Arcom - SBC104

Embedded PC Compatible CPU Board

Technical Manual

Product Information

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Useful Contact Information

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Arcom's board production facilities are fully compliant with ISO 9002

Warning

Handling

This board contains static sensitive devices. Observe anti-static precautions at all times. Unpacking and installation of the board should be undertaken in an anti-static working area.

Battery

Note: The board is supplied with the battery supply isolated. Move Link 3 to position A before using the board.

The board is fitted with a Nickel Metal Hydride rechargeable battery. Do not short circuit the battery or place the board on a metal surface where the battery terminals could be shorted.

Dispose of the battery with care. Do not incinerate, crush or other wise damage the battery.

Electromagnetic Compatibility (EMC)

The SBC104 is classified as a 'component' with regard to the European Community EMC regulations and it is the users responsibility to ensure that systems using the board are compliant with the appropriate EMC standards. Arcom can offer an EMC CE compliant solution if the SBC104 is used as part of the ACE (Arcom Compact Enclosure) product.

Acknowledgements

Arcom Flash Filing System (AFFS), is the generic name given to the ported Flash Filing System called CardTrick™. *Both CardTrick and ROM-DOS 6.22 are trademarks of Datalight Inc.* Each SBC104 Includes two small license labels to identify the installed Datalight product. Do not remove.

Revision History

Manual	PCB	Comments	
Issue A	V1 Iss2	961122	First full release of Manual
Issue B	V1 Iss2	970107	Minor edits throughout Manual
Issue C	V1 Iss2	970227	Inclusion of ROM-DOS 6.22
Issue D	V2 Iss2	971022	[ECO2614, 2649]

Contents

Introduction

The SBC104 is a PC-compatible 386SX/486SXLC processor board supporting a 16-bit PC/104 interface which combined with a PC/104 VGA CRT/Flat Panel display module can form the complete DOS compatible PC for embedded applications. The board is fitted with 2 or 4 Mbytes of DRAM, 1 or 2 Mbytes of FlashFile™ memory and optionally 128 Kbyte of battery backed SRAM. Systems BIOS and extensions are contained in a 128 Kbyte EPROM. Onboard peripheral ports include COM1 and COM2, a floppy disk controller, hard disk (IDE) controller, a parallel port (LPT1) and keyboard interface.

The board is available in the following variants:

SBC104-386-252-F1 - 386SX processor, 2 Mbyte DRAM and 1 Mbyte Flash memory
SBC104-386-254-F2 - 386SX processor, 4 Mbyte DRAM and 2 Mbyte Flash memory
SBC104-486-504-F2 - 486SXLC processor, 4 Mbyte DRAM and 2 Mbyte Flash memory

Features

- 25MHz 80836SX or 50MHz TI 486SXLC2 processor
- TI486SXLC2 contains 8 Kbyte of internal cache
- PC-AT architecture
- 2 or 4 Mbytes of DRAM
- 1 or 2 Mbytes of FlashFile™ memory
- Includes Arcom Flash Filing System
- Includes ROM-DOS 6.22
- Optional 128 Kbyte of battery backed SRAM
- Battery backed Real Time Clock
- FDD interface via vertical 34-way header
- HDD IDE interface via vertical 40-way header
- LPT parallel port via vertical 26-way header
- COM1 & COM2 RS232 serial ports via individual 9-way D-type plugs
- Link selectable half- duplex RS-485 available on COM2
- AT keyboard interface via a 6-way 'Mini' DIN socket
- Mini Buzzer for audible alarm
- Watchdog timer generating an NMI or optional reset (3 second time-out)
- PC/104 Interface, 16-bit, single Master only
- 11mAHr Ni-MH battery: Full charge time = 70 hours
  Hold-up time = 550 hours
  Battery life = 6 years @ 25°C
- Operating temperature range : **386SX**
  +5°C to 65°C (with battery fitted)
  -20°C to +70°C (without battery fitted)
  486SXLC
  +5°C to 50°C (with battery fitted)
  -20°C to +50°C (without battery fitted)
- Power Consumption: @ +5v 700mA
- MTBF (using generic figures from MIL-HDBK-217F at ground benign): 152,240 hours
- Single Eurocard form factor
- EMC Chassis connection point
- Status LEDs for Flash drive access and Processor running
- Single User Link

Arcom also manufactures a range of PC/104 modules for use with the SBC104. These include optoisolated digital and analogue I/O, VGA controller, relay output, CAN interface, multi-port serial communications and ethernet.

Getting Started with the SBC104

How the SBC104 works

The SBC104 is a PC-compatible processor board. There are connections on the SBC104 for a keyboard, floppy drive, a hard drive, two serial communication ports and a centronics parallel port. There is also a PC/104 connector that will allow you to connect a PC/104 VGA board to form a complete PC system environment.

The SBC104 board is supplied with Arcom Flash Filling System (AFFS) and ROM-DOS 6.22 pre-loaded. ROM-DOS is a flexible, small and fast compatible DOS. More information on the differences between ROM-DOS and the DOS standard can be found on the utilities disk under A:\DOC\ROMDOS.DOC.

Using AFFS the on-board Flash memory appears exactly as a normal hard drive interface. All the application software can be loaded onto the Flash and run exactly as if it were a standard hard drive. There is no need to configure the on-board Flash memory in the BIOS set-up utility as the AFFS will automatically configure the Flash as the C:\ drive. Any additional drives connected to the IDE connector will be allocated as the next drive up (i.e. the D:\ drive). The on-board Flash can be disabled for applications which are intended to have an external IDE drive as the C:\ drive (see appendix on disabling the on-board Flash).

The SBC104 can be used either with or without a VGA/Keyboard interface. The SBC104 is factory loaded with a simple AUTOEXEC.BAT file and a small program FINDVGA.EXE that detects the presence of VGA card. If there is a VGA card fitted then the SBC104 can be used as exactly as any PC. If there is no VGA card fitted then the SBC104 will re-direct output to the serial port COM1 which should be connected to a PC terminal emulator or a PC with a windows terminal emulator. This kind of operation is referred to as Remote Mode.

Before Powering up the board

Connect a +5v power supply to the power header PL5. The SBC104 does **not** require ±12v to operate so if any of the PC/104 boards connected to the SBC104 require a +12v or -12v power supply (such as the AIM104-SER4) then connect these to PL5. Refer to the labelling on the board and the appendix for the correct connections.

Battery back-up is necessary to maintain the CMOS BIOS settings. If a battery back-up voltage is not present then the SBC104 will revert to its default settings. The battery link LK3 is isolated on the SBC104 during shipment. Move LK3 to position A to enable the battery backup facility. If battery backup is to be supplied from an external source instead of the on-board battery then connect positive voltage from the backup supply (which must be +3.7) to +VBB and the ground to GND on PL5. In this case LK3 should be removed completely.

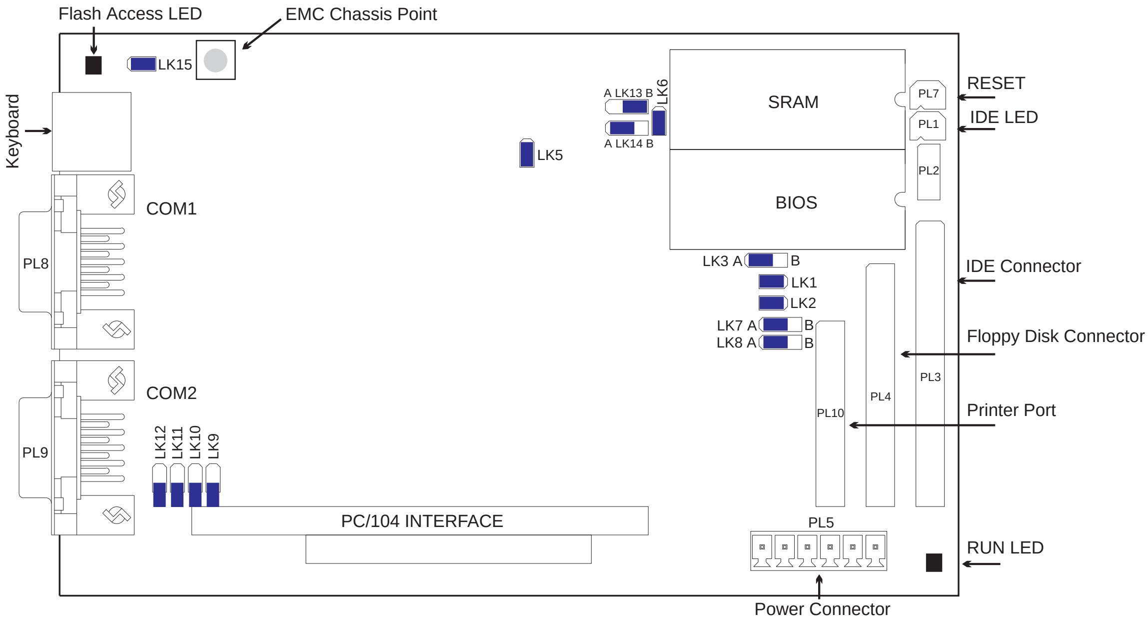
Switching On

As the battery link has been removed during shipment the CMOS RAM may be corrupted and the board will either need to be reconfigured or it will reset to its default CMOS settings These default settings configure the SBC104 for a single floppy drive. To reconfigure the board to accept another floppy or a hard drive then it is necessary to connect a PC/104 VGA board and a keyboard in order to alter the parameters within the SET-UP utility (see appendix on configuring drives.).

Note: Even in this default configuration the SBC104 will boot successfully without a keyboard, floppy or hard drive connected. There will, however, be an error message on boot-up that will indicate that drive a:\ is not configured correctly.

Links and Options

Link Configuration



LK1 IRQ4 Source Select
If fitted, interrupt IRQ4 will be enabled to work from COM1 and PC/104
If omitted IRQ4 will work solely from the PC/104 bus

LK2 IRQ3 Source Select
If fitted, interrupt IRQ3 will be enabled to work from COM2 and PC/104
If omitted IRQ3 will work solely from the PC/104 bus

LK3 Battery back-up link
Position A = Connected
Position B = Isolated

Note: If battery back-up is provided via the +VBB connection on PL5 then this link should be omitted.

LK4 Factory Fit only - Do Not Change

LK5 Watchdog time-out Selection
If fitted a Watchdog time-out will cause a hardware reset.
If omitted a Watchdog time-out will cause an NMI.

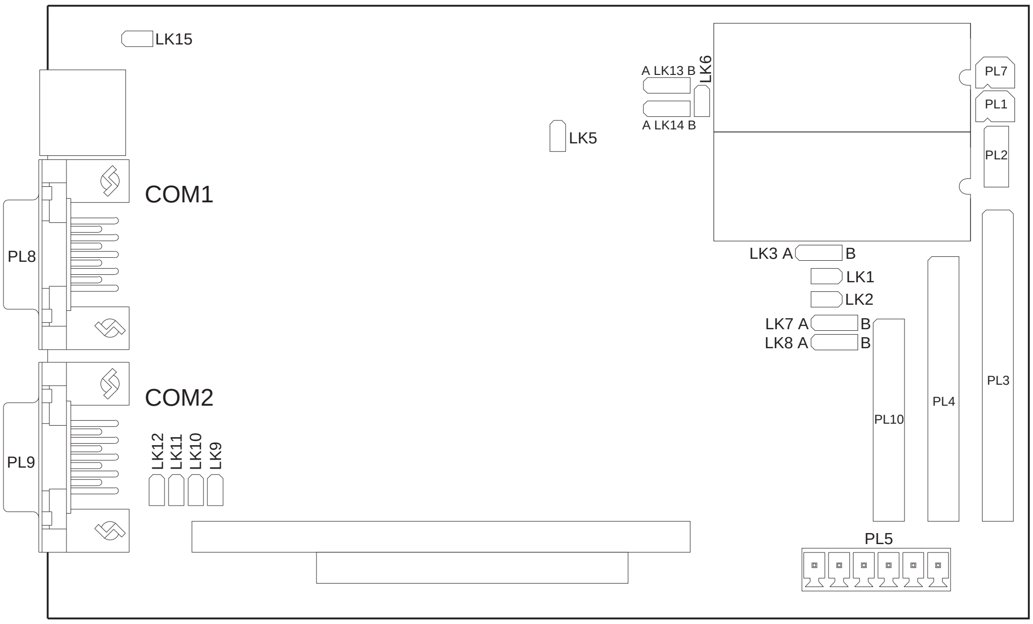
LK7 & 8 Floppy Disk Drive Configuration Links
Position A = Drives that do not require a twisted cable
Position B = Drives that do require twisted cable
(See appendix on Drive Connections).

LK9, 11 & 12 COM2 RS232/RS-485 Configuration Links
If fitted COM2 operates in RS-485
If omitted COM2 operated in RS232

(Continued from previous page)

LK10	RS-485 Termination Resistor Link If fitted RS-485 on COM2 is terminated by a 120Ω resistor If omitted resistor is isolated
LK6, 13 & 14	Factory Fit Only - Do Not Change

User Configuration Diagram



EMC Chassis Point

The SBC104 has a clearly labelled EMC chassis point near the keyboard connector. This point serves as a mounting hole for the PC/104 stack through modules. It should be connected to the earth point of the enclosure.

Using the SBC104

Getting Started

Please ensure that you have read the Getting Started section of this manual as it contains important information that should be used in conjunction with this section.

Setting up the SBC104 for a PC/104 VGA card and Keyboard.

1. Connect a standard PC keyboard to the PS/2 keyboard socket SK3.

2. Plug a PC/104 VGA or CRT/Flat panel interface board into the PC/104 stack connector. The SBC104 will work with either 8-bit or 16-bit cards.

3. If required connect a floppy drive to PL4, a hard drive to PL3 and any parallel device to PL10. Make sure that the cables are connected the right way round (see appendix for connections).

4. Turn the power on. The BIOS SETUP utility can be entered during the boot process by pressing Ctrl-Alt-S when prompted. Once in SETUP various parameters can be configured. To change a parameter use the arrow keys to highlight the relevant section and then use the space bar to scroll through the available options. To save the settings and exit press F10. To exit without saving the new parameters press ESC. For standard operation of the SBC104 the only usual changes that have to made are to the time and date, floppy and hard drive parameters.

Altering some of the advanced CMOS BIOS parameters may cause the SBC104 to work incorrectly. To reset to the default settings turn off the power to the SBC104 and move LK3 to position B for a few seconds. Then replace LK3 in position A.

6. Once the SBC104 has beeped to confirm that all the BIOS hardware checks have been completed successfully, the SBC104 will run the pre-installed AUTOEXEC.BAT file and FINDVGA.EXE from the on-board FlashFile™ memory which will check to see if there is VGA card present. Once this is done the SBC104 will display a message saying VGA FOUND and then return C:\ prompt. The SBC104 has now successfully booted.

Setting up the SBC104 for Remote mode

1. A null modem cable should be connected between the COM1 D-type connector on the SBC104 and a free COM port on the PC. The cable should configured as follows:

SBC104 9-way	PC/Terminal 9-way	PC/Terminal 25-way
1	nc	nc
2	3	3
3	2	2
4	6	6
5	5	7
6	4	20
7	8	5
8	7	4
9	nc	nc

2. The output from the SBC104 needs to be re-directed to the serial port COM1. The board is pre-fitted with a simple AUTOEXEC.BAT file that calls FINDVGA.EXE which will default to COM1 if a PC/104 VGA card is not detected. These files can be found on the utilities disk under `A:\INSTALL\AUTOEXEC.BAT`. The SBC104 will configure COM1 to the settings below:

```
Baudrate   9600
Parity     none
Bits       8
Stop       1
```

3. To communicate with the SBC104 through this serial link a terminal emulator window should be opened on the host PC and set to the above settings. In Windows 3.11 use the terminal icon. In Windows 95 use the hyper terminal. The terminal emulator window should be set to the PC serial communications port that the null modem cable is connected to.

4. Turn on the SBC104. The Flash Access LED will Flash intermittently to show that the FlashFile™ memory is being accessed as the SBC104 boots. After approximately thirty seconds the message below should appear in your terminal window:

```
CHIPS SCATsx/PEAKsx BIOS Version 3.04.a
Decompilation or Disassembly Prohibited
Copyright Arcom Control Systems Ltd.
SBC104 Version 1.1
Copyright (c) Chips and Technologies, Inc,.All Rights Reserved

C:\
```

Note: Once you have reached the c:\ prompt the installed files shown below can be deleted if necessary. This will allow the SBC104 to boot straight to the C:\ prompt on future occasions without checking for a VGA card and then possibly re-directing the output to the serial port COM1. These pre-installed files can be found on the utilities disk in the a:`\install` *directory. When the SBC104 is booted from the utilities disk you are given the option of re-installing these files or re-installing AFFS and ROM-DOS. This can be done in remote mode through a terminal emulator as the utilities disk also scans for VGA card and re-directs output to COM1 if there is no VGA Card connected.*

Using the SBC104 in remote mode.

The SBC104 can be used with no VGA card or keyboard connected in remote mode as described earlier. But when developing software for the SBC104 there is still the problem of loading it onto the on-board Flash. The most practical way of doing this is to connect a floppy drive to the SBC104 and copy files to the Flash via commands in a terminal emulator window. This can be slow if there are many files to be copied. An alternative to this is to use the ROM-DOS remote disk utility to copy files onto the SBC104 FlashFile™ memory and a remote debugging facility to evaluate the application software.

ROM-DOS Remote-Disk

The ROM-DOS Remote Disk Utility program allows you to access the SBC104 on-board FlashFile™ memory as a logical disk drive on a client desktop PC. This allows you to edit and copy files between the host system and the SBC104 as if it were just another hard drive. The SBC104's FlashFile™ memory drive will appear as the next available drive letter (e.g. D:\).

In remote disk setup, the SBC104, which is sharing its c:\ drive, is termed the Server. The other system, the PC that will access and use the remote drives, is called the client.

Below are brief guidelines on using ROM-DOS Remote Disk. Run the file `A:\DOCS\RDUSER.EXE` from the utilities disk to obtain the full manual text.

Using ROM-DOS Remote Disk with Windows 3.11

1. Create a directory on your hard disk called REMDISK. Copy the files REMDISK.EXE and REMQUIT.EXE from the utilities disk to this directory.
2. Add the line DEVICE=C:\REMDISK\REMDISK.EXE /b9600 /comN to the CONFIG.SYS file. Where N is the COM port that the null modem cable is connected to. This will cause the client PC to assign a drive for the SBC104 Flash memory. Turn off the client PC.
3. Complete the above section on Setting up the SBC104 in Remote Mode.
4. At the c:\ prompt in the terminal window, type: REMSERV c: /b9600 /com1. This will configure the SBC104 on-board Flash for remote access. As the SBC104 is now running REMSERV it can not be accessed through the terminal window until the Remote Disk utility is terminated.
5. Open the file manager and the SBC104 FlashFile™ memory should appear as the D:\ drive or the next available drive.
6. To terminate the remote disk utility open a MS-DOS window and type: REMQUIT. This will free the SBC104 from running REMSERV and allow you to run programs on the SBC104 using the terminal window.

Using ROM-DOS Remote Disk with Windows 95

Windows 95 differs from Windows 3.11 in the manner in which it controls the COMs ports. This can lead to the Remote Disk utility working incorrectly. To avoid this, follow the steps below exactly:

1. Follow steps 1-4 on how to use Remote disk with Windows 3.11
2. Close the Hyper terminal window as Windows 95 will not let two applications share a COM port.
3. Open Windows Explorer. The SBC104 should appear as Removable Disk [D:] or the next available drive letter.
4. To terminate the Remote Disk utility the SBC104 must be re-booted. (REMQUIT does not work.)

Borland C Turbo Debug Remote

The Borland C Turbo Debug Remote facility is the most appropriate for developing code. It requires the SBC104 to be loaded with the file TDREMOTE.EXE. After this the application code can be loaded via the serial link and run on the SBC104 within the familiar Turbo debug environment.

If you are developing using BORLAND C, the SBC104 can be used in remote mode using the TDREMOTE.EXE utility. To use this program you will require a NULL MODEM cable (as described earlier). Copy the program TDREMOTE.EXE from your BORLANDC\BIN directory to your SBC104. You can use the ROM-DOS remote disk utility mentioned above. Add the following command to the AUTOEXEC.BAT of your SBC104 (or type it at the DOS prompt). If you have placed this in you AUTOEXEC.BAT you will need to reboot.

```
TDREMOTE  -rpX -rsN
```

-: where **X** is the COM port to use (default is COM1) and where **N** is the baud rate to use. This is specified as :

-rs1	Slowest speed, 9600 baud.
-rs2	Slow speed, 19,200 baud.
-rs3	Medium speed, 38,400 baud.
-rs4	Fastest speed, 115,000 baud (default)

As an example, the following command will configure COM2 for remote communication at 38,400 baud :

```
TDREMOTE  -rp2 -rs3
```

The SBC104 is now ready to receive the application. Next, we set up the host system. The host system will be you development PC that contains the compiler/ debugger and the application that you are developing for the SBC104. Type the following at the DOS prompt :

```
TD  -rpX -rsN AppName
```

Again the X refers to the COM channel on the PC that is used and the N refers to the serial link speed. Please note that the link speed set here MUST be the same as that set up on the SBC104. The parameter **AppName** refers to the application name (the .EXE name). When you have done this you will see the familiar TURBO DEBUGGER screen. You can now debug your application remotely as it is running on the SBC104.

NOTE: Full details of Remote Debugging can be found in the BORLAND manuals or in the Borland HELP files.

Memory Map

When adding boards or software memory managers it is important that they are configured so that they do not contend or interfere with the on-board memory devices.

400000	Optional extra 2 Mbyte DRAM accessed as extended or EMS memory
200000	1 Mbyte DRAM accessed as extended or EMS memory
100000	64K PC BIOS
F0000	BIOS Extension (AFFS and Millennium Check)
E4000	16K Paged SRAM (8 pages) (optional)
E0000	PC/104
CF000	16K Paged Flash Memory (64 pages)
CC000	PC/104 (VGA etc.)
A0000	640K On-board DRAM
00000	

I/O Map

3FF	On-Board COM1
03F8	On-board Floppy Disk
03F0	PC/104 Space
02F8	On-Board COM2
0259 0258	258h Flash Paging Register 259h Flash Paging Register
0219 0208	EMS Page Registers
01F7	On-Board IDE Controller
01F0	PC/104
0100	Reserved I/O Space
	95h User LInk Register (Read only) 94h SRAM Page Register 93h Watchdog Trigger (Write Only)
	Reserved I/O Space
0000	

Special Function Registers

Flash Memory (258h,259h) - Write Only

These registers are cleared at reset. These registers are normally accessed by the Arcom Flash Filing System. This information is included for reference only.

258h

D7	Flash Memory enable bit (low to enable)
D6	Reserved
D5	Reserved
D4	Reserved
D3	Flash Memory low page address (A17)
D2	Flash Memory low page address (A16)
D1	Flash Memory low page address (A15)
D0	Flash Memory low page address (A14)

259h

D7	Not Used
D6	Not Used
D5	Not Used
D4	Not Used
D3	Not Used
D2	Flash Memory upper page address (A20)
D1	Flash Memory upper page address (A19)
D0	Flash Memory upper page address (A18)

SRAM Memory (94h) - Write Only

This register is cleared at reset. These registers are used by `SRAMDISK.SYS.`

D7	SRAM Write Enable Bit (High to enable)
D6	Not Used
D5	Not Used
D4	Not Used
D3	Not Used
D2	SRAM memory page address (A16)
D1	SRAM memory page address (A15)
D0	SRAM memory page address (A14)

Watchdog Timer (93h) - Write Only

Writing to this address will trigger the watchdog timer. This must be re-triggered within 3 seconds to avoid generating an NMI or if LK5 is fitted a system reset.

User Link (95h) - Read Only

Reading from this address will give the status of the user Link LK15.

D7	User Link (high if not fitted, low if fitted)
D6	Not Used
D5	Not Used
D4	Not Used
D3	Not Used
D2	Not Used
D1	Not Used
D0	Not Used

Additional On-Board Features

User Link

The status of the user link LK15 can be obtained by reading the I/O port 95h. If the link is fitted then bit 7 will read as a zero. If the link is omitted then bit 7 will read as a one. All other bits will be zero.

Status LEDs

There are two status LEDs on the SBC104. D1 is a RUN LED. This differs slightly from a power-on LED in that it is ON when the processor is not in a RESET condition. This means that the LED indicates when the +5v power to the board is good and the processor is running. D8 is a Flash access LED. This will flicker when the on-board Flash is being address.

*Note: If the on-board Flash has been disabled in the BIOS set-up the Flash access LED will **still** work whenever the previously allocated Flash region is addressed.*

Watchdog Timer

The Watchdog is not active after system reset. After the first access to the Watchdog (write any value to I/O port 93h), this must be repeated within a 3 second period. If this does not occur, the NMI line will be asserted. An NMI will have no effect on the normal operation of the SBC104. The user must include a suitable interrupt service routine in their application software. If LK5 is inserted, the SBC104 will be reset.

Systems BIOS

The SBC104 board is fitted with Chips and Technologies SCATsx BIOS. The BIOS includes special extensions to support the Flash Filing System. This feature allows the board to boot directly from the Flash drive. An extension is also included to ensure that the DOS clock correctly interprets the date information in the next millennium.

SRAM

A 32-pin DIL socket (IC1) is fitted to the board to allow installation of a 128Kbyte SRAM i.c. by the customer. SRAMS should be low power (-L) versions with an access time <120ns. The SRAM may be initialised as a high speed battery backed DOS drive by adding `SRAMDISK.SYS` in your CONFIG.SYS file as follows:

```
DEVICE=SRAMDISK.SYS SBC104
```

This drive should be used for scratchpad files or high speed logging files. A suitable part is available from Arcom (Stock No. 2495-03740-000-000).

RS-485

COM2 can be link configured to operate as half duplex RS-485. The signals available are DATA+, DATA- and GND. Refer to the Appendix for pinouts. The maximum line length allowable for the RS-485 standard is 1300 metres. The combined impendance of a driver output and receiver allows upto 32 tranceivers on the bus. The wire ends of a RS-485 bus must be terminated with a resistor equal to their characteristic impendance, typically 120Ω if the SBC104 is at the end of the RS-485 transmission line, but then LK10 should be inserted to connect the 120Ω resistor.

The SBC104 Utilities Disk

The board is supplied with a bootable utility disk containing the following files:

- All ROM-DOS 6.22 files
- All Arcom Flash Filing System files
- SRAMDISK.SYS - Device driver to use SRAM as a high speed read/write drive.
- MS-Word 6.0 file (ROM-DOS.DOC) - Comparative review of ROM-DOS 6.22 and MS-DOS 6.22 and a list of additional commands.
- All the pre-installed files supplied on the embedded Flash.

When booting from the utilities disk a menu is displayed giving the choice of formatting the on-board flash (note: the board is shipped formatted) or re-installing the factory loaded files which scan for a VGA card. The functions can be carried out with or without a VGA card being fitted as the utilities disk runs FINDVGA.EXE when it boots. This re-directs the output to COM1 if there is no VGA card.

The utilities disk is intended to provide a fall back solution should the pre-installed files on the Flash get accidentally deleted or the flash gets corrupted. In such a case a floppy drive should be connected to the SBC104 and the utilities disk inserted. About twenty seconds after re-booting the SBC104 output will be re-directed to COM1 if running in Remote mode. A menu will appear giving the option to copy the factory fitted files back onto the on-board Flash or to format the Flash and install ROMDOS. Select an option and wait a few seconds. When formatting the Flash read the on-screen instructions carefully.

SAVECMOS Utility

The SBC104 utilities disk includes the file `SAVECMOS.EXE`. This utility is used to safe-guard the CMOS settings in case of a battery back-up failure. If the battery fails, the SBC104 will start using the default BIOS settings. If the system had been configured to use a hard drive, for example, these settings would be lost. By running SAVECMOS, the BIOS settings stored in the CMOS memory will be written to a file on the FlashFile™ drive. If the SBC104 looses the CMOS settings, the SAVECMOS utility (in AUTOEXEC.BAT) will detect this, reload the CMOS settings from the file and reboot the SBC104. For help on how to use `SAVECMOS.EXE` place the utilities disk in the floppy drive and type: `a:\savecmos /?`.

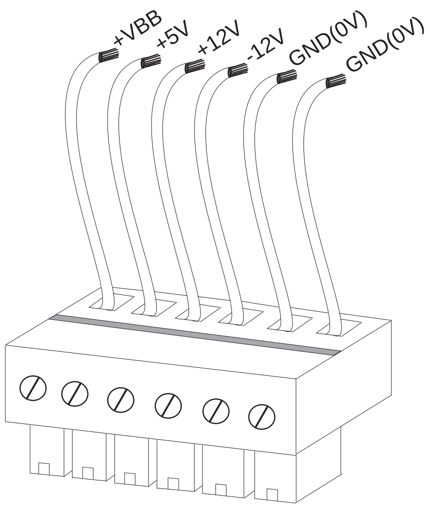
Appendix A. Connections

Power Connections

The board only requires +5v for normal operation. If however any additional PC/104 modules are fitted +/-12v may also be required. There is no on-board +5v to +/-12v converter. These should be connected to the plug-in terminal block of PL5 (1) as shown. The board typically requires 700mA for normal operation.

An external battery back-up voltage +VBB can be connected to the board also at PL5. The external voltage used should be 3.7v. The average drain current on the battery back-up is 20uA.

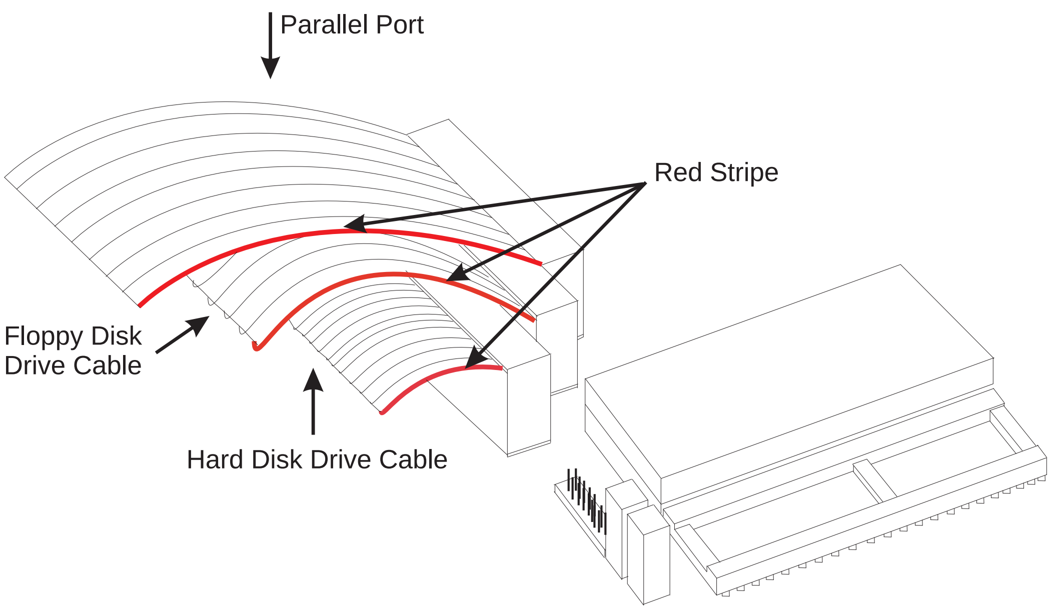
Note: If an external voltage source is used LK3 must be removed to isolate the on-board battery.



Hard Disk Drive and Parallel Port Connections

HDD and LPT can be connected to the SBC104 using standard 40-way and 26-way ribbon cable assemblies respectively. The ribbon cable IDC connectors should be fitted as shown.

The SBC104 only supports hard drives of up to 2 GBytes in size. Larger capacity drives may be connected but must be configured (in the BIOS setup) as a drive of less than 2 GBytes.



40-way IDE HDD Connector

/RST	1	2	GND
IDE D7	3	4	D8
D6	5	6	D9
D5	7	8	D10
D4	9	10	D11
D3	11	12	D12
D2	13	14	D13
D1	15	16	D14
D0	17	18	D15
GND	19	20	n/c
n/c	21	22	GND
/IOWR	23	24	GND
/IORD	25	26	GND
n/c	27	28	n/c
n/c	29	30	GND
IRQ14	31	32	/IOCS16
A1	33	34	n/c
A0	35	36	A2
/HDCS0	37	38	/HDCS1
Drive access LED	39	40	GND

Floppy Disk Drive Connections

The FDD can be connected via a 34-way cable as with the HDD and LPT. The SBC104 caters for two types of floppy drive. Most PC's require a cable with a twist to be connected in order for the floppy to be assigned as Drive a:\. Other floppy's use a straight cable and a require slightly different pin-out. If the floppy to be connected has a twisted cable place links 7 and 8 in position B. If the drive requires a straight cable place links 7 and 8 in position A.

34-way Floppy Disk Drive Header

GND	1	2	Low Current
GND	3	4	n/c
GND	5	6	n/c
GND	7	8	/Index
GND	9	10	/Drive 0 or /Motor 0
GND	11	12	/Drive 1
GND	13	14	n/c or /DRV0
GND	15	16	/Motor 0/1 or /Motor 1
GND	17	18	Direction
GND	19	20	/Step
GND	21	22	/Write Data
GND	23	24	/Write Gate
GND	25	26	/Track 0
GND	27	28	/Write Protect
GND	29	30	/Read Data
GND	31	32	Head Select
GND	33	34	Disk Changed

PC/104 Interface

Both 8-bit and 16-bit modules can fitted to the SBC104. The board complies with the PC/104 specification with the exception that the MASTER* signal line is not implemented on the 40-way connector. The SBC104 is therefore the only master allowed in the system.

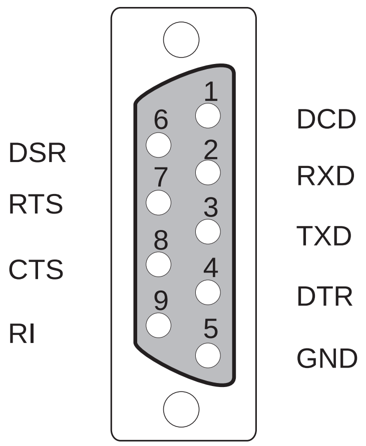
Care should be taken when installing modules, especially 16-bit types. Ensure that all the pins are correctly aligned with the sockets on the SBC104 before pushing the module home. The module should then be secured with the fixing kit provided with the add on module.

PC/104 Connector Pin Assignments

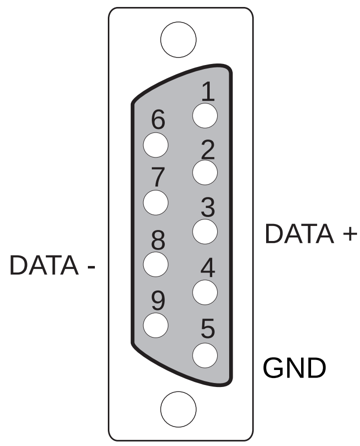
Pin Number	SK2 Row A	SK2 Row B	SK1 Row C	SK1 Row D
0	--	--	0V	0V
1	IOCHCHK*	0V	SBHE*	MEMCS16*
2	SD7	RESETDRV	LA23	IOCS16*
3	SD6	+5V	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	--	LA20	IRQ12
6	SD3	--	LA19	IRQ15
7	SD2	-12V	LA18	--
8	SD1	ENDXFR*	LA17	DACK0*
9	SD0	+12V	MEMR*	DRQ0
10	IOCHRDY	--	MEMW*	DACK5*
11	AEN	SMEMW*	SD8	DRQ5
12	SA19	SMEMR*	SD9	DACK6*
13	SA18	IOW*	SD10	DRQ6
14	SA17	IOR*	SD11	DACK7*
15	SA16	DACK3*	SD12	DRQ7
16	SA15	DRQ3	SD13	+5V
17	SA14	DACK1*	SD14	--
18	SA13	DRQ1	SD15	0V
19	SA12	REFRESH*	--	0V
20	SA11	SYSCLK	--	--
21	SA10	IRQ7	--	--
22	SA9	--	--	--
23	SA8	IRQ5	--	--
24	SA7	IRQ4 (*Note 1*)	--	--
25	SA6	IRQ3 (*Note 2*)	--	--
26	SA5	--	--	--
27	SA4	TC	--	--
28	SA3	BALE	--	--
29	SA2	+5V	--	--
30	SA1	OSC (14.318MHZ)	--	--
31	SA0	0V	--	--
32	0V	0V	--	--

COM1 and COM2 Connections

In RS232 mode the two serial communications ports have a pin-out as standard. The SBC104 has the link selectable option of RS-485 on COM2. The only two signals implemented are DATA+ and DATA-. This provides half duplex operation only. The RTS signal from COM2 is used to enable transmission. The receive input is enabled permanently when in RS-485 mode. Do not use any of the other pins apart from GND, DATA+ and DATA- when using COM2 in RS-485 mode.

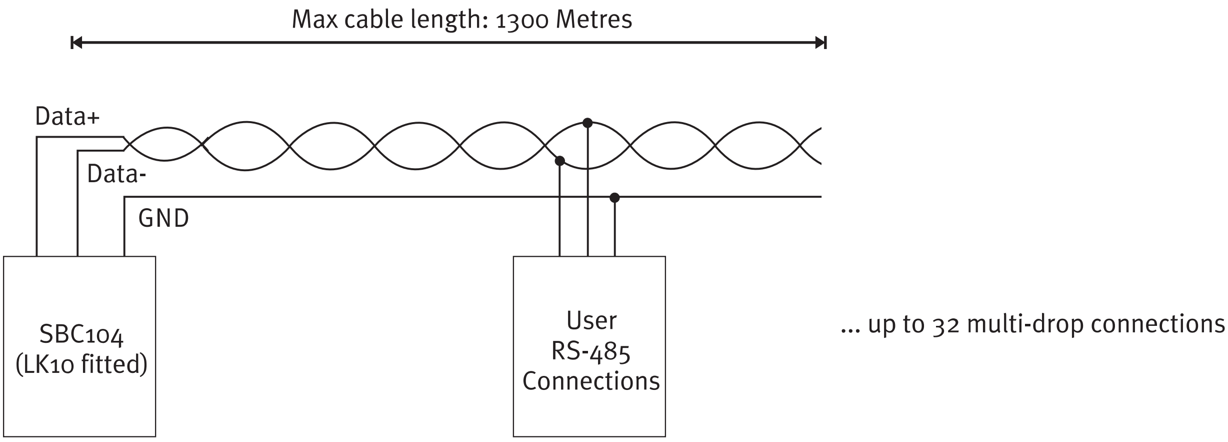


RS-232



RS-485

RS-485 Configuration



The RS-485 groundline should be connected between the units. The terminating resistor (LK10) should be selected if the SBC104 is at the end of the cable.

Keyboard Connection

The SBC104 will interface to a standard PC-AT keyboard. A 5-pin DIN to 6-pin 'Mini' DIN plug adapter cable is required.

Appendix B. Disabling the On-board Flash

The AFFS Flash Filing System used to organise the on-board Flash always assigns the on-board memory as drive C:\. If it is necessary for your primary c:\ drive to be a IDE hard drive then the Flash should be disabled (This is particularly useful if the SBC104 is intending to run Windows from an IDE drive).

To disable the Flash enter the BIOS SET-UP as described in Appendix B. Press Pg Up (Page Up) to the Chipset Register menu. A warning message will be displayed saying that improper use of the Chipset registers may cause the system to fail. Press any key to reach the register table. Scroll down to register 48 and across to bit 4. Press the space bar to change the 1 to a 0. Scroll right to bit 5 and press the space bar to change this to a 0. This will disable the part of the EPROM BIOS that loads in the AFFS to run the Flash memory. Press F10 to re-boot. The SBC104 will boot, without the usual AFFS and Millennium Check messages, to the floppy or hard drive that is connected.

To activate the Flash simply return to the Chipset register menu in the BIOS SET-UP and change bits 4 and 5 of register 48 back to 1's.

WARNING: Do not alter any of the other values in the Chipset register menu. If the SBC104 does not appear to work correctly after the BIOS settings have being changed then turn of the SBC104 move LK3 from position A to B. Wait a few seconds and then replace LK3 back in position A. Turn on the SBC104 and the BIOS will boot the SBC104 with the default BIOS settings.

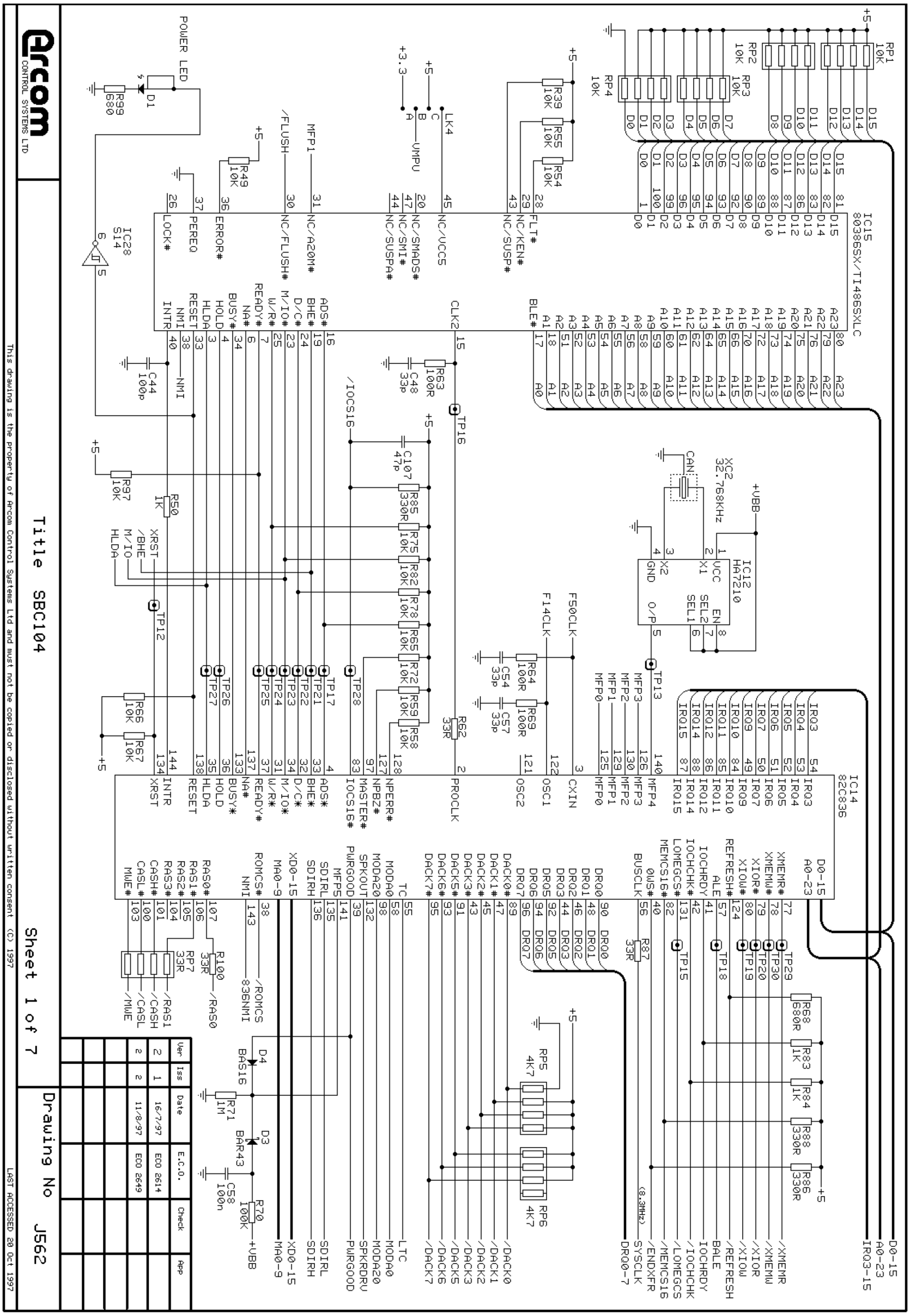
Appendix C. Reference

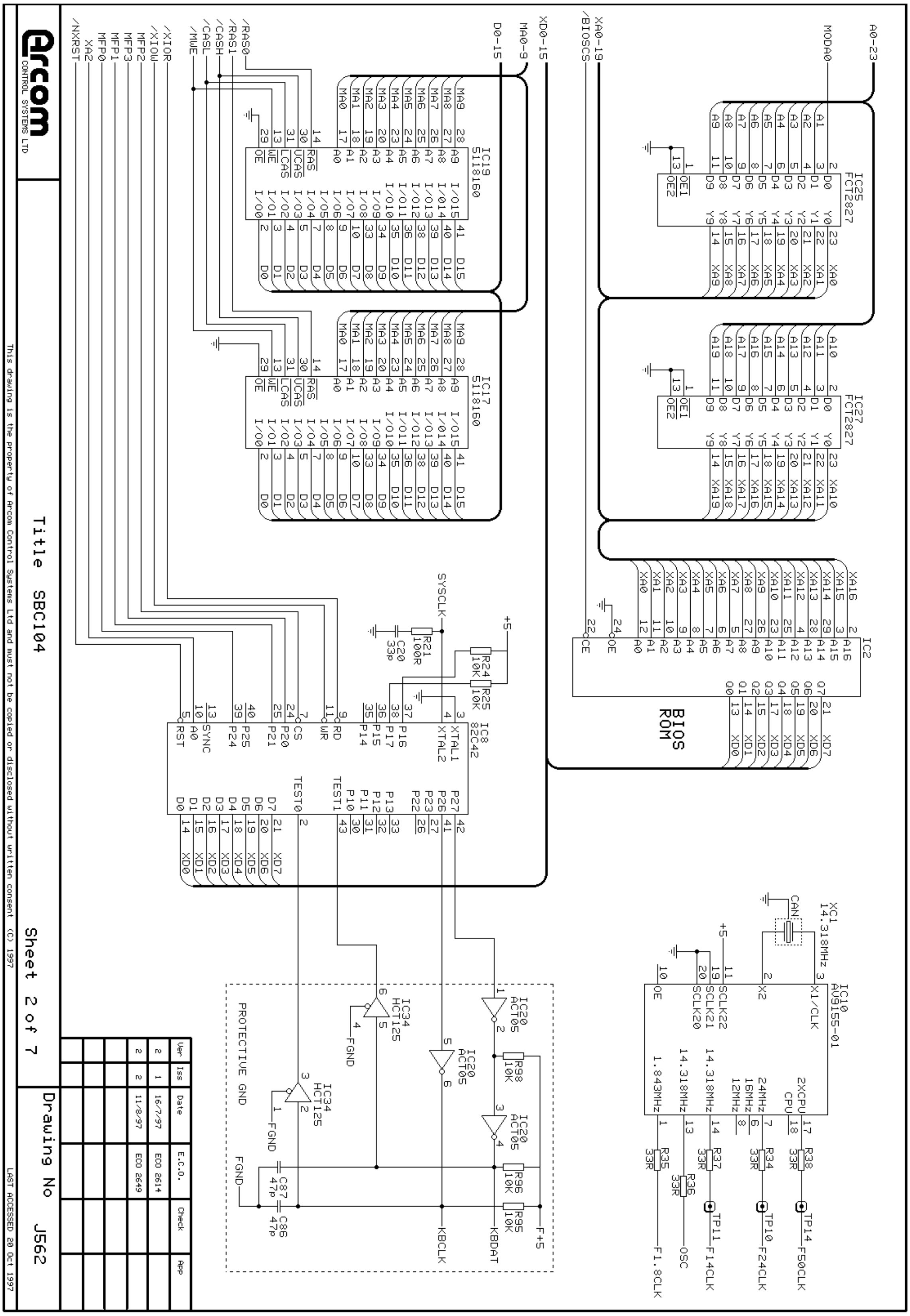
Audible Signals

The BIOS provides audio alert signals during the Power On Self Test. Each of these is specified below. In each case, long and short refer to the time period of the beep.

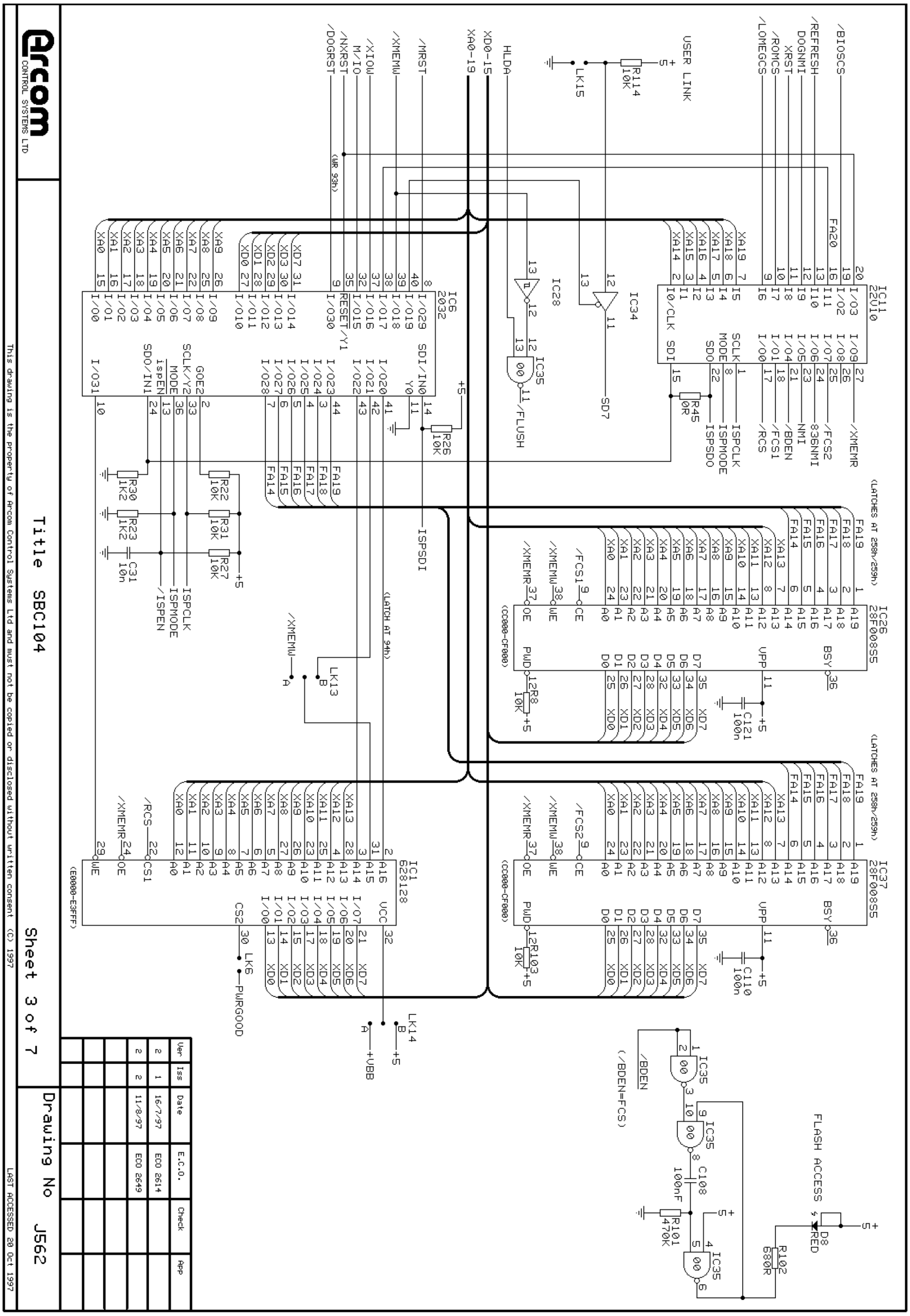
Audio Alert	Condition	Description
1 Long	POST Passed	This indicates that all of the Power On Self Test (POST) hardware tests completed without encountering any errors.
2 Long	POST Failed	This is caused by failure of one of the Power On Self Test (POST) hardware tests.
1 Long & 2 Short	Video Adapter Failure	This alarm results from one of the two hardware problems: 1. Video BIOS ROM Failure and Checksum error encountered. 2. CGA Adapter installed and the horizontal retrace has failed.
1 Long & 3 Short	Video Failure	This is caused by one of three possible hardware problems: 1. The video DAC has failed 2. The monitor detector process has failed 3. The video RAM test has failed.
3 Short	64K RAM Failure	The system BIOS could not rely on the integrity of the memory due to failure of the base 64K of system RAM.

Appendix D. Circuit Diagrams





arcom CONTROL SYSTEMS


Arcom CONTROL SYSTEMS LTD
Title SBC104
Sheet 3 of 7
Drawing No J562
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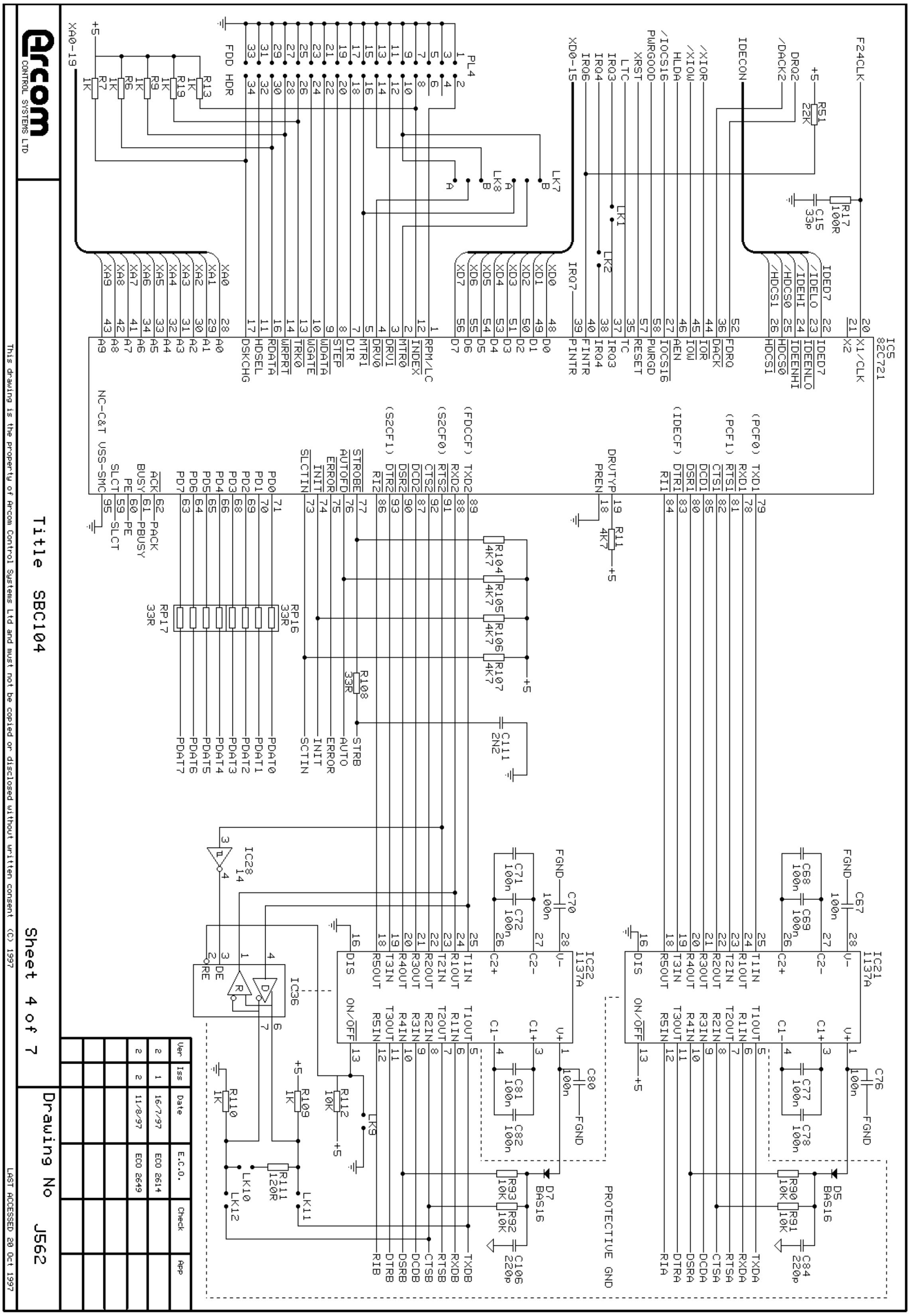
LAST ACCESSED 20 Oct 1997
FLASH ACCESS
USER LINK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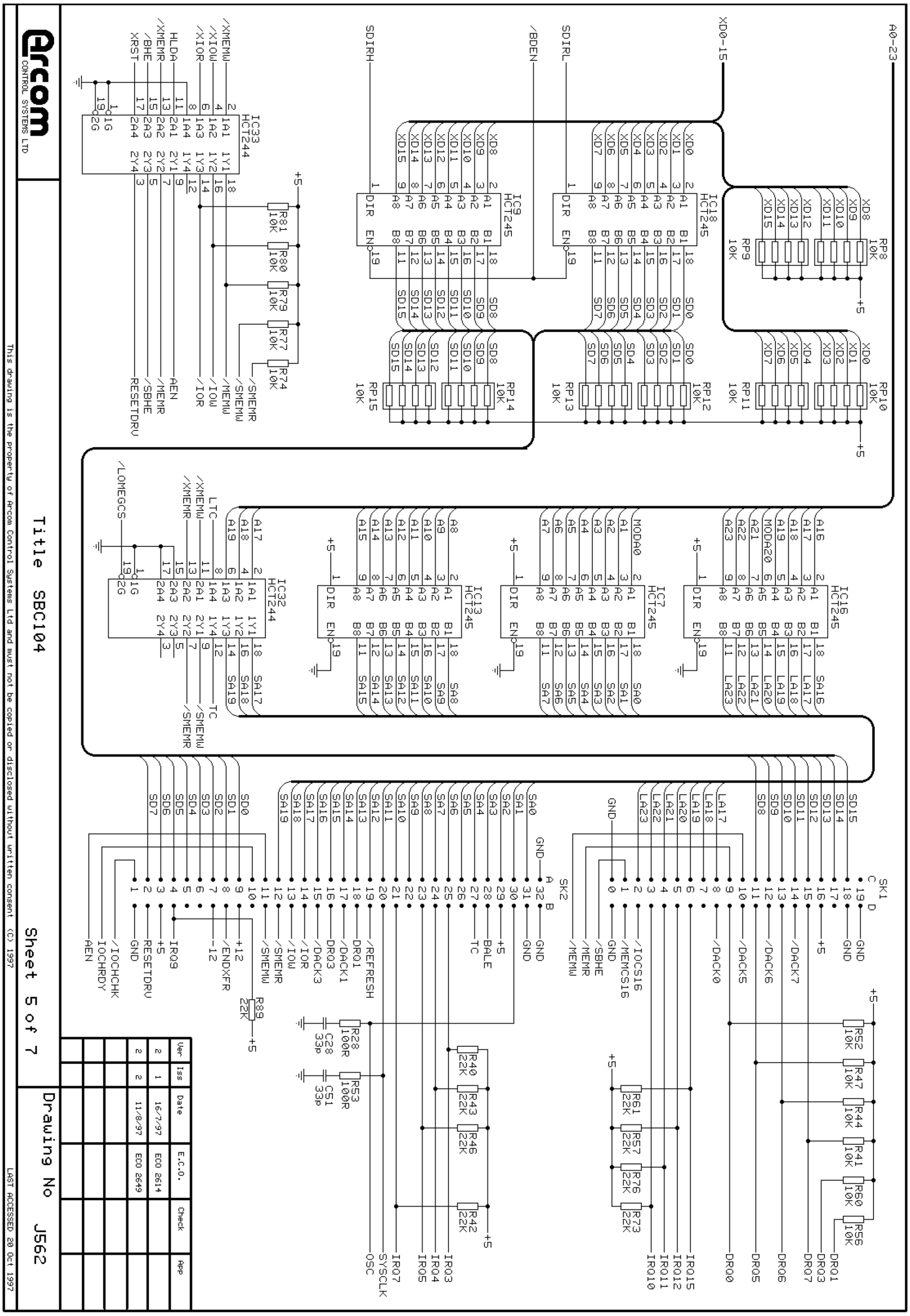
LAST ACCESSED 20 Oct 1997
PROTECTIVE GND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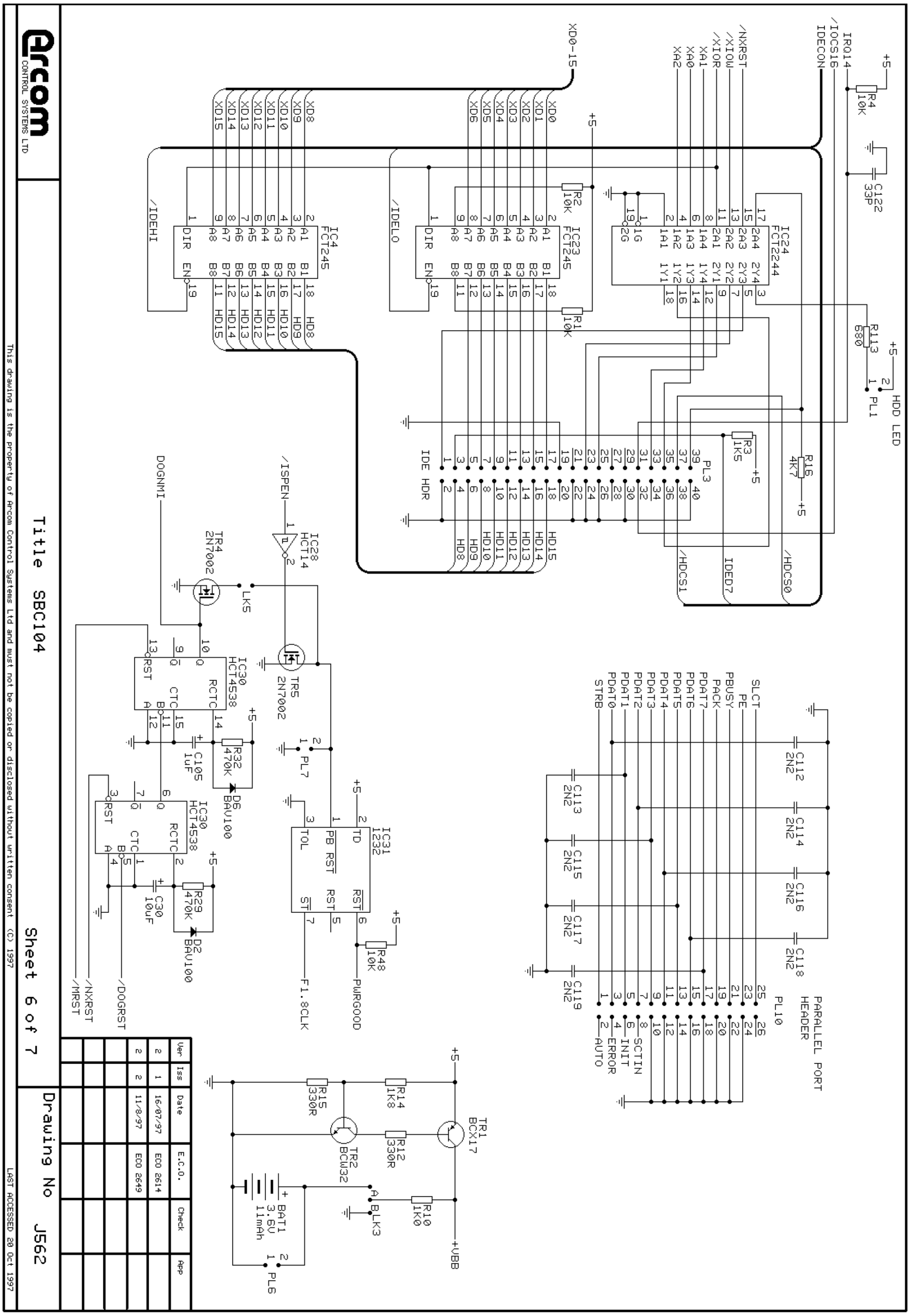
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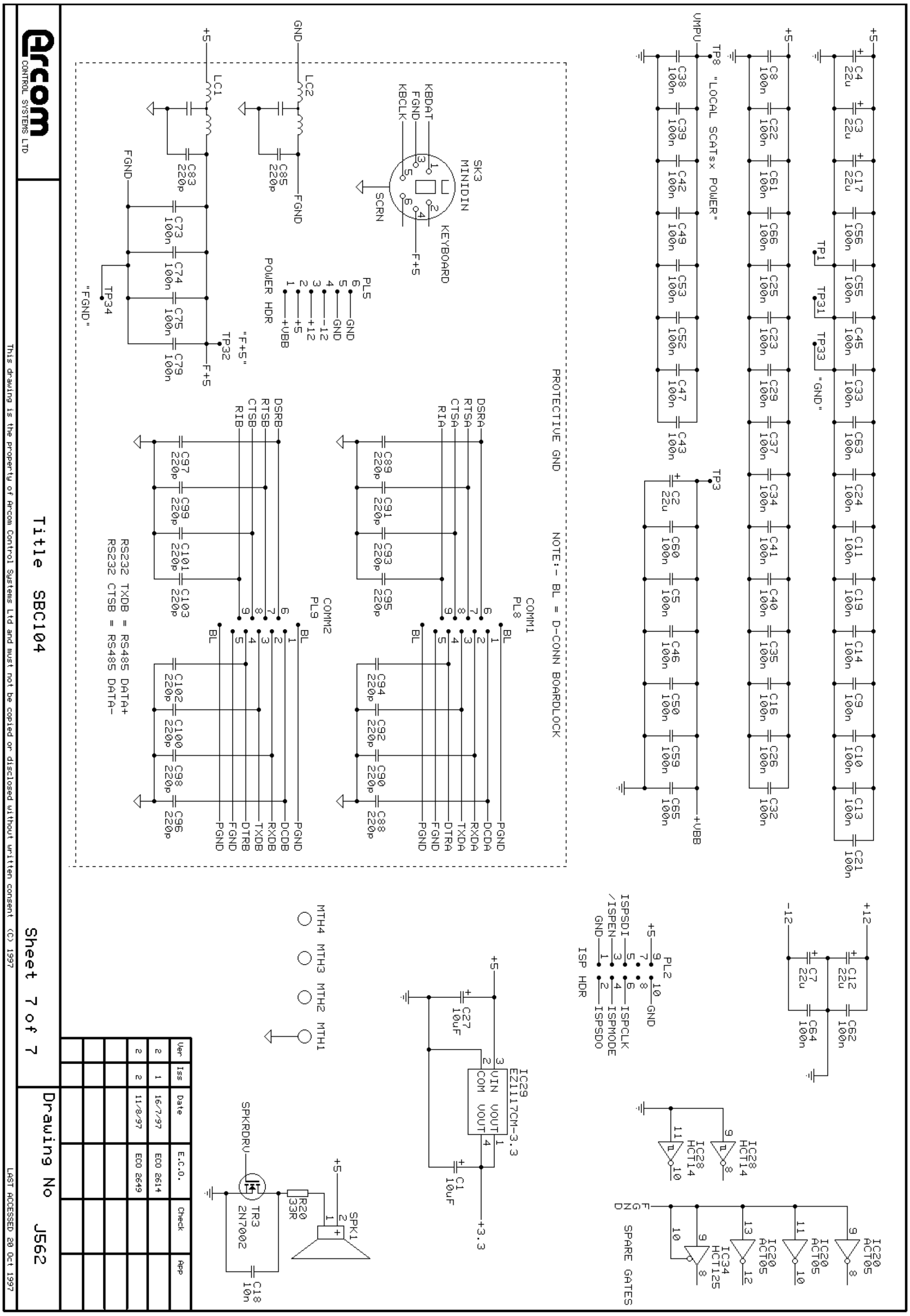
IDE HDR
PARALLEL PORT HEADER
HDD LED


Title SBC104
Sheet 7 of 7
Drawing No J562
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PROTECTIVE GND
NOTE:- BL = D-CONN BOARDLOCK
SPARE GATES
ISP HDR
POWER HDR
RS232 TXDB = RS485 DATA+
RS232 CTSB = RS485 DATA-