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COMBO II

USER'S REFERENCE GUIDE

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Interestingly, this odd device uses the IBM (not TI) parallel printer cable, and a DB-9-pin (like the IBM AT) serial port!

Sure makes life easier to be able to purchase a printer cable in any computer store.

INTRODUCTION

The MULTICOM COMBO II incorporates two versatile peripheral interfaces. The first interface is the industry standard RS232 serial interface.

This is probably the most versatile for it allows the connection of many peripheral devices: printers, modems, and other computers.

The second interface is the industry standard centronics compatible parallel printer interface. This allows the connection of most printers for the home computer market without the added expense of installing a serial interface to your printer.

These two interfaces are incorporated into one box that is plugged into the right hand side expansion port of your TI-99/4A.

The following documentation details installation and technical data allowing interfacing to as many devices as the users imagination will allow.

COMBO II INSTALLATION

(Caution: make sure all power is off)

The COMBO II is installed by simply plugging the unit into the peripheral expansion port located to the right of your TI console. Just push the protruding 44 pin edge card connector into the peripheral expansion port.

ATTACHING PLUG IN WALL TRANSFORMER

Your COMBO II is powered by a Plug in Wall Transformer. A cable extends from your Plug in Wall Transformer that must be plugged into the back of your COMBO II. The wall transformer plug is keyed and will only insert completely if inserted properly. No electrical damage will occur if an attempt is made to plug your power cable in upside down. Your plug in wall transformer may be installed in any 110 V. AC 60HZ wall outlet.

FOREIGN POWER SUPPLY INSTALLATION

If your COMBO II is to be installed in a foreign country, special care must be taken to insure proper power is available. The standard COMBO II uses 110 VOLTS 60 HZ; 220 VOLT 50 HZ power wall transformers are available by special order for those areas in the world where this power is used.

32K MEMORY EXPANSION

Your COMBO II includes 32k of expansion memory. This gives your system a maximum of 48k of random access memory (ram). This expanded memory is designed to work with such other software as TI LOGO, TI EXTENDED BASIC, EDITOR/ASSEMBLER, and other software written by TI or others. Information as to whether any given software will work with extended memory should be referred to the module owner,s manual, or instruction that accompany that software.

NOTE:
The TI basic computer language which is built into the computer and most software packages cannot make use of the added 32k memory. To make use of any extended memory beyond your standard 16k memory, the TI Extended Basic Command Module or another specialized Command module must be inserted in the computer console.

CONNECTING RS232 DEVICES

RS232 devices may be attached to the 9 pin D connector plug labeled "RS232". This RS232 connector is fashioned after the IBM PC AT 9 pin serial port. Cables may be purchased with that compatibility in mind. 100% compatibility was not possible because this is an interface for the TI.
Even though RS232 is an industry standard, there are many options involved in how device interconnection can be achieved. To aid the user, a detailed pin description plus sample interconnections are described.

COMBO II RS232 PIN OUT:

COMBO II IS A DB9 MALE CONNECTOR.

Pin	Description:		
2	Receive Data	(RXD)	Receives serial data
3	Transmit Data	(TXD)	Transmits serial data
4	Data Terminal Ready	(DTR)	Pulled to a logic true.
5	Ground	(GND)	Signal ground
6	Data Set Ready	(DSR)	Input: When high allows RS232 to transmit When low, disables data transmission.
7	Request to Send	(RTS)	Output: indicates valid data.
8	Clear To Send	(CTS)	Pulled to a logic true.

RS232 WIRING EXAMPLES

The following are examples of RS232 interconnection. These are just examples and depending on the device your connecting to some variation may be required. In most cases, the hook up is all that is required.

You will notice that under the heading "OTHER RS232 DEVICES" that the pin numbers have been intentionally left out. This was done, because depending on if you're connecting to a DTE (DATA TERMINAL EQUIPMENT), or a DCE (DATA COMMUNICATIONS EQUIPMENT), the pin number for TXD (TRANSMIT DATA) could either be pin 2 or pin 3. This is also true for all other RS232 signals.

6 WIRE HOOK-UP

```
GROUND          5-------------- GROUND
RECEIVE DATA    2-------------- TRANSMIT DATA
TRANSMIT DATA   3-------------- RECEIVE DATA
RTS             7-------------- CTS
DSR             6-------------- DTR
```

CONNECTING TO MODEM

COMBO II PIN #			MODEM
RECEIVE DATA	2	------ 3	TRANSMIT DATA
TRANSMIT DATA	3	------ 2	RECEIVE DATA
DTR	4	------ 20	DSR
GROUND	5	------ 7	GROUND
DSR	6	------ 6	DTR
RTS	7	------ 4	CTS
CTS	8	------ 5	RTS

CONNECTING PARALLEL DEVICES

This port is compatible with IBM PC,XT and AT printer ports, and compatible cables and printers.
The use
of the parallel port over an RS232 port for the purpose of printer interfacing has two important benefits. The first benefit is usually the cost of your printer is reduced because you do not have to pay extra for an RS232 option on your printer at the time of purchase. The second benefit is that the nature of the parallel interface allows your printer to operate at its fastest print rate. It is the printer that determines how fast data is to be transferred from the computer by the use of its Busy control line in the interface.

A pin-out of the Parallel Port is given below. Also a cable diagram is given to aid those people who desire to build their own cable.

COMBO II Parallel Interface pin out:

Pin#	Description	
1	Strobe	
2	Data Bit 0	(Generated by Interface)
3	Data Bit 1	(Generated by Interface)
4	Data Bit 2	(Generated by Interface)
5	Data Bit 3	(Generated by Interface)
6	Data Bit 4	(Generated by Interface)
7	Data Bit 5	(Generated by Interface)
8	Data Bit 6	(Generated by Interface)
9	Data Bit 7	(Generated by Interface)
11	Busy	(Generated by Printer)
18-25	Ground	

PRINTER CABLE SCHEMATIC

25 Pin "D"	36 pin printer
connector Amphenol	connector
p.n.117-DBE-9P	Amphenol p.n.
	57-30360

```
PIN #
   1 ---------------------- 1

   2 ------------------- 2

   3 ------------------ 3

   4 ------------------ 4

   5 ----------------- 5

   6 ------------------ 6

   7 ------------------ 7

   8 ------------------ 8

   9 ------------------- 9

  10 ----------------- 10

  11 ------------------ 11

  16 ----------------- 16

  17 ------------------- 17

  19 ------------------ 19
```

Use shielded 15 conductor 22 gauge
stranded cable. Cable shield should be
connected to COMBO II case.

TESTING THE COMBO II

Built into the COMBO II are two tests to allow you, the user, to verify its operation. The first test, "STEST" is used to verify the operation of the serial port, and the second test, "PTEST," is used to verify the operation of the parallel port.

A. COMBO II Serial Test, or "STEST," is used to verify the operation of the serial port. This test requires that a terminal or other serial device be connected to the COMBO II. This external device will have characters sent to it from the COMBO II and is used to verify the test operation.

OPEN #1: "SIO.BA=1200"
OPEN #2: "STEST/1"
(MAKE SURE YOU USE ALL CAPITALS)

The first command is to set up the serial port. If required software switches many be set (see section USING THE COMBO II) to initialize the Baud rate. All software switches, other than Baud rate, have no effect. The second command is used to start the test. The test outputs from the serial port 95 characters on two lines with each line followed by a carriage return and a line feed.
For an example of print out see fig. 1.

B. COMBO II Parallel Test, Or "PTEST," is used to verify the operation of the parallel port. This test requires that a printer to be connected to the COMBO II. This external device will have characters sent to it from the COMBO II and is used to verify the test operation.

To run the COMBO II Parallel Test, use the Open Command in TI Basic and use the test name, "PTEST," as the file name. The test name must be entered in all capital letters. Enter the following command:

OPEN #1:"PTEST/1"

This test outputs from the parallel port 95 characters on two lines with each line followed by a carriage return and a linefeed. Below is an example of the printout.

(figure 1)

```
 !"#$%&'()*+,-./0123456789
                    :;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`ABCDEFGHI
                    JKLMNOPQRSTUVWXYZ{|}~
 !"#$%&'()*+,-./0123456789
                    :;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`ABCDEFGHI
                    JKLMNOPQRSTUVWXYZ{|}~
```

NOTE: Some of these characters may not be printable by your printer, please refer to your printer manual. It is also possible that other characters will be substituted by your printer due to different fonts.

The test will continue indefinitely until the test is terminated by pressing "CLEAR" (the Function key and the 4 Key at the same time) on your TI console. An I/O error 6 will occur, but this is normal and should be ignored.

TI SWITCH OPTIONS

(The first four Switch Options work only with the RS232 port)

SWITCH   DESCRIPTION

.BA=XXX   BAUDRATE: where XXX equals 110,
            300,600,1200, 2400,4800, or 9600.
,B   If no switch is specified the
            baudrate will default to 300 baud.

.PA=X   PARITY: where X equals "O" for
            Odd, "E" for Even, and "N" for No
            parity.   If   no   switch   is
            specified, Odd parity is used as
            the default.

.DA=8   DATA BITS=8:   This sets the word
            length to eight bits. Default is
            7 bits.

.CH   CHECK PARITY: This   option
            performs   parity   checking   on
            received data as specified in the
            .PA switch.

.TW   TWO STOP BITS: This specifies
            that   two   stop   bits be inserted
            during transmission and   checked
            for during receiving.   If   not
            specified, one stop bit will be
            used.

.NU   NULLS: This specifies that 8
            null characters be inserted after
            carriage   returns   to   allow slow
            printers to "catch up." No nulls
            will   be   inserted   if nothing is
            specified.

for TRS PRINTER

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_".C.W BA=600, DA=8, PA=N "_

(The following Switches work with both the RS232 and the Parallel Port)

.EC   ECHO OFF: This   inhibits   the
             automatic   retransmission   of
             received   characters.   If   not
             specified, echo is automatic.

.CR   CARRIAGE RETURN and LINEFEED OFF:
             This disables automatic carriage
             return and linefeed of   variable
             length records. If not specified,
             automatic   insertion of   carriage
             return and linefeed will occur.

.LF   LINEFEED OFF: This disables auto
             linefeed. If nothing is specified,
             auto   linefeeds   occur.   These
             switches may be used in any order
             and note that the period in each
             command must be used.

BASIC INSTRUCTION DESCRIPTIONS AND EXAMPLES

This section deals with the individual instructions, their descriptions, and examples of how they are used. The discussions in this section deal only with how these instruction can be used with the COMBO II. For more information on these instructions, please refer to your TI 99 4/A USERS REFERENCE GUIDE.

The following instruction will be discussed: Open, Close, Input, and Print statements, List, Old, and Save commands.

OPEN STATEMENT

The OPEN STATEMENT sets-up TI BASIC in preparation for data files to be used with peripheral devices.

OPEN STATEMENT FORMAT:

OPEN #FILE-NUMBER:"FILE-NAME[.SWITCH
                        OPTIONS]"[ATTRIBUTES]

FILE-NUMBER is a numeric expression that is equal to an integer from 1 to 255.

FILE-NAME is a string expression containing one of the four names used with the COMBO II: SIO or SIO/1 when using the RS232 port, and LP or LP/1 when using the parallel port. The file name is optionally followed by a list of software switch options.

ATTRIBUTES are string expressions, separated by commas, that specifically record organization and file accessing characteristics. (REFER TO P.II119-II122 OF YOUR USERS REFERENCE GUIDE for options and descriptions.)

OPEN STATEMENT EXAMPLES:

The following are examples of open statements for the RS232 port.

OPEN #1:"SIO"
(All default values are assumed for the RS232 port.)

OPEN #A:"SIO.BA=1200.EC.CH"

(File A on the serial port has a baud rate of 1200, the echo switch and parity checking switch is used. A is a variable which must equal to a number between 1 and 255.)

OPEN #Z:"A$",FIXED32
where Z=3
A$="SIO/1.TW.BA=110"

(This device is attached to the serial port, with two stop bits and a baud rate of 110. The record length is 32 characters.)

CLOSE STATEMENT

This statement is used to terminate the association between the file specified by the file-number and the program.

CLOSE STATEMENT FORMAT:

CLOSE #FILE-NUMBER

FILE-NUMBER is a numeric expression that is equal to an integer from 1 to 255.

CLOSE STATEMENT EXAMPLE:

CLOSE #1
(This closes file number 1.)
CLOSE #C
where C = 5

(This closes file number 5 because C=5.)

INPUT STATEMENT

Incoming data from the RS232 PORT of the COMBO II can be assigned to a variable list. This is done by using the INPUT statement.

INPUT STATEMENT FORMAT:

INPUT #FILE-NUMBER:VARIABLE LIST

FILE-NUMBER is a numeric expression that is equal to an integer from 1 to 255.

VARIABLE-LIST is a set of variables to which data is assigned.

The OPEN statement will specify the number of characters that may be input by the INPUT statement. If a fixed length of data is to be input, the number of characters should be specified by the OPEN statement. Data will then be inputted into the computer when the number of characters equals the record length specified by the OPEN statement or a CLEAR is pressed on the keyboard.

INPUT STATEMENT EXAMPLES:

INPUT #56:A$,C,Z$

(In this example, data are input to file 56 three values-a string is assigned to A$, a number is assigned to C, and another string is assigned to Z$.)

INPUT #Y:A,B
where Y=10

(In this example, two numbers are input from file 10 (Y=10) and they are assigned to the variables A and B.)

PRINT STATEMENT

This statement is used to send data through the COMBO II to a peripheral device.

PRINT STATEMENT FORMAT:

PRINT #FILE-NUMBER[:PRINT-LIST]

FILE NUMBER is a numeric expression that is equal to an integer from 1 to 255.

PRINT LIST is a set of variables to which data is assigned.

PRINT STATEMENT EXAMPLES:

PRINT #2:"THE PRICE IS",C

(In this example, the string constant "THE PRICE IS" printed to file number 2 along with the number assigned to the variablec. File number 2 is described in a previous Open statement.)

PRINT #T:A$,B$
where T=32

(In this example, the strings assigned to A$ and B$ are printed to file 32.)

LIST COMMAND

Program lines may be outputted through the COMBO II by using the LIST COMMAND.

LIST COMMAND FORMAT:

LIST "FILE-NAME[.SWITCH-OPTION]"[:LINE LIST]

FILE-NAME must equal SIO, or SIO/1 when using the RS232 port, or LP or LP/1 when using the parallel port.

SWITCH-OPTION is described in the SWITCH OPTION section.

LINE-LIST is described in the USER's REFERENCE GUIDE.

LIST STATEMENT EXAMPLES:

LIST "SIO"

(In this example, all lines of the program are output to the RS232 port using the default parameters.)

LIST "LP"

(The same as LIST "SIO" except data is sent to the parallel port.)

LIST "SIO.BA=1200":100-200

(In this example lines 100 through 200 only are printed but at a baud rate of 1200.)

SAVE AND OLD COMMANDS

The SAVE and OLD commands allow programs to be exchanged between two home computers when they are either connected together by two COMBO II or two modems.

SAVE AND OLD COMMAND FORMAT

SAVE "file-name[.software switch options]"
OLD "file-name[.software switch options]"

The file-name must be SIO or SIO/1 when using the RS232 port. For the serial ports, the only software switch options allowed are baud rate (.BA) and number of stop bits (.TW). Because the parallel port is output only, the SAVE and OLD statements do not operate on the parallel port. The number of data bits is always 8 when exchanging programs. The default values are described in the "Switch Options" section. Corresponding SAVE and OLD commands must specify the same baud rate and number of stop bits when using the serial port.

SAVE AND OLD STATEMENT EXAMPLES:

The following examples are SAVE and OLD commands for the RS232 port:

```
SAVE "SIO.BA=600.TW"
OLD "SIOP/1BA=600.TW"
```

Remember that the SAVE and OLD commands can only be used with the serial port.

USING THE COMBO II WITH TI SOFTWARE

Your COMBO II can be used with TI Software such as Multiplan, and TI WRITER and other software. When using some software the device names of SIO or LP can not be used. In these cases the device names of RS232 or PIO should be used.

RADIO FREQUENCY INTERFERENCE

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with manufacturer's instructions, may cause interference to radio and television reception. This equipment has been designed to provide reasonable protection against such interference in a residential installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

REORIENT THE RECEIVING ANTENNA

RELOCATE THE COMPUTER WITH RESPECT TO THE RECEIVER

MOVE THE COMPUTER AWAY FROM THE RECEIVER

PLUG THE COMPUTER INTO A DIFFERENT OUTLET SO THAT COMPUTER AND THE RECEIVER ARE ON DIFFERENT BRANCH CIRCUITS.

The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the US Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4."

TECHNICAL SPECIFICATIONS

POWER REQUIREMENTS

PLUG IN WALL   110 V ac, 60 HZ
TRANSFORMER

COMBO II   9 V ac 50-60 HZ

PHYSICAL DIMENSIONS

Size   1 in. wide
                                              8 in. deep
                                          2.5 in. high

Weight   less than 2 lbs.

OPERATING ENVIRONMENT

Temperature   60 to 80 degrees F
Humidity   10% to 80%
                                       non condensating

RS232 INTERFACE
(EIA RS-232-C standard subset)

Baud rates   110,300,600,1200
                                          2400,4800,9600
Parity   odd, even, or none
Stop bits   one or two
Character output   ASCII
Transmission distance   standard 50 ft.

PARALLEL INTERFACE
(IBM Centronics compatible)

CHARACTER OUTPUT   8 BIT ASCII

Control lines   Strobe, Busy,
Transmission distance   12 feet
Voltage levels   TTL