

# **COMX**

## **EXPANSION BOX**

### **MANUAL**

COMX is a trademark of COMX WORLD OPERATIONS LTD.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of COMX WORLD OPERATIONS LIMITED.

The information in this document has been carefully checked and is believed to be entirely reliable. No responsibility, however, is assumed for inaccuracies. Furthermore, such information does not convey to the purchaser of the product described any licence under the patent rights or copyrights of COMX WORLD OPERATIONS LIMITED or others.

## Contents

Chapter 1	: Introduction
Chapter 2	: Expansion box user manual
2.1	Introduction and installation
2.1.1	Introduction
2.1.2	Installation
2.2	User guide
Chapter 3	: Hardware reference manual
3.1	Circuit description
3.2	Expansion slot hardware reference guide
3.2.1	Expansion slot pin out
3.2.2	Pin function description
Chapter 4	: Software reference manual
4.1	Routines call
4.2	Firmware parameter list
Chapter 5	: General specifications

## WARNING

PLEASE INSERT ALL INTERFACE CARDS VERTICAL INTO THE EXPANSION SLOTS AT ALL TIMES. CARELESSNESS IN OPERATIONS MAY BE HARMFUL TO THE EXPANSION BOX.

## COMX Expansion Box Manual

### Chapter 1

#### Introduction

COMX Expansion Box is a powerful expansion tool of the COMX personal computers. It provides the following features:

1. It eliminates the use of CALL statement to access thermal printers and standard printers, etc.
2. It provides a set of statements to users for the ease of use of the interface cards.
3. It enables users to use more than one interface card at any one time.
4. Interface cards can be used on any slot, they are slot independent.
5. It also provides a set of useful routines for the advanced users to use.
6. It gives the user a chance to expand and utilize the powerfulness of the COMX microcomputer.

## 2.1 Introduction and installation

## 2.1.1 Introduction

The Expansion Box firmware provides the followings:

1. selection of slot
2. auto searching of standard printer card
3. auto searching of thermal printer card
4. auto searching of DOS card
5. auto searching of RAM card
6. auto switching between 80-column card and DOS card
7. ease of use of interface card
8. memory move
9. memory verify

## 2.1.2 Installation

1. Switch off the COMX personal computer
2. Plug the expansion box left edge into the COMX expansion slot.
3. Plug those interface cards into the slot of the expansion box. Notice that the printed name of the interface card should face to you. Make sure that the cards are not in the wrong direction.
4. Switch on the COMX personal computer, a statement "ready" should appear on the left hand corner of the screen. Try to select the interface card with "CARD Sm" statement, m is the slot number chosen, and then test your interface card with the interface card self test function. If the self test is okay, the expansion box is in a good condition.

5. If there is anything wrong, switch off the computer and then pull all the interface card out from the expansion slots. On typing "CARD Sm", an error message "empty slot" and a high pitch sound will be given. If the computer does not response like this, your expansion box is out of order. Please consult our agents for help.

6. If step 5 goes right, then switch off the COMX personal computer and pull the expansion box out from the side connector. Then plug the interface card into the expansion slot and test the interface card with its self test. If it does not work, consult our agents for help.



## 2.2 User guide

The following options can be used with the expansion box installed.

### 1. CARD Sn

This option is used whenever the user wants to select a particular interface card plugged into slot n. n ranges from 1 to 4.

### 2. CARD Tm

This option is used whenever the user wants to use the Thermal Printer card. The Thermal Printer card will be searched. An error message will be echoed if the Thermal Printer card does not exist. m specifies the functional options of the Thermal Printer card. m ranges from 0 to 8. The following is the functions description:

Syntax	Function	Equivalent Assembly call
CARD T0	mode preselection	CALL(@C040)
CARD T1	switch off the thermal printer with 8 line feeds	CALL(@C050)
CARD T2	enter the thermal printer Text mode	CALL(@C060)
CARD T3	switch on the printer and TV display	CALL(@C080)
CARD T4	disable keyboard input	CALL(@C0A0)
CARD T5	memory dump(HEX & ASCII )	CALL(@C0C0)
CARD T6	switch the printer to no line space	CALL(@C0D0)
CARD T7	self test	CALL(@C0E0)
CARD T8	create screen image	CALL(@C0F0)

Note : before any assembly call, the user should enable the thermal printer card first, by the OUT 1 instruction. If by BASIC, just use any CARD Tm before the CALL statement.

### 3. CARD Pm

This option is used whenever the user wants to use the Standard Printer card. The Standard Printer card will be searched. An error message will be echoed if it does not exist. m specifies the functional options of the standard printer card. m ranges from 1 to 11. The following is the functions description:

Syntax	Function	Equivalent Assembly call
CARD P0	selection routine	CALL(@C040)
CARD P1	switch off the printer	CALL(@C050)
CARD P2	switch on the printer with control character suppressed	CALL(@C060)
CARD P3	switch on the printer	CALL(@C070)
CARD P4	switch on the printer and TV display mode with control character suppressed	CALL(@C080)
CARD P5	switch on the printer and TV display mode	CALL(@C090)
CARD P6	disable keyboard input to printer	CALL(@C0A0)
CARD P8	memory dump	CALL(@C0C0)
CARD P10	self test	CALL(@C0E0)

Note : before any assembly call, the user should enable the thermal printer card first, by the OUT 1 instruction. If by BASIC, just use any CARD Pm before the CALL statement.

### 4. CARD Bm

This option is used whenever the user wants to use the RAM card. The RAM card will be searched. Error message will be echoed if it does not exist. m specifies the selected bank of the RAM card, m ranges from 0 to 3.

### 5. CARD M

This option is used whenever the user wants to move a block of memory content from one place to another. Before this statement, the user should poke the source address into \$BF45, \$BF46 (HI/LO), the target address into \$BF47, \$BF48 (HI/LO) and the length of the block into \$BF49, \$BF4A (HI/LO).

#### 6. CARD Q

This option is used when the user does not want the 80-column display any more. Notice that the 80-column display has a higher priority over the 40-column display.

#### 7. CARD V

This option is used whenever the user wants to compare a block of memory content with another. Before this statement, the user should poke the source address into \$BF45, \$BF46 (HI/LO), the target address into \$BF47, \$BF48 (HI/LO) and the length of the block into \$BF49, \$BF4A (HI/LO).

#### 8. DOS

This option is used whenever the user wants to use the DOS with DOS controller card installed. The DOS card will be searched. An error message will be given if it does not exist.

## Chapter 3

### Hardware Reference Manual

#### 3.1 Circuit descriptions

The function of the expansion box is mainly to provide slot selection. The five bit latch E1 (40174) is to latch the high byte address for the EPROM E5 (2732). E4 (4075), E3 (4049), E8 (4075) and E2 (4073) form the main address decoding circuitry of the EPROM E5. The EPROM E5 will be chip selected if the decoded address are \$E800 to \$EFFF or \$1000 to \$17FF. The first range \$E800 to \$EFFF store the firmware of the expansion box. The other range \$1000 to \$17FF is to overwrite the original BASIC ROM. Whenever a program run within this range, it will select this EPROM and at the same time disable the original BASIC ROM through the slot pin EXTROM. E2, E3 and E5 (40175) a four bit latch form the slot selection circuitry. A clock is given to E5 whenever a OUT 1 instruction is encountered. E5 then latches the data into the four bit latch. The output of these latch is connected to the pin B of the expansion slot. Every interface card should use this pin to enable itself.

#### 3.2 Expansion slot hardware reference guide

##### 3.2.1 Expansion slot pin out

Function	Pin Number	Pin Number	Function
GND	1	A	GND
NC	2	B	DS
+5V	3	C	+12V
D0	4	D	D1
D2	5	E	D3
D4	6	F	D5
D6	7	H	D7
DP'	8	J	Q
CLEAR'	9	K	MRD'
TPA	10	L	N0
N1	11	M	N2
RAS'	12	N	INT'

WAIT'	13	P	CK
SCI	14	R	SC0
EF4'	15	S	CASE'
TPB	16	T	A15'
MWR'	17	U	A14
A7	18	V	A14'
A5	19	W	A6
A4	20	X	A3
A2	21	Y	EXT-ROM'
A1	22	Z	A0

Note : a symbol ' after the pin syntax means the pin is low active.

### 3.2.2 Pin function description

Pin Number	Syntax	I/O	Function
1	GND	0	Ground
2	NC		No Connection
3	+5V	0	Reserve for future expansion Positive 5 volt dc supply
4	D0	I/O	System data bit 0
5	D2	I/O	System data bit 2
6	D4	I/O	System data bit 4
7	D6	I/O	System data bit 6
8	DP'		No Connection Reserve for future expansion
9	CLEAR'	I	System clear pin This pin combined with WAIT' Provides four control modes:
	CLEAR'	WAIT'	MODE
	L	L	LOAD
	L	H	RESET
	H	L	PAUSE
	H	L	RUN
10	TPA	0	High address byte trigger pulse The trailing edge of TPA is used to latch the high order address byte.
11	N1	0	I/O instruction bit signal 1
12	RAS'	0	Row address strobe of DRAM Low active
13	WAIT'	I	System wait pin (see pin 9)
14	SC1	0	This pin combined with pin SC0 indicate the current state of the CPU.
State	Type	SC1	SC0
S0	(Fetch)	L	L
S1	(Execute)	L	H
S2	(DMA)	H	L
S3	(INTERRUPT)	H	H



15	EF4'	I	This input enables the interface to transfer status information to the processor. The processor can test this with the flag test instruction.
16	TPB	O	Processor data latch clock.
17	MWR'	O	Memory write pulse. Low active.
18	A7	O	Multiplexed address bit 7. In each processor cycle, the higher order byte of a 16 bit memory address appears on the memory address lines A0-A7 first. Then the lower order address byte.
19	A5	O	Multiplexed address bit 5.
20	A4	O	Multiplexed address bit 4.
21	A2	O	Multiplexed address bit 2.
22	A1	O	Multiplexed address bit 1.

Pin Number	Syntax	I/O	Function
A	GND	O	Ground
B	DS	O	Device Select This is the interface card selection pin all interface card will use this pin to enable itself. Each interface card is free to use the address range \$C000 to \$DFFF whenever this pin is pulled high.
C	+12V	O	Positive 12 volt DC.
D	D1	I/O	System data bit 1.
E	D3	I/O	System data bit 3.
F	D5	I/O	System data bit 5.
H	D7	I/O	System data bit 7.
J	Q	O	Single bit output from the CPU which can be set or reset under program control.
K	MRD'	O	Memory read pulse. Low active.
L	N0	O	I/O instruction signal 0.
M	N2	O	I/O instruction signal 2.
N	INT'	I	Processor interrupt request. Low active.
P	CK	O	Processor output clock, 2.8 MHZ.
R	SC0	O	Processor state code (see pin 14).
S	CASE'	O	Column address strobe for DRAM. Low active.
T	A15'	O	Inverse address bit 15.
U	A14	O	Address bit 14
V	A14'	O	Inverse address bit 14.
W	A6	O	Multiplexed address bit 6.
X	A3	O	Multiplexed address bit 3.
Y	EXTROM'	I	BASIC ROM disable pin. Whenever this pin is pulled low, the BASIC ROM is disselected.
Z	A0	O	Multiplexed address bit 0.



## 4.1 Routines call

## 1. CARD \$E817

This is the CARD statement handler entry point.

## 2. DOCARD \$E86D

This is the DOS statement handler entry point, it will call the SEARCH routine to find the DOS card and then jump to the DOS.

## 3. CHANGE \$E8AF

This routine will change the input and output hook if the user selects other interface card during the 80-column display.

## 4. THERMAL \$E8FB

This is the CARD Tm statement handler.

## 5. PRINTER \$E9AA

This is the CARD Pm statement handler.

## 6. BANK \$EA5D

This is the CARD Bm statement handler.

## 7. WHO \$EAD0

This routine will tell the user the current bank of the RAM card.

## 8. QUIT \$EB0A

This routine enables the user to quit the 80-column display.

## 9. SEARCH \$EB19

This routine will search the interface card with its id stored in the location pointed by RC. This routine can be called by an assembly program.

## 10. SELECT \$EB57

This is the CARD Sn handler.

## 11. ECHO \$EBF5

This routine will give the sound effect whenever an error message is given. This routine can be called by an assembly program.

## 12. INPUT \$EC3E

This is the new input hook. This routine will perform the switching function between the current selected card and the 80-column card.

## 13. OUTPUT \$EC6D

This is the new output hook. This routine will perform the switching between the current selected card and the 80-column card.

## 14. MOVE \$ECB8

This routine will perform the memory move. Before the call, the user should store the source address in \$BF45 AND \$BF46 (HI/LO), the target address in \$BF47 and \$BF48 (HI/LO) and the length of the memory block in \$BF49 and \$BF4A (HI/LO).

## 15. MOVEC \$ECED

This is the other entry of the memory moving routine. Before the call, the user should store the source address in R8, the target address in RA and the length of the memory in \$BF49 AND \$BF4A (HI/LO).

## 16. VREF \$ED1E

This routine will perform the memory comparison. Before the call, the user should store the source address in \$BF45 AND \$BF46 (HI/LO), the target address in \$BF47 and \$BF48 (HI/LO) and the length of the memory block in \$BF49 and \$BF4A (HI/LO).

## 17. VERFC \$ED54

This is the other entry of the memory comparison routine. Before the call, the user should store the source address in R8, the target address in RA and the length of the memory in \$BF49 AND \$BF4A (HI/LO).

## 4.2 Firmware parameter list

### 1. ID (\$BF41)

This location stores the id of the current interface card.

the id of the standard printer interface card is 1

the id of the thermal printer card is 2

the id of the DOS card is 3

the id of the 80 column card is 4

the id of the EPROM programmer is 5

RAM card has no id number

### 2. CURRENT (\$BF42)

This location stores the slot allocation number of the current selected interface card.

slot 1 is % 0000 0010

slot 2 is % 0000 0100

slot 3 is % 0000 1000

slot 4 is % 0001 0000

Notice that bit 0 should be zero, only bit 1 to 4 are used to enable slot, bit 5 and bit 6 are used in the bank selection of the RAM card.

### 3. DOSID (\$BF43)

This location stores the slot allocation information of the DOS card.

### 4. ID80 (\$BF44)

This location stores the slot allocation information of the 80-column card.

### 5. SOURCE (\$BF45, \$BF46)

This two locations store the source address used in CARD M statement.

### 6. TARGET (\$BF47, \$BF48)

This two locations store the target address used in CARD M statement.

### 7. LENGTH (\$BF49, \$BF4A)

This two locations store the length of block of memory used in CARD M statement.

## Chapter 5

## General Specifications

1. Number of slots : 4

2. Slot type : 44 pin edge connector

3. Supply current from mother slot : 154 mA

4. Maximum current for the four slots : 1.5 A

5. High level commands : CARD Sm, CARD Pn, CARD Tn, CARD Bn,  
CARD Q, CARD M, CARD V

6. Firmware size : \$5A6 (1446) bytes