COLEX-3250 Operations Manual

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Introduction.

The COLEX-3250 is designed to provide a truly expandable 68000 based computer for system integrators and other OEMs. This Colex computer uses the industry standard 68000 microprocessor and the industry standard STD bus. The combination of these two well established computer concepts gives the Colex customer the most powerful software and hardware combination at an afordable price.

The COLEX-3250 uses the widely accepted UNIX system 3 operating system and contains the following features as key elements:

      68000 processor operating at 8.0 MHz
      512K bytes (characters) of dynamic memory
      2 Centronics printer interfaces
      A Modem interface
      A video display or serial printer interface
      1 - 5.25" floppy disk unit with 758 Kilobytes
      10 megabyte hard disk
      built-in video display (optional)
      Cartridge tape backup (optional)

1.1 UNIX operating system

The COLEX-3250 is shipped with a fully configured version of the UNIX system 30 operating system. This configuration supports all the I/O ports of the basic computer, plus the optional built-in video display.

1.2 STD bus

The STD bus was first released in 1978. Now a proposed standard from the American IEEE (P691), the bus forms the basis of the highest volume standardized bus card family today. Advances in technology have allowed significantly increased densities on the basic card so that today the Colex computer can be built with 4 times the memory in less than half the space of an equivalent machine built only 3 years ago. Colex also has made significant innovations in proprietary logic to expand the bus beyond the original limitations, without losing STD bus compatibility. The basic COLEX-3250 can be expanded in I/O and memory functions with Colex cards such as voice output (WORDS), more serial I/O interfaces (SIO4 or PSIO), Video displays (CRT and IGDC), dedicated slave processors (Slave) or parallel TTL I/O (PIO2). New products now in design will further expand the system's capabilities. Also, other companies offer products which will plug into to the 4 free slots of the COLEX-3250.

Even the central processor of the system can be replaced with the other generations of 8/16/32 bit internal data path machines. The Colex Z80 card is one example. With this card, the system can be converted to CP/M operation. The Colex design of the 68000 and 256K ram cards allow 16 megabytes of data to be addressed on the STD bus, which previously allowed only 64k.

1.3 68000 processor, STD-68000

The heart of the computer is the STD-68000 board. This board contains the 68000 CPU chip and a 4K byte Read Only Memory for initially starting the system. It also contains system control functions including memory refresh, system timing, bank switch and common memory control. The 4k byte ROM contains a boot program and a debugger.

1.4 512K dynamic memory, STD-256RAM (2 pcs)

Memory for the system is provided by the 256K bytes memory boards. Eight banks of 8-64K ram chips are used on the cards, the bank select logic is controlled by the MCSYNC output from the 68000 card. 128 kilobytes of the memory is reserved as supervisor, enabled by MEMEX, used by the operating system as protected memory.

1.5 I/O interfaces, STD-PSIO

The STD-PSIO card interfaces the COLEX-3250 to external I/O devices. They are, 2 serial channels for virtually any type of serial protocol, plus a parallel interface IC which can be used for a wide range of timing and control functions. The standard COLEX-3250 uses this port for printer interfaces.
The board uses the Z80-SCC chip for serial I/O which includes software baud rate generation, and the Z80-CIO chip for the parallel interface. Both of these chips offer a wide range of programmable options.

1.5.1 Connection for Centronics printers

The 20 bit parallel interface on the PSIO card is programmed for connecting the computer to any Centronics compatible printer. The UNIX system supports these interfaces. The pinout matches the lower 25 pins of the standard 36 pin Centronics interface. This way a cable can simply be built by crimping the upper 25 pins of a 36 pin male connector to a 25 pin cable.

Connector J5 is the primary printer port. Connector J6 is the auxillary printer port. This allows for example a letter printer and a dot matrix printer to be connected to the computer at the same time.

1.5.2 Connection for a Modem (Serial Printer)

A serial port with the configuration 'DTE' is provided on connector J14. This allows direct connection to a standard modem. This port may also be used with serial printers if a cable is used which changes the 'DTE' pinning into 'DCE'.

1.5.3 Connection for a Video display

Connector J13 is provided for use of the system with an external terminal. The 'DCE' pinout of this connector matches directly with all standard terminals. The standard baud rate used is 9600 baud.

1.6 Floppy disk drives

The Colex COLEX-3250 uses high density Teac 55F disk drives which store 758 Kilobytes of data on each 5.25" diskette. Data is written in double density format, on both sides, and with 96 tracks per inch. A high quality Colex Floppy disk controller board assures reliable data storage. A total of 160 tracks with 10 sectors of 512 bytes each are used. Either 1 or 2 floppy disk drives may be specified to be supplied with the system. The controller can support up to 4 drives.

1.7 Floppy disk controller STD-FLP2

Control and data encoding/decoding of the floppy disk is done by the FLP2 card. It uses the WD1797 controller chip with matching data separation chips. DMA transfers are used between the disk and memory, allowing fullest use of the processor, and faster disk transfer rates.

1.8 10 megabyte hard disk

The Colex system is supplied with a 10 Megabyte (formatted capacity) TEAC 412 winchester Hard disk. This disk holds the equivalent of 13 floppy disks. Larger disk drives may be connected externally to the system via the SASI interface card. This is done by adding a second STD-SASI board to the system chassis. The drive connected via this board can be configured for any size using the ´winstall´ program. The program is self prompting. With this external connection, disk drives with virtually unlimited capacity may be added.

1.9 Tape cartridge

For straightforward and semi-automatic backup or archiving of the data on floppy disk or hard disks, Colex will offer a 20 Megabyte Tape drive which can be installed onto the COLEX-3250. This drive allows the user to copy the entire contents of the hard disk onto a high density digital version of the Philips cassette in less than 10 minutes, without manual intervention. The floppy disk procedure for complete backup requires manual exchange of up to 13 disks. This feature is now in development. Contact Colex for delivery information.

1.10 Built-in video display STD-CRT

The Colex system can be expanded to have a VT52 upward compatible video display interface built-in. The advantages of this solution are that one serial interface otherwise used for the terminal becomes available for a second printer or other device, and that the built-in controller operates at a much higher data transfer rate. The Colex STD-CRT card contains it's own processor which relieves the system's 68000 from display oriented tasks. The features of this interface exceed that of the VT52, and match those of the Heath/Zenith H19, which most install programs support. The Video display option comes with a detached VT100 style keyboard which uses a telephone like cord for connection to the system.

The COLEX STD-CRT video card is installed into any free slot in the STD bus backplane, the video connector is installed into J16, this is then wired to any standard video monitor. The keyboard connector is installed into J15, this 5 pin 'DIN' connector mates with the cable on the serial keyboard. The system software automatically uses the STD-CRT card if it is installed.

1.11 Expansion slots

The Colex COLEX-3250 was designed for expandability. The basic unit has 4 STD bus slots free for user expansion. The power supply can provide up to 4 Ampere for these extensions.

1.12 Z80 based COLEX systems

A lower cost version of the COLEX-3250 is the Z80 based system. This system uses CP/M 3.0 together with a Z80 to provide a power environment for the vast library of CP/M compatible SW. Like the COLEX-3250, the system uses the STD bus, the Z80 CPU card can be replaced by a 68000 card for upgrading to UNIX performance. Ask for more details on the Colex Z80 based system product line.

2.0 Setting up the COLEX-3250 system

2.1 Connecting the serial terminal

Using a 25 pin male connector, and a 25 pin male or female connector which matches your terminal, connect the terminal of your choice to the COLEX-3250. The terminal connector is J13. Colex does not recommend any particular type of display unit, but the terminal chosen should be supported by the applications software you wish to use. Virtually every type of terminal can be supported by the UNIX system. After booting the system, check the ´termcap´ file for the type of printer you are using and set your envirment for that type. See section x.y for detailed info.

The COLEX-3250 connector J13 is wired to match 95% of all terminals available which have an RS232 interface. This should be a simple ´one to one´ connection, in which all pins on the system are connected to the same pins on the terminal. The STD-PSIO manual, which is attached, can be referenced for more details on this connection.

The standard baud rate used is 9600 baud, full duplex. Set your terminal to this speed, also no parity is used, set your terminal to ignore parity. The system supports XON/XOFF, so the terminal may use these codes to control the rate of characters from the system, use the ´device´ utility to enable XON/XOFF in your ´profile.sub´ routine. Other baud rates may likewise be supported.

2.2 Connecting a Centronics printer

A cable is required which has a 25 pin male connector on the system end, and a 36 pin male connector on the printer end. Pin one of the 25 pin connector is connected to pin 1 on the printer connector, and the next 24 pins are connected, typically by mass termination, to the alternating 24 pins of the printer connector. This cable is the same as used on most other small computers. The 25 pin connector is plugged into J5 or J6.

2.3 Connecting a Modem

The COLEX-3250 connector J14 is wired to match most modems available. This should be a simple ´one to one´ connection, in which all pins on the system are connected to the same pins on the modem. The STD-PSIO manual, which is attached, can be referenced for more details on this connection. If a modem is attached, it can be used for calling other UNIX computers, or the modem channel can be used to receive calls automatically from remote terminals. The modem will automatically be hung-up on logout or after15 minutes of inactivity.

2.4 Connecting power

The COLEX computer should be ordered with the power option required by your location. Should you have to change the power supply voltage, you must open the computer, open the power supply and change the strap to either 110 or 220 volt as required. A philips screwdriver is all that is required for this change. Be sure to change the marking on the back panel after doing this.

If the voltage is correct, (the back panel is marked) then insert a grounded cable which matches the local type of plug into the 3 prong standard connector on the back panel.

2.5 Inserting a floppy disk

The floppy disk should be inserted with the top to the left side (write protect notch down). Be sure to handle the floppy disks properly.

3.0 Operation of the COLEX-3250

The system will start (boot) automatically from the disk after power is applied. It is delivered with the UNIX operating system installed and ready for operation. The floppy disk 'BOOT' provided contains a backup copy of the operating system, but not all UNIX files fit onto one floppy disk. It is suggested that a TAR (tape archive)dump be made immediately of the system disk before use. See section x.y for info on TAR.

Early systems require the user to enter 'return' before booting begins. If the COLEX debugger prompt is displayed on the screen, then wait 20 seconds (for the disk to reach it's operating speed) then type 'return'. After the message 'standalone boot', enter 'return' again to load UNIX.

After reset or power-on, the system will wait 5 seconds or until the hard disk (if any) has reached full speed, which ever is longer. Should the user wish to boot from the floppy instead of the hard disk, then the 'ESC' key should be pressed during the initial delay interval.

After booting is complete, the system is in single user mode. multiuser, for example for use of the modem for remote access, can be enabled by entering 'init 2'.

The hard disk is device w0. The disk has 3 partitions.:

Boot   under 200Kb
Swap   2 megabytes
File   rest of drive

If a second drive is installed into the system, this drive will be used as an extension to w0. The file area of the disk will increase in siaze to match the added drive capacity.

If a drive is added on the sasi expansion bus (via a second STD-SASI card), this drive will have the name w1. It will also have the 3 partitions available for complete duplication of critical file system data.

The floppy disk drive is either f0, f0ibm or other device name depending on the format required. See the appendix on floppy disks for detailed information.

3.1 Formatting disks

Floppy disks may be formatted using..........

The hard disk is supplied preconfigured and formatted. Should formatting be required, the entire file system will have to be recreated from either a different hard disk or from floppies.

Formatting with copying from w1........

Formatting with copying from floppy.......

4.0 Trouble shooting the system

A number of common problems can be solved without calling for service if the suggestions here are followed. Some are understandable by the layman, others require some tools. Note that any modification or repair work done on the COLEX computer (except that done by qualified COLEX repair staff) will void the warranty.

APPENDIX A.

INTERNAL BOARD STRAPPING

Each card in the system has several strapping options for use in a wide variety of applications. In the COLEX COLEX-3250 systems, the strapping is as shown in the following tables. Please refer to the appropriate board manual for more details on the significance of the strapping options.

STD-68000

        Address at power on: 0000H (4Kb EPROM)
        U1 contains system boot EPROM
        J1 is strapped 3-4

STD-256DRAM (card 1)

        Populated with 256K RAM
        Address space 00000-3FFFF
        U13 row is 0-FFFF
        U14 row is 10000-1FFFF
        U15 row is 20000-2FFFF
        U16 row is 30000-3FFFF

        J1: 1-2, 3-4, 5-6, 7-8
        J2: open
        J3: 1-2,3-4,
        J4: 1-2
        J5: 1-2
        J7: open

STD-256DRAM (card 2)

        Populated with 256K RAM
        Address space 40000-7FFFFH
        U13 row is 40000-4FFFF
        U14 row is 50000-5FFFF
        U15 row is 60000-6FFFF
        U16 row is 70000-7FFFF

        J1: 1-2, 3-4, 5-6, 7-8
        J2: 2 to J4 pin 2 (see note)
        J3: 3-4
        J4: 3-4 (not required on rev c)
        J5: open
        J7: open

Early systems may have a connection from J4 pin 2 to U12 pin 3. (pin 3 is disconnected from VCC.) In these systems, J2 pin 2 must not be wired.

STD-PSIO

>   Address of ports is:
>   SCC DCE port status : 0
>   data : 2
>   SCC DTE port status : 1
>   data : 3
>   CIO port : 4-7
>   IOEXP line is decoded as : 0
>   J2: 1-2, 3-4, 5-6, 7-8, 9-10, 11-12
>   J3: 3-4, 21-22
>   J4: not used
>   J5: Open
>   J6: Open
>   J7: Open

STD-FLP2

>   Address is E0
>   J2: open
>   J4: 1-2
>   J5: Open
>   J6: 2-3
>   J7: 2-3, 1-4
>   J8: 1-2, 5-6
>   J9: Open
>   The 5.25" floppy cable connects to pins 17-50 of the J3
>   connector, pin 1 of the cable mates to pin 17 of J3.

STD-SASI

>   Address is A0
>   J2: 1-2, 3-4, 5-6, 7-8, 11-12
>   JA: open

STD-SASI (optional second board)
>   Address is A4
>   J2: 3-4, 5-6, 7-8, 11-12
>   JA: open

STD-CRT

>   Address is DC
>   J2: 5-6
>   J3: (internal use only, do not change)

Sequence of card positions: (slot 1 is left side)

	COLEX-3250
STD-FLP2	1
STD-SASI	2
STD-256DRAM 1	3
STD-256DRAM 2	4
STD-PSIO	5
STD-68000	6

No gaps may exist between the cards.

APPENDIX B
SYSTEM CONNECTIONS

Standard connections (all 25 pin female 'D' type connections).

Device codes (dev code) are noted as major:minor.

UNIX device	Connector	Description
/dev/lp	J5	Centronics printer interface. dev code 8:0 132 column, auto-wraparound, form feeds are expanded to line feeds with 66 lines/page, tabs are expanded to spaces assuming tabs stops are set each 8 character positions. Other options may be set using the 'setlp(1)' program.
	J6	is reserved for future auxillery printer use.
/dev/tty0	J13	Display terminal (DCE). dev code 6:0
/dev/tty1	J14	Modem (DTE). dev code 6:129 Local terminal 2, dev code 6:1
STD-CRT {	J15	Serial keyboard interface (5 pin DIN).
{	J16	Video connection (75 ohm BNC).

tty0 refers expressly to the J13 connector. Normally, /dev/console refers to tty0. If a STD-CRT card is installed in the system then it will be assigned as the console instead of tty0. Baud rates for tty 0 and 1 are settable via the 'stty(1)' program.

If the modem option is selected, then the system will hang up the modem if carrier detect is lost. The modem must be able to handle full duplex operation.

Backpanel connector pinouts

Pin	J14	J13	J5	J6	J15
1	ground	ground	/STROBE	/STROBE	+5 V
2	Transmit data	Receive data	data 0	data 0	KB data
3	Receive data	Transmit data	1	1	Ground
4	RTS out	RTS in	2	2	Chassis
5	CTS in	CTS out	3	3	Bell/LED
6	DCD in	DCD out	4	4	
7	ground	ground	5	5	
8	–	–	6	6	
9	–	–	7	7	
10	–	–	–	–	
11	–	–	BUSY	BUSY	
12	–	–	–	–	
13	–	–	–	–	
14	–	–	ground	ground	
15	sync I/O	sync I/O	ground	ground	
16	–	–	ground	ground	
17	clock I/O	clock I/O	ground	ground	
18	–	–	ground	ground	
19	–	–	ground	ground	
20	DTR in	DTR out	ground	ground	
21	–	–	ground	ground	
22	–	–	ground	ground	
23	–	–	ground	ground	
24	–	–	ground	ground	
25	clock I/O	clock I/O	ground	ground	

Power connections.

    110/220 Volts (internally selectable).
        Max. 160 watts required.

Reset push button.

    Forces the Processor to start as if power had just been applied. Located on the front panel.

Power switch.

    Applies power to the system when depressed.

APPENDIX C

FLOPPY DISK FORMAT

UNIX supports several common floppy formats. The built-in floppy disk drive is capable of:

    double sided
    double density
    40/80 track
    5.25" media
    up to 24 sector/track (128 byte sectors)
    up to 18 sector/track (256 byte sectors)
    up to 10 sector/track (512 byte sectors)
    up to 5 sector/track (1024 byte sectors)

UNIX will identify the number sectors per track and sector size when a diskette is inserted into the system. Subsequent accesses will automatically match the format determined. This assumes the sectors per track is constant throughout the diskette.

The number of sectors per track and bytes per sector are user selectable during formating. See the 'diskformat(1)' writeup.

it is:

    controller 0
    unit   0

UNIX allows lower density recording formats to be supported by this drive.

The sectors per track and bytes per sector supported are as shown below when the minor device code bit 3 = 0.

			bytes/sector			
			128	256	512	1024
5.25 inch single density			16	9	5	2
	double density	(40 tpi)	24	16	8	5
		(80 tpi)	24	16	9	5

    bit 0/1   :   binary unit number
    bit 2   :   controller number (must be 0)
    bit 3   :   1 table + 1
                  0 from table
    bit 4   :   1 for 5.25 inch
                  0 for 8 inch (future option)
    bit 5   :   1 for single density
                  0 for double density
    bit 6   :   1 for 40 track (48 tpi)
                  0 for 80 track (96 tpi)
    bit 7   :   1 for single sided
                  0 for double sided

The built-in floppy has different device names for common formats. The user may re-assign the format or create new device names via 'mknod' program. The devices provided are: (major:minor device codes)

UNIX device	device code	Description
/dev/f0ibm	80 decimal	5.25 inch, 40 track, double sided, double density. 320Kb or 360 Kb storage
/dev/f0	16 decimal	5.25 inch, 80 track, double sided, double density. 720Kb storage

Note, when buying UNIX software, the 'reloc' (starting) address of COLEX UNIX binary files is address 0x20000.

APPENDIX D

8 INCH DISK INTERFACE

An 8 inch disk can be connected to the system if a cable is added to the STD-FLP2 card. This cable is 50 pins, pin one of J3 mates to pin 1 of the 8 inch floppy disk. The drive must be strapped as radial select unit 2 (DS3). It is possible for both 5.25" and 8 inch drives to be connected at the same time, no straps need be changed on the STD-FLP2 card.

APPENDIX E

Hard disk specifications

The COLEX 3250 suppport the following hard disk combinations:

On SASI card £1 (address 0xA0):

one or two arbitraily large disk drives:
(sizespecsare indicated during format,the drivesmayhave
different specs.)

/dev/w0 is located as unit 0 on SASI controller select line 0
/dev/w1 is located as unit 1 on SASI controller select line 0

On SASI card £2 (optional, address 0xA4)

one or two arbitraily large disk drives:
(size specs are indicated during format)

/dev/w2 is located as unit 0 on SASI controller select line 0

Minor device codes are defined as follows:

bit 0/2   :   partition number
bit 3   :   unit 0 or 1 of SASI controller
bit 7   :   enables writing to block 0 if set

SASI to 9 track tape drive (future)

select line 4

Ordering information.

The Colex COLEX-3250 computer is available in the following configuration:

COLEX-3250   68000 computer basic configuration. 4 free STD bus slots. UNIX system 3 operating system supplied. 512KB RAM, 1 10Mb hard disk, 1 Floppy disk drive (758KB), 2 serial ports, 1 parallel port. Includes system manual, and UNIX users manual.

VT52U   A built-in video display controller allows VT52 emulation at low cost. The VT52U includes the STD-CRT video display interface card plus a detachable VT100 style keyboard.

For more information on any Colex product, including the COLEX range of computers or the STD and VME bus board products, please contact your local Colex sales agent or Colex office.

Standard versions are all 110 volt, 50/60 Hz. To specify a 220 volt version, add an 'E' after the product name.

VT52 is a trademark of DEC.
UNIX is a trademark of Bell Labs.
CP/M is a trademark of Digital Research.

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STD-FLP2

  Address is E0
  J2: Open
  J4: 1-2
  J5: Open
  J6: 2-3
  J7: 2-3, 1-4
  J8: 1-2, 5-6
  J9: Open
  The 5.25" floppy cable connects to pins 17-50 of the J3
   connector, pin 1 of the cable mates to pin 17 of J3.

STD-SASI

  Address is A0
  J2: 1-2, 3-4, 5-6, 7-8, 11-12
  JA: Open

STD-SLAVE

Hex adresses are as follows:	J6
user 1 = 4-7	1-2, 3-4, 5-6, 7-8, 9-10
user 2 = 8-B	1-2, 3-4, 5-6, 7-8, 11-12
user 3 = C-F	1-2, 3-4, 5-6, 7-8,
user 4 = 10-13	1-2, 3-4, 5-6, 9-10, 11-12
user 5 = 14-17	1-2, 3-4, 5-6, 9-10

  J1: not used
  J2: channel B (printer)
  J3: channel A (terminal)
  J4: open
  J5: open
  J6: see above
  J7: open

Sequence of card positions: (slot 1 is left side)

	COLEX-850MU
STD-FLP2	1
STD-SASI	2
STD-64DRAM	3
STD-PSIO	4
STD-CPU2	5
STD-SLAVE	6-10

No gaps may exist between the cards.