NANOCOMPUTER NBZ80-HL AND NBZ80-ASED

TECHNICAL MANUAL

SBS

NANOCOMPUTER®
NBZ80-HL
AND
NBZ80-ASED

TECHNICAL
MANUAL

Edition 1

September 1981

PREFACE

The NBZ80-HL and NBZ80-ASED are the High Level versions of the SGS-ATES Z80 Nanocomputer. They were developed to allow the Nanocomputer user to work with the aid of the BAS-Z/N BASIC Interpreter and the ASED Assembler/Editor Operating System.

This manual describes both NBZ80-HL and NBZ80-ASED. After a general description of the systems (Chapter 1) and the installation procedure (Chapter 2) a brief overview is contained in Chapter 3, which describes the Hardware and Software configurations. A detailed description of the hardware is contained in Chapter 4, while the peripherals are described in Chapter 5. Some application examples follow in Appendix A. A Trouble Shooting Chart is contained in Appendix B.

As many parts of the system are covered by other SGS-ATES technical manuals, the reader will find some reference to this literature in the first chapter of this manual.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

The SGS-ATES Nanocomputer is a product line mainly devoted to beginners, students, hobbyists and in general to people needing to develop small- and medium-sized microcomputer programs.

The low- and medium-end versions of this line (NBZ80, NBZ80-B, NBZ80-S) are particularly suited to learning all about the Z-80 microprocessor family and to develop programs at machine language level.

At the upper level we can find two products of this line:

- the NBZ80-HL, which supports the BASIC language
- the NBZ80-ASED, supporting assembler language.

Both products can also be obtained by upgrading the NBZ80-S, by adding the UPZ80-HL kit (see UPZ80-HL Assembly Instructions Manual) or respectively the UPZ80-ASED kit (see UPZ80-ASED Assembly Instruction Manual).

For this reason, you won't find in this manual the description of the parts already described in other manuals. For instance, for the description of the CPU Board and Experiment Board or NKZ80 hexadecimal display-keyboard, refer to Z80 Nanocomputer Training System Technical Manual; for a comprehension of the BAS-Z/N BASIC Interpreter or of the ASED Operating System, refer to Software Manuals.

Here a list of related manuals follows.

- Z80 Nanocomputer Training System Technical Manual
- VDZ80 Technical Manual
- PPZ80 Technical Manual
- RCZ80 Technical Manual
- SGS Basic Language User's Manual
- Basic Programmer Primer
- ASED User's Manual
- EPZ80 Technical Manual
- UPZ80-HL Assembly Instructions Manual
- UPZ80-ASED Assembly Instructions Manual

Also useful are the following:

- Z80 microprocessor book 1 - Programming
- Z80 microprocessor book 3 - Interfacing

CHAPTER 2

INSTALLATION

2.1 Unpacking

Before doing anything else check the contents of the shipped carton and look for eventual damage.

If any damage (or any missing part) appears, notify immediately the shipping firm or SGS-ATES System Division.

The list of the parts you must find in the pack is the following:

- Nanocomputer NBZ80-S, i.e. a container (35.7 x 38.5 x 4.4 cm. sized) including the CPU board, the experimentes board, the hexadecimal keyboard, the plexiglass cover and the power supply
- The EP/ROM expansion board, with the BASIC Interpreter or the ASED Operating System resident in EP/ROM plugged in the vertical connectors of the experiments board (in case of NBZ80-ASED there is also an EPROM, plugged in a CPU board socket, as a part of the Operating System)
- an alphanumeric keyboard with a cable for the TV monitor and one for the serial connection, also including a TV Interface Board.

2.2 System set-up

To start the system, do the following (see Fig. 2.2.1):

- fit the REZ80 board in the vertical connectors J1' J2' of the experimenter board
- connect the serial interface cable to J5 on the Nanocomputer CPU board
- connect the video signal cable to the input of the TV monitor

NOTE

If you use a TV set instead of a TVZ80 monitor, swap from pin 7 to pin 1 on the lead coming from J3 on the VDZ80 Board or use the W6Z80 cable.

7

- put the ON-OFF (BASIC-MONITOR) switch on the rear of the Nanocomputer (J6 of CPU board) in OFF (MONITOR) position

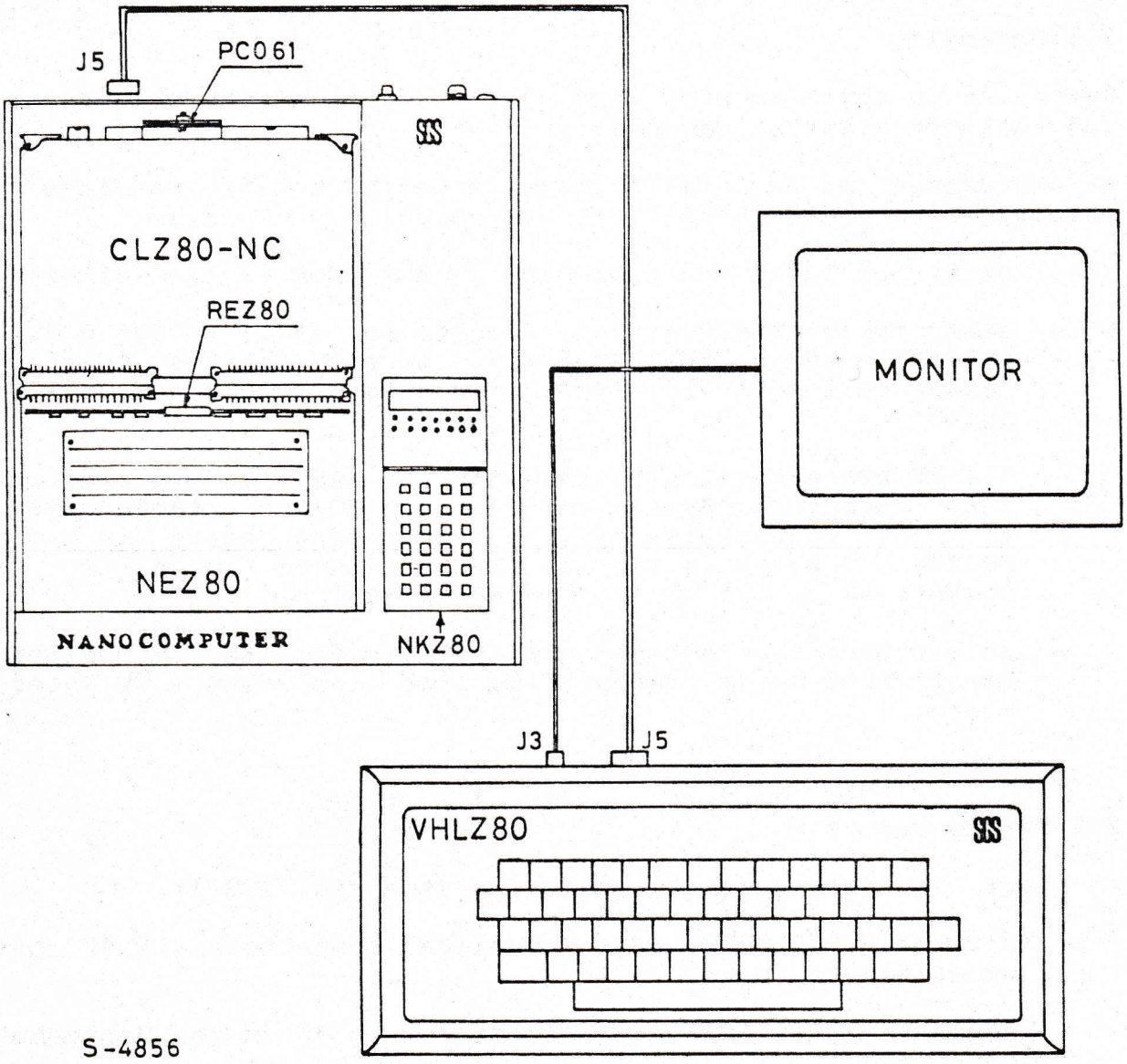


Fig. 2.2.1 - NBZ80-HL and NBZ80-ASED assembly diagram

- switch on the power to each system element (Nanocomputer, Keyboard, TV monitor)
- observe the cursor (a flashing "-") in the top left side of the screen (otherwise look at the trouble shooting chart)
- press RESET key on Nanocomputer hexadecimal keyboard (NKZ80)

- enter the correct entry point (see Table 3.a) on the NKZ80 display
- press GO on NKZ80
- observe that the NKZ80 display goes blank (if not, look at the trouble shooting chart)
- toggle the ON-OFF switch to the ON (BASIC) position
- press the space bar on the alphanumeric keyboard
- observe a message (see Table 3.a) on the screen

FOR NBZ80-HL:

- issue the right terminal width or a RETURN on the alphanumeric keyboard (in the last case the default value is 64)
- observe this new line on the screen:

```
MEMORY TOP?
```

- issue the top memory location in decimal or a RETURN on the alphanumeric keyboard (in the last case, the system founds itself the memory top location)
- observe the new line on the screen:

```
xxxxx   BYTES   FREE
>
```

The system is now ready to receive BASIC statements or programs and execute them.

FOR NBZ80-ASED:

- assign the input/output devices
- issue the proper commands as described in the software manual.

CHAPTER 3

SYSTEM OVERVIEW

3.1 Hardware

Like the simplest versions of the Nanocomputer, also the -HL and -ASED versions are based on the NC-Z monitor, resident in an EP/ROM plugged in the CPU board.

Of course, all the functions of the NBZ80-S Nanocomputer are available, by the aid of the hexadecimal keyboard and the experiment board.

Besides the NBZ80-S, the system contains other parts which will be described in detail in next chapter or in separate technical manuals.

A printed board (REZ80), to be plugged in the vertical connectors of the experimenter board, acts as an EP/ROM expansion. It contains the system firmware, the BASIC interpreter for the NBZ80-HL and the Assembler and Editor for the NBZ80-ASED (in this case there is another EPROM, mounted in one CPU board socket, linking the NC-Z Monitor with Assembler/Editor).

An alphanumeric keyboard and a TV monitor are matched to form a terminal. The keyboard container also includes a video interface board (VDZ80): the connection between this board and the TV monitor and CPU board is shown in Fig. 2.2.1.

On the back of the Nanocomputer a switch mounted on a small printed board allows the user to select between BASIC or ASSEMBLER/EDITOR and MONITOR. Its use will be described in next chapter.

10

3.2 Resident Software

Memory maps for either NBZ80-HL and -ASED Nanocomputers are shown in Figures 3.2.1 and 3.2.2.

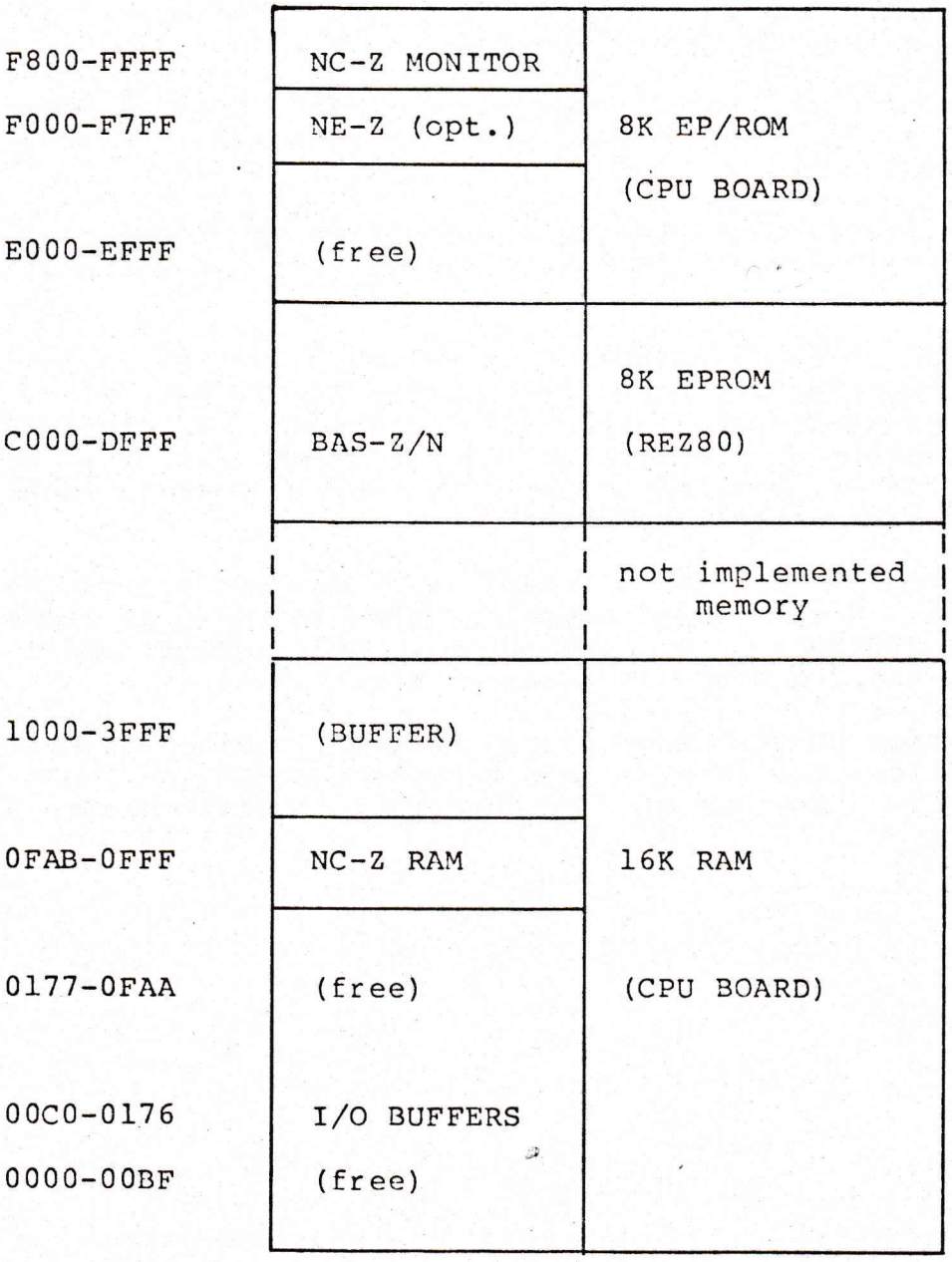


Fig. 3.2.1 - Memory Map for NBZ80-HL

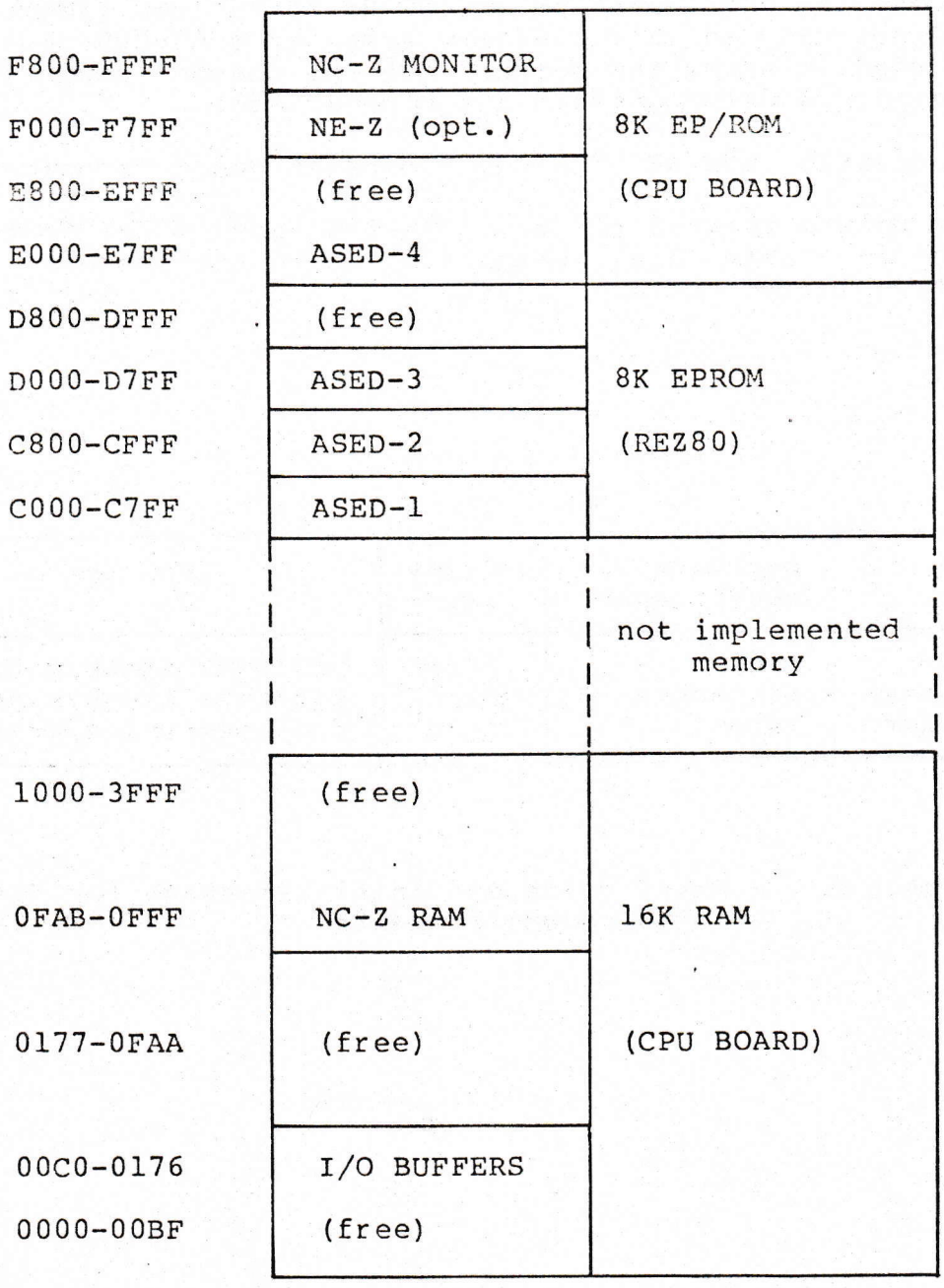


Fig. 3.2.2 - Memory Map for NBZ80-ASED

12

Notice that the upper 16K are reserved for the EP/ROM, either on CPU Board or on ROM Expansion Board (REZ80).

The free sockets, of course, can be filled with user-programmed 2716 EPROMs. The ROM socket on the REZ80 Board (the right one) is empty and not enabled in the memory area: if a M36000 8 K x 8 ROM is to be used in here, the jumpers must be changed according to the desired memory address (within 8 K boundaries).

For more details, see REZ80 EPROM Expansion Board Technical Manual.

The entry points related to the BAS-Z/N and ASED Softwares are summarised in Table 3.a, which also shows the messages issued to the displays in the various cases.

SYSTEM	SOFTWARE ENVIRONMENT	ENTRY POINT	MESSAGE
NBZ80-HL	BASIC	C000	SGS/ATES BAS-Z/N REL.x.x
NBZ80-ASED	ASSEMBLER	C800	SGS/ATES ASS-Z/N REL.x.x
NBZ80-ASED	EDITOR	C000	SGS/ATES EDI-Z/N REL.x.x

Table 3.a - Entry point and initial message for different software environments

CHAPTER 4

NBZ80-HL and NBZ80-ASED HARDWARE

4.1 NBZ80-S

A detailed description of the NBZ80-S Nanocomputer, which is the base for the NBZ80-HL and NBZ80-ASED, is contained in the Z80 Nanocomputer Training System Technical Manual.

There are two main differences between the standard version of the NBZ80-S and the one used in the NBZ80-HL or NBZ80-ASED: RAM size and ON-OFF switch (also called BASIC-MONITOR switch or SW8).

The RAM size is 16K (against the 4K mounted on the standard NBZ80-S).

Due to this fact, memory chips are M4116 (instead of M4027), and the jumpers to select RAM size and allocation are different (refer to jumpers table contained in the schematic diagrams and in the above mentioned Technical Manuals).

The reason for the back switch is the following. The selection between the serial interface and the magnetic cassette interface is manually done in the NBZ80-S, by switching the TTY-CASS selector, which forces the MAG- signal to the proper logic level.

If the cassette recorder has to be driven by a command issued via the serial interface (like the video terminal) the switching between the two interfaces must be software-driven.

A switch is required to select between the previous situation (MAG- connected to the TTY-CASS switch) and a new one (MAG- driven by PA6, the bit 6 of port A of PIO #1).

This is done in the V01 version of the printed board on the back of the Nanocomputer (called PC061) carrying this switch (Fig. 4.1.1).

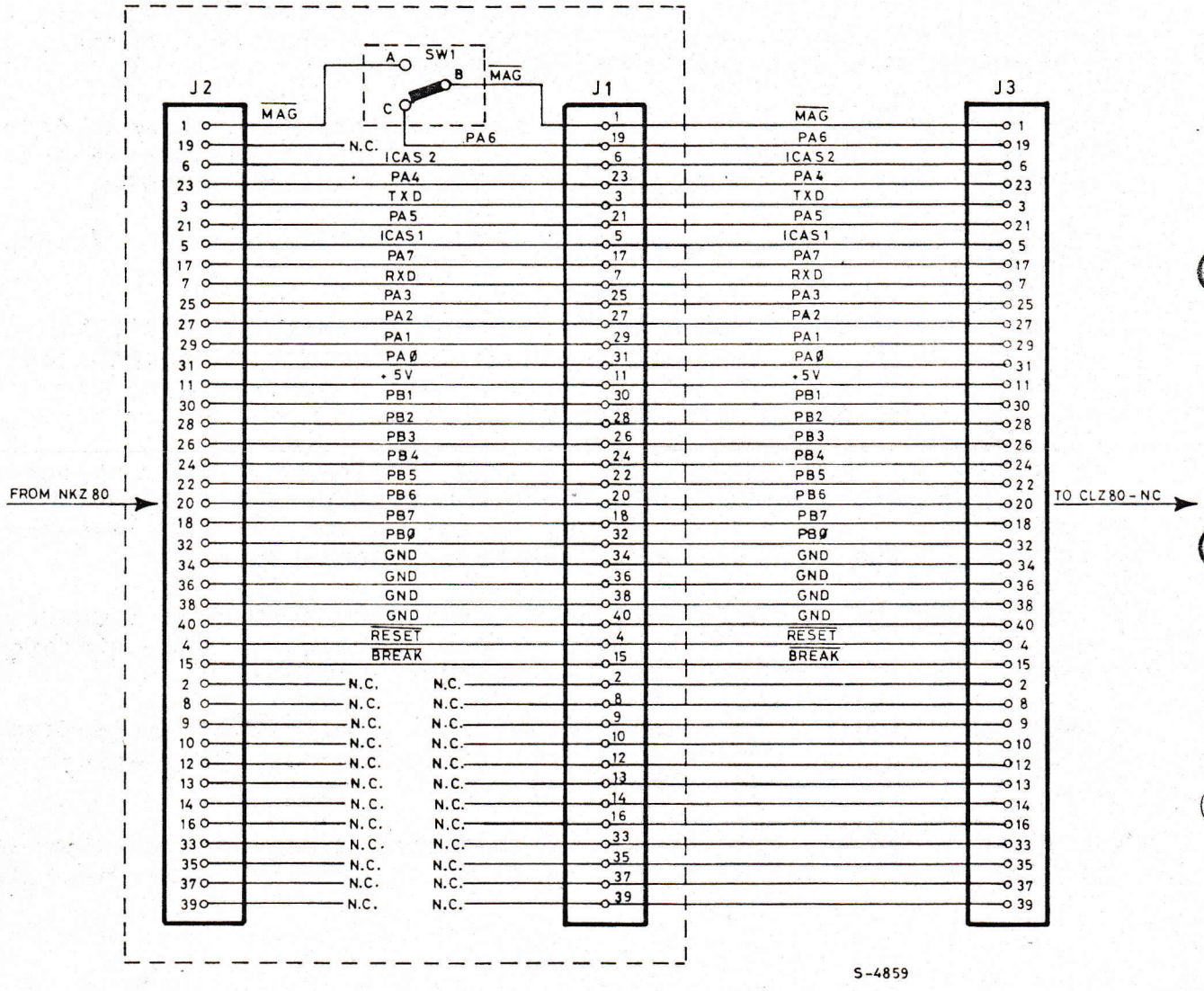


Fig. 4.1.1 - PC061 Adapter schematic diagram (V01)

To allow two cassette recorders to be driven by the software, the V02 version of this adapter unit has been introduced, in which the ICAS2 signal (remote control for cassette recorder #2) can be connected to the PB7 pin.

In this case, the switch (named SW8) is a double switch (Fig. 4.1.2).

The V02 verson has been introduced for the NBZ80-ASED (which needs two cassette recorders) and is now mounted also on the NBZ80-HL Nanocomputer.

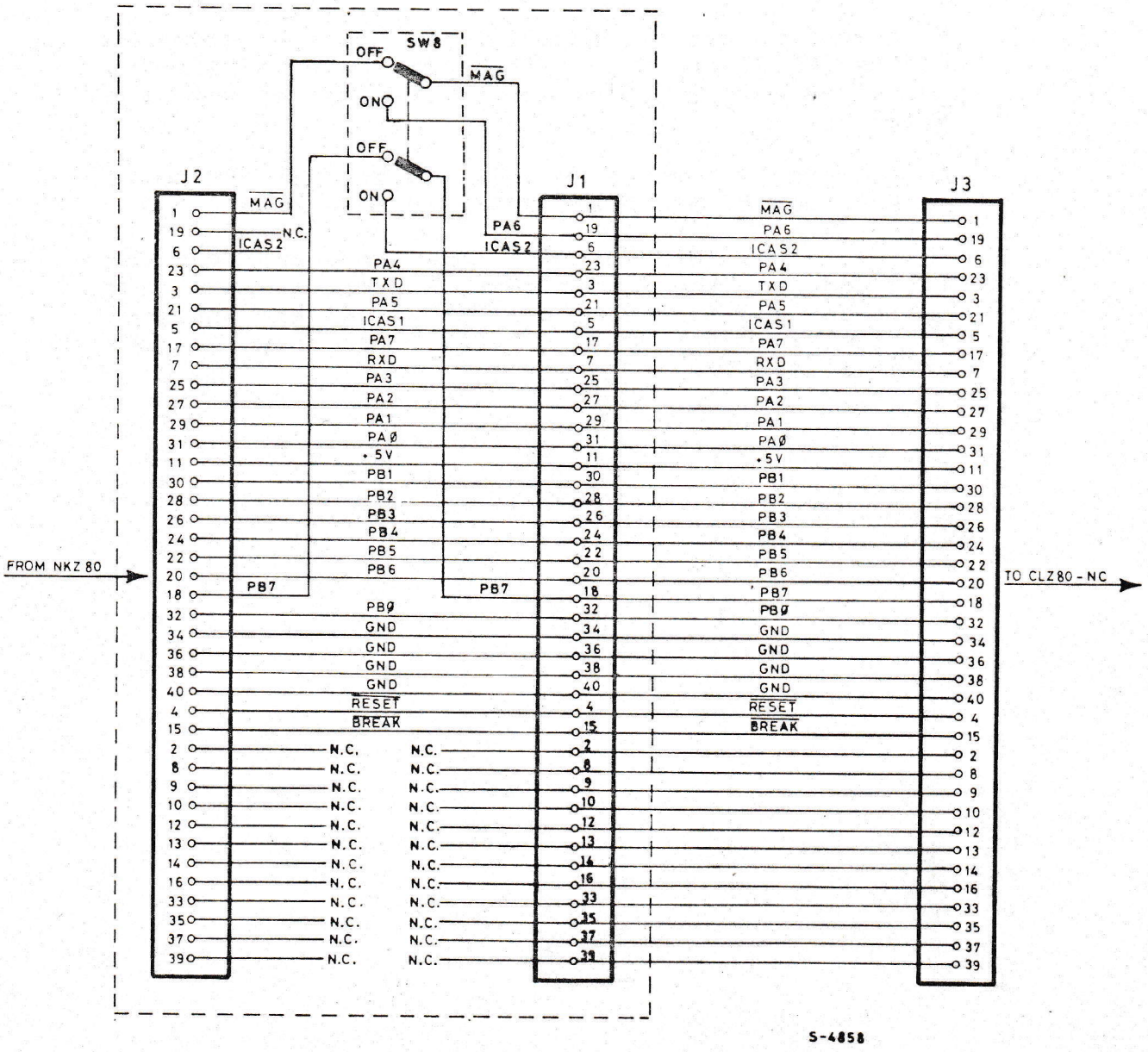


Fig. 4.1.2 - PC061 Adapter schematic diagram (V02,V03)

16

NOTE 1

The upgrading of the NBZ80-HL to the NBZ80-ASED (or in general to a version needing two cassette recorders) can be done with the V02 version of the PC061 adapter, can not be done with the V01 version (the version name is written on the adapter board). If you have the V01 version and buy the ASED, you can have the V02 without any extra charge (contact SGS System Division Product Marketing).

NOTE 2

To allow the user to supply power to the expansion boards (REZ80 and NEZ80) from an external supply, two wires and a connector are furnished with the NBZ80-HL.

An external power supply is required if the power consumption of NEZ80 and REZ80 is more than 0.5 A.

In this case, the user must move the jumper ABC (at left end of the Experiment Board) to the A-B position, and connect the red-black wires-connector to the EXTERNAL POWER SUPPLY plug and to the external supply.

4.2 The EP/ROM Expansion Board (REZ80)

The EP/ROM expansion board allows to expand the EP/ROM and is described in detail in the SGS-ATES REZ80 Technical Manual.

For the NBZ80-HL it is filled with four 2K x 8 EPROMs carrying the BAS-Z/N BASIC Interpreter (described in the SGS BASIC Language User's Manual).

The memory space reserved for the BASIC Interpreter is C000-DFFFhex, so that the jumpers are those corresponding to the standard version, as described in the REZ80 Technical Manual.

The EPROMs are labeled "BAS-Z/N Rx.x" and numbered from 1 to 4. They are plugged in the four left sockets of the REZ80 in the order 1-2-3-4.

For NBZ80-ASED three 2K x 8 EPROMs are mounted on the REZ80 and one in the CPU board. The EPROMs labeled "ASED Rx.x" and numbered from 1 to 3 include respectively the Editor (2K) and the Assembler (4K) and are mounted in the three left sockets of the REZ80; the EPROM numbered 4 is mounted on 049 (the left EPROM socket) of the CPU board.

NOTE

Due to the presence of the 2K x 8 EPROM on the CPU board, the NC-Z monitor must also be in 2K x 8 EP/ROM. If it is in one 1K x 8 EPROM, request the NC-Z in 2K x 8 EP/ROM and do the corresponding modifications in jumpers for EPROM size and allocation.

18

4.3 The keyboard

The alphanumeric keyboard is included in a container sized cm. 37x21x5.

Besides the standard ASCII keyboard, the container includes a video interface board (VDZ80/B), a power supply, a cooling fan and the interconnecting cables (see Fig. 4.3.1).

The alphanumeric keyboard is a Keytronic mod. 1648 ASR33 type.

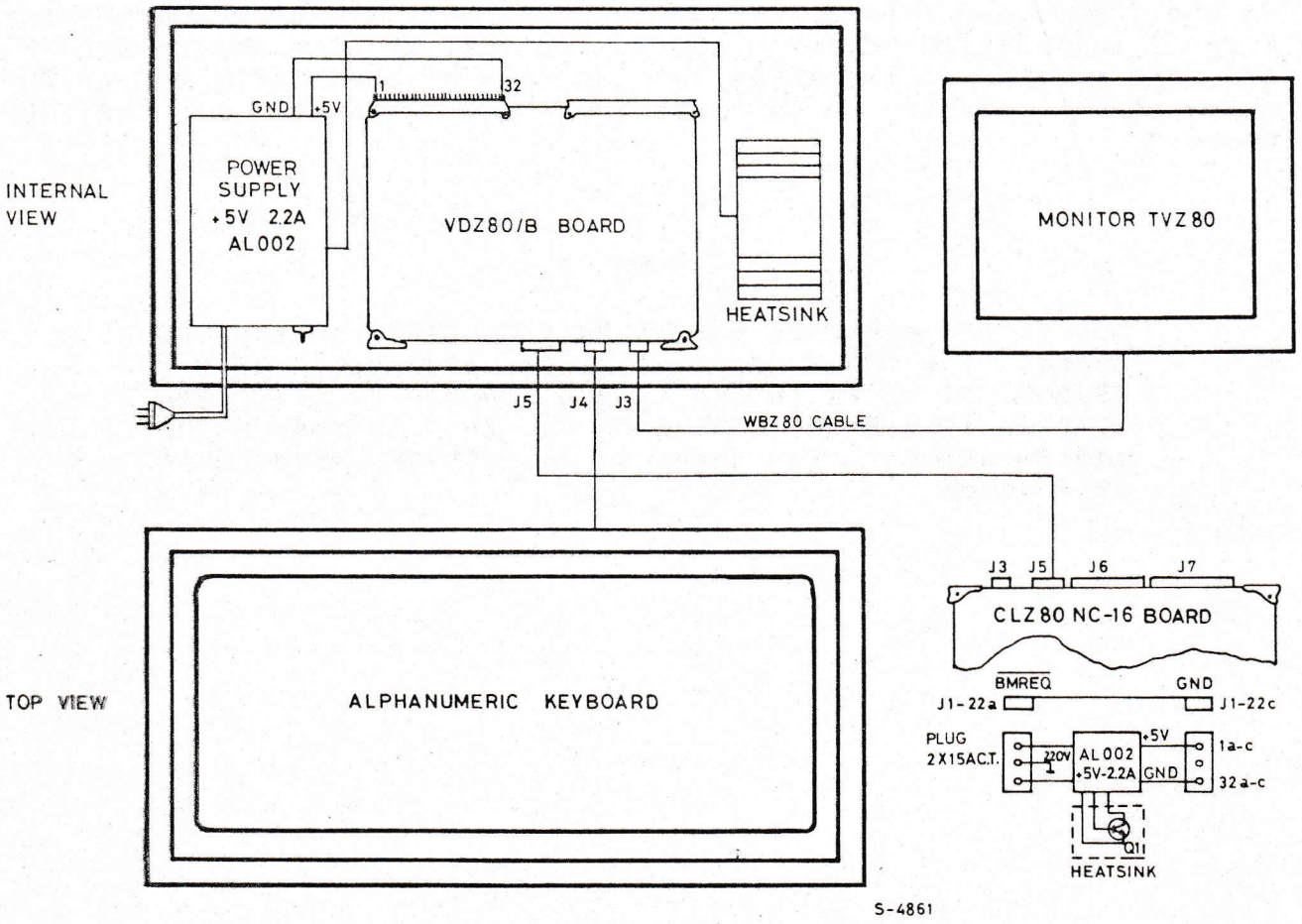


Fig. 4.3.1 - Schematic diagram of the console unit

The power supply can sink 2.2 A at +5V and supplies power for the Video Interface Board and for the fan.

A switch on the back of the container allows to switch on/off the power supply.

An internal cable connects the keyboard to the Video Interface Board (J4 Connector), see Fig. 4.3.2 for keyboard signal description.

A cable for the serial connector, attached to the J5 connector of the Video Interface Board, is free on the other end, to be connected to the J5 connector on the Nanocomputer CPU Board.

The video lead attached to the J3 connector of the video Interface Board is free for the connection to the antenna socket of the Monitor.

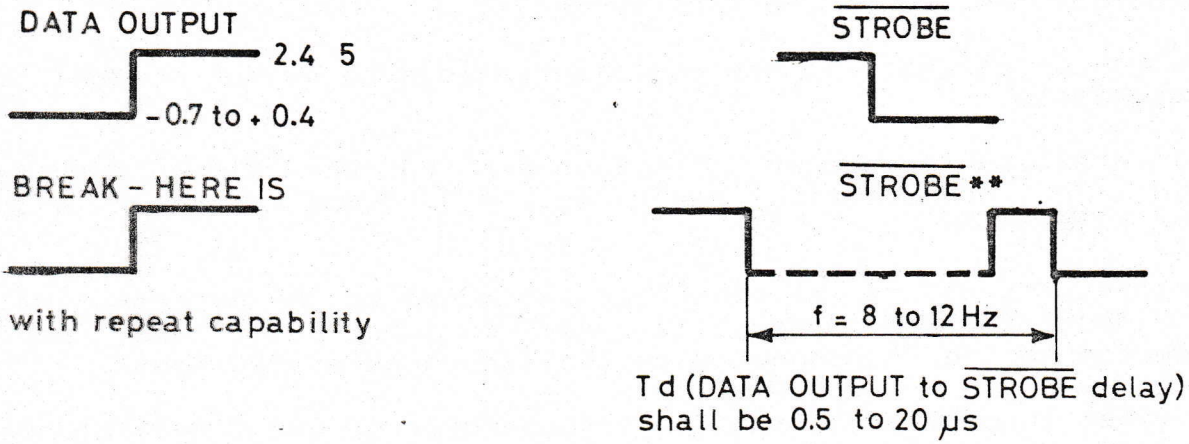
NOTE

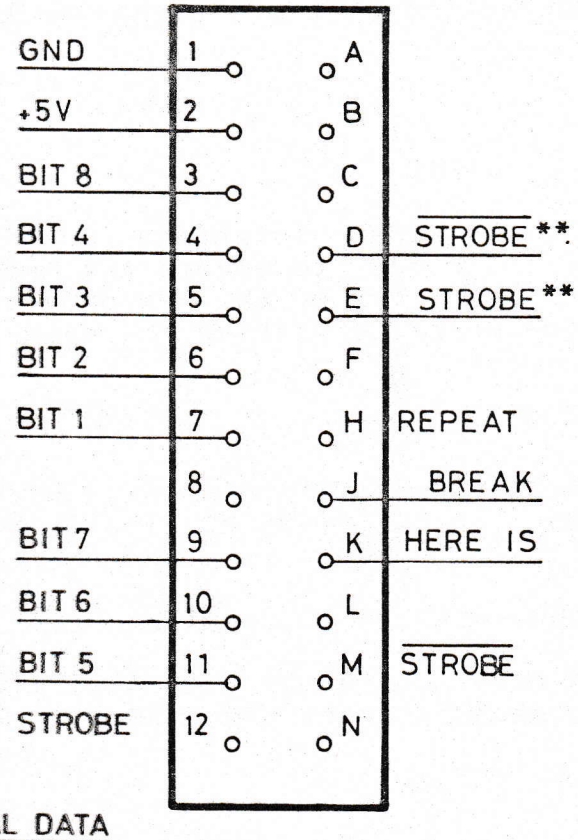
The MREQ- signal for the Video Interface Board is forced active (low) in order to enable the memory selection logic. It is driven by the CPU only when the Video Interface Board is sharing the same bus as the CPU Board.

The TV Z80 monitor has a 12 inch CRT display, with standard receivable CCIR format (625 lines, 15,625 HZ line frequency, 50HZ frame frequency).

The input impedance is 75 ohm, with no DC coupling.

It needs 220-240 v, has a power consumption of 41W, size 30x33x28 cm, and can be ordered as a separate part from SGS-ATES (order code TVZ80).





ELECTRICAL DATA

Input power: 5 vdc at 250 ma
Data output: 8 bit parallel (ASC II)
Strobe: repeating or non-repeating strobe
Strobe repeat: internal circuitry with REPEAT key

} OUTPUT TTL COMPATIBLE

Recommended connector EDAC 305-024-500-202 or equivalent

S-4862

Fig. 4.3.2 - Keyboard signal description

CHAPTER 5

PERIPHERALS

5.1 Cassette recorders

One or two audio cassette recorders can be used as a low-cost mass memory storage medium.

The suggested type is the RCZ80/P (a modified version of the PHILIPS N2233) described in detail in the SGS RCZ80 Technical Manual).

The CPU Board carries an interface for the magnetic cassette described in the CLZ80 Technical Manual and in the Nanocomputer Training Course Technical Manual. The recorder(s) is (are) connected to the Nanocomputer by the use of a cable plugged in the J3 connector (the top left one in the CPU Board).

There are two different recording cables: the W2Z80/P (with four jacks, to be used with two recorders) for the NBZ80-ASED and the W10Z80/P (with three jacks, to be used with one only recorder) for the NBZ80-HL.

5.1.1 Use of cassette recorder with NBZ80-HL.

The SAVE command is used to dump a file program on a cassette; the LOAD and MERGE commands are used to load it from a cassette.
In order to use the cassette (after the system inizialization, see Chapter 2), do the following:

- connect the recorder cable as shown in Fig. 5.1.1
- connect the recorder power cable to the main power
- check the position of the switch on the adapter on the back of the Nanocomputer: it must be in the ON (BASIC) position.

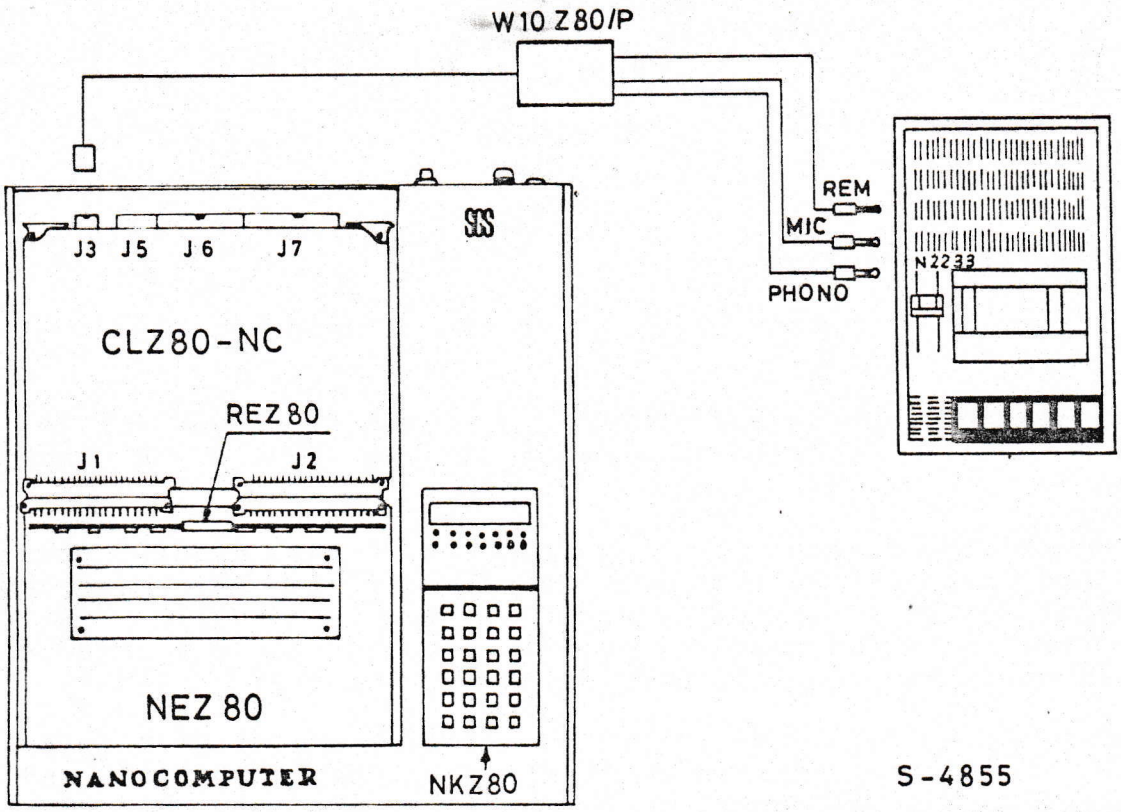


Fig. 5.1.1 - Connection between NBZ80-HL and RCZ80/P recorder.

DUMP PROCEDURE

If a program file has to be recorder on a cassette, follow these instructions:

- issue the SAVE command: the system will ask

  READY?

- position the cassette and push the REC and PLAY keys on the recorder. If the recorder was previously set with REC, PLAY and PAUSE pressed, release PAUSE now.

- answer "Y" at the console: the dumping will start

- at the end of the dumping, a ">" prompt character will appear on the display.

NOTE

The cassette doesn't stop at the end of the recording: stop and rewind it manually!

LOAD PROCEDURE

To load a program file:

- position the cassette at the beginning of the file
- issue the LOAD or MERGE command (LOAD clears the programs already in memory, while MERGE doesn't)
- when the program has been loaded, a prompt character (">") will appear on the screen.

NOTE

After loading, the cassette doesn't stop.

5.1.2 Use of cassette recorder with NBZ80-ASED

As previously outlined, the NBZ80-ASED requires the W10Z80/P cable in order to use two recorders simultaneously.

The recorders must be connected as shown in Fig. 5.1.2.

The cassette recorder must be declared as an input or an output device with the answer "C" to the input/output requests:

```
INPUT (L,H,C)=
OUTPUT(L,H,C)=
```

in Editor, or:

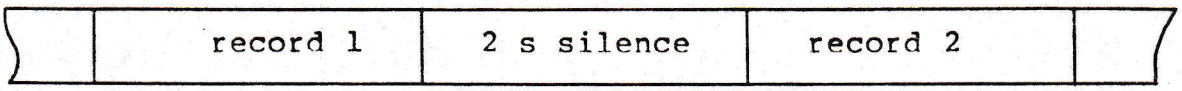
```
IN  (L/H/C)=
BIN (L/H/C)=
LIS (L/H/C)=
```

in Assembler. See the ASED Manual for a detailed description of the Assembler and Editor initialization and use.

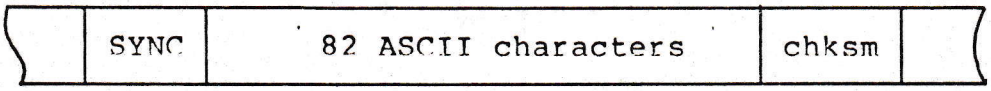
The recording formats used by NC-Z and ASED Operating Systems are different. The NC-Z does not use a sync character nor checksum; the physical format of data on tape is a free format organized as follows:

20 sec MARK(1) silence 100 nulls records 100 nulls

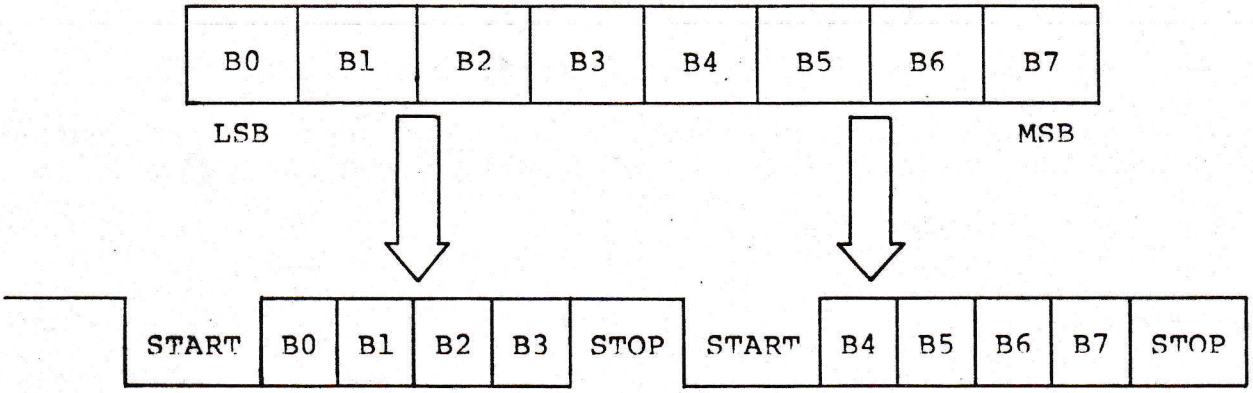
The ASED Operating System formats data in records separated by a period of 2 seconds of silence in order to allow automatic start/stop control of the audio cassettes.



Each record is composed by a SYNC character, 82 ASCII characters and a 8 bit checksum.



Notice that each 8-bit character is split into 2 5-bit serial characters in order to limit the influence of the tape speed variations. For the NC-Z each character is an 8-bit serial character.



NOTE 1

Remember to start the recorders before assigning them as an input or an output: press the PLAY key for the reading recorder and the PLAY and REC keys for the writing recorder.

NOTE 2

The H input assignment is not used (reserved for future expansion).

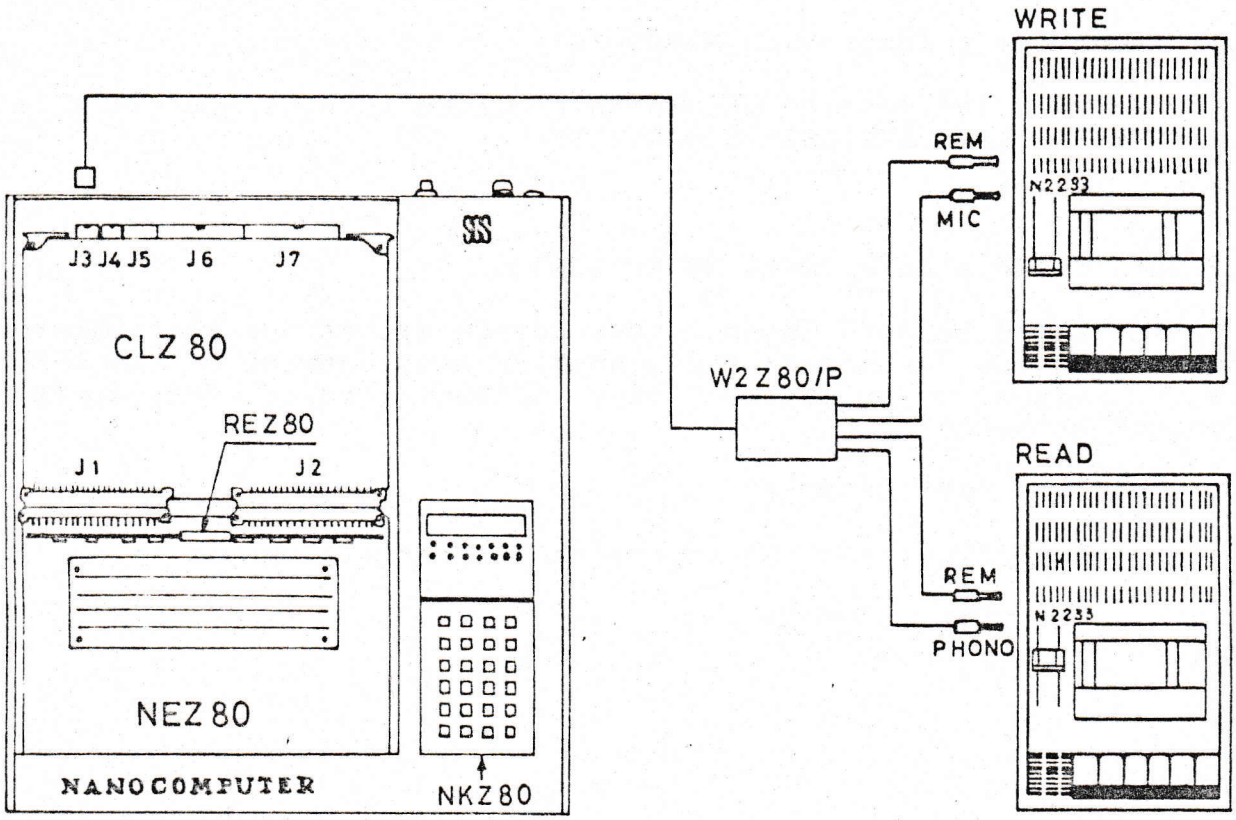


Fig. 5.1.2 - Connection between NBZ80-ASED and two RCZ80/P recorders

5.2 Printer

The printer (order code SSZ80) can be connected to the PIO # 2 connector (J7) on the CPU Board via a printer cable (W12Z80, see Fig. 5.2.1).

It is therefore necessary to disconnect the actual cable carrying the PIO signals to the Experiment Board.

The READY LED on the printer cable must be on, to indicate that the SSZ80 printer has the paper loaded an the READY switch correctly set.

5.2.1 Use of the printer with NBZ80-HL

The command LPRINT must be issued in order to print an output file (see SGS BASIC LANGUAGE USER'S MANUAL).

5.2.2 Use of the printer with NBZ80-ASED

The printer can be used as an output device either for the binary output or for the listing in the Assembler environement of the ASED operating system. To print the binary output, answer "H" to the assignment statement:

```
BIN (L/H/C)=
```

To print the listing, ask "H" to the assignment statement:

```
LIS (L/H/C)=
```

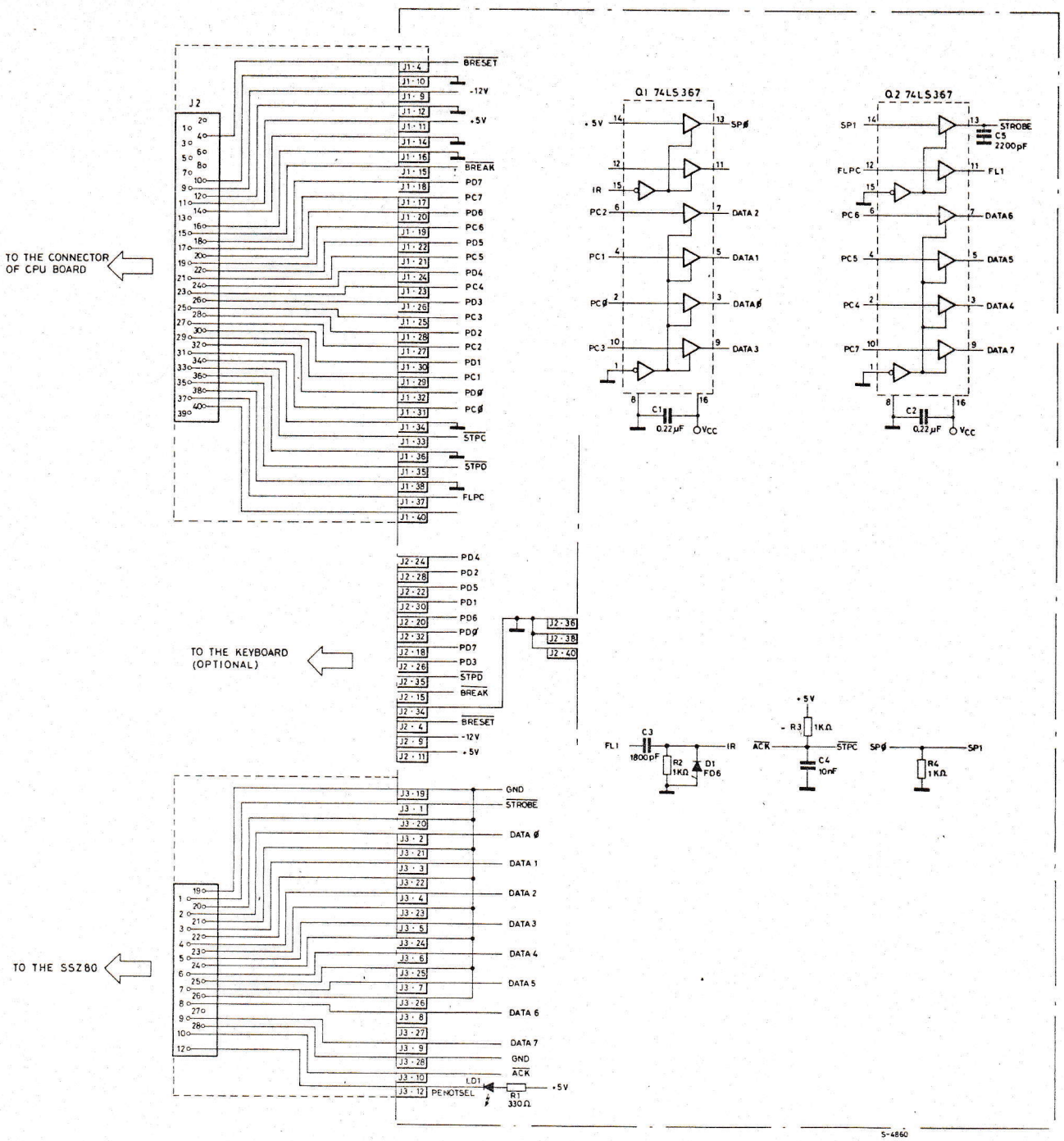


Fig. 5.2.1 - Printer cable connection diagram

APPENDIX A

EXAMPLES

A.1 NBZ80-HL

After the initialization (see Section 2.2) let's introduce a simple BASIC program, computing and displaying the value of the function:

$$y = \sin(x) + \sin(3x) + \sin(5x).$$

Enter from the console the following program (note that each REM statement is only a comment):

```
10   REM  PROGRAM  SIN
20   REM  COMPUTES AND DISPLAYS THE VALUE OF THE
     FOLLOWING FUNCTION
30   REM  Y = SIN X + SIN 3X + SIN 5X
40   REM  FOR STEPS OF 15 DEGREES
50   PRINT  "       X", "       Y"
60   PRINT
70   REM  HEADING OF THE TABLE
80   X = 15
90   B = X/57.296
100  REM B IS THE VALUE OF A IN RADIANS
110  Y = SIN (B) + SIN (3*B) + SIN (5*B)
120  PRINT  X, Y
130  IF X = 180 GO TO 180
140  X = X + 15
150  REM UPDATE X
160  GO TO 90
170  REM LOOP AGAIN
180  END
```

If you enter RUN now, the program will be executed and the following table will appear on your display:

```
X         Y
15        1.93185
30        2.00001
45        .707122
60        0
75        .517623
90        1
105       .517659
120       5.96046E-08
135       .707062
150       1.99997
165       1.9319
180       1.10292E-04
```

29

If you want to save your program on the cassette, connect the recorder as described in Chapter 5, then issue:

SAVE

followed by a RETURN.

The question:

READY?

will appear on the display.

Start recording on the cassette recorder (by pressing PLAY and REC) and issue a Y on the keyboard.

At the end of the recording, an

OK

message is displayed, followed by the prompt. After that, rewind the cassette.

When you need to load the program by the cassette, use the recorder in PLAY and issue a LOAD or MERGE command, and answer Y to the question

READY?

If a recording error occurs, an error message will appear; adjust the volume control and try again, till a successful reading.

A.2 NBZ80-ASED

Let's try to write, compile, load and execute a simple program in Assembler.

The purpose of the suggested program is to write a message on the display of the Nanocomputer hexadecimal keyboard and make it flash.

Suppose that we are using the cassette for the source and binary code and the printer for the listing.

After the initialization (see Section 2.2), enter the Editor (entry point C000 hex) and assign L as the input device and C as the output. Remember to start the writing recorder before pressing the "C" key.

Wait for the queue on the cassette and when the prompt ("#") appears on the display, issue as "A" (APPEND) command in order to write the source program.

Then enter the text listed at the end of this Appendix.

When the text has been entered to memory, swap it on the cassette by issuing the command "O". (For the use of "E" or "W" commands, see the ASED User's Manual).

If some mistake has been done in the previous step, correct it by use of the Editor, by rewinding the cassette, assigning both input and output devices to the cassette and using the Editor commands to read (R) the old file, modify it and dump it on the new cassette.

In order to compile the source program, let's enter the Assembler environment (entry point C800 hex) and assign the cassette as input device and for the binary output and H for the listing.

Read the first time the cassette by answering "1" to the question "PASS?" and rewind it after the new question "PASS?".

Start both the recorders and read again the cassette to compile the source program, by answering "2": the binary code is generated by the Assembler and recorded on the cassette.

If a printed listing is needed, rewind the cassette and read it from the Assembler by answering "3" to the question "PASS?". The printer will be activated and the listing printed out.

The binary tape can now be loaded from the Monitor, rewinding the cassette and loading it by the commands 2nd and LD on the Nanocomputer hexadecimal keyboard (the 2nd command is requested as the binary tape has not been generated in the NC-Z format). Remember to activate the Monitor by the aid of to back switch (it must be in Monitor or OFF position).

Enter the entry point (in our case 0200) via the hexadecimal keyboard, then press GO; the program will be executed, and a message will flash on the hexadecimal display.

SOURCE PROGRAM TO BE ENTERED FOR THE PRESENT EXAMPLE

```
MAIN:   ORG     200H
        LD      SP,0F90H        ;STACK INITIALIZATION
        XOR     A
        OUT     (PORTBC),A      ;PIO #1 PORT B OUTPUT MODE
        LD      A,0CFH
        OUT     (PORTAC),A      ;PIO #1 PORT A CONTROL MODE
        LD      A,0FH
        OUT     (PORTAC),A      ;BIT MASK
        LD      B,3             ;SET B REGISTER FOR LOOP
DISGS:  LD      HL,TABSGS       ;WRITE FIRST MESSAGE
        CALL    MSG
        DJNZ    DISGS
        LD      B,3
DSYSTE: LD      HL,TABSYS       ;WRITE SECOND MESSAGE
        CALL    MSG
        DJNZ    DSYSTE
        LD      B,3
        JR      DISGS
;
;MSG SUBROUTINE
;
;DISPLAYS A MESSAGE BLINKING
;
MSG:    PUSH    BC
        CALL    WAITB
        LD      DE,LEDH
        LD      BC,0AH
        LDIR
        CALL    WAITW
        POP     BC
        RET
;
;WAITB ROUTINE
;
;WAITING BLANK LOOP
;
WAITB:  PUSH    BC
        LD      BC,5FFFH
LOOP:   DEC     BC
        LD      A,B
        OR      C
        JR      NZ,LOOP
        POP     BC
        RET
;
;WAITW SUBROUTINE
;
;WRITES ON THE DISPLAY BY USING THE ROUTINE DYSPLA
;
```

```
WAITW:  LD      DE,02FFH
LOOP1:  DEC     DE
        CALL    DYSPLA
        LD      A,E
        OR      E
        JR      NZ,LOOP1
        RET
;
;DYSPLA ROUTINE
;
;
;ACTIVATE THE NANOCOMPUTER DISPLAY
;
DYSPLA: PUSH    BC
        LD      HL,DATA
        LD      BC,1305H
OUTLP:  LD      A,0FFH
        OUT     (PORTBD),A
        LD      A,3
LP:     DEC     A
        JR      NZ,LP
        LD      A,(HL)
        CPL
        RES     0,A
        OUT     (C),B
        DEC     B
        OUT     (C),B
        OUT     (PORTBD),A
        LD      A,10H
A2:     DEC     A
        JR      NZ,A2
        DEC     HL
        LD      A,L
        CP      0B9H
        JR      NZ,NXT1
        LD      L,0C1H
NXT1:   CP      0BDH
        JR      NZ,NXT2
        LD      L,0B9H
NXT2:   DEC     B
        JP      P,OUTLP
        OUT     (C),B
        POP     BC
        RET
;
;CODE TABLES
;
TABSGS: DEFB    0
        DEFB    0
        DEFB    0
        DEFB    0
```

```
        DEFB    2               ;SPACE
        DEFB    0B6H            ;S
        DEFB    0BCH            ;G
        DEFB    0B6H            ;S
        DEFB    2               ;SPACE
        DEFB    0
;
;
;
TABSYS: DEFB    0
        DEFB    0
        DEFB    0B6H            ;S
        DEFB    76H             ;Y
        DEFB    0B6H            ;S
        DEFB    1EH             ;T
        DEFB    9EH             ;E
        DEFB    2AH             ;M
        DEFB    22H             ;"
        DEFB    0
;
;
;
;BUFFERS DEFINITION
;
        ORG     0FB8H           ;DISPLAY LOCATIONS
LEDH:   DEFS    2
ADD7:   DEFS    3
DATA:   DEFS    1
DATA7:  DEFS    4
;
;PORT DEFINITION
;
PORTAD: EQU     04H             ;PORT A DATA
PORTAC: EQU     06H             ;PORT A CONTROL
PORTBD: EQU     05H             ;PORT B DATA
PORTBC: EQU     07H             ;PORT B CONTROL
;
;
;
        END
;
```

APPENDIX B

TROUBLE SHOOTING CHART

	FAULT	SYMPTOMS	CAUSE	CURE
1	NO CURSOR	No raster	Monitor off	Switch Monitor on
			Brightness or Contrast incorrectly set	Set controls to get raster
			Monitor fault	Return for repair
		Raster on	VDZ80 not switched on	Switch VDZ80 on
			Video signal open or not connected	Fit video cable Check continuity
			VDZ80 fuse blown	Check fuse
			Domestic TV incorrectly used	See NOTE in Section 2.2
			System fault	Return for repair
2	HEX DISPLAY DOES NOT GO BLANK AFTER PRESSING GO		Entry point was not en-entered properly	Reset and try again
			Key other than GO pressed	Reset and try again
			REZ80 not fitted into J1',J2' properly	Switch off and refit REZ80
			No power to REZ80 board	With power on check for +5V on pin 1 of J1',J2'
			System fault	Return for repair

35

	FAULT	SYMPTOMS	CAUSE	CURE
3	SPACE BAR HAS NO EFFECT	No cursor	VDZ80 or Monitor	Carry out checks in item 1
		Cursor OK	DP key pressed instead of GO	Reset and try again
			Serial interface cable not connected properly or faulty cable	Switch off and make sure cable is fitted properly if still nogo then check cable serviceability
			ON-OFF switch is in the OFF position	Switch to ON and try again
			System fault	Return for repair
4	THE RECORDER DO NOT START		Main cable not connected	Connect the main cable
			Recorder fault	Return for repair
5	THE RECORDER CAN NOT READ	"RD ERROR" message	Reading error in BASIC environment	Adjust the level control (about 6.5) and try again
		"CASSETTE ERROR" message	Reading error in ASED environment	Adjust the level control and try again
		Either error	Reading error	Check the ground connection with a tester between a screw of the cage and a grounded point on the circuit (if it is not present, make it)
		Either error message	Cassette not well recorded	Record the cassette again

SGS-ATES GROUP OF COMPANIES

INTERNATIONAL HEADQUARTERS
SGS-ATES Componenti Elettronici SpA
Via C. Olivetti 2 - 20041 Agrate Brianza - Italy
Tel.: 039 - 65551
Telex: 330131-330141

BENELUX
SGS-ATES Componenti Elettronici SpA
Benelux Sales Office
B- 1180 Bruxelles
Winston Churchill Avenue, 122
Tel.: 02 - 3432439
Telex: 24149 B

DENMARK
SGS-ATES Scandinavia AB
Sales Office
2730 Herlev
Herlev Torv, 4
Tel.: 02 - 948533
Telex: 35411

EASTERN EUROPE
SGS-ATES Componenti Elettronici SpA
Export Sales Office
20041 Agrate Brianza - Italy
Via C. Olivetti, 2
Tel.: 039 - 6555287/6555207
Telex: 330131-330141

FINLAND
SGS-ATES Scandinavia AB
Sales Office
02210 Esbo 21
Kääntöpiiri, 2
Tel.: 90 - 881395/6
Telex: 123643

FRANCE
SGS-ATES France S.A.
75643 Paris Cedex 13
Résidence "Le Palatino"
17, Avenue de Choisy
Tel.: 00331 - 5842730
Telex: 042 - 250938

WEST GERMANY
SGS-ATES Deutschland Halbleiter
Bauelemente GmbH
8018 Grafing bei München
Haidling, 17
Tel.: 08092-691
Telex: 05 27378
Sales Offices:
3012 Langenhagen
Hubertusstrasse, 7
Tel.: 0511 - 772075/7
Telex: 09 23195
8000 München 90
Tegernseer Landstr., 146
Tel.: 089 - 6925100
Telex: 05 215784
8500 Nürnberg 15
Parsifalstrasse, 10
Tel.: 0911 - 49645/6
Telex: 0626243
7000 Stuttgart 80
Kalifenweg, 45
Tel.: 0711 - 713091/2
Telex: 07 255545

HONG KONG
SGS-ATES Singapore (Pte) Ltd.
1329 Ocean Centre
Canton Road, Kowloon
Tel.: 3 - 662625
Telex: ESGIE HK 63906

ITALY
SGS-ATES Componenti Elettronici SpA
Direzione Commerciale Italia
20149 Milano
Via Correggio, 1/3
Tel.: 02 - 4695651
Sales Offices:
20149 Milano
Via Correggio, 1/3
Tel.: 02 - 4695651
00199 Roma
Piazza Gondar, 11
Tel.: 06 - 8392848/8312777

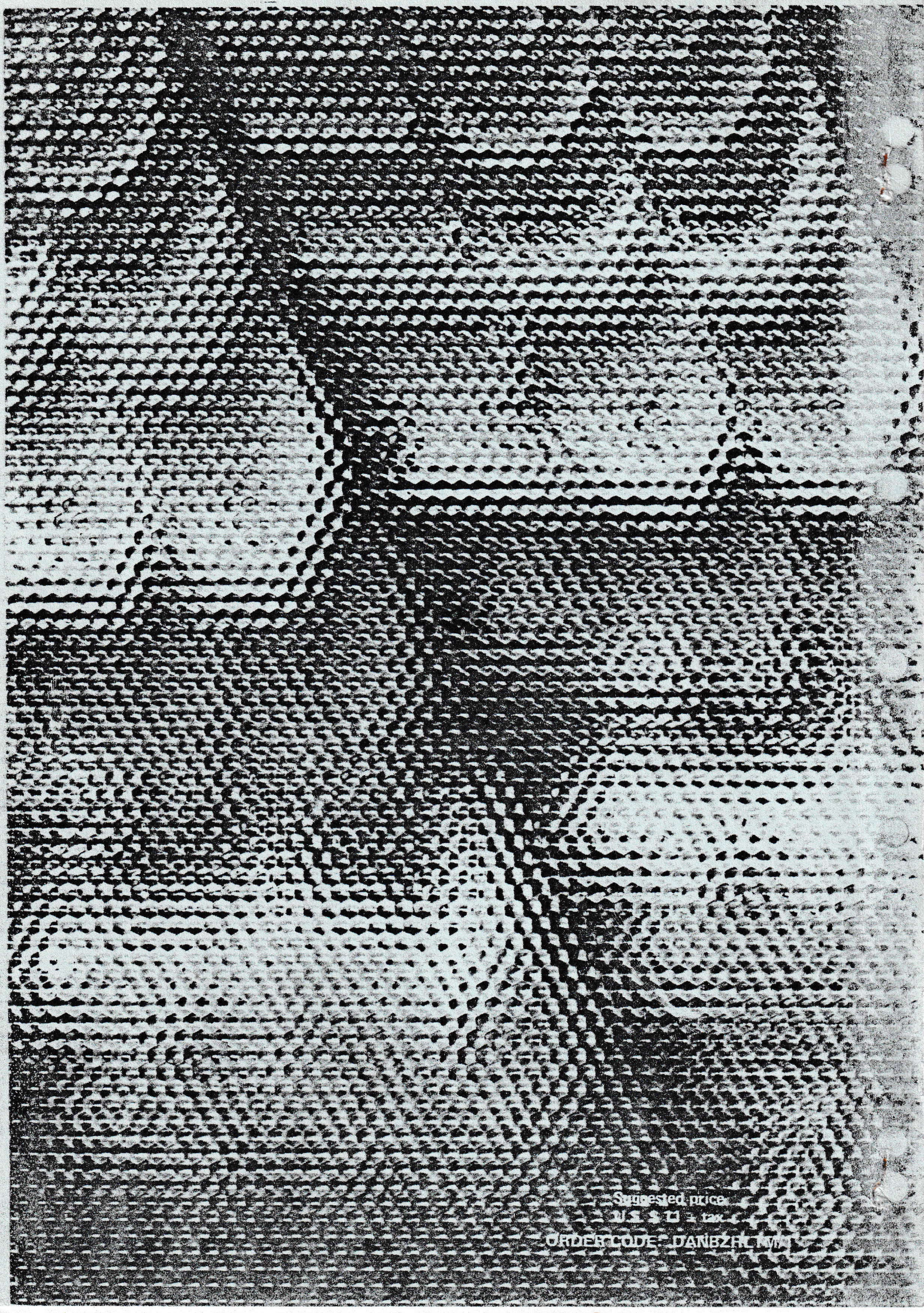
SINGAPORE
SGS-ATES Singapore (Pte) Ltd.
Singapore 1231
Lorong 4 & 6 - Toa Payoh
Tel.: 2531411
Telex: ESGIES RS 21412

SWEDEN
SGS-ATES Scandinavia AB
19501 Märsta
Box 144
Tel.: 0760 - 40120
Telex: 042 - 10932

SWITZERLAND
SGS-ATES Componenti Elettronici SpA
Swiss Sales Offices
6340 Baar
Oberneuhofstrasse, 2
Tel.: 042-315955
Telex: 864915
1218 Grand-Saconnex (Geneve)
Chemin Francois-Lehmann 22
Tel.: 022-986462/3
Telex: 28895

UNITED KINGDOM
SGS-ATES (United Kindgom) Ltd.
Aylesbury, Bucks
Planar House, Walton Street
Tel.: 0296 - 5977
Telex: 041-83245

U.S.A.
SGS-ATES Semiconductor Corporation
Scottsdale, AZ 85251
7070, East 3rd Avenue
Tel.: (602) 990-9553
Telex: SGS ATES SCOT 165808
Waltham, MA 02154
240, Bear Hill Road
Tel.: (617) 890-6688
Telex: 923495 WHA
Des Plaines, IL 60018
2340, Des Plaines Ave Suite 309
Tel.: (312) 296-4035
Telex: 282547
Santa Clara, CA 95051
2700, Augustine Drive
Tel.: (408) 727-3404
Telex: 346402
Woodland Hills, CA 91367
6355, Topanga Canyon Boulevard
Suite 220
Tel.: (213) 716-6600
Telex: 182863
Orlando, FL 32792
1309, South Semoran Blvd.
Lakeview, 436 Office Park
Tel.: (305) 671-8599


Suggested price
ORDER CODE: DANBZR