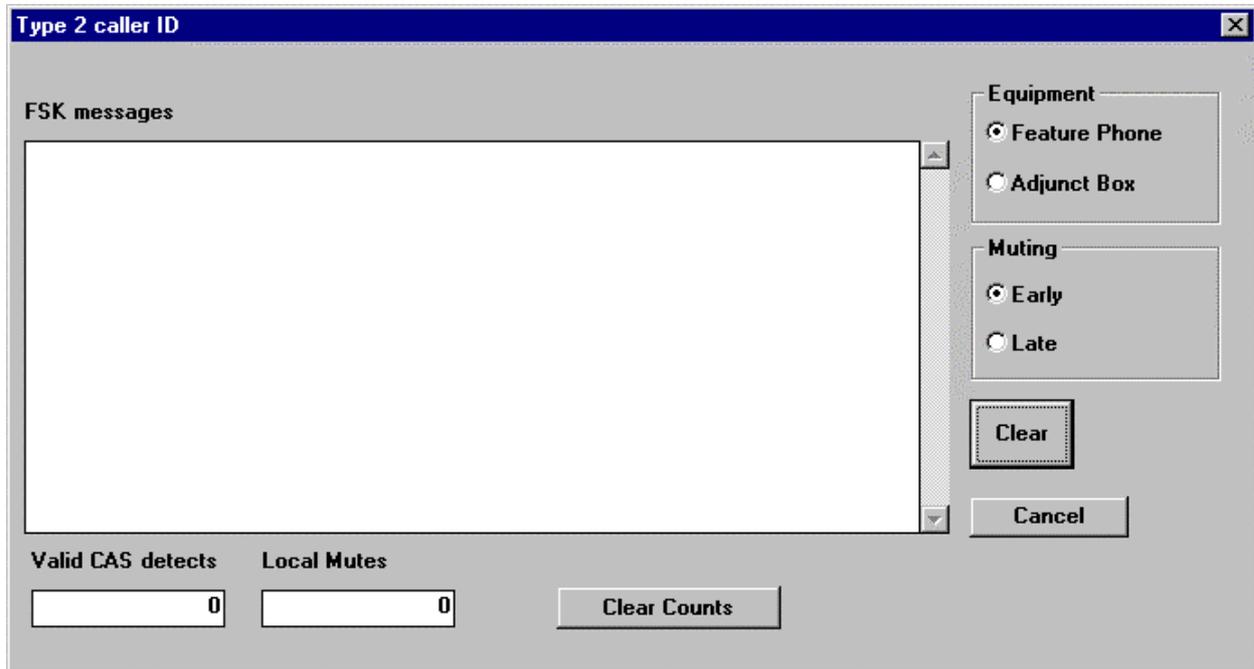
This dialog box pops up when the BT/Bellcore type 2 demonstration is selected.

The EV6021 is instructed to perform the off-hook / type 2 / CIDCW demonstration. The nature of the demonstration can be altered by selecting Feature Phone or Adjunct Box and Early or Late muting on the right hand side of the dialog box.

The valid CAS detects and local Mute counters are provided to assist with talk-off and talk-down testing, see later sections.

CLI message data is shown and the remaining controls are as described for the type 1 dialog box.

1.6.3   Firmware
This section describes the operation of the EV6021 kit using the LCD module and the demonstration selection switches SW2 to SW4. It also describes the sequence of events followed by the available demonstrations.

1.6.3.1   Start-up
As described in Quick start section.
The opening messages will be EF6021 Vx.x (where x.x represents the version number), followed by an indication of the current selection from switches SW2 to SW4.

1.6.3.2   Demonstration Selection
Use switches to alter the selection as indicated on the printed circuit silkscreen:

   SW2 - Adjunct Box or Feature Phone.
   SW3 - BT or Bellcore.
   SW4 - Type1 or Type2.

When a new selection has been made the start up messages will be displayed on the LCD until a new CLI message has been received.

1.6.3.3   BT type 1 demonstration
This demonstration covers the BT on-hook service initiated by a line reversal followed by an alert tone, see flowchart in CMX602B datasheet (application notes section). CLI message parameters are displayed on the LCD.

On the EV6021 board, FET TR9 is switched on to provide wetting current for 15ms during the silent period between the alert tone and the FSK data. A resistor can be fitted in the R7 position if a current wetting pulse is required.

FET TRI0 is switched on during the FSK receive period. If an ac termination is required, components can be fitted in positions R4, R6 and C3.

1.6.3.4   Bellcore type 1 demonstration
This demonstration covers the Bellcore on-hook service associated with ringing, see flowchart in CMX602B datasheet (application notes section). Any ringing of duration < 500ms is assumed to be a line reversal and is ignored. CLI message parameters are displayed on the LCD.

Relay 1 is energised during the FSK receive period. If an ac termination is required, components can be fitted in positions R4, R6 and C3.

1.6.3.5   BT and Bellcore type 2 demonstration
This demonstration covers both the BT and Bellcore off-hook caller ID services, see flowchart in CMX602B datasheet (application notes section).

If 'Feature Phone' is selected, the local speech path is enabled and muted when a CAS tone is detected (when the CMX602B DET output is set in tone alert mode, termed early mute). Also signals from the line, e.g. CAS tone, will be taken from the Rx side of the 2 to 4 wire interface.

If 'Adjunct Box' is selected, the link to an external telephone, socket J2, is muted when a valid CAS tone has been received (when CMX602B IRQN pin goes low in tone alert mode, termed late mute).

If the EV6021 is linked to a PC, see section 1.6.2, the point at which muting occurs can be toggled between early and late.

Counters record the number of times muting has occurred (M) and the number of times a valid CAS tone has been detected (C). The counts are displayed on row 3 of the LCD.

DTMF digit 'D' is transmitted on to the phone line as an acknowledgement tone. If the EV6021 is linked to a PC other DTMF digits can be sent as an acknowledgement. CLI message parameters are displayed on the top two rows of the LCD.

On the EV6021 board, the line termination resistor R21 (factory-fitted 600Ω) should be fitted and the switch SW1 set to 'RESISTIVE'. If an off-hook dc load is required, for feature phone mode, a resistor must be fitted in position R8 (factory-fitted 2k2Ω).

If a complex termination is required positions C11, R16 and R19 can be used with switch SW1 set to 'COMPLEX'.
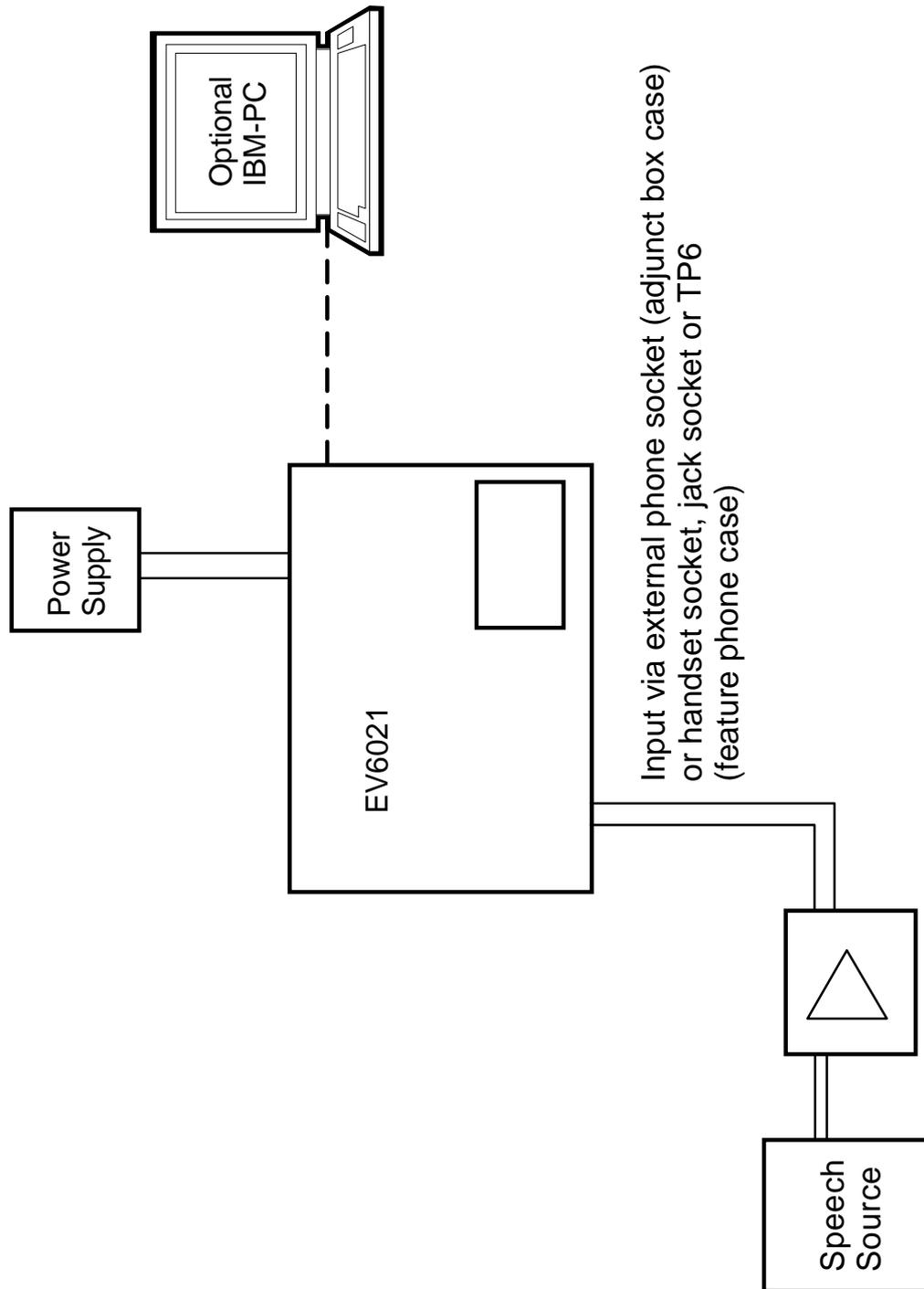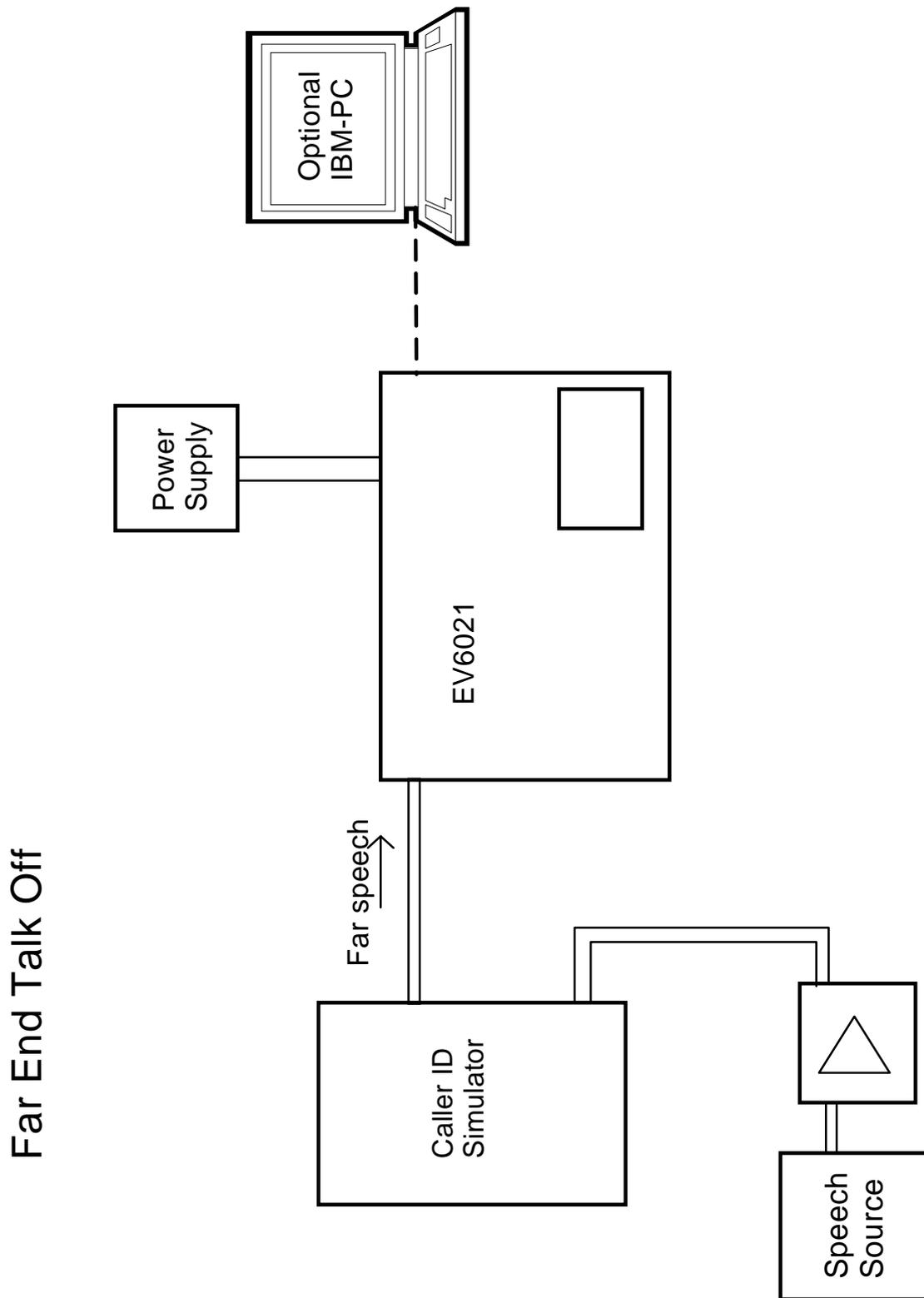
1.6.4   Additional Information

Figure 7 Near End Talk-Off Tests With The EV6021

Figure 8 Far End Talk-Off Tests With The EV6021

Near End Talk Down

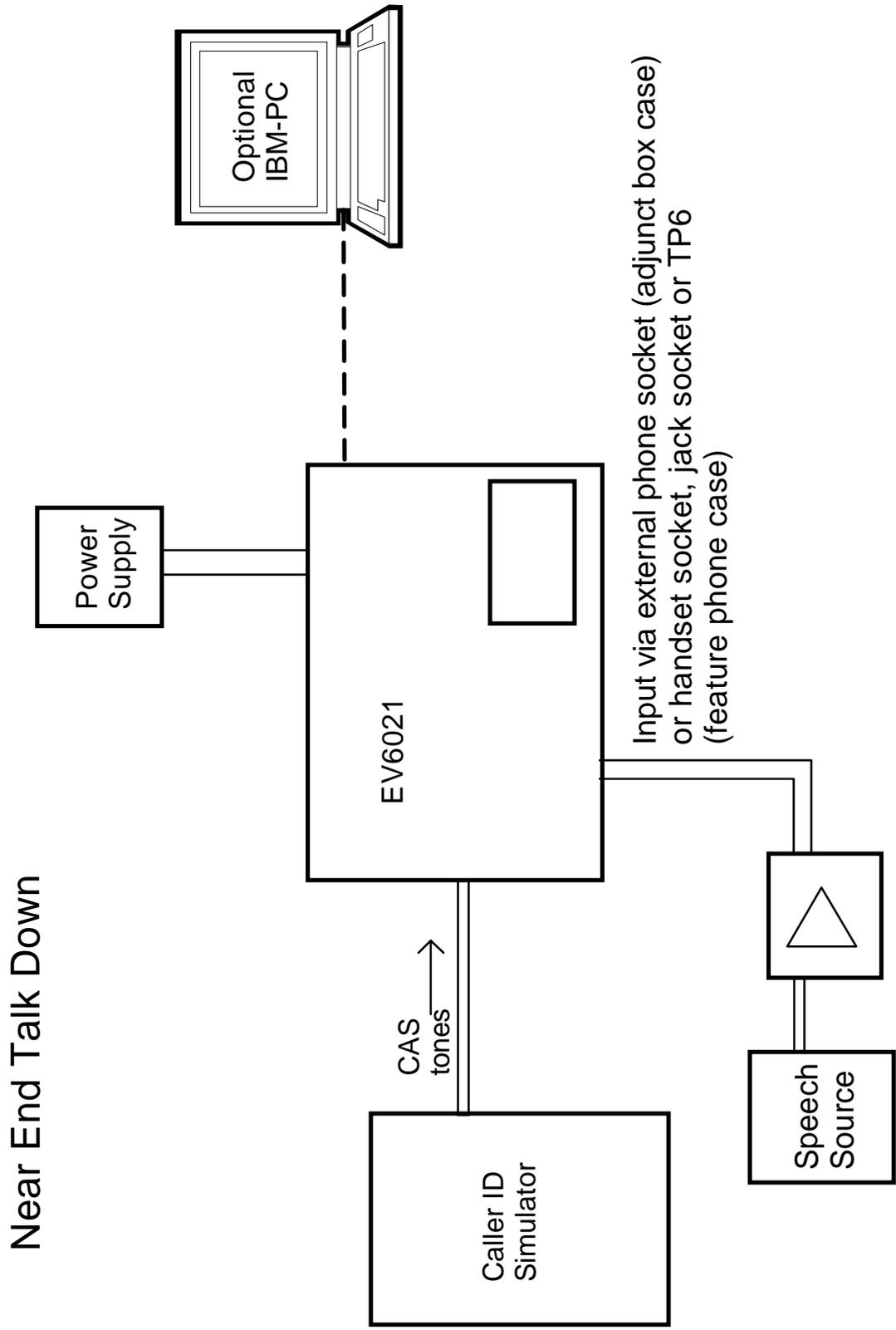**Figure 9 Talk Down Tests With The EV6021**

1.6.4.1   In-circuit re-programming of PIC16C74A

In order that the PIC16C74A μController may be re-programmed the existing program must be erased by placing the device in a uv- eraser for approximately 15 minutes.

TO ENTER PROGRAMMING MODE
(a)   Remove power from board
(b)   Set switch, SW6, to 'PROG'
(c)   Re-apply power to board
(d)   Connect the programming voltage (V_{PP} = 12.5V to 13.5V) power supply between test point TP16 (+ve) and V_{SS} (-ve)
(e)   Ensure the PIC μC programming utility **PICPROGA.EXE** is loaded into the PC under DOS and the PC is connected to the evaluation kit
(f)   Reset the EV6021 board by momentarily pressing switch, SW5

USING THE SOFTWARE - PICPROGA
This is supplied on disk as a self-documented executable file **PICPROGA.EXE** for a PC running DOS (either directly or as a DOS window in Windows 3.11 or '95). It is not recommended for use on Windows NT systems. Please note that this programming software does not meet the Arizona Microchip Technology verification requirements for a "production quality" programmer. Also, it does not support the programming of ID locations and there is no checksum facility.

The user interface consists of two windows. The top window contains the operating instructions and the bottom window shows the command line and data communications with the PIC μC. When the top window first appears the user will be prompted to enter the number of the serial communications port to which the EV6021 board is connected. Once the user has entered this number, the following commands are displayed:

```
press F    to load file

press C    to enter Configuration Word.  Currently - xxxx

press B    to check target device is blank.

press P    to program target device.

press V    to verify target device.

press R    to read target device.

press A    to view contents of program data array.

press Esc  to return to DOS.
```

A new function from the above table can be selected whenever the **>ok** prompt appears in the bottom window.

Notes:

a)   Assembler output files must be in the Intel hex format **(.HEX)** in order to be usable by this programming software.

b)   The PIC μC supplied has a Configuration Word which is preset **3FB1H**. This selects the crystal oscillator, disables the watch dog timer, enables the power up timer and disables code protection. The programming software currently defaults to **3FB1H.** Consult Arizona Microchip Technology for more information on the Configuration Word.

c)   The "blank check" command **(B)** only looks at the first location. A programmed device will always have data in this location as it is the program start address.

d)   For each of the commands **B,P,R** and **V** the user will be prompted to manually reset the target μC, by pressing the RESET switch (SW5) on the EV6021 Evaluation Board. This is because PIC programming always starts from location **0000** and the program counter can only be incremented.

e)   Pressing **A** will display the program data in the bottom window, formatted in pages of 48 consecutive locations. Use the **<PageUp>** and **<PageDown>** keys to scroll through the data. Pressing **<Esc>** will return the user to the **>ok** prompt.

TO LEAVE PROGRAMMING MODE

(a) Remove power from board (including the programming voltage, V_{PP}).
(b) Set switch, SW6, to 'OP'.
(c) Power up board as described in previous sections for normal operation.

1.6.4.2   DTMF Generator

For anyone wishing to write their own code for the EV6021 the code table for the DTMF generator, U5, is as follows:

DTMF GENERATOR DECODE TABLE				DTMF CODE
pin 12 (D3)	pin 11 (D2)	pin 10 (D1)	pin 9 (D0)	
0	0	0	0	D
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	0
1	0	1	1	*
1	1	0	0	#
1	1	0	1	A
1	1	1	0	B
1	1	1	1	C

1.7   Performance Specification

1.7.1   Electrical Performance

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

	Min.	Max.	Units
Supply (V_{IN} - V_{SS})	-0.3	40.0	V
Supply (V_{DD} - V_{SS})	-0.3	7.0	V
Voltage on any pin to V_{SS}	-0.3	V_{DD} + 0.3	V
Current into or out of V_{IN} and V_{SS} pins	0	+1.5	A
Current into or out of any other pin	-20	+20	mA
Storage Temperature	-	+70	°C
Operating Temperature	+10	+35	°C

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

	Notes	Min.	Max.	Units
Supply (V_{IN} - V_{SS})		8.0	14.0	V
Supply (V_{DD} - V_{SS})		3.0	5.5	V
Operating Temperature		+10	+35	°C
External Clock Frequency for CMX602B		3.575965	3.583125	MHz
External Clock Frequency (for µC at 5.0V V_{DD})		0.1	20.0	MHz
External Clock Frequency (for µC at 3.0V V_{DD})		0.1	4.0	MHz

Operating Characteristics
For the following conditions unless otherwise specified:
Evaluation Device and DTMF Generator Xtal Frequency = 3.579545MHz, µC = 4.00MHz
V_{DD} = 3.3V to 5.0V, Tamb = +25°C.

	Notes	Min.	Typ.	Max.	Units
DC Parameters					
I_{DD} (evaluation board - idle)	1	-	50.0	-	mA
AC Parameters					
Xtal/Clock Input to Evaluation Device					
'High' pulse width	2	100	-	-	ns
'Low' pulse width	2	100	-	-	ns
OSC1 Input to PIC µC					
'High' pulse width		50.0	-	-	ns
'Low' pulse width		50.0	-	-	ns

Notes: 1.   Relays not energised.
              2.   Timing for an external input to the CLOCK/XTAL pin.

Operating Characteristics - Timing Diagrams

For CMX602B timing information, refer to current CML CMX602B Data Sheet.

CML Microcircuits

COMMUNICATION SEMICONDUCTORS

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**.

These companies are all 100% owned operating companies of the CML Microsystems Plc Group and these changes are purely changes of name and do not change any underlying legal entities and hence will have no effect on any agreements or contacts currently in force.

CML Microcircuits Product Prefix Codes

Until the latter part of 1996, the differentiator between products manufactured and sold from MXCOM, Inc. and Consumer Microcircuits Limited were denoted by the prefixes MX and FX respectively. These products use the same silicon etc. and today still carry the same prefixes. In the latter part of 1996, both companies adopted the common prefix: CMX.

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

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