

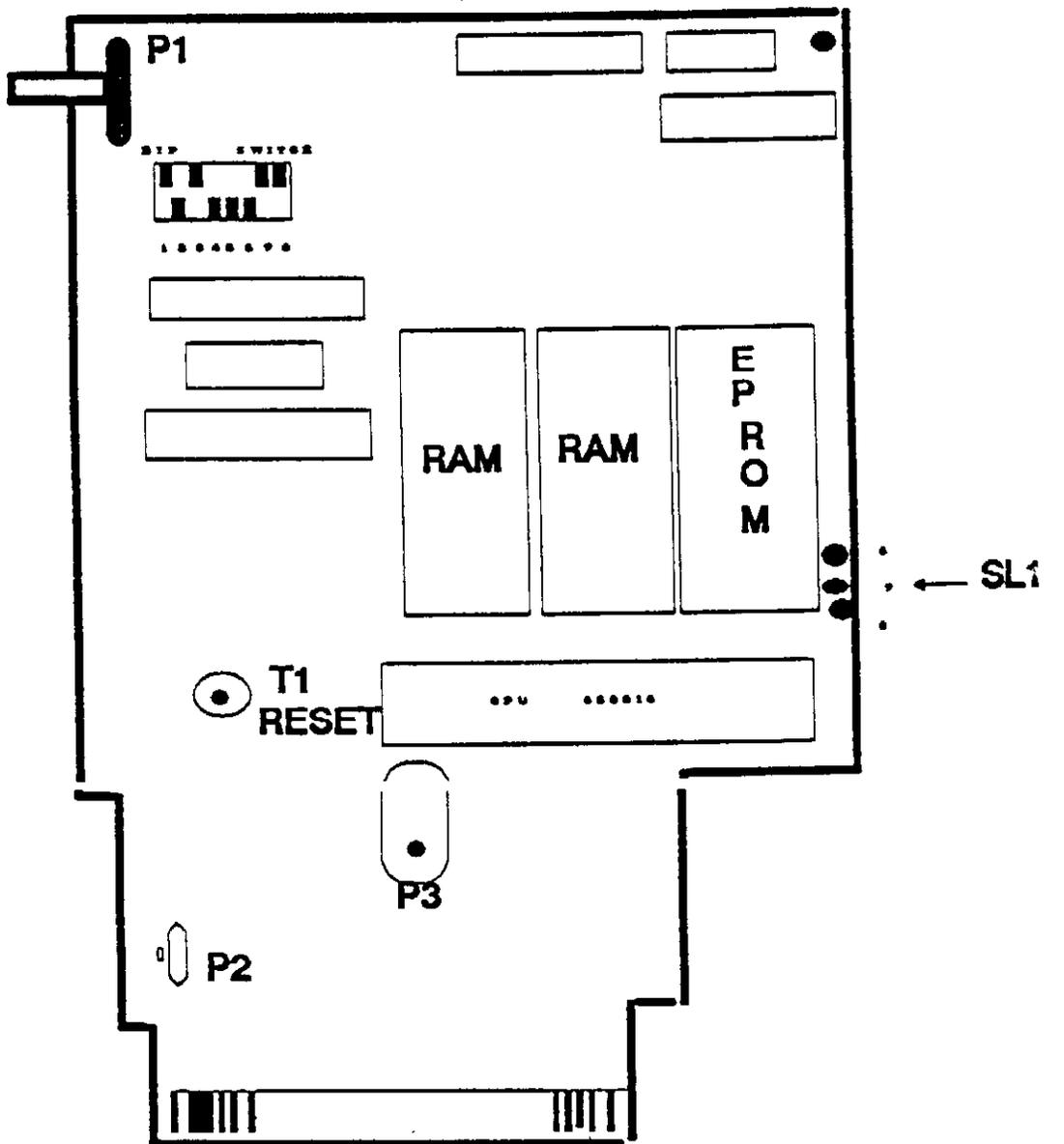
TURBO PROCESSOR

OWNERS MANUAL

SWISSCOMP Inc – USA

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OPERATION MANUAL AND USER GUIDE

TURBO PROCESSOR 4 Mhz 16 Bit Expansion card
for the Commodore C64

*PLEASE READ ENTIRE MANUAL FIRST BEFORE
USING TURBO PROCESSOR*

1. INTRODUCTION

We congratulate you on your purchase of one of the best hardware add on which is available for Commodore C64 . With Turbo 64 your Computer becomes one of the most efficient home computers in the world.

To develop the TURBO PROCESSOR it needed a lot of research and time as we wanted to develop a card which is simply plugged into the expansion port and runs. We also discovered that one C64 is not the same as another C64. There are many different versions with different timings, i.e. a C64 made in England is different from the one made in USA. Therefore you will find on the PCB of TURBO PROCESSOR three trim pots for adjusting the timing to suit your own C64.

2. ABOUT THE TURBO PROCESSOR

The TURBO PROCESSOR is a complete computer with 64k Byte RAM except for the I/Os. It contains

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CMOS IC and therefore does not require much power and additionally the RAM is battery backed, so that in case of power failure the programs loaded into the TURBO PROCESSOR will not be lost.

As CPU the TURBO PROCESSOR has a 65816 Microprocessor . This CPU has two modes:

a) It can Emulate 6502 and 6510 (The main CPU of the C64) respectively.

b) 16 Bit operation: TURBO PROCESSOR can be switched to 16 bit operation. If you wish to program in machine language, you can use the full power of the CPU for your sub-routine programs with its:

- 16 Bit Index register
- Powerful new address types
- Block move commands
- Direct addressing of the 16MByte Memory.

Please refer to the book on the 65816 CPU that is available from computer book shops nearest to you.

We have been asked the following questions frequently :

i) Which programs run faster and which ones not and what about sound ? Whether it runs 4 times faster !!!

Generally speaking all programs run faster, with the exception: of those that make heavy use of I/O (Video controller, CIA, Sound chip etc.) When a program uses the I/O the TURBO PROCESSOR switches back to 1 MHz. The user would for sure not like to hear his sound four times faster. It is also not possible to run the VIC on 4 MHz. As the CIA's continue to run on 1 MHz, the internal clock and the IRQ do not change.

ii) Which programs run with the TURBO PROCESSOR

In general all the programs which do not use illegal OP-Codes. As the name already says: the functioning of those commands, which the 6502 or 6510 CPU do not know, is not guaranteed by the manufacturer of the CPUs. This means that programs which have been written with illegal OP-codes do not function on the C64 also. The CPU 65816 does not know any illegal codes and that's the reason why such programs also do not run with the TURBO PROCESSOR. However the illegal OP-codes have only been used in few games. Standard-programs like Flight simulator, Pocket writer, Superbase, Visastar, other wordprocessors, spreadsheets etc do not use illegal OP-codes. Illegal op-codes have to be removed first in order for such programs to work on the TURBO PROCESSOR. TURBO PROCESSOR will not speed up LOADING or SAVING to of programs from the Disk or Cassette as this is the function of the I/O controllers. However, you may order from us the optional TURBO LOADER kit, which will connect to your 1541 or 1541C disk drive and the USER port and speed up the LOADING process by 1000% (or 10 times faster). (Please specify drive type ordering).

3. OPERATING THE TURBO PROCESSOR

Before you put the TURBO PROCESSOR to use please check that you have received the following:

- i) TURBO PROCESSOR CARD
- ii) Demo diskette
- iii) Operations manual
- iv) Warranty registration card

Please fill out the warranty card return it immediately to Swisscomp.

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Switch = 8 POSITION DIP SWITCH S1-S8

3.1 QUICK START

3.1.1 Ensure that Switch S1 and S3 on the TURBO PROCESSOR are ON (upwards)

3.1.2 Ensure that S2 and S5-S6 are OFF. (downwards)
(S5 ON if using the optional TURBO LOADER kit)

3.1.4 Ensure that switch S7-8 are ON (up)

3.1.5 Turn the Pot P1 clockwise all the way down
(from left to right) resting to the right.

3.1.6 Ensure that Computer is switched OFF.

3.1.6 Plug in the TURBO PROCESSOR carefully into
the Expansion port of the C64.

3.1.7 Switch ON the Computer while holding the CTRL
key down and releasing it after the screen responds. If
you want to make a complete new start after switch-
ing the C64 ON, you should press the left arrow key
and while holding it down press the RESET Button T1
on the TURBO PROCESSOR and release the left
arrow key. This will clear out any previous programs
from the memory.

3.1.8 If you have a disk drive insert the Demo disk and
type the following command:

```
LOAD"HIRES*",8 RETURN
```

```
RUN RETURN
```

```
LOAD"DEMO",8 RETURN
```

```
RUN RETURN
```

In few seconds you will see a graphics program alter-
nating in speed between 1 MHz and 4 MHz.

If you want to use the P1 to reduce the speed, S2 should be ON.

3.2 SWITCHES AND CONTROLS FUNCTIONS:

S1- ON (UP) = TURBO PROCESSOR ON.
OFF (DOWN) TURBO PROCESSOR is OFF

S2- ON = Switches ON potentiometer P1 control of speed. Speed can be regulated by adjusting P1. OFF speed control function OFF. When S2 is ON, S7 + S8 should also be ON.

S3- TURBO PROCESSOR has a 32KB Eprom with different operating systems programmed into it. If you wish, you may replace the 32KB Eprom with a 64KB of the type 27512 and with switch S3 select between two 32KB banks. Please make sure that the Eprom has a speed of atleast 150nS when replacing it with a 27512.

S4 - If you have programmed in a 16KB of Cartridge program in the Eprom, such as our Assembler AS64, you can select that by switching S4 in ON position.

S5 - is for Switching between 2 operating systems resident on the TURBO PROCESSOR when used with the optional TURBO LOADER kit and it's operating system. S5 OFF = C64 operating system mode. S5 ON = TURBO PROCESSORS own operating system (used with optional TURBO LOADER kit).

S6 - TURBO PROCESSOR can also be run asynchronous to the C64. However IN/OUTPUT will be inoperational. In asynchronous mode the TURBO PROCESSOR'S speed increases by another 10-20%. This mode is useful in case of long calculations. When S6 ON allows switching between synchronous and asynchronous mode by software, in which the Bit 6 of Address \$0001 is set or erased. NOTE: THE OPERATION OF THIS MODE SHOULD BE HANDLED BY EXPERIENCED MACHINE LANGUAGE PROGRAMMERS, as it may cause address \$0001 of the computer can be lost when done improperly. One should not put in just any values in this address, but

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only those that are combined with AND and OR statement that set the individual bits.

S7 - When this switch is closed (ON) then switching between 1 and 4 MHz is done by the software by setting or erasing Bit 7 of the address \$0001. When this switch is open (OFF) then the switching between 1 and 4 MHz is achieved through hardware with switch S8.

S8 - When S8 is OFF the TURBO PROCESSOR will run at 4MHz. But as the serial IEEE bus of the C64 can not operate at 4MHz, the LOADING, SAVING and PRINTING have to be done at 1 MHz. The operating systems included in the TURBO PROCESSOR as delivered from the factory do this switching automatically when Switch S7 and S8 are ON. In the following table a + means that at that point it falls back to the on IEEE bus

S 7 S 8

- OFF OFF = 4 MHz through hardware switching
- + OFF ON = 1 MHz through hardware switching
- ON OFF = 4 MHz through hardware switching
- + ON ON = 1 and 4 MHz through software

T1 - Reset Button

P1 - Potentiometer to regulate the speed of program between 100KHz and 3.2 MHz. (When S2 is ON).

P2 - Potentiometer to synchronize the CRT output of the TURBO PROCESSOR with the C64.

P3 - Potentiometer to synchronize the frequency of the TURBO PROCESSOR with the C64.

4. USER GUIDE

So that the TURBO PROCESSOR can run on all the versions of C64 at the expansion port and as the C64

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are not all identical in their timing- behavior, we have made the control lines adjustable by means of two trim pots: P2 and P3.

Ensure that the C64 Computer is switched OFF.

Plug the TURBO PROCESSOR into the expansion port C64. S1 and S3 should be ON. S2 and S4-S6 should be OFF (down). S7-S8 should be ON. Potentiometer P1 should be turned all the way to the right (clockwise). Switch ON the C64 now and you should get a normal screen display with the following message:

COMMODORE 64 BASIC V2

TURBO-PROCESS 38911 BASIC BYTES FREE

READY

The switch S5 allows switching between the two operating systems which are in the Eprom. S5 should be OFF for running your existing programs with TURBO PROCESSOR if you do not have the optional TURBO LOADER kit installed in your 1541 or 1541 disk drives and connected to the USER port of the C64. You also have the possibility to put only one operating system into the Eprom and additionally a 16 kByte cartridge program. The selection is made with the switch S4. Speed adjustment between 1/10th of the original C64 speed (100 kHz) to 3,2 MHz. (Maximum 3,2 Mhz can be achieved with P1 when S2 is ON).

4.1 CHANGING SPEED BY SOFTWARE

The change over between 1 MHz and 4 MHz can also be achieved by software. This function is provided by writing into bit 7 of address 1. If that bit is set the TURBO PROCESSOR runs on 4 MHz, if it is cleared, your computer is switched on to 1 MHz.

POKE 1,PEEK (1)OR128 switches on 4 MHz

POKE 1,PEEK (1)AND127 switches on 1 MHz

As there are some programs which without any logical reason write and add values into the address 1, we made it possible that the switching over based on software can be disabled. S6 accomplishes that, if switched OFF, The TURBO PROCESSOR can be switched between 1 MHz and 4 MHz by software.

If it is OFF, Bit 6 of the address 1 has following meaning: if the Bit is set, the TURBO PROCESSOR runs synchronous to C64 as normal. However if that Bit is cleared S6 ON the working speed of TURBO PROCESSOR is increased to about 4.5 MHz. As the Turbo 64 now runs asynchronous to the C64 no screen display is possible.

Typical Applications: Lengthy and time consuming calculations can be speeded up.

Software switching between 1 MHz AND 4 MHz:

POKE 1, PEEK(1)OR64 means synchronous operation

POKE 1, PEEK(1)AND191 switches on to asynchronous operation (4MHz)

4.2 BASIC Programs:

BASIC programs maybe resumed from the TURBO PROCESSOR's RAM by first resetting the BASIC pointer and then giving the Command: RUN.

4.3 Parallel Operating system

If you have switched ON the TURBO PROCESSOR's parallel operating system, the BASIC can be resumed by pressing CTRL *.

After switch ON of the computer the TURBO PROCESSOR resets all the pointers. e.g. for BASIC or Variable beginning. It means that after switch ON or RESET of the hardware it might appear that a BASIC program has disappeared, but in efect it has not.

4.4 GAMES

There are some games that use the video heavily, it is possible that this might cause some problems with one or the other Sprite. If it is important to you that such games also run, you can achieve an absolute compatibility with the video range with 3 cables.

To make this change use a 3 conductor ribbon cable. Look at the diagram of the TURBO PROCESSOR provided with the manual. You will see a 3 Pin connector marked SL2.

If you count the pin which is closest to the 40 pin CPU 65C816 as pin 8 then the following connections are achieved to the PLA of the C64.

<u>SL2</u>	<u>PLA</u>	<u>Meaning</u>
Pin 8	Pin 8	LORAM
Pin 7	Pin 7	HIRAM
Pin 6	Pin 6	CHAREN

If you are unable to do this alteration please contact the nearest authorized repair or service place nearest you that handles Commodore computers.

NOTE: If you have tried using a program that uses illegal op- codes either in its initial loading stages or during the program operation, it is possible that the TURBO PROCESSOR will stop operating, this happens because the program's illegal op-codes have not been recognized by the TURBO PROCESSOR. To get the TURBO PROCESSOR to operate again, put switch S5 in ON position, and then while depressing the left arrow key press the reset button once and release the left arrow key, the memory will clear up and TURBO PROCESSOR will be operational. Switch S5 OFF again, if you are not using the TURBO PROCESSOR's operating system in combination with the optional TURBO LOADER cable.

4.5 16 BIT OPERATION

TURBO PROCESSOR can be switched to operate in 16 bit mode. If you want to write programs in machine language, for your sub routines that begin with SEI, you can use the full power of the TURBO PROCESSOR:

- 16 bit Index register
- Powerful new address types
- Block-move command capabilities
- Direct addressing of upto 16 MB of memory.

Swisscomp will be introducing shortly a memory expansion card upto 1 MB . Since the programming possibilities of the 65816 CPU are in the form of a 600 page book it is not possible to describe in detail these possibilities here. We therefore suggest that you obtain this book titled: PROGRAMMING THE 65816, by David Eyes/Ron Lichty, Prentice Hall press.

4.6 SOUND CHIP AND TURBO PROCESSOR

In principle all the programs will be speeded up except those that make heavy use of the I/O. Whenever the program has to go to the I/O for it's operation the TURBO PROCESSOR will switch to 1 MHz.

4.7 VIC AND CIA

VIC and CIA will continue running at 1MHz. It is im possible to speed up the VIC. It is also not useful to speed up the CIA to 4MHz as the internal clock and interrupts should not bechanged.

5. OPERATING SYSTEMS

5.1 OPERATING SYSTEM 3 (up).

The TURBO PROCESSOR's Operating System V3.0 comes as standard together with the C64's original

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operating system adjusted for operation on the TURBO PROCESSOR . However the parallel data transfer is achieved with our optional TURBO LOADER kit for the 1541 disk drive). The data transfer takes place through the USER port. It comes with a special Kernal . Besides the improved speed loading (up to 10 times faster) we have made some additional improvements which are activated by holding CTRL key together with another key.

5.2 AUTOEXECUTE PROGRAMS

As also the autoexecute programs now remain in the memory of the TURBO PROCESSOR after switch OFF, You may however by pass this by pressing CTRL key during Switch ON or during RESET, the Autoexecute program is ignored or bypassed. It is therefore possible to bypass any Autoexecute programs.

5.3 Floppy parallel bus.

We have made the parallel bus with "FAST LOAD" so you have an additional LOADING speed of 10 times. FAST LOAD commands are described later.

5.4 Implementing own operating system into the TURBO PROCESSOR:

Should you want to program your own operating system into the TURBO PROCESSOR card you can do that. However you must ensure that you use 32 KB - 27256 type Eprom which has a speed of 150 nS at least but optimally 120 nS.

The Eprom is set up as follows:

Eprom with 2 operating systems:

TURBO PROCESSOR EPROM:

\$6000 - \$7FFF 1st Operating system

\$4000 - \$5FFF 2nd Operating system (for use with TURBO LOADER)

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\$3000 - \$3FFF Character generator
\$2000 - \$2FFF empty
\$0000 - \$1FFF 8 KByte BASIC

16K Module Operating system:

\$6000 - \$7FFF 1st Operating system
\$2000 - \$5FFF 16Kbyte Module
\$0000 - \$1FFF 8 KByte BASIC

In order that your own operating system works at Loading and Saving software wise between 1 MHz and 4 MHz, it is necessary to make the following changes in the LISTEN and UNLISTEN routines:

In the Commodore C64's original operating system at the RAM address \$ED24, \$ED3A, \$ED41 and \$EE2A a jump to another routine, (switchover to 1MHz), which will stay at the address \$E4B7, should be made. This change can be made with the Direct assembler or per Hex dump.

20 B7 E4 JSR \$E4B7

The memory address \$EE10 should have a jump in the additional routine (switchover to 4MHz) at the position \$E4C2:

20 C2 E4 JSR

Now implement the additional routines as follows:

E4B7 48 PHA
E4B8 A5 01 LDA \$01
E4BA 25 7F AND #\$7F
E4BC 85 01 STA \$01

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E4BE 68 PLA
E4BF 4C 97 EE JMP\$EE97
E4C2 48 PHA
E4C3 48 A5 01 LDA 01
E4C5 05 80 ORA #80
E4C7 D0 F3 BNE \$E4BC

5.5 Operating with the SPEED DOS PLUS:

As many users also have Speed Dos Plus operating system we document below the changes necessary so that a smooth function of this is achieved on the TURBO PROCESSOR card. These two Routines and must be made to the appropriate addresses:

Switchover to 1 MHz		Switchover 4 MHz	
\$F14A 48	PHA	\$F495	PHA
\$F14B A5 01	LDA \$01	\$F496 A5 01	LDA \$01
\$F14D 29 7f	AND #80	\$F498 09 80	ORA #80
\$F14F 85 01	STA \$01	\$F49A 4C 4F F1	JMP F14F
\$F152 4C 97 EE JMP \$EE97			

Patch at the following address:

\$ED3A 20 4A F1 JSR \$F14A ;SLOW
\$ED7A 20 4A F1 JSR \$F14A ;SLOW
\$EE2A 20 4A F1 JSR \$F14A ;SLOW

\$EFB1 20 4A F1 JSR \$F14A ;SLOW

\$EE10 20 95 F4 JSR \$F495 ;FAST

\$77 29 9F AND #\$9F ;IRQ-ROUTINE: RE-
CORDER-MOTOR; OFF (AND #\$1F)

NOTE: We have experienced that there are many versions of the Speed Dos kernels, which have some differences between them and which have to be patched differently.

The patch on the FAST routine is always the same.

5.6 MONITOR PROGRAM

We have also integrated a monitor program that will increase the speed for SAVING a block of program on the diskette, or to LOAD a program to a defined begin address or just to view the computer's memory.

The Monitor is activated with CTRL and RETURN and will respond at every BREAK command as long as no other monitor is active.

5.4.1. The Monitor Commands

The monitor recognizes 5 Commands.

l) M(emory) XXXX

M (emory) displays 184 Bytes from Hexaddress XXXX as Hex-ASCII- Dump on the CRT. For each line it displays 8 Bytes first as Hex value and then as ASCII code. e.g.

:4000 2a 2a 2a 2a 2a 2a 2a 2a *****

:4008 2a 2a 2a 2a 2a 2a 2a 2a *****

The hex values may be changed by writing over them. The ASCII codes can not be changed. The change is to be confirmed by the RETURN key. After inputting line a new page will be displayed from the position of

the changed address. Since after the changed screen with the new page the Cursor rests at the last line of the new output page it is therefore possible to advance through the memory pages rapidly by hitting the RETURN key repeatedly.

ii) L(oad) "TEST" XXXX

Loads a file with the name "Test" at the defined Address XXXX. The Loading address should always be a 4 digit Hexadecimal number. As separators spaces may be included but are not really necessary.

iii) S(ave) "Test" XXXX YYYY

Saves a block between XXXX and YYYY-1 with name "Test" on floppy diskette. XXXX and YYYY are 4 digit Hexadecimal numbers.

iv) G(o) XXXX

Starts an existing machine language program from the memory at the XXXX address. If the machine language program is interrupted by a Break, the monitor will appear again.

v) X (Exit)

Allows exiting of the Monitor and return to BASIC. If the monitor is reactivated through SHIFT and RESET then X command continues the already begun RESET routine, and in this way makes a hard start of the system.

5.4.2 Reset Routines

If the following keys are depressed during the RESET routine they execute a certain definite response of your computer.

i) CTRL + RESET

The computer bypasses or ignores a previously loaded Autoexecute program in the memory and makes cold start of the operating system.

nize the CRT color address as \$D020 rather than as 53280

5.8 Screen editor enhancement.

As a result of the keyboard decoding table the TURBO PROCESSOR now allows not only 8 but 16! different function keys, which are to be differentiated from the BASIC. In the following table you will find the ASCII CHR\$ values of all the 15 Function keys briefly described.

SHIFT +	
F1 : CHR\$(133)	F2 : CHR\$(137)
F3 : CHR\$(134)	F4 : CHR\$(138)
F5 : CHR\$(135)	F6 : CHR\$(139)
F7 : CHR\$(136)	F8 : CHR\$(140)

CBM +	CTRL +
F9 : CHR\$(120)	F10: CHR\$(124)
F11: CHR\$(121)	F12: CHR\$(125)
F13: CHR\$(122)	F14: CHR\$(126)
F15: CHR\$(123)	F16: CHR\$(127)

You can test the above values when you run the BASIC program listed below:

```
1000 GET A$: IF A$ = "" THEN 1000
1010 PRINT ASC(A$): GOTO 1000
```

5.9 AUTO LINE NUMBERING

When writing programs you will get automatically numbered next line number after hitting RETURN. The line numbers increase by 10 but can be changed by @ # INC to a desired value between 0 and 255. You may also overwrite the automatically presented number.

The auto numbering maybe ended by typing in anything other than a number at the beginning of the row. e.g. a Direct mode command such as LIST or if you press SHIFT RETURN.

If you do not enter anything at the automatically presented line number and RETURN then the previously stored line with same number will be erased and a new number will be presented. This allows speedier erasing of long programs simply by hitting RETURN.

5.10 DOS 5.1

With DOS 5.1 you can operate the disk drive with simple commands. The operation of the floppy is possible through @. We give below the commands in detail: (to be used with RETURN key)

- i) @ fetches the actual floppy status error channel and displays it on the CRT.
- ii) @\$ will display the directory of the diskette in the floppy drive on the CRT. You may also add a file specification with this command such as @\$D*=P will display all directory entries beginning with a D.
- iii) @\$<STRING> In this function an input of a search String is possible.
- iv) @#<Byte>. This command allows the alteration of the step size for the automatic row numbers. The parameter "Byte" can be any number (even Hex or Binary) number between 0 and 255.

v) @ ^ <NAME > Will output a text file (NAME) on the screen. Same as a TYPE command.

vi) @ <STRING > Also possible to send commands to the Floppy drive. e.g. @I etc.

vii) @Q. The entire command enhancement as well as the Auto function keys can be cancelled by this command. (Quit)

5.11 SCREEN Editor.

i) CTRL A. Normally when you reset or restart your computer all the keys have a Auto repeat function activated. However, by simply pressing CTRL A once the auto repeat functions will only be available in the cursor control and space bar keys. A second pressing of the CTRL A will bring it back in the Auto repeat mode for the entire key board.

ii) CTRL B. Is the opposite of the HOME key. Moves the cursor to the left hand bottom corner.

iii) CTRL D. Displays the disk directory. Those programs previously loaded into the memory are not erased with the command as is the case when the command LOAD"\$",8 is executed. You can leave out the primary address ",8" for all the LOADING and SAVING operations.

iv) CTRL L. Loads a program from the directory to the BASIC start (LOAD"NAME",8). If this command is executed without first displaying the directory CTRL D, then it will type the command LOAD on the screen.

v) CTRL O. Closes a previously opened disk channel and executes a: OPEN 1,DEV,15,". The command CTRL O in the directory will erase the program on which the cursor is resting after confirming it with a RETURN.

vi) CTRL P. Will print out the contents of the screen to an attached Printer (Centronics parallel or Serial)

vii) CTRL V. Initializes the Video controller anew and switches to a standard screen (\$0400). The screen does not get erased.

viii) CTRL X. Switches OFF all previously Loaded Basic enhancements and reactivates the command enhancement of the Kernal. This command

ix) CTRL\$. Has the same function as DELETE key. However the cursor will remain on it's old position and the characters are deleted from the right of the cursor.

x) CTRL has the function of a TAB. The cursor moves 5 spaces to the right.

xi) CTRL ,. Is the same as CTRL L; however the file is LOADED as absolute (,8,8).

xii) CTRL: Is the same as ESCAPE, in that it sets the Insert mode back.

xiii) CTRL *. Restores a previously erased BASIC program i.e. after a NEW or RESET.

xiv) CTRL /. Displays the status of the floppy drive on the Screen.

xv) CTRL @. Allows switching between upto 4 floppy disk drives.

xvi) CTRL +. Allows switching between FAST and SLOW mode of the TURBO PROCESSOR.

xvii) CTRL DEL. Deletes the entire line to the right of the cursor.

xviii) CTRL HOME. Deletes entire line to the left of the cursor.

xix) CBM STOP. Executes a RUN and RETURN.

xx) SHIFT STOP. Loads and starts the first program from the disk drive at address # 8

All of the above commands are integrated into the TURBO PROCESSORS operating system and can be used with optional TURBO LOADER kit when connected to 1541 or 1541C.

6. IN CASE OF TROUBLE:

Before doing any trouble shooting make sure all the IC are seated firmly in their sockets. It is possible that in transit and after a while the sockets contract or expand.

Problem: *Possible Cause:*

At power up the screen remains blank Make sure all the Dip Switches are properly in their position. (not half way). Check that S1, S3 (optionally S2), S7 and S8 are ON (up). Check to see that S4-S6 are OFF (down).

Check to see that P1 is turned all the way to the right. (Clock wise). Ensure that the TURBO PROCESSOR is firmly connected to the Expansion port. Reboot the computer. If it still does not come on then put S5 in ON (top) position, depress the left arrow key, and while holding it depressed press the RESET button the TURBO PROCESSOR and release the left arrow key. This will clear up the memory, which normally gets blocked by usage of a program that uses illegal op-codes. Some programs using illegal op-codes maybe run on the TURBO PROCESSOR, but only after removing all the illegal op-codes first. This is achieved by using our EXPERT CARTRIDGE.

Random Graphics characters at Power up.:

Adjust the trimpot P2 while pressing and releasing the reset button until the screen is normal. Adjust the P3 trimpot while pressing and releasing the reset button.

After Loading the program takes very long to appear on the screen:

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Turn the Trimpot P1 all the way to the right and S2 in OFF.

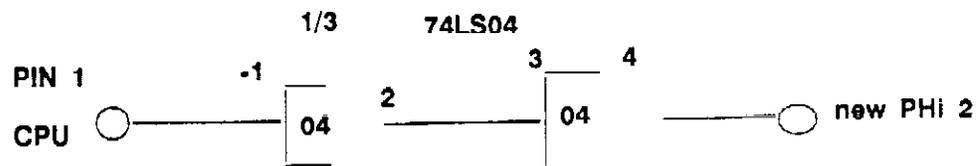
When loading the screen displays: Device not present Error. Make sure S7 and S8 are ON (up).

Check regularly that the bus lines which connect the TURBO PROCESSOR board to the cartridge port are clean.

DOT-CLOCK PROBLEM;

It is possible that on some older models of the C64 the Random graphic characters will not disappear even by adjusting the P3, this happens because such C64 have defective Video controller chip 6569 R1 (Revision 1). It might be necessary to replace this chip. However, before you go out and buy an expensive replacement chip try to make the following alteration:

WARNING: THIS ALTERATION SHOULD ONLY BE MADE BY AN AUTHORIZED REPAIR SHOP OR AN EXPERIENCED TECHNICIAN.



Switch OFF the C64 and open it up. With an Ohm meter find a through contact in the South-East direction of the CPU 6510 which is connected with pin 39 of the CPU 6510 (PHI-2). Solder at this point an approximately 2" jumper wire. Take a TTL ic type 74LS04 or 74LS14 and solder the other side of the jumper wire to pin 4 of the TTL IC. Jumper Pin 2 and Pin 3 of the TTL together. Pin 1 of the TTL should be connected with a 2" jumper cable to the Pin 1 of the CPU 6510. Pin 7 should be connected to ground and

TURBO PROCESSOR - OWNERS MANUAL

Pin 14 should be connected to a +5V supply. Cut the connection of Pin 39 of the CPU 6510 with PCB.

Now type in a test program as follows:

```
10 PRINT I, SQR(I) : I = I + 1 : GOTO 10
```

Put the switch S7 in OFF position and switch S8 ON and OFF to see the 1 MHz and 4 Mhz operation. Finally put both the switches S7 and S8 in ON position. You will see the program running at 4 MHz.

SOME USEFUL HINTS:

If you have not used the TURBO PROCESSOR for a longer period it is possible that the battery is discharged and it will take about 30 minutes after plugging in and having the computer ON that built in Battery is recharged before it can operate properly. This should also be done when you first receive your TURBO PROCESSOR card.

There are some versions of the C64 which have a very poor power supply and this may cause problem for the recharging of the battery on the TURBO PROCESSOR. Such poor power supplies only put out 4.5V instead of the 4.9V to 5.1V required. The only solution to this problem is to get a good power supply.

Another problem may arise in the operation of the serial IEEE bus. It only runs at 1 MHz! It means for LOADING SAVING and PRINTING one has to go down to the slower speed of 1 MHz. The two operating systems in the EPROM of the TURBO PROCESSOR do this automatically. However, if you want to use your own operating system, it is necessary to make a small alteration. These alterations are explained in the previous chapter.

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COMMOPORE POKE's

	64	VIC	PLUS/4,16	128
Disable LIST	775,191	775,223	774,187	775,138
Enable	775,167	775,199	774,110	775,81
Disable SAVE	819,246	818,73	816,136	818,180
Enable	819,245	818,133	816,164	818,78
Disable LOAD	816,157	816,103	814,239	816,0
Enable	816,165	816,73	814,74	816,108
Disable RUN/STOP	808,239	808,100	806,103	808,100
Enable	808,237	808,112	806,101	808,110
Disable VIDEO	53265,6	---	---	---
Enable	53265,27	---	---	---
Disable RESTOR	792,193	792,7	---	792,125
Enable	792,71	792,173	---	792,64
Disable KEYBOARD	649,0	649,0	1343,0	2592,0
Enable	649,10	649,10	1343,10	2592,10
No KEYS REPEAT	650,64	650,64	1344,64	2594,64
All KEYS REPEAT	650,128	650,64	1344,128	2594,255
Enable repeating keys (SPACE, DELETE, and CURSOR KEYS)	650,0	650,0	1344,0	2594,0
Clear keyboard buffer (before (INPUT)	198,0	198,0	239,0	208,0
Change character color, x is 0-7 for VIC, 0-15 for others	646,x	646,x	1339,x	241,x
Remove line numbers during LIST	22,35	22,35	22,35	24,37
Enable	22,25	22,25	22,25	24,27

TURBO 64 POKE's

for 1 mhz (poke1,peek(1)or127

for 4 mhz (poke1,peet(1)and128

Stückliste für Tuning 64

Widerstände	Wert	Farbringe
R1..R3	= 10 kOhm	braun schwarz orange
R4	= 1,2 kOhm	braun rot rot
R5..R6	= 10 kOhm	braun schwarz orange
R7	= 270 Ohm	rot violett braun
R8..R9	= 10 kOhm	braun schwarz orange
R10	= 1,2 kOhm	braun rot rot
R11	= 560 Ohm	grün blau braun
R12	= 10 kOhm	braun schwarz orange
R13	= 220 Ohm	rot rot braun
R14	= 470 Ohm	gelb violett braun
R15..R24	= 10 kOhm	braun schwarz orange

Potentiometer	Bauform
XP1	= 1 kOhm linear stehend, kleines Rastermaß
XP2	= 1 kOhm linear liegend, kleines Rastermaß
XP3	= 250 kOhm linear stehend, großes Rastermaß, mit Achse

Kondensatoren	Bauform
C1	= 270 pF <i>GF.</i> keramisch
XC2..C3	= 100 nF keramisch
XC4	= 5,8 uF 6,3 V o.ä. Tantal
→ XC5	= 220 uF 16 V o.ä. Elektrolyt
XC6	= 6,6 uF 6,3 V o.ä. Tantal
XC7	= 100 pF <i>BR.</i> keramisch
XC8	= 33 pF <i>BL.</i> keramisch

Diode	Transistoren
XD1..D2	= Germanium-Diode AA 113
XLED	= Leuchtdiode 3 bzw. 5mm, rot
	X T1 = BC 558
	X T2 = BC 550

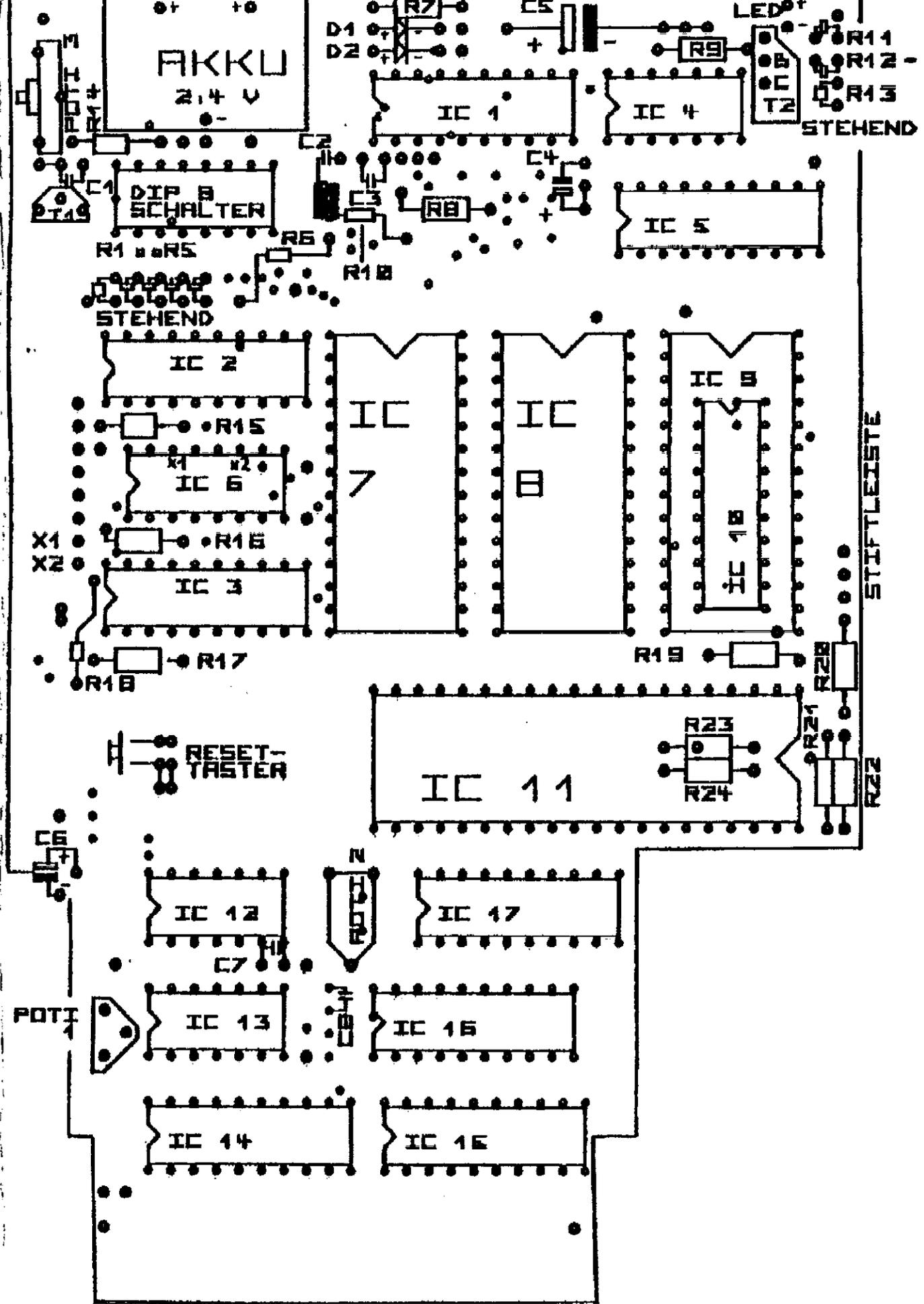
IC's	
X IC1	= spezieller PAL-Baustein, bei uns erhältlich
X IC2	= spezieller PAL-Baustein, bei uns erhältlich
X IC3	= spezieller PAL-Baustein, bei uns erhältlich
X IC4	= 74LS32 TTL
X IC5	= 74LS688 TTL
→ IC6	= 74LS367 TTL
X IC7..IC8	= 43256-12 32k CMOS Ram, 120 ns Zugriffszeit
X IC9	= 27256-15 32k Eprom, möglichst mit 150 ns Zugriffszeit
X IC10	= 74LS374 TTL
→ IC11	= 655C816-4 16-Bit CMOS CPU, minimum 4 MHz
X IC12	= 74LS74 TTL
X IC13	= 74LS32 TTL
X IC14..IC17	= 74LS374 TTL

Im PAL/Eprom-Satz enthalten : IC1, IC2, IC3, IC9; IC11 im CPU-Satz.

Diverses

- 1 Fassung 40-polig
- 3 Fassungen 28-polig
- 8 Fassungen 20-polig
- 1 Fassung 16-polig
- 3 Fassungen 14-polig

- 1 Micro-Taster Schließer Rastermaß 1 oder 2
- X 1 DIP-Switch (Mäuse-Klavier) 8 Schließer (DIP 8)
- 10 cm Schaltdraht oder Fädeldraht oder Litze
- 1 Akku-Block 2,4 V ca. 100 mA, z.B. VARTA 53010 702 013



AKKU
2.4 V

DIP 8
SCHALTER

STEHEND

IC 2

IC 6

IC 3

IC 12

IC 13

IC 14

IC 1

IC 5

IC 7

IC 8

IC 9

IC 10

IC 11

IC 17

IC 15

IC 16

IC 4

STEHEND

STIFTLEISTE

RESET-
TASTER

POT1

LED

R14
R12 -
R13

R22

D1
D2

R23
R24

POT2

R1 = R5

R18

X1
X2

R18

C6

C7

C2

C3

C4

C5

R19

R20

R21

R23

R24

R9

T2

C5

C4

C5