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LSX 3020/3030/3040

Service Manual

olivetti

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L2

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Service Manual

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PREFACE

This manual is meant for the service engineers that have to repair the LSX 3020/3030/3040 systems.

SUMMARY

This manual is divided in five chapters and an appendix in the following manner.

Chapter 1 contains a system introduction, boards location on slots and their compatibility with their relative L1 and L2 systems.

Chapter 2 describes the basic module, lines and work stations installation procedure.

Chapter 3 describes in detail the power supply unit used by various modules.

Chapter 4 describes the various boards used, by shown thier setup and the specific connections that have to be carried out.

Chapter 5 contains the main information on the magnetic peripherals connected to the system.

Chapter 6 describes the system autodiagnostics and contains the list of stand-alone test programs.

Chapter 7 is dedicated to the basic software and in particular the MOS and X/OS operating systems.

The appendix at the end of the manual contains a synthesis of the

BIOGRAPHY:

The system biography is contained in appendix A.2

SECTORRANGE PRODUCT: B2 LSX 3020, LSX 3030, LSX 3040

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CONTENTS

1. GENERAL

1.1 INTRODUCTION

The LSX 3020, LSX 3030 and LSX 3040 are the most recent in the line of OLIVETTI mini-computers. Though the system is similar to the M64 and M70 models of the L1 Line (same cabinet, same peripherals, same bus architecture), these differ from one another in two fundamental ways.

1. New CPU based on the 32 bit Motorola 68020 microprocessor.

2. Possibility to choose between the MOS and UNIX operating system.

Another difference is the use of different hardware modules for workstations if the system is used in UNIX operating system.

As mentioned before the mechanical structure of the LSX 3020/30/40 systems are the same as those used for the M64 and M70 L1 models.

Even though the magnetic peripherals are different the same controllers are used to control these.
The system maintains the architecture of the L1 system using the usual

The system has been improved in modular characteristics and flexibility already existed in the L1 line, by increasing the calculation power, the possibility to use a very wide range of peripherals with regards to capacity and characteristics, the use of new intelligent controllers, the possibility to choose between different operating systems

The new systems are of the stand-up type (figure 1-1), and are available in three different versions:

- The LSX 3020 monoprocessor version

- The LSX 3030 biprocessor version

- The LSX 3040 triprocessor version.

From the hardware point of view the three versions do not present any differences to justify individual description.
If the computer is considered from the operating system point of view; The most these are distinguished between the workstations to be installed in the MOS and UNIX case.

All the description on this manual refers to the LSX 3020 monoprocessor model until stated otherwise.

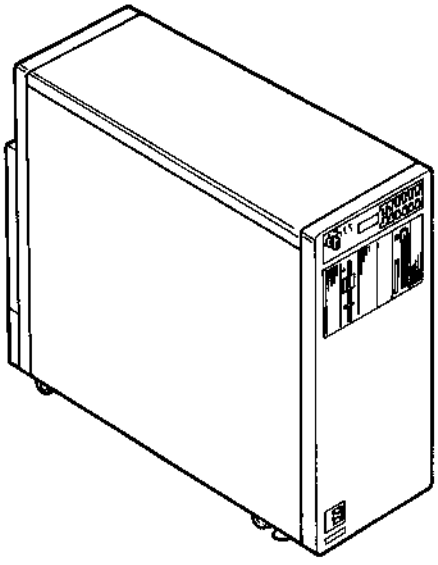

Fig. 1-1 LSX 3020 System Front View

The LSX 3020 system will use the following modules:

BASIC UNIT SB0 housing:

- 11 board slots for the electronic boards
- Integrated magnetic peripherals
- Operator console
- Power supply
- Ventilator.

CABINET SB1 used as follows:

- 5 board expansion slots for the SB0 unit
- Space for magnetic peripherals (8" removable or 5"1/4 fixed magnetic units).

CABINET SB2 houses:

- Place for the Magnetic Tape Unit (MTU).

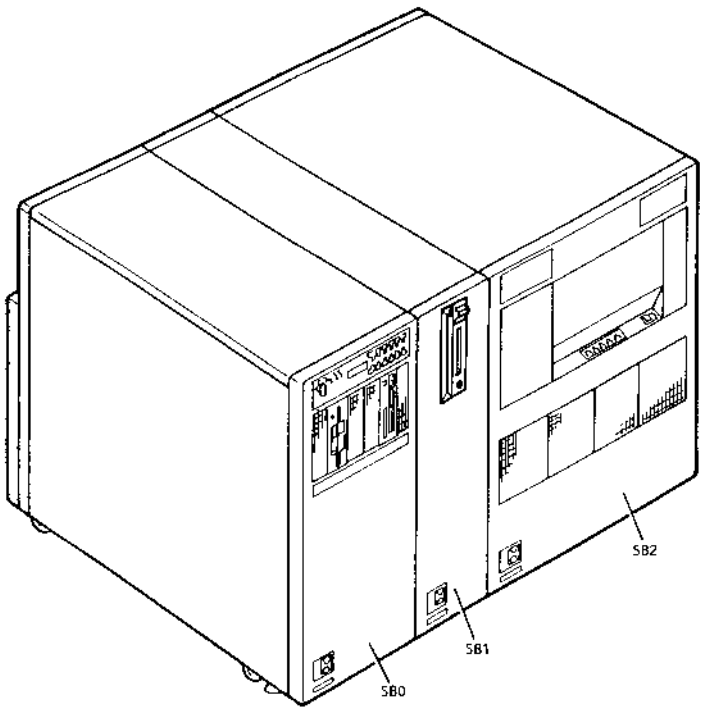

Fig. 1-2 Basic Unit SB0 and External Cabinets SB1 and SB2

1.1.1 BASIC UNIT SB0

The SB0 unit has the following physical dimensions: 750 x 302 x 650 mm and houses the following items:
Power supply, LB40 type, 350 W power, plus expansion power supply LC12 of 120 W (only on systems with 11 board slots).

Board rack (maximum 11 board slots) where the different memory and control boards are inserted. The back plane is of the 8000 type, adapted to double height electronic board connector (as in M70); two versions exist, IN087 for systems with 11 boards, IN088 for systems with 16 boards (of which five are in SB1).

Upper Space used to place the magnetic peripherals:
these can number up to four (all of the 5 1/4" format), two removable type to be mounted on the front of the module, and two fixed type to be mounted on the rear.

Console for maintenance and diagnostic operations.
There are two types of console:
BASIC CONSOLE comprising:

- Interface with operator, system and services
- Real time clock
- Unattended feature.

CONSOLE WITH TELEDIAGNOSTIC has the same features as the basic console plus telediagnostics.

1.1.2 EXPANSION CABINET SB1

This cabinet has the following physical dimensions: 750 x 181 x 650 mm.
Its form of use depends on the configuration of the model it is associated with: on an LSX 3020 with 11 slots, the SB1 model is used only to house an 8" removable magnetic peripheral (1MB FDU or 20MB STC) or one or two fixed, 5 and 1/4" magnetic peripherals. The configuration with HDU on SB1 with the dual-port option for sharing with other systems requires a specific LS10 power supply and console C0126.
On an LSX 3020 with 16 slots, the SB1 expansion module also has a 5-slot rack to be combined with the 11-slot rack in the SB0. In this case the IN088 back plane is used and the expansion power supply LS30 is mounted.

1.1.3 EXPANSION CABINET SB2

The physical dimensions of the cabinet are: 750 x 542 x 650 mm. The cabinet is used to house a 40 MByte Magnetic Tape Unit (MTU).

1.2 PRIORITY AND CONDITIONS OF BOARDS IN THE LSX 3020 SYSTEM RACK

Rack slots are numbered from left to right, when looking at the system from the front (figure 1-3).

Conditions

Never leave slots vacant between boards in the rack.

Position 0 and 1 (first and second position on left, system seen from front) is occupied by the OLIDISK and by the OLICOM controllers respectively.

Position 2 (third position on the left, system seen from front) is occupied by the main unit board, or the CPU boards with regards to the LSX 3030 and LSX 3040.

The TCM board, if jumpered master, is inserted immediately to the right of the last CPU board.

Although they can be inserted almost anywhere, to maintain a certain order, the memory boards (slave jumpered TCM boards) should be inserted to the right of the TCM master.

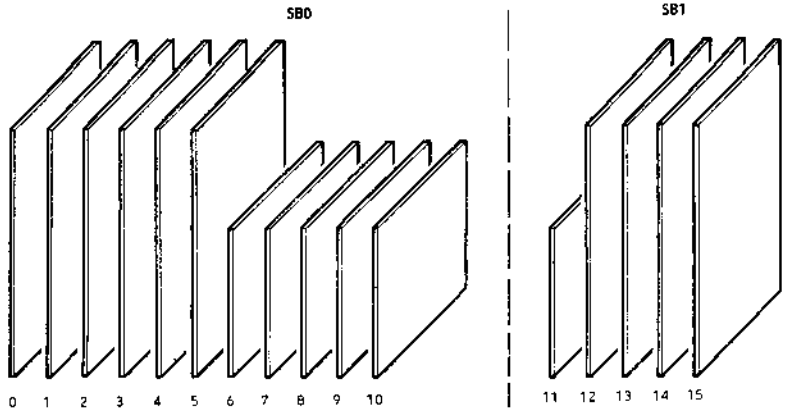

Fig. 1-3 Board Rack for LSX 3020 System

The correct order for insertion of boards in the rack is determined, in addition to the above considerations, by the following criteria:

DMA Priority:

The priority of boards working in DMA diminishes from left to right, i.e. the further they are from the central unit board.

Interrupt priority:

There are three interrupt levels, which, in decreasing order, are:

Level 1A: Highest priority: starts from master TCM board and decreases from right to left.

Level 1B: Board priority decreases from left to right, i.e. the closer to the TCM master.

Level 2: Lowest priority; board priority increases the closer it is to the TCM master.

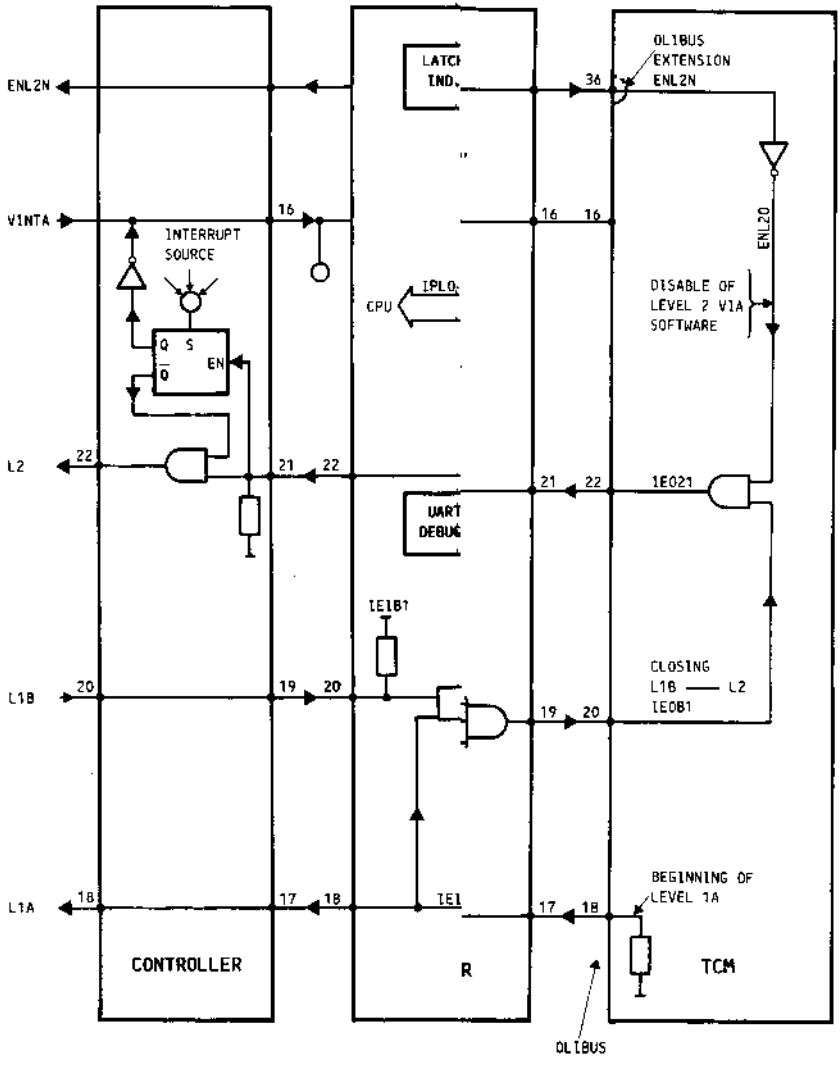

Fig. 1-4 Priority Daisy Chain for LSX 30

1.2.1 ORDER OF BOARDS IN RACK

The table below indicates the order of boards in the LSX 3020 rack. System configuration limits must obviously be kept in mind, so the list of modules in the "Progetto di Gestione" - see Appendix A - should be consulted.

LSX 3020 Board Rack

HARDWARE MODULE	BOARD NAME	LOGIC NAME	INTERRUPT LEVEL	
OLIDISK HDU controller	G0427	70	L2	
OLICOM 16-way mux	G0426	71	L2	
Central Unit	UC068	FF		
FDU/mFDU Control 1 MB	G0280/D	E1	L2	The controllers in this group work in DMA.
STC Control 45/60 MB	~~G0418~~	--	L2	
Formatter & Controller	G0417	E7		G0437
Multiplexer Controller	G0322 G0435	30	L1B/L2	
Ethernet Line Control	G0212/A G0459	6F	L1B/L2	1/2 G64
V24 + V24 Line Control	G0331	28	L1B	
Encryption Control	G0257/C	33	L1B	
MTU Control	G0278/B	62	L2	
TCM Board 2 or 4 MByte	TCM	F9		

Note: The MTU controller has the highest priority of those in the L2 interrupt daisy chain; at the same time, it has the lowest priority of those in DMA.

1.3 COMPATABILITY OF BOARDS IN RELATION TO SYSTEMS

The following table details compatibility of the hardware modules on the M54, M64, M70 and LSX 3020 systems.

NAME	BOARD DESCRIPTION	M54	M64	M70	3020
	CENTRAL UNITS AND OTHER MODULES				
UC070	Central Unit	yes	yes	no	no
UC071	Central Unit	no	no	yes	no
UC068	Central Unit	no	no	no	yes
TCB82/A	Timing Control Board	no	no	yes	yes
TCM	Timing Control Memory	no	no	yes	yes
GO 257	Encryption + Real Time Clock	yes	yes	no	no
GO 257/C	Encryp. (pin check + alg. CAT)	yes	yes	yes	yes
INO 62	Back plane	yes	no	no	no
INO 80	Back plane	no	yes	no	no
INO 87	Back plane, 11 board slots	no	no	yes	yes
INO 88	Back plane, 16 board slots	no	no	yes	yes
	RAM STORAGE BOARDS				
RA57/E	512 KByte: 64 Kb chips	yes	yes	no	no
RA57/C-B-A	1/1.5/2 MByte: 256 Kb chips	yes	yes	no	no
RA65/B	1 MByte: 256 Kb chips (ECC)	yes	yes	no	no
RA065	2 MByte: 256 Kb chips (ECC)	yes	yes	no	no
RA80/B-N	2/4 MByte: 256 Kb chips (ECC)	no	no	yes	yes
	POWER SUPPLIES				
LA 17	170 W	yes	no	no	no
LB 40	350 W for SB0 cabinet	no	yes	yes	yes
LB 12	125 W for SB1 cabinet	no	no	yes	no
LC 12	120 W for SB0 cabinet	no	no	no	yes
LS 30	300 W for SB1 cabinet	no	no	no	yes
LS 10	106 W for SB1 cabinet	no	no	no	yes
	KEYBOARD/DISPLAY CONTROLS				
GO 322	Multiplexer	yes	yes	yes	yes
GO 426	Olicom (16-way Multiplexer)	no	no	no	yes

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NAME	BOARD DESCRIPTION	M54	M64	M70	3020
	FLOPPY/mFLOPPY CONTROLS				
GO 280/C-E	Minifloppy Unit 320 KB	yes	no	no	no
GO 280/B-D	Floppy/Minifloppy Unit 1 MB	yes	yes	yes	yes
	SCT AND MTU CONTROLS				
GO200B+342	STC Archive (XU 1130) 20 MB	no	yes	no	no
GO417+418	STC 45/60 MB	yes	yes	yes	yes
GO 278/B	MTU (XU 1705) 40 MB	no	yes	yes	yes
	HARD DISK CONTROLS				
GO 363	ST506 Interface Control	yes	yes	yes	yes
GO301A-302A	SMD3 Interface Control	no	yes	yes	no
GO404-405	ESDI Interface Control	yes	yes	yes	yes
GO 427	OLIDISK (intelligent ESDI int.)	no	no	no	yes
	LINE AND SERIAL INTERFACE CONTROLS				
GO 331	V24 + V24 (MOS)	yes	yes	yes	yes
GO 212/A	Ethernet line (Unix/MOS)	yes	yes	yes	yes
GO 435	STARLAN (Unix)	no	no	no	yes
GO 430	ILC V24 + V24 (Unix)	no	no	no	yes
GO437	SCT controlle	yes	yes	yes	yes

2. INSTALLATION

This chapter is divided into 4 sections, each treating one specific aspect of system installation.

The first section is a brief introduction on preparation of the site chosen for system installation.

The second part deals with assembly and disassembly of the basic unit SB0 and the external modules SB1 and SB2.

The third section is on workstation organization, while the fourth and final part relates to regulations for the installation of internal lines and local networks.

2.1 ENVIRONMENT CONDITIONS CHECK

The hints given below should be followed to prepare the site for installation of systems and system peripherals. For more detailed information, see the "Site Preparation Guide".

Main Power Supply Network

Wires and switches must be able to support both the scheduled work load and the high surge currents at power-on.
Ground resistance must be to national standard requirements. A resistance of 50 ohms covers disturbance and Italian ENPI standards require a resistance of 20 ohms maximum for operator protection.

Electrical noise

The system must be insulated against sources of electrical noise and devices causing excessive voltage level variations or which introduce large inductance or capacitance loads into the system.
However, some of the smaller, general office machines may be admitted on the same line as the system just as several L1 systems may be connected to the same mains power source, provided each machine has its own plug.

Temperature and humidity

The table below indicates the minimum and maximum temperature and humidity values for the system and magnetic peripherals in operation, when stationary and in storage. All readings are calculated with no condensation.

MODULE	OPERATION		STATIONARY		STORAGE	
	TEMP. C	HUMID. %	TEMP. C	HUMID. %	TEMP. C	HUMID.%
LSX 3020	10 - 40	10 - 95	5 - 50	5 - 95	-15 - +55	5 - 95
FDU - mFDU	10 - 40	20 - 80	5 - 50	8 - 80	-30 - +53	8 - 90
HDU	10 - 40	8 - 80	5 - 50	5 - 95	-34 - +55	5 - 95
SCT	10 - 40	20 - 80	5 - 50	5 - 90	-30 - +55	5 - 95
MTU	10 -32.8	15 - 95	5 - 50	10 - 90	-30 - +50	10 - 90
BADGE READER	10 - 40	10 - 90	5 - 50	5 - 95	-35 - +55	5 - 95

Static electricity

Extremely low humidity may cause electrostatic charges to be generated effecting the magnetic media in read/write operations and operation of the electronic devices and paper service equipment.
Carpets and mats can also cause electrostatic charge generation.
Humidity must be kept to required levels and anti-static floor coverings used.

Dust

Systems may be installed in a normal room designed for office purposes so maximum dust level permitted is 0.25 mg/mc.
A high dust level effects, in particular, the magnetic media, reducing effective head life.

Operating area

All parts of the system must be accessible to allow technical service.
Systems should not be installed in full sunlight or near direct heat sources.
A free flow of air should be guaranteed the system and all inlets left unobstructed.

2.2 ASSEMBLY/DISASSEMBLY

As stated, the modules making up the LSX 3020 systems are the SB0, SB1 and SB2. While for the SB0 and SB2, there are no major differences between their use on the systems, use of the SB1 is strictly related to the type of system and configuration. Therefore, the procedures for assembly and disassembly of the modules will be described below irrespective of the system used and any differences from system to system pointed out.

Note: After unpacking the system, the blocking plates must be removed. These plates are generally inside the system and are designed to block the boards in the board rack and to block peripherals etc. They are easily recognized by their distinctive yellow colour, forming a strong contrast with the rest of the system. They must be removed before the system is powered for the first time.

2.2.1 REMOVING THE SB0 CABINET PANELS

To remove the panels of the SB0 cabinet casing (see figure 2-1), the procedure is as follows:

1. **Upper shelf:** Lift up and remove the upper shelf, applying pressure with a screwdriver in position "1".

2. **Side panels:** After removing the upper cover panel from the machine, loosen the two screws (position 2) securing each panel and then remove the panels by lifting upwards.

3. **Front panel:** Loosen the two screws towards the top in position "3" and remove the panel by first pulling it backwards and then lifting up.

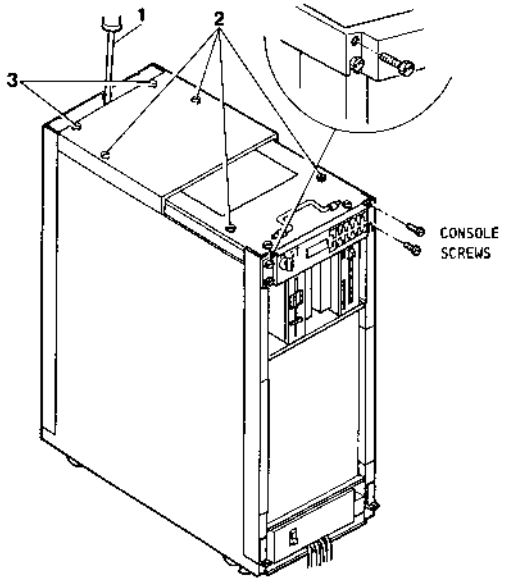


Fig. 2-1 Removing the S80 Cabinet Panels from the Front

4. **Rear panels:** The cabinet rear consists of three panels (see figure 2-2):

   a) Panel covering the frame supporting the D-BOX or RS232 to Current Loop (for LSX 3020 systems with, respectively, MOS or UN1X operating system) and C-BOX - Loosen the screw in position "1" and remove the panel pulling downwards.

   b) Rear cover - loosen the two screws at the top in position "2" and remove the panel by first pulling back and then upwards.

   c) Power supply grid panel - slacken the four screws in position "3" and remove panel by drawing backwards.

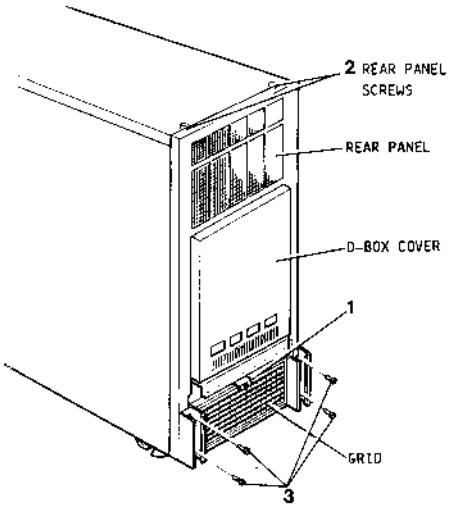


Fig. 2-2 Removing Panels at Rear of SBO Cabinet

2.2.2 REMOVING SB1 CABINET PANELS

The procedure for removal of the SB1 cabinet casing panels (see figure 2-3) is as described below:

1. **Upper shelf:** Lift up and remove the upper shelf, applying pressure in position "1" with a screwdriver.

2. **Right side panel:** After removing the upper cover panel of the SB1 cabinet, slacken the two screws (position 2) securing the panel and remove by lifting upwards.

3. **Front panel:** After removing the upper cover panel of the SB1 cabinet, loosen the two screws at panel top in position "3" and remove panel by first drawing backwards and then upwards.

4. **Rear panel:** After removing the upper cover panel of the SB1 cabinet, slacken the two screws at panel top in position "4" (see figure 2-4) and remove panel by first pulling backwards and then upwards.

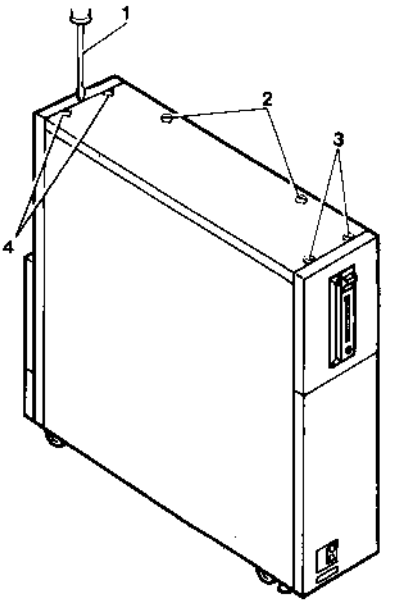
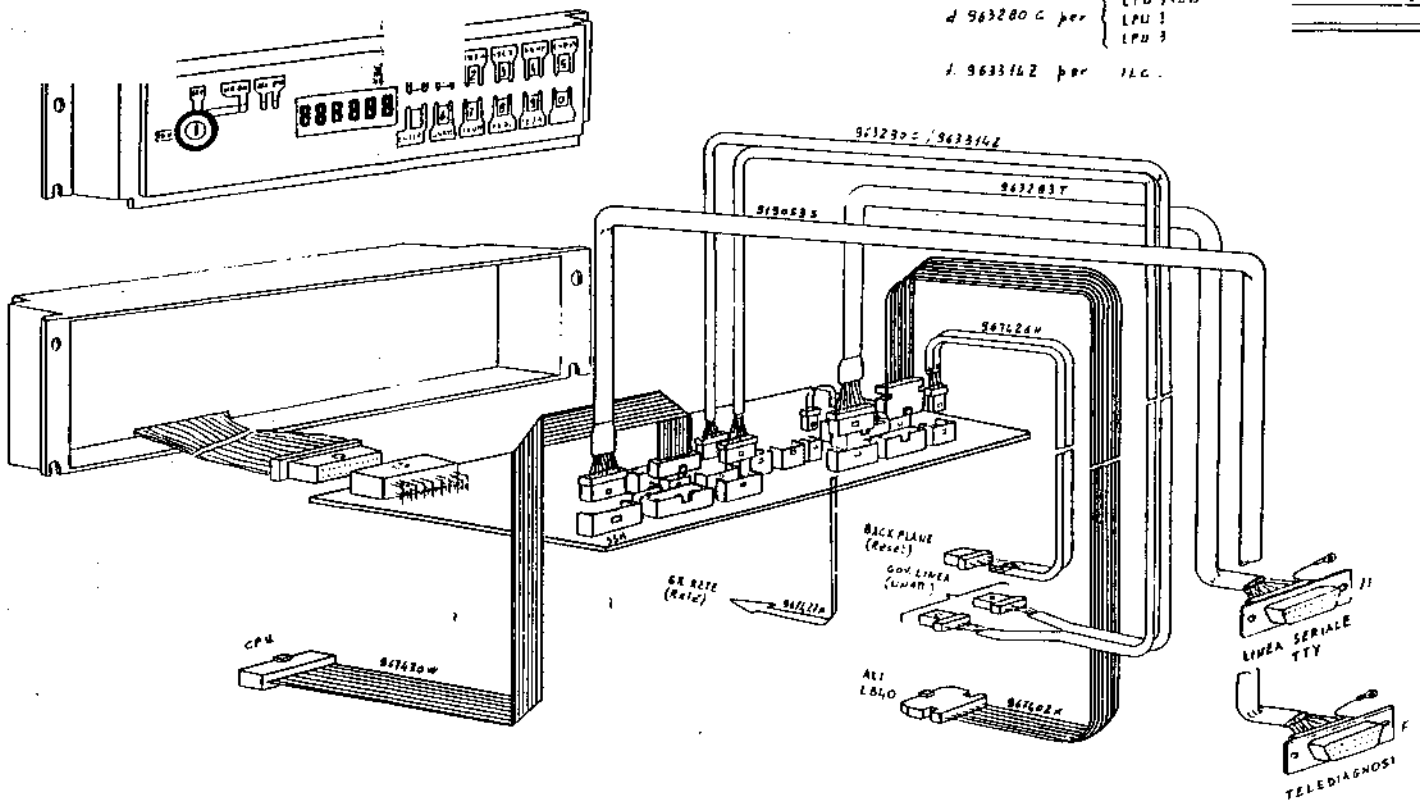


Fig. 2-3 View of SB1 Cabinet



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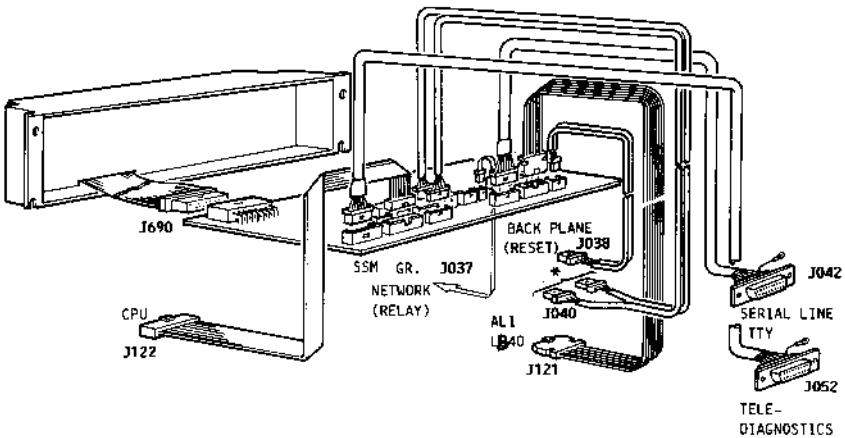
2.2.3 DISASSEMBLY AND ASSEMBLY OF CONSOLE IN SBO

The procedure below is valid for consoles with and without telediagnostic.

Disassembly

See figure 2-4

1. Remove the SBO upper panel (see section 2.2.1).
2. Remove the cover on the top of the SBO by loosening the screw securing it to the frame (to grant access to the connectors on the rear of the SSM board).
3. Loosen the screws securing the SSM board to the frame.
4. Disconnect all the connectors on the SSM board (see figure below).



* LINE CONTROLLERS (UNATTENDED)

Fig. 2-4 Rear View of Extended Console and SSM Board

5. Unscrew the two upper screws and slacken the two lower screws securing the console to the frame (see figure 2-1).
6. Remove the console and SSM board.

Assembly

To assemble the console, reverse the disassembly operations described above.

2.2.4 DISASSEMBLY AND ASSEMBLY OF CONSOLE IN SB1

Disassembly

See figure 2-5

1. Remove the SB1 upper panel (see 2.2.2).
2. Unscrew the two upper screws and slacken the two lower screws securing the console to the frame.
3. Disconnect the connectors connected to the console (only for SB1 with HDU).

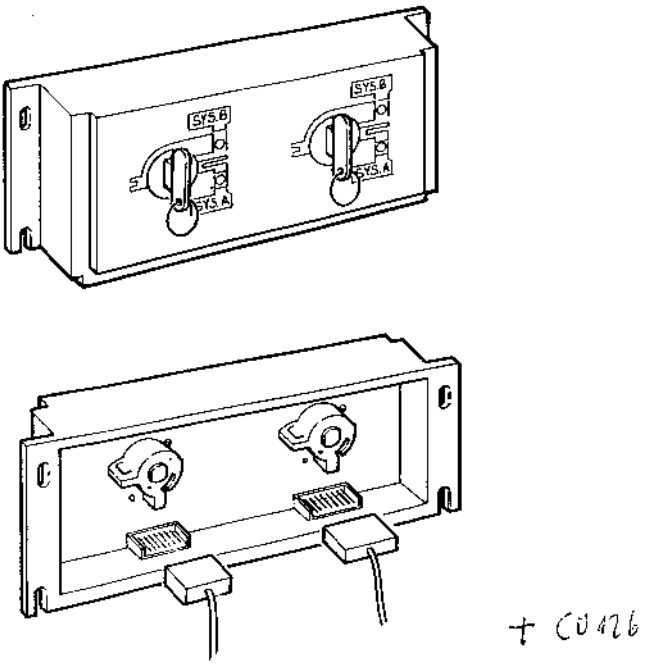


Fig. 2-5 Front and Rear View of the Console in SB1 Cabinet for 2 HDU

Assembly

To mount the console, reverse the disassembly operations described above.

2.2.5 DISASSEMBLY AND REASSEMBLY OF POWER SUPPLY LB40

Disassembly

See figure 2-6

1. Remove the grid panel at the bottom of the lower part of the SBO cabinet (see section 2.2.1).

2. Remove the AMP MOD II 10x2-way connector (console signals).

3. Remove the white 4-way connector for the +35 V and ground.

4. Remove the green AMP MODU I connector of the +12 V and -12 V.

5. Unscrew the three screws connecting the three ground cables (black) and remove the cord ends from the nuts.

6. Unscrew the three screws securing the three +5 V cables (red) and remove cord ends from nuts.

7. Unscrew the two screws of the "L"-shape band connecting the logic ground to the system ground and securing the LB40 power supply board to the frame.

8. Remove the power supply from its position by sliding it backwards on its guide-rails.

Assembly

1. Set power supply in position by sliding it along its guides.

2. Reverse the disassembly procedure outlined above.

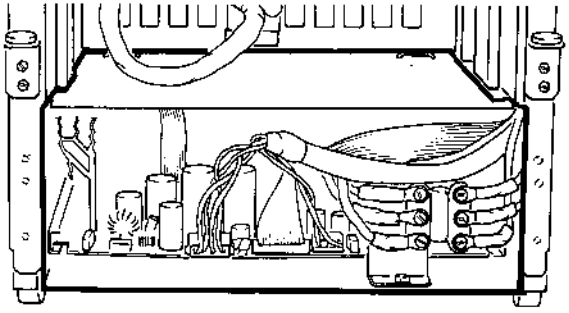


Fig. 2-6 Rear View of Power Supply LB40

2.2.6 DISASSEMBLY AND REASSEMBLY OF POWER SUPPLY LC12

This power supply is the system power supply LB40 expansion, and is used only on 11-slot systems.

Disassembly

See figure 2-7

1. Remove the rear panel of cabinet SB1 (see section 2.2.2).
2. Remove the grid at the bottom of the lower part of the SB1 cabinet by unscrewing the two screws securing it to the frame.
3. Remove the black, 4x1 way AMP MODU II connector (LB40 control signals).
4. Unscrew the three screws securing the three ground cables (black) and remove plugs from nuts.
5. Unscrew the three screws connecting the three +5 V cables (red) and remove plugs from nuts.
6. Unscrew the two screws of the "L"-shape band connecting the logic ground to the system ground and blocking the LC12 power supply board to the frame.
7. Remove power supply from its position by sliding backwards along guide-rails.

Assembly

1. Set power supply in position by sliding it along its guides.
2. Reverse the disassembly operations outlined above.

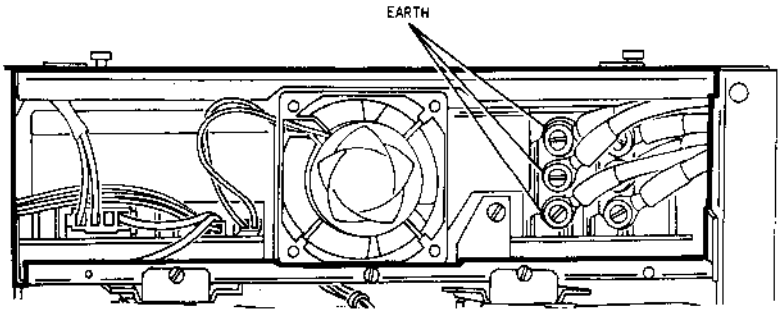


Fig. 2-7 Rear View of Power Supply LC12

2.2.7 DISASSEMBLY AND ASSEMBLY OF LS30 POWER SUPPLY

This power supply is the system power supply LB40 expansion, and is used only on 16-slot systems.

Disassembly

See figure 2-8

1. Remove the SB1 rear panel (see 2.2.2).
2. Remove the grid on the bottom rear of the SB1 after unscrewing the two screws securing it to the frame.
3. Remove the black AMP MODU II 4x1 way (LB40 control signals) connector.
4. Unscrew the three screws holding the three ground cables (black) and remove the cord ends from nuts.
5. Unscrew the three screws holding the three +5 V cables (red) and remove the cord ends from the nuts.
6. Unscrew the two screws of the L-shape band connecting the logic ground to the system ground and blocking the LB12 power supply board to the frame.
7. Remove the power supply from its position by sliding backwards along its guide-rails.

Assembly

1. Insert the power supply in position by sliding it along its guides.
2. Reverse the disassembly operations described above.

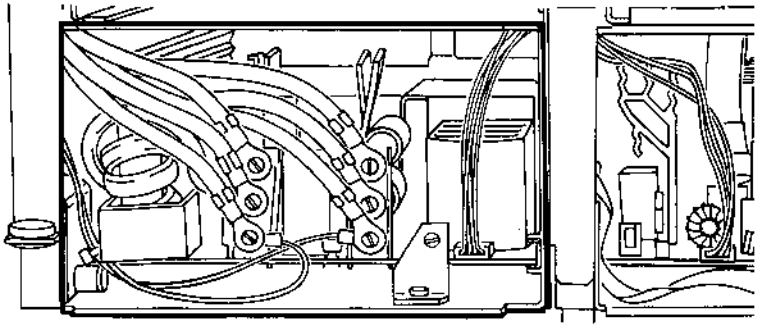


Fig. 2-8 Rear View of LS30 Power Supply

2.2.8 DISASSEMBLY AND REASSEMBLY OF LS10 POWER SUPPLY

This power supply is used to power one or two HDU in cabinet SB1, with the dual port option for sharing of the HDU between systems.

Disassembly

See figure 2-9

1. Remove the SB1 rear panel (see 2.2.2).

2. Remove the grid on the top rear of the SB1 by unscrewing the two screws holding it to the frame.

3. Remove the MODU 1, 6-way input connector (110/220 V power supply voltage coming from the SB0 mains box).

4. Remove the MODU 1, 4-way output connectors (+5 V power supply voltage plus reset signal for dual port board) and MATE-N-LOK, 4-way connectors (+5 V and +12 V power supply voltages for HDU peripherals).

5. Unscrew the two screws of the L-shape band connecting the logic ground to the system ground and blocking the LS10 power supply to the system frame).

6. Remove the power supply from its position by sliding backwards.

Assembly

1. Insert power supply in position by sliding along its guides.

2. Reverse the power supply disassembly operations described above.

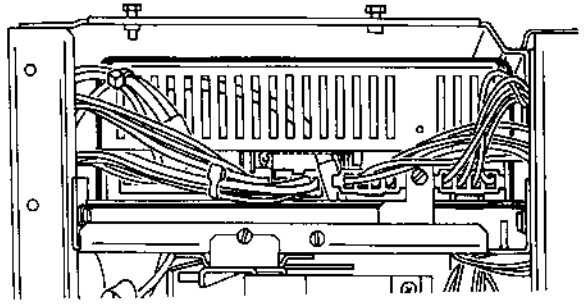


Fig. 2-9 Power Supply LS10 Rear View

2.2.9 DISASSEMBLY AND ASSEMBLY OF REMOVABLE PERIPHERALS ON SBO

Disassembly

See figure 2-10

1. Remove front panel (see section 2.2.1).
2. Remove peripheral shielding grid.
3. Unscrew two screws securing peripheral to frame.
4. Disconnect the signals/data flat cable on rear of peripheral.
5. Disconnect power cable on front of peripheral unit.
6. Remove peripheral by sliding it along the guide-rails.

Assembly

To reassemble peripheral, reverse the disassembly operations outlined above.

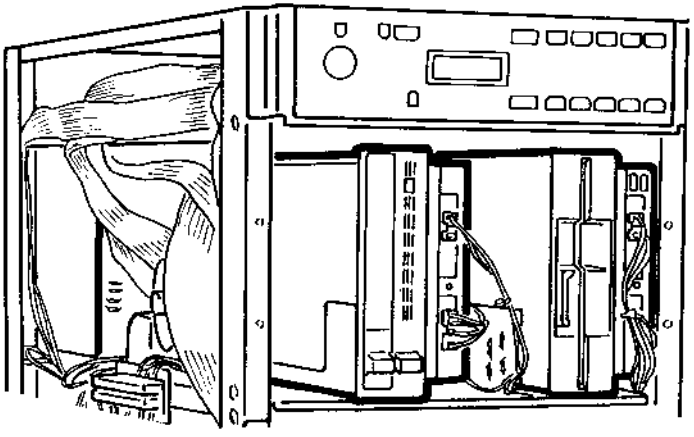


Fig. 2-10 Removable Peripherals

2.2.10 DISASSEMBLY AND ASSEMBLY OF FIXED PERIPHERALS ON SBO

Disassembly

See figure 2-11

1. Remove the rear panel and the left side panel (see section 2.2.1).
2. Remove peripheral unit shield grid.
3. Unscrew the two screws securing peripheral to frame.
4. Disconnect the AMP MOD I connector (green colour) of the +35V and its ground (red and black wires, respectively).
5. On the SBO left side, disconnect the small, data flat cable (one for each peripheral).
6. On the SBO left side, disconnect the flat cable of the peripheral unit control signals.
7. Remove the peripheral by sliding it along its guides.

Assembly

To assemble peripheral, reverse the disassembly operations outlined above.

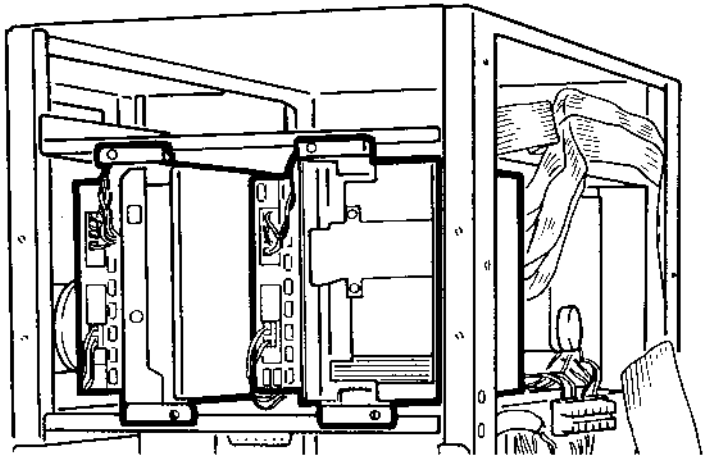


Fig. 2-11 Rear View of Fixed Peripheral Units

2.2.11 ASSEMBLY/DISASSEMBLY OF DC/DC CONVERTER FOR FIXED AND REMOVABLE PERIPHERALS IN SBO

Disassembly

See figure 2-12

1. Remove the peripheral (see relative section: 2.2.9 for removable peripheral, 2.2.10 for fixed peripheral).

2. Disconnect the power supply connector, +12 V and +5 V (for DC/DC 36/512) or 24 V and +5 V (for DC/DC 36/524), and the ground (green, AMP MOD I 6x1 way connector on DC/DC converter side, white 4-way connector on peripheral side) of the peripheral.

3. Unscrew the four screws (see figure below) securing the DC/DC converter to the peripheral unit side.

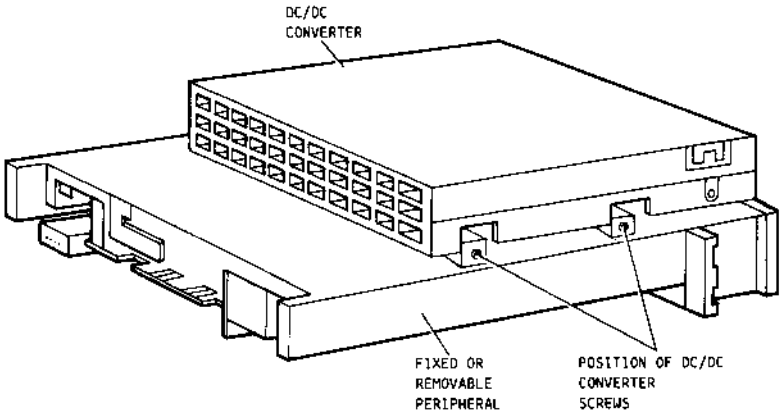


Fig. 2-12 Side View of DC/DC Converter and Peripheral Unit

Assembly

To mount DC/DC converter on peripheral, reverse the disassembly operations outlined above.

The two power wires of the DC/DC converter on the open side must be connected to the +35 V and ground of the LB40 power supply; this connection can be made directly on a terminal strip on the left of the basic cabinet.

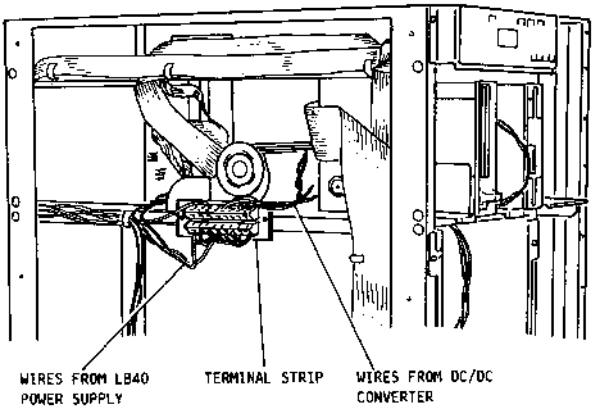


Fig. 2-13 Side View of Terminal Strip for DC/DC Converter Power

2.2.12 D-BOX DISASSEMBLY AND ASSEMBLY

Disassembly

See figure 2-14 and 2-2.

1. Remove the SBO rear panels.
2. Disconnect D-BOX connection cables.
3. Unscrew the two screws securing the D-BOX connector to the MUX and take out connector.
4. Unscrew the three screws securing the D-BOX to the support plate.
5. Remove the D-BOX support plate, loosening the four screws securing it to the frame.
6. Unscrew the four spacers from the frame.

Assembly

To mount the D-BOX, reverse the operations described for disassembly.

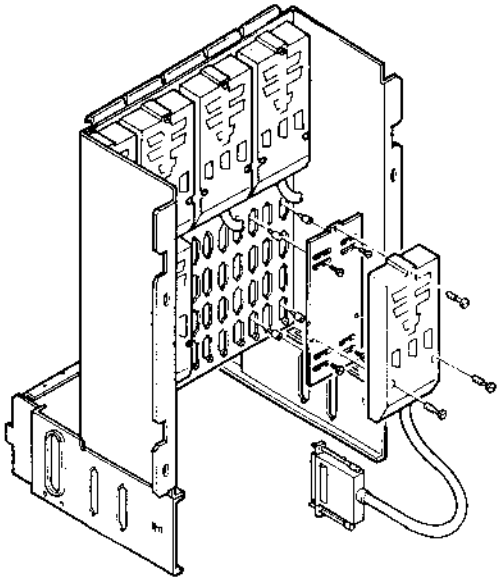


Fig. 2-14 D-BOX and Support Plate

2.2.13 RS232/CURRENT LOOP ADAPTER DISASSEMBLY AND ASSEMBLY

Disassembly

See figure 2-15 and 2-2

1. Remove the SBO rear panels.

2. Remove the four 9-way, D-shell connectors secured to the RS232/Current Loop converter with two screws.

3. Unscrew the two screws securing the RS232/Current Loop converter.

4. Remove the RS232/Current Loop converter by pulling backwards.

5. Remove the four 9-way, D-shell connectors secured to the frame with two screws (the signals on the four connectors arrive directly from one of the four OLICOM channels).

6. Remove the OLICOM connectors (16-way MUX).

7. Remove the OLICOM to RS232/Current Loop Converter connection flat cables from the system frame.

Assembly

To assemble the RS232/Current Loop converter, reverse the disassembly operations described above.

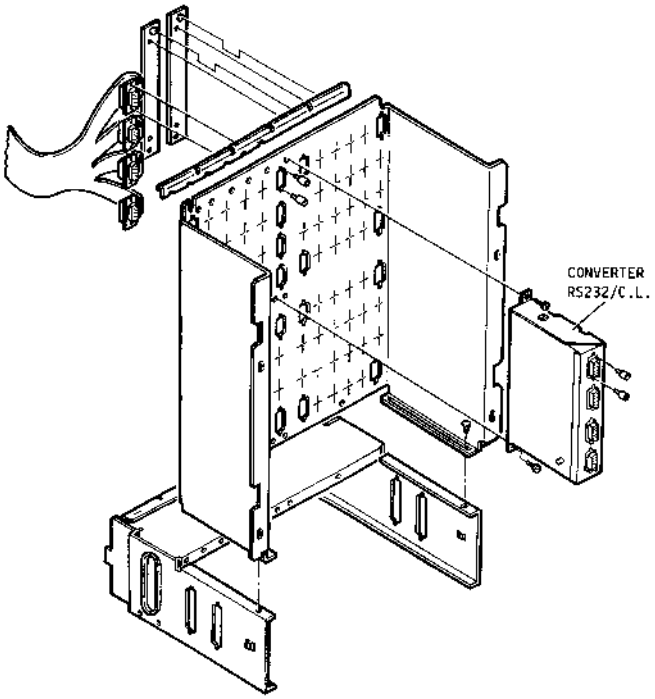


Fig. 2-15 RS232/Current Loop Converter and Support

2.2.14 C-BOX DISASSEMBLY AND ASSEMBLY

Disassembly

See figure 2-16 and 2-2.

1. Remove the SBO rear panels.
2. Disconnect any cables connecting into C-BOX.
3. Unscrew the two screws securing the C-BOX connector to the line controller and remove connector.
4. Unscrew the three screws securing the C-BOX to the support plate.
5. Remove the C-BOX support plate, unscrewing the four screws securing it to the frame.
6. Remove the four spacers from the frame.

Assembly

To assemble the C-BOX, reverse the disassembly operations described above.

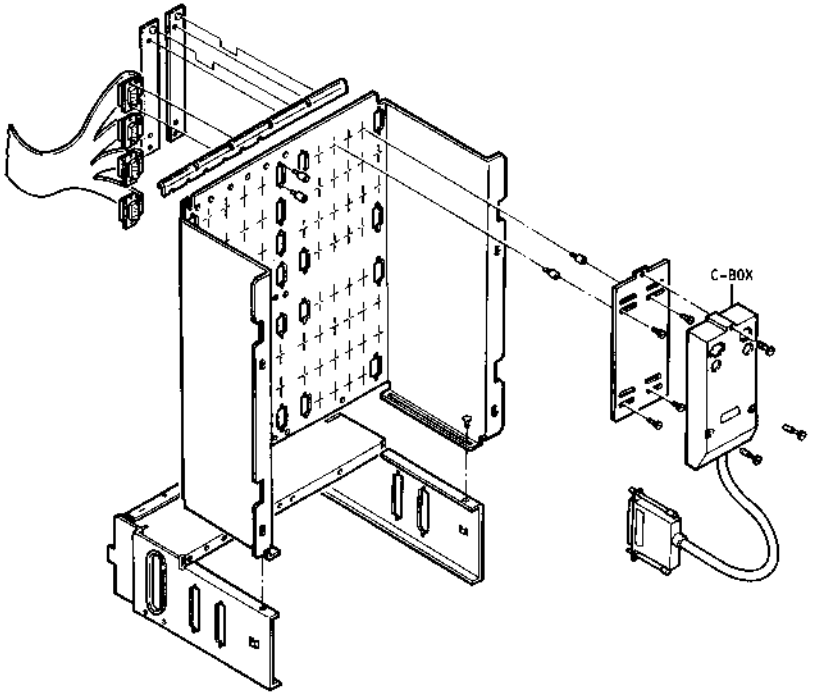


Fig. 2-16 C-BOX and Support

2.2.15 DISASSEMBLY AND ASSEMBLY OF 11-SLOT BACK PLANE IN087

Disassembly

1. Remove the SBO front panel and left side panel (see 2.2.1).

2. Remove all 3000 and 8000 type boards in the system.

3. Remove the SBO rear panels.

4. Remove all D-BOX connectors connected to the 4-way MUX for systems with MOS operating system.
   For systems with UNIX operating system, remove all RS232/Current Loop adapters and respective D-shell connectors connected to 16-way MUX (OLICOM).

5. Remove any C-BOX connectors connected to their line controllers.

6. Unscrew the four screws of the D-BOX or RS232/Current Loop adapters and C-BOX support frame and loosen the four securing screws (see figure 2-17).

7. Pull back the D-BOX or RS232/Current Loop adapters support frame.

8. Disconnect the three red +5 V power supply cables and the three black ground cables (see figure 2-19) on the left of the SBO (see figure 2-18).

9. Remove the 2x1 way, ±12 V line voltage, AMP MODU I connector in position beside the power supply cables (see figure 2-18).

10. Disconnect the 4x1 way, AMP MODU II connector of the RESET and POWFA signals in position beside the power supply cables (see figure 2-17).

11. Unscrew the screws (12) securing the back plane to the casing and remove the back plane.

Assembly

To assemble the back plane, reverse the disassembly operations describe above.

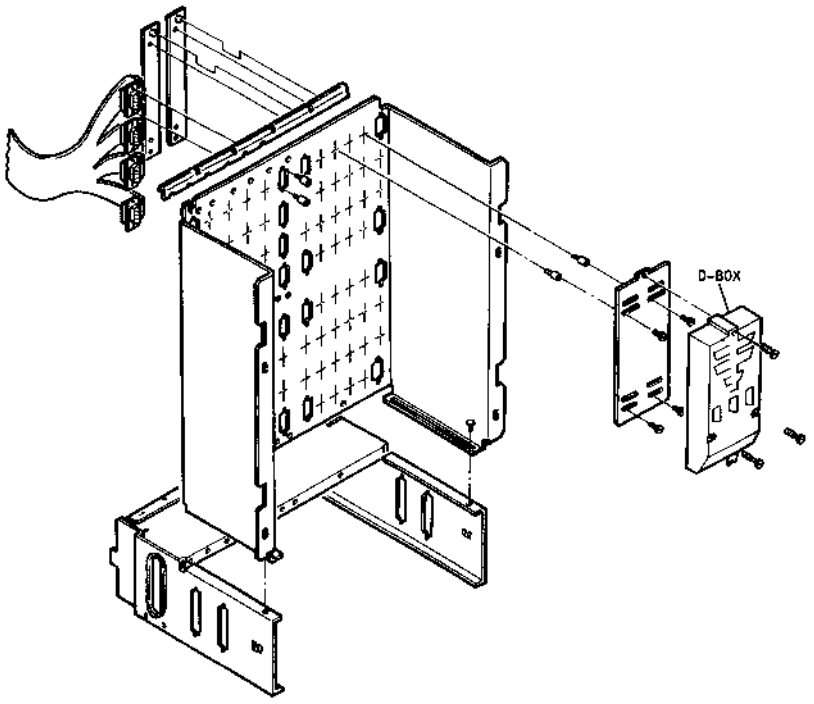


Fig. 2-17 D-80X or RS232/Current Loop Adapter Support Frame

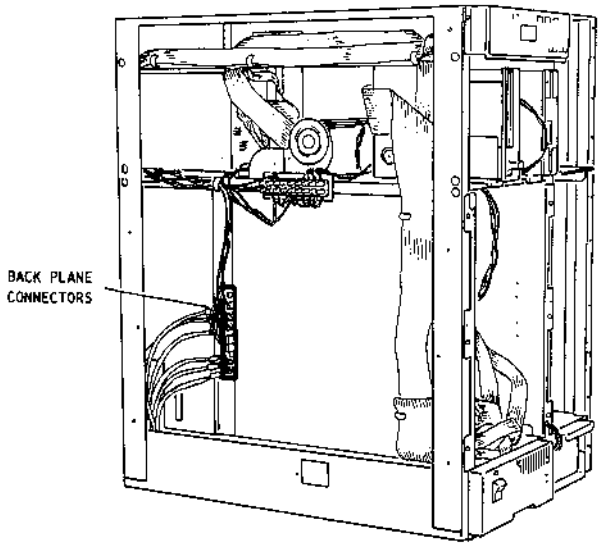


Fig. 2-18 Position of BACK PLANE Connectors on System Frame

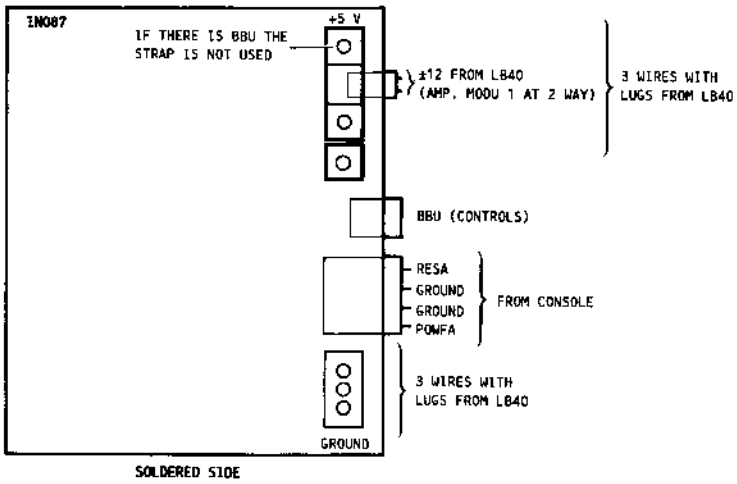


Fig. 2-19 Rear View of BACK PLANE and Connectors

2.2.16 DISASSEMBLY AND ASSEMBLY OF 16-SLOT BACK PLANE IN088

Disassembly

1. Remove the SB0 front panel and left side panel (see 2.2.1).

2. Remove the SB1 front panel and right side panel (see 2.2.2).

3. Remove all 3000 and 8000 type boards from the SB0 and SB1 cabinets.

4. Remove the SB0 rear panels and the SB1 rear panel.

5. Remove all the D-BOX connectors connected to the 4-way MUX for systems with MOS operating system.
   For systems with UNIX operating system, remove all RS232/Current Loop adapters and respective D-shell connectors connected to 16-way MUX (OLICOM).

6. Remove any C-BOX connectors connected to their controllers.

7. Unscrew the four screws of the D-BOX or RS232/Current Loop adapters and C-BOX support frame and loosen the four securing screws (see figure 2-17).

8. Pull back the D-BOX or RS232/Current Loop adapters support frame.

9. Disconnect the three red +5 V power supply cables and the three black ground cables (see figure 2-21) on the left of the SB0 (see figure 2-20).

10. Disconnect the three red +5 V power supply cables and the three black ground cables (see figure 2-21) on the right of the SB1 (see figure 2-20).

11. Remove the 2x1 way, ±12 V line voltage, AMP MODU I connector in position beside the power supply cables on the left of the SB0 (see figure 2-21).

12. Disconnect the 4x1 way, AMP MODU II connector of the RESET and POWFA signals in position beside the power supply cables (see figure 2-21).

13. Unscrew the screws (20) securing the back plane to the casing and remove the back plane.

Assembly

To assemble the back plane, reverse the disassembly operations describe above.

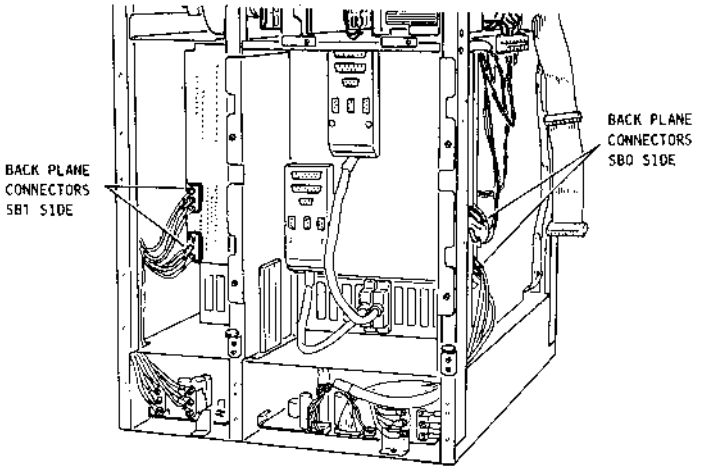


Fig. 2-20 Position of BACK PLANE Connectors on System Frame

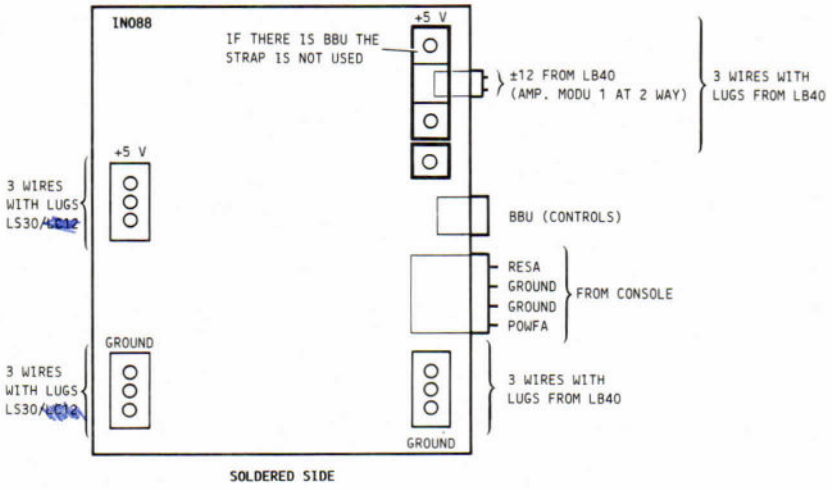


Fig. 2-21 Rear View of BACK PLANE and Connectors

2.2.17 DISASSEMBLY/ASSEMBLY OF MAINS GROUP ON SB0 CABINET

Disassembly

See figure 2-22

1. Remove the front panel (see section 2.2.2).
2. Unscrew the screws securing the mains group to the frame.
3. Remove the following connectors:
   a) Mains 110/220 V (3 brown, green, yellow-green wires).
   b) Floppy power in SB1 (for OPE 8" floppy).
   c) SB0 fan power.
   d) Fan and mains group for SB1 cabinet on LSX 3020 with 16 board slot BACK PLANE.
4. AMP MODU 1, 2x1 way connector for fan switch-on from console.
5. Remove the mains box by pulling outwards (there are no guides).

Assembly

To mount the mains group, reverse the disassembly operations described above.

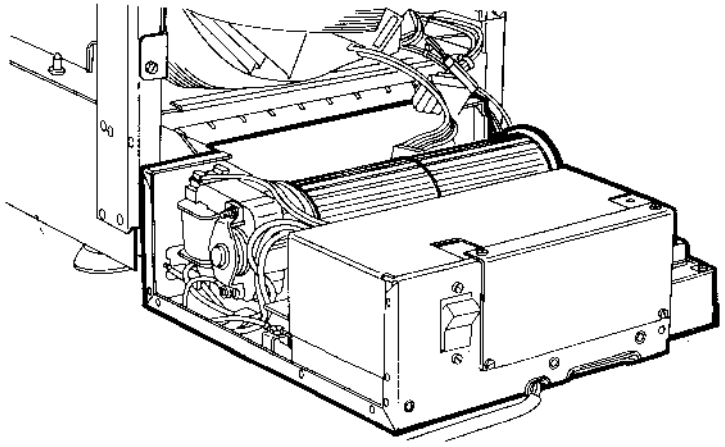


Fig. 2-22 Mains Group on SB0 Cabinet

2.2.18 DISASSEMBLY/ASSEMBLY OF MAINS GROUP ON SB1 CABINET

Disassembly

See figure 2-23

1. Remove front panel (see section 2.2.2).
2. Unscrew screws securing mains group to frame.
3. Remove mains 110/220 V connector (3 brown, yellow, yellow-green wires) and other relative supply connectors (see figure 2-24).
4. Remove mains box by pulling outwards (there are no guides).

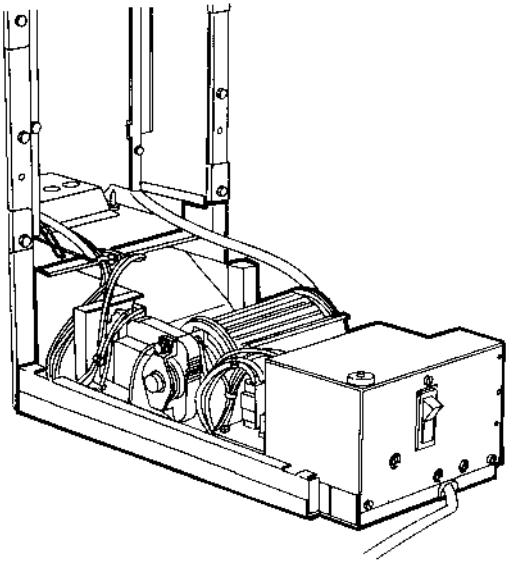


Fig. 2-23 Mains Group on SB1 Cabinet

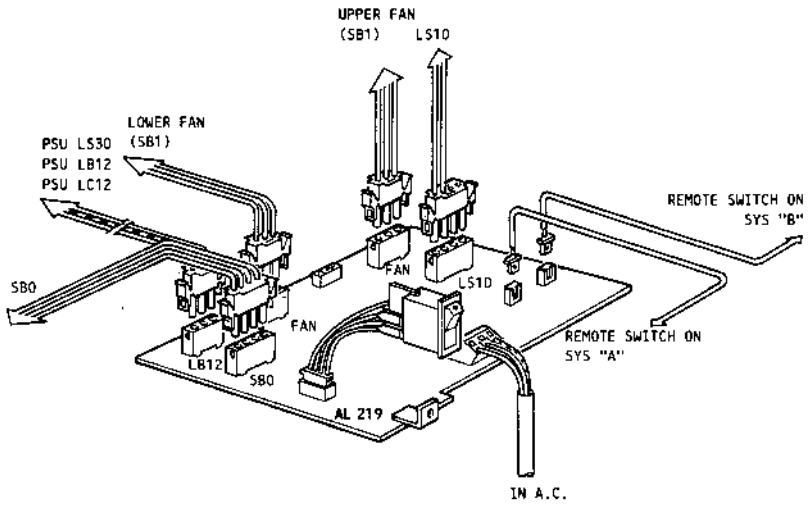


Fig. 2-24 Mains Group Connectors in SB1

2.2.19 INSTALLATION OF SB1 CABINET

The procedure to attach SB1 cabinet to SB0 cabinet is as follows:

1. Remove the SB0 and SB1 upper shelves (see section 2.2.1 and 2.2.2).

2. Remove the SB0 right side panel (see section 2.2.1).

3. Unscrew the terminals on the SB0 frame lower right (see figure 2-25) and mount them on the bottom right of the SB1.

4. Set the SB1 and the SB0 side by side and secure by tightening the two screws on the upper protrusion of the SB0 and the six internal screws.

5. Replace the upper shelves and the right side panel (removed from the SB0) on the SB1.

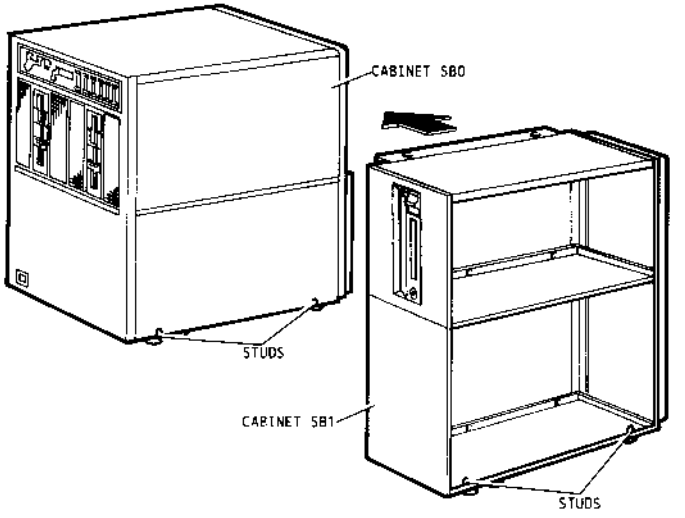


Fig. 2-25 Front View of SB0 and SB1 Frames

2.2.20 DISASSEMBLY/ASSEMBLY OF REMOVABLE PERIPHERAL ON SB1

Disassembly

See figure 2-26 and paragraph 2.2.2.

1. Remove shelf and front panel of SB1.
2. Remove SB1 side panel.
3. Unscrew the two screws securing the peripheral to the frame.
4. Disconnect the signals/data flat cable on the peripheral rear.
5. Disconnect the power cable coming from the DC/DC converter DCA 36/524 (6-way orange connector) on the right-hand side of the peripheral.
6. Disconnect the power (220 V) cable from the terminal strip on the top part of the peripheral and which is accessed through the slot on the upper shelf of the SB1 cabinet (the slot is normally covered by a plate screwed to the SB1 frame).
7. Remove the peripheral by sliding it along its rails.

Assembly

To mount the peripheral, reverse the disassembly operations described above.

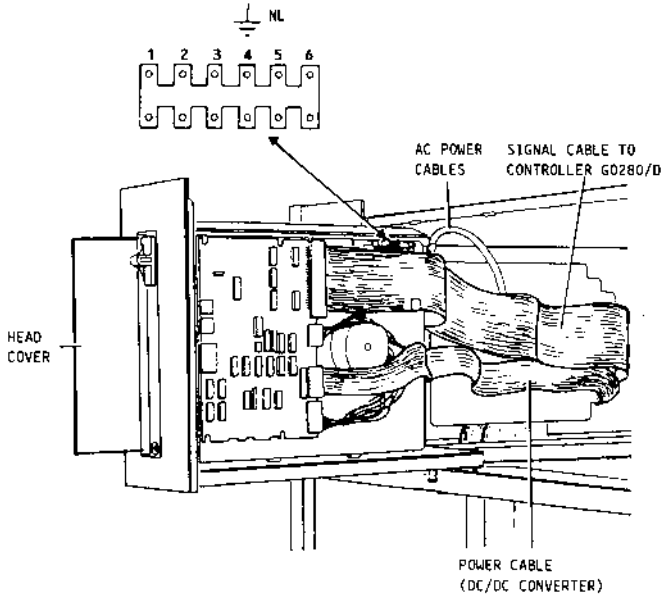


Fig. 2-26 Peripheral Unit on S81 Cabinet

2.2.21 DISASSEMBLY AND ASSEMBLY OF FIXED PERIPHERALS ON SB1

Disassembly

See figure 2-27

1. Remove front or rear panel (depending on whether peripheral is one on front or at back) and right side panel (see 2.2.2).

2. Remove the peripheral unit shield grid.

3. Unscrew the two screws securing the peripheral to the frame.

4. Disconnect the peripheral unit power supply connector coming from the LS10 power supply.

5. On the SB1 right hand side, disconnect the small, data flat cable (one for each peripheral) from the HDU controller (OLIDISK ESDI).

6. On the SB1 right side, disconnect the small, commands flat cable (one for each peripheral) from the HDU controller (OLIDISK ESDI).

7. Take out the peripheral, sliding it along its guide rails.

Assembly

To mount the peripheral, reverse the disassembly operations described above.

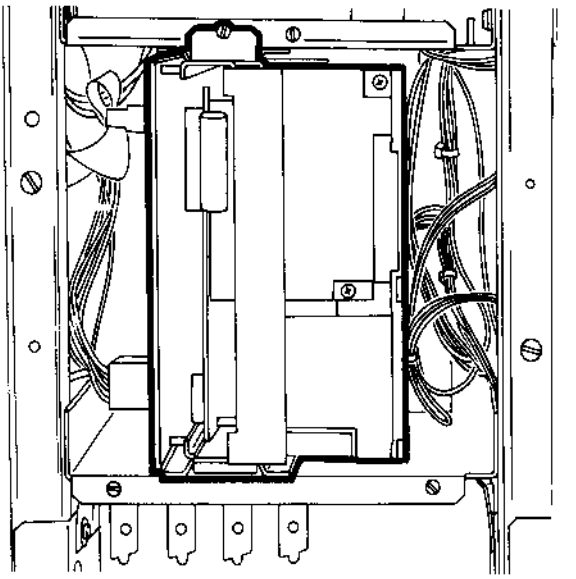


Fig. 2-27 Fixed Peripheral Units seen from Rear

2.2.22 INSTALLATION OF CABINET FOR MTU (SB2)

There are no particular installation conditions for this module. The main operations to be performed are:

1. Check power cables are connected correctly.

2. Connect cables from controllers to relative peripherals.

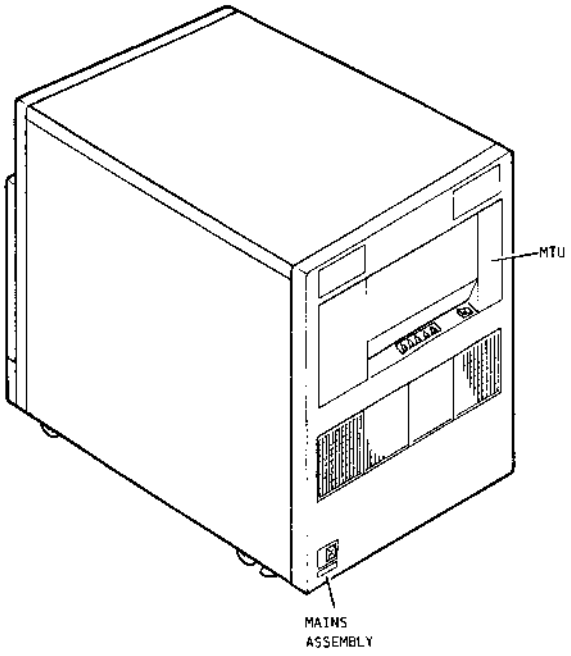


Fig. 2-28 SB2 Cabinet Front

2.2.23 INSTALLATION OF CPU BOARDS FOR LSX 3020 AND LSX 3030/40 SYSTEMS

Disassembly

1. Remove the upper panel and the front panel of the SBO cabinet.

2. Remove the console signals connector from the CPU board UC068 in logic position "two", located in the third slot on the left of the SBO cabinet for the LSX 3020 UNIX monoprocessor system, In the LSX 3020 MOS the CPU has the first logic position and second physical position after OLIDISK.

3. **For LSX 3030 and LSX 3040 multiprocessor systems only.**
   Remove the flat connector for connection of CPU board located on the right of the first CPU board (one for the LSX 3030 and two for the LSX 3040).

4. Remove the 8000-type CPU board UC068 by pulling it out of the rack.

Assembly

To mount the CPU board, reverse the disassembly operations described above.

For LSX 3030 and LSX 3040 multiprocessor systems only

For LSX 3030 and LSX 3030 multiprocessor systems, connect the CPU boards as shown in figure 2-29 using the flat cable illustrated in figure 2-30 and jump connect as required.

Note: The CPU board UC068, the flat cable and the system name plates are part of the kit APU 8022.

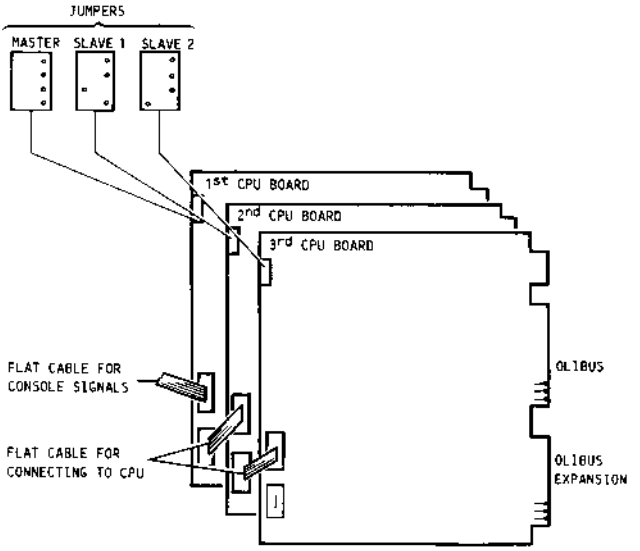


Fig. 2-29 Connection of CPU Boards for Multiprocessor Systems

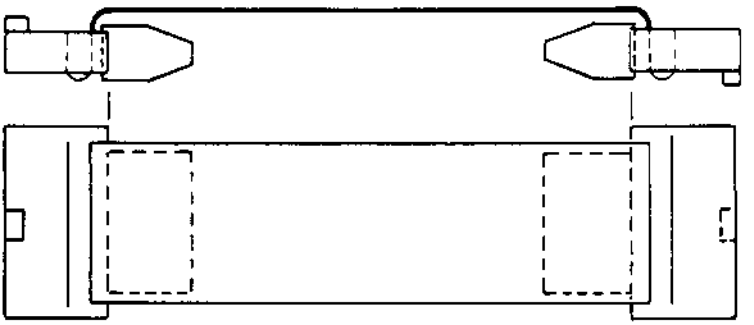


Fig. 2-30 Flat Cable for Connection of CPU Boards on Multiprocessor Systems

2.3 WORKSTATIONS

In the context of L2 line systems, there are workstations with UNIX operating system and workstations with MOS operating system. This section looks separately at the workstations for L2 LSX 3020 systems with UNIX and with MOS.

2.3.1 L2 LSX 3020 SYSTEM WORKSTATION WITH UNIX

The L2 LSX 3020 workstations with UNIX operating system are based on:

- 16-way multiplexer (OLICOM)
- RS232/Current Loop converter
- Work Station 685 or PC.

The elements which together make up a functional UNIX workstation are examined individually below.

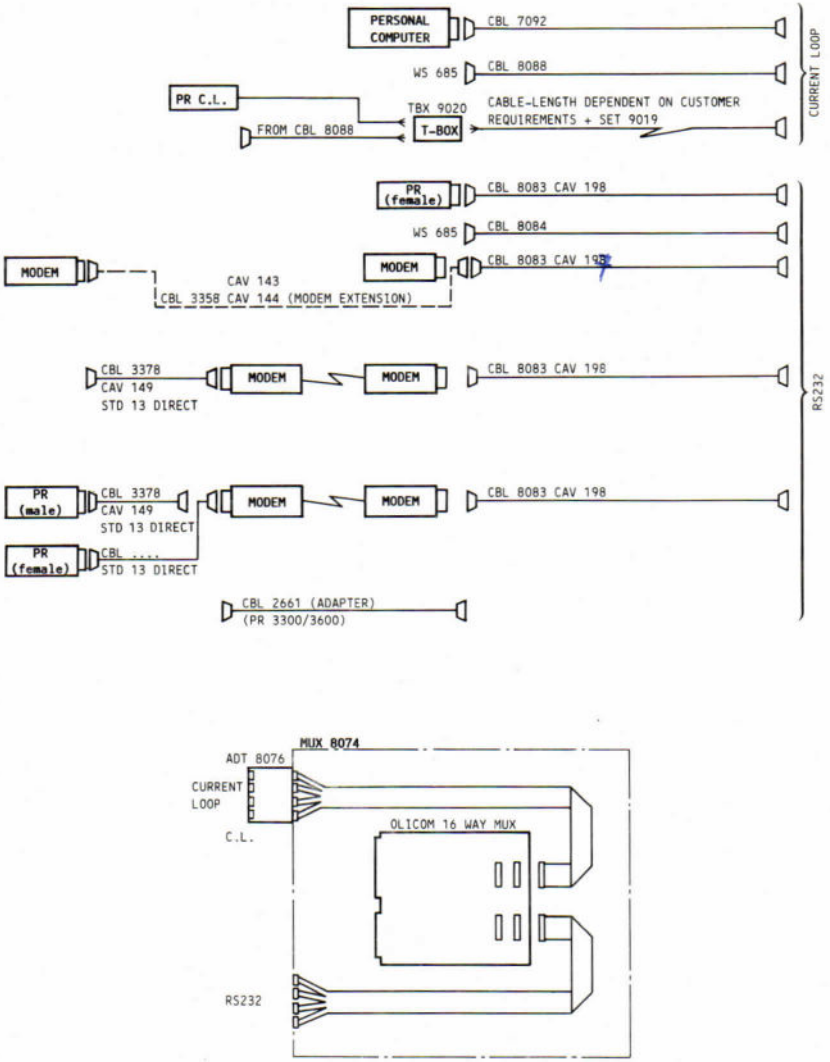


Fig. 2-31 UNIX Workstation General Diagram

2.3.2 16-WAY MULTIPLEXER CONTROLLER (OLICOM)

This is an intelligent module capable of handling 4 channels for a total of 16 ways with RS232.
Connection between this controller and the peripherals it handles is by way of an RS232 to Current Loop adapter.

2.3.3 RS232/CURRENT LOOP CONVERTER

This is an RS232 to Current Loop interface converter device inserted between 16-way Multiplexer (OLICOM) and workstation based on WS 685 or PC with Current Loop interface. One device is required for each channel of the multiplexer (OLICOM handles up to 4 channels) and each device handles a maximum of four peripheral units.

The adapter is mounted on a frame on the rear of the SB0 or SB1 cabinet.

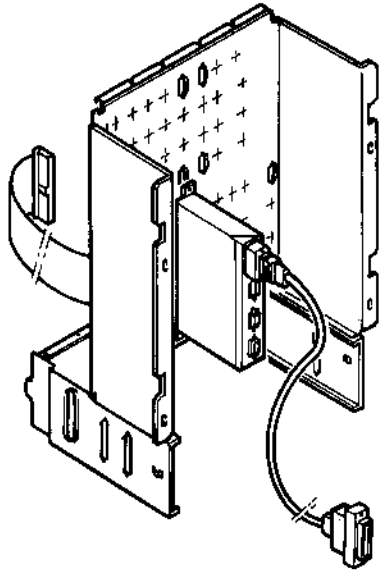


Fig. 2-32 RS232/Current Loop Adapter Support Frame on SB0

2.3.4 WORK STATION 685

The Olivetti video terminal WS 685 is a multiprocessor-controlled, input/output peripheral unit used in all UNIX environment applications. It can function in both full and half duplex and in the following modes - conversational, block, on line transmission or local. The terminal consists of three main sub-modules - video display unit, keyboard and base. The base unit contains the circuitry for the terminal interface and data communication functions. Interfaces handled by the WS 685 are:

Primary port - serial port, RS232C or Current loop standard
Auxiliary port - serial port, RS232C standard

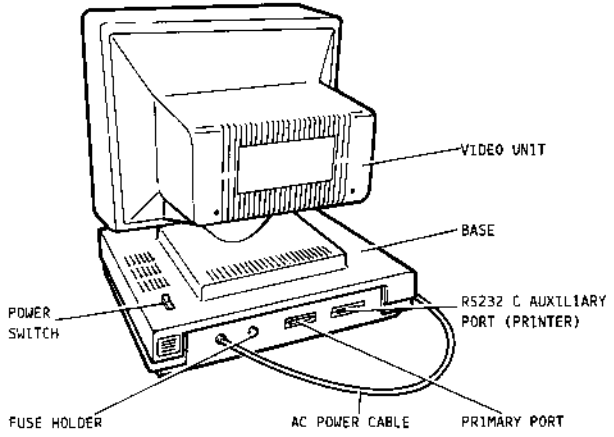


Fig. 2-33 WS 685 for L2 LSX 3020 Systems, UNIX Version

2.3.5 L2 LSX 3020 WORKSTATION WITH MOS

The L2 LSX 3020 workstations with MOS operating system are based on the following:

- Multiplexer controller GO 322
- Distribution box D-BOX
- Electronics box EL8 3684 or PC
- Current Loop/RS232 connection line
- Galvanic separation box T-BOX (TBX 9020).

The elements which together make up a functional MOS workstation are examined individually below.

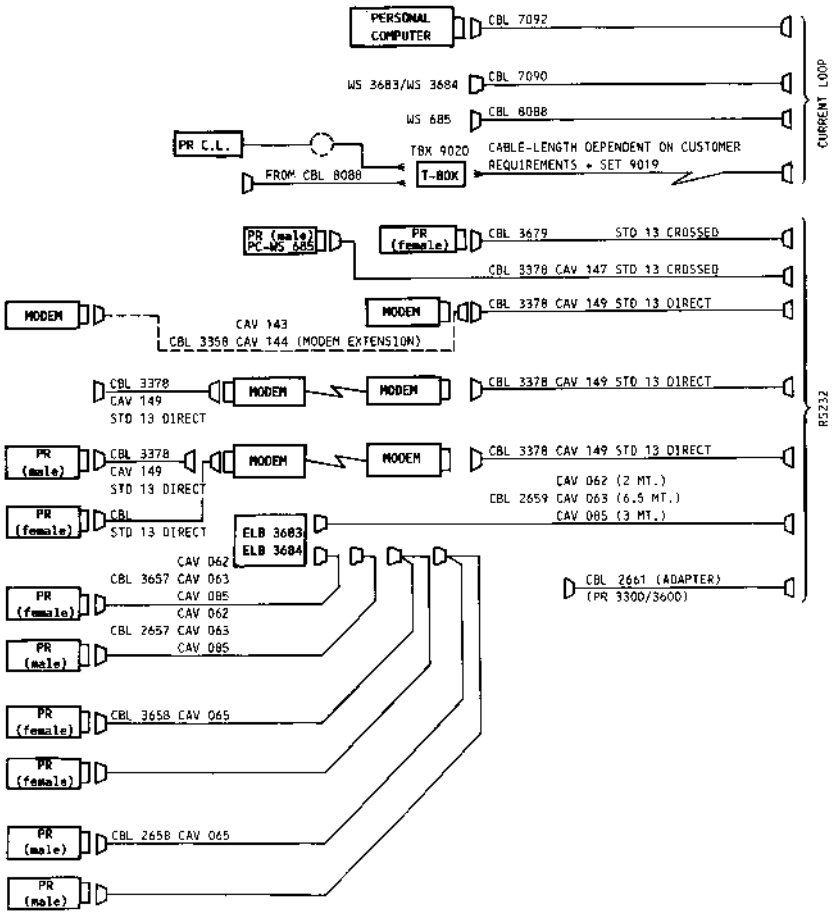


Fig. 2-34 MOS Workstation General Diagram

2.3.6 MULTIPLEXER CONTROLLER

This is an intelligent module, capable of handling 4 full duplex connections at speeds of up to 19,200 baud and transfer rate of up to 76,800 bits/sec.
Its interfaces are the "20 mA Current Loop" and "RS 232 C".
All connections between this controller and peripherals are by way of the D-BOX device.

2.3.7 DISTRIBUTION BOX D-BOX

This is a passive device connecting the system multiplexer controller to the different peripherals; in other words, it "distributes" connections (RS 232 and/or Current Loop) to the peripherals.
It is mounted on a frame (on the rear of the SBO cabinet) supporting up to a maximum of 8 D-BOXes.

It also has a cable 30 cms. long with, at one end, a connector plugging into the MUX board.

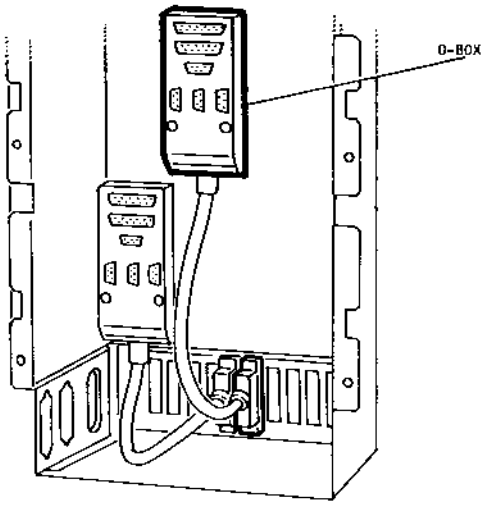


Fig. 2-35 D-BOX Support Frame on SBO Cabinet

2.3.8 ELECTRONICS BOX ELB 3684

This intelligent module is the central element of the workstation and consists of:

- COMPOSITION:
  - Power supply unit LG03
  - Electronics mother board BA126
  - Pin pad and badge reader optional board G0329
- EXCHANGE WITH SYSTEM: serial, point to point, asynchronous, free running, via multiplexer controller
- INTERFACES WITH SYSTEM:
  - 20 mA Current Loop for distances of up to 1 km
  - RS 232 C for distances of up to 15 metres
- INTERFACES WITH PERIPHERALS:
  - Display/Keyboard interface
  - Two RS 232 C interfaces
  - Two TTL interfaces.

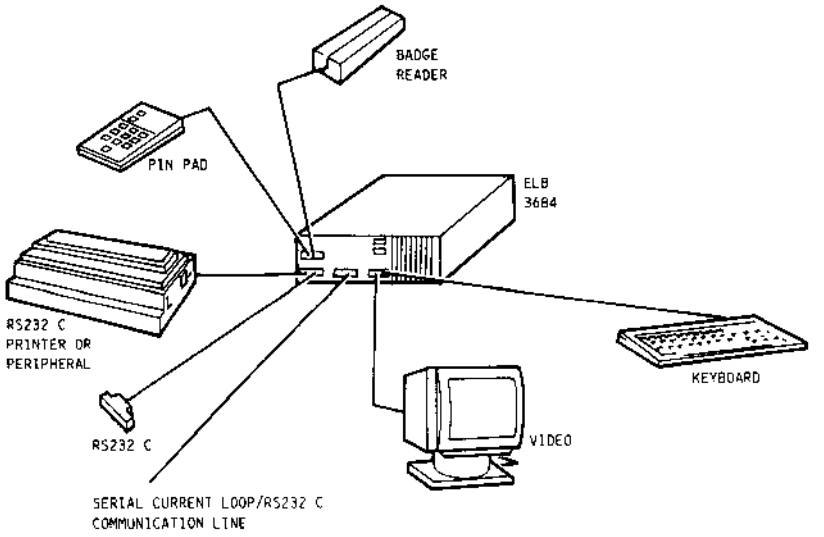


Fig. 2-36 Diagram of Connection between ELB 3684 and Peripherals

Installation of ELB 3684

The ELB 3684 has a felt-padded base and a cooling fan.
In its workstation context, the ELB may either be set on a table or in a semi-enclosed housing; however, in both cases, a free supply of air must be guaranteed. The ELB 3684 does not have any holes on its upper cover to take a monitor.

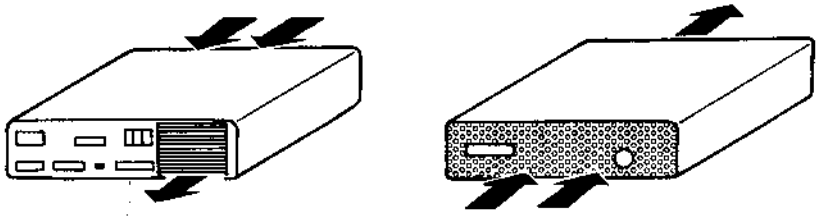


Fig. 2-37 ELB 3684 Ventilation

To remove the ELB 3684 casing, the securing screws on the rear panel must first be slackened and the casing pulled slightly forward so that it can then be turned over backwards and lifted off the base of the ELB without damaging the copper earth springs in the framework contact zones.

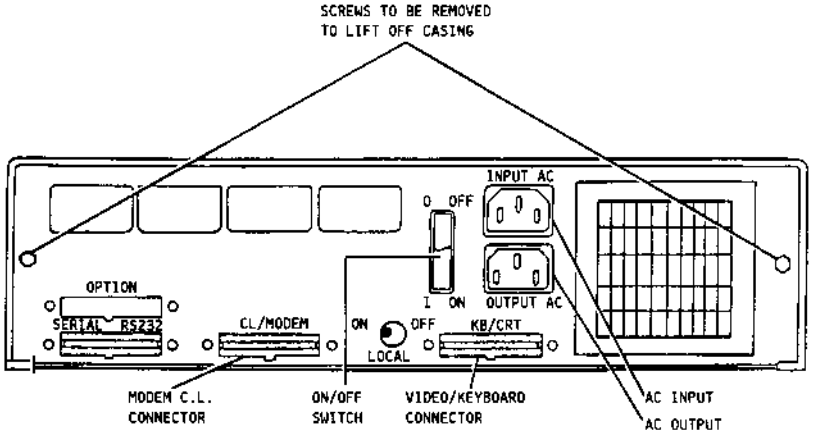


Fig. 2-38 Removing the ELB 3684 Casing

Assembly of the pin pad and badge reader option board G0329

To mount the pin pad and badge reader option board in the ELB, the procedure is as follows (see also figure below):

- Remove the ELB 3684 casing as described earlier
- Mount the option board, securing it to the motherboard BA126 with the screws and spacers shown in the figure
- Connect the option board to the motherboard and the power supply unit via the 40-way flat cable, plugging into the J124 connectors of BA126 and G0329.

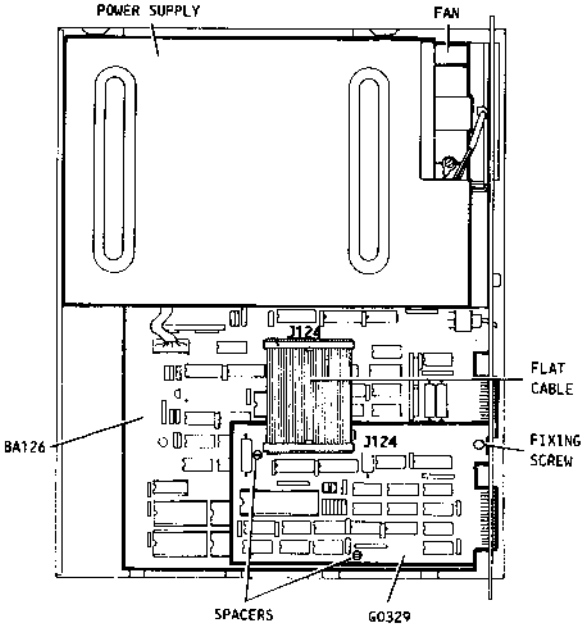


Fig. 2-39 Assembly of Pin Pad and Badge Reader Option Board

Power supply assembly

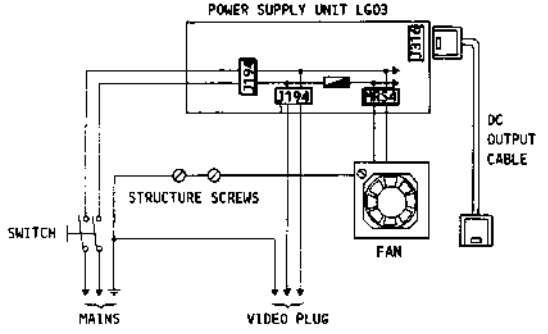
The power assembly LG03 is contained in a sheet metal structure including the fan, switch, power plug and video socket. The assembly is in two parts:

- Electronics board
- A.C. distribution.

The electrical characteristics of the electronics board, which also includes the mains filter, are:

- Frequency: 50-60 Hz ±5%
- Jumper-selected mains voltage: 100-120 V or 220-240 V
- Power absorption: 50 VA
- Power raised: 35 watt.

How the alternating current is distributed is illustrated in the figure below:



CONNECTOR J316		
1	+5 V	RED
2	+5 V	RED
3	M	BLACK
4	M	BLACK
5	+12 V	ORANGE
6	-12 V	ORANGE

Fig. 2-40 ELB 3684 A.C. Distribution

2.3.9 CURRENT LOOP AND T-BOX CONNECTION LINE

For a Current Loop type connection between system and ELB 3684, for distances not greater than 10 metres from the D-BOX, the Current Loop standard cable CBL 7090 is used.
The twin leaf connector plugs into the connector marked 'CL/MODEM' on the ELB 3684; the other end goes into one of the four 9-pin connectors on the D-BOX, depending on the channel used.

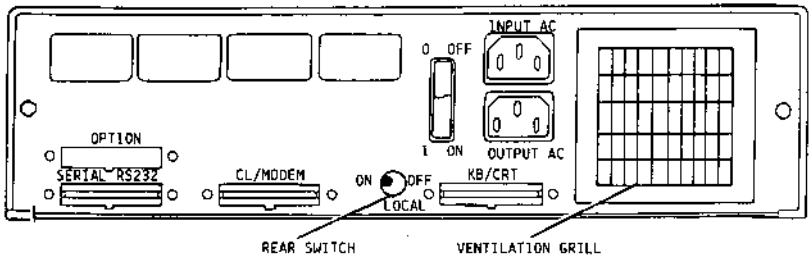


Fig. 2-41 ELB 3684 Rear View

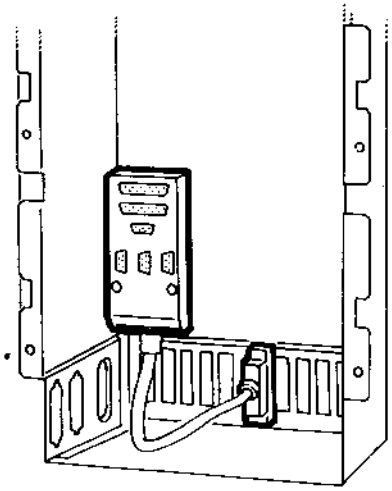


Fig. 2-42 D-BOX Front View

T-Boxes are inserted in remote connections of over 10 metres and also in shorter, local connections where the ELB 3684 and D-Box grounds are not of equal potential.
This has a dual purpose: a) it ensures galvanic separation between the shield grounds of the two devices and b), it acts as junction between the CBL 3610 cable and the quadripole, shielded AWG 24 D-Box connector cable. The cable connecting D-Box and T-Box can be 1 km in length and is available from "Gestione Ricambi" in reels of 500 metres.
The 4 ELB 3684 wires are connected to the T-Box as illustrated in the table below.

T-BOX TAGS	CBL 3610 CABLE
+T	R+ WHITE/BROWN
+R	T+ WHITE
-T	R- WHITE/RED
-R	T- WHITE/BLACK

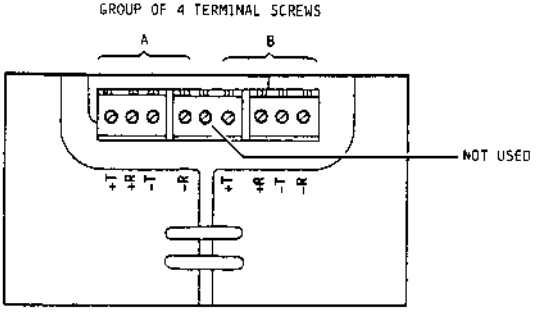


Fig. 2-43 T-Box Assembly View

The T-Box has two sets of 4 terminal posts each to which the ELB and D-Box devices may be connected indifferently.
D-Box and T-Box are interconnected in the same way as seen earlier for connection of the D-Box to the ELB, and as is now shown in the next figure.

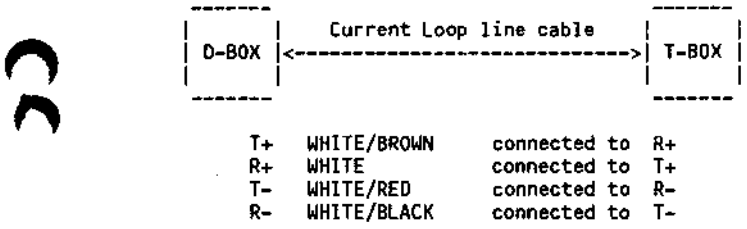


Fig. 2-44 Connection between D-Box and T-Box

On the T-BOX side, the cable wires are connected to the T-BOX terminals which are accessed only after the device cover is removed while on the D-BOX side, there is a 9-way, D-shell connector plugged directly into one of the four "Current Loop" connectors on the D-BOX (depending on the channel).

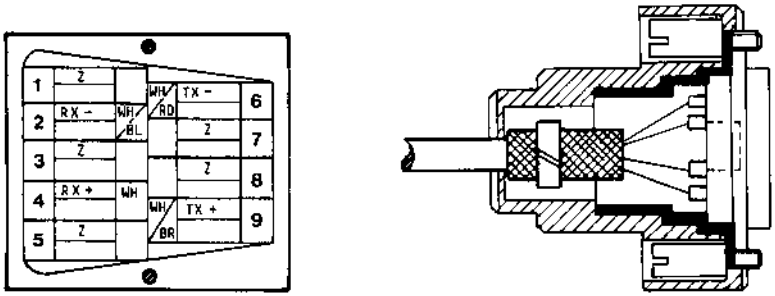


Fig. 2-45 9-way D-shell Connector and Cable Connections

T-Box installation

The T-BOX is set at a maximum distance of 10 metres from the ELB 3684 and is secured to the wall or floor by wedge-type pressure screws.
The holes are 4.5 mm in diameter and are at a distance of 49 mm, centre to centre.
The T-Box can only be secured after the cover is lifted off and the printed circuit removed as shown in figure.

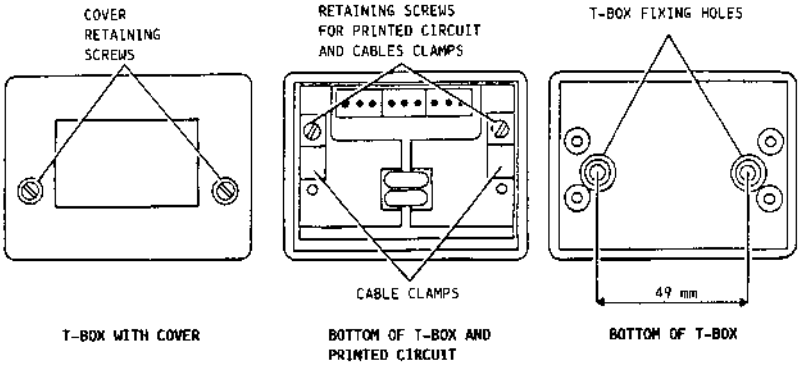


Fig. 2-46 Disassembly of T-Box

6.10.2 CAVO CURRENT LOOP (ELB 3684)

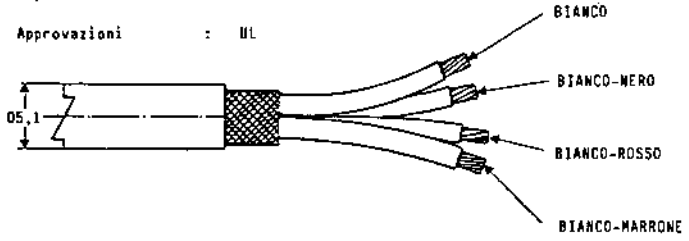
DESCRIZIONE

Cavo quadripolare schermato flessibile, composto da quattro conduttori in rame elettrolitico ricotto stagnato, isolati e inseriti in una calza schermante in rame e una guaina isolante grigia.

CARATTERISTICHE

Rame elettrolitico	:	Cu – ETP UNI 5649
Resistività	:	0,017094Ω mm^2/m
Style	:	2448
Approvazioni	:	UL

Codice	Ind.
5731315 Q	



Se si presenta la necessità di giuntare il cavo Current Loop, la soluzione consigliata è la seguente:

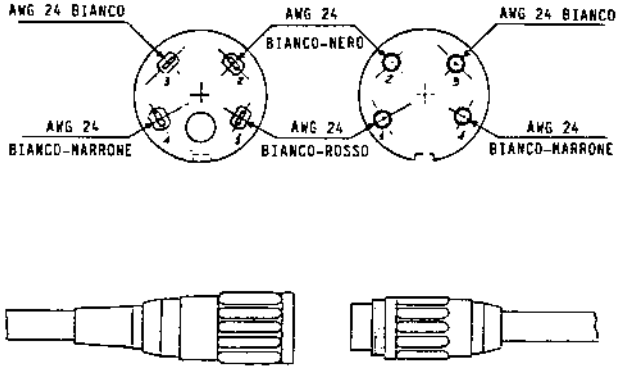


Figura 6-10 Descrizione cavo Current Loop

2.4 INSTALLATION OF LINES

Some general points are given below and apply to all types of line.

The cable must not be positioned close to electric power devices which could cause harmful electromagnetic interference. Such noise sources are:

- Electric lighting systems (neon lights in particular).
- Energy generators and distributors, such as transformers and alternators.
- Air conditioner motors, elevators and large fans.
- Radio and TV transmitters.
- Signal generators, communications and safety systems.

Another factor influencing line noise level is the distance the line runs parallel to the noise source.

The table below gives the minimum distance the line is to be kept from the noise source in relation to the distance they run parallel.

IN PARALLEL	MINIMUM DISTANCE BETWEEN LINE CABLE AND NOISE SOURCE
from 0 to 100 m	10 cm
over 100 m	0.30 - 0.50 cm

Note: When a line cable and an a.c. cable cross over, they must be kept 15 cms. apart.

The line must also be guaranteed adequate mechanical protection in the more exposed zones of the installation, such as particularly busy passageways. Here, the use of cable ducts is strongly recommended.

2.4.1 ETHERNET LOCAL NETWORK

The Ethernet local network uses a co-axial cable with characteristic impedance of 50 ohm to link the systems (nodes) by way of transceivers. The main considerations for network configuration are:

- Co-axial cable segments must not exceed 500 metres in length and must have a terminator resistor of 50 ohm, or the same as the characteristic line impedance.

- Up to 100 nodes, a minimum of 2.5 metres apart, can be connected on any one cable segment.
  As seen in figure, systems are connected to the network by a receive/ transmit cable and a transceiver supplied with cable.

- Repeaters are used to interconnect Ethernet segments.
  There may not be more than two repeaters between any two nodes. A repeater has to be connected to a transceiver (node position) on both segments it connects and, by regulation, it must have local a.c. power supply.

- Maximum length of the transceiver cable (from a transceiver to a control unit) is 50 metres.

- The network extends to a maximum of 2800 metres, as outlined below:

  . Five 500 metre segments (total: 2500 metres)

  . 100 metres per repeater (2 repeaters = 200 metres)

  . 50 metres per system (2 machines in end positions = 100 metres).

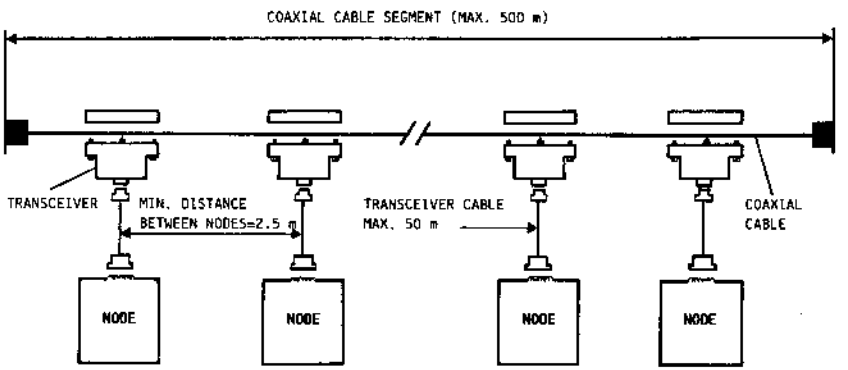
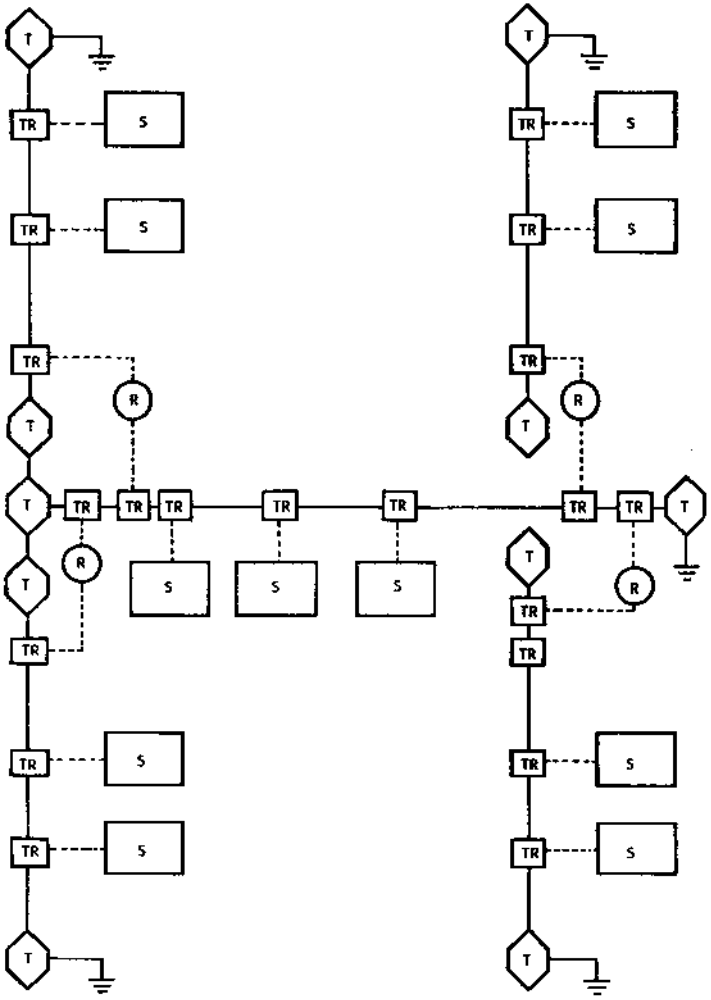


Fig. 2-47 Ethernet Segment Configuration



KEY: R = Repeater
S = System (node)
T = Terminator
TR = Transceiver

Fig. 2-48 Ethernet Network Extended Configuration

3. POWER SUPPLY

3.1 GENERAL

This chapter deals with the power supply for LSX 3020 systems.
It includes the following:

- Characteristics of primary power supply LB40.
- Characteristics of expansion power supplies LS30, LC12 and LS10.
- Characteristics of DC/DC converters DCA 36/512 and DCA 36/524.
- Diagrams of a.c. distribution in the SB0 and SB1 cabinets.
- A table showing power absorption figures for the hardware modules.

3.2 LB40 POWER SUPPLY FOR LSX 3020 SYSTEMS

3.2.1 A.C. INPUT CHARACTERISTICS

The electrical input characteristics of the LB40 power supply on LSX 3020 systems are:

1. Single phase alternating current at the following rated voltages: 100-120 Volts or 200-240 Volts (on the LB40, the power voltage is selected by way of jumpers which can be seen in the power supply board diagram).
2. Permanent input voltage variations: +10% and -15%, giving the following operating voltage ranges, 85 - 132 Volts and 170 - 264 Volts respectively.
3. Nominal frequency: 45 Hz to 65 Hz.
4. Frequency variations: ± 5%.
5. Maximum input voltage 110% of the rated max. value (132 or 264 V). For voltages of 110% to 120% of the rated max. for a period of not more 5 seconds, there is no permanent damage to the power supply.
6. Maximum mains impedance: 0.4 + J0.25 ohm.
7. Input/output isolation: 1650 V.
8. Maximum inrush current: 25 A peak for first cycle.

9. Mains failures: the LB40 is unaffected by mains failures of 100% for 0.5 cycles and of 30% for 25 cycles at the minimum rated voltage.

3.2.2 LB40 OUTPUT CHARACTERISTICS

The LB40 is to be found in the lower part of the SBO cabinet and consists of two power supplies:

- Auxiliary power supply
- Main power supply.

AUXILIARY POWER SUPPLY

Used to power the console with an output voltage of +5 V; also provides a +16V voltage for for the power supply internal needs and the expansion LB12.

The auxiliary power supply can be switched on only through the general system switch.

The +5 V voltage is regulated in the test phase through a potentiometer, which is accessed from the output connectors side (see power supply board figure).

The table below gives the auxiliary power supply output characteristics:

VOLTAGE [V]	TOLERANCES	RIPPLE PP. [mV]	Imin [A]	Imax [A]	Pmax [W]
+ 5	± 5%	50	2.5	2.5	12.5
+16	± 6%	-	-	0.3	4.8

The +5 V voltage of the auxiliary power supply is protected against overvoltages by a crowbar SCR; following intervention of this mechanism, the power supply is restored to operation by switching on and off at the general system switch after the cause of the overvoltage is removed.

If there is an overload or a short circuit on any one of the output voltages, the power supply switches off automatically without suffering damage.
Operation is restored in the same way as described above following intervention of the overvoltage protection.

MAIN POWER SUPPLY

This power supply is switched on if the auxiliary power supply is on and the control signal "PONOFF" activated by the console is present so that, when the general system switch is closed, the auxiliary power supply is always operating but the main power supply only comes on after the "PONOFF" signal is received from the console. The +5 V voltage is regulated through a potentiometer close to the output connectors (see power supply board figure) and the ± 12 V voltages are regulated in function of the +5 V.

3.2.2.1 Output Characteristics

The main power supply output characteristics are given in the table below:

Voltage [V]	Tolerances	Ripple p.p. max. [mV]	CURRENT			Power max. [W]
			min. [A]	max. [A]	peak [A]	
+ 5	- 1 % + 5 %	50	6.00	40.0	-	204.0
+ 12	± 5%	100	0.02	1.4	-	16.8
- 12	± 5%	100	0.02	1.4	-	16.8
+ 35	± 10%	300	0.00	4.1	6.0 5.0 4.5	145.0

Absorption peaks on the +35 have the following maximum duration:

6.0 A	- 0.5 s	on power-on
5.0 A	- 10.0 s	on power-on
4.5 A	- 0.5 s	random

Maximum continuous power raised is 350 W.

3.2.3 OUTPUT PROTECTIONS

Protections on the power supply outputs are:

- Overvoltage protection
- Overload and short circuit protection
- Switch-on delay protection
- Ventilation and thermal protection.

Overvoltage Protection
The +5 V voltage is protected against overvoltages by a crowbar SCR.

The power supply is restored to operation by opening and closing the system general switch after the causes of the overvoltage have been removed.

Protection against Overloads and Short Circuits
A short circuit or an overload on any of the output voltages results in the power supply switching off without any damage being caused.

Operation is restored in the same way as described for the overvoltage protection intervention.

Switch-on Delay Protection
A switch-on delay, or the time elapsing from when the system general switch is closed and the control signal ALIUP is raised, must not exceed 1.5 s. (provided that "ton" <= 0.5 s, where "ton" is the time occurring between generation of signal PWUP, with voltage in tolerance, and activation of PONOFF by the console); otherwise, the power supply will be blocked.

Ventilation and Thermal Protection
The power supply requires forced ventilation in normal operation.

Under stand-by conditions, where only the auxiliary power supply is operating, forced ventilation is not required, irrespective of the amount of time in stand-by.

Thermal protection is guaranteed by a PTC thermistor on the low voltage dissipator.

When temperature reaches critical point, the control signal DATE is raised; this signal is then read by the console which takes the necessary steps to switch off the main power supply.

3.2.4 CONTROL SIGNALS

The control signals are all optically isolated.
All signals are considered active in the presence of light.

ALIUP: When active, this signal indicates that the main power supply voltages (+5, +12, -12) are all above the minimum tolerance level.

Absence of any one of the conditions above results in the signal being de-activated.

PWUP: This signal is activated when the mains voltage is in tolerance; the signal is not de-activated for mains failures which the power supply can withstand.

PONOFF: Signal controlled only by the console.
When this signal is activated, the main power supply operates. When the signal is de-activated (mains voltage present), the power supply is in stand-by.

DATE: The signal is activated when the working temperature is below the critical temperature.

3.2.5 OUTPUT CONNECTION

The +5 V main logic ground voltages are strapped so that three cables can be screwed for each connection.

The +35 V output connection is through a 90 degree / 4-way MATE-N-LOK connector.

The group of +12/ -12/ 0 V./ aux. +5 control signals is connected through a 90 degree / 20-way (10x2) AMP MODU II connector.

The +12/ -12 connection is by way of a 90 degree / 4-way AMP MODU I connector.

Connection to the LS30 or LC12 expansion is through a 90 degree / 4-way AMP MODU II connector.

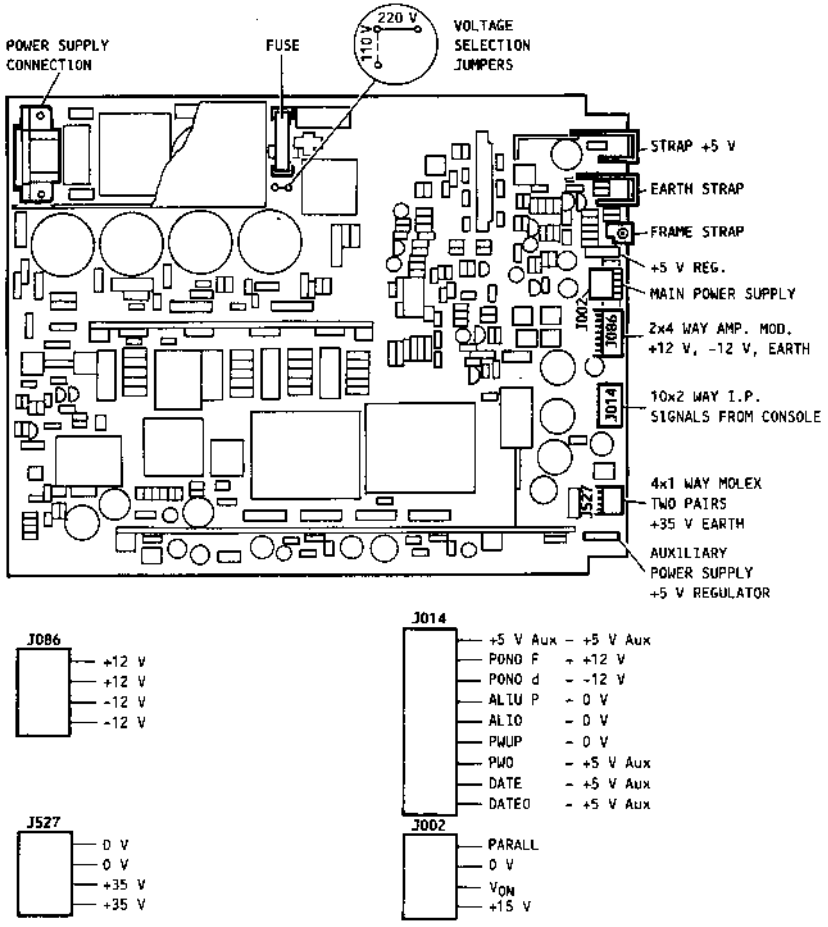


Fig. 3-1 LB40 Power Supply Board

3.3 EXPANSION POWER SUPPLY LS30 FOR LSX 3020 SYSTEMS

The LS30 power supply of max. power 300 W is a current generator used in parallel with the LB40 power supply to sustain the +5V load voltage.

Note: The LS30 is used on LSX 3020 systems only in configurations with 16 board slots and back plane IN088.

The maximum current supplied by the LS30 to back up the +5V voltage is 60A.

For its internal functions, the LS30 uses the signals coming from the LB40 auxiliary power supply. The auxiliary power supply also handles the parallel signal between the LB40 and LS30 to control the amount of current supplied by the latter; for this reason, the LS30 power supply may not be used alone.

3.3.1 INPUT CHARACTERISTICS

The LS30 power supply input characteristics are:

1. Single phase alternating current at the following rated voltages: 100-120 Volts or 200-240 Volts (on the LB40, the power voltage is selected by way of jumpers which can be seen in the diagram of the power supply board).

2. Permanent input voltage variations: +10% and -15%, giving the following operating voltage ranges, 85 - 132 Volts and 170 - 264 Volts respectively.

3. Nominal frequency: 45 Hz to 65 Hz.

4. Frequency variations: ± 5%.

5. Maximum input voltage 110% of the rated max. value (132 or 264 V). For voltages of 110% to 120% of the rated max. for a period of not more 5 seconds, there is no permanent damage to the power supply.

6. Maximum mains impedance: 0.4 + J0.25 ohm.

7. Input/output isolation: 1650 V.

8. Maximum inrush current: 25 A peak for first cycle.

9. Mains failures: the LB40 is unaffected by mains failures of 100% for 0.5 cycles and of 30% for 25 cycles at the minimum rated voltage.

10. Switch-on time: after being switched on at the mains, the power supply outputs the voltage when the control signals coming from the LB40 are active.

11. Input protection: a fuse responding to the local safety regulations in series with the power supply.

3.3.2 OUTPUT CHARACTERISTICS

The LS30 power supply outputs the +5 V voltage regulated at 5.6 V so that when set in parallel with the LB40 power supply +5 V, it acts as a current generator controlled by the LB40 itself.

The maximum current the LS30 can output is 25 A.

3.3.3 OUTPUT PROTECTIONS

The power supply output protections are:

- Protection against overloads and short circuits
- Overvoltage protection
- Thermal protection
- No load.

Protection against Overloads and Short Circuits
The LS30 power supply is protected against overloads and short circuits. If a short circuit occurs, output current remains limited to a value of just over 60 A; switching off is performed by the LB40.

Overvoltage Protection
The LS30 is protected against overvoltages; the protection is triggered for voltages in the 6.25 V (±0.5 V) range and causes the power supply block.

There is no crowbar SCR.

Thermal Protection
If working temperature reaches a critical point, the power supply switches off and remains blocked; a sensor on the output diodes dissipator is triggered at a temperature of 90 degrees Celsius.

Operation is restored following intervention of the thermal or overvoltage protection by de-activating and re-activating the voltage signal (Von) by switching the LB40 on and off at the mains.

No Load
Absence of load does not result in damage to the LS30.

3.3.4 PHYSICAL DIMENSIONS AND VENTILATION

The power supply, mains filter included, is on a single board of dimensions 126.5 x 323 mm and maximum height of 80 mm. It is cooled by forced ventilation.

3.3.5 CONTROL SIGNALS FOR THE POWER SUPPLY LS30

The LB40 and LS30 communicate on a master (LB40) - slave (LS30) basis by way of signals generated by the LB40. These signals are:

- +17 V power: the auxiliary voltage, reference the output ground, used to power the internal circuits; always present, even with the power supplies blocked following an output voltage anomaly or when in stand-by.

- Signal Von: reference the output ground; informs the LS30 power supply that the remote switch-on from the console is active and there are no anomalies.

- Signals 0 and PARALL: indicate to the LS30 how much current it must raise.

These signals are all received through an AMP MOD II 4-way connector.

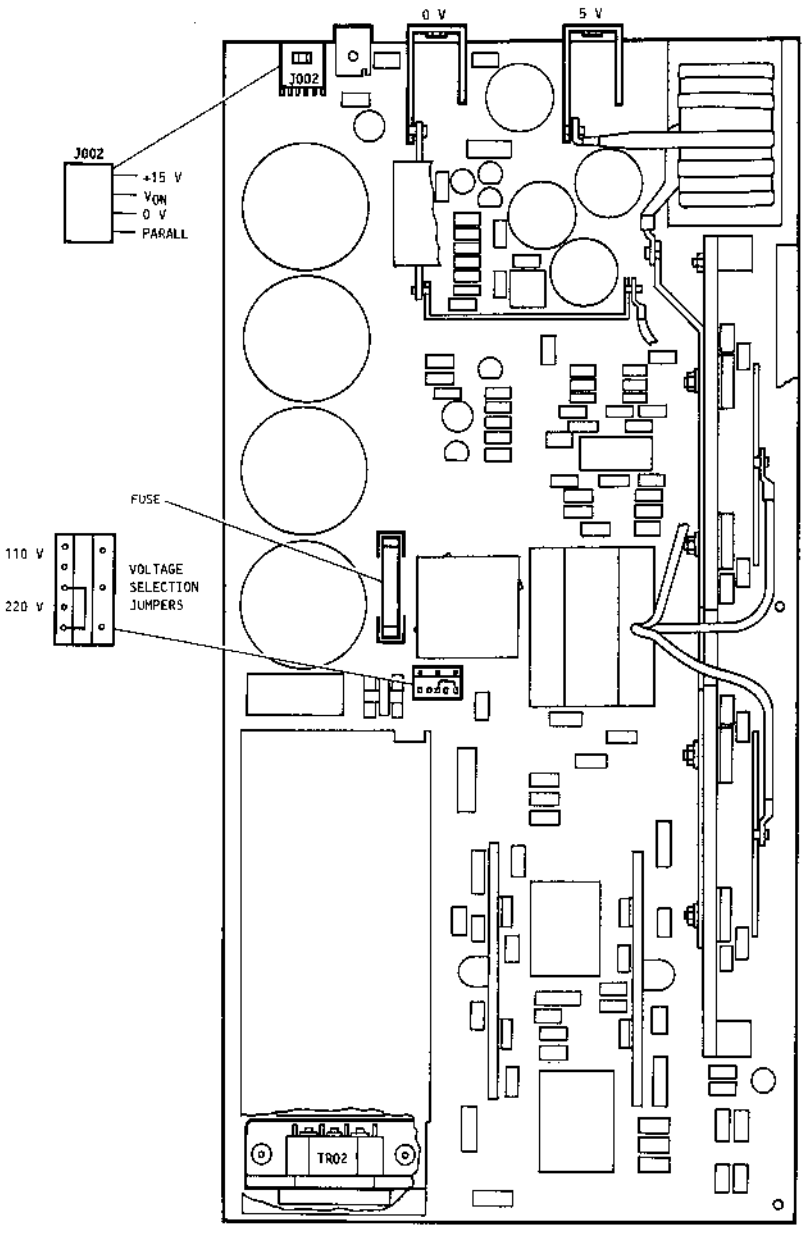


Fig. 3-2 Power Supply Board LS30

3.4 EXPANSION POWER SUPPLY LC12 FOR LSX 3020 SYSTEMS

The LC12 power supply with max. power of 120 W is a current generator used in parallel with the LB40 power supply to sustain the +5 V load voltage.

Note: The LC12 power supply is used on LSX 3020 systems only in configurations with 11 board slots and back plane IN087.

The maximum current supplied by the LC12 to back up the +5 V voltage is 25 A.

For its internal functions, the LC12 uses the signals coming from the LB40 auxiliary power supply. The auxiliary power supply also handles the parallel signal between the LB40 and LC12 to control the amount of current supplied by the latter; for this reason, the LC12 power supply may not be used alone.

3.4.1 INPUT CHARACTERISTICS

The LC12 power supply input characteristics are:

1. Single phase alternating current at the following rated voltages: 100-120 Volts or 200-240 Volts (on the LC12, the power voltage is selected by way of jumpers which can be seen in the diagram of the power supply board).

2. Permanent input voltage variations: +10% and -15%, giving the following operating voltage ranges, 85 - 132 Volts and 170 - 264 Volts respectively.

3. Nominal frequency: 45 Hz to 65 Hz.

4. Frequency variations: ± 5%.

5. Maximum input voltage 110% of the rated max. value (132 or 264 V). For voltages of 110% to 120% of the rated max. for a period of not more 5 seconds, there is no permanent damage to the power supply.

6. Maximum mains impedance: 0.4 + J0.25 ohm

7. Input/output isolation: 1650 V.

8. Maximum inrush current: 25 A peak for first cycle.

9. Mains failures: the LC12 is unaffected by mains failures of 100% for 0.5 cycles and of 30% for 25 cycles at the minimum rated voltage.

10. Switch-on time: after being switched on at the mains, the power supply outputs the voltage when the control signals coming from the LB40 are active.

11. Input protection: a fuse responding to the local safety regulations in series with the power supply.

3.4.2 OUTPUT CHARACTERISTICS

The LC12 power supply outputs the +5 V voltage regulated at 5.6 V so that when set in parallel with the LB40 power supply +5 V, it acts as a current generator controlled by the LB40 itself.

The maximum current the LC12 can output is 25 A.

The LC12 power supply also outputs a d.c. voltage of +12 V, for use by its power supply. Maximum current raised by this output is 250 mA.

3.4.3 OUTPUT PROTECTIONS

The power supply output protections are:

- Protection against overloads and short circuits
- Overvoltage protection
- Thermal protection
- No load.

Protection against Overloads and Short Circuits
The LC12 power supply is protected against overloads and short circuits. If a short circuit occurs, output current remains limited to a value of just over 25 A; switching off is performed by the LB40.

Overvoltage Protection
The LC12 is protected against overvoltages; the protection is triggered for voltages in the 6.25 V (± 0.5 V) range and causes the power supply block.

There is no crowbar SCR.

Thermal Protection
If working temperature reaches a critical point, the power supply switches off and remains blocked; a sensor on the output diodes dissipator is triggered at a temperature of 90 degrees Celsius.

Operation is restored following intervention of the thermal or overvoltage protection by de-activating and re-activating the voltage signal (Von) by switching the LB40 on and off at the mains.

No Load
Absence of load does not result in damage to the LC12.

3.4.4 PHYSICAL DIMENSIONS AND VENTILATION

The power supply, mains filter included, is on a single board of dimensions 126.5x323 mm and maximum height of 80 mm. It is cooled by forced ventilation.

3.4.5 CONTROL SIGNALS FOR THE LC12 POWER SUPPLY

The LB40 and LC12 communicate on a master (LB40) - slave (LC12) basis by way of four signals generated by the LB40. These signals are:

- +15 V power: the auxiliary voltage, reference the output ground, used to power the internal circuits; always present, even with the power supplies blocked following an output voltage anomaly or when in stand-by

- Signal Von: reference the output ground; informs the LC12 power supply that the remote switch-on from the console is active and there are no anomalies

- Signals 0 and PARALL: indicate to the LC12 how much current it must raise.

These signals are all received through an AMP MOD II 4-way connector.

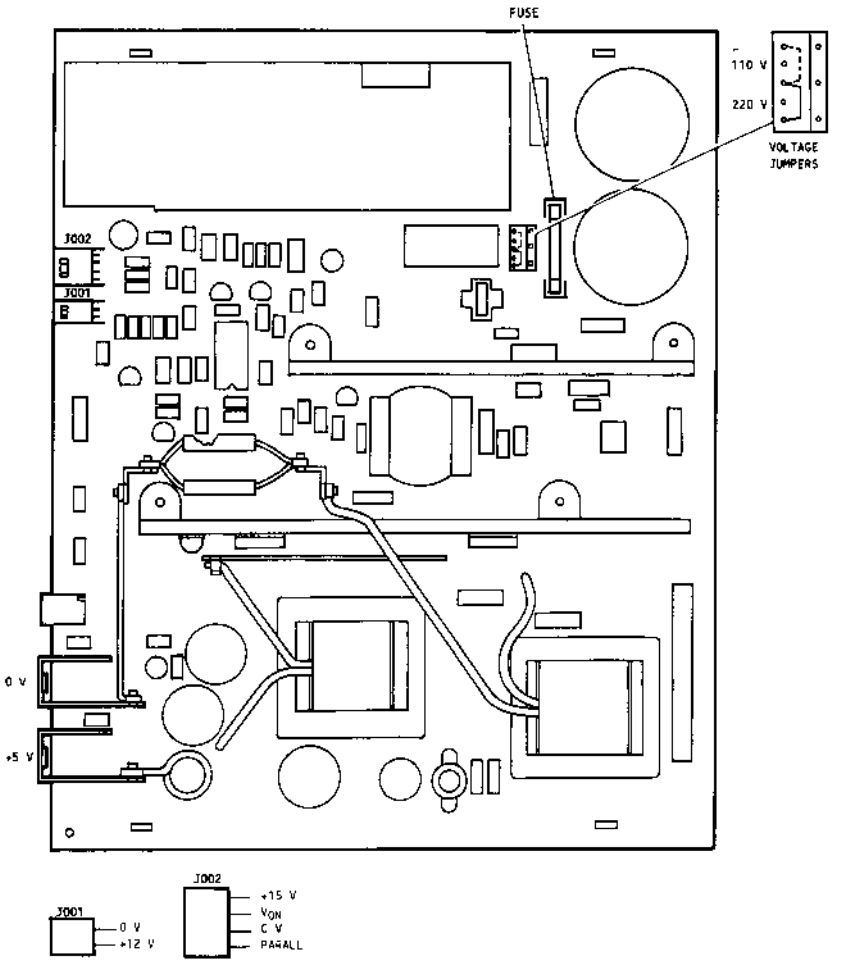


Fig. 3-3 Power Supply Board LC12

3.5 POWER SUPPLY LS10 FOR LSX 3020 SYSTEMS

The LS10 power supply giving peak power of 180 W and continuous power of 106 W is used in the SB1 cabinet to power one or two HDU, possibly with dual port option.

Note: The LS10 power supply can be used on LSX 3020 systems only in configurations with SB0 + SB1 (with one or two HDU used as third and fourth non-shared ESDI disk unit or as first and second shared ESDI disk unit).

3.5.1 INPUT CHARACTERISTICS

The LS10 power supply input characteristics are:

1. Single phase alternating current at the following rated voltages: 100-120 Volts or 200-240 Volts (on the LS10, the power voltage is selected by way of jumpers which can be seen in the diagram of the power supply board).

2. Permanent input voltage variations: +10% and -15%, giving the following operating voltage ranges, 85 - 132 Volts and 170 - 264 Volts respectively.

3. Nominal frequency: 45 Hz to 65 Hz.

4. Frequency variations: ± 5%.

5. Maximum input voltage 110% of the rated max. value (132 or 264 V). For voltages of 110% to 120% of the rated max. for a period of not more 5 seconds, there is no permanent damage to the power supply.

6. Maximum mains impedance: 0.4 + J0.25 ohm.

7. Input/output isolation: 1650 V.

8. Maximum inrush current: 25 A peak for first cycle.

9. Mains failures: the LS10 is unaffected by mains failures of 100% for 0.5 cycles and of 30% for 25 cycles at the minimum rated voltage.

10. Switch-on time: after being switched on at the mains, the power supply outputs the voltage when the control signals coming from the LB40 are active.

11. Input protection: a fuse responding to the local safety regulations in series with the power supply.

3.5.2 OUTPUT CHARACTERISTICS

The output characteristics of the LS10 power supply are given in the table below:

Voltage [V]	Tolerance	Ripple p.p. max. [mV]	CURRENT min. [A]	CURRENT max. [A]	CURRENT peak [A]	Power max. [W]
+ 5	- 3 % + 5 %	50	0.40	6.5	-	32.5
+ 12	- 3 % + 5 %	50	1.00	6.0	12 *	144.0

* for a maximum of 15 s

The +5 V voltage is regulated to 5.1 V and the +12 V to 12.2 V in maximum load conditions (5 V with 6.5 A and 12 V with 6 A); if voltages go out of range, the power supply is regulated by way of potentiometers (see power supply LS10 board diagram).

3.5.3 OUTPUT PROTECTIONS

The power supply output protections are:

- Protection against overloads and short circuits
- Overvoltage protection
- Thermal protection
- No load.

Protection against Overloads and Short Circuits
The LS10 power supply is protected against overloads and short circuits. If a short circuit occurs, output current remains limited to a value of just over 25 A; switching off is performed by the LB40.

Overvoltage Protection
The LS10 is protected against overvoltages; the protection is a crowbar SCR and is triggered for voltages in the range 6.2 V - 6.8 V. After being switched off, the power supply can be restored to operation by turning the general system switch off and on.

Ventilation and Thermal Protection
Forced ventilation is not required during normal operation.
Protection against overheating is provided by a PTC thermistor connected to the power supply heat sink. If critical temperature is reached, the SCR crowbar is activated and the power supply switched off. Normal operation is restored by opening and closing the general system switch.

No Load
Absence of load does not result in damage to the LS10.

3.5.4 PHYSICAL DIMENSIONS

The power supply, mains filter included, is on a single board of dimensions 157x260 mm with a protective cover which also serves as heat sink. Maximum height from board level to top of cover is 50 mm.

3.5.5 RESET SIGNAL FOR THE LS10 POWER SUPPLY

The reset signal controls the power supply output voltages. At power-on, the reset signal goes to level 1 approx. 100 ms after the +5 V and +12 V voltages are above the minimum tolerance level. When the power supply is switched off, the reset signal goes to 0 at least 1 ms before the voltage drops. If there are anomalies or if one of the voltages goes below tolerance level, the reset signal goes to 0.
The power supply has a relay powered by the +5 V and with contacts in parallel with the reset signal to guarantee a genuine ground during the switch on and off transient phases.

Input and Output Connections
All the input and output connections are made through connectors as detailed below:

- A 6-way MODU I input connector.

- Four output connectors, two 4-way MODU I and two 4-way MATE-N-LOK.

There is also a ground bracket, used also to secure the power supply to the system frame.

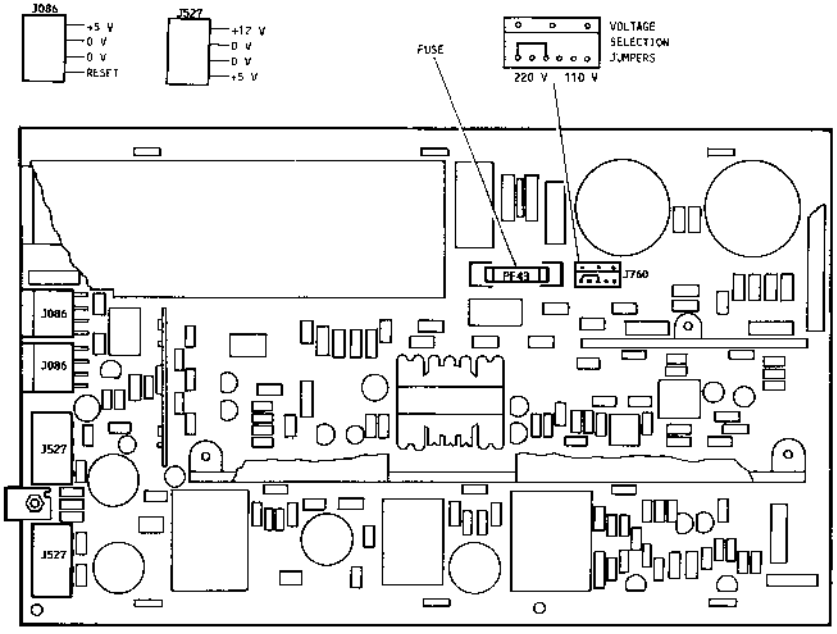


Fig. 3-4 Power Supply Board LS10

3.6 DC/DC CONVERTERS

The DCA 36/512 and DCA 36/524 type DC/DC converters used to power the magnetic peripherals have a secondary which is galvanically isolated from the primary and can raise peak power of 61 W and continuous power of 35.3 W. On the M64, they power the 5 and 1/4" (DCA 36/512) and 8" (DCA 36/524) magnetic peripherals; they are used in association with the LB40 power supply.

3.6.1 INPUT CHARACTERISTICS

Both converters require a direct, input voltage of 35 V ± 10%.

3.6.2 OUTPUT CHARACTERISTICS

The DCA 36/512 converter outputs voltages of +5 V and +12 V. Maximum, minimum and peak current values raised by the voltages, tolerances and maximum ripple permitted for the DCA 36/512 are given in the table below:

RATED VOLTAGE	TOLERANCE	Imin	Imax	Ipeak	RIPPLE pp
+ 5 V	± 5%	0.55 A	1.3 A	1.4 A	50 mV
+12 V	± 5%	1.25 A	2.4 A	4.5 A	100 mV

The DCA 36/524 converter outputs voltages of +5 V and +24 V. Maximum, minimum and peak current raised by the voltages, tolerances and maximum ripple permitted for the DCA 36/524 are given in the table below:

RATED VOLTAGE	TOLERANCE	Imin	Imax	Ipeak	RIPPLE pp
+ 5 V	± 5%	0.55 A	1.3 A	1.4 A	50 mV
+24 V	± 5%	0.60 A	1.2 A	2.3 A	100 mV

Regulation of voltages
The voltages are regulated by regulating the +5 V to +5.00 V at the maximum continuous output power of 35.3 W.

Switch-on time
The voltages are in tolerance within 100ms of the input voltage going above 75% of its maximum value.

Output absorption peaks
Both converters support a power peak of 61 W at power-on for 10 s; voltages are guaranteed in tolerance.

3.6.3 PROTECTIONS

Protection against overloads and short circuits
The converters are protected against overloads by way of a power limiter which comes into action at 70 W approx. and against short circuits on all of the voltages. Intervention of the protections causes oscillations to cease and the LED on the front of the converter to come on indicating that an anomaly has occurred.

Extra current protection
Overvoltage protection is only for the +5 V voltage for values in the 6.25 V ± 0.6 V range. Its intervention triggers a crowbar SCR, the power supply blocks and the relative LED comes on.

Recovery of converter following anomalies
Following intervention of one of the above protections, with interruption of oscillations, the power supply can be restored by pressing the button beside the LED. For a temporary fault, when the button is pressed, the LED goes off; if it remains on, the converter is restored to operation after the error is removed.

The button acts as block circuit reset and must not be kept pressed down to avoid internal converter damage where the anomaly persists.

No load
If there is no load at the output, the converter is not damaged.

Protection against internal short circuits in primary section
A fuse in series with the power supply is designed to prevent the LB40 power supply which powers the converter from blocking should a fault occur in the converter primary section (following short circuits of the +35 V).

3.6.4 MECHANICAL CHARACTERISTICS

The converter is housed in a 150 x 129.5 x 35 mm metal container and is attached in four parts to the magnetic peripheral structures.

3.6.5 DCA 36/512 CONNECTORS

The input connector is a 4-way AMP MODU 1, of which only two pins are used. The output connector is a 6-way AMP MODU 1 where two pins are for the +12 V, three for ground and one for the +5 V. The figure below illustrates the position of the connectors, the trimmer for +5 V regulation, the LED and the reset button on the front of the converter.

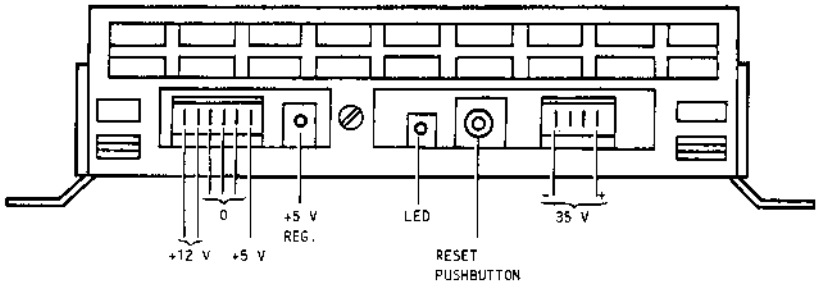


Fig. 3-5 Front of Converter DCA 36/512

3.6.6 DCA 36/524 CONNECTORS

The input connector is a 4-way AMP MODU I, of which only two pins are used. The output connector is 6-way AMP MODU I, where two pins are for the +24 V, three for the ground and one for the +5 V. The figure below illustrates the position of the connectors, the trimmer for +5 V regulation, the LED and the reset button on the front of the converter.

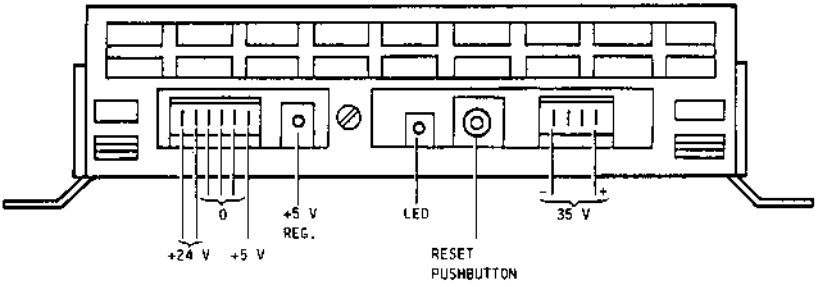


Fig. 3-6 Front of Converter DCA 36/524

3.7 MAINS ASSEMBLY FOR LSX 3020 SYSTEMS

The input mains assembly is responsible for power distribution to the whole system and consists of:

1. Circuit Breakers.
2. Main mains filter.
3. Auxiliary mains filter.
4. Connectors.
5. Mains control device.
6. Fans.

The printed circuit board used must be able to support all the connections needed for both the full and the reduced versions; current density must not however exceed 6A/mmq, unless otherwise stipulated by the board manufacturer. The standard specified safety distance between tracks must be adhered to in all cases.

The international standards applying are as follows:

UL_478	(Data Processing)
CSA22.2-154	(Data Processing)
IEC_435	(Data Processing)
IEC_380	(Office Machine)

Whatever form of mains assembly is implemented, total shielding must be guaranteed between the "Olivetti or Internal" section and the "Power station or External" network and all closing mechanisms must give sufficient protection from E.M.I.

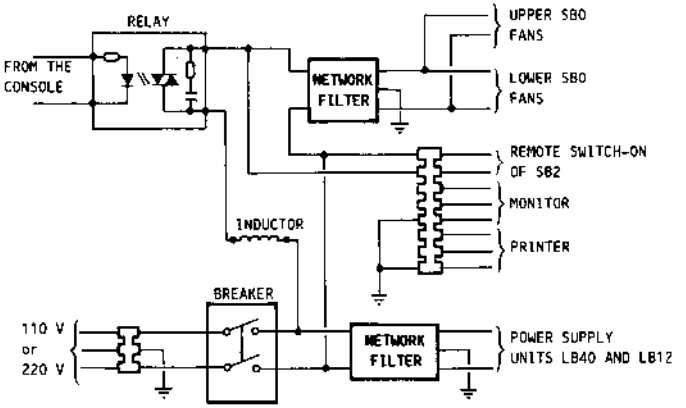


Fig. 3-7 A.C. Distribution in SBO for LSX 3020 Systems

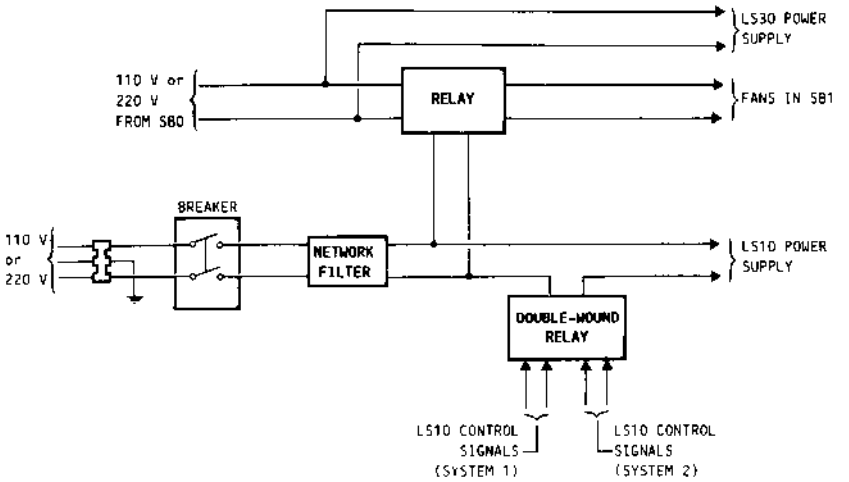


Fig. 3-8 A.C. Distribution in SB1 for 16-Slot LSX 3020 Systems

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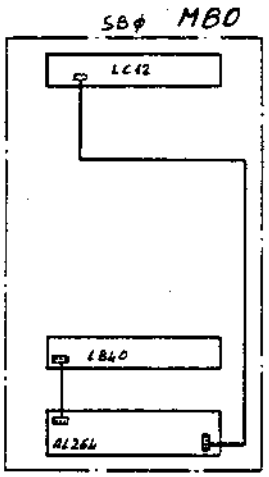
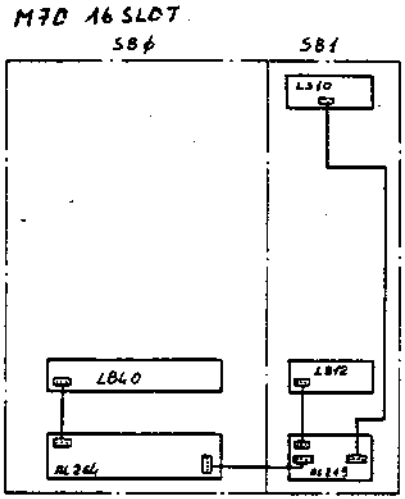
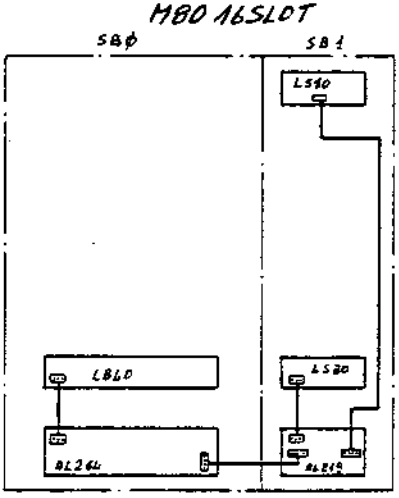
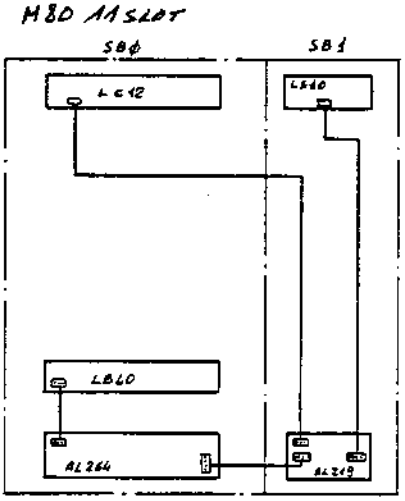








A
B
C
D
E
DE

Codice	Rif.	Q.tà	Descrizione

* Per versione in lingua straniera

Le tolleranze sono espresse in micrometri (µm)

Cat. Tecn.

N.P.M.

Scri. Prog.

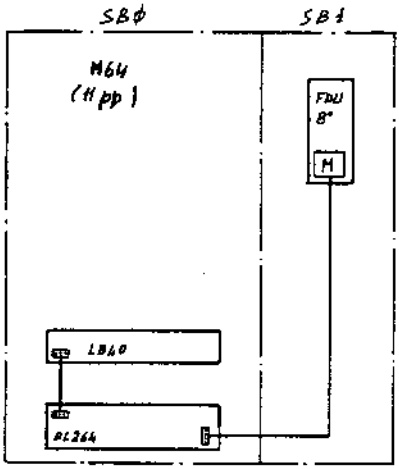
olivetti

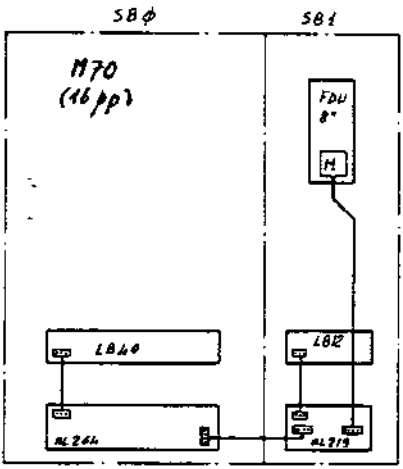
Descrizione: SCHEMA COLL. ALI L2

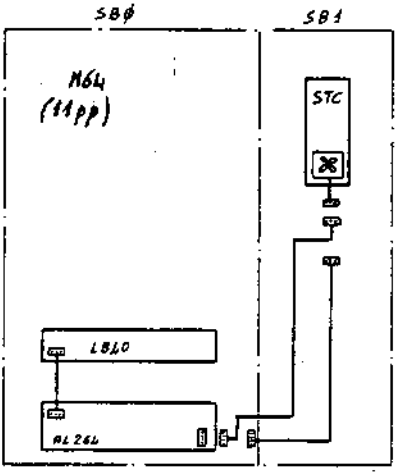
Scala | T.P. | Ar. Geol.

Progetto	Materiale	Mov.	Data	Mov.	Data	Firma: Rossetto	Cod. Semilavorato a
Sostituisce il a	Tratt. Term.					Visto	Cod. Greggio a
Sostituito da a						Data: 30/4/87	
Derivato da a	Tratt. Superf.					Codice a Sull.	

Codice	a	Suff.







Codice	Rif.	Q.tà	Descrizione

* Per versione in lingue straniere

Le tolleranze sono espresse in micrometri (µm)

olivetti

Descrizione: SCHEMA COLL. FDU-STC 8" IN SB1

Scala | T.P. | Ar. Geol.

Prodotto	Materiale	Mov.	Data	Mov.	Data	Fase: 10/10	Cod. Semilavorato
Sostituisce il	Tratt. Term.					Visto	Cod. Greggio
Sostituito da						Data: 30/4/87	
Derivato da	Tratt. Superf.					Codice	a / Suff.

Cal. Tecn. | N.P.M. | Scn. Prog.

3.8 ABSORPTION OF HARDWARE MODULES

The table below gives absorption of all the hardware modules used on the LSX 3020 system.

MODULE DESCRIPTION	ABSORPTION (in amperes) + 5 V	+12 V	-12 V	+24 V	POWER (watt)	NOTES
Central Unit UC068	9.50	0.032	0.032		47.768	LSX 3020
Timing Control Memory 2 M	3.60				18.00	selected
	2.0				10.00	standby
Timing Control Memory 4 M	4.20				21.50	selected
	2.96				14.80	standby
Encryption Control G0257/C	1.85	0.10			10.45	
1 MB FDU/mFDU con. G0280/D	2.5	0.15			14.30	
HDU control (ESDI) G0404	5.2				26.00	
G0405	5.2				26.00	
OLIDISK (ESDI) G0427	6				30.00	
STC control (SLIM) G0417	5.00				25.00	
G0418						
40 MB MTU control G0278/B	2.85				14.25	
1 MB mFDU (drive)	0.55	1.25			17.75	
1 MB FDU (drive)	0.70			1.0	17.75	
45-60 MB STC (drive)	0.60	1.7			23.40	Operating
	0.60	4.4			55.80	Start

>>>

>>>

MODULE DESCRIPTION	ABSORPTION (in amperes) + 5 V	+12 V	−12 V	+24 V	POWER (watt)	NOTES
V24+V24 Line Con. G0381	2.74	0.12	0.1		16.34	
Ethernet control G0212/A	2.10	0.50			16.50	
STARLAN INTELL. G0435	3.50		0.03		17.86	
Multiplexer control G0322	2.32	0.15	0.05		14.00	
OLICOM G0426	6.8				34.00	
Multifunctional keyboard	0.40	0.05			2.60	
Pin pad PIN 1440	0.35	0.05			2.35	
Badge reader MBR 1932	0.10				0.50	
Badge reader MRW 1810	0.10				0.50	

Note: - All current values have a tolerance of ±20 %.

- Power values given are for D.C. voltages.

4. SYSTEM HARDWARE AND SETTINGS

4.1 HARDWARE MODULES

The hardware modules discussed in this chapter are listed below:

HARDWARE MODULE DESCRIPTION	MODULE NAME
Central Unit	UC068
TCM: Timing Control Memory 2 MB	TCM
TCM: Timing Control Memory 4 MB	TCM
Encryption Control + Pin check	G0257/C
Multiplexer Control 4-way (MOS)	G0322
Multiplexer Control 16-way (OLICOM)	G0426
RS232/Current Loop Adapter	IF 373
mFDU/FDU Control	G0280/B-D
OLIDISK ESDI interface for HDU	G0427
SCT Control 45-60 MB	G0417, G0418
MTU Control 40 MB	G0278/B
V24 + V24 Intelligent Line Control	G0331
Ethernet Internal Line Control	G0212/A
Intelligent STARLAN	G0435

Note: Unless specified otherwise, the following conventions are adopted for DIP-switch settings in the remainder of the manual:

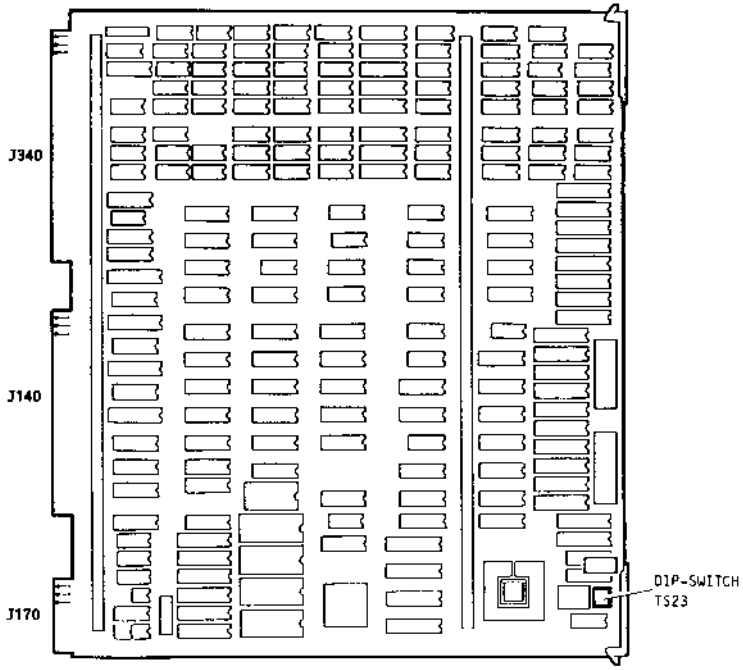
O = OPEN = OFF

C = CLOSED = ON

X = DON'T CARE

– = NOT USED

4.1.1 CENTRAL UNIT UC068 FOR LSX 3020

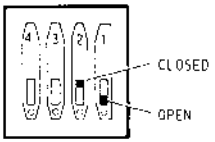


Note: 16 MHz CPU MC68020
CM MC 68881
ACIA 8251 (for telediagnostic)
ACIA 8251 (for debugger)
CACHE MEMORY 8 KBYTE
TIMER 8253

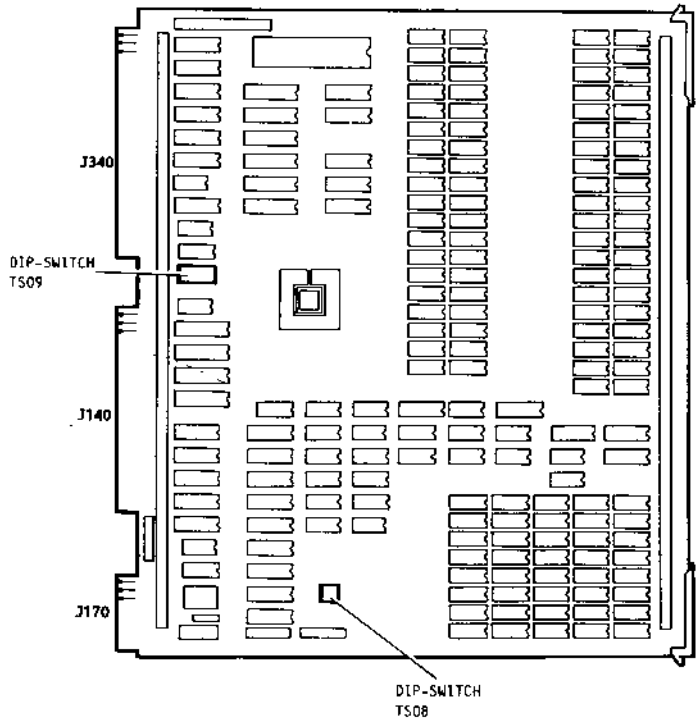
DIP-SWITCH TS23

FUNCTION: Used by software to define CPU name in multiprocessor context

SETTING				SIGNIFICANCE
1	2	3	4	
C	C	C	C	CPU 0 MASTER
C	C	O	C	CPU 1 SLAVE
C	C	C	O	CPU 2 SLAVE
O	C	X	X	CPU disabled



4.1.2 2 MB TIMING CONTROL MEMORY: TCM



Note: - Fast RAM 256 x 1
- 32 MHz Clock Generator
- Error Correction Code

This board can operate in different modes, selected through the board DIP-switch TS08 in position J04L1.

TS08 CONFIGURATION JUMPERS

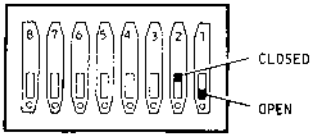
JUMPER	POSITION	BOARD OPERATION MODES
No. 1	ON	TCM performs SEQUENTIAL CYCLE
	OFF	TCM performs FAST SEQUENTIAL CYCLE
No. 2	ON	TCM configured SLAVE
	OFF	TCM configured MASTER
No. 3	ON	Board set in ARRAY mode
	OFF	Board set in TCM mode
No. 4	ON	Position not used
	OFF	16 Mbyte addressing

Configuration of board DIP-switch TS09 for start address.

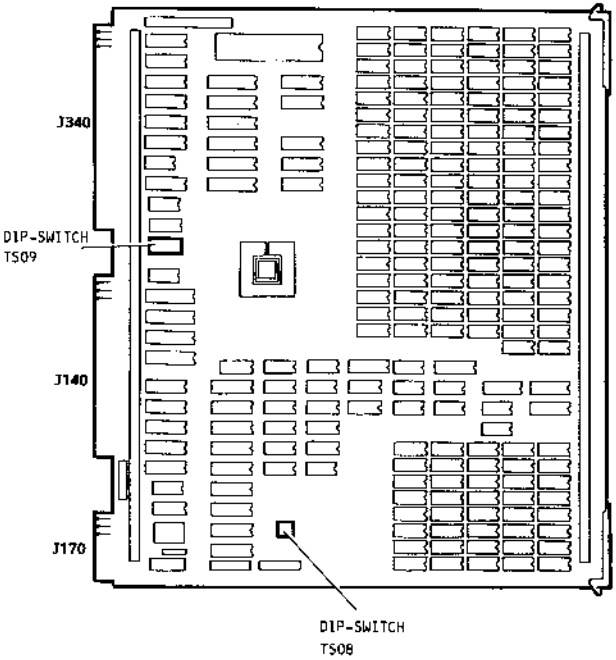
START ADDRESS CONFIGURATION JUMPERS TS09

START ADDRESS END	JUMPER P7	P6	P5	P4	P3	P2	P1	P0
200000 - 3FFFFF	X	ON	ON	ON	ON	ON	ON	OFF
400000 - 5FFFFF	X	ON	ON	ON	ON	ON	OFF	ON
600000 - 7FFFFF	X	ON	ON	ON	ON	ON	OFF	OFF
800000 - 9FFFFF	X	ON	ON	ON	ON	OFF	ON	ON
A00000 - BFFFFF	X	ON	ON	ON	ON	OFF	ON	OFF
C00000 - DFFFFF	X	ON	ON	ON	ON	OFF	OFF	ON
E00000 - FFFFFF	X	ON	ON	ON	ON	OFF	OFF	OFF

X = not used



4.1.3 4 MB TIMING CONTROL MEMORY: TCM



Note: - Fast RAM 256 x 1
- 32 MHz Clock generator
- Error Correction Code

This board can operate in different modes, selected through the board DIP-switches TS08 in position J04L1.

TS08 CONFIGURATION JUMPERS

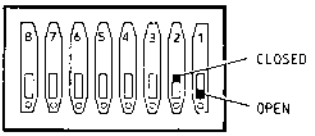
JUMPER	POSITION	BOARD OPERATING MODES
No. 1	ON	TCM performs SEQUENTIAL CYCLE
	OFF	TCM performs FAST SEQUENTIAL CYCLE
No. 2	ON	TCM configured in SLAVE mode
	OFF	TCM configured in MASTER mode
No. 3	ON	Board set in ARRAY mode
	OFF	Board set in TCM mode
No. 4	ON	Position not used
	OFF	16 Mbyte addressing

Configuration of the board DIP-switch TS09 for start address.

START ADDRESS CONFIGURATION JUMPERS TS09

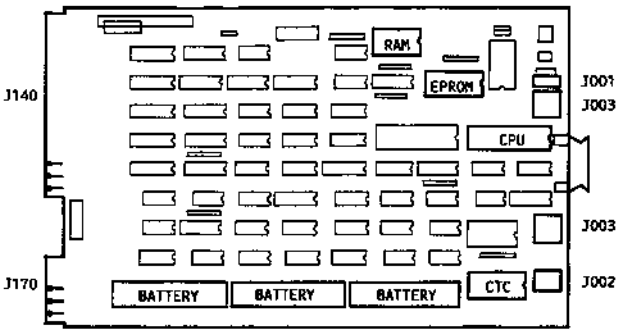
START END ADDRESS	JUMPER P7	P6	P5	P4	P3	P2	P1	P0
000000 - 3FFFFF	X	ON	ON	ON	ON	ON	ON	ON
200000 - 5FFFFF	X	ON	ON	ON	ON	ON	ON	OFF
400000 - 7FFFFF	X	ON	ON	ON	ON	ON	OFF	ON
600000 - 9FFFFF	X	ON	ON	ON	ON	ON	OFF	OFF
800000 - BFFFFF	X	ON	ON	ON	ON	OFF	ON	ON
A00000 - DFFFFF	X	ON	ON	ON	ON	OFF	ON	OFF
C00000 - FFFFFF	X	ON	ON	ON	ON	OFF	OFF	ON

X = not used



4.1.4 ENCRYPTION CONTROL WITH PIN CHECK G0257/C

G0257/C Board Picture



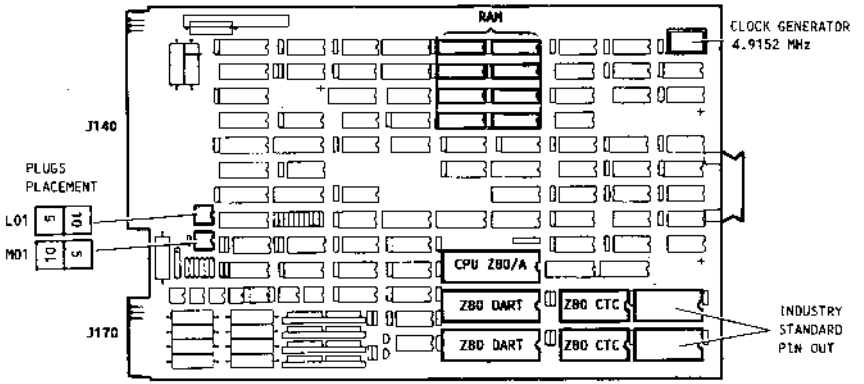
Note: - J01: +5 V power supply connector for connection to ASD module
- J02: Customer safety jumper
- J03: Connector for ASD module and line connection

Characteristics:

- Microprocessor Z80/A
- Counter Timer Controller (CTC) Z80/A
- Dual Port RAM 2K x 8
- Battery Back-up RAM 2K x 8
- ROM 8K x 8.

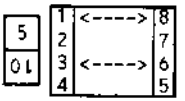
4.1.5 MULTIPLEXER CONTROLLER: G0322

The G0322 is an intelligent controller, used as interface between the system and workstation, and based on the ELB 3683. The 4 board channels are not connected directly to the ELB but via a distribution box D-BOX.

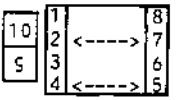


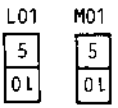
The G0322 jumper connections made by way of 5|10 plugs and illustrated below must be taken into account in connecting peripherals or the ELB 3683 to the D-BOX:

Position 5 for RS232 select

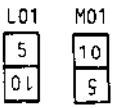


Position 10 for Current Loop select

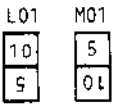




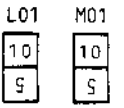
Channel 1 = RS232
Channel 2 = C.L.
Channel 3 = RS232
Channel 4 = C.L.



Channel 1 = RS232
Channel 2 = C.L.
Channel 3 = C.L.
Channel 4 = C.L.



Channel 1 = C.L.
Channel 2 = C.L.
Channel 3 = RS232
Channel 4 = C.L.



Channel 1 = C.L.
Channel 2 = C.L.
Channel 3 = C.L.
Channel 4 = C.L.

4.1.6 OLICOM 16-WAY MULTIPLEXER CONTROLLER: 60426

The OLICOM is four channel, intelligent controller giving a total of 16 ways. It is used as a module interfacing between a system with UNIX operating system and a WS 685 type workstation. The 16 ways are not connected directly to the WS 685 but through RS232 to Current Loop converter boxes.

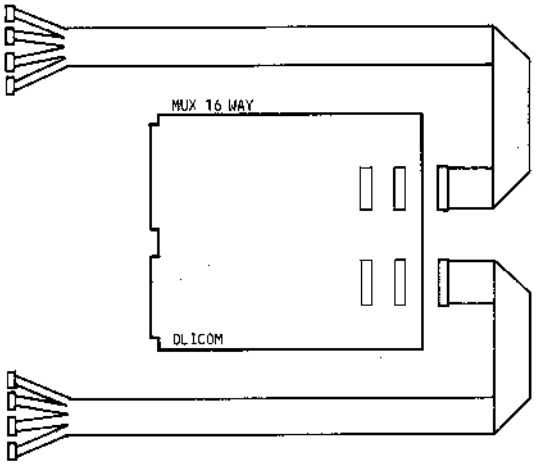
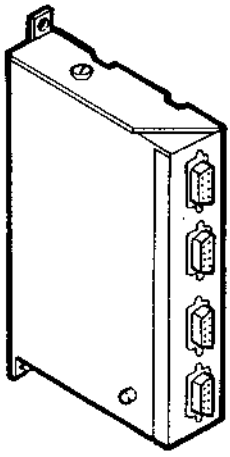


Fig. 4-1 OLICOM Controller Board

4.2 RS232/CURRENT LOOP ADAPTER: IF373

The IF373 is an RS232 to Current Loop adapter used as interface between the 16-way multiplexer (OLICOM) and the WS 685.

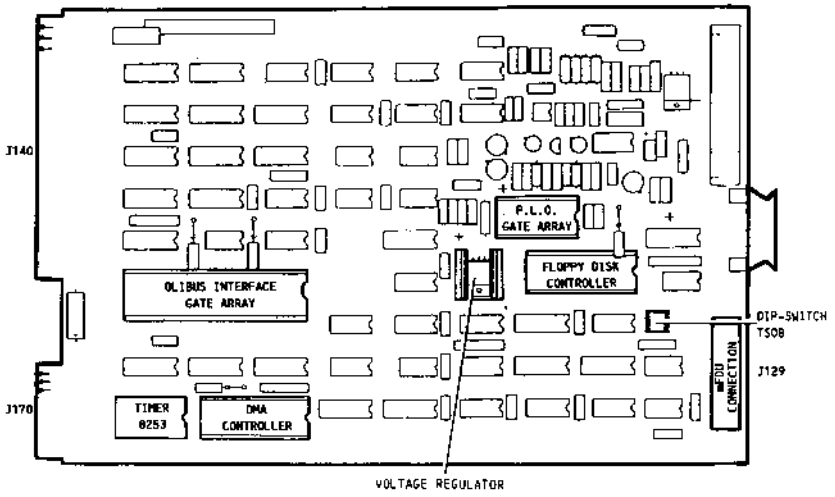


Main characteristics:

- Four Current Loop channels
- Current raised by 20 mA
- Maximum transmission distance 1000 m, at a rate of 19,200 Baud
- Fully transparent for OLICOM controller.

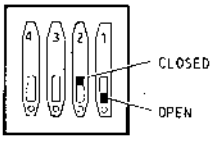
4.2.1 1 MB mFDU/FDU CONTROLLER: G0280/D

This controller can handle up to four 1 MB floppy or minifloppy disk units. The board structure is based on the NEC Floppy Disk Controller PD765. The type of unit connected is defined through the DIP-switch TS08 (in board position G10). The PLO calibration, where necessary, is performed in the electronic lab using an oscilloscope.



DIP-switch TS08 jump connections

SETTING				SIGNIFICANCE
4	3	2	1	
0	0	0	C	1 Mbyte Floppy
0	0	C	C	1 Mbyte Minifloppy



Note: From the above, it will be seen that the same controller cannot simultaneously support configurations with floppy and minifloppy units.

4.2.2 OLIDISK HDU CONTROLLER, ESDI INTERFACE: G0427

The OLIDISK is an intelligent controller with ESDI interface, handling up to four HDU with ESDI interface.

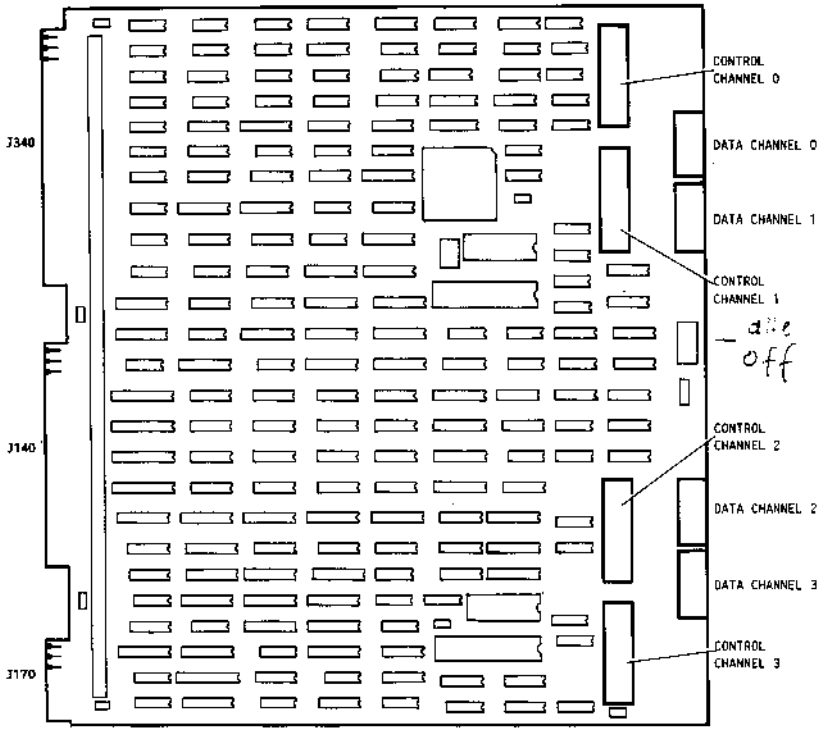
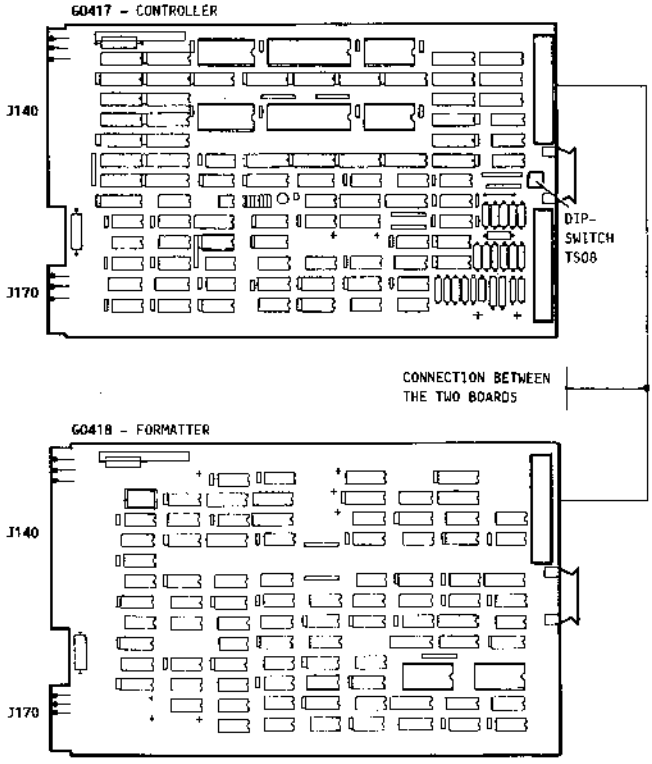


Fig. 4-2 OLIDISK Controller Board

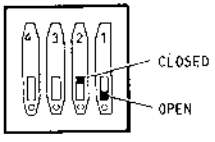
4.2.3 45-60 MB SCT CONTROLLER: G0417, G0418

Interconnection between controller and peripherals

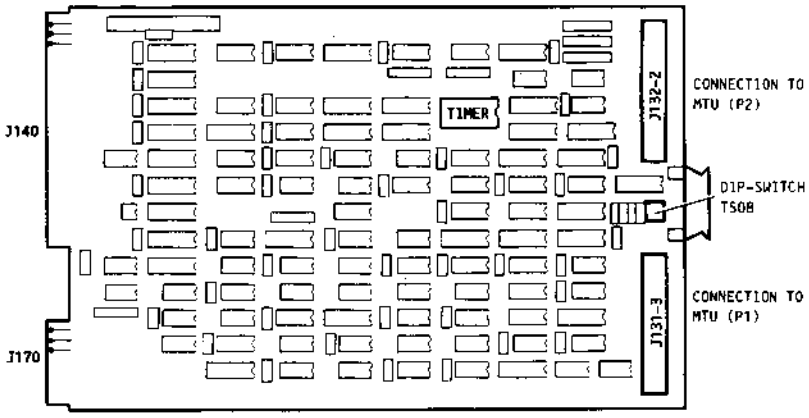


Check the setting of the block of four DIP-switches in position G10 of board G0417; they should be set as follows:

SETTING				SIGNIFICANCE
4	3	2	1	
O	C	C	C	Peripheral connected STC 45-60
X	X	X	X	For future use



4.2.4 40 MB MTU CONTROLLER: 60278/B

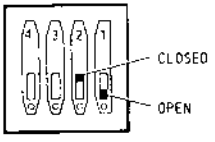


Characteristics:

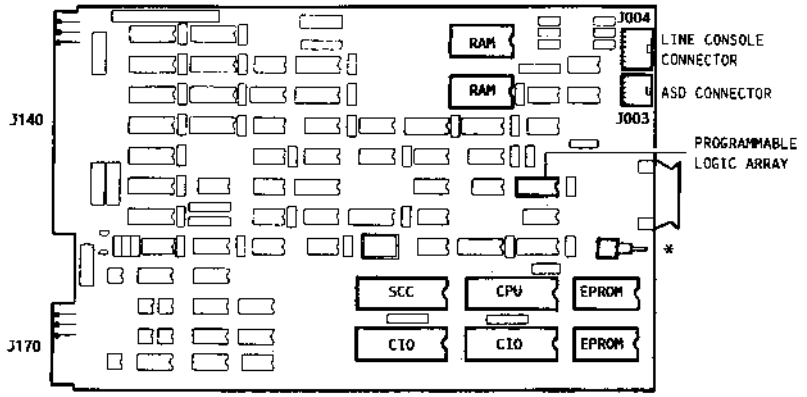
- 8253 TIMER to determine length of DMA transfer
- FIFO buffer for DMA data exchanges with OLIBUS and peripherals
- Pertec industry standard interface.

A DIP-switch in position G10 is used to select the number of peripherals connected:

SETTING				SIGNIFICANCE
4	3	2	1	
C	C	C	C	No peripheral connected
C	C	C	O	First peripheral connected
C	C	O	C	Second peripheral connected
C	C	O	O	First and second peripherals connected



4.2.5 V24 + V24 INTELLIGENT LINE CONTROLLER: G0331



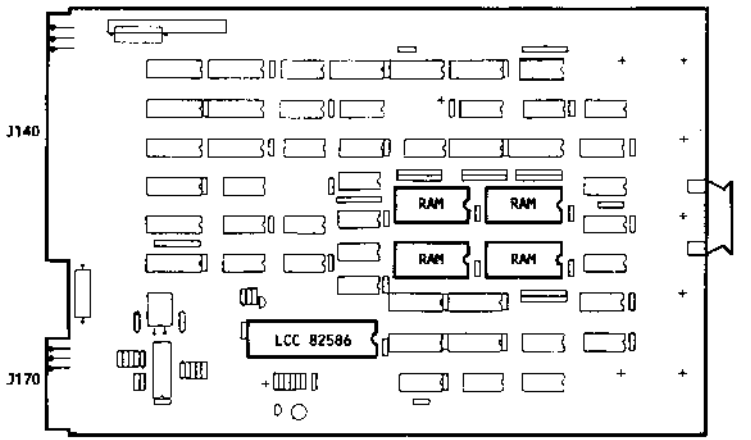
* Switch for selection of the remote switch-on signals:
- RING INDICATOR
- NEUTRAL
- DATA CARRIER DETECTOR

Connector J170 is connected to the modem.

Characteristics:

- Two RS232 channels, V24 interface, for remote internal or external lines
- Z8002 microprocessor
- Self-diagnostic feature
- 32 KB ROM to handle lines
- 16 KB RAM to exchange data and parameters
- Character oriented, SDLC, HDLC protocols.

4.2.6 ETHERNET INTERNAL LINE CONTROLLER: G0212/A

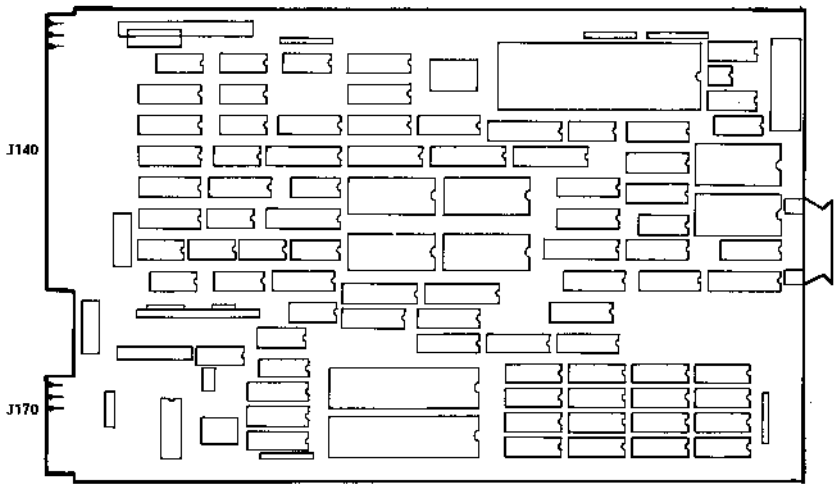


Characteristics:

- Line Communication Controller - LCC 82586
- Ethernet Serial Interface ESI 82501
- 32 KB Dual-Port memory
- Internal line protocol based on ETHERNET recommendations
- Transfer speed: 10 M bps
- CSMA/CD channel control
- Manchester code.

4.2.7 STARLAN INTELLIGENT CONTROLLER : G0435

Interface controller, 3000 format with two LAN channels - Ethernet and Starlan.



Characteristics:

- Microprocessor 68000, 8 MHz
- Local EPROM, 64 Kb
- Internal RAM, 512 Kb DRAM
- Two Serial Controllers, 82520 or Z853.

5. MAGNETIC PERIPHERALS

5.1 INTRODUCTION

This chapter describes all the peripheral units available for LSX 3020 systems and how they are connected in the systems; for more detailed information on the individual peripherals, see the relative documentation.
The table below gives a complete picture of the peripherals that may be used on LSX 3020 systems.

P.U.	TYPE	MANUFACTURER	NAME	INTERF.	CONTROL	SIZE
mFDU	1 MB	Toshiba (slim)	ND08 DE	-	G0280/D	5"
FDU	1 MB	Ope	XG 6030	-	G0280/D	8"
STC	45/60	Archive 5945C	-	QIC24	G0417 G0418	5"
MTU	40 MB	Cypher	XU 1705	PERTEC	G0278/B	
HDU	70 MB	Micropolis 1353	-	ESDI	G0427	5"
HDU	70 MB	Fujitsu 2244 # N	-	ESDI	G0427	5"
HDU	140 MB	Micropolis 1355	-	ESDI	G0427	5"
HDU	140 MB	Fujitsu 2246 # N	-	ESDI	G0427	5"
HDU	300 MB	-	-	ESDI	G0427	5"

5.2 MAGNETIC PERIPHERAL CONFIGURATIONS

The magnetic peripheral units which may be mounted in the different LSX 3020 cabinets are as follows:

BASIC CABINET SB0

Max. four 5 and 1/4" peripherals:

- 1 - 2 HDU (70/140/300 MB) + STC (45/60 MB)
- 1 - 2 HDU (70/140/300 MB) + 1 - 2 MFD (1 MB)
- 1 - 2 HDU (70/140/300 MB) + 1 STC (45/60 MB) + 1 MFD (1 MB).

EXPANSION CABINET SB1

In the SB1 expansion cabinet, one removable 8" peripheral or one or two fixed 5 and 1/4" magnetic peripherals may be mounted.

Removable magnetic peripheral: FDU, 8", 1 MB.

Fixed magnetic peripherals: 1 or 2 HDU, 5 and 1/4", 70, 140 or 300 MB.

EXPANSION CABINET SB2

One removable, 8" peripheral: 40 MB MTU (not obligatory)

Note: In this cabinet, the different HDU (60, 120 or 275 MB) may be used as third and fourth hard of a system or as disk units shared with other systems using the DUAL PORT option.

5.2.1 RESTRICTIONS ON CONFIGURATIONS

The conditions and restrictions binding magnetic peripheral unit configurations are listed below:

- The SB0 cabinet can only house full and slim size 5 and 1/4" peripheral units.
- The SB1 cabinet can house only only one removable 8" or one or two fixed magnetic peripherals.
- The SB2 cabinet can only house one removable MTU.

5.2.2 1MB MINI-FLOPPY DISK UNIT: MD08-DE

The mini-floppy unit is mounted vertically with the LED upwards together with the DC/DC converter in the top part at the front of the SBO cabinet (for assembly, see chapter 2). The figure below illustrates the peripheral unit connectors.

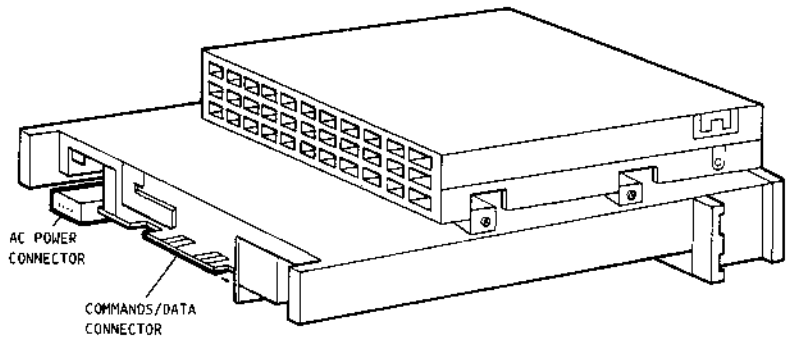


Fig. 5-1 1 MB Slim Minifloppy Disk Unit

Connection of the mini-floppy disk driver with the controller board G0280D and of the mini-floppy driver with the DC/DC converter DCA 36/512 is illustrated in the figure below.

If the second mini-floppy drive is used, the signals/data flat cable must be daisy chain connected; the double driver must be configured as second driver by removing the jumper in D1 and inserting jumper D2 (see figure below).

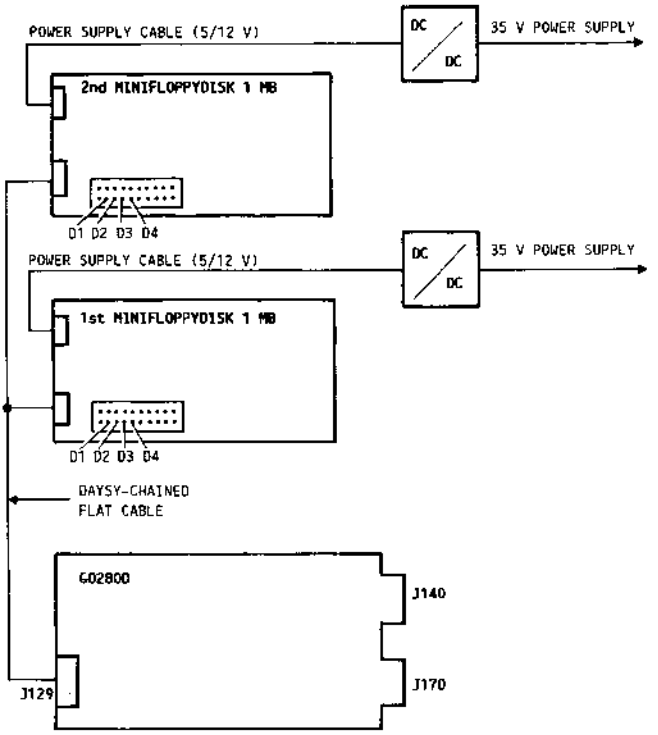


Fig. 5-2 1 MB Mini-floppy Disk Unit Connection

5.2.3 1 MB FLOPPY DISK UNIT: XG 6030

The 8" floppy disk unit is mounted vertically in the expansion cabinet SB1 as described in chapter two.

The figure below illustrates the connectors used in drive XG 6030 connection

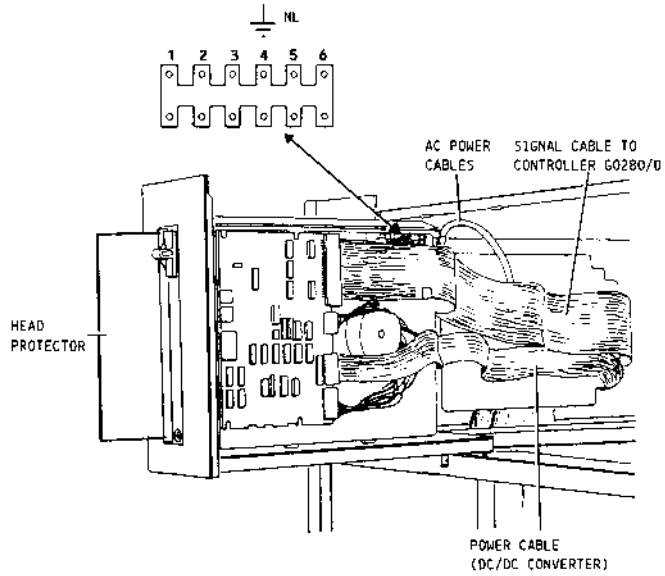


Fig. 5-3 1 MB Floppy Disk Unit

The diagram below illustrates connection of the floppy disk driver with the controller board G0280D, the DC/DC converter DCA 36/524 and the mains assembly (220 V).

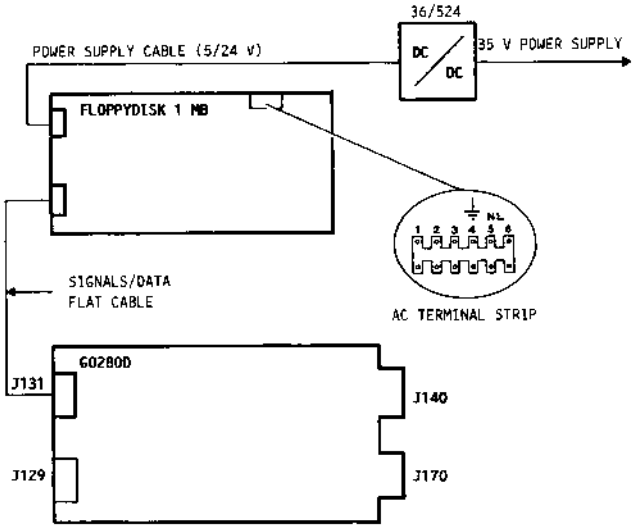


Fig. 5-4 Connection of 1 MB Floppy Disk Unit

5.2.4 45-60 MB 5 AND 1/4 INCH STREAMING TAPE UNIT

The 5 and 1/4" STC unit is mounted vertically together with the DC/DC converter at the top on the front of the SBO cabinet (for assembly, see chapter 2).

The figure below illustrates connection of the peripheral with the system by way of the G0417 (controller) and G0418 (formatter) boards.

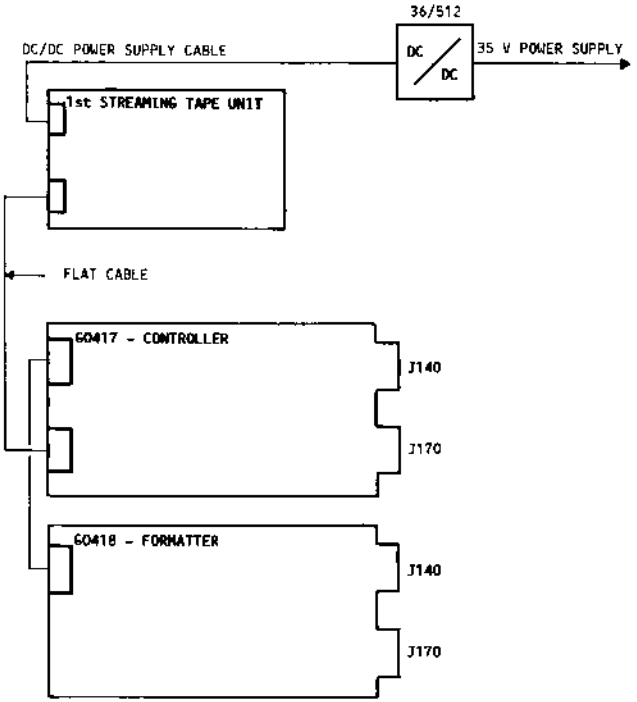


Fig. 5-5 Connection of Streaming Tape Unit to System

5.2.5 40 MB MAGNETIC TAPE UNIT: XU 1705

Settings on Peripheral

Remove the spacers marked '1' in the figure.

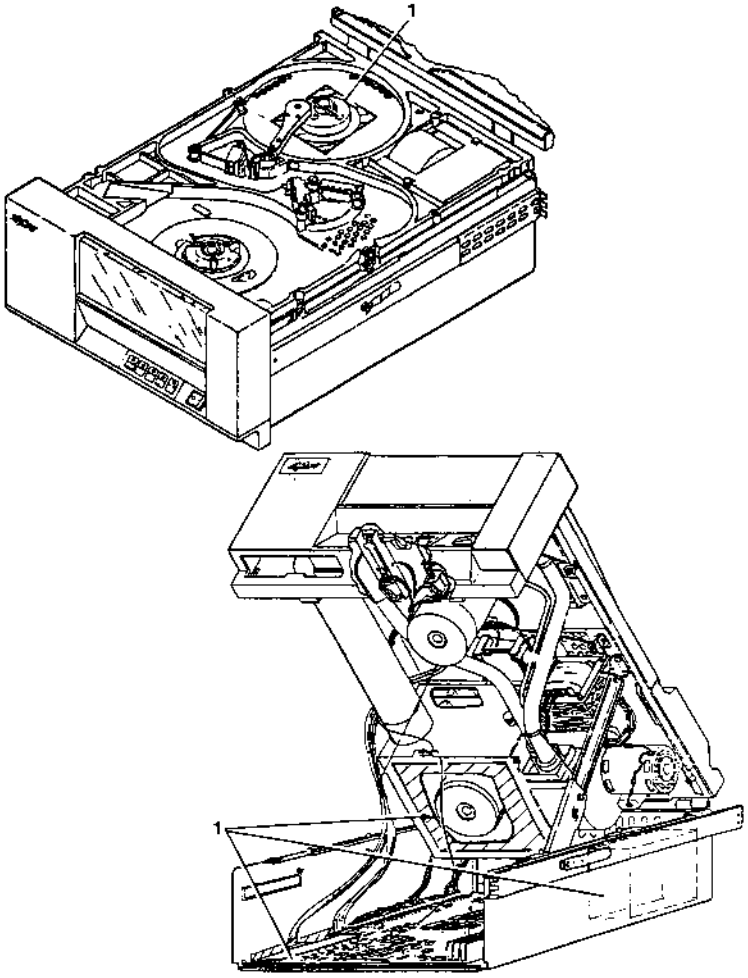


Fig. 5-6 Removing the Peripheral Unit Protections

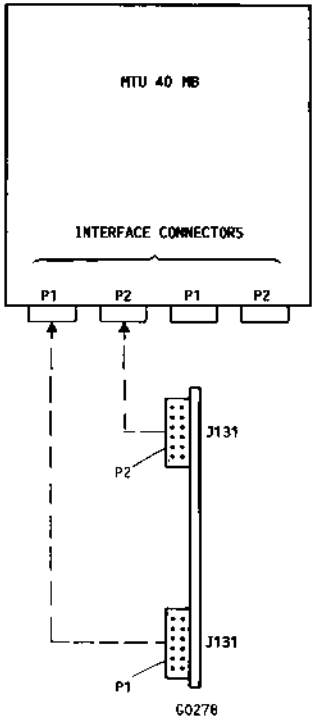
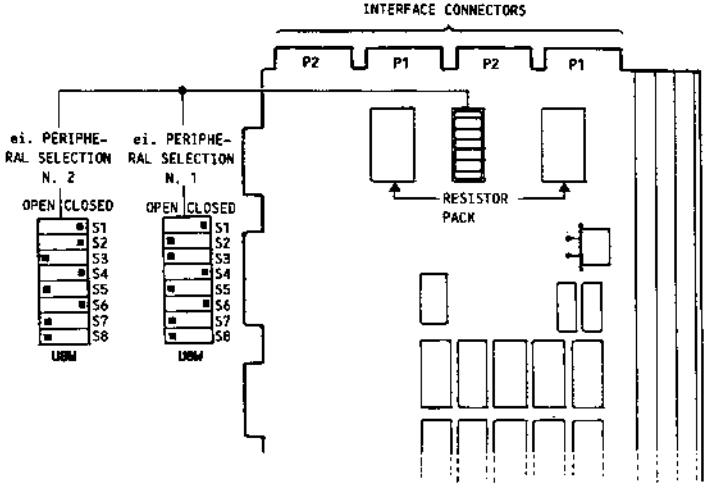


Fig. 5-7 Connection of Controller and MTU Peripheral



DIP-SWITCH U8W

POSITION	FUNCTION
S1	Formatter address (see table)
S2	Transport address (see table)
S3	GAP length reserved
S4	Transport address (see table)
S5	C = Selection of external parity
S6	C = Generation of internal parity
S7	Reserved
S8	Reserved

C = CLOSED

DECODE TABLE FOR LINE ADDRESSES

IFAD	ITAD 0	ITAD 1	S1	S2	S4	ADDRESS
0	0	0	1	1	1	0
0	1	0	1	0	1	2

0 = FALSE INTERFACE LEVEL 0 = OPEN
1 = TRUE INTERFACE LEVEL 1 = CLOSED

Fig. 5-8 Position of DIP-switch U8W

5.3 5 AND 1/4 INCH HARD DISK UNITS WITH ESDI INTERFACE

A 5 and 1/4" hard disk unit controlled by the OLIDISK controller G0427 with ESDI interface must be vertically mounted in either the SB0 or the SB1 cabinet. If in the SB0 cabinet, it must be mounted together with a DC/DC power converter (for assembly, see chapter 2). If in the SB1, the power is taken from the LS10 power supply.

Some of the hard disk units which can be mounted are:

- MICROPOLIS HDU 70, 140 MByte
- FUJITSU HDU 70, 140, 300 MByte.

The following figures illustrate the connectors and setting jumpers of the MICROPOLIS and FUJITSU hard disk units respectively.

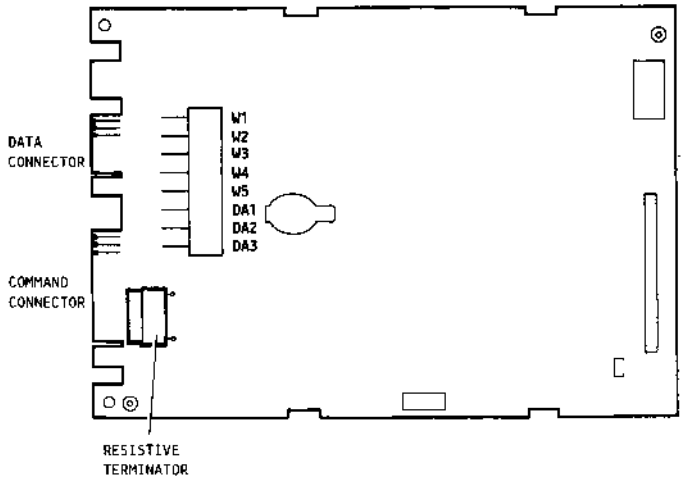


Fig. 5-9 MICROPOLIS 70/140 MByte Hard Disk Unit

The settings of the jumpers of the MICROPOLIS 70/140 MByte unit are shown below:

LOGIC UNIT	JUMPERS DA3	DA2	DA1
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF

The remaining jumpers W1, W2, W3, W4 and W5 must be left open. In addition, each peripheral must have the terminator resistor pack installed.

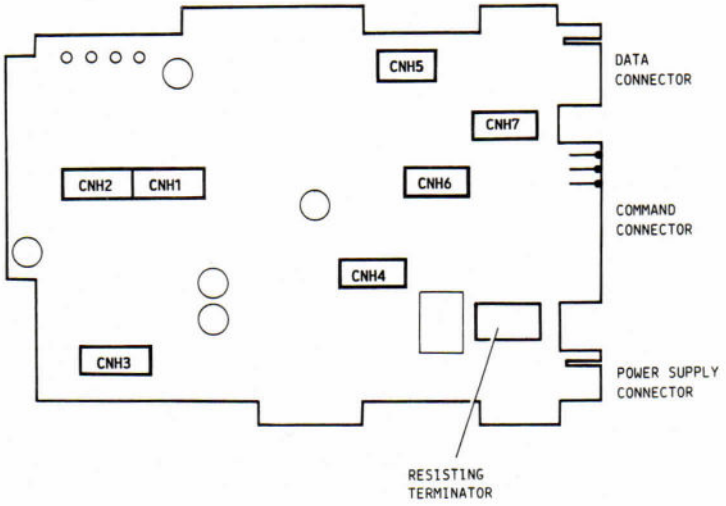


Fig. 5-10 FUJITSU 70/140 MByte Hard Disk Unit

The jumper settings of the 70/140 MByte FUJITSU unit are illustrated below.

LOGIC UNIT	CNH 6 JUMPERS							
	P1	P2	P3	P4	P5	P6	P7	P8
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF

HDU MODEL	CNH 7 JUMPERS			
	P3	P4	P5	P6
M2244 (70 MB)	OFF	OFF	OFF	OFF
M2246 (140 MB)	ON	ON	OFF	OFF

SECTORS PER TRACK	BYTES PER SECTOR	CNH 7 JUMPERS					
		P7	P8	P9	P10	P11	P12
35	596	ON	ON	OFF	OFF	ON	ON

HARDWARE SYNCHRONIZATION	CNH 7 JUMPERS					
	P13	P14	P15	P16	P17	P18
	OFF	OFF	OFF	OFF	OFF	OFF

In addition, each peripheral must have the terminator resistor pack installed.

From the viewpoint of the connectors, there are no substantial differences between the two peripherals so the diagram below is general diagram of connection of the hard disk peripheral by way of OLIDISK with ESDI interface.

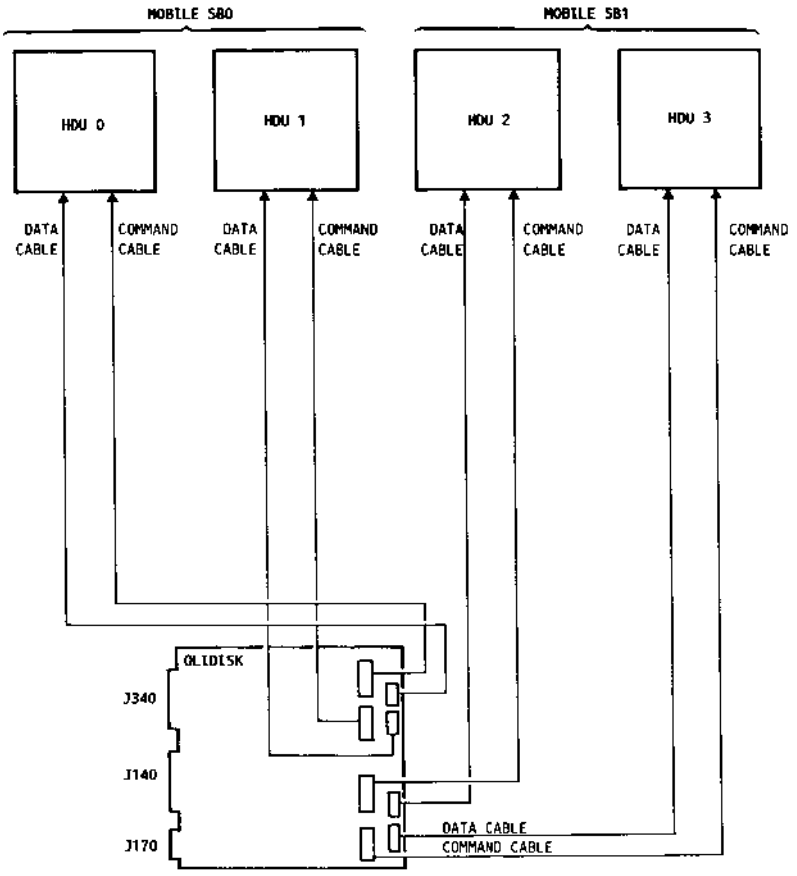


Fig. 5-11 Diagram of Interconnection of Four Hard Disk Units with ESDI interface

5.3.1 DUAL PORT BOARD: IF 206

This module is used to share the same 70/140/300 MB HDU between two different systems. The connection diagram can be seen below.

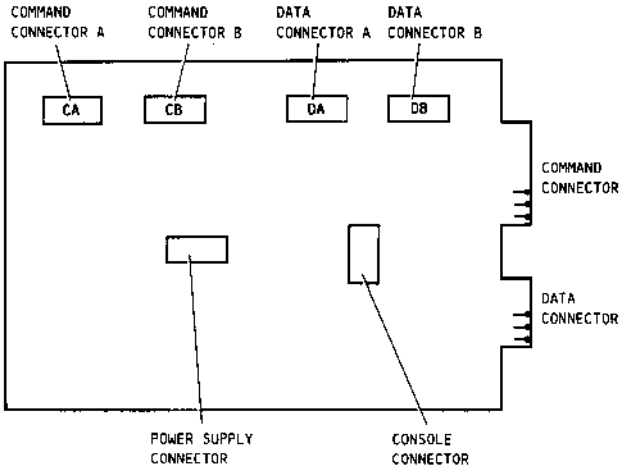


Fig. 5-12 Dual Port Board IF 206

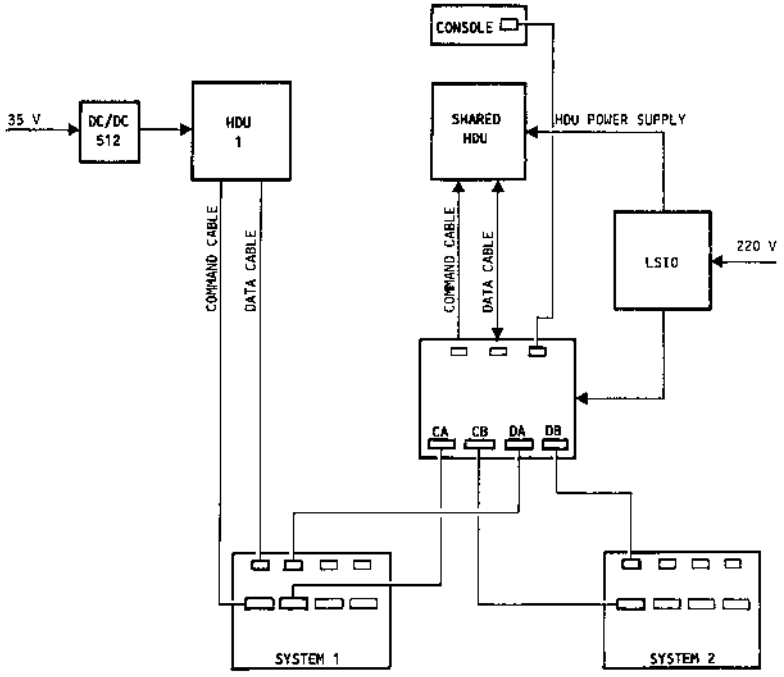


Fig. 5-13 Connection of Two HDU with Two Systems (one shared)

6. CONSOLE, AUTODIAGNOSTIC AND DIAGNOSTIC

6.1 SSM CONSOLE FOR LSX 3020 SYSTEM

The SSM (System Support Module) is the LSX 3020 system console and is a device responsible for handling the following activities:

- Determining and handling system functional states: off, on, unattended, telediagnostic enabled or disabled.
- Control of power supplies and handling of the power on and off sequences and mains power failures.
- Direct connection to CPU, through pseudo-serial dedicated line.
- Direct connection to "TTY system" (PC or VT100 type terminal), on RS232 line.
- Telediagnostic and handling of the connection with the technical service centre.
- Signalling of anomalies discovered during system autodiagnostic or the telediagnostic session.
- System personalization and protection through use of passwords.
- Handling of clock and calendar.

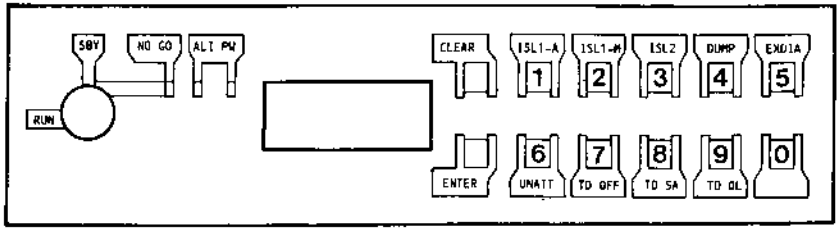


Fig. 6-1 Console Front Panel

6.1.1 SYSTEM - OPERATOR INTERFACE

The interface between console and operator is comprised mainly of the devices on the console front panel.
The operator enters the code of the function required, followed by "ENTER", (plus any passwords) through the keyboard. During entry of the code, the console mirrors on the display all keys entered. In the current cases, the response is also displayed.
Certain commands require parameters and, in this case, it will be the console to guide the operator in entry of the parameters.

Console/system exchanges take place on a pseudo-serial, dedicated line and not on the system bus.
Some of the commands the console sends the system imply an answer for the exclusive use of the system; in this case, transmission is transparent. With other commands, messages are displayed on the screen; in this way, the system can supply the operator with the information required.

6.1.2 TELEDIAGNOSTIC

Telediagnostic is a means by way of which system diagnostic can be performed from a remote technical service centre, under the control of highly qualified personnel.

The remote centre and local system can be several kilometres apart and are connected, via modem, by an ordinary, switched telephone line.

The console cannot simultaneously handle a telediagnostic centre connection and a TTY system connection; thus, when telediagnostic is enabled, the PC terminal connection is disabled.

WARNING

There are two types of console: with and without telediagnostic. The only difference is, in fact, the presence or absence of the telediagnostic feature. Below, reference is made constantly to the console with telediagnostic. All such references are therefore to be considered irrelevant in connection with the console without telediagnostic.

6.1.3 LIST OF FUNCTIONS AND COMMANDS POSSIBLE

The console can perform functions and commands sent by the operator, by the system CPU and the telediagnostic centre and respond to these commands.

Functions available to operator

Practically all the functions available to the operator are protected by a password. The functions are as follows:

- ISL (Initial System Loading) from the primary device, automatic or manual, or from a secondary device.
- System memory dump.
- Extended system diagnostic.
- Unattended condition, disabling the key and allowing the system to be switched on or off only on command from the timer, CPU or sent on line.
- Enable and disable connection with the remote telediagnostic centre or setting the system under exclusive control of the telediagnostic centre.
- Read and clear the Error Logging registers.
- Activate and deactivate the "Auto off" state, enabling the key and allows the system to be switched on and off automatically only.
- Generate a non-maskable interrupt.
- Display and update the calendar and the times of daily, automatic switch-on.
- Enter and modify passwords.
- Supply diagnostic information on the boards in the rack.
- Display cyclically the status of the main console functions.

Commands sent out by the system CPU

The commands the CPU sends the system are used to:

- Request console configuration, release and the autodiagnostic result.
- Request the switch-on means, position of the key, the ISL device and the autodiagnostic method.
- Perform memory dump, system reset and switch-off.
- Send console the result of the CPU autodiagnostic.
- Display a character string (in hex or ASCII) or the time in hours and minutes.
- Activate and deactivate the buzzer, switch diagnostic LED on, off or blinking.
- Program or read calendar and daily automatic switch-on schedules.
- Program, activate and deactivate the automatic switch-on/switch-off timer.
- Enable and disable the "unattended" function.
- Read and write the reserved RAM zone.
- Read and clear the Error Logging registers.

Commands sent out by remote diagnostic centre

From the remote centre, a series of commands can be sent out to:

- Switch on or off and initialize the local system
- Read the local system and console configuration
- Run a diagnostic cycle, extended or shortened, and check execution step-by-step
- Perform ISL from a selected console device or from the remote diagnostic centre
- Transfer and start execution of diagnostic programs
- Display a character string on the console display
- Start and complete a "remote login" session, during which the telediagnostic centre becomes a remote terminal of the local system.

6.1.4 DESCRIPTION OF FRONT PANEL

The interface devices on the console panel control the whole system including the switching on and off phases. Elements on the console front panel are listed below:

1. Switch-on key.
2. Power on LED.
3. Power supply status LED.
4. Diagnostic LED.
5. Buzzer.
6. Display.
7. Keyboard.

Switch on key

There are two positions for the switch-on key: "RUN" and "SBY" (stand-by), from both of which it can be removed. The two positions signify:

- SBY position: switches system off (after two seconds) and sets it in stand-by. Operation can proceed only on the console.
- RUN position: the system is powered and fully active.

Note:

- Switch the console off at the main ON/OFF switch.
- The "RUN --> SBY --> RUN" transition, if carried out in two seconds, re-initializes the system without switching it off.

Power on Led

This is a green-coloured LED marked PW driven directly by mains voltage and indicating presence or absence of mains voltage on the power supply input. Its two states are:

- ON: mains power present
- OFF: mains power missing.

Power supply unit status Led

This is the green-coloured LED marked ALI and is commanded by the signals output by the power supply unit and refers to the status of the system power supply voltages. Active when the key is in the RUN position. Its two states are:

- ON: system power supply present
- OFF: system power supply absent.

Diagnostic Led

This is the yellow LED marked NO GO. It is off when the switch-on key is in RUN. Can assume the following three states:

- OFF: the system has executed ISL and there are no anomalies.
- ON: the system was not able to perform ISL and the code indicating ISL not performed is displayed.
- FLASHING: the firmware has found a non-blocking error (warning condition).

Buzzer

This device is used to attract operator attention.
It is controlled by the system through the "on" and "off" commands.

Display

This is a 6-character, alphanumeric display used to display the result of the console and system autodiagnostic and the reply messages to functions activated.

Keyboard

The keyboard consists of ten number keys and two special keys.

- Number keys: used to input function codes, parameters and passwords
- CLEAR key: cancels any incorrect entries and interrupts the operation in progress.
- ENTER key: confirms the function selected or the data input.

6.1.5 FUNCTIONS AVAILABLE FOR OPERATOR

The commands that the operator can enter via the keyboard can be either mnemonic or coded functions.

The mnemonic functions are those with codes of only one digit; the coded functions, however, have a code with two digits. Almost all functions are protected by a password, as will be seen in detail later.

All the functions are activated by entering the code; if the function selected is protected by password, the password must also be entered. Certain functions require parameters which must be entered in the order proposed by the console.

All data entered, whether code, password or parameter, must be confirmed by way of the ENTER key. Incorrect data is not accepted, the buzzer is activated and the display is cleared.

The CLEAR key aborts the operation in progress, whatever it may be, cancelling all data already entered during the operation (even if confirmed by ENTER), clearing the display and switching off the buzzer.

Mnemonic functions

All the mnemonic functions are protected by a different password, with the exception of the ISL (Initial System Loading) selection functions, for which there is one password only.

All these functions can be called up only with the key in SBY (system off, console powered) except for the "dump", for which the key must be in RUN, and "unattended" functions, for which the key can be in either SBY or RUN.

MNEMONIC FUNCTION CODES

CODE	FUNCTION AND DESCRIPTION
1	**ISL1-A.** Performs ISL from the primary device, automatically.
2	**ISL2-M.** Performs ISL from the primary device, manually.
3	**ISL2.** Performs ISL from the secondary device.
4	**DUMP.** Performs the system memory dump. Performed automatically on reset.
5	**EXDIA.** Performs extended diagnostic cycle.
6	**UNATT.** Activates "unattended" status, by deactivating all key functions. The system therefore maintains its status (on/off) even if the key position is switched and the following message is displayed. ***UNAT***. In this state, the system can only be switched on or off via a command sent from the timer, the CPU or on line.
7	**TD OFF.** Sets the system under the exclusive control of the operator and blocks any connection with the remote diagnostic centre.
8	**TD SA** (stand alone). Deactivates the key functions and sets the system in diagnostic under exclusive control of the remote diagnostic centre.
9	**TD OL** (on line). The system remains under the control of the operator, but it is possible it to connect it to the remote diagnostic centre. The set of commands available to the remote operator will be reduced.
0	Code not used.

Coded functions

Some of the coded functions are protected by password, as will be explained in detail below.

All these functions can be called up with the key in either SBY or RUN, with the exception of the "Auto off" functions, for which the key must be in RUN, and that of "Set password", for which the key must be in the SBY position.

CODED FUNCTION CODES

CODE	FUNCTION AND DESCRIPTION
00	**Error Logging Registers read.** Reads the Error Logging registers, i.e. the registers containing the number of power supply control signal transitions. This function is protected by password. After the function code and password have been entered, the following message appears on display **Rc.** At this point the code of the register to be read must be entered. Valid codes are: 10 = register detailing deactivations of the ALIUP signal not preceded by a PWUP or PONOF activation 11 = register of deactivations of the DATE signal (DAngerous TEmperature) 12 = register of deactivations of the FANFAIL signal 13 = register of re-activations of the PWUP signal before de-activation of the PONOF signal.
01	**Error Logging Registers clear.** Cancels the Error Logging registers. The protective password is the same as that of the previous function. The function is identical to the previous function, with the difference that the register selected is cleared and not read.
02	**Auto off.** Prevents the system from being switched off even if the key is moved to SBY. This function is protected by password.
03	**Auto off clear.** Cancels the "Auto off" command. Protected by the same password as that of the previous function.
04	**Non maskable interrupt.** Activates the POWFA signal for half a second, thus generating a non maskable interrupt.

>>>

CODE	FUNCTION AND DESCRIPTION
05	**Set data.** Displays and updates the date and time. Year, month, day, hours and minutes must be entered in order.
06	**Set system on.** Displays and updates the times of daily, automatic switch-on. Status for the function (0=off, 1=on) is requested. If the function is set "on", switch-on times for all the days of the week, starting from Saturday, are displayed and requested in order. If automatic switch-on is not required for one or more days, the value 99 must be input for the hour or minutes. A sequence of 4 hyphens instead of the time indicates that no automatic switch-on has been programmed for that day.
07	**Set firmware mode.** Sets a flag that indicates the input requests in Forth diagnostic environment. This flag is set "off" by entering 0, and "on" by entering 1.
20	**Set password.** Input or modification of the passwords. After the function code is entered, the display shows: **Fc.** At this point, the code of the function for which the password is to be input or modified must be entered. If there is no password, switch the key as follows in a 10 second interval: "SBY --> RUN --> SBY". The password is entered or modified as follows: 1. The display reads: **TpNpwd.** The new password (which should be of 6 characters) must be keyed in (an "X" will appear on the display for each keystroke) 2. The display should now read: **RtNpwd.** The operator must key in the new password again.

>>>

CODE	FUNCTION AND DESCRIPTION
21	**Diagnostic result.** Provides diagnostic information on the boards present in the board rack. A message with the following format is given for each slot: **XXN:YY,** where: XX is the control board code N is the number of slots (in hexadecimal) YY is the result of the diagnostic, and can be: OK: board operational KO: board not operational WR: board partially operational An empty slot is represented by: **FFn:**.** At the end, memory status is indicated with one of the following messages: **RAM OK** = RAM board operational **RAM KO** = RAM board not operational **RAM fr** = RAM board partially operational
22	**Show data.** The date and time are displayed in cycles three times. The message has the following format: **YY MMM WWW DD, TT hh:mm,** where: YY = last two figures of the year MMM = month WWW = day of the week DD = day of the month TT = hour type (AM or PM) hh:mm = time
99	**Console status.** The states of the main functions of the console are displayed in cycles. The message has the following format: **Olivetti console, STATUS: IPL by X1, DUMP = X2, EXDIA = X2, UNATTENDED = X2, AUTO-OFF = X2, FW MODE = X2, the SYSTEM is X3,** where: X1 = **ISL1-A** or **ISL1-M** or **ISL2** X2 = **OFF** or **ON** X3 = **OFF** or **ON for key/timer/unattended 1 or 2**

95 - 033 R14 Consol + CPU Rel.
96 - 20851 Power ON Timer
97 - 20550 Schlüssel in RUN Time

6.1.6 CPU - CONSOLE EXCHANGES

Dialogue between the CPU and the console is activated exclusively by the CPU and involves issue of a command, followed by a delay during which the reply should arrive. This implies that the CPU does not issue two consecutive commands but must wait for the reply (where given) to the first before issuing a second command.

The commands sent out by the CPU are made up of a code, followed, in some cases, by certain parameters.
The console, in the present cases, initially responds by repeating the code of the command and then sends out the relative reply data.

Pseudo serial line

The CPU and console communicate on a pseudo-serial, dedicated line, and not via the system bus.

Each character has 8 bits, transmission starting from the least significant bit. Bit transmission involves use of three signals, connected as shown below:

```
==========================
Tx             Rx
--------------------------
DATA OUT ----> DATA IN
SYNC OUT ----> SYNC IN
REPLY IN <---- REPLY OUT
==========================
```

Transmission protocol

Transmission protocol is as follows:

1. The transmitter loads the first bit to be transmitted on the DATA OUT and sets SYNC OUT to 1.

2. The receiver senses SYNC IN at 1, reads DATA IN and sets REPLY OUT to 1.

3. The transmitter senses REPLY IN at 1 and sets SYNC OUT to 0.

4. The receiver senses SYNC IN at 0 and sets REPLY OUT at 0.

5. The transmitter senses REPLY IN at 0 and then transmits the next bit, repeating the above sequence.

Commands from CPU to console

CODES AND PARAMETERS	COMMAND AND DESCRIPTION
00	Request for console configuration
01	Request for console firmware release
02	Request for telediagnostic firmware release
03	Request for result of the console autodiagnostic
04 XX	XX characters displayed
05	Buzzer on
06	Buzzer off
10 NN XX .. XX	Display presents in hexadecimal; NN = number of bytes in message (from 1 to 16) XX..XX = message (two digits per byte) If the message is of more than 3 bytes, it will be displayed in "wrap-around"
11 NN XX .. XX	Display presents in ASCII; NN = number of bytes in message (from 1 to 32) XX..XX = message (one character per byte) If the message is of more than 6 bytes, it will be displayed in "wrap-around"
13 XX	Handling of diagnostic LED; XX = 00 LED off XX = 01 LED on XX = 02 LED flashing
14	Display of hours and minutes (the refresh occurs once a minute)
15	Cancellation of display
16	Display "booked" for write
17	Display "booking" cancelled

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CODES AND PARAMETERS:	COMMAND AND DESCRIPTION
19 NN XX YZ .. XX YZ RR	CPU autodiagnostic result sent to console; NN = number of bytes to follow, and, for each slot: XX = board code Y = 0 board operational Y = 1 board not operational Y = 2 board partially operational Y = 3 slot empty Z = digit reserved for future expansions at end: RR = 01 RAM board operational RR = 02 RAM board non operational RR = 03 RAM board partially operational
20 XX YY MM DD hh mm ss	Programming of calendar; XX : bit 7-4 = reserved for future expansions bit 3 = 0 Gregorian calendar bit 3 = 1 Show a calendar bit 2-0 = day of the week (0=Sat, 1=Sun ... 6=Fri) YY MM DD = year, month, day of the month hh : bit 7-6 = 00 time AM bit 7-6 = 01 time PM " = 10 " 0/23 bit 5-0 = hour mm ss = minutes and seconds
22	Request for year, month, day of the month, day of the week, hour, minutes and seconds
23	Request for hour, minutes and seconds
24 YY MM DD hh mm ss	Programming of auto switch-on timer; for parameters, see calendar programming
25	Activation of the auto switch-on timer
26 YY MM DD hh mm ss	Programming of the auto switch-off timer; for parameters, see calendar programming
27	Activation of the auto switch-off timer
28	Deactivation of auto switch-on timer
29	Deactivation of auto switch-off timer
30	Request for switch-on reason

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CODES AND PARAMETERS	COMMAND AND DESCRIPTION
31	Request for key position
32	Request for ISL device
33	Request for system memory dump
34	Request for autodiagnostic means
35 XX	Handling of the "unattended" function; XX = 00 unattended deactivated XX = 01 " activated
36 XX HH MM .. HH MM	Programming of the weekly automatic switch-ons; XX = 00 auto switch on deactivated XX = 01 " " " activated HH MM .. HH MM = 14 byte sequence, of which each pair represents hour and minute of auto switch-on for each day (from Saturday to Friday) the time 99:99 indicates auto switch on deactivated
37	Request for times of weekly auto switch-ons
40	Execution of a system "reset"
41	Request for system switch-off; the system only switches off if in "Auto off" and with key in SBY position
42 HH NN XX .. XX	Write in the reserved area of the RAM; HH = offset NN = number of bytes to be written less one XX..XX = bytes to be written
43 HH NN	Reading of the reserved RAM area; HH = offset NN = number of bytes to be read less one
44 XX	Error Logging registers reset: XX = 10 register of ALIUP deactivations before activation of PWUP or PONOF XX = 11 register of DATE deactivations XX = 12 register of FANFAIL deactivations XX = 13 register PWUP re-activations before deactivation of PONOF
45 XX	Reading of the Error Logging registers; the parameter XX has the same coding as above for register resetting
46	Reading of the "Firmware mode" Flag

Replies from console to CPU

CODES AND PARAMETERS	COMMAND AND DESCRIPTION
00 XX	Console configuration; XX = 0 only console functions
01 XY	Console firmware release; X = compatibility level Y = functional level
02 XY	Telediagnostic Firmware release; X = compatibility level Y = functional level for console without telediagnostic XY will be = 00
03 XX YY	Result of the console autodiagnostic; XX: bit 7 = 0/1 RAM operational/faulty bit 4 = 0/1 EPROM operational/faulty bit 0 = 0/1 RTC operational/faulty YY = byte reserved for future expansions
04 XX	Repeat of XX character
22 XX YY MM DD hh mm ss	Reply to the year, month, day, day of the week, hour, minutes and seconds request; for the parameters, see the calendar programming command described in the previous section
23 hh mm ss	Reply to the hour, minutes and seconds request; for the parameters, see the calendar programming command, described in the previous section
24	Reply to the auto switch-on timer programming request
25 YY MM DD hh mm ss	Reply to the auto switch-on timer request; for the parameters, see the calendar programming command, described in the previous section
26	Reply to the auto switch-off timer programming request
27 YY MM DD hh mm ss	Reply to the auto switch-off timer activation; for the parameters, see the calendar programming command, described in the previous section

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CODES AND PARAMETERS	COMMAND AND DESCRIPTION
30 XX	Means of switch-on; XX = 00 key XX = 01 unattended line 1 XX = 02 timer XX = 03 telediagnostic XX = 04 unattended line 2
31 XX	Key position; XX = 01 RUN XX = 03 SBY
32 XX	Request for ISL device XX = 01 primary device with automatic selection (ISL1-A) XX = 02 secondary device (ISL2) XX = 03 primary " with manual selection (ISL1-M)
33 XX	Reply to request for memory dump; XX = 00 dump not executed XX = 01 dump executed
34 XX	Resident autodiagnostic procedure; XX = 00 extended autodiagnostic XX = 01 shortened " "
35 XX	Handling of the "unattended" function; XX = 00 unattended deactivated XX = 01 " activated
37 XX HH MM .. HH MM	Reply to the request for times of weekly auto switch-ons; for parameters, see the programming command of the weekly auto switch-ons, described in the previous section
43 XX .. XX	Reply to the reading of the RAM reserved area; XX..XX = bytes read
45 XX	Reply to the reading of the Error Logging registers; XX = contents of the register selected (in BCD)
46 XX	Status of "Firmware mode" flag; XX = 00 flag deactivated XX = 01 " activated

6.1.7 TELEDIAGNOSTIC

Telediagnostic is a means of performing system diagnostic from a remote technical service centre connected to the console of the system and run by highly qualified personnel.

In the text below, the term **remote** refers to the service centre and the term **local** to the system being tested.

A series of commands can be issued from the remote centre for the following:

- Switch on, switch off and initialize the local system.
- Read the local system and console configuration.
- Run the diagnostics, extended or shortened, and check execution step by step.
- Perform ISL from a selected console device or from the telediagnostic centre.
- Transfer and execute certain diagnostic programs.
- Display a character string on console display.
- Initialize and complete a "remote login" session, during which the telediagnostic centre becomes a remote terminal of the local system.

Connection between remote centre and console

The remote centre and the local system can be several kilometres apart and are connected via modem on an ordinary, switched telephone line.

Transmission protocol

The transmission protocol used is the BSC2. The line is configured as follows:

PARAMETER	VALUE
Speed	1200 Bauds
Bits/Character	7
Stop bits	1
Parity	Odd
Type of link	Half duplex

Message format

All the messages on the connection line between console and remote centre have the following format:

FIELD	LENGTH	POSSIBLE VALUES AND DESCRIPTION
RECEIVER	2 Bytes	2F 4A = console 2F 4B = remote centre 2F 4C = local system
SENDER	2 "	as per the RECEIVER field
CODE	1 "	see below
TYPE	1 "	30 = request for command 31 = reply to command
STATUS	1 "	if TYPE = 30 30 = sender does not require reply 31 = sender requires reply --- if TYPE = 31 30 = command correctly executed other = anomaly verified
LENGTH	4 "	number of bytes in PARAMETER field
PARAMETERS	variable	all those provided by the command
CLOSURE	1 Byte	0A

Commands from remote center to local system

The commands that the remote centre sends the local system console can be divided into two groups:

1. Commands that can be executed directly by the console.

2. Commands that can be executed by the local system CPU.

The following pages detail the commands that can be issued from the remote centre.

Commands executed by the console.

CODES	COMMAND AND DESCRIPTION
2E	**READ CONSOLE STATUS.** Request for transmission of the console description. (position of key, data entered through keyboard and contents of display)
2B	**SYSTEM ON.** Local system switch-on command.
2C	**SYSTEM OFF.** Local system switch-off command.
2D	**SYSTEM RESET.** Local system hardware reset command.
32	**READ SYSTEM STATUS.** Request for transmission of local system description.
35	**READ SOFTWARE RELEASE.** Request for transmission of the software release of the environment loaded on the local system.
36	**READ SSM SOFTWARE RELEASE.** Request for transmission of the software release of the console.
38	**WRITE DISPLAY.** Write console display command.
39	**TERM ON.** Start of the "remote login" session.
3A	**TERM OFF.** End of the "remote login" session.
3B	**LINE UP.** Non-significant code, used to keep the BSC2 line active when there are no messages.

Commands executed by the local system CPU.

CODES	COMMAND AND DESCRIPTION
20	**AUTODIAGNOSTIC RESTART.** Local system software reset command (restart of resident autodiagnostic).
21	**EXTENDED DIAGNOSTIC 2.** Command to execute the second step of the resident autodiagnostic, extended version.
22	**INFORMATION.** Request for transmission of information collected during diagnostic.
23	**SPECIAL ISL.** Command to perform ISL from a local system device, selected specifically (slot and unit).
24	**ISL CONSOLE.** Command to perform ISL from a selected console device.
25	**REMOTE ISL.** Command to perform ISL from a remote diagnostic centre device.
26	**GO TO.** Command to execute the code of the program loaded previously.
27	**REDUCED DIAGNOSTIC 2.** Command to execute the second step of the resident autodiagnostic, shortened version.
2F	**DOES NOT FUNCTION.** Command to check CPU activity.
30	**CALL PROGRAM.** Command to call up the code of the program loaded previously.
73	**OPEN.** Beginning of the file transfer session.
74	**SEND.** Transmission of a program code block.
75	**CLOSE.** End of file transfer session.

6.1.8 CONSOLE CONNECTIONS

Connections of the console on the LSX 3020 system are illustrated in the table below.

LSX 3020 CONNECTIONS

CONNECTOR	DESTINATION
J690	Front panel
J052	Telediagnostic line
J040/1	Channel 1 line connector
J040/2	Channel 2 line connector
J037	SBO mains group relay
J121/1	SBO power supply
J038/1	SBO back plane
J122	UC068 board
J042	RS232 serial line (PC/VT100)

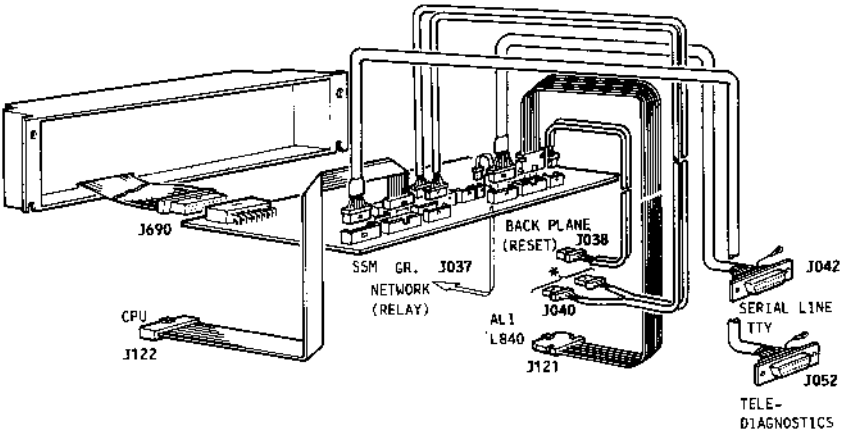
6.1.9 DESCRIPTION OF BOARD CONNECTORS

The connectors connecting the console board to the rest of the system are described below.

Position of the connectors on the console board is illustrated in the figure.

For each connector the following are shown:

1. Point of arrival and destination of the connection cable.
2. Pin layout.
3. Names of signals.



* LINE CONTROLLERS (UNATTENDED)

Fig. 6-2 Position of Connectors

Front panel connector - J690

A 30-way (15x2) connector connecting the console board to the front panel of the console.

PIN	SIGNAL	PIN	SIGNAL
1	LNOGA	16	TASR3
2	M	17	DIIN5
3	LALIA	18	TAC41
4	M	19	DIVFL
5	LPWON	20	DIIN6
6	KEYON	21	DIDSP
7	HISHA	22	DIDIN
8	Z	23	DIIN0
9	Z	24	DICLK
10	Z	25	DIIN1
11	TAC11	26	DIRST
12	TASR1	27	DIIN4
13	TASR2	28	+5 V
14	TAC21	29	DIIN3
15	TAC31	30	DIIN2

Telediagnostic connector - J052

A 24-way (12x2) connector connecting the console board to the RS232 line used for telediagnostic.

PIN	SIGNAL	PIN	SIGNAL
1	A1010	13	M
2	Z	14	A1080
3	A1030	15	A1090
4	A1140	16	A1400
5	A1040	17	Z
6	Z	18	A1250
7	A1050	19	Z
8	A1150	20	A1110
9	A1060	21	Z
10	A1410	22	A1130
11	A1070	23	Z
12	Z	24	A1420

LSX 3020 central unit connector - J122

A 26-way (13x2) connector connecting the console to the LSX 3020 CPU board (UC068) with a pseudo-serial line.

PIN	SIGNAL	PIN	SIGNAL
1	CARIC	14	M
2	M	15	CT104
3	DAC00	16	M
4	M	17	CT105
5	DAC10	18	M
6	M	19	CT106
7	LED0A	20	M
8	M	21	CT107
9	LED1A	22	M
10	M	23	CT108
11	LED2A	24	RESCA
12	M	25	CT109
13	CT103	26	Z

Line 1 controller connector - J040

This connector connects the console to the channel 1 unattended line.

PIN	SIGNAL
1	T1TTL
2	M
3	R1UNT
4	Z
5	COF1A
6	TEL1N
7	CON1A
8	+5 V

Line 2 controller connector - J040

This connector connects the console to the channel 2 unattended line.

PIN	SIGNAL
1	T2TTL
2	M
3	R2UNT
4	Z
5	COF2A
6	TEL2N
7	CON2A
8	+5 V

Relay connector - J037

A 2-way connector connecting the console to the mains group relay.

PIN	SIGNAL
1	PISCA
2	PIU12

TTY system connector - J042

The TTY system connector is a 10-way connector with the following pin layout:

PIN	SIGNAL
1	M
2	CD103
3	CD104
4	CD105
5	CD106
6	CD107
7	CD108
8	CD109
9	Z
10	Z

Power supply connector - J121

A 20-way (10x2) connector connecting the console to the power supply.

PIN	SIGNAL	PIN	SIGNAL
1	M	11	M
2	M	12	M
3	+5 V	13	PWSB1
4	+5 V	14	M
5	PONOF	15	M
6	PIU12	16	+5 V
7	PONOD	17	DTSB1
8	MEN12	18	+5 V
9	AUSB1	19	M
10	M	20	+5 V

Back plane connector - J038

A 4-way connector connecting the console to the back plane.

PIN	SIGNAL
1	RESEA
2	M
3	M
4	POWFA

6.1.10 AUTODIAGNOSTIC FROM CONSOLE

When the console is switched on, a diagnostic designed to reveal memory (RAM and EPROM) and Real Time Clock faults which could jeopardise correct operation of the console is executed automatically.

In the first step of the autodiagnostic, the front panel LEDs will go on for approximately 3 seconds, the addressable latches will be reset and the EPROM CRC test will be performed.
This checks that the back up batteries powering the RAM are operating and that the data in memory is correct. If there data losses, a test is made to check RAM hardware efficiency.
Finally the Real Time Clock is tested to prove it is working correctly.

If errors are found, the following error message will be displayed on the console display: **CON XX**. Byte XX represents the faulty devices, as shown in the table below:

BYTES	FAULTY DEVICES
10	RTC
20	EPROM
30	EPROM + RTC
40	RAM
50	RAM + RTC
60	RAM + EPROM
70	RAM + EPROM + RTC

If RAM and EPROM errors are found, the console processor will stop after displaying an error message and initialization will not be performed.

6.1.11 INITIALIZATION

The initialization procedure switches off the front panel LEDs, clears the display, keeps the system off and initializes the memory areas and all buffers that will be used subsequently.

Furthermore, if a RAM data errors were found in the diagnostic cycle executed previously, all passwords will be cancelled and the following message will appear on display **NO PWD**, informing the operator that all protections have been cancelled.

6.2 L2 LSX 3020/30/40 SYSTEMS AUTODIAGNOSTIC

The autodiagnostic is designed to test all the system hardware functions in an adequate and logical manner before the software modules are loaded. It is performed in the following steps:

a) CPU functional check.

b) Logic pack analysis (RAM descriptor and device table compilation).

c) Interactive FORTH environment activation.

d) ROM DEBUGGER activation.

e) IPL scheduler activation for loading of first software module.

f) Control passed to module loaded.

This order may be interrupted for the following functions to be executed:

- UNATTENDED
- TELEDIAGNOSTIC
- TOTAL MEMORY DUMP
- DIAGNOSTIC LOOP (for board testing purposes).

Note: Only the UNATTENDED and LOOP functions are currently active. The others are still in the design phase.

6.2.1 TEST STRUCTURE AND SEQUENCE

All autodiagnostic activity is carried out using the FORTH language resident in ROM, except for the check of the hardware components of essential importance to the FORTH itself which is made in ASSEMBLER 68020. Powering the system on (or a key-performed RESET) activates the ROM DEBUGGER resident in the CPU ROM.

When the console is present (connected to the CPU UART on interrupt level 7), the ROM DEBUGGER maintains control, allowing the user access to its features. If the console is not connected, the ROM DEBUGGER hands control over immediately to the ROM LOADER, which starts work.

6.2.2 MASTER CPU OPERATING SEQUENCE

The master CPU sequence of operations is outlined below:

- All devices disabled, buzzer activated (for 200 ms approx.) and console tested.

- A "1' displayed on console, CPU RAM test, ROM CRC calculation, timer and level 4 ACIA test.

- If telediagnostic is active, control is passed to the telediagnostic monitor; if not, and there is a Total Memory Dump request, a "D" is displayed and control given to the module responsible. Otherwise, the subsequent tests are carried out.

- Central unit test, level 7 interrupt generation test, level 7 ACIA test, IPC interrupt generation test, level 6 and 4 interrupts test, level 3, 2 and 1 interrupts test and microprocessor inner cache test.

- A "2" is displayed and RAM size calculated. If unattended is active, the RAM is filled with zeroes, the RAM test is not performed and the RAM Descriptor is compiled, taking for granted that the RAM is good. If unattended is not active, the RAM is tested and the descriptor compiled in function of the test results.

- A "3" is displayed, and the MMU and mathematic coprocessor M68881 are tested.

- A "4" is displayed, the "device table" compiled and the slave CPUs activated so that their resident autodiagnostic can be completed. If a diagnostic loop request is active, all the tests performed up to this point are repeated; if not, and the firmware mode flag is "on", the Forth interpreter is activated. Otherwise, the ROM DEBUGGER is activated for the second time.

- A "5" is displayed. If flag EXDIA (external diagnostic) is off, the extended diagnostic, including the TCB/TCM, system cache and bus tests, is carried out. The IPL scheduler is activated for loading of the first software module. If the IPL is successful, the ROM DEBUGGER is activated for the third time and the code loaded is given control. If the IPL fails, device scheduling continues in an attempt to perform IPL correctly.

6.2.3 SLAVE CPU OPERATING SEQUENCE

The sequence of operations of each Slave CPU is described below briefly:

- CPU RAM test, ROM CRC calculated, timer and level 4 ACIA tested.
- Central unit test, level 7 interrupt generation test, level 7 ACIA test, IPC interrupt generation test, interrupt levels 6 and 4 test, interrupt levels 3, 2 and 1 generation test and analysis of microprocessor internal cache.
- Testing interrupted with interval before Master CPU re-activates, after which the following steps are performed.
- Request for outcome of resident autodiagnostic, MMU, mathematic co-processor and cache test (if flag EXDIA is off).
- Transfer of RAM Descriptor and device table from master CPU memory to slave CPU memory.

All the events listed are described in detail in the next section.

6.2.4 DESCRIPTION OF AUTODIAGNOSTIC TESTS

Preliminary notes

The key autodiagnostic tests are the console, CPU RAM, ROM CRC, timer and level 4 UART tests. These tests are carried out without use of the system RAM, making it more probable for the diagnostic to reach an advanced stage. It also means that telediagnostic is activated with a greater degree of safety and environment does not change for a Total Memory Dump request or for FORTH diagnostic activities.

The autodiagnostic firmware interfaces three types of console: the M60 console, the NEW L1 console (no telediagnostic) and the SSM console (with telediagnostic). The latter two have a series of flags which can alter the sequence of operations.
These flags are:

- EXDIA: determines the type of resident autodiagnostic to be performed
- DUMP: activates Total Memory Dump
- FW MODE: activates the interactive FORTH interpreter.

If the console is NEW L1 or SSM, these flags are read; for the other type of console, they are assumed to have the following default values:

- EXDIA = off (extended autodiagnostic performed)
- DUMP = off (Total Memory Dump not performed)
- FW MODE = on (FORTH interpreter activated).

Console test

An exchange is performed through a dedicated, pseudo-serial interface and the "echo" feature used to check correct reception/transmission. If the exchange is possible, the result of the resident diagnostic is requested. The test is not interrupted if an error is found. Console type is also acknowledged.

CPU RAM test

The 4 Kbytes of protected RAM on the CPU board are tested using an algorithm which, at the end of the test, leaves contents unaltered. The test is performed with long word, word and byte operations; the circuitry rendering this zone of memory "write protected" is checked.

As this memory is of fundamental importance for subsequent testing, an error will result in suspension of the tests.

ROM CRC calculation

The calculation involves all 128 Kbytes of ROM. An error will cause testing to be interrupted.

TIMER test

The three sections of the timer are programmed for the following modes of operation:

section 1: rate generator
section 2: stop on terminal count
section 3: rate generator

Section 3 is reserved for the serial interfaces and cannot be tested directly.

Sections 1 and 2 (used by the CPU for internal activity) are appropriately programmed and a check made that end of count occurs within the time set, using a software timer.

This test is performed with interrupts disabled. Level 6 interrupt is then enabled and the test waits for the count end interrupt to be generated.

An error does not result in suspension of testing.

Level 4 ACIA test

For the purposes of this test, the hardware feature in which a loop can be set up between the serial receiver and transmitter is used: a character is sent out and the test waits for it to be received. The send/receive characteristics are as follows:

speed : 9600 baud
bits/character : 7
parity : even
stop bits : 1

The test is performed with interrupts disabled. The level 4 interrupt is then enabled and the test waits for the interrupt to be generated by the ACIA.

An error does not result in suspension of testing.

Central Unit test

At this point, a first conclusion can be drawn; if the diagnostic is still in progress, the processor basic functions are OK. This test, as a result, is limited to a series of checks on the handling of exceptions, in which the following exceptions are generated under control:

- Illegal instruction
- Divide by zero
- Chk instruction
- Trapv instruction
- Trap vector instruction (trap 32-47)
- Addressing error

Following a fault in this phase, testing is interrupted.

Level 7 autovector test

The test consists in controlled generation of this interrupt.

Note: The test assumes that the RAM boards in the rack do not cover all the memory space addressable by the RAM.

Successive RAM reads are, therefore, made starting from address 40000 (first physical address possible) and the test waits for the interrupt in question to be generated by a time-out on the bus.

An error results in suspension of testing.

Level 7 ACIA test

Only the transmit interrupt of this device can be tested, as the internal receive/transmit loop cannot be created (as with the level 4 interrupt). Programming characteristics, however, are the same as those for ACIA level 4.

An error does not result in suspension of testing.

Interprocessor communications test

The hardware in question is tested by causing generation of the level 7 interrupt for both the multiprocessor IPC and the debugging IPC. An error does not result in suspension of testing.

Level 3, 2 and 1 interrupts test

The test consists in controlled generation of each of these interrupts. Errors do not cause suspension of testing.

Microprocessor internal cache test

The register containing the cache status. If correct, the cache is enabled; if not, it is disabled and the next tests are performed.

Calculation of RAM size

The MMU is disabled and all operations are at physical addresses.

Calculation starts from the 2 Mbyte address (first memory array) and continues in subsequent steps of 16 Kbyte each. After each sum, a check is made that the RAM responds at each address obtained. Calculations end at 16 Mbytes. The start and end values obtained are written into the PH LOW and PH HIGH fields of the RAM Descriptor.
If memory size is under 128 Kbyte, the autodiagnostic stops.

RAM test

In this test too, all operations are at physical addresses as the MMU is maintained transparent.
The test sequence of events is as follows:

1. The ECC function is enabled and the entire RAM is filled with the "00" pattern.

2. The system power-on means is checked. If "by unattended", the RAM test is considered over and the subsequent steps are not performed. Otherwise, the ECC function is disabled and the RAM is checked to be filled with zeroes. An error in this phase will raise the RAM USER FAIL flag, jeopardizing test continuation.

3. The first 128 Kbytes of RAM are checked through two write, read and compare cycles using the "5555AAAA" and "AAAA5555" pattern (32 bit). As this part of memory will be used by the firmware later in testing, an error in this stage will cause testing to be suspended.

4. The status of flags EXDIA and RAM USER FAIL is checked. If EXDIA is "on" (reduced diagnostic) and if RAM USER FAIL is "off", the test will be considered finished. If this is not the case, the rest of the physical RAM available will be checked with the method used previously.

   In either case, the RAM Descriptor is compiled. This descriptor contains the list of limit values of the single, functioning RAM blocks (if there are RAM interruptions due to malfunctions). To be included in the list, a block must be of 64 Kbytes at least. The maximum number of blocks accepted is 8. For a RAM which is completely functional, one block only is given.

MMU test

This test is performed in the following steps:

1. MMU disabled and a memory zone written with a known pattern using "physical" addressing.

2. MMU programmed and enabled. The zone containing EVA is mapped in segments and the test zone in pages.

3. The same zone as before read and compared using "logical" addressing.

4. Generation of an read violation interrupt is tested (the page used for the test is declared read only).

5. MMU disabled and test terminated.

Floating point mathematic co-processor M68881 test

This test is in two parts: one concerning the co-processor exceptions, the other its mathematic and trigonometric functions.

In the first part, all interrupts possible with this component are generated under control.
In the second, calculations are carried out to test all operations and mathematic and trigonometric functions. At the end of each operation, the value obtained is compared with the result expected.

An error during this test does not result in suspension of testing.

Compiling the device table

The board rack is scanned and a list of the controllers present drawn up, in slot number order, in a defined area of RAM with logic name and status (working or not). Scansion always takes into account maximum board rack expansion (16 slots) so that 16 fields are compiled in all cases.

6.2.5 EXTENDED DIAGNOSTIC

Extended diagnostic is the term used to indicate the series of tests performed only if the diagnostic is requested from the console (flag EXDIA = "off"). These tests are:

- TCB Test
- TCM test
- System cache memory test
- Bus test (I/O test)

TCB test

Deliberate memory errors are are made so as to check single error correction and double error reporting. The error logging function is also tested. Following the test, the TCB will have the following characteristics:

- ECC function enabled
- Autovector level 7 generation enabled
- Correction enabled during refresh cycles
- Error logging buffer cleared
- Error logging function disabled

Anomalies are detailed in the device table. Numbers and faults correspond as follows:

01 = no interrupt on double error
02 = single error not corrected
03 = no report given on accumulation of 15 errors
04 = TCB status not valid
05 = unscheduled interrupt

TCM test

Errors are caused so as to check single error reporting and correction and double error reporting. Following the test, TCM characteristics will be:

- ECC function enabled
- Autovector level 7 generation enabled
- Correction enabled during refresh cycles
- Error logging buffer reset
- Error logging disabled

Any errors are detailed in the device table. Numbers and faults correspond as follows:

01 = no interrupt on double error
02 = single error not corrected
04 = TCM status not valid
05 = unscheduled interrupt

System cache test

A check is made first on the data RAM. The test continues with a check of the miss (data not in cache) and hit (data in cache), pseudo random write and write through functions. If test is passed, the cache is left enabled; if not, it will be disabled.

Bus test (I/O test)

This test has a double purpose: a further, more detailed check of the controllers in the logic pack and a check, at bus level, of environment efficiency.

First, a command is sent to all controllers in the rack to carry out their diagnostic and the result checked. If negative, the device table compiled previously is updated.

To check the bus, possibly illegally occupied by a faulty controller, a reduced memory test is performed (on the last 16 Kbytes of RAM). If there is an error, it will not be possible to activate the bootstrapper.

6.2.6 UNATTENDED STATUS HANDLING

Unattended status is ascertained by reading specific information from the console. If unattended is active, all the autodiagnostic tests, except the system RAM test which has the longest execution time, are performed.

6.2.7 DIAGNOSTIC LOOP HANDLING

Diagnostic loop status is recognized by reading one of the jumpers giving the CPU "name"; the loop is activated if the jumper with weight 2 is open, i.e. if the corresponding signal, IN010, is at 1. Resident autodiagnostic tests will be repeated continuously.

6.2.8 FORTH ENVIRONMENT HANDLING

The FORTH environment code is in the CPU ROM. It is activated by the FW MODE flag, which is set by the console. An interactive interpreter, a compiler and a driver for M24 PC (or compatible) are available.

FORTH environment allows use of already existing words (both primary and secondary), new words can be written, programs can be written and executed and all writes stored on the PC magnetic medium.

6.2.9 ROM DEBUGGER ACTIVATION

The ROM DEBUGGER code is also CPU ROM resident and is activated through indirect addressing (the real address is in a preset zone of the CPU RAM). It is activated three times:

1. When the system is switched on (or reset)

2. Before the IPL scheduling phase

3. Before control is handed over to the software module loaded.

It is always activated, even if the console is "missing" (connected to UART level 7) so that control of the CPU can always be recovered, obviously after re-activation of the console.

Note: In multiprocessor environment, the debugger terminal must be connected to the master CPU.

6.2.10 IPL

The IPL device is selected depending on the information supplied by the console and on device priority. The priority table is as follows:

primary devices: OLIDISK
HDC5
ESDI

secondary devices: FDU/mFDU
STC5
MTU

A primary device IPL request means the IPL will be attempted only for that category of device; for secondary (or removable) device IPL, it will be attempted only for secondary devices.

Note: If there is a fault and the console does not give a valid response, IPL will default to the secondary devices.

Devices, in each category, are scanned in the order of the table above, irrespective of the physical position of the controllers in the rack.

Where there are two controllers of the same type, IPL is attempted from the one found first (starting from rack slot 0), unless it is not in condition to do so or the code loaded is not an acknowledged bootstrapper code. Furthermore, if the device from which the IPL is attempted has several units connected, its units will be scanned in order.

In loading, a block of 4 Kbytes is transferred. This means the bootstrapper may vary in length, up to a maximum of 4 Kbyte. It may not be less than 256 bytes. At the end of the transfer, the bootstrapper loaded is checked to be among those accepted. Two "labels" are accepted: SYSO (OS environment) and DIAG (diagnostic environment).

Note: Label is the term used to indicate the first four characters of the module loaded.

6.2.11 BOOTSTRAPPER ACTIVATION

Bootstrap address
After all operations have been duly carried out, the ROM LOADER hands control to the code loaded during IPL. The start address is compiled in the two words following the label and is a physical address.

Condition of master CPU on bootstrapper activation
On bootstrapper activation, the master CPU conditions, if an extended diagnostic has been carried out (EXDIA=off), are as follows:

- CPU cache enabled (if functioning)
- System cache enabled (if functioning)
- MMg not significant
- CPU registers: not significant
- ISP: in system RAM area
- USP and MSP: not significant
- VBR = 00002A000 H (CPU RAM)
- SFC = DFC = 7
- SBR = SNR = 0
- Coprocessor "not referenced"
- CPU timer in HALT
- CPU RAM protected
- Power fail enabled
- First free vector (level 5): the third (EVA offset = 0108 hex).

If, on the other hand, the reduced diagnostic has been performed (EXDIA=on), the system cache is left disabled as it has not been tested. For the rest, the CPU is in the same conditions as given above.

Status of slave CPUs on bootstrapper activation
If extended diagnostic has been performed, slave CPU status is as follows:

- CPU cache enabled (if functioning)
- System cache enable (if functioning)
- MMU disabled
- Status register: supervisor
- Interrupts enabled: level 7 only
- Flags: not significant
- CPU registers: not significant
- ISP: in system RAM area
- USP and MSP: not significant
- VBR = 00002A000 H (CPU RAM)
- SFC = DFC = 7
- SBR = SNR = 0
- Coprocessor "not referenced"
- CPU timer in HALT
- CPU RAM protected
- Power fail enabled.

As for the master CPU, if the reduced diagnostic has been performed, the system cache is left disabled. The other CPU states are as shown above. Slave CPU activation, following an IPC, consists in reading in a defined RAM zone, the address to be given control of execution.

6.2.12 CONSOLE HANDLING

The console display is used in autodiagnostic to indicate the test being performed and to display diagnostic messages if there are errors.

Activity status display

The display is a six-figure display; normal format to indicate the test being displayed is as follows, from left to right:

first digit: always a dot
second digit: always a space
third digit: always a space
fourth digit: the diagnostic step within the test
fifth digit: always a space (except for a bus error)
sixth digit: the test in progress

Exceptions are for FORTH interpreter and ROM DEBUGGER activation, where the messages displayed are "FORTH" in the first case and "DEB1" and DEB2" for debugger.

Events signalled on the console are listed below:

```
.  1 1   console test (start of CPU test)
.  2 1   CPU RAM test
.  3 1   ROM CRC calculation
.  4 1   timer test
.  6 1   central unit test
.  7 1   level 7 interrupt test
.  8 1   level 4 ACIA test
.  9 1   IPC test
.  A 1   level 3, 2 and 1 interrupts test
.  B 1   CPU cache test
.  C 1   MMU test
.  D 1   mathematic co-processor M68881 test
.    D   Total Memory Dump
.  1 2   RAM size calculation (start of RAM test)
.  2 2   RAM filled with pattern "00"
.  3 2   RAM test (first 128 Kbytes)
.  4 2   RAM test (remainder)
.  1 4   device table compilation
DEB1     first ROM DEBUGGER activation
FORTH    FORTH environment active
.    5   IPL attempt in progress
.  1 5   TCB/TCM test (start of extended diagnostic)
.  2 5   system cache test
.  3 5   bus test (I/O test)
DEB2     second ROM DEBUGGER activation
.        (a dot only) bootstrapper activation
```

Note: This table does not give the actual sequence of console displays. For practical reasons, a diagnostic step may sometimes be performed not in the logical sequence to which the test belongs.

Diagnostic indications

Resident autodiagnostic execution may produce some unexpected, asynchronous events. These are indicated in a "dot - 4 spaces - character" format and are as follows:

```
.    1   unscheduled interrupt level 1 to 24 (offset 04-60 hex)
.    3   unscheduled interrupt level 5
.    7   unscheduled interrupt level 7
.    8   unscheduled interrupt level 6, 4, 3, 2, 1
```

The diagnostic messages displayed in the IPL attempt have the following format:

```
first digit: always a dot
second digit: always a space
third digit: always a space
fourth digit: type of fault
fifth digit: slot involved
sixth digit: last unit analyzed
```

Faults reported are:

```
1   faulty controller
2   faulty unit
3   unscheduled (or incorrect) interrupt
4   faulty medium
8   non-system file, or medium not inserted
```

GO/NOGO LED handling

During the autodiagnostic, this LED remains on. It will change before the bootstrapper is activated as follows:

```
off      :     no faults found in autodiagnostic
blinking :     non-blocking errors found
on       :     a blocking error has been found
```

The bootstrapper can then be activated in the first two cases only.

6.3 STAND ALONE DIAGNOSTIC PROGRAMS

Using stand alone diagnostic programs, all the modules in the system can be tested.

If there are errors, error messages are output (these can be found with a description in the relative Functional Checks manual).

For all information on these programs, see the appropriate manual. A list of the programs which can be run is given below.

PROGRAM	DESCRIPTION
DIM080	Diagnostic monitor for L2
WS68VIDEO	Test of Video on WS Connected via ELB 3683
WS68KEY	Test of Keyboard on WS Connected via ELB 3683
WS68PPCR	Test of Pinpad/Card Reader Connected via ELB 3683
WS68LINE	Test of WS - MUX Connection
7032_ERRATE	Error rate for FDU/MFDU XG7032
STC5_ERRATE	Error rate for STC5
ESDI_ERRATE	Error rate for HDU with ESDI Interface
STD24_MICR1355	Installation of STD24 on Micropolis HDU 1355 (140 MB)
STD24_FUJIM2246E	Installation of STD24 on Fujitsu HDU M2246E (140 MB)

7. OPERATING SYSTEMS

7.1 GENERAL

LSX 3020, LSX 3030 and LSX 3040 systems may operate with two different operating systems: MOS and UNIX. The product hardware must be configured differently for MOS and UNIX, which also means that a system may be used with one operating system only. Information on system hardware for each operating system can be found in the previous chapters of this manual.

Some information of a general nature on MOS and UNIX operating systems will be given below.

7.2 MOS OPERATING SYSTEM

MOS (Multifunction Operating System) is an operating system designed to support multifunction applications and distributed processor structures (masters-satellites, local network, geographic network etc.). Mono and multifunctional, stand-alone structures are also supported. Being of a flexible and modular architecture, MOS can simultaneously satisfy the application requirements of the different workstations, without minimizing the specific functions of each. MOS, in addition, grants all users simultaneous access to central resources, such as archive, printer spooler, terminal emulators, external connection lines, network services, etc.

The main MOS functions are:

- Control and handling of common resources (lines, printers, data base)
- Control and handling of interaction between user and workstation
- Multiprogramming
- Handling of interactive and batch work in concurrent mode
- Handling of graphics
- Print spooler handling
- High level programming languages
- Program preparation tools.

7.2.1 MOS STRUCTURE

MOS architecture is based on a kernel and a series of high level components: file system, workstation handling subsystem, communication subsystem, background monitor, spooling system, system packages, environment monitor, etc.

The figure below is a diagram of the hardware and software architecture of LSX 3020/30/40 systems in MOS.

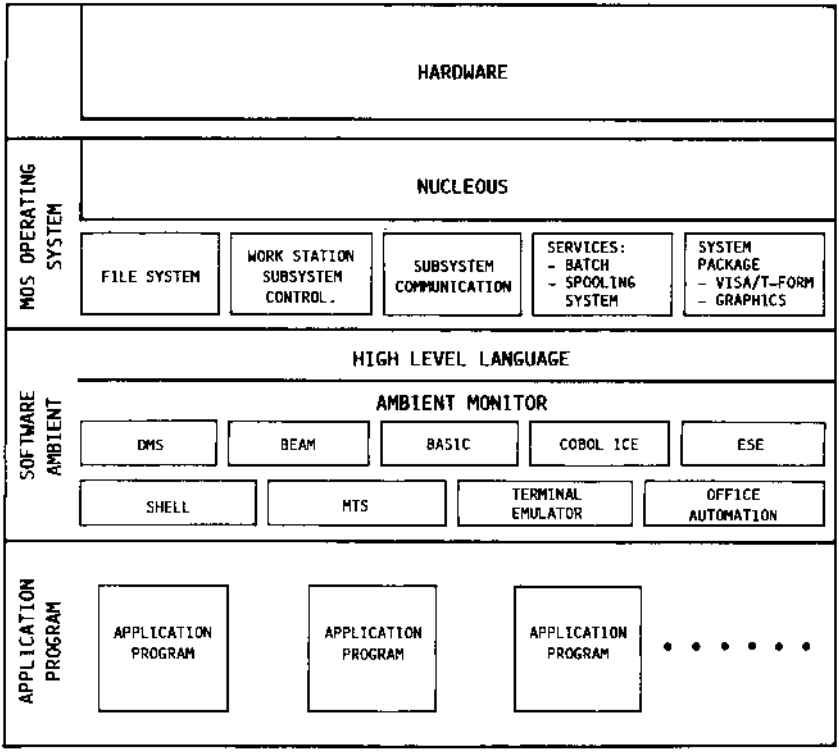


Fig. 7-1 Hardware and Software Architecture of LSX 3020/30/40 Systems in MOS

7.2.2 FILE SYSTEM

The main element of MOS is its file system. The file system provides the basic support for storage and updating of data, offering a high degree of independence from the peripherals used. In this way, data can be represented as files made up of a string of characters, whether they be lines of print or data entered through the keyboard or coming from disk units or lines. All information in a file system recorded on magnetic media is organized in a tree-like, hierarchical structure, consisting of files, directories and volumes. A volume and, as a result, the file system may extend to several magnetic units. The file system allows several users to access a file in any part of the tree concurrently. File sharing between users is handled by MOS through mechanisms which guarantee data confidentiality and integrity at all times.

7.3 UNIX OPERATING SYSTEM

UNIX is one of the most popular operating systems on small and average size computers due to its flexibility, operating power and ease of use. Like MOS, UNIX architecture is based on a kernel and a series of high level components: file system, workstation handling subsystem, communication, spooling system, etc.

The figure below is a diagram of the hardware and software architecture of LSX 3020/30/40 systems in UNIX.

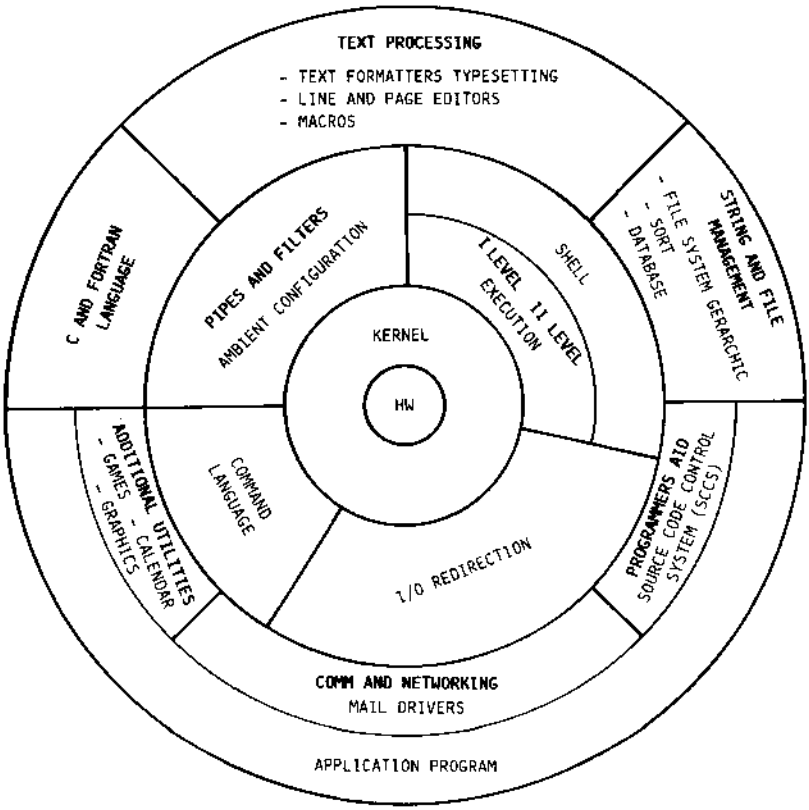


Fig. 7-2 Hardware and Software Architecture of LSX 3020/30/40 Systems in UNIX

7.3.1 UNIX SYSTEM CHARACTERISTICS

One of the most important characteristics of the UNIX operating system is its file concept. Elements such as data files, terminals, mass memory, drivers and practically all units are seen by UNIX as files. This means the user is fully aware of system resources and how they are positioned, and hence the file system structure.

The file system thus represents the interface between the user and I/O devices. Generally speaking, there are three different types of file: normal files, directories and special files.

Normal files

A normal file is structured as a sequence of bytes, in blocks of 512 bytes. Block allocation, as the file increases in size, is automatic and not user transparent.

Directories

A directory establishes the link between file names and the files themselves. Practically, it is a list of files automatically updated by the system, depending on user needs. Each directory may contain one or several directories. The file system thus has a tree-like, hierarchical structure. At the base of the tree is the "root" or system directory on which the entire file system depends. The root directory is represented by a slash ("/" character); the main system directories which may be found under the root are as follows:

- **/bin:** Contains the UNIX commands in machine code.
- **/dev:** Contains all the special files (devices).
- **/etc:** A directory designed for maintenance, development and control of the system activities, of special use to the staff members in charge of the system.
- **/lib:** Contains function libraries for programs in C language, Pascal, pl1 and other languages.
- **/lost+found:** When the system crashes or a power failure occurs, UNIX saves into this directory the contents of files in which users were working.
- **/priv:** Private directory of the system staff members.
- **/tmp:** The directory to which all temporary files produced by commands such as the editor "vi" are sent.
- **/usr:** Normally, the largest directory in number of files and amount of memory occupied; in addition to the user files, also contains other commands, admin files, manuals (those called up via the "man" command), libraries and general utility files.

Special files

Special files are all physical and logical I/O devices. Disk units, printers or any other device are all treated in the same way as a file, thus simplifying all I/O operations on the peripheral units. The special files are always to be found in the "/dev" directory.

7.3.2 FILE SYSTEM INTERNAL DESCRIPTION

The file system is physically disk resident and addressable in blocks of 512 bytes. It is divided into four main parts: bootstrap area, superblock, i-list, and free blocks area.

Bootstrap area

The bootstrap procedure is used to load the operating system kernel in central memory. It is used only at start-up, which generally consists of two stages. At the start, a code resident in system ROM loads from disk into memory a program known as Initial Program Loader; this program is subsequently handed system control and is responsible for loading the kernel in memory. The IPL is always in the first block (Block 0) of the file system. This block is called "bootstrap area" and is never used by the operating system.

Superblock

The superblock (file system block 1) contains the vital file system information. Without the contents of this block, it is impossible to access information in the file system. Among the most important items of information are: size of the file system, size of the i-list area and size of the free blocks area.

I-list

The i-list is an area containing information relative to the files. For each file, there is a 64 byte area called the i-node. All i-nodes have a number, the i-number. A file in the file system may be identified unmistakably through its i-number. The i-nodes contain information on the type of file (normal, special, directory), the owner code, protection bits, number of links, file size, date of last access (read), date of last modification (write) and finally the pointers to the blocks comprising the file.

Free blocks

Disk space available is handled by way of a list with pointers; each block in the chain contains a pointer to the next block and 50 pointers to free blocks. This is designed to optimize I/O operations in handling free blocks.

7.4 INSTALLATION OF OPERATING SYSTEMS

LSX 3020/30/40 systems, after their hardware is configured, require a software installation. The first stage in operating system installation consists in creating a partition on the primary hard disk in which to load the software initializing the system each time it is activated. For this operation, there are a number of system start operations available on a removable medium (tape or disk) for on-site configuration and installation of the operating system chosen on hard disk. So, when the system is activated, the basic software (UNIX or MOS and associated utilities) is loaded and the system initialized directly by the disk unit. The system manager can create user areas, activate lines for workstations and structure peripheral units depending on the configuration of the system.

7.5 REFERENCE PUBLICATIONS

Below is a list of the basic software manuals for UNIX-based LSX 3020/3030/3040 systems.

MANUAL TITLES

- LSX System Administration Utilities User Manual ..... 4041480 F (0)
- LSX User Manual ..... 4043610 C (0)
- LSX Advanced Utilities User Guide ..... 4043620 D (0)
- LSX Utilities Reference Manual ..... 4041460 V (0)
- C Language User Manual ..... 4041520 T (0)
- System Interfaces and Libraries Programmer Manual ..... 4041500 D (0)
- Program Development Tools User Manual ..... 4040400 A (0)
- FORTRAN Language User Manual ..... 4043390 E (0)
- PASCAL Language User Manual ..... 4043420 H (0)
- MF Level II COBOL/ET Reference Manual ..... 4043000 L (0)
- MF Level II COBOL/ET Program Preparation and Execution. 4043010 H (0)
- MF Level II COBOL/ET Forms-2 Reference Manual ..... 4043020 A (0)
- MF Level II COBOL/ET RM COBOL To MF COBOL Conversion .. 4043030 B (0)
- MF Level II COBOL/ET DG COBOL To MF COBOL Conversion .. 4043040 C (0)
- C-ISAM User Manual ..... 4040410 X (0)
- INFORMIX-SQL Reference Manual ..... 4043060 E (0)
- INFORMIX-SQL User Guide ..... 4043070 F (0)
- INFORMIX-ESQL/C Programmer Guide ..... 4043080 Q (0)
- INFORMIX-ESQL/COBOL Programmer Guide ..... 4043090 R (0)
- CMX User Guide ..... 4043460 D (0)
- OLINET-LAN Server Installation and Administration ..... 4050280 T (0)

A. APPENDIX

A.1 HARDWARE MODULES LISTED IN THE 'PROGETTO DI GESTIONE'

A.1.1 TABEL OF MODULES FOR LSX 3020/30/40

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
LICENCE TO USE BASIC MOS SOFTWARE	MOS operating system	SWB 80MS
LICENCE TO USE BASIC UNIX SOFTWARE	UNIX operatin system	SWB 80UX
LSX 3020 BASIC UNIT 11 BOARD SLOTS MONOPROCESSOR WITHOUT CONSOLE	SBO Basic cabinet with: .11 slot board rack IN087 .CPU UC068 .LB40 Power supply (350 W) .Mains and fans assembly .Cables	BU 8009
LSX 3020 BASIC UNIT 16 BOARD SLOTS MONOPROCESSORE SENZA CONSOLE	SBO Basic cabinet with: .16 slot board rack IN088 .CPU UC068 .LB40 and LS30 Power supplies .Mains and fans assembly .Cables	BU 8010
PSE FOR EBU 8009 (Power expansion)	.LC12 Power Supply (120W) .Cables	PSE 8013
AUXILIARY PROCESSING UNIT (to upgrade to bi/triprocessor)	.CPU UC068 .Flat cable .System name plate	APU 8022
KIT TO TRASFORMARE LSX 3020 BU8009 IN BU 8010 (to pass from 11 to 16 board slots	.LS30 Power Supply (300 W) .Cables .11 + 5 Board cabinet. .Back Plane .Mains and fans assembly	KIT 8079

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
CONSOLE WITHOUT TELEDIAGNOSTICS	Board with: . Power-on Key . Buzzer . 6-digit display . Maintenance keyboard . Three LEDs . Unattended features . Real time clock Cables	CDS 7099
CONSOLE WITH TELEDIAGNOSTICS	Features: As CDS 7099 plus the telediagnostics features	CDS 8077

A.1.2 OPTIONS AND MEMORIES

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
DATA ENCRYPTION MODULE FOR PIN CHECK AND REAL TIME CLOCK	Board with lock	DEM 8038
2 MB MEMORY WITH ECC	Board with 256 KB chips	TCM 8046
4 MB MEMORY WITH ECC	Board with 256 KB chips	TCM 8047

A.1.3 MAGNETIC PERIPHERALS

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
1 MB SLIM MINIFLOPPY DISK	1 MB Drive Slim 5"1/4 DC/DC converter DCA 512/36 Signals cable Power cable	MFU 8053
1 MB SLIM MINIFLOPPY AND 1 MB 8" FLOPPY DISK DRIVES CONTROLLER	Controller board G0280/D	MFC 8054
STREAMING TAPE 45/60 MB	STC Drive DC/DC converter DCA 512/36 Signals cable Power cables	STU 8061
45/60 MB STREAMING TAPE CONTROLLER	G0437 board	STC 8062
HDU WITH ESDI INTELLIGENT INTERFACE CONTROLLER	G0427 Board	HDC 8063
ESDI INTERFACE COMMAND CABLE	Command cable	CBL 8056
70 MB HARD DISK WITH ESDI INTERFACE INTEGRATED IN BASIC CABINET	5"1/4 format drive DC/DC converter DCA 512/36 Data cable Power cable	HDU 8066
140 MB HARD DISK WITH ESDI INTERFACE INTEGRATED IN BASIC CABINET	5"1/4 format drive DC/DC converter DCA 512/36 Signals cable Power cables	HDU 7051
315 MB HARD DISK WITH ESDI INTERFACE INTEGRATED IN BASIC CABINET	5"1/4 format drive DC/DC converter DCA 512/36 Signals cable Power cables	HDU 8067

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
EXPANSION CABINET	SB 1 cabinet	CAB 8093
PARTS FOR THIRD AND FOURTH HDU OR FIRST AND SECOND DRIVES DIVIDED WITH ESDI INTERFACE, INTEGRATED IN CAB 8093	.Rear panel .drives shelf .Grid .LS10 (100W) Power supply .Mains box with teleswitch	
70 MB HARD DISK WITH ESDI INTERFACE INTEGRATED IN 8093 CABINET	5"1/4 format drive Signals cable Power cables	HDU 8072
140 MB HARD DISK WITH ESDI INTERFACE INTEGRATED IN 8093 CABINET	5"1/4 format drive Signals cable Power cables	HDU 8071
315 MB HARD DISK WITH ESDI INTERFACE INTEGRATED IN 8093 CABINET	5"1/4 format drive Signals cable Power cables	HDU 8073
DUAL PORT KIT FOR HDU DIVISION IN CABINET 8093	Dual Port board Cables	KIT 8039
CONSOLE FOR DUAL PORT	Console	CDP 8068
1 MB 8" FLOPPY DISK INTEGRATED IN CABINET 8093	1MB floppy drive DC/DC Converter DCA 524/36 Cables	FDU 8069
CABINET FOR MAGNETIC PERIPHERALS EXPANSION AT A HIGH FORM LEVEL	Cabinet with the with teleswitching possibility AC mains power distribution	CAB 7018
MTU 7040 CONTROLLER	G0278/B board	MTC 3543
40 MB MAGNETIC TAPE UNIT FOR CAB 7018	Tape unit Signals cable Power	MTU 7040

A.1.4 SPECIFIC MODULES FOR THE LSX 3020/30/40 UNIX SYSTEM

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
16 WAY RS 232 MUX	G0426 board	MUX 8074
RS 232 CURRENT LOOP ADAPTER FOR THE 16 WAY MUX (Drives up to 4 Current Loop)	Structure Adapter board	ADT 8076
25 WAY SERIAL INTERFACE CABLE CONNECTOR FOR MODEM/PERIPHERAL AND 9 WAY CONNECTOR ON THE SYSTEM SIDE	5 meter cable	CBL 8083
25 WAY SERIAL INTERFACE PERIPHERAL MALE TYPE CONNECTOR AND 9 WAY CONNECTOR ON THE SYSTEM SIDE	5 meter cable	CBL 8084
C.L. CABLE FOR P.C. CONNECTION	10 meter cable	CBL 7092
C.L. CABLE FOR WS 685 CONNECTION	10 meter cable	CBL 7088
SERIAL INTERFACE CABLE WITH FEMALE CONNECTOR ON THE PERIPHERAL SIDE FOR THE MODEM/PERIPHERAL CONNECTION TO THE DISTRIBUTION BOX	Cable	CBL 3378
CABLE ADAPTER FOR PR 3300/3600 READ AND MARKING MODULES AND OTHER PERIPHERALS WITH FEMALE CONNECTORS. FEMMINA	L = 50 cm cable	CBL 2661
CABLE ADAPTER FOR STD 13 PERIPHERALS	L = 10 cm cable	CBL 3349
MODEM EXTENSION CABLE	Cable	CBL 3358
STD 13 DIRECT MALE/MALE CABLE FOR PERIPHERAL CONNECTION WITH FEMALE CONNECTOR ON MODEM	Cable	CBL 8092

A.1.5 SPECIFIC MODULES FOR THE LSX 3020/30/40 MOS SYSTEM

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
4 WAY MULTIPLEXER DRIVER FOR LOCAL LINE	G0322 board Signal distribution box Cable	MUX 7089
REMOTE CONTROL VIA A STATISTIC MULTIPLEXER OR ERROR CONTROLLER CONTROLLER	Controller board Signal distribution box Cable	MUX 7091
ALPHANUMERIC WORKSTATION MONOCROMATICO REMOTE	Box Electronic control Power supply Video Keyboard cable ELB mains cable Video mains cable	ELB 3684
ENCRYPTION/DECRYPTION DATA PIN CHECK AND REAL TIME CLOCK MODULE	Board with lock G0257/C	DEM 8038
9" TRIVALENT ALPHANUMERIV VIDEO	Video Filter Tilt support	DSM 3619
15" B/W ALPHANUMERIC	15" viveo with tilt Filter	DSM 3615
SPACER RING FOR 15" VIDEO	Ring	SET 1245
ALPHANUMEREIC KEYBOARD +FUNCTIONS UNIFIED MULTIFUNCTIONS	Keyboard	ANK 1401
ALPHANUMERIC KEYBOARD +FUNCTIONS +KEY UNIFIED MULTIFUNCTIONS	Keyboard	ANK 1402
NUMERIC KEYBOARD +FUNCTIONS UNIFIED MULTIFUNCTIONS	Keyboard	NK
NUMERIC KEYBOARD +FUNCTIONS + KEY UNIFIED MULTIFUNCTIONS	Keyboard	NKB 1406
PIN PAD	Pin Pad with 1.5 m cable	PIN 1440
OPTIONS FOR PIN PAD AND BADGE READER	Electronic control	EXF 3686

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
10 m C.L.CABLE FOR ELB 3684 CONNECTION	10 m cable connector kit	CBL 7090
SERIAL INTERFACE CABLE WITH MALE CONNECTOR ON PERIPHERAL SIDE FOR MODEM/PERIPHERAL CONNECTION TO THE DISTRIBUTION BOX		CBL 3378
SERIAL INTERFACE CABLE WITH MALE CONNECTOR ON PERIPHERAL SIDE FOR CONNECTION TO THE DISTRIBUTION BOX	3 m cable length	CBL 3679
10 m C.L. CABLE FOR P.C. CONNECTION	10 m cable connector kit	CBL 7092
MONOCHANNEL RS232 CABLE FOR SERIAL PERIPHERALS WITH FEMALE CONNECTOR ON PERIPHERAL SIDE		CBL 2657
BICHANNEL RS232 CABLE FOR SERIAL PERIPHERALS WITH FEMALE CONNECTOR ON PERIPHERAL SIDE		CBL 2658
ADAPTER CABLE FOR PR 3300/3600, READ/MARKING MODULES AND OTHER PERIPHERAL HAVING A FEMALE CONNECTOR	50 cm cable length	CBL 2661
RS232 MONOCHANNEL CABLE FOR SERIAL PERIPHERALS WITH MALE CONNECTORS ON PERIPHERAL SIDE		CBL 3657
BICHANNEL CABLE FOR SERIAL PERIPHERALS WITH A MALE RS232 CONNECTOR ON THE PERIPHERAL SIDE		CBL 3658
STD 13 ADAPTER CABLE FOR PERIPHERALS	10 cm cable length	CBL 3349
MODEM EXTENSION CABLE		CBL 3358
STD 13 DIRECT MALE/MALE CABLE FOR PERIPHERAL CONNECTION WITH FEMALE CONNECTOR ON MODEM		CBL 8092

A.2 SYSTEM DOCUMENTATION

A complete list of the service manuals of the modules used on the LSX 3020/3030/3040 systems is given below.

- Mechanical parts catalogue (LSX 3020/30/40 systems) ..... 4117880 X

WORKSTATION

- ELB 3684 - General Service Manual ..... 4114240 A
- WS 685 - General Service Manual ..... 4111880 N
- Video with supply - Service Manual ..... 3963450 B
- Low profile keyboard - Service Manual ..... 3963470 D

MAGNETIC PERIPHERALS

- ND 08DE (mFDU 1 Mbyte Slim) - Service Manual ..... 4107810 T
- XG 6030 (FDU 1 Mbyte) - Service Manual ..... 3961610 T
- STC 45/60 Mbyte (Archive 5945C) - Service Manual ..... 4113600 D
- XU 1705 (MTU 40 Mbyte) - General Service Manual ..... 4101810 J
- HDU 140 MB (Micropolis 135x) - Service Manual ..... 4112280 V
- HDU 140 MB (Fujitsu M224xC/E) - Service Manual ..... 4112280 V

PRINTERS

- PR 15 - General Service Manual ..... 4101290 V
- PR 17 - General Service Manual ..... 4101340 J
- PR 19 - General Service Manual ..... 4101390 X
- PR 340 - General Service Manual ..... 4103590 K
- PR 1470 - General Service Manual ..... 3930460 Y
- PR 1480 - General Service Manual ..... 3964000 G
- PR 1580 - General Service Manual ..... 4101330 R
- PR 2835 - General Service Manual ..... 3964060 S
- PR 2845 - General Service Manual ..... 4101900 V
- PR 2850 - General Service Manual ..... 3956160 S
- PR 2880 - General Service Manual ..... 4151570 J
- PR 2890 - General Service Manual ..... 4100980 S
- PR 3300/3600 - General Service Manual ..... 3963490 P

A.3 CONNECTOR PHYSICAL POSITION ON THE SBO UNIT

The physical position of the multiplexer line connectors (Olicom) can be installed on the chassis in any manner. It is however recommended to follow the following table for correct cabling architecture and neatness.

SBO Unit Chassis Rear View

RS232 OUTPUTS					RS232 / CURRENT LOOP OUTPUTS					
53	49				05	01	21	17	37	33
54	50				06	02	22	18	38	34
55	51				07	03	23	19	39	35
56	52				08	04	24	20	40	36
61	57				13	09	29	25	45	41
62	58				14	10	30	26	46	42
63	59				15	11	31	27	47	43
64	60				16	12	32	28	48	44
From MUX4					From MUX1		From MUX2		From MUX3	

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