



Service Manual
(M60-M60/2-M60/3)

olivetti

FOREWORD

This manual is for technicians who are called on to service all M60-M60/2/3 systems in field.

SUMMARY

The manual consists of six chapters and an appendix; the subject matter of each is as follows:

Chapter 1 is an introduction to the systems, providing details of the position of the boards in the rack and their compatibility with the different Line 1 systems.

The second chapter is on installation of the basic modules, lines and workstations.

The third chapter deals with power supply for the various modules.

In the fourth chapter, the controllers, settings and specific connections required are described.

Chapter five gives information on the magnetic peripherals that can be connected to the system.

Chapter six, in addition to the system autodiagnostic description, provides a list of the stand alone test programs.

The appendix summarizes relevant aspects of the "Progetto di Gestione" and gives a complete system bibliography.

PRE-REQUISITES: Attendance on a specific system course.

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1. GENERAL

1.1 INTRODUCTION

The M60 is the model at the top end of the L1 line systems. It is currently available in three versions:

Monoprocessor: called **M60**

Bi-processor: called **M60/2**

Tri-processor: called **M60/3**

N.B.: Differences between the models are not sufficient to justify a separate description for each. The following account will deal primarily with the monoprocessor model; however, where necessary, specific reference may be made to the multiprocessor models.

The M60 physical structure consists, typically, of a number of modules which can be assembled side by side or one on top of the other, each with specific functions. The modules are:

- BASIC MODULE (SB0)

Consists of a support structure known as SB0, of identical dimensions to the M40/44, i.e. 590x510x700 mm.

This module houses its own power supply unit LB30, the rack for the electronic boards, an external console, fans and cables.

- DOUBLE DEPTH MODULE (SB2)

Created by setting two SB0 modules, one behind the other giving a module with dimensions of 590x800x700 mm.

Though specifically intended for magnetic tape units (MTU), it can also house 60/120 MB hard disk units.

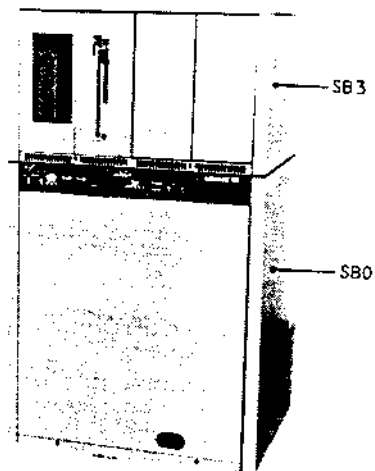
The above units all have their own power supply.

- HALF HEIGHT MODULE (SB3)

This module is half the height of the SB0 and measures 590x510x350 mm. It is always installed on top of a support base or, in some cases, another empty SB3, acting only as a support.

The module has its own power supply unit LA40, used by all the magnetic peripherals except the 60/120 MB hard disk units which have their own power supply.

The SB3 can house all types of peripheral unit, except the magnetic tape units (MTU), which, as seen earlier, are accommodated in the SB2.



SB2

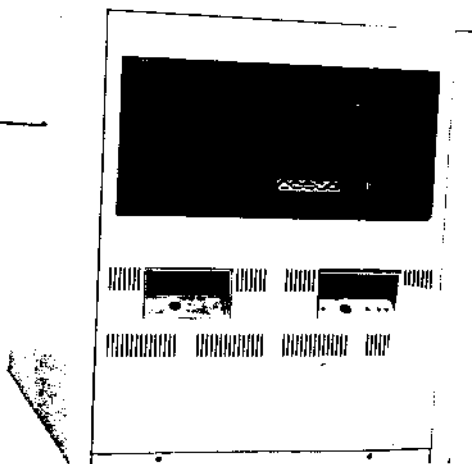


Fig. 1-1 M60 system basic modules

1.2 POSITION OF BOARDS IN THE RACK

Board rack slots are numbered from left to right, with the system seen from the front (Fig 1-2).

Conditions

No slots must be left empty between boards in the rack.

Position 0 can be used for the central unit board, followed immediately by the Cache board, as these two boards must be kept together. Then follow the other CPU/Cache board couples, if dealing with M60/2 and M60/3. Position 0 may also be occupied by a memory board, or be used as "test position" for boards functional checks are to be run on.

The TCB board is to be inserted immediately to the right of the last controller.

Memory boards can, in theory, be inserted anywhere though the best position is to the right of the TCB to maintain a logical sequence.

Boards with slot names of only 4 bits cannot be inserted in positions "A" and "C" of the figure as this would result in positions 0-16, 1-17 and 2-18 having the same configuration on address bits 12 - 15. Controllers of this type are:

- 18 MB HDU controller, G0230-G0231/A
- FDU/mFDU controller; G0280/B
- Graphic colour display controller, G0259-G0260-G0261

Central unit boards and controllers working in DMA cannot be inserted in the zone marked "B" in the figure.

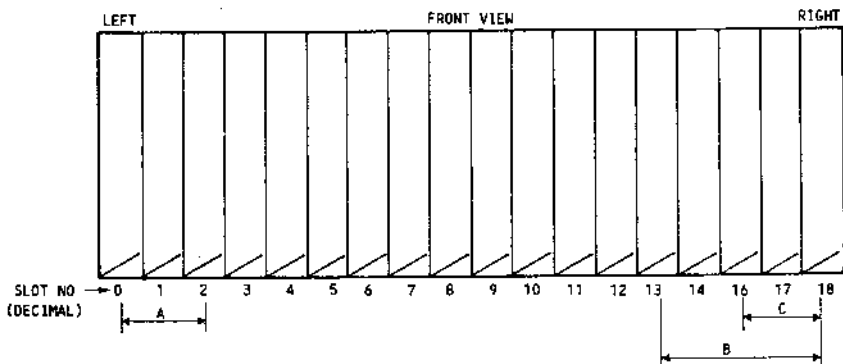


Fig. 1-2 M60 Board rack

The exact order for insertion of boards in the rack, in addition to the conditions seen above, is determined by the following criteria:

DMA priority:

Priority of the boards which work in DMA decreases the further they are to the right, i.e. the further they are from the central unit.

Interrupt priority:

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

- Level 1A: Highest level, starts from TCB and decreases in the right to left direction.
- Level 1B: Priority decreases in right to left direction, i.e. the closer boards are to the TCB.
- Level 2: Lowest priority, board priority increases the closer the board is to the CPU.

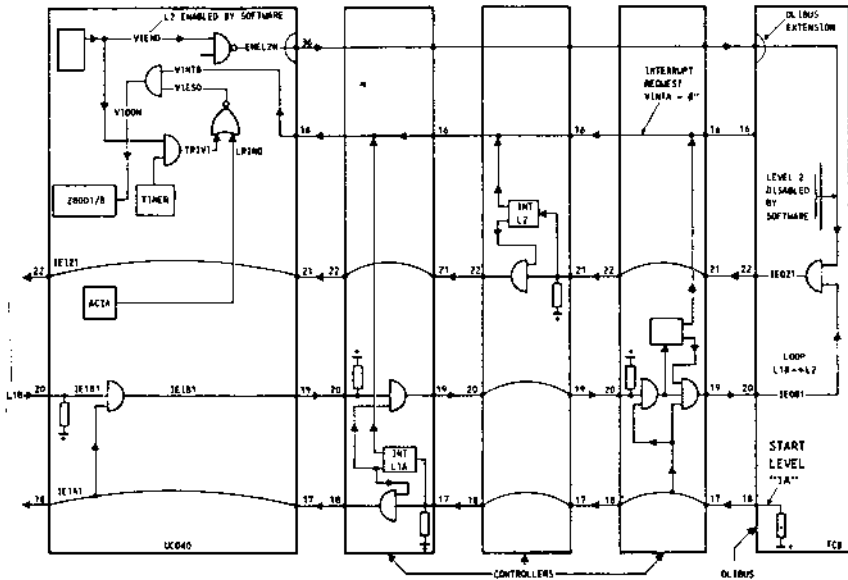


Fig. 1-3 Interrupt daisy chain

1.2.1 ORDER OF BOARDS IN BOARD RACK

The table below illustrates the correct order for insertion of boards in the rack (from right to left); configuration limits will have to be considered for each system.

HARDWARE MODULE	BOARD NAME	LOGIC NAME	INTERRUPT LEVEL	
Central Unit	UC040/A	FF		
Cache memory	UC041	--		
1 MB FDU/mFDU Control board	G0280/D/B	E1	L2	This group contains control boards which work in DMA
320 KB mFDU Control board	G0280/E/C	E0	L2	
20MB STC Control.(XU 1120) Formatter and Controller	G0201/B G0200/B	-- E6	L2	
20MB STC Control.(XU 1130) Formatter and Controller	G0342 G0200/B	-- E6	L2	
SMD HDU Control.(XU 1700/03) Formatter and Controller	G0301/A G0302/A	61 --	L2	
ST506 HDU Control.(XU1709)	G0363	65	L2	
OPE HDU Control.(XU 5010) Controller and Formatter	G0230 G0231/A	E4 --	L2	
Twin Control. c.l. - RS 232	G0327	CF	L1B	
Alphanumeric display Contr. Graphic interface Graphic Colour KDC	G0259 G0260 G0261	F8 -- F7	L1B	Control boards in this group are connected to ELB 1382.
Alphanumeric colour KDC	G0224	FE	L1B	Colour or B/W alphanumeric controls should not be inserted between two B/W graphic display controls.
Governo KDC b/n alphanumeric	G0252	FE	L1B	
Graphic expansion board	G0255/A + G0252	FD FE	L1B	
Omninet local network contr.	G0308	7B	L1B	(See note 1)

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FD
MFD

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HARDWARE MODULE	BOARD NAME	LOGIC NAME	INTERRUPT LEVEL	
Alphanumeric display contr.	G0259	FB	L2	Controllers in this group are not connected to ELB 1382.
Graphic interface	G0260	--		
Graphic colour KDC	G0261	F7	L1B	
Graphic expansion board	G0255/A + G0252	FD FE	L1B	B/W or colour alphanumeric controllers must never be placed between two B/W graphic display controllers.
Alphanumeric colour KDC	G0224	FE	L1B	
Alphanumeric B/W KDC	G0252	FE	L1B	
Multiplexer control board	G0322	30	L1B/L2	
Ethernet line control board	G0312/A	6F	L1B/L2	
V24 + Lion 200 line control	G0256	27	L1B	Controllers with microprocessor: intelligent control boards (see note 1)
V24 + Lion 9.6 line control	G0340/A	26	L1B	
V24 + V24 line control	G0236	28	L1B	
Encryption Cont. (pin check)	G0257/B	33	L1B	
MTU Control board	G0278/B	62	L2	(See note 2)
TCB	TCB82	F8		
RAM modules	RAB0/X			
Integrated Modem MOIN 5.2	1F 192			(See note 3)

NOTE 1: These are Dual-Port memory control boards, half segment version. Logic names of the equivalent whole segment boards are: - 6B for G0308, - 23 for G0256, - 25 for G0340/A, -.22 for G0236, - 21 for G0257/B.

NOTE 2: The MTU controller is the top priority controller in the L2 interrupt daisy chain; it is also the controller with lowest priority of those working in DMA.

NOTE 3: The MOIN 5.2 occupies 2 board slots and is therefore inserted on the extreme right, in the last physical slot of the board rack. Its control board, however, can take up position reflecting its priority.

1.3 COMPATIBILITY BETWEEN BOARDS IN THE VARIOUS L1 SYSTEMS

The following table indicates whether the M60 hardware modules are compatible with those of other L1 models. The M30/M40 and M34/M44 systems considered are the following basic units:

M30: BU 3415; M40: BU 3515; M34: BU 3417; M44: BU 3517

CODE NAME	DESCRIPTION	M30	M40	M34	M44	M60
RAM BOARDS						
RA57/E	512 KByte: 64K chips	yes	yes	yes	yes	no
RA57/C-B-A	1.0/1.5/2.0 MByte: 256K chips	yes	yes	yes	yes	no
RA80/C-B-A-N	1.0/2.0/3.0/4.0 MB: 256K chips	no	no	no	no	yes
RA80/D	1.0 MByte: 64K chips	no	no	no	no	yes
MISCELLANEOUS MODULES						
UC040/A	Central Unit	no	no	no	no	yes
UC041	Cache Memory	no	no	no	no	yes
TCB82	Timing Control Board	no	no	no	no	yes
REDAC MR/MC	Redac board	no	no	no	no	yes
GO 257 (*)	Encryption + RTC Control.	yes	yes	yes	yes	no
GO 257/A (*)	Real Time Clock Module	yes	yes	yes	yes	no
GO 257/B (*)	Encryption + RTC (pin check) con.	yes	yes	yes	yes	yes
POWER SUPPLY UNITS						
LA 17	170 W	yes	no	yes	no	no
LA 40	345 W (PSU 3567)	no	yes	no	yes	no
LA 40	345 W for SB3 cabinet (PSU 3545)	no	yes	no	yes	yes
LD 10	100 W expansion for PSU 3567	no	yes	no	yes	no
LB 30	300 W for SB0 cabinet	no	no	no	no	yes
LA 04	40 W for Redac	no	no	no	no	yes
KEYBOARD/DISPLAY CONTROLLERS						
GO 157	B/W, alphanumeric	yes	yes	no	no	no
GO 207	Graphic expansion (+ GO 157)	yes	yes	no	no	no
GO 252/A-B	B/W, alphanumeric, trivalent	yes	yes	yes	yes	yes
GO 255	Graphic expansion (+ GO 252)	yes	yes	no	no	no
GO 255/A	Graphic expansion (+ GO 252)	yes	yes	yes	yes	yes
GO 224	Colour, alphanumeric	yes	yes	yes	yes	yes
GO 259-60-61	Graphic, colour and alphanumeric	yes	yes	yes	yes	yes
FLOPPY/mFLOPPY CONTROLLERS						
GO 280/A	320 KB minifloppy unit	yes	yes	no	no	no
GO 280/C-E	320 KB minifloppy unit	yes	yes	yes	yes	yes
GO 280	1 MB floppy/minifloppy unit	yes	yes	no	no	no
GO 280/B-D	1 MB floppy/minifloppy unit	yes	yes	yes	yes	yes

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CODE NAME	DESCRIPTION	M30	M40	M34	M44	M60
HARD DISK CONTROLLERS						
GO 230-231	18 MB HD (XU 5010)	no	yes	no	no	no
GO 230-231/A	18 MB HD (XU 5010)	no	yes	no	yes	yes
GO 301A-302A	SMD3 HD interface (XU 1700/1703)	no	yes	no	yes	yes
GO 363	ST506 HD interface (XU 1709)	yes	yes	yes	yes	yes
STC AND MTU CONTROLLERS						
GO 200A+201A	20 MB Streaming tape (XU 1120)	no	yes	no	no	no
GO 200X+201B	20 MB STC (XU 1120)	no	yes	no	no	no
GO 200B+201B	20 MB STC (XU 1120)	no	yes	no	yes	yes
GO 200B+342	20 MB Cipher STC (XU 1130)	no	yes	no	yes	yes
GO 278/B	40 MB MTU (XU 1705)	no	yes	no	yes	yes
LINE CONTROLLERS AND SERIAL INTERFACES						
GO 156	V24, external/internal, remote	yes	yes	no	no	no
GO 300	V24, external/internal, remote	yes	yes	yes	yes	no
IF 192	MOIN 5.2 Integrated Modem	yes	yes	yes	yes	yes
GO 234	Lion 9.6	yes	yes	no	no	no
GO 333	Lion 9.6	yes	yes	yes	yes	no
GO 303 (*)	X24, external line	yes	yes	yes	yes	no
GO 236 (*)	V24 + V24, with microprocessor	yes	yes	yes	yes	yes
GO 331 (*)	V24 + V24, with microprocessor	yes	yes	yes	yes	yes
GO 256 (*)	V24 + Lion 200, with microproc.	yes	yes	yes	yes	yes
GO 340 (*)	V24 + Lion 200, with microproc.	yes	yes	yes	yes	yes
GO 340/A(*)	V24 + Lion 9.6, with microproc.	yes	yes	yes	yes	yes
GO 308 (*)	Omninet local network	yes	yes	yes	yes	yes
GO 212/A(*)	Ethernet internal line	yes	yes	yes	yes	yes
GO 322 (*)	Multiplexer	yes	yes	yes	yes	yes
GO 327	RS232 Interface and current loop	yes	yes	yes	yes	yes

N.B.: All controllers marked with an asterisk (*) are Dual-Port mem controllers, of which there are two versions - whole segment half segment, the latter being the more recent. The GO212/A, GO303, GO340/A and GO322 boards are exceptions in that they are produced in the new version only. The GO 236 and the GO 331 are interchangeable only if the former is half segment.

It is absolutely essential that Dual Port Memory boards on a system are of the same type - whole segment or half segment.

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 the system.

The second part deals with assembly and disassembly of the basic unit SB0 and the SB3 and SB2 modules.

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

N.B.: Contents of this chapter apply to all models of the M60 family. Any differences between the multiprocessor and monoprocessor models will be attributed to the appropriate model.

2.1 SURROUNDING CONDITIONS

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", code number 3932790 N.

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.

The table below illustrates the nominal voltages and frequencies possible in this system:

FREQUENCY	VOLTAGE				
	110V	115V	120V	220V	240V
50 hertz	yes		yes	yes	yes
60 hertz	yes	yes		yes	

Maximum deviation for the values illustrated in the table are:

- Mains voltage variation: $\pm 10\%$
- Frequency variation: $\pm 2\%$

If these tolerances are exceeded, a stabilizer with power equivalent to the system maximum power absorption must be inserted.

Ground

Ground resistance must be to national standard requirements. A resistance of 50 ohms covers disturbance and, as operator protection, Italian ENPI standards demand a resistance of 20 ohms maximum.

Mains failures

The system will resist mains failures in the following cases:

- Voltage drops of under 15%
- Voltage drops of under 30% for a maximum of 25 cycles
- Total mains failure for no more than one half cycle (10ms)

When these limits are exceeded, the system is reset.

Electric 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.

Maximum a.c. mains conducted noise values accepted by this system are:

- Voltage: 500 V
- Frequency: 100 Hz
- Rising edge time: 40 ns
- Falling edge time: 500 us

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.

	OPERATION		STATIONARY		STORAGE	
	TEMP. C	R.HUM. %	TEMP. C	R.HUM. %	TEMP. C	R.HUM. %
M60 - M60/2/3	10 - 40	20 - 80	5 - 50	8 - 80	-15 - +55	8 - 90
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
STC	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

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 for 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 UNPACKING AND CHECKING CONTENTS

Ensure that the outer wrapping has not suffered substantial damage. Then unpack the modules, opening the cardboard boxes and polystyrene covers.

To avoid damaging the magnetic heads, the parts being unpacked should not be subjected to rough treatment of any kind.

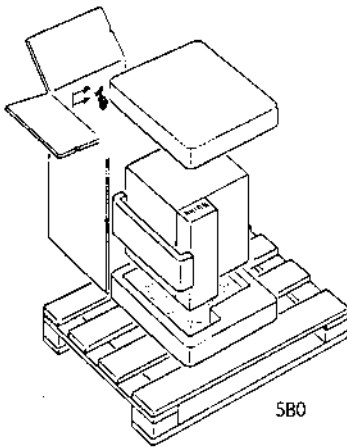
Perform the following operations:

1. Check that the basic module SB0 packaging contains:
 - a couple of keys for system switch-on, inserted in the cable duct
 - connection cables for a V24/L10N200 line
 - spacers and securing screws for the SB3 module
2. Check that the SB2 and SB3 packaging contains:
 - screws, brackets and link joint for module assembly
 - peripheral unit connection cables
 - power supply cables
3. Check that the packaging for the SB3-type support contains screws and brackets for module assembly.
4. Check the panels of the units have not been damaged.
5. Check that the voltage/frequency values on the label on the rear panel of each module correspond to the customer's local values.
6. Ensure that the machine contents card exactly corresponds to actual system composition.

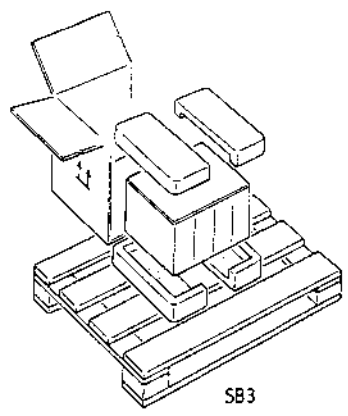
As a guide to module and board identification, see the "Progetto di Gestione" appendix.

Any faults discovered should be brought immediately to the notice of DATC/TEC, Ivrea, together with the Quality Control form that follows.

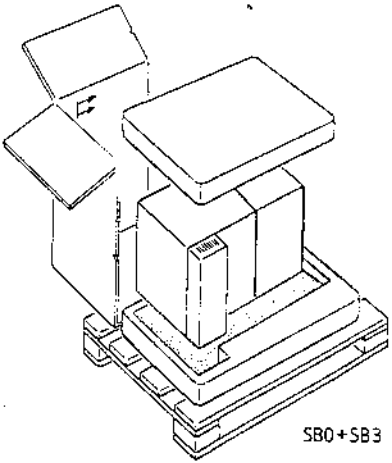
Unpacking procedures are illustrated in the figure on the next page.



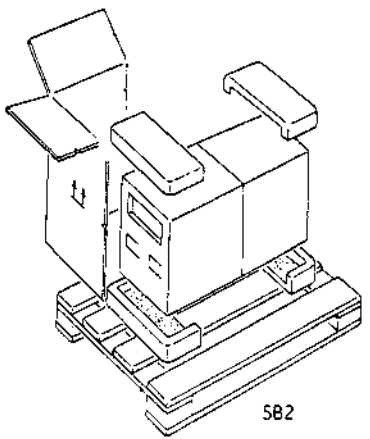
SB0



SB3



SB0+SB3



SB2

Fig. 2-1 Unpacking the SB0, SB2 and SB3 modules

2.3 OPERATIONS TO BE PERFORMED ON S80 MODULE WITH MACHINE OFF

With reference to figures 2-2, 2-3 and 2-4, perform the following operations:

- Remove the upper panel
- Remove the rear panel
- After removing the cable duct and the internal cover, check that the mains cables are correctly in position
- Remove the front panel
- Remove the two board fixing plates
- Check that the system boards are those required by the customer
- Check that the jumpers on the boards are set as shown in chapter four
- Check that the boards are inserted in the rack as outlined in section 1.2
- When the above operations have been completed, re-assemble all parts, with the exception of the yellow transport bar
- Set the support feet face down on the support surface to avoid unwanted machine movements

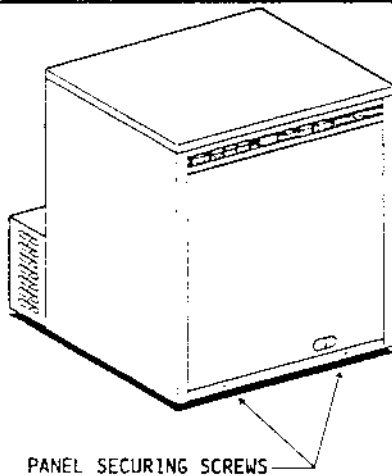
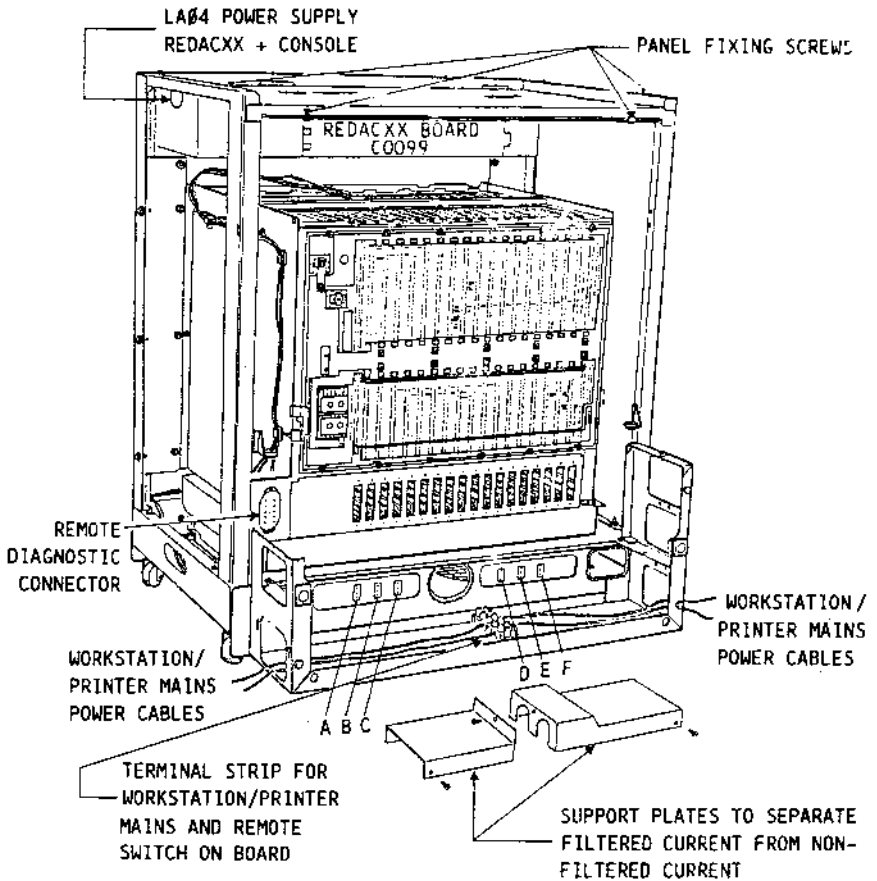


Fig. 2-2 Front view of S80 module - closed

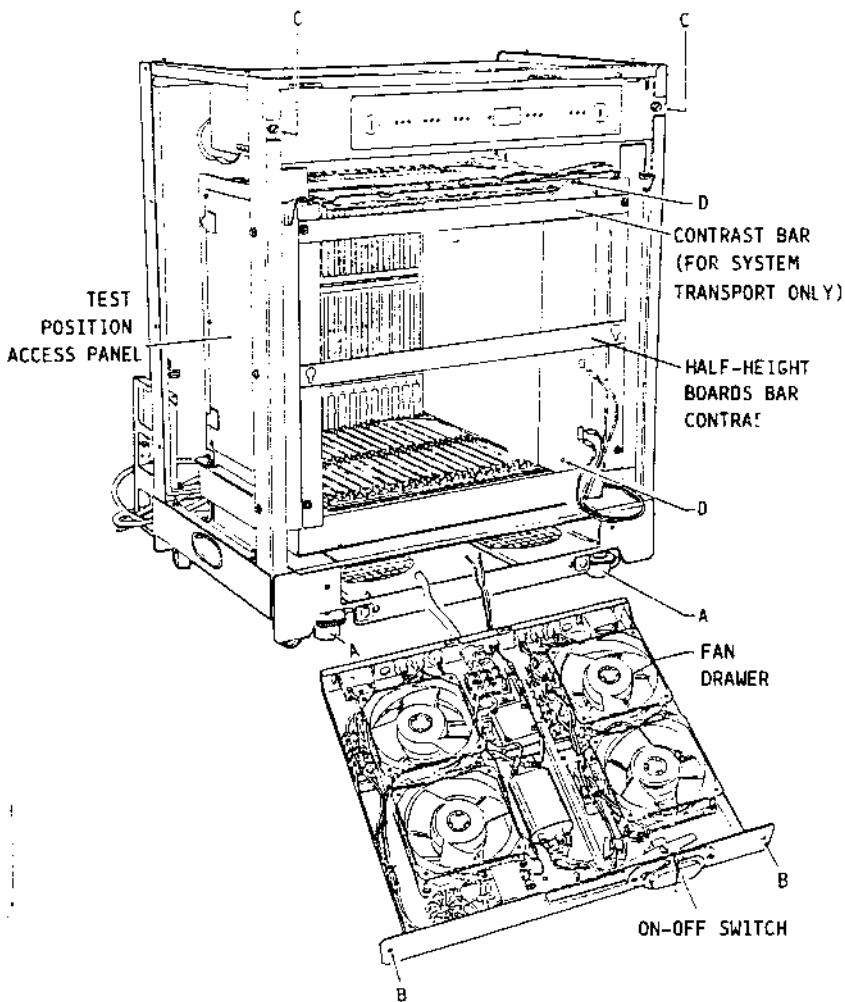
2.3.1 OVERALL VIEW OF SBO MODULE - OPEN



- A-B-C: "AMPEX" type connectors for console power supply LA04 connection
- D: "AMPEX" type connectors for connection to solid state relay
- E-F: "AMPEX" type connectors for connection to primary power supply LB30

N.B.: The support plates must be maintained in place as separators between the non-filtered current (a.c. cables) and the filtered current (d.c. cables).

Fig. 2-3 SBO module rear view



N.B.:

- A: Support feet
- B: Screws for fan container
- C: Screws for FEC/REDAC/LA04 box
- D: Screws for LB30 power supply unit

Fig. 2-4 SBO module rear view

2.4 OPERATIONS TO BE PERFORMED ON SB3 MODULE WITH MACHINE OFF

The various assembly possibilities for the SB3 module are shown in figure 2-6.

To assemble as required, proceed as described below (see figure 2-5):

- Secure the SB3 module by using the accessories supplied
- Check the the power supply cable connections are as illustrated in section 3.2
- Connect (or check, if already connected) the cables between controllers and their peripherals
- Unblock the heads of the HD units and remove the FDU and SCT protections, but only after completing all the module assembly operations (for installation of peripheral units, see chapter 5)
- When all operations have been completed, re-assemble all parts and switch module on at the ON/OFF switch on the rear of the module.

N.B.: To remove a peripheral unit from the module, the front panel must first be removed and then the screws of the peripheral unit.

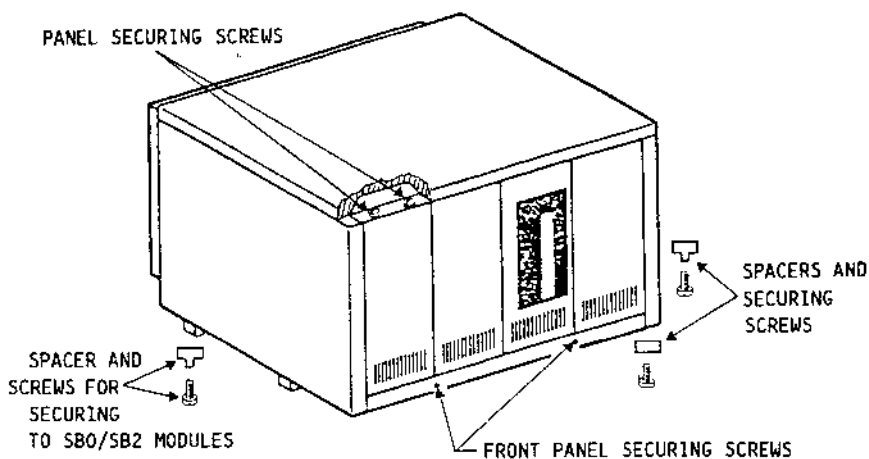


Fig. 2-5 Installation of the SB3 module

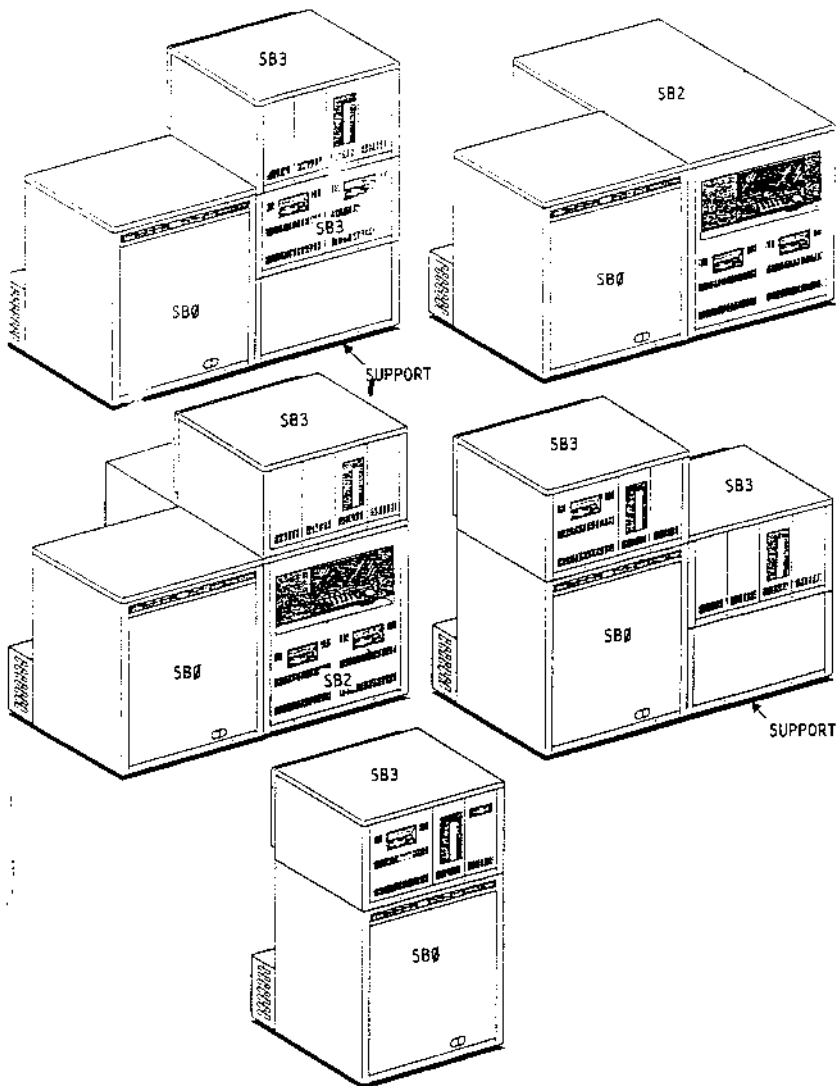


Fig. 2-6 SB3 Assembly possibilities

2.5 OPERATIONS TO BE PERFORMED ON SB2 MODULE WITH MACHINE OFF

Install SB2 module, setting it to the right side of the SBO basic module, to allow easy access to the first board slot of the SBO board rack. This position, known as "test position", is, in fact, used for board operation checking.

The procedure is described below:

- Secure the SB2 module using the screws, brackets and joint as shown in figure 2-7.
- Check that the power supply cables are connected correctly
- Connect the controller cables to the relative peripheral units
- Release the heads of the 60 MB HDU and remove the MTU protection, though only after completing the module assembly operations (for installation of peripheral units, see chapter 5).

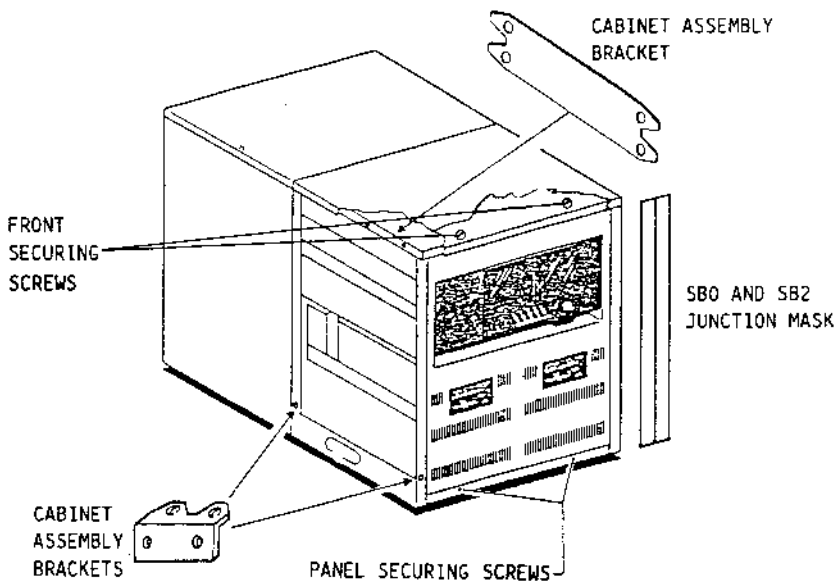


Fig. 2-7 SB2 module installation

2.6 MULTIPROCESSOR SYSTEM INSTALLATION

A multiprocessor system is installed in the same way as the monoprocessor system.

However, it is advisable to perform these additional checks:

- Check that the UC040/A, IF300 and C0099 boards are correctly connected
- Ensure that the UC040/A board has the PD25 and PD26 EPROMs with, respectively, the multiprocessor system firmware and the remote diagnostic firmware
- Check the UC040/A has the second MMU
- Remembering that, with MOS release 5.0, the CPU RS232 channel is used for remote diagnostic only, check that all RS 232 peripherals are connected by multiplexer controller (G0322).

In bi-processor systems (M60/2), a plug must be inserted on the IF 300 board connector 'CPU3', as shown in the figure below:

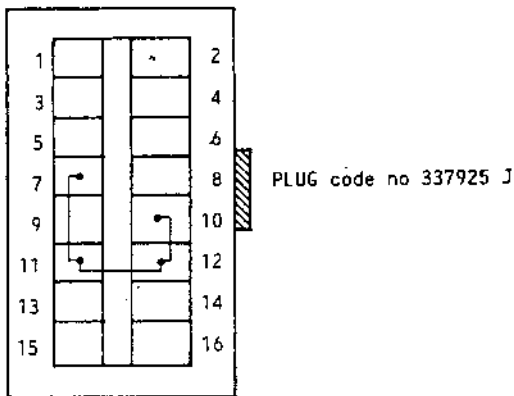


Fig. 2-8 IF 300 plug for M60/2

The two figures shown overleaf represent interconnection between the Central unit and Cache boards, and between the IF 300 and the console board C0099 for both the M60/2 (no remote diagnostic) and the M60/3 (with remote diagnostic) systems.

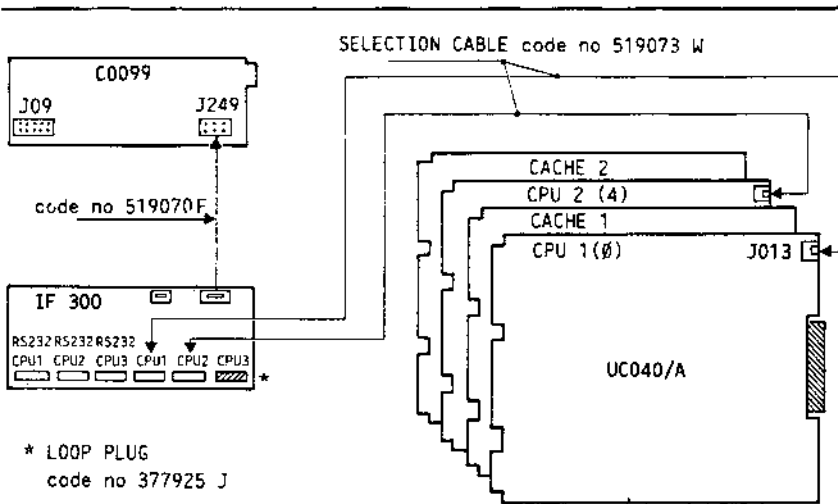


Fig. 2-9 Interconnection diagram for M60/2 without remote diagnostic

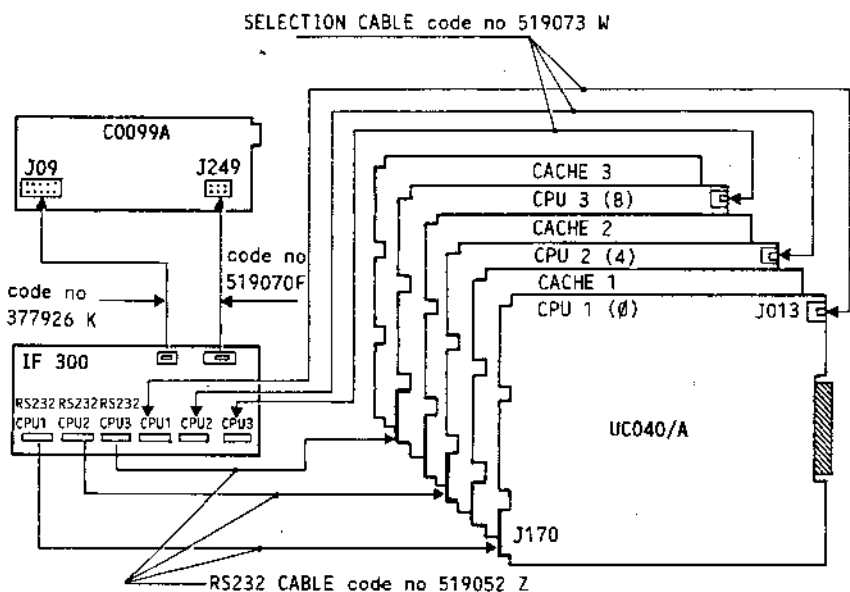


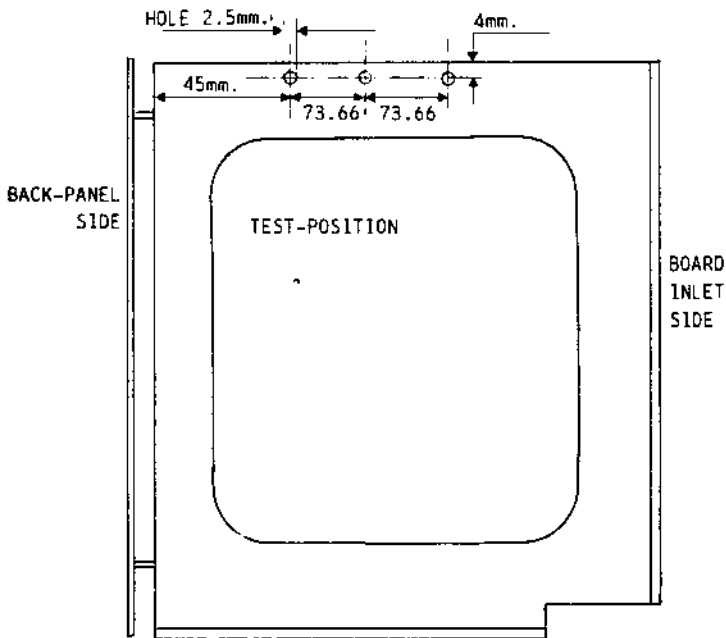
Fig. 2-10 Interconnection diagram for M60/3 with remote diagnostic

2.6.1 M60 SYSTEM UPGRADING PROCEDURE

Procedures for upgrading M60 into a bi/tri-processor system, with remote diagnostic possibility, are described below:

IF 300 Board

Secure the board to the three holes on the left side of the board rack, remembering, however, that these holes do not exist on systems produced in 1984, and must, therefore, be made as illustrated in the figure below.



N.B.: the boards and the fan container should be protected against shavings caused in drilling.

Fig. 2-11 Drilling left side of SB0 board rack

UC040 Board

Carry out the following operations:

- Mount the second MMU Z8010 chip on the UC040 central unit boards, in position Z09FN.
- Fit the EPROM PD25 containing the multiprocessor firmware in position Z10F.
- Fit the EPROM PD26 containing the remote diagnostic firmware in position Y10.
- Change board tag label from UC040 to UC040/A.
- On the UC040/A boards, check that the chips mentioned above and the jumpers of DIP-switch SW1 shown in section 4.1.1 are correct.

Other system boards

Proceed as follows:

- Insert the other UC040/A - UC041 couples in the slots immediately after the first U.C./CACHE board couple
- Connect the cables as shown in figures 2-9 and 2-10.
- Remove the twin board, G0327, incompatible in multiprocessor environment
- In upgrading systems, keyboard/display controllers and multiplexer controllers can be used simultaneously.
- Use the central unit RS 232 channel only for remote diagnostic.
- After completing the above operations, check that the boards in the rack are packed together in the correct order as shown in section 1.2.

2.6.2 UPGRADING MODULES

A list of the modules required to update an M60 into an M60/2, M60/3 system with remote diagnostic facility.

SET 6211: Modules to upgrade from M60 to M60/2	CODE NO.
UC041 board	414069 Z
UC040/A + ROM board	414071 K
IF 300 board	414317 N
M1 247 plug	335572 W
IF 300 loop plug	337925 J
Redac - multiprocessor interface RS 232 cable	337926 K
Redac - central unit serial line	519052 Z
Redac signals cable	519070 F
Console - central unit signals cable	519073 W
Three M3x6 screws	920843 V
M60/2 label	519068 H
EPROM 231, PD25	963339 A
EPROM 231, PD26	963340 P

SET 6311: Modules to upgrade from M60/2 to M60/3	CODE NO.
UC041 board	414069 Z
UC040/A + ROM board	414071 K
M1 247 plug	335572 W
Redac - central unit serial line cable	519052 Z
Console - central unit signals cable	519073 W
M60/3 cable	5190

TEL 6047: Modules to upgrade to systems with remote diagnostic	CODE NO.
Remote diagnostic board C0099/A	335659 M
Redac - central unit serial line	519052 Z
Redac - remote diagnostic line cable	519053 S
RS 232 cable	519063 U
EPROM 231, PD25	963339 A
EPROM 231, PD26	963340 P

2.7 WORKSTATIONS

New workstations have been designed for the L1 line, based on the ELB 3683 and the multiprocessor controller G0322. Earlier workstations were based on keyboard/display controllers and on the ELB 1381/1382 electronics box.

For the M60 and upgraded versions of the M60, a mix of both old and new workstations is permitted.

For original multiprocessors, however, only new workstations can be accommodated.

Key elements in operation of the workstation will be examined individually in the next sections.

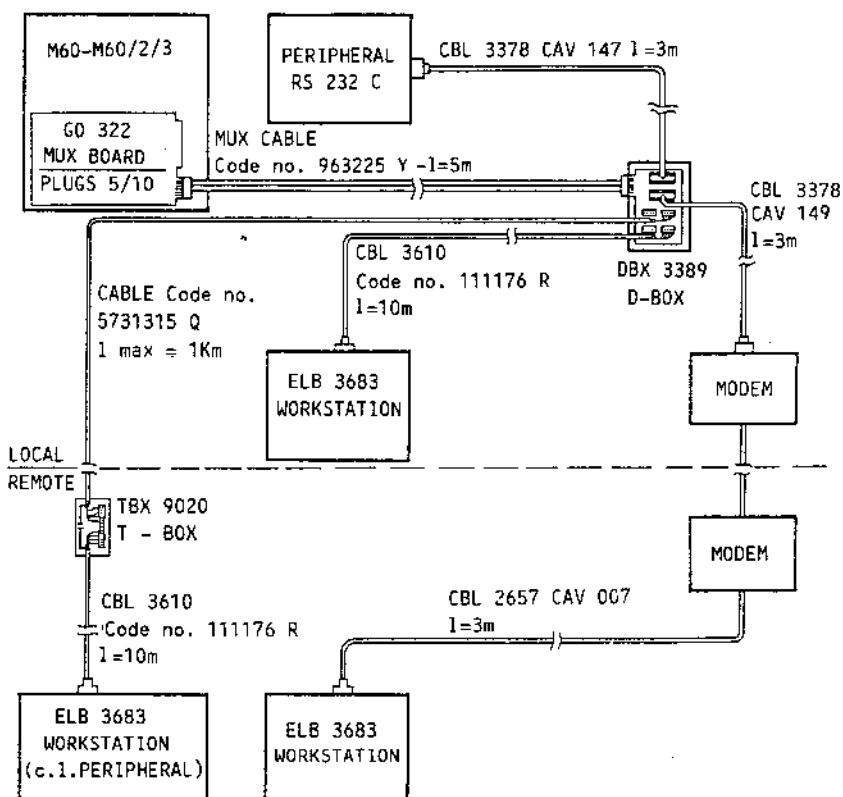


Fig. 2-12 Workstation installation plan

2.7.1 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 external D-BOX device.

2.7.2 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.

The cable for connection to the multiplexer controller is 5 metres long.

The D-box must be set close to the system and secured to the wall or the floor at a maximum distance of 4 metres.

There are two slot holes on the base of the D-box for wedge type pressure screws.

To have access to the slot holes, the D-box cover, held in place by embedded wings, should be removed. While the anti-disturbance frame can be left in place, the protective cover plugs must be taken off the male Cannon connectors.

To secure the D-BOX, two holes must be made at a distance of 102 mm centre-to-centre with diameter depending on the wedge used. The screws used should be 3.2 mm in diameter.

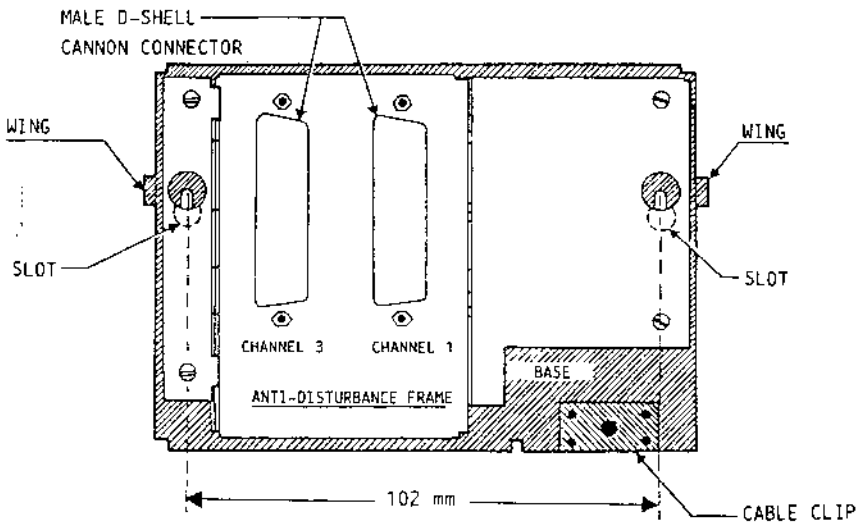


Fig. 2-13 D-BOX with casing removed

2.7.3 ELECTRONICS BOX ELB 3683

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
- 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:
 - . keyboard interface
 - . video controller interface
 - . two RS 232 C interfaces
 - . two TTL interfaces
- EXCHANGE WITH SYSTEM: serial, point to point, asynchronous, free running, via multiplexer controller

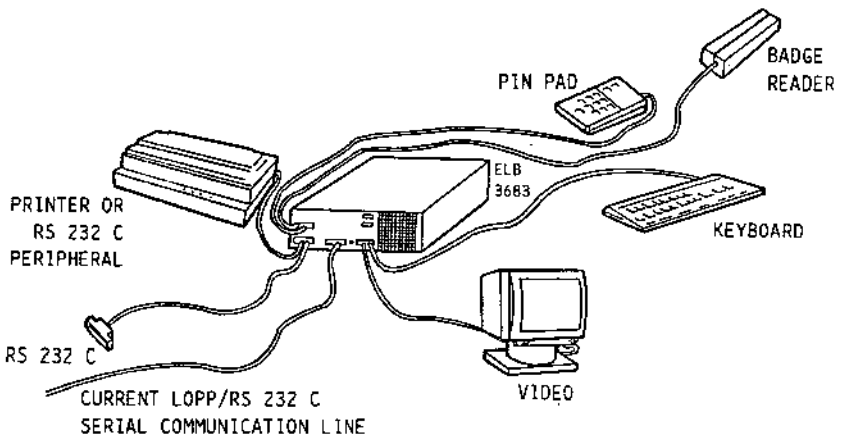


Fig. 2-14 Diagram of connection between ELB 3683 and peripherals

Installation of ELB 3683

The ELB 3683 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 3683 does not have any holes on its upper cover to take a monitor.



Fig. 2-15 ELB 3683 Ventilation

To remove the ELB 3683 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.

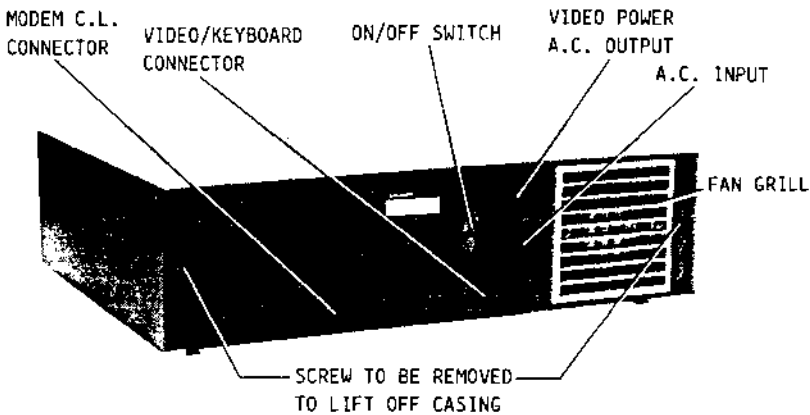


Fig. 2-16 ELB 3683 casing - rear view

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 3683 casing as described earlier
- Mount the option board, securing it to the motherboard BA126, using 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.

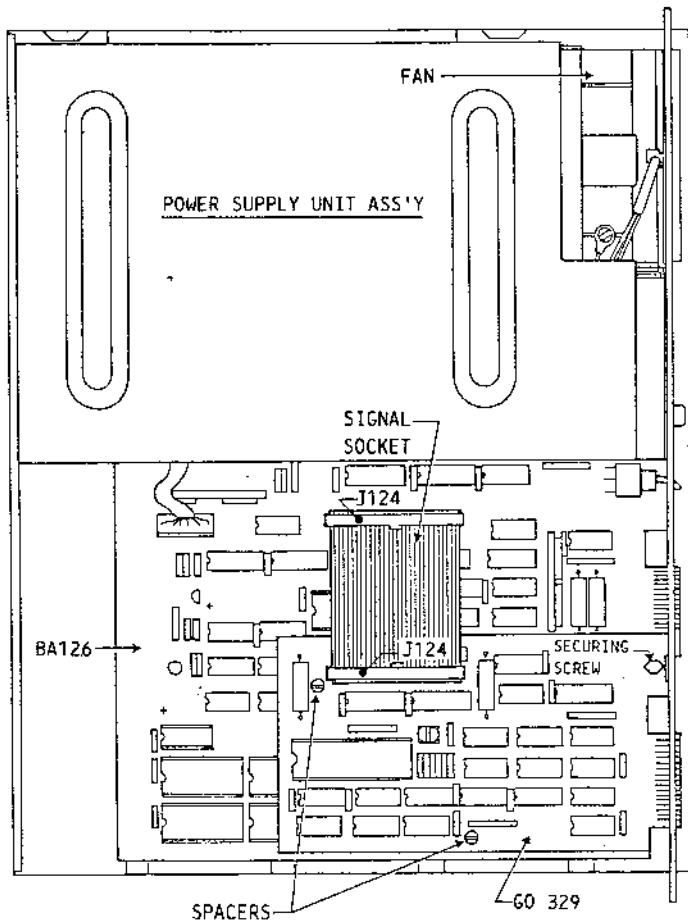


Fig. 2-17 Assembly of pin pad and badge reader option board

Power supply assembly

The power assembly LG03 is contained in a sheet metal structure including the fan, switch, power plug and display 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 $\pm 5\%$
- 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:

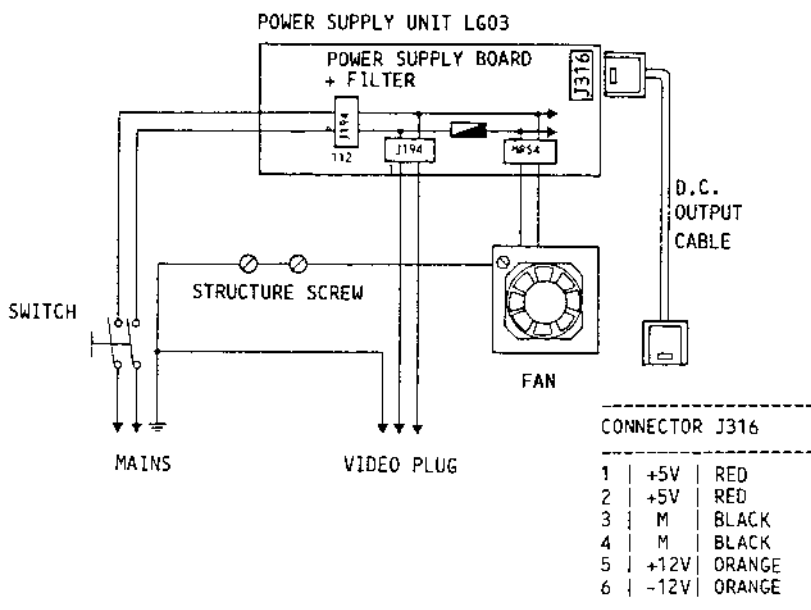


Fig. 2-18 A.C. distribution in ELB 3683

2.7.4 CURRENT LOOP CONNECTION LINE AND T-BOX

For a Current Loop type connection between system and ELB 3683, for distances not greater than 10 metres from the D-Box, the Current Loop standard cable CBL 3610 is used.

The ELB 3683 can take a twin leaf connection as it has a polarity key; it should be inserted in the "CL/MODEM" connector.

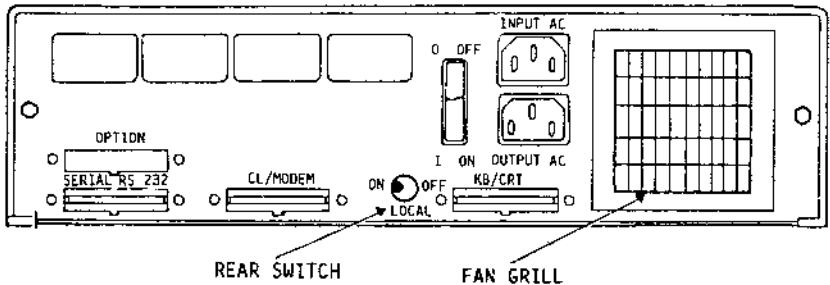


Fig. 2-19 ELB 3683 rear view

The conditions listed below must be respected in connecting the CBL 3610 cable:

D-BOX ASSEMBLY VIEW

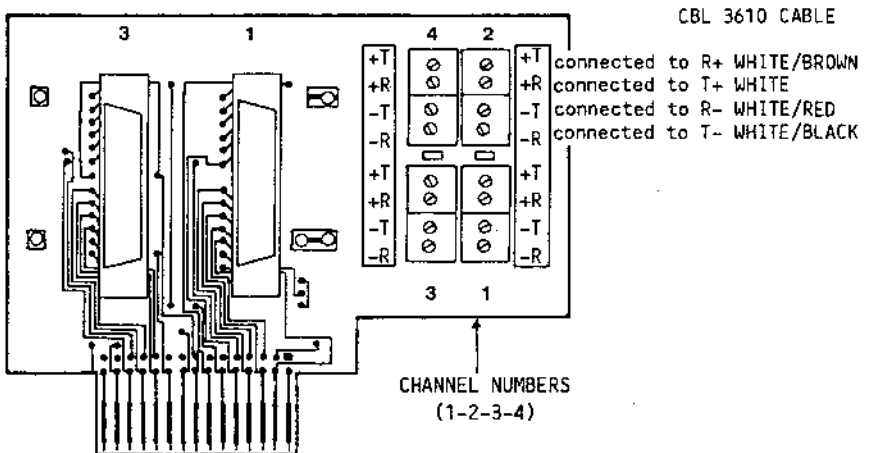


Fig. 2-20 Connection of a CBL 3610 cable to a D-BOX

T-Boxes are inserted in remote connections of over 10 metres and also in shorter, local connections where the ELB 3683 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) junction of the CBL 3610 cable and the quadripole, shielded AWG 24 D-Box connector cable.

The latter cable, connecting D-Box and T-Box, can be a max. of 1 km in length and is available from "Gestione Ricambi" in reels of 500 metres. The 4 ELB 3683 wires are connected to the T-Box in the same way as seen earlier for the D-Box and illustrated in figure 2-20.

SCREW IN TERMINAL POSTS - GROUPS OF 4

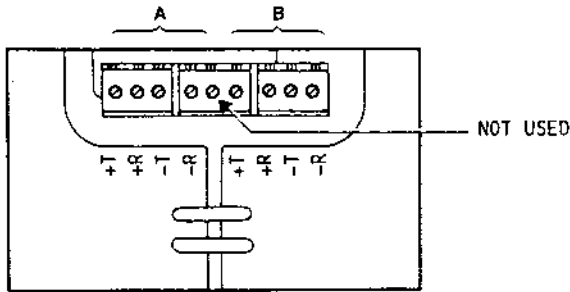
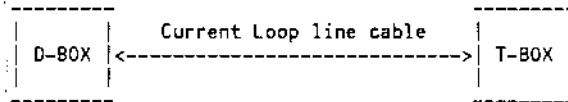


Fig. 2-21 T-Box assembly view

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 figure below:



T+	WHITE/BROWN	connected to	R+
R+	WHITE	connected to	T+
T-	WHITE/RED	connected to	R-
R-	WHITE/BLACK	connected to	T-

Fig. 2-22 Connection between D-Box and T-Box

The T-Box and D-Box terminal posts are accessed after the covers are removed from the two devices.

T-BOX Installation

The T-BOX is set at a maximum distance of 10 metres from the ELB 3683 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 2-19.

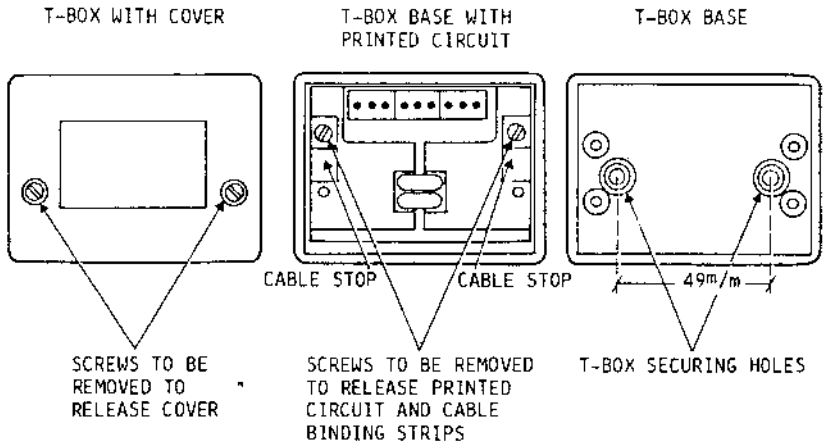


Fig. 2-23 Disassembly of T-Box

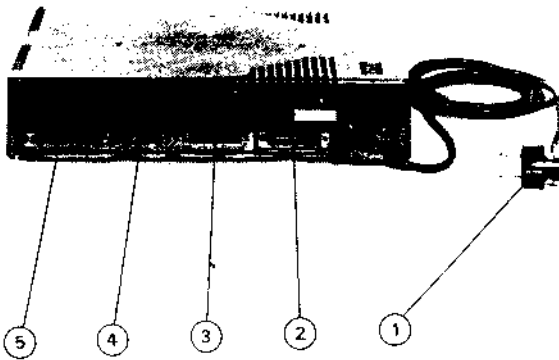
2.7.5 ELB 1380/1382 ADAPTER

In addition to the ELB 3683, there is a further type of ELB with, however, more modest performances.

With the 1381 version, workstations with video and keyboard only can be set up at a maximum distance of 100 metres from the system.

The 1382 version should be used to connect workstations with peripherals with RS 232 serial interfaces and pin pad/badge reader devices as well as the video and keyboard. Maximum distance is still 100 metres.

The ELB 1382 adapter connectors are illustrated in the figure below.



- 1- Cable for connection to mains voltage
- 2- Connector for video/keyboard controller (in M60 rack)
- 3- Connector for connection to video and keyboard
- 4- Connector for peripherals with RS 232 serial interface
- 5- Connector for Pin pad and Badge reader

Fig. 2-24 ELB 1382 Cables and Connectors

N.B.: The ELB 1381 does not have the connectors numbered 4 and 5 present on the 1382.

2.8 INSTALLATION OF LINES

2.8.1 GENERAL

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.

N.B.: When a line cable and an a.c. cable cross over, they must be kept 5 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 cableducts is strongly recommended.

2.8.2 LION INTERNAL LINE

The LION 200 (Local Internal Olivetti Network) internal line is used in system cluster configurations.

The LION 200 consists of a controller with microprocessor, which has a V24 interface and a 200 Kbps LION type interface. Only two-wire internal lines can be implemented with this controller.

Maximum trunk length with AWG 20 wire is 2 Kms, and 1.2 Kms with AWG 22 wire.

The maximum number of systems that can be connected to a trunk is 32. A polling-selecting type protocol is used (master-slave).

The maximum number of systems that can be connected with a Tap-box (to be described later) at any point of the trunk is 8.

Minimum distance between two tap-boxes is 5 metres when there are two junctions, and 2.5 metres with one junction only.

Description of transmission means

The LION internal line trunk must have a cable with very precise characteristics, code no. 5731835 M. This cable has two twisted, AWG20 conductors, each with 7 primary AWG28 wires.

The AWG24 cable can only be used for already existing wires.

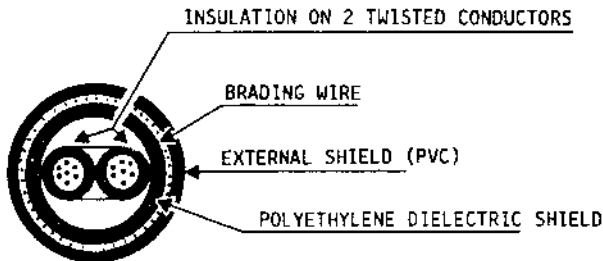


Fig. 2-25 LION cable

Description of junction

A junction box, or TAP-BOX (identified as TAP 1070), is used in LION internal lines for connection on a terminal strip of the two trunks, the trunk shield and one or two junctions for terminals.

Each Tap-box allows one or two junctions to be connected: to order the correct number of Tap-boxes, a precise installation plan should be drawn up.

Tap-boxes come without female connectors. The female connectors are part of the corresponding line controller commercial module and have the wires needed for connection of the junction to the trunk soldered across their pins. A 0.1 microfarad capacitor is also soldered to the ground wire (see figure 2-26).

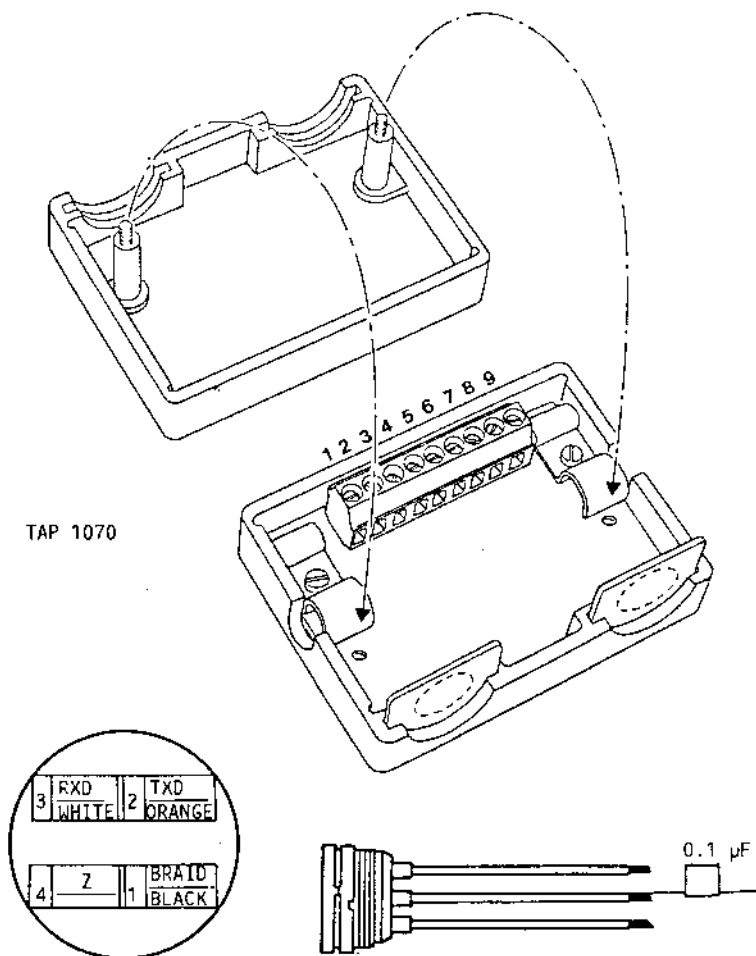


Fig. 2-26 Tap-Box for LION internal line

In the latest version of the TAP-BOX, the capacitor is inserted in the printed circuit (see figure 2-27). As the female connector supplied with the cable has both a capacitor and a ground connection bracket, depending on the type of TAP-BOX installed, the capacitor must be eliminated and the ground bracket used instead, or vice versa.

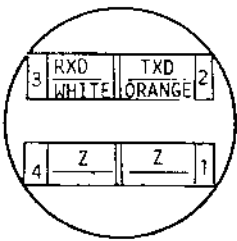
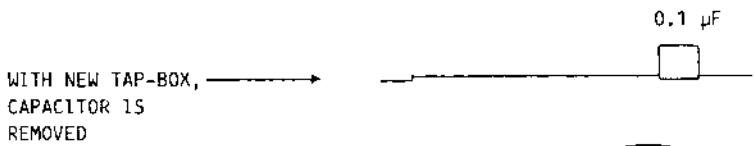
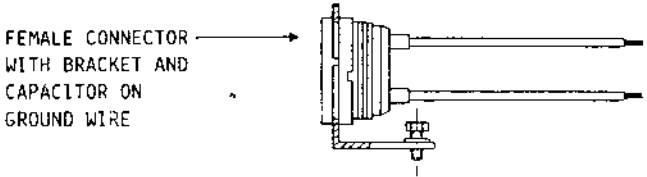
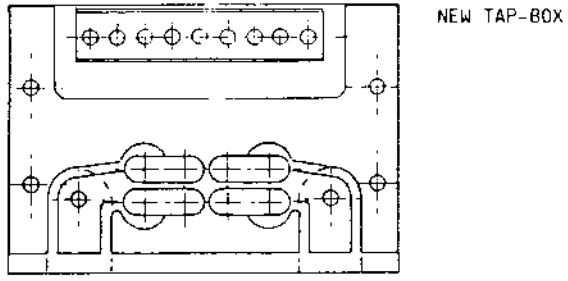


Fig. 2-27 TAP-BOX with capacitor inserted in printed circuit

Trunk shield ground connection

The trunk shield must be connected to ground at one of the ends of the line.

A unipolar, AWG18 wire with an eyelet to be positioned under the cable clip on the same side as the terminator resistor should be inserted.

The other end of the wire should be attached to the ground terminal of a power plug which is then inserted in a nearby mains socket. One of the Tap-boxes at the end of the trunk must, therefore, be set up close to a mains source.

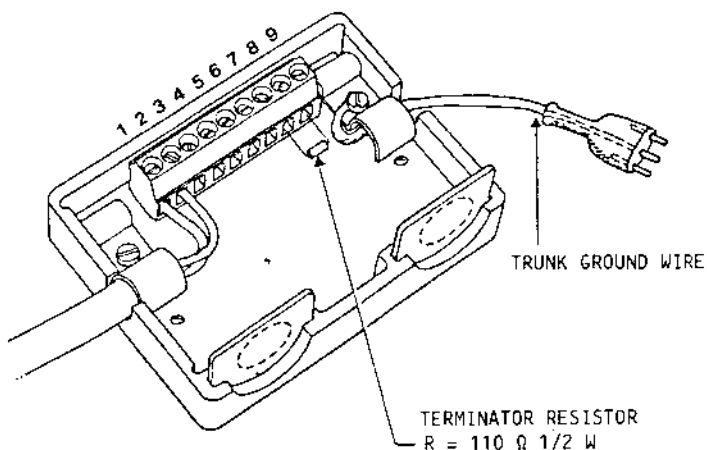


Fig. 2-29 Tap-box at end of trunk

Junction connections

The outlets towards junctions in the Tap-box are sealed with plastic plugs. The female connector code no. 336470 D can only be inserted after the plug is removed. Three wires are soldered to this connector, one white, one orange and the third black with a capacitor on the free end. The type of connection to be made is shown in the table below:

WIRE COLOUR	CONNECT TO TERMINAL STRIP PIN NO.:	
	(FIRST JUNCTION)	(SECOND JUNCTION)
WHITE	4	6
ORANGE	3	7
BLACK	5	5

The capacitors on the trunk shields ensure that there is no galvanic coupling between the junction shields and the trunk shield while a.c. coupling is maintained.

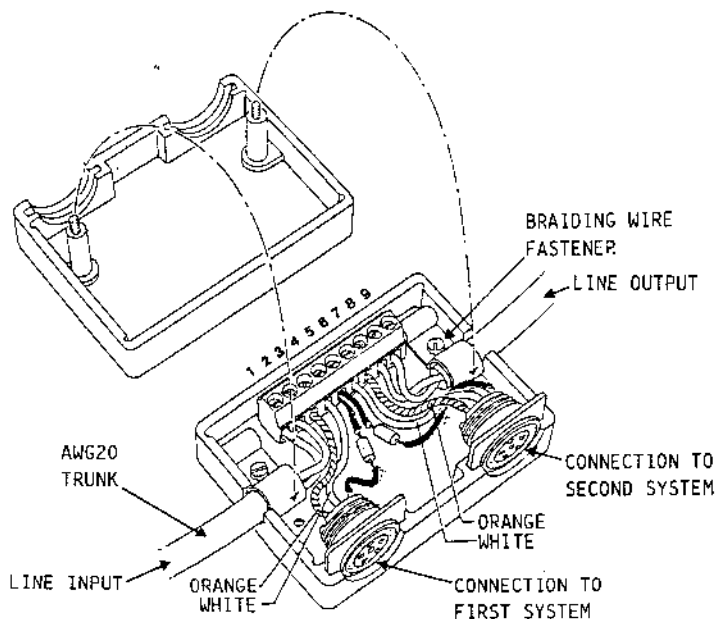


Fig. 2-30 Example of a two terminal junction

2.8.3 OMNINET LOCAL NETWORK

The OMNINET local network is a fast (1 MHz), internal line consisting essentially of:

- Trunk cable
- TAP-BOX
- Ground cable
- Workstation connection cables
- Repeater

Network configuration

The Omnet network must meet the following conditions:

- Maximum distance between Tap-boxes or Repeaters: 150 metres
- Maximum length of segment without Repeater: 150 metres
- Maximum number of Repeaters to be used: 3
- Maximum length of line: 600 m
- A maximum of 16 systems can be connected to a line segment. Two systems can be connected to a Repeater.

An example of a network is shown in the figure below.

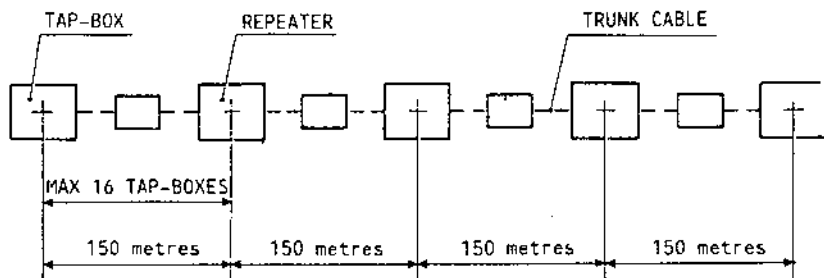


Fig. 2-31 Example of an Omnet network

Trunk

A twisted, shielded pair code no. 5731835 M is used as trunk.

TAP-BOX

Both the Tap-boxes described earlier for the LION network and a more recent type with capacitors inserted in the printed circuit can be used in an Omnet network. The female connector coming with the cable has both the capacitor and a bracket on its ground cable. Depending on the type of Tap-box used, either the capacitor or the bracket will have to be removed.

Junction cable (drop cable)

The cable used to connect systems to the network, like the trunk, is of AWG20 wires, and is a maximum of 2.5 metres long.

Repeater

Repeaters must be used when the trunk exceeds 150 metres in length. For further information, see the specific General Service Manual (see appendix "Bibliography").

Line safety

For correct Omnet operation, these conditions should be satisfied:

- the whole area served by the network is to be connected to the same ground
- all systems connected, including repeaters and the trunk braiding wire, are to be connected to the same ground
- there should, if possible, be only one power supply station; if not possible, all stations should have the same ground
- the network should be installed inside the same building
- maximum voltage on a ground point is 3V; a potential difference of more than 12 V could damage the line drivers connected.

2.8.4 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, i.e. 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 2-32, systems are connected to the network by a receive/transmit cable and a transceiver supplied with cable.
- Repeaters are used to interconnect Ethernet segments (see figure 2-33).
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)

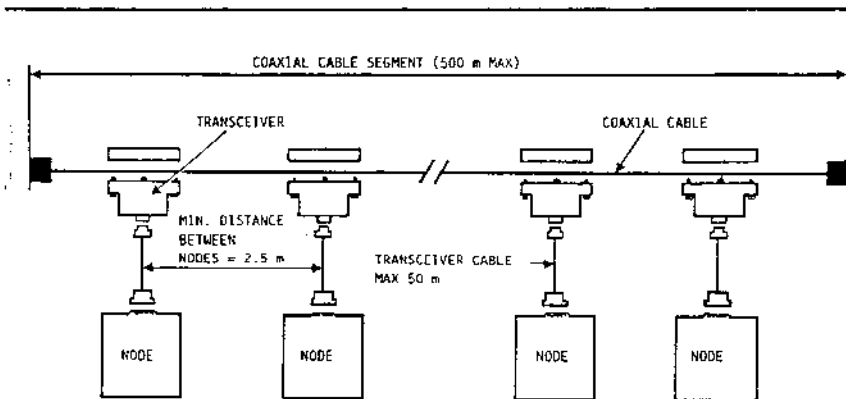
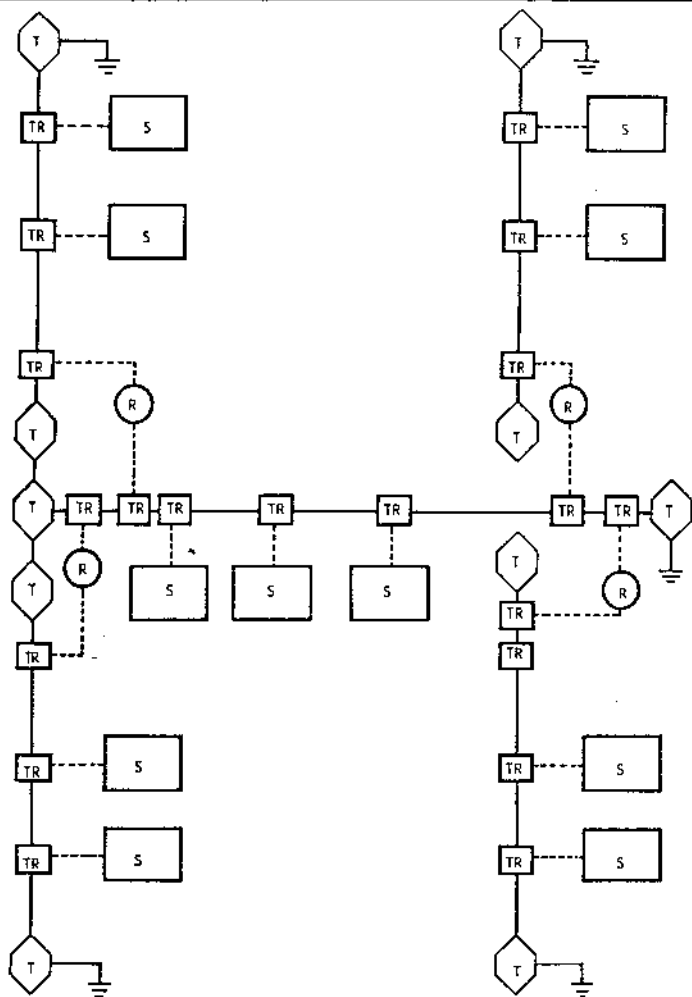


Fig. 2-32 Ethernet segment configuration

N.B.: for Ethernet local network installation procedure, see NOP code no. 3874208 Z/18.



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

Fig. 2-33 Ethernet network extended configuration

2.8.5 RS232 INTERFACE STATIC MULTIPLIER (MSW 3369)

This is a manual, mechanical two-way switch used in connections to devices with RS 232 interface. It comes in a desk-top version and consists of one board with three RS 232 outputs.

Typical applications of the static multiplier are:

1. Alternating an external line between two systems
2. Alternating a printer between two systems
3. Alternate connection of two printers to the same system.

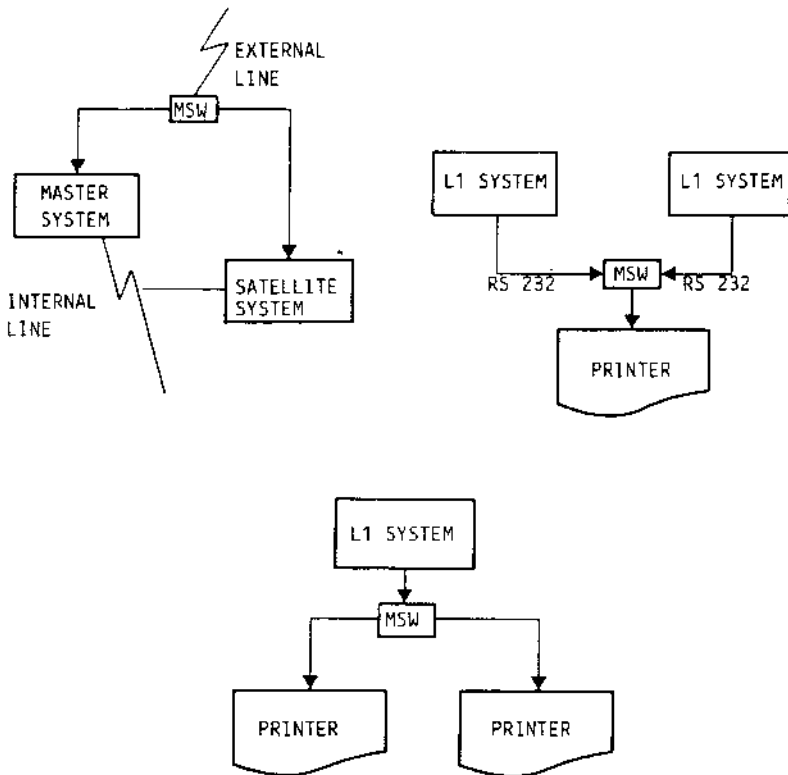


Fig. 2-34 Configurations with the RS232 interface static multiplier

2.8.6 V24 INTERFACE DYNAMIC MULTIPLIER (DIM 3379)

This is a desk-top device, consisting of one board only.

It is used to regenerate interface signals, broadcast messages and to branch multi-point lines.

It has five V24 outputs, one of the "common" type, the other four "expanded". Signals arriving on the common output are also sent simultaneously to the other four outputs; similarly, signals coming from the four outputs are also sent to the common output.

The dynamic multiplier is transparent to the type of protocol used and can be used for synchronous and asynchronous transmission in full or half duplex.

Used for multi-point trunk connections, it allows for a reduction in the number of modems required. It means, in practise, that an internal/external line modem can be dynamically shared between four stand alone/satellite systems as illustrated in the figure below.

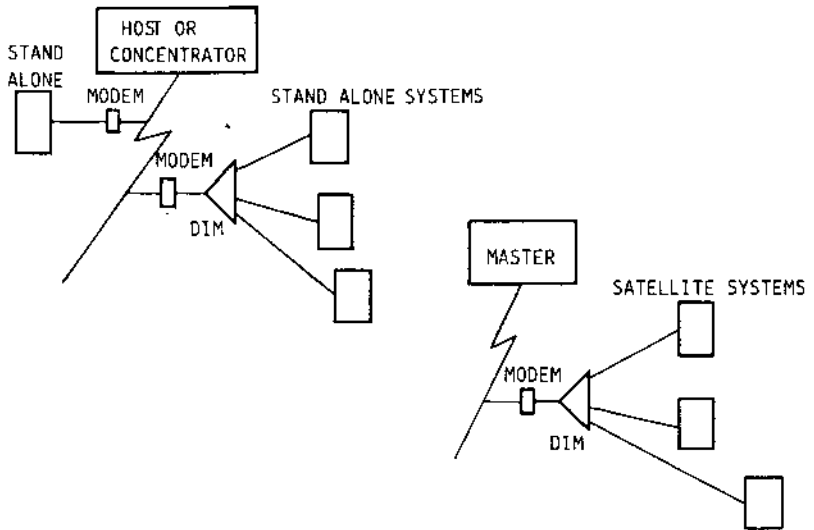
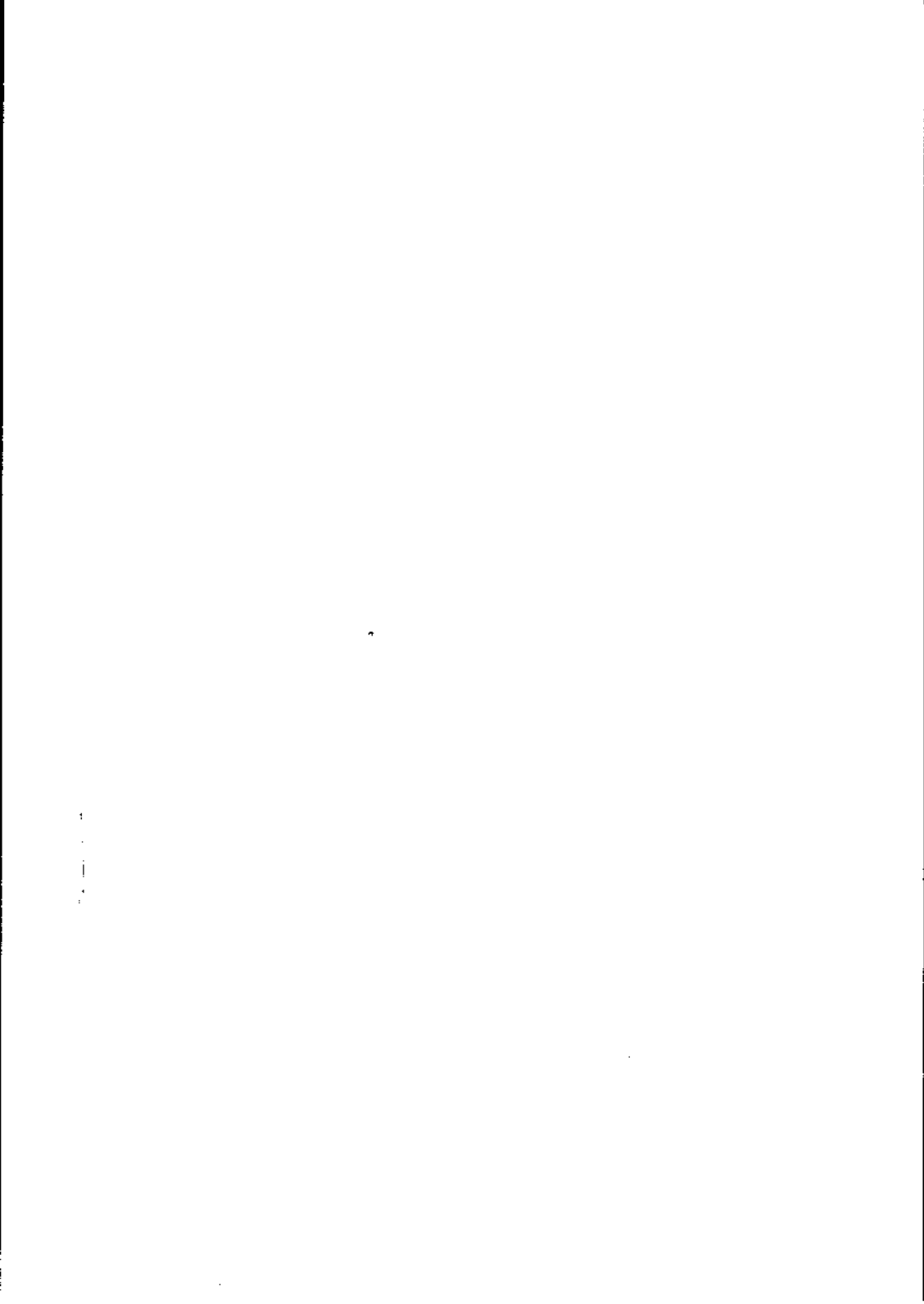


Fig. 2-35 Diagram of connection using a V24 interface dynamic multiplier



3. POWER SUPPLY

3.1 GENERAL

This chapter deals with the power supply for M60, M60/2 and M60/3 systems and the external cabinets SB3 and SB2.

It gives information of a general nature, diagrams showing A.C. distribution in the SB0 and SB3 cabinets, information on each of the power supply units used, the SB0 back panel diagram and absorption values for the hardware modules used.

Power supply units used for M60 and SB3 cabinets are listed below:

LB30: Main power supply unit, 300 W

LA17: + 5 V extension power supply unit for absorption of more than 50 A

LA04: 40 W power supply unit for Redac and console

LA40: 345 W power supply unit for SB3

N.B.: The LA40 is used in the SB3 cabinet to supply the magnetic peripherals housed in the SB3, except for the 60/120 MB hard disk units which have their own power supply unit, the XU 1701.

The SB2 cabinet does not have any specific power supply unit, apart from individual magnetic peripheral power supply units.

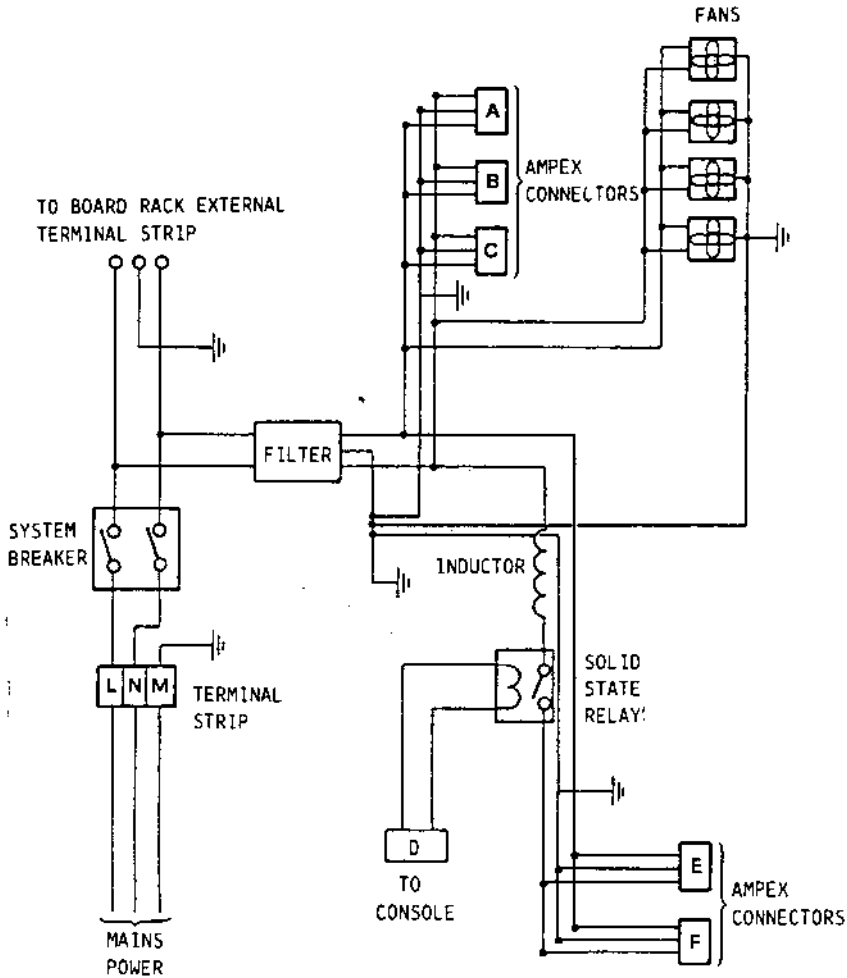
Current raised by each individual unit is shown in the table below:

POWER SUPPLY UNIT	ABSORPTION (amperes)					
	POWER (watt)	+ 5V	+12V	-12V	+24V	-24V
LB30 - SB0 integrated	300	50.0	2.0	1.5	--	--
LA17 - PSE 6050	170	25.5	4.3	0.7	--	--
LA04 - for Redac	40	5.0	0.9	0.3	--	--
LA40 - PSU 3545 (in SB3)	345	30.0	4.5	2.8	5.2	1.0

3.2 SBO MODULE POWER SUPPLY

3.2.1 A.C. DISTRIBUTION

The figure below is a diagram illustrating A.C. distribution in the SBO basic module.



N.B.: For the physical position of the AMPEX connectors, see figure 2-3.

Fig. 3-1 SBO module wiring diagram

3.2.2 BAC: PANEL IN060

There are two versions of the IN060 back panel, distinguished essentially by different J002 and J003 connector settings.

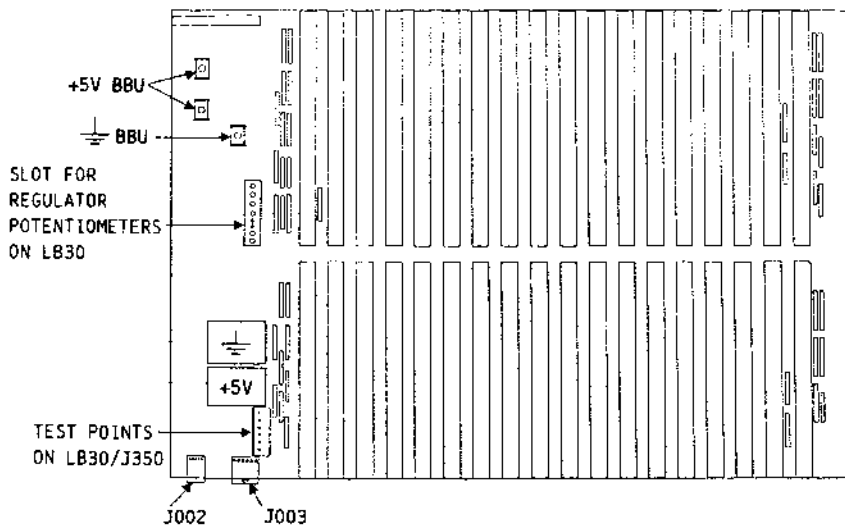


Fig. 3-2 Back panel IN060: previous version

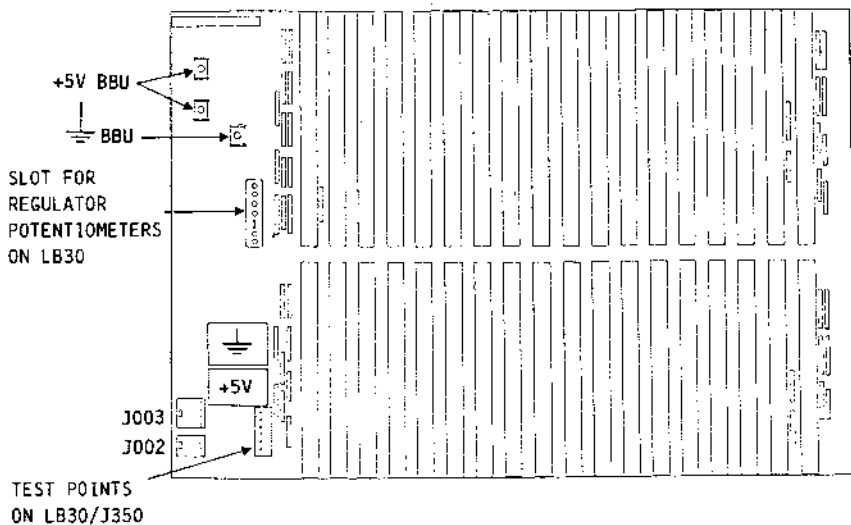
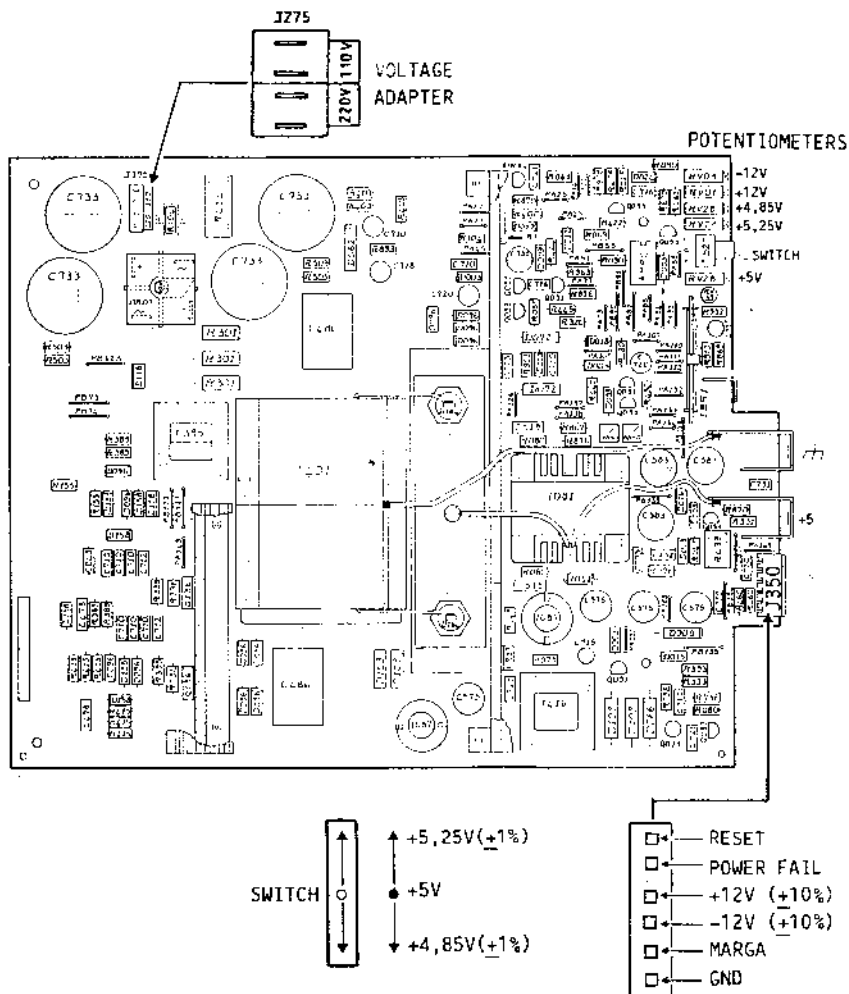


Fig. 3-3 Back panel IN060: current version

3.2.3 LB30 POWER SUPPLY UNIT

The figure below shows the LB30 board picture, and the measurement and regulation points. All measurements are made with a digital tester with the machine on, access through the back panel (see the previous two figures).



N.B.: The +5 V limit voltages are regulated with potentiometers which can be accessed through a slot in the back panel. As these voltages are used only by production, the switch should always be in the central position.

Fig. 3-4 LB30 power supply unit board picture

3.2.4 LA17 POWER SUPPLY UNIT

In systems where current absorption on the +5 V is expected to exceed 50 A, the extension PSE 6050 must be mounted. This extension is provided by power supply unit LA17.

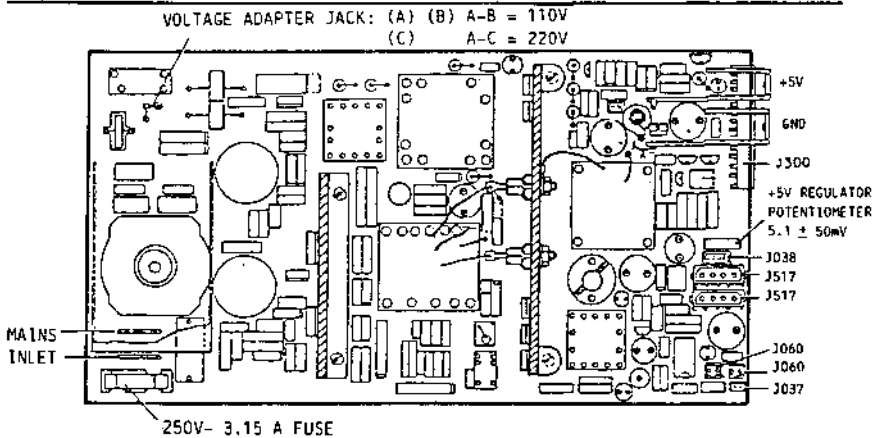


Fig. 3-5 LA17 power supply unit board picture

LA17 Installation

To install the LA17 in the 580 cabinet, holes must be drilled in the sides of the casing, as illustrated in the figure below.

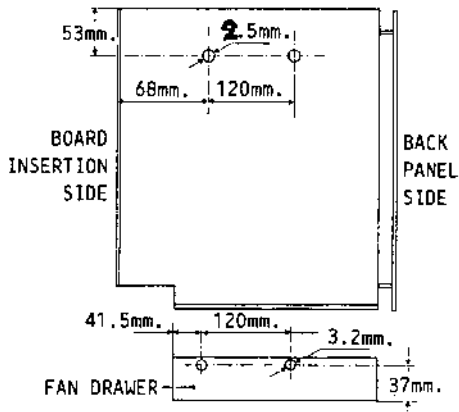


Fig. 3-6 Drilling holes in the M60 casing for the LA17

After completing the drilling, taking care not to cause the boards and fan housing any damage, perform the following operations:

- Secure the LA17 support (code no. 338651 Q) to the two upper holes
- Attach the LA17 securing frame (code no. 338650 T) to the two holes in the fan housing
- Mount the power supply unit, connecting it to the Redac board, as shown in the interconnection diagram in the figure below.

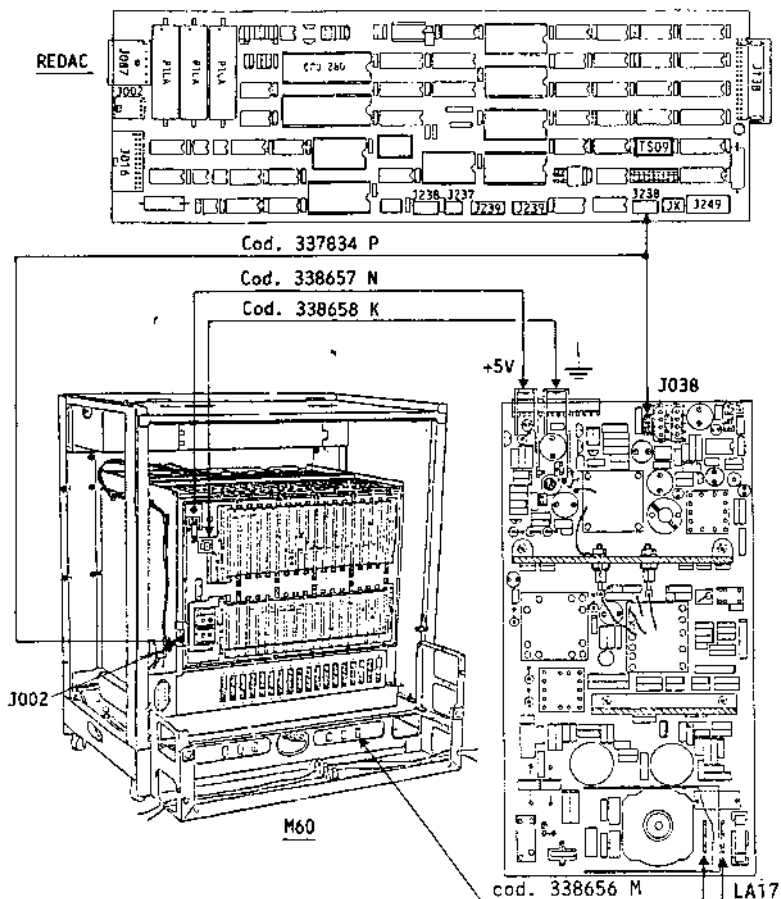


Fig. 3-7 LA17 interconnection diagram

3.3 SB3 MODULE POWER SUPPLY

3.3.1 A.C. DISTRIBUTION

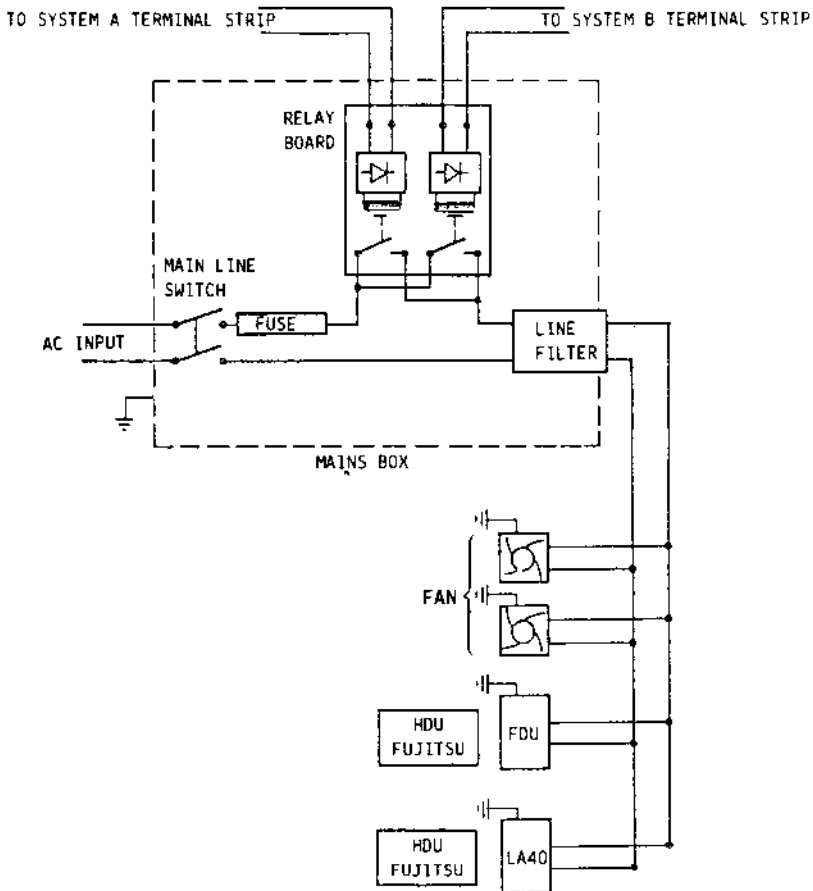


Fig. 3-9 Wiring diagram of SB3 module mains box

The figure below represents the LA40 power supply unit connectors and their voltages:

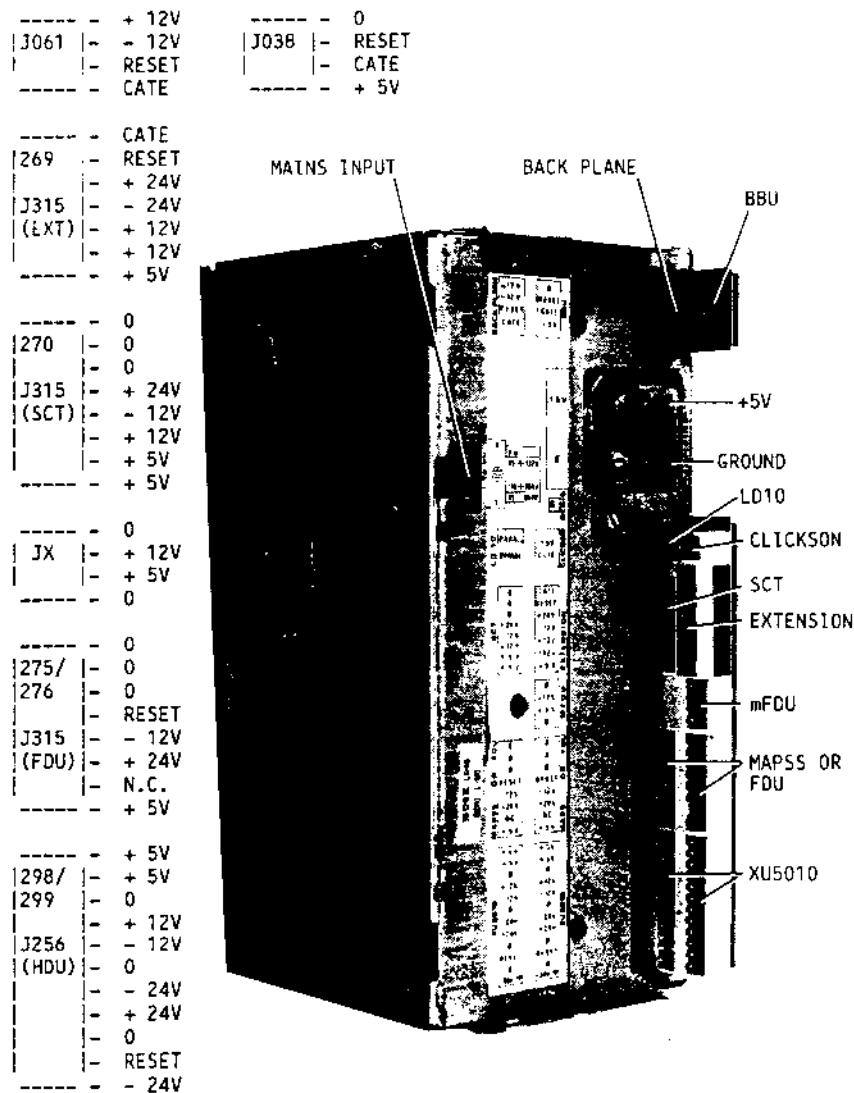


Fig. 3-11 LA40 view - connectors side

3.3.3 SB3 REMOTE SWITCH-ON DEVICE

This is a device used for remote SB3 cabinet switching-on by one or two M60 systems.

It consists of a single board integrated in the SB3 mains box. If the SB3 is not shared, there is one cable only to connect between the board and the M60 mains terminal strip.

If the cabinet is shared by two systems, a second cable is required for connection between the board terminal strip and the mains strip of the second M60. This cable (code no. 338627) comes with the SET 3569 (Dual-Port).

Voltages and frequencies accepted are:

- 200/220 V (-15% +10%), frequency 50/60 Hz (from 45 to 65 Hz)
- 100/120 V (-15% +10%), frequency 50/60 Hz (from 45 to 65 Hz)

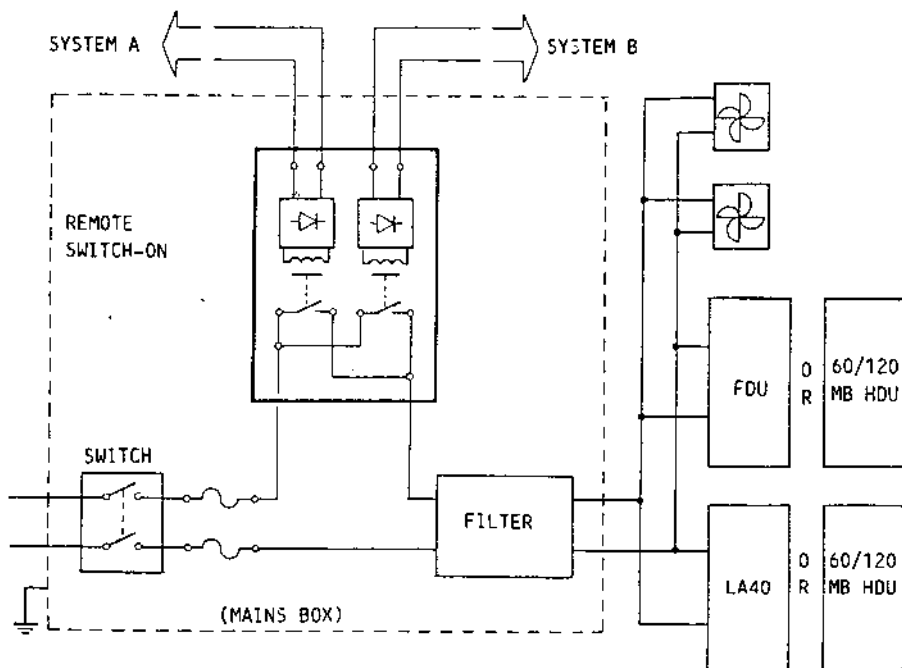


Fig. 3-12 Diagram of SB3 Remote switch-on device connection

3.4 SB2 MODULE POWER SUPPLY UNIT

3.4.1 A.C. DISTRIBUTION

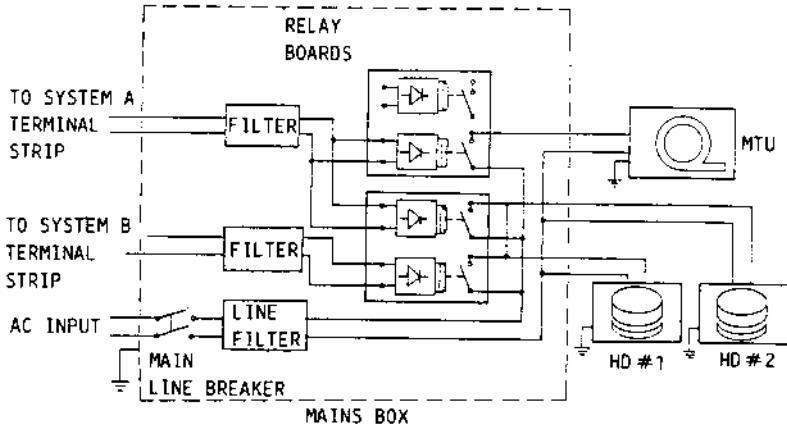


Fig. 3-13 Wiring diagram of SB2 module mains box

3.4.2 REMOTE SWITCH-ON DEVICE ON SB2

This is a device used for remote SB2 cabinet switching-on by one or two M60 systems.

It consists of two boards integrated in the SB2 mains box.

Where the SB2 is not shared by two systems, there is only one cable to be connected between the first EEC plug of the terminal strip of the mains box and the M60 mains terminal strip.

If the cabinet is shared by two systems, then a second cable is required to connect the second EEC plug to the mains strip of the second M60. This cable (code no. 571598, length 1.5 metres) comes with the SET 3569 (Dual-Port).

The sharing concept involves the hard disk units only, the MTU being dedicated to one system.

Power supply voltages and frequencies are as listed below:

- 200/220 V (-15% +10%), frequency 50/60 Hz (from 45 to 65 Hz)
- 100/120 V (-15% +10%), frequency 50/60 Hz (from 45 to 65 Hz)

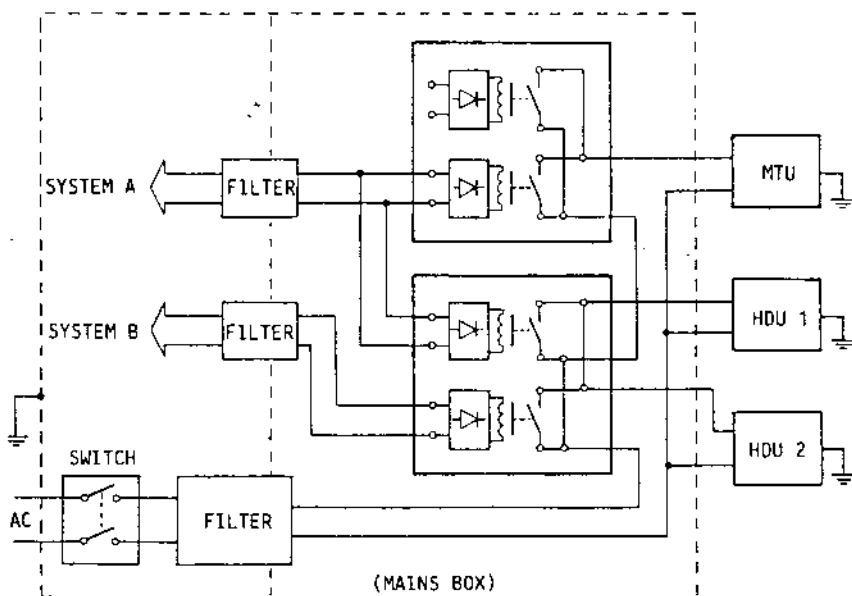


Fig. 3-14 Diagram of SB2 remote switch-on device connection

3.5 ABSORPTION OF HARDWARE MODULES

Absorption values for the various hardware modules used in M60-M60/2/3 systems are given in the figure below:

MODULE DESCRIPTION	ABSORPTION (amps)			POWER (watt)	NOTES
	+ 5V	+12V	-12V		
Central Unit UC040	4.50	0.023	0.018	23.00	
Cache memory UC041	3.50			17.50	
Timing Control Board	3.50			17.50	
1.0 MB Memory RA80/C	2.20			11.00	s.by 1.1A 5.5W
2.0 MB Memory RA80/B	2.50			12.50	s.by 1.4A 7.0W
3.0 MB Memory RA80/A	3.00			15.00	s.by 1.7A 8.5W
4.0 MB Memory RA80/N	3.30			16.50	s.by 2.0A 10.W
1.0 MB Memory RA80/D	3.10			15.50	s.by 2.0A 10.W
0.5 MB Memory RA80/F	2.40			12.00	s.by 1.4A 7.0W
Encryption Cont.G0257/B	1.85	0.10		10.45	
1MB FDU/mFD 1MB G0280/D	2.50	0.15		14.30	
ST506 Int. HDU Con. G0363	3.30			16.50	
SMD HDU Con.G0301/A-302/A	6.1		0.55	37.10	
18 MB HDU Con.G0230-231/A	5.00		0.30	28.60	
MAPSS Board G0306	1.30		0.35	10.70	
STC Cont.G0200B+201B/ 342	4.30			21.50	
40MB MTU Cont. G0278/B	2.85			14.25	
V24+V24 line cont. G0236	2.74	0.12	0.10	16.34	
V24+LION line cont.G0256	2.79	0.17	0.05	16.59	
Ethernet Control G0212/A	2.10	0.50		16.50	
Omninet Control G0308	2.30			11.50	
Integrated Modem M01N 5.2	0.60	0.25	0.25	9.00	
Twin Control G0327	1.73	0.12	0.06	10.81	
Triv. Display Con.G0252	2.30			11.50	
Graphic Expansion G0255A	3.70	0.04	0.05	19.58	
A/n Col. Dis. Con. G0224	3.20			16.00	
Col. Gr. Con. G0259/60/61	10.77	0.037	0.017	54.50	
Multiplexer Control G0322	2.32	0.15	0.05	14.00	

N.B.: - Current values shown support a tolerance of +/- 20%

- Power figures are those calculated in D.C.

- A.C. power figures are obtained by multiplying the corresponding D.C. figures by 1.42

4. SYSTEM HARDWARE AND PRESETTINGS

4.1 HARDWARE MODULES

Hardware modules discussed in this chapter are listed below. The list is in two parts: the first part lists the specific M60-M60/2/3 modules, the second contains the modules common to the L1 line systems.

It should be remembered that typical M60 boards are large format boards, known as double height boards.

<u>HARDWARE MODULES SPECIFIC TO M60-M60/2-M60/3</u>	<u>MODULE NAME</u>
Central Unit.....	UC040/A
Cache memory.....	UC041
TCB: Timing Control Board	TCB82-TCB80/A
RAM storage: 1.0 - 0.5 MByte	RA800-RA800/A
RAM storage: 1.0 - 0.5 MByte	RA80/D-RA80/F
RAM storage: 4.0 - 3.0 - 2.0 - 1.0 MByte	RA80/N-A-B-C
Adapter board.....	IF 300
FEC: Front End Console	C0096
REDAC MR: Console board (without remote diagnostic)....	C0099
REDAC MC: Console board (for remote diagnostic).....	C0099/A

<u>L1 SYSTEM COMMON HARDWARE MODULES</u>	<u>MODULE NAME</u>
Encryption and Real time clock (pin check) Contr.....	G0257/B
SAB50/450 Interface Control. for MB mFDU/FDU	G0280/D
ST506 Interface Cont. for 65 MB HDU	G0363
OPE Interface Cont. for 18 MB HDU	G0230, G0231/A
SMD Interface Cont. for 60/20 MB HDU	G0302/A, G0301/A
DEL Interface Cont. for 20 MB SCT	G0200/B, G0201/B
QIC36 Interface Cont. for 20 MB SCT (Cipher)	G0200/B, G0342
PERTEC Interface Cont. for 40 MB MTU	G0278/B
Trivalent display/keyboard control	G0252-252/A-252/B
Graphic display expansion module (with G0252)	G0255/A
Alphanumeric colour display/keyboard control	G0224
Graphic colour display/keyboard control (3 boards)	G0259, G0260, G0261
Multiplexer controller	G0322

>>>

>>>

LT SYSTEM COMMON HARDWARE MODULES	MODULE NAME
V24 + V24 intelligent line control	G0236 (see note)
V24 + LION 200 intelligent line control	G0256 (see note)
V24 + LION 9.6 intelligent line control	G0340/A
Omninet local network line control	G0308
Ethernet local network control	G0212/A
RS232 - Current Loop interface control	G0327
MOIN 5.2 Integrated Modem	IF192

NOTE 1: In future, boards G236 and G0256 will be replaced respectively by G0331 and G0340.

NOTE 2: As for the TCB, only one type of printed circuit corresponding to the TCBB2/A version.

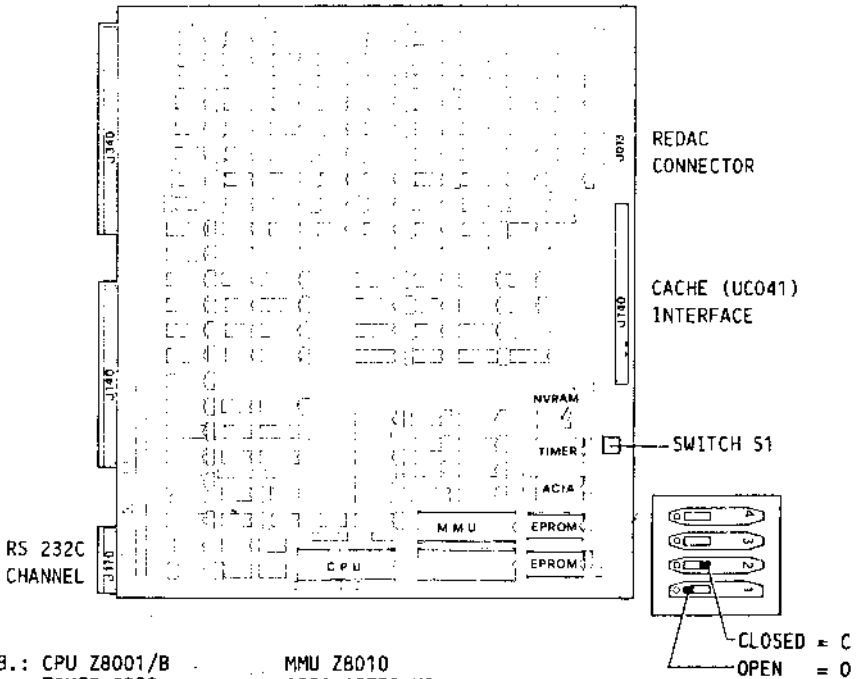
NOTE 3: Power supply modules have already been described in chapter 3. For the different magnetic units used, see chapter 5.

NOTE 4: Unless otherwise stated, the conventional symbols adopted throughout the rest of the manual for DIP-switch settings are:

- . O = OPEN = OFF .
- . C = CLOSED = ON
- . X = DON'T CARE
- . - = NOT USED

4.2 BOARD PICTURES AND JUMPER SETTINGS

4.2.1 CENTRAL UNIT: UC040 - UC040/A



N.B.: CPU Z8001/B
 TIMER 8253
 NVRAM 256x4

MMU Z8010
 ACIA 68450 MC

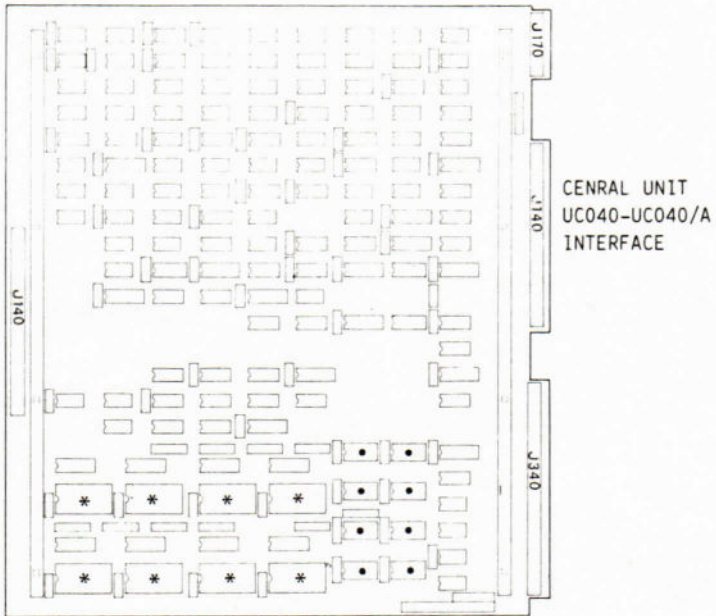
DIP-SWITCH S1

POSITION: V10

FUNCTION: Used by the software to define CPU name in multiprocessor environment

SETTING				SIGNIFICANCE
1	2	3	4	
C	C	C	C	CPU 0
C	O	C	C	CPU 4
O	C	C	C	CPU B
C	O	C	O	CPU disabled

4.2.2 CACHE MEMORY: UC041



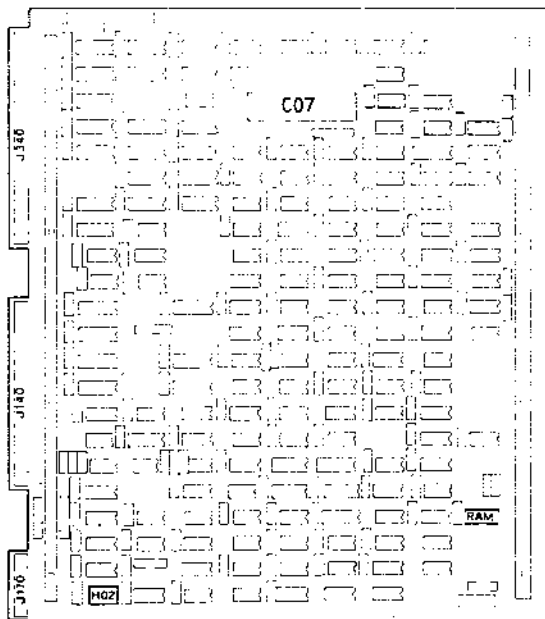
N.B.:

- No special settings are required for this board, it is connected to the UC040 by the M1247 plug
- (•): 1024x4 RAM chips = 4K * 8
- (*): 64x9 RAM chips = 512 * 9

4.2.3 TIMING CONTROL BOARD: TCB82

In certain system configurations, current absorption on the + 5V is greater than 50 A. In this case, as stated in chapter three, the extension power supply unit must be mounted. At the same time, the TCB82 board must be modified, as a result of which it becomes TCB82/A.

If required on new systems, the modification will be made in production; for systems already in field, technical service personnel will carry out the modification following the instructions in the document issued by DATC/TEC.

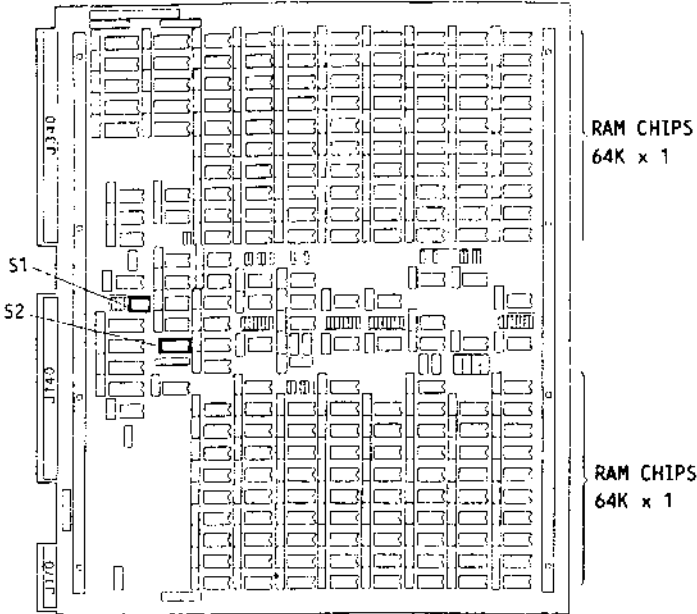


- N.B.:
- Fast RAM 4096x1
 - 32 MHz clock generator
 - Error Correction Code (ECC) in position C07

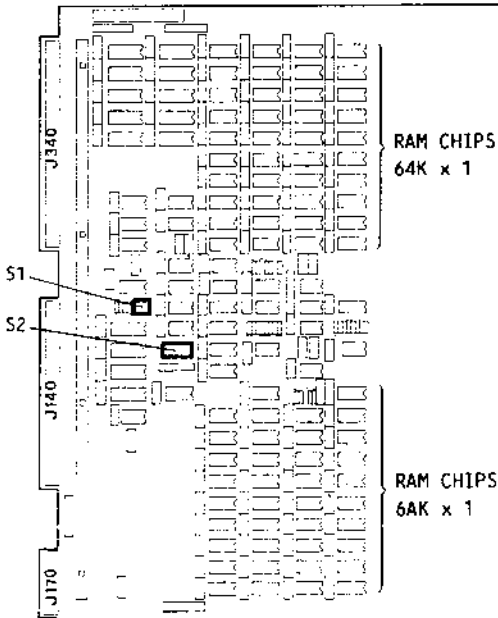
This board is inserted at the end of the logic board pack, on the right of the last controller. It can interface up to 8 memory arrays.

4.2.4 RAM STORAGE BOARDS

1 MByte Memory: RA800



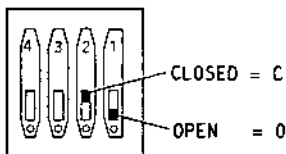
512 KByte Memory: RA800/A



DIP-SWITCH 51 in position R2

FUNCTION: Address setting

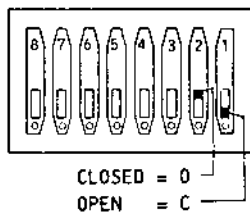
SETTING				ADDRESS FIELD (Hex)
4	3	2	1	
C	C	C	0	100000 - 1FFFFFF
C	C	0	C	200000 - 2FFFFFF
C	C	0	0	300000 - 3FFFFFF
C	0	C	C	400000 - 4FFFFFF
C	0	C	0	500000 - 5FFFFFF
C	0	0	C	600000 - 6FFFFFF
C	0	0	0	700000 - 7FFFFFF
0	C	C	C	800000 - 8FFFFFF
0	C	C	0	900000 - 9FFFFFF
0	C	0	C	A00000 - AFFFFFF
0	C	0	0	B00000 - BFFFFFF
0	0	C	C	C00000 - CFFFFFF
0	0	C	0	D00000 - DFFFFFF



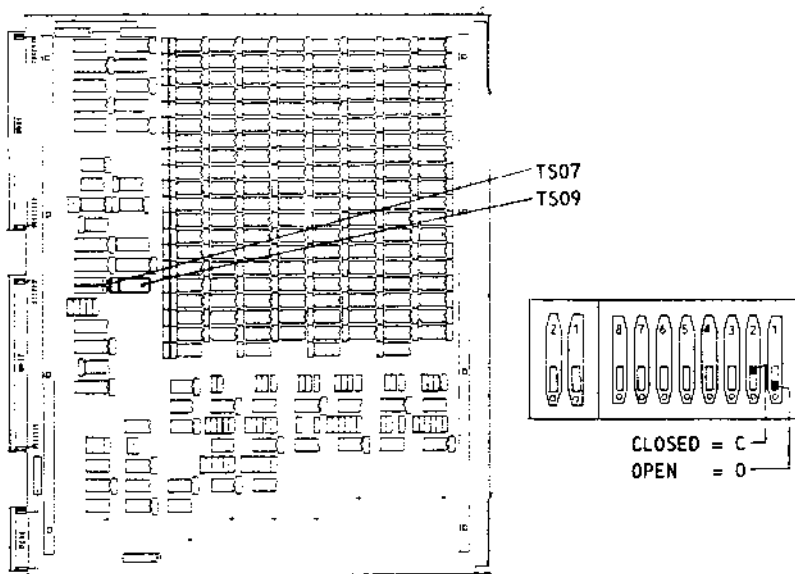
DIP-SWITCH 52 in position T3

FUNCTION: Board type selection

SETTING								SIGNIFICANCE
8	7	6	5	4	3	2	1	
C	C	C	C	C	C	C	C	1 MB Board
0	0	C	C	0	0	C	C	512 KB Board



R080/D: 1 Mbyte Memory 64 Kbit chips, boundary 0.5 MByte

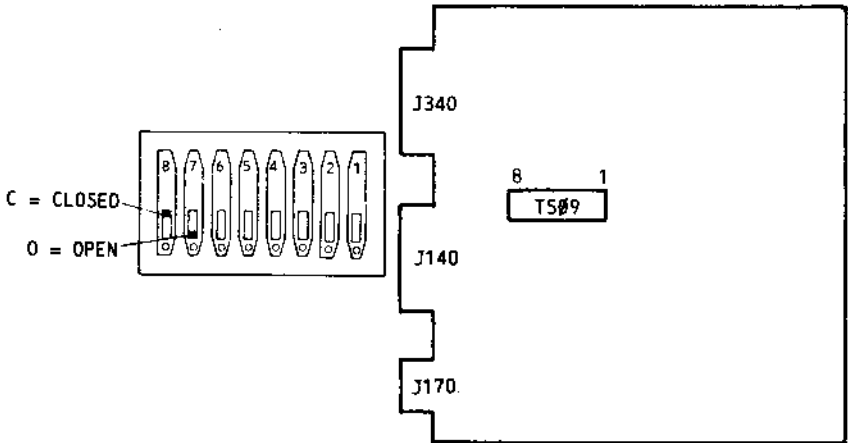


DIP SWITCH TS07 in position R02
 DIP SWITCH TS09 in position R03

FUNCTION: Address setting

SETTING		ADDRESS FIELD (Hex)	SETTING		ADDRESS FIELD (Hex)
TS07	TS09		TS07	TS09	
2	1		2	1	
0	0	100000-1FFFFFF	0	0	700000-7FFFFFF
0	0	180000-27FFFF	0	0	780000-87FFFF
0	0	200000-2FFFFFF	0	0	800000-8FFFFFF
0	0	280000-37FFFF	0	0	880000-97FFFF
0	0	300000-3FFFFFF	0	0	900000-9FFFFFF
0	0	380000-47FFFF	0	0	980000-07FFFF
0	0	400000-4FFFFFF	0	0	A00000-0FFFFFF
0	0	480000-57FFFF	0	0	A80000-B7FFFF
0	0	500000-5FFFFFF	0	0	B00000-BFFFFFF
0	0	580000-67FFFF	0	0	B80000-C7FFFF
0	0	600000-6FFFFFF	0	0	C00000-CFFFFFF
0	0	680000-77FFFF	0	0	C80000-D7FFFF
0	0		0	0	D00000-DFFFFFF

RA80/F: 512 KByte Memory, 64 Kbit chips, boundary 0.5 MByte



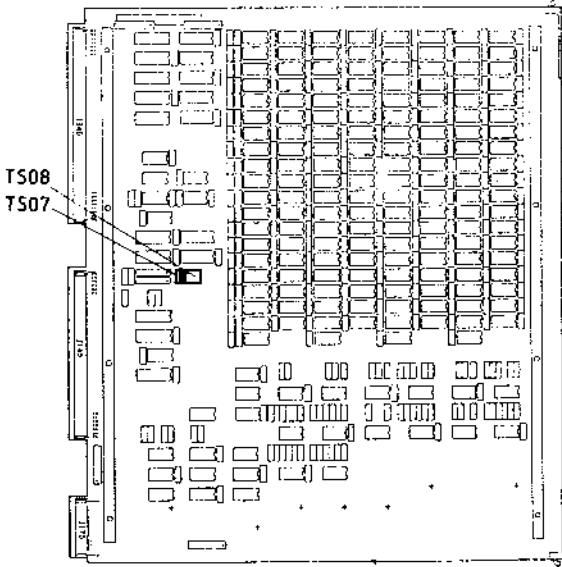
DIP-SWITCH TS09 in position R03

FUNCTION: Address setting

SETTING	ADDRESS FIELD (Hex)
8 7 6 5 4 3 2 1	
C C C C C O C	100000 - 17FFFF
C C C C C O O	180000 - 1FFFFF
C C C C C O C C	200000 - 27FFFF
C C C C C O C O	280000 - 2FFFFF
C C C C C O O C	300000 - 37FFFF
C C C C C O O O	380000 - 3FFFFF
C C C C O C C C	400000 - 47FFFF
C C C C O C C O	480000 - 4FFFFF
C C C C O C O C	500000 - 57FFFF
C C C C O C O O	580000 - 5FFFFF
C C C C O O C C	600000 - 67FFFF
C C C C O O C O	680000 - 6FFFFF

SETTING	ADDRESS FIELD (Hex)
8 7 6 5 4 3 2 1	
C C C C O O O C	700000 - 7FFFFF
C C C C O O O O	780000 - 87FFFF
C C C O C C C C	800000 - 8FFFFF
C C C O C C C O	880000 - 97FFFF
C C C O C C O C	900000 - 9FFFFF
C C C O C C O O	980000 - 07FFFF
C C C O C O C C	A00000 - AFFFFF
C C C O C O C O	A80000 - B7FFFF
C C C O C O O C	B00000 - BFFFFF
C C C O C O O O	B80000 - C7FFFF
C C C O O C C C	C00000 - CFFFFF
C C C O O C C O	C80000 - D7FFFF
C C C O O C O C	D00000 - DFFFFF

RA80/N: 4.0 MByte memory, 256 Kbit chips, boundary 2 MByte

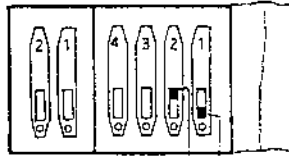


DIP-SWITCH TS07 in position R02
 DIP-SWITCH TS08 in position R03

FUNCTION: Address setting

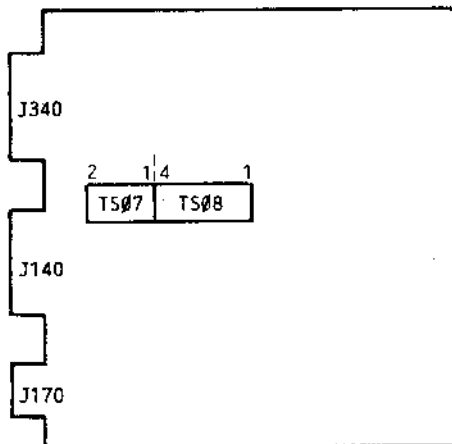
*30 RA80/N
 - initial
 - OFF*

SETTING		ADDRESS FIELD (Hex)
TS07	TS08	
2 1	4 3 2 1	
C 0	C C C 0	200000 - 5FFFFFF
0 0	C C 0 C	400000 - 7FFFFFF
C C	0 C 0 0	600000 - 9FFFFFF
0 C	0 0 C C	800000 - BFFFFFF
C 0	0 0 C 0	A00000 - DFFFFFF



C = CLOSED
 0 = OPEN

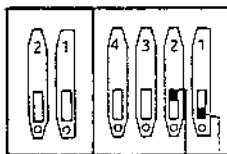
RA80/0: 3.0 MByte Memory, 256 Kbit chips, boundary 2 MByte



DIP-SWITCH TS07 in position R02
 DIP-SWITCH TS08 in position R03

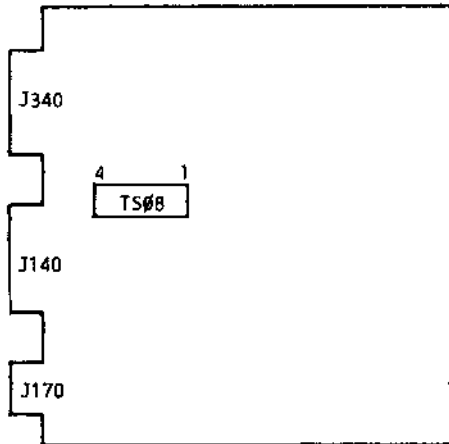
FUNCTION: Address setting

SETTING		ADDRESS FIELD (Hex)
TS07	TS08	
2 1	4 3 2 1	
C 0	C C C 0	200000 - 4FFFFFF
0 0	C C 0 C	400000 - 6FFFFFF
C C	0 C 0 0	600000 - 8FFFFFF
0 C	0 0 C C	800000 - AFFFFFF
C 0	0 0 C 0	A00000 - CFFFFFF



C = CLOSED
 0 = OPEN

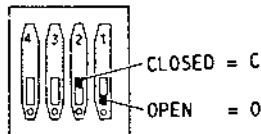
RA80/B: 2.0 MByte Memory, 256 Kbit chips, boundary 2 MByte



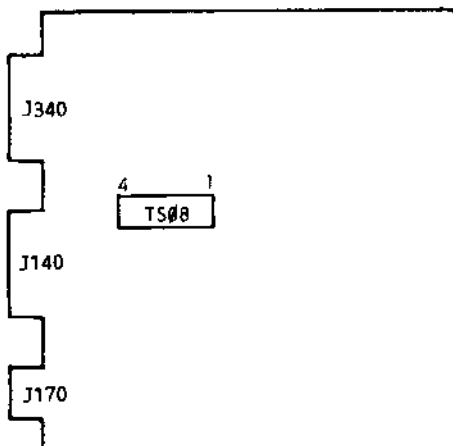
DIP-SWITCH TS08 in position R03

FUNCTION: Address setting

SETTING				ADDRESS FIELD (Hex)	
4	3	2	1		
C	C	C	0	200000	- 3FFFFFF
C	C	0	C	400000	- 5FFFFFF
C	C	0	0	600000	- 7FFFFFF
C	0	C	C	800000	- 9FFFFFF
C	0	C	0	A00000	- BFFFFFF
C	0	0	C	C00000	- DFFFFFF



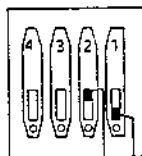
RA80/C: 1.0 MByte Memory, 256 Kbit chips, boundary 2 MByte



DIP-SWITCH TS08 in position R03

FUNCTION: Address setting

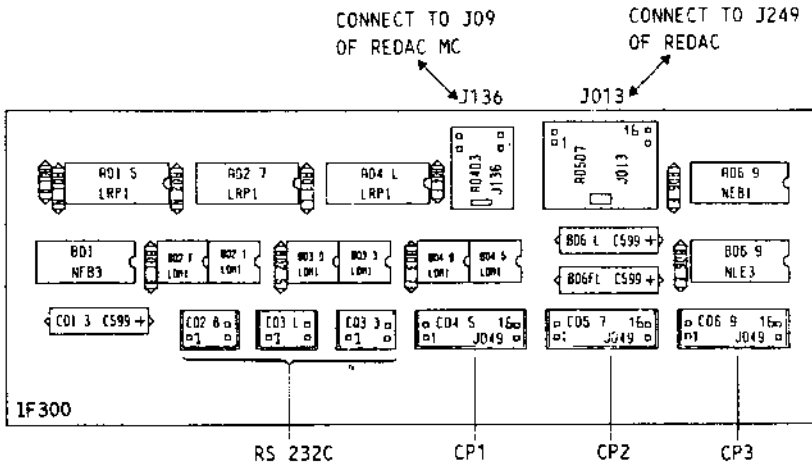
SETTING				ADDRESS FIELD (Hex)
4	3	2	1	
C	C	C	0	200000 - 2FFFFFF
C	C	0	C	400000 - 4FFFFFF
C	C	0	0	600000 - 6FFFFFF
C	0	C	C	800000 - 8FFFFFF
C	0	C	0	A00000 - AFFFFFF
C	0	0	C	C00000 - CFFFFFF



CLOSED = C
OPEN = 0

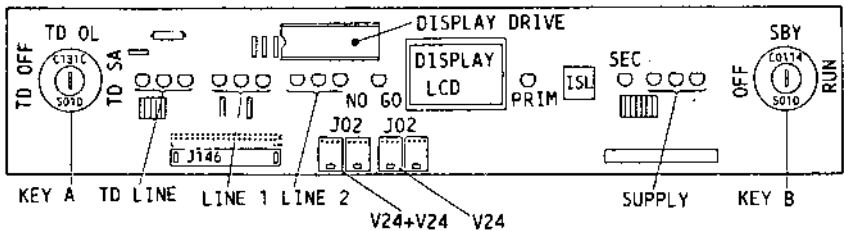
4.2.5 ADAPTER BOARD: 1F300

Not part of the board rack, this board provides the interface between the CPU boards in multiprocessor systems. Cables coming from the central unit boards (selection and RS232 cables) and the cables going to the REDAC board are connected to this board. Information regarding installation of this board will be found in section 2.6. A board picture and names of connectors will be seen in the figure below:



4.2.6 FRONT END CONSOLE: CAA96

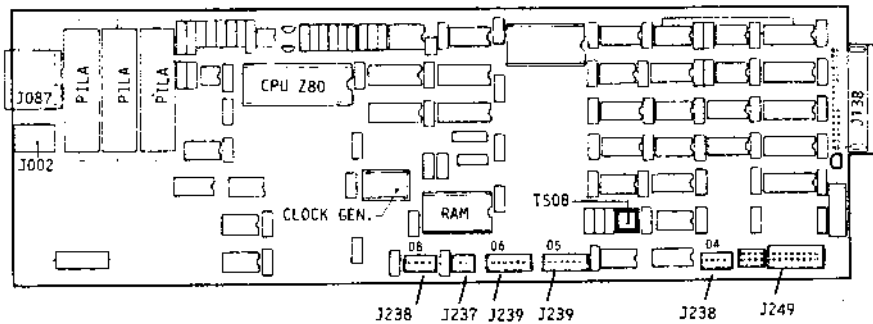
The drawing below represents the console board and its commands and controls.



N.B.:

- KEY A: remote diagnostic key, removable in all three positions
- KEY B: system switch-on key, removable in all three positions
- LINE 1: Three LEDs indicating line status
- LINE 2: Three LEDs indicating line status
- SUPPLY: Three LEDs indicating power supply unit status
- PRIM/SEC: Two LEDs indicating primary or secondary IPL channel
- DISPLAY: 4-digit liquid crystal display
- ISL: Monostable pushbutton for IPL channel selection
- J02: Four 4-way connectors for line connection
- J146: 20x2 way connector for connection to REDAC board

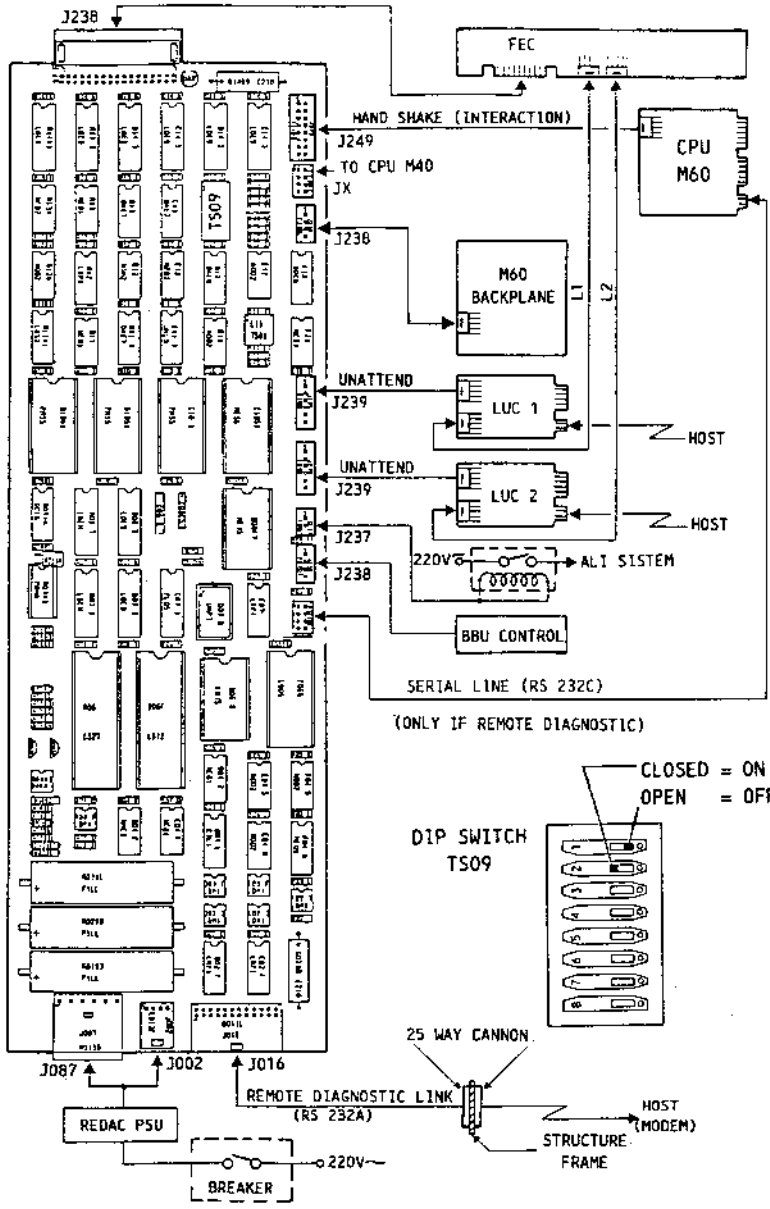
4.2.7 REDAC MR BOARD (console only): C0099



N.B.:

- 4.9152 MHz clock generator
- C-MOS RAM 2048x8
- DIP-switch TS08, not used
- J002 4-way connector: RESET, POWER FAILURE signals
- J087 6-way connector: +5V, +12V, -12V voltages
- J138 17x2-way connector to FEC (all console commands)
- J237 2-way connector: Signals for solid state relay
- J238 (08) 4-way connector for system BBU
- J238 (04) 4-way connector to Back panel: MARGA, POWER FAILURE, +5V
- J239 (05-06) 6-way connectors to line connectors
- J249 8x2-way connector to UCA40 board

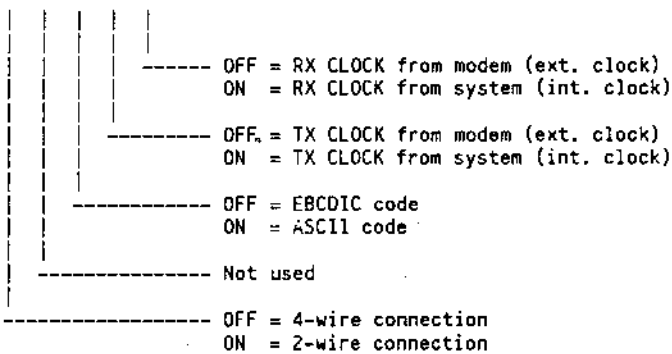
4.2.8 REDAC MC BOARD (console and remote diagnostic): C0099/A



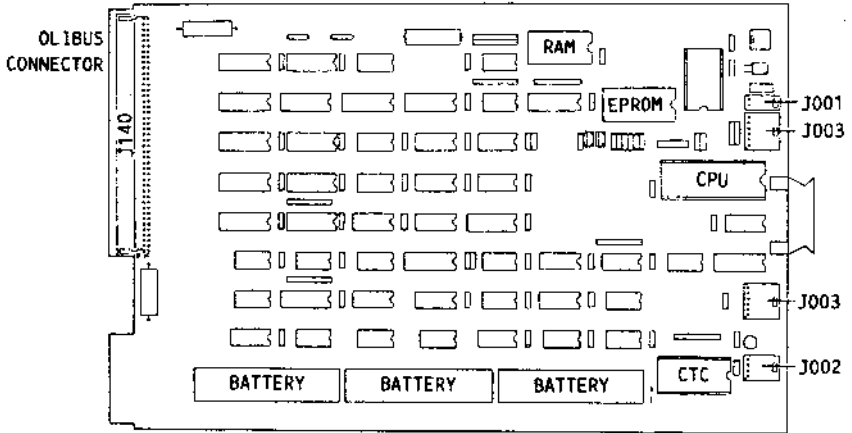
TS09 DIP-switch settings

SETTING			SPEED
5	3	1	
OFF	OFF	OFF	9600 baud
OFF	OFF	ON	4800 baud
OFF	ON	OFF	2400 baud
OFF	ON	ON	1200 baud
ON	OFF	OFF	600 baud
ON	OFF	ON	300 baud
ON	ON	ON	150 baud

SWITCH: 8 7 6 4 2



4.2.9 ENCRYPTION MODULE: G0257

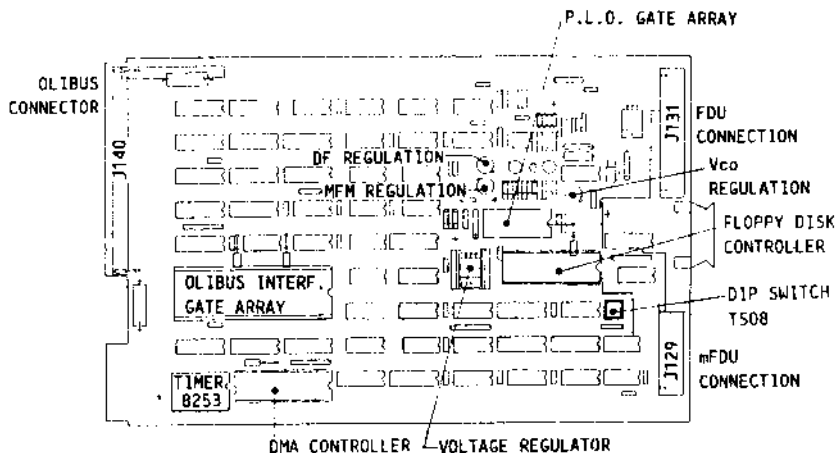


N.B.: - CPU Z80/A
- CTC Z80/A
- RAM 2Kx8
- EPROM 8Kx8

- J01: Connector for +5V power supply when ASD module connected
- J02: Customer safety jumper
- J03: Connector for line and ASD module

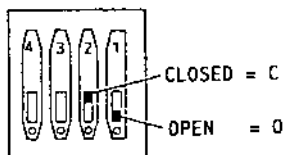
4.2.10 1 MB mFDU/FDU CONTROLLER: G0280/B-D

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 T508 (in board position G10).



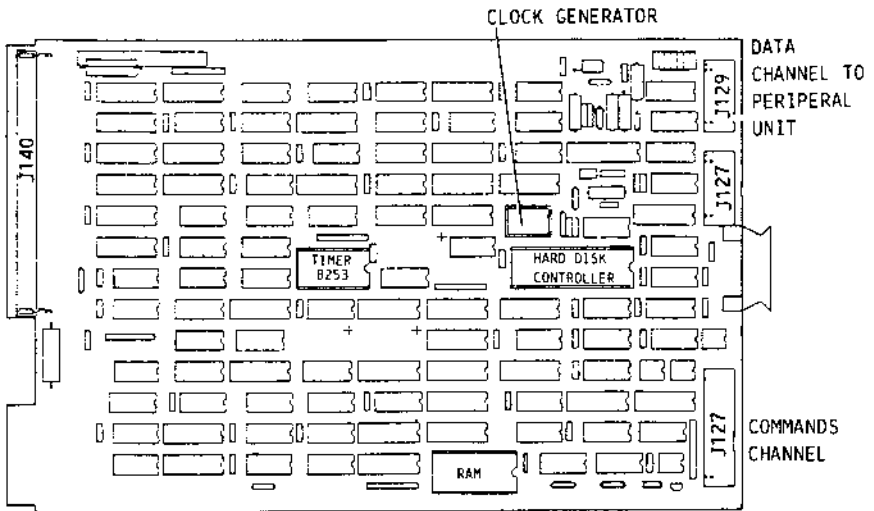
DIP-switch T508 jump connections

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



4.2.11 ST506 INTERFACE HDU CONTROLLER: 60363

Unlike other hard disk controllers, this is a single board controller. It can drive two peripheral units with ST506 interface. It requires no settings as it recognises the type of peripheral connected by reading the relative information on track 0 of the disk connected.

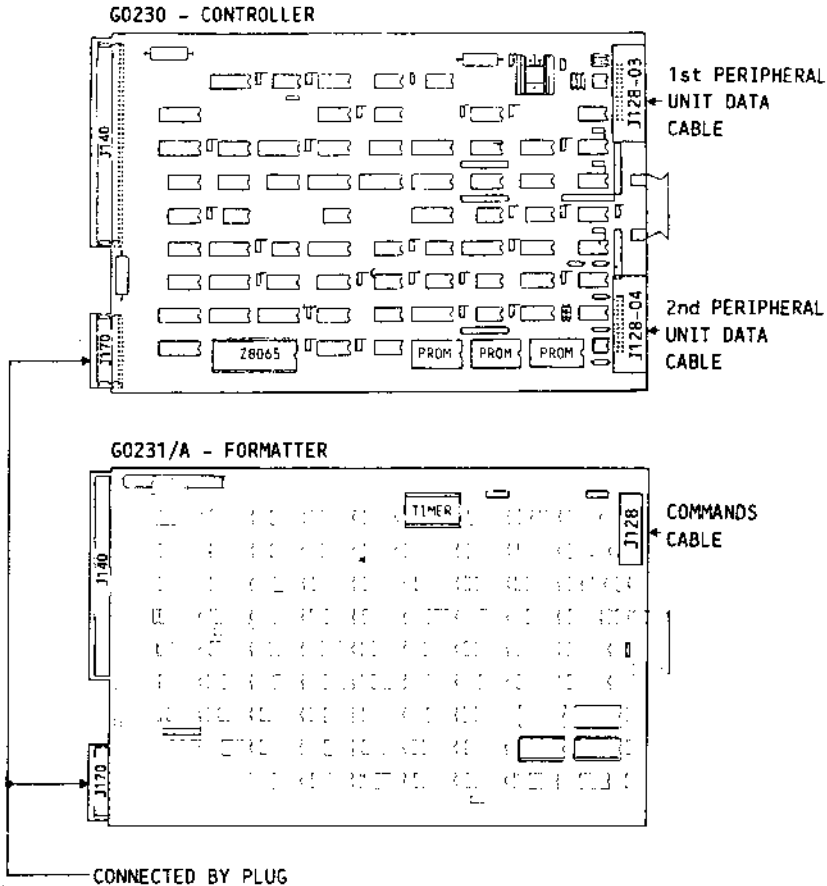


Characteristics:

- Hard disk controller PD 7261
- Programmable timer 8253
- C-MOS ROM 8Kx8
- Clock generator: 20 MHz quartz

4.2.12 18 MB HDU CONTROLLER: G0230 - G0231/0

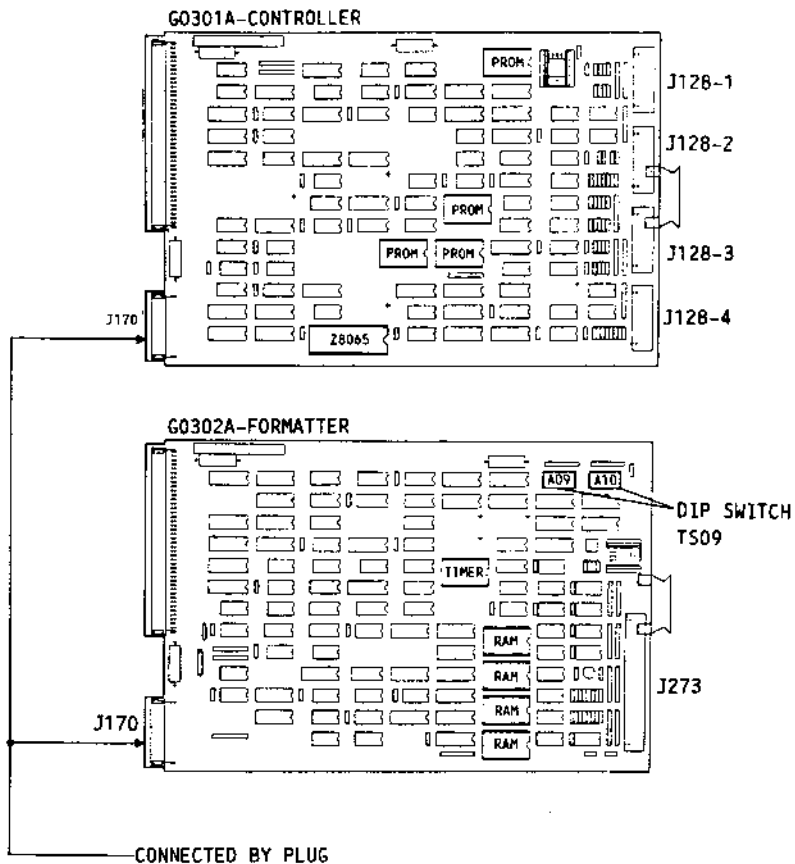
Diagram of interconnection between controller and XU 5010 peripherals



Characteristics:

- Z8065 component for ECC calculation
- TIMER 8253 to determine length of DMA transfers
- PROM to handle data/command channels to peripheral unit
- ROM for DMA data exchanges with OLIBUS and peripheral unit

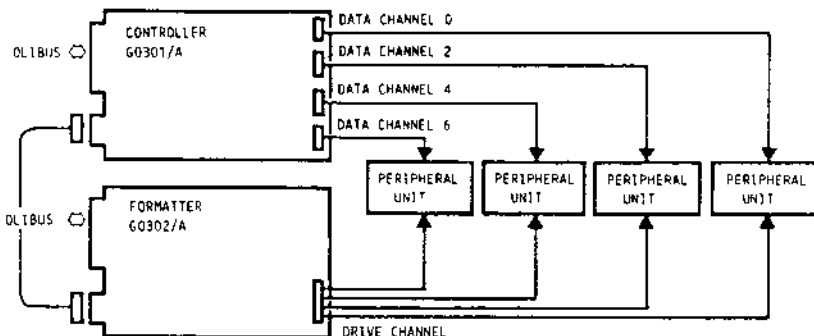
4.2.13 SMD INTERFACE HDU CONTROLLER: G0301/A - G0302/A



Characteristics:

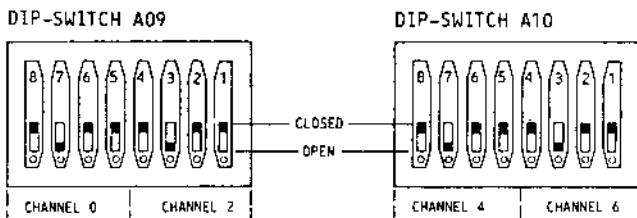
- Z8065 component for ECC calculation
- TIMER 8253 to determine length of DMA transfers
- Three PROMs to handle data channels and command channel to peripheral unit
- Four ROMs for DMA data exchanges with OLIBUS and peripheral unit

Diagram of interconnection between controller and XU 1700/1703



Setting DIP-switches A09 and A10 on board G0302/A

These two DIP-switches are used to identify the type of peripheral unit connected. In the example illustrated below, four 60 MB units are connected:

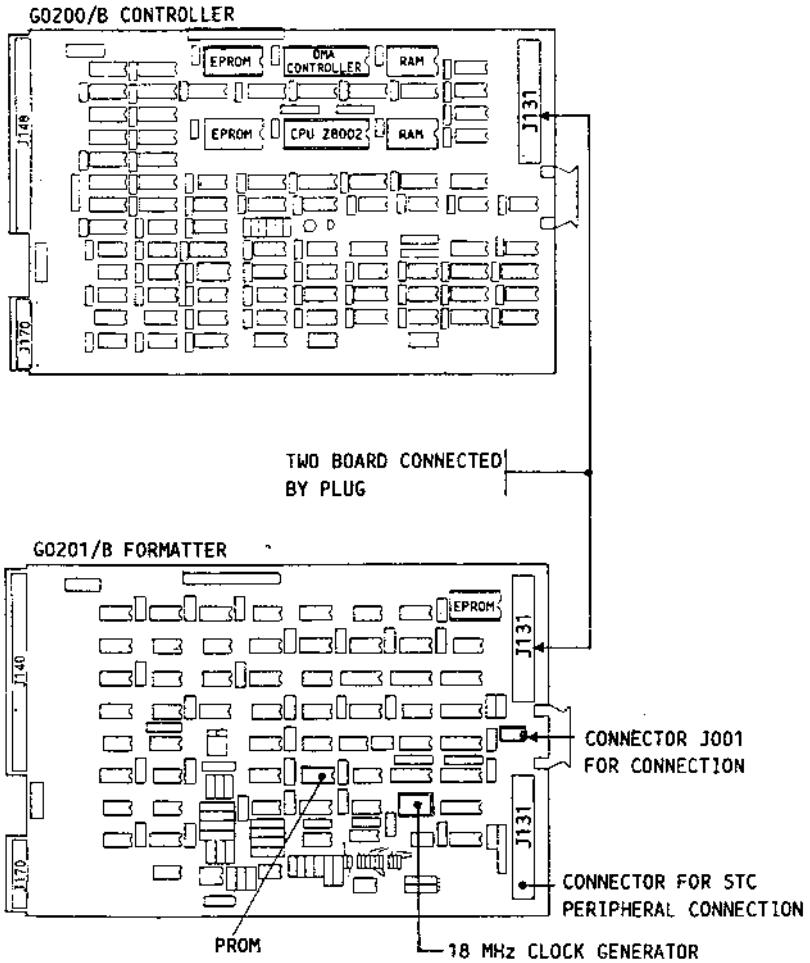


As a rule, the settings possible for each channel are as follows:

SETTING	SIGNIFICANCE
8 7 6 5 4 3 2 1	
C C C C	No peripheral connected
C 0 C C	60 MB HDU - no Dual-Port board
C 0 C 0	60 MB HDU with Dual-Port board
C 0 0 C	120 MB HDU - no Dual-Port board
C 0 0 0	120 MB HDU with Dual-Port board

4.2.14 20 MB STC CONTROLLER (DE1): G0200/B - G0201/B

Diagram of interconnection between controller and XU 1120 peripherals

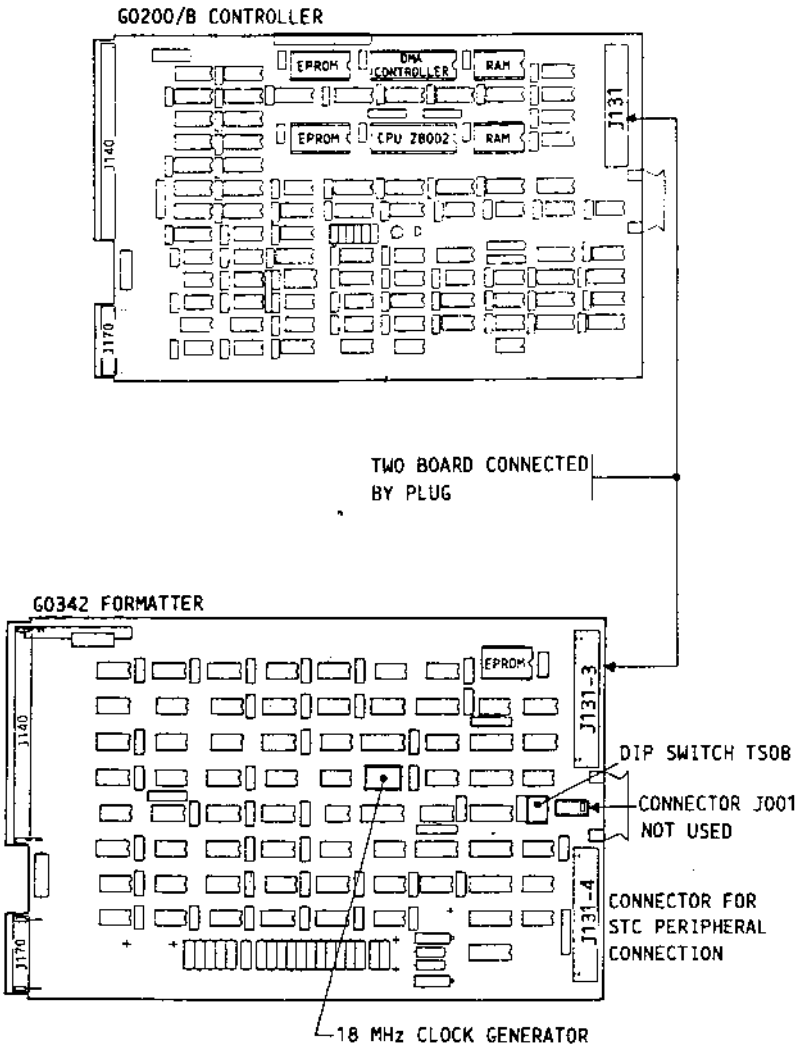


Characteristics:

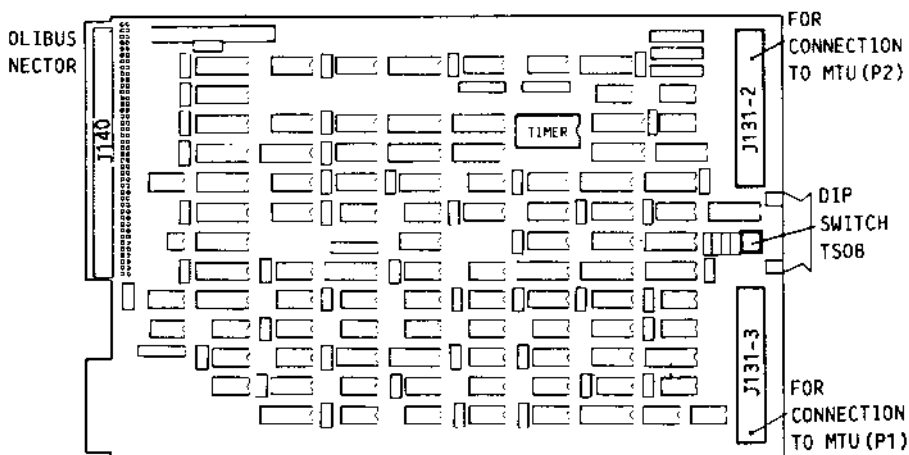
- Microprocessor Z8002
- 4 KB ROM
- DMA controller 9517

4.2.15 20 MB STC CONTROLLER (CIPHER): 60200/B - 60342

Diagram of interconnection between controller and XU 1130 peripherals



4.2.16 40 MB MTU CONTROLLER: 60278/B

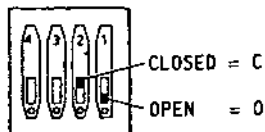


Characteristics:

- TIMER 8253 to determine length of DMA transfer
- FIFO buffer used in DMA data exchanges with OLIBUS and with peripheral
- Pertec industry standard interface

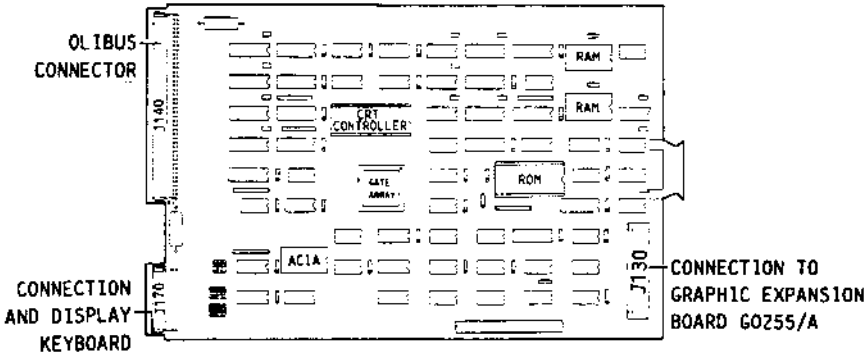
The DIP-switch mounted in position G10 is used in selection of the number of peripherals connected:

SETTING				SIGNIFICANCE
4	3	2	1	
C	C	C	C	No peripheral connected
C	C	C	0	First peripheral connected
C	C	0	C	Second peripheral connected
C	C	0	0	First and second peripherals connected



4.2.17 KEYBOARD/DISPLAY CONTROLLERS

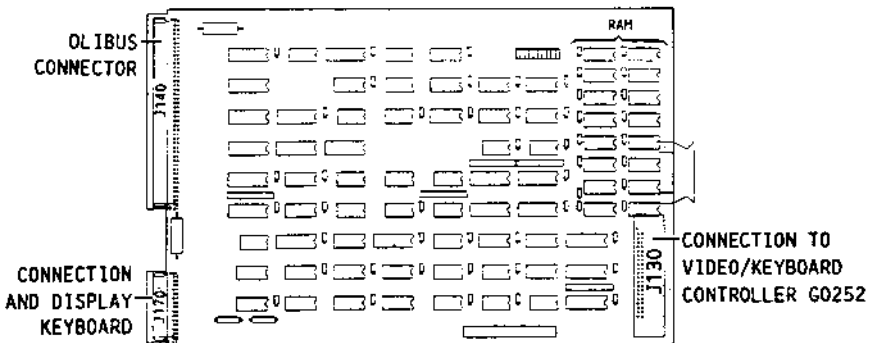
Trivalent display controller G0252



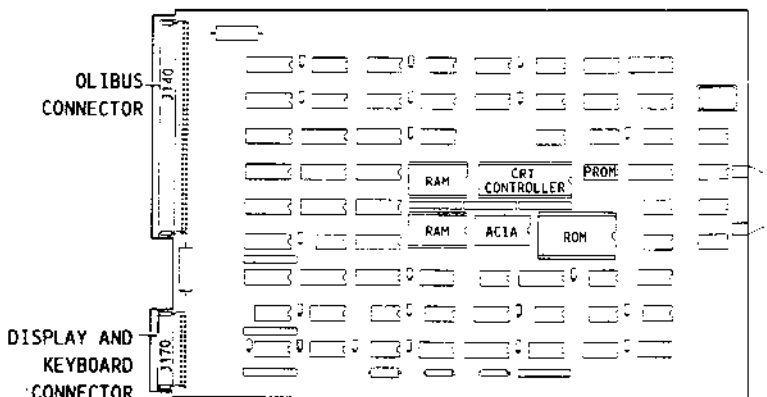
Characteristics:

- CRT controller 6845 to handle 5", 9" and 15" displays
- 8 KB Refresh RAM (data and attributes)
- 4 KB Character generator ROM
- Asynchronous serial interface for exchanges with keyboard or ELB 1381/1382 (for workstations at distances of 5 - 100 metres from system)
- Can be connected to monochrome graphic expansion
- Grid handling for G0252/A
- Conforms to UL/CS0 regulations as regards G0252/B.

Graphic display expansion module: G0255/A



Alphanumeric colour display: G0224



Characteristics:

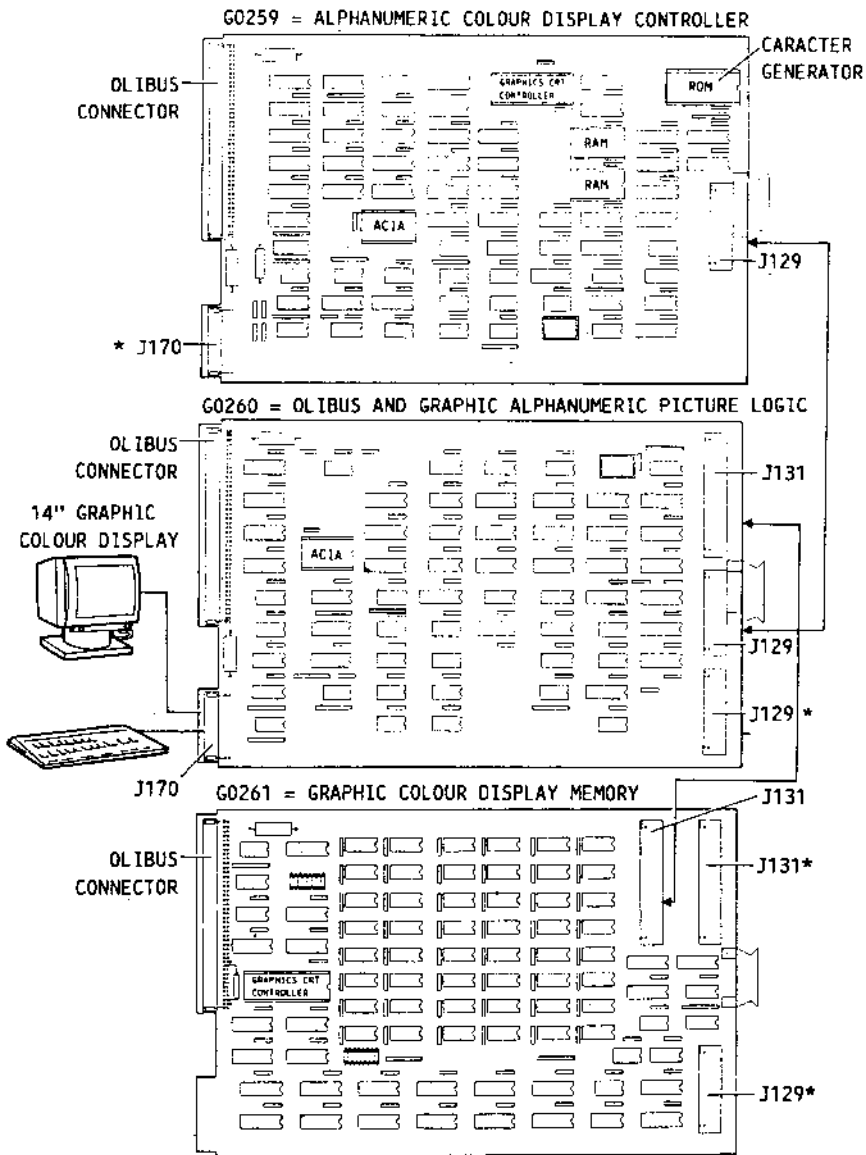
- 6845 CRT controller for 14" colour video
- 8 KB refresh RAM (data and attributes): addressed in memory segment FF0000 to FFFFFF.
- 4KB Character generator ROM
- Asynchronous serial interface for exchanges with keyboard and ELB 1381 or 1382

Graphic colour display controller: G0259/G0260/G0261

Characteristics

- Two NEC 7220 graphic display controllers: one on G0259 for the alphanumeric memory, the other on G0261 for the graphic memory
- Asynchronous serial interface for exchange with keyboard or with ELB 1381 or 1382.
- Character generator ROM

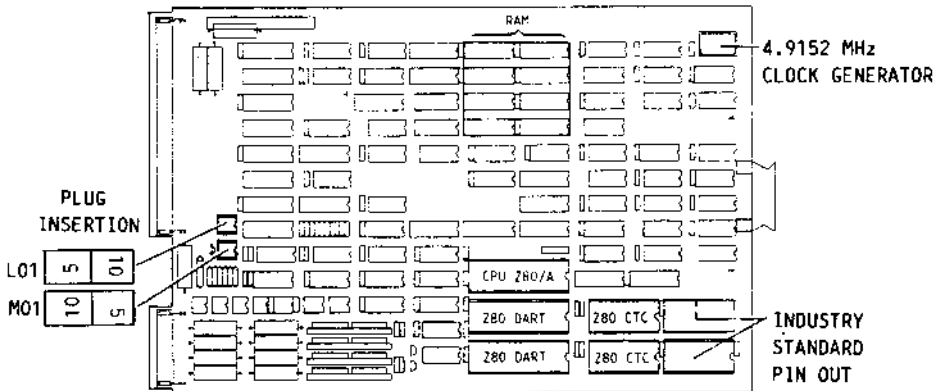
Picture showing boards and interconnections



(*): NOT USED

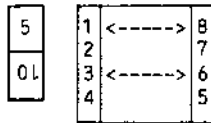
4.2.18 MULTIPLEXER CONTROLLER: G0322

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.

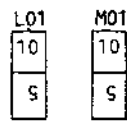
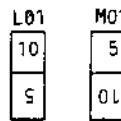
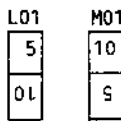
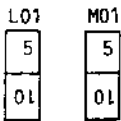
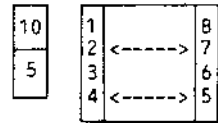


The G0322 jumper connections made by way of 5110 plugs and illustrated below must be taken into account in connecting peripherals or the ELB 3683 to the D-BOX:

Position 5
for RS 232
select



Position 10
for Current
Loop select



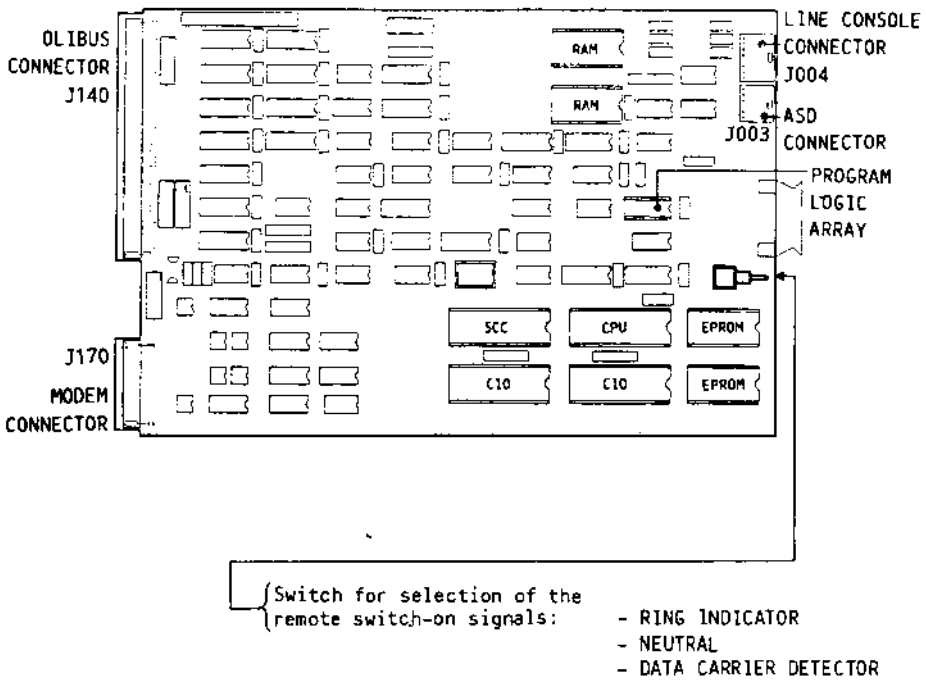
Channel 1 = RS 232
Channel 2 = C.L.
Channel 3 = RS 232
Channel 4 = C.L.

Channel 1 = RS 232
Channel 2 = C.L.
Channel 3 = C.L.
Channel 4 = C.L.

Channel 1 = C.L.
Channel 2 = C.L.
Channel 3 = RS 232
Channel 4 = C.L.

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

4.2.19 V24 + V24 INTELLIGENT LINE CONTROLLER: G0236

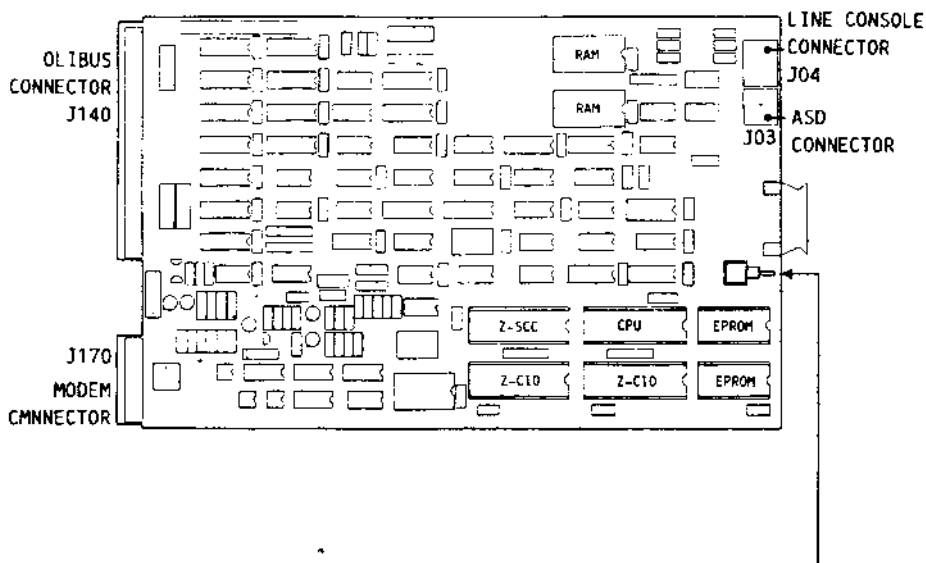


Connector J170 is connected to the modem.

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

4.2.20 V24 + LION 200 INTELLIGENT LINE CONTROLLER: G0256



Switch for selection of the remote switch-on signals:

- RING INDICATOR
- NEUTRAL
- DATA CARRIER DETECTOR

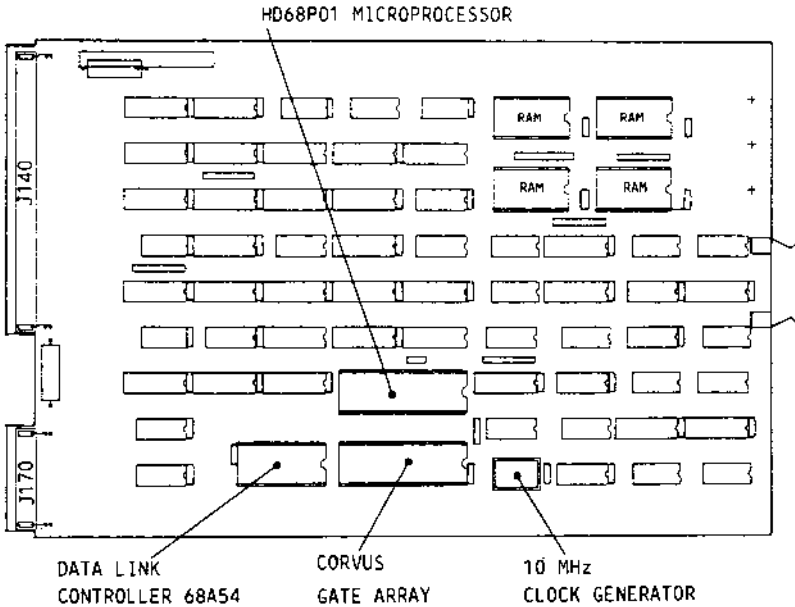
Connector J170 is connected to the modem.

Characteristics:

- Control for external (V24 channel) and internal (LION 200 channel) lines
- Z8002 microprocessor
- Self-diagnostic feature
- 32 KB ROM to handle the lines
- 16 KB RAM to exchange data and parameters
- Character oriented, SDLC and HDLC protocols.

N.B.: There are no major differences between the G0256 (V24 + Lion 200) and the G0340/A (V24 + Lion 9.6) line controllers; the above considerations are, therefore, valid for both.

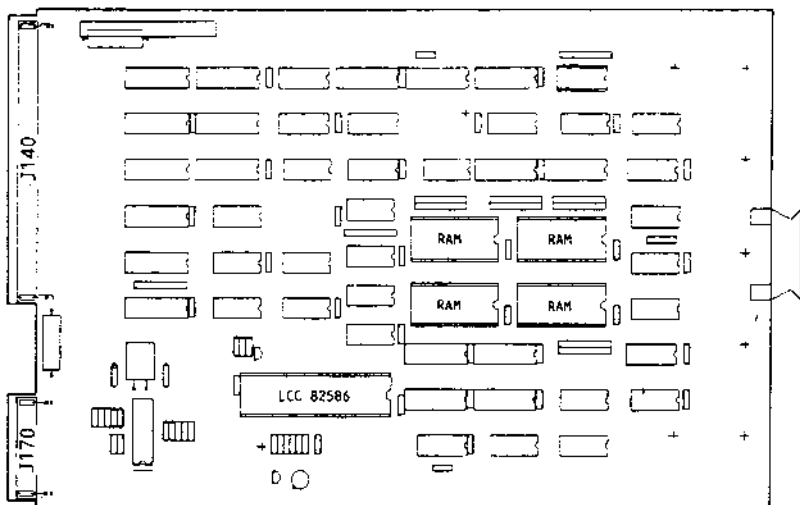
4.2.21 OMNINET LOCAL NETWORK CONTROLLER: G0308



Characteristics:

- CORVUS Omnet kit, consisting of:
 - . Microprocessor 68P01
 - . Line controller 68A54
 - . Gate array
- 8 KB Dual-Port memory
- Internal line protocol based on OMNINET specifications
- Transfer speed: 1M bps
- CSMA Channel control
- NRZI code

4.2.22 ETHERNET INTERNAL LINE CONTROLLER: 60212/A



Characteristics:

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

DIP-switch M09

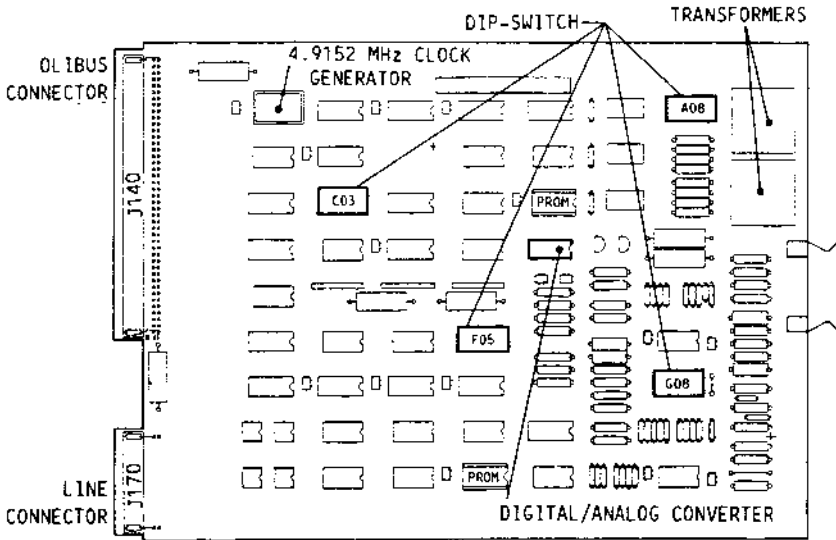
The second DIP-switch, in position M09, establishes whether or not the DCD is busy in RS232, and whether the current is direct or inverted in a Current Loop connection.

SETTING										SIGNIFICANCE
8	7	6	5	4	3	2	1			
X	X	X	X	-	-	X	C		Channel A DCD BUSY	
X	X	X	X	-	-	C	X		Channel B DCD BUSY	
X	X	X	0	-	-	X	X		RX Channel A direct	
X	X	0	X	-	-	X	X		TX Channel A direct	
X	0	X	X	-	-	X	X		RX Channel B direct	
0	X	X	X	-	-	X	X		TX Channel B direct	

↓ ↓
current RS232
loop

The third DIP-switch, in position A09/A10, is not used at the moment.

4.2.24 INTEGRATED MODEM MOIN 5.2: 1F192



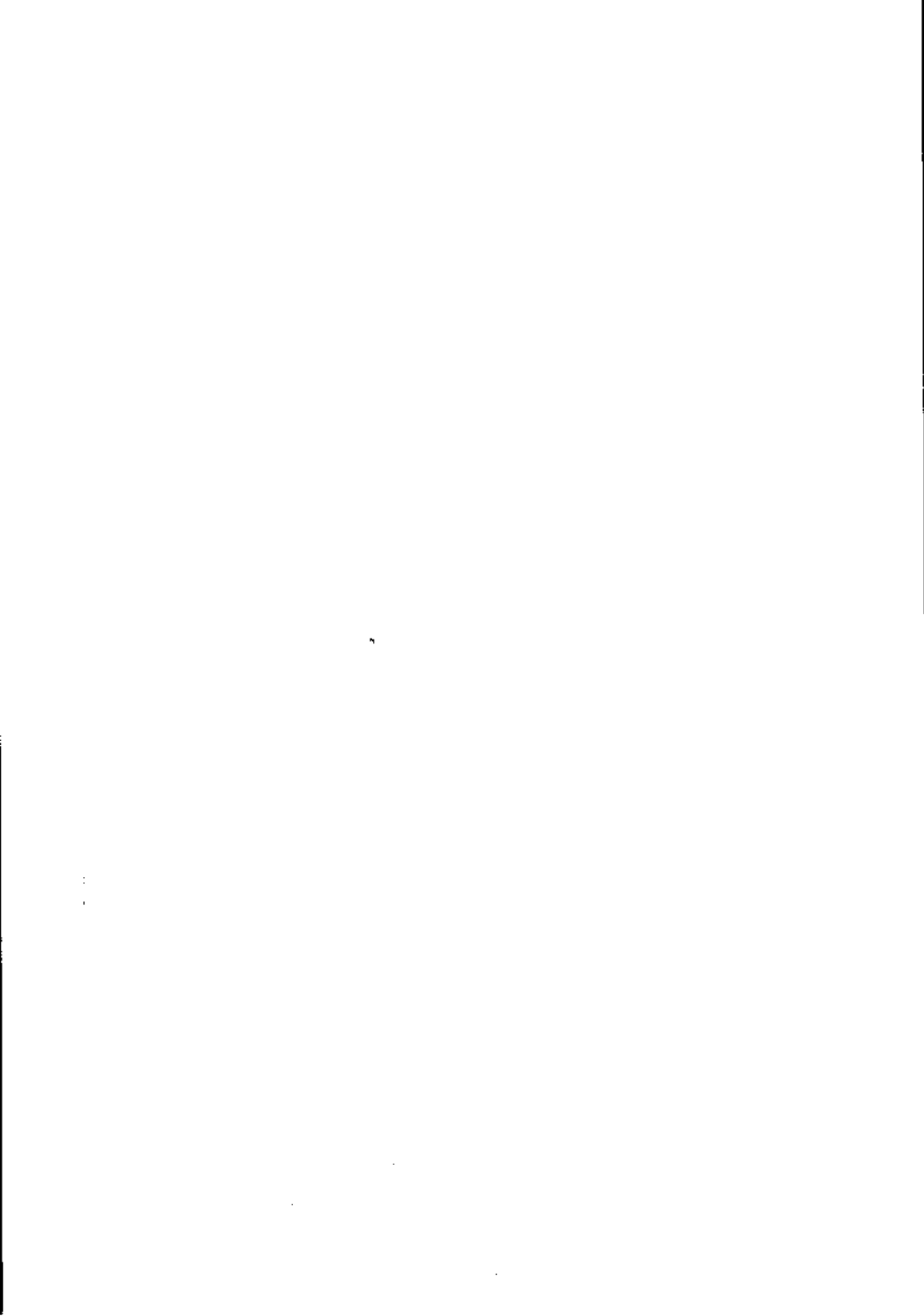
Characteristics:

- Synchronous transmission
- Differential and non-differential twin-phase modulation
- Half duplex or full duplex 4-wire operation
- Point-to-point, multi-point and ring configuration

DIP-switch A08

Sets line impedance value:

SETTING	SIGNIFICANCE
8 7 6 5 4 3 2 1	
C 0 C - - C C 0	150 ohm point-to-point
0 C C - - C 0 C	600 ohm point-to-point
C 0 0 - - 0 C 0	150 ohm multi-point
0 C 0 - - 0 0 C	600 ohm multi-point



5. MAGNETIC PERIPHERALS

5.1 PERIPHERALS CONNECTED

The table below gives a complete list of the peripherals that can be connected to M60 and M60/2/3 systems.

XU 4305: 1 MByte Minifloppy

ND-08DE: 1 MByte Slim Minifloppy (not available at the moment)

XG 6030: 1 MByte Floppy unit

XU 5010: 18 MByte HDU, OPE interface

XU 1709: 65 MByte HDU, ST506 interface

XU 1700: 60 MByte HDU, SMD interface

XU 1703: 120 MByte HDU, SMD interface

XU 1120: 20 MByte STC, DEI interface

XU 1130: 20 MByte STC, QIC36 interface

XU 1705: 40 MByte MTU, PERTEC interface

Modules to be integrated on the above units are:

- MAPSS board (G0306) for 18 MB HDU
- Dual-Port board (XU 1702) for 60/120 MB HDU

5.2 CONFIGURATION RESTRICTIONS AND LIMITATIONS

External cabinets which can be added to systems of the M60 family are as follows:

- 1 or 2 SB3 cabinets (CAB 3558)
- 1 SB2 cabinet
- 1 SB2 cabinet + 1 SB3 cabinet

External cabinets are fixed to the SB0 electronics cabinet, in such a position to allow easy cable passage; for further information, see chapter 2.

The SB3 cabinet houses a maximum of three peripherals from among 5 1/4" or 8" minifloppy units, STC, 18 MB or 65 MB HDU. Configurations with one 60/120 MB HDU plus a peripheral with removable medium or two 60/120 MB HD units are also possible.

It should be remembered that, apart from the 60/120 MB HDU which have their own power supply unit (XU 1701), the LA40 power supply unit is required for all other peripherals.

Apart from the tape unit for which it is specific, the SB2 cabinet can also house one or two 60/120 MB HD units.

Configuration limitations

- The maximum number of 5 and 1/4" and 8" minifloppy units permitted is two; the two types of unit cannot co-exist.
- The system can have only one STC.
- Systems cannot have both STC and MTU, as one unit would remain idle.
- There can be no co-existence between 18 MB HDU and 65 MB HDU.
- 18 MB and 65 MB HD units cannot co-exist with 60/120 MB HD units.

The maximum number of 60/120 MB HD units, in function of the cabinets available, is as follows:

- 1 SB3: 1 HDU + removable unit
- 2 SB3: 2 HDU + removable units
3 HDU + removable units
- 1 SB2: 2 HDU + MTU
- 1 SB3 + 1 SB2: 3 HDU + MTU
4 HDU + MTU

5.2.1 MAGNETIC PERIPHERAL CONFIGURATIONS IN SB3 AND SB2 CABINETS

The tables below illustrate magnetic peripheral configurations with upgrading possibilities.

PERIPHERALS IN SB3

CONFIG. NO.	18 MB HDU	60/120 MB HDU	65 MB HDU	1 MB FDU	1 MB ■FDU	20 MB STC	UPGRADING
1	1	0	0	0	0	0	2-5-6
2	1	0	0	0	0	1	6
3	0	1	0	0	0	0	4-7
4	0	1	0	0	0	1	None
5	2	0	0	0	0	0	6
6	2	0	0	0	0	1	None
7	0	2	0	0	0	0	None
8	0	0	0	0	0	1	2-4-6
9	0	0	0	0	1	0	11-13-16-17-19
10	0	0	0	1	0	0	12-14-15-18-20
11	0	0	0	0	2	0	None
12	0	0	0	2	0	0	None
13	0	0	0	0	1	1	9
14	0	0	0	1	0	1	18
15	1	0	0	1	0	0	20
16	1	0	0	0	1	0	19
17	1	0	0	0	1	1	None
18	1	0	0	1	0	1	None
19	2	0	0	0	1	0	None
20	2	0	0	1	0	0	None
21	0	1	0	0	1	0	None
22	0	1	0	0	0	0	None
23	0	0	1	0	0	1	24
24	0	0	2	0	0	1	None
25	0	0	2	0	0	0	None
26	0	0	1	0	1	1	None
27	0	0	1	0	0	0	25
28	0	0	1	0	1	0	None

PERIPHERALS IN SB2

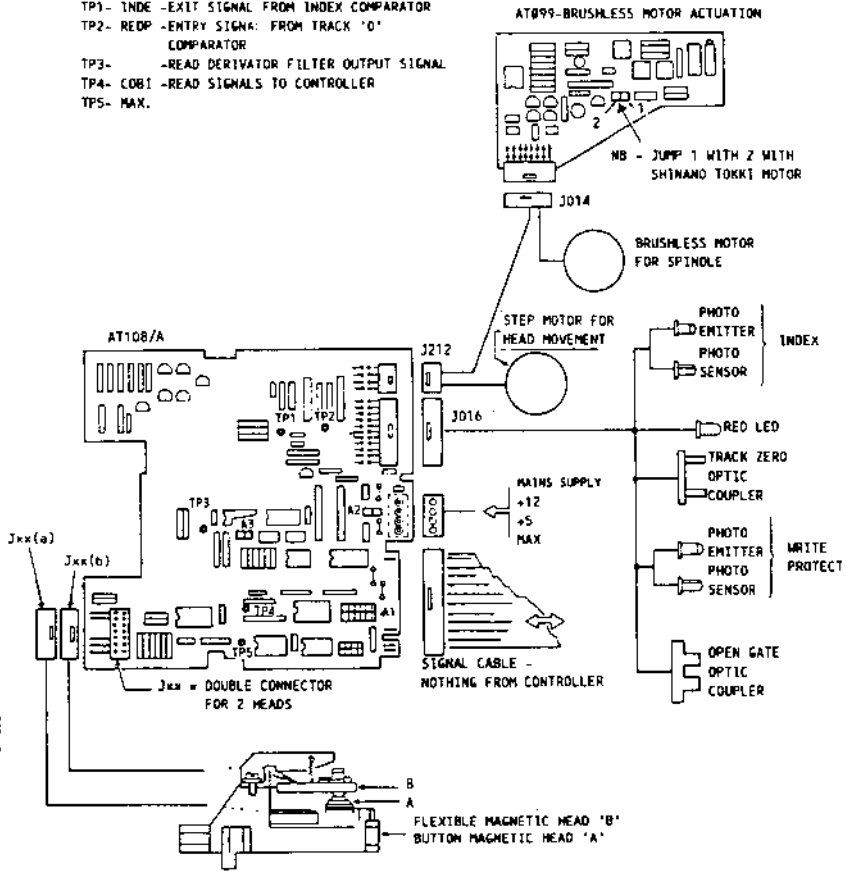
CONFIG. NO.	40 MB MTU	60 MB HDU	120 MB HDU	UPGRADING
1	1	0	0	2-3-4-5-6
2	1	1	0	3-6
3	1	2	0	None
4	1	0	1	5-6
5	1	0	2	None
6	1	1	1	None

5.2.2 1 MB MINIFLOPPY DISK UNIT: XU 4305

XU 4305 Drive boards - AT108/A and AT099/A

MEANING OF TP ON AT108/A BOARD

- TP1- INDE -EXIT SIGNAL FROM INDEX COMPARATOR
- TP2- REDP -ENTRY SIGNAL: FROM TRACK '0' COMPARATOR
- TP3- -READ DERIVATOR FILTER OUTPUT SIGNAL
- TP4- COBI -READ SIGNALS TO CONTROLLER
- TP5- MAX.



N.B. Jxx(a) red connector to be mounted on the board at the bottom.

Fig. 5-1 XU4305 unit drive boards

5.2.3 1 MB FLOPPY DISK UNIT: XG 6030

The XG 6030 unit connection cables are illustrated in the figure below. Ensure that the unit power cable and the signal cables are correctly connected.

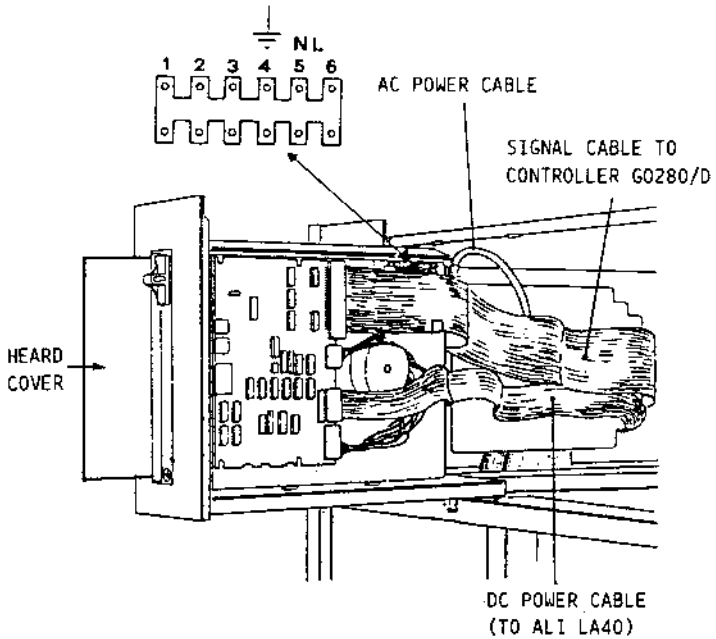


Fig. 5-2 XG 6030 Drive

5.2.4 18 MB HARD DISK UNIT: XU 5010

The XU 5010 peripherals are always connected to their controller boards (G0230 and G0231/A) via a MAPSS board (G0306). The figure below is a diagram illustrating how they are interconnected.

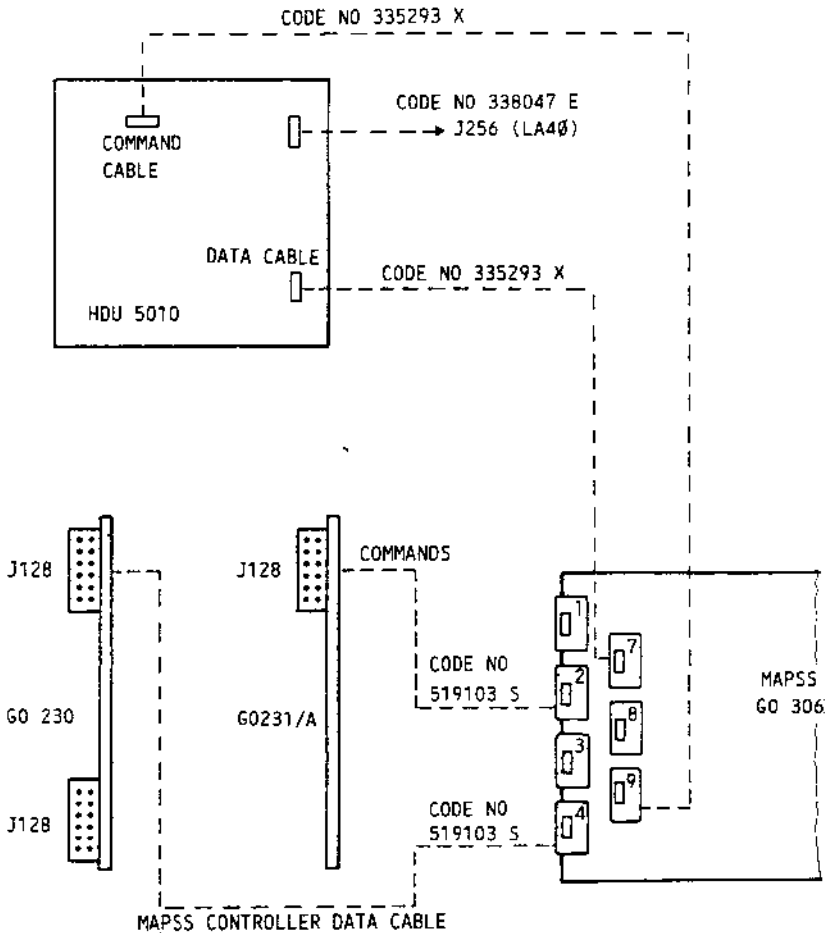
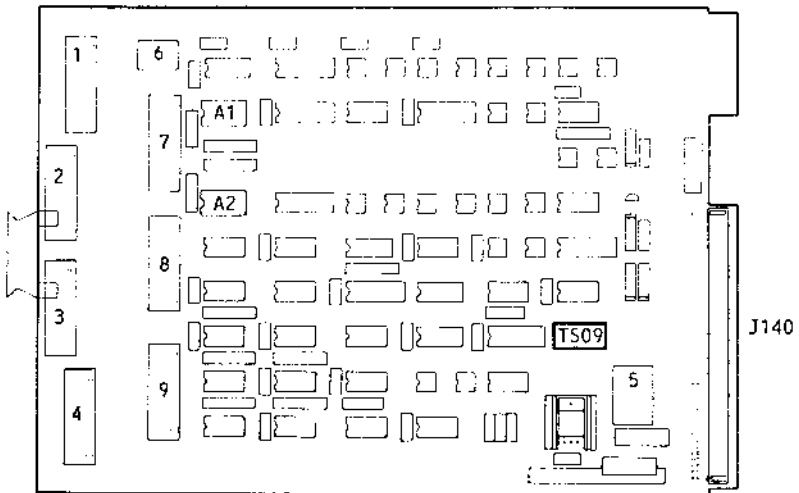


Fig. 5-3 Diagram of interconnection between XU 5010, controller and MAPSS

MAP55 BOARD G0306: board picture and DIP-switches



- N.B.:
- | | |
|-----------------------------|------------------------------------|
| 1 = Command cable channel 2 | 6 = Connector for switch |
| 2 = Command cable channel 1 | 7 = Peripheral channel cable |
| 3 = Data cable channel 2 | 8 = Peripheral 2 (or 3) data cable |
| 4 = Data cable channel 1 | 9 = Peripheral 4 (or 1) data cable |
| 5 = Power supply connector | A1-A2 = Terminators |

Fig. 5-4 G0306 board picture

DIP-switch TS09: used to select cables of different lengths or to limit selection made with the key.

1	2	3	4	DATA CHANNEL CABLE LENGTH	INTERVAL
C	0	0	0	0 - 3 metres	20 ns
0	C	0	0	3 - 6 metres	40 ns
0	0	C	0	6 - 9 metres	60 ns

5	6	7	8	KEY FUNCTION
0	0	C	0	Enable with key at all times
0	0	0	C	Enable only with machine off

Locking/unlocking XU 5010 peripheral unit heads

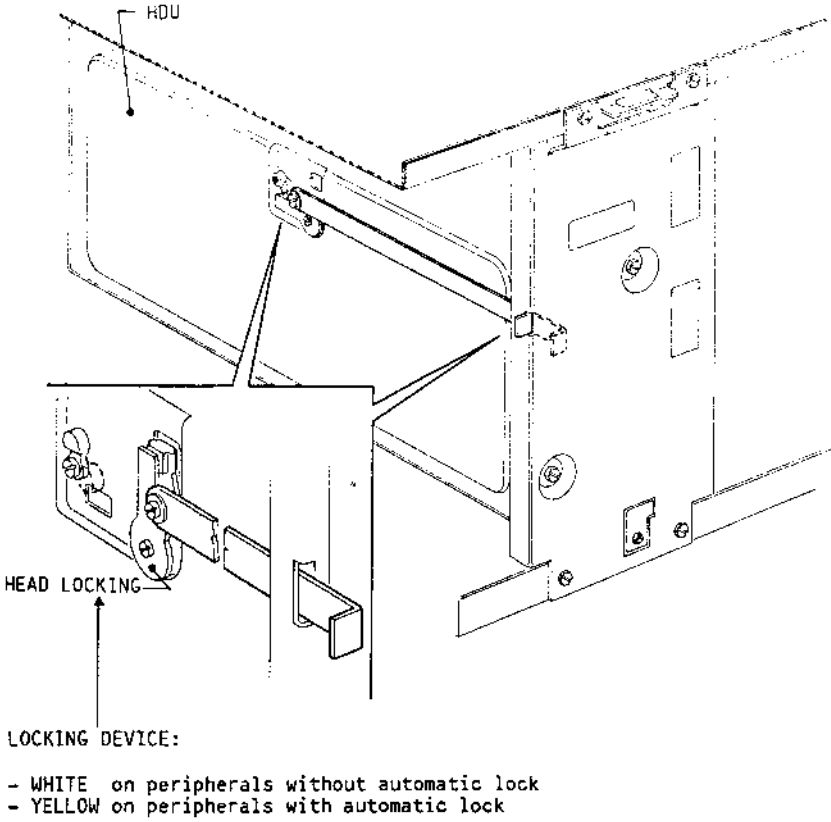


Fig. 5-5 XU 5010 head lock device

5.2.5 65 MB HARD DISK UNIT: XU 1709

This unit is mounted upright with the LED facing upwards to grant correct operation of the head arm return mechanism.

N.B.: The head lock device is automatic.

As the LA40 unit on the SB3 cannot supply the + 12V voltage required by this unit, a DC/DC converter must be fitted.

This device, the XU 1708, converts the + 24V voltage supplied by the LA40 into a + 12 V output voltage.

DC/DC Converter board installation

The board has two cables which are to be connected as follows:

- LA40 power supply unit (8-way cable)
- Peripheral unit (4-way cable)

The board must be mounted at the rear of the peripheral unit housing, as illustrated in the figure below:

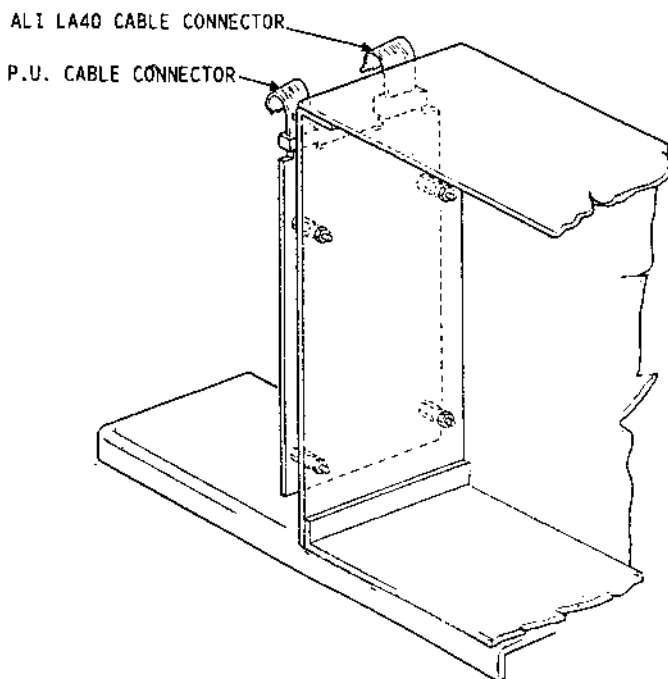


Fig. 5-6 Converter board assembly

XU 1709 installation in SB3

With reference to figures 5-7/8/9, perform the following operations:

- Secure the HD unit to the support bar with the two screws A
- Using 6 screws, fix support and unit to the structure (4 screws B for the support and two screws C for the peripheral)
- Secure to slide using two screws D
- Fix the ground spring support bar to the front of the lower guide and insert spring
- Secure the lower guide to the cabinet frame, using the 4 screws marked E in the figure
- Mount the DC/DC converter board on the rear of the unit using the four columns and screws as shown in the previous figure
- Screw the rubber pad support bar to the SB3 frame; this bar eliminates oscillation at the rear of the peripheral
- Connect as described below:

4-way cable from DC/DC converter to peripheral XU 1709

8-way cable from DC/DC converter to LA40 power supply unit

20-way data cable and 34-way command cable to peripheral XU 1709

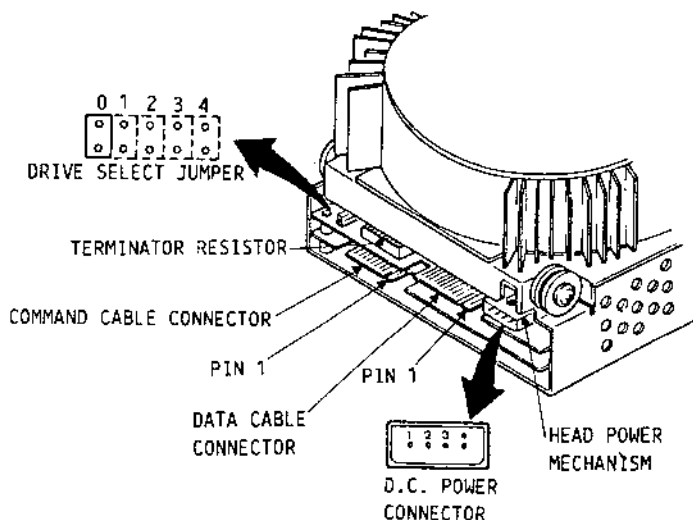


Fig. 5-7 Peripheral unit XU 1709 - rear view

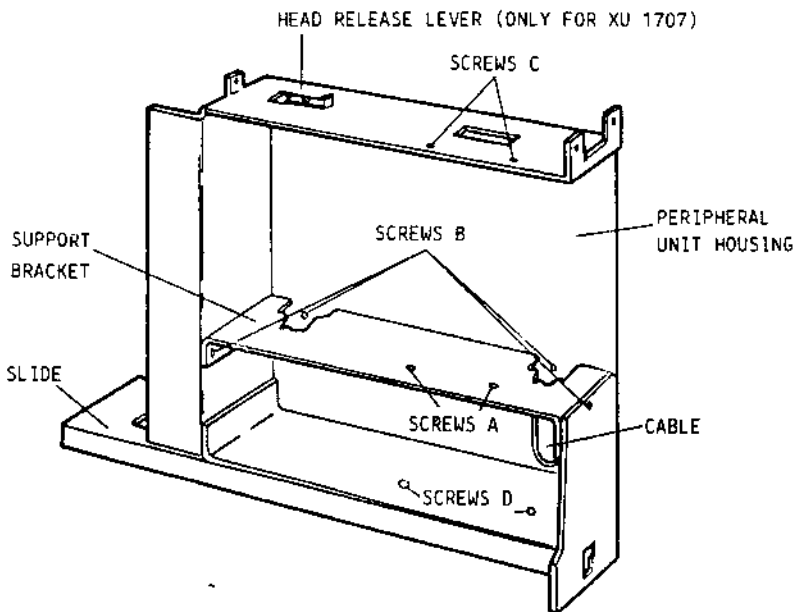


Fig. 5-8 Installation of peripheral XU 1709 in SB3

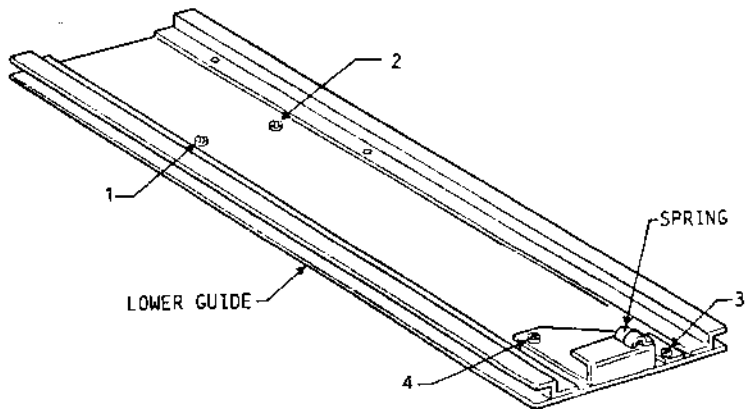


Fig. 5-9 Lower guide assembly

5.2.6 60/120 MB HARD DISK UNIT: XU 1700/1703

When installing the unit, unscrew screws A, B and C (see figure below) and remove the yellow coloured rods. Then tighten above screws again. Remove yellow coloured screws D from rear of unit.

It should be remembered that this type of peripheral has its own power supply unit, the XU 1701.

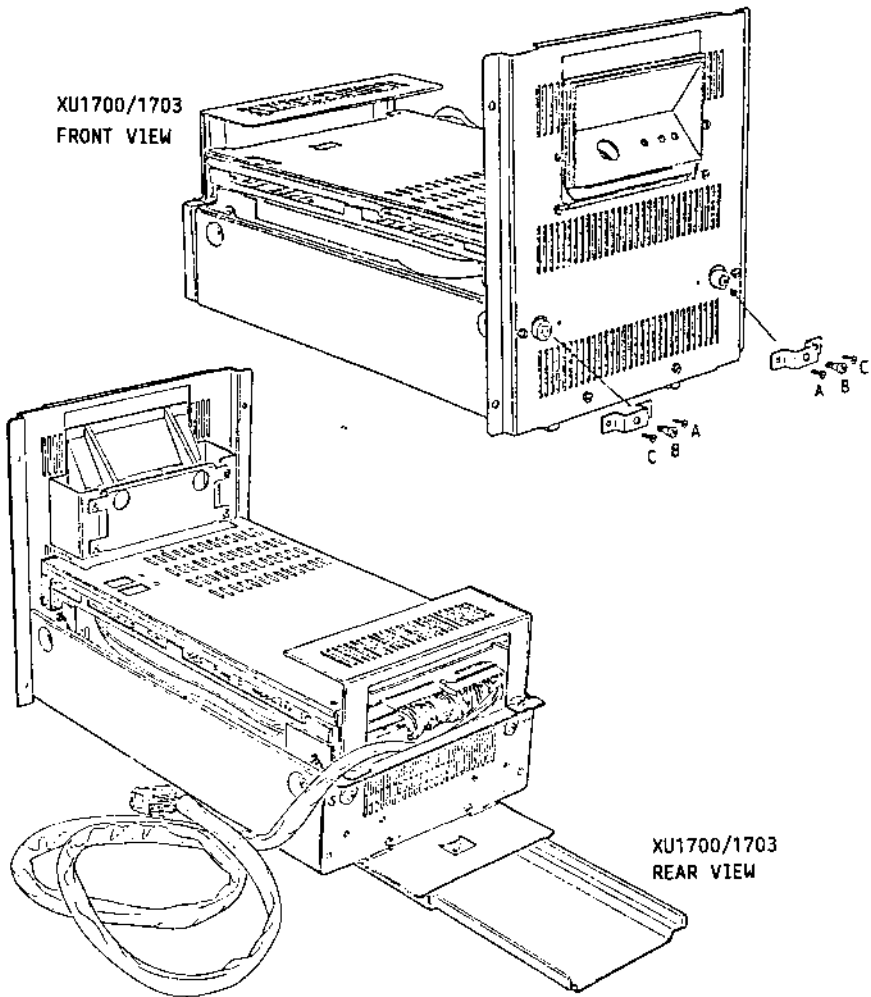


Fig. 5-10 XU 1700/1703 - front and rear views

If installing an XU1700 (60MB HD), the heads must be unlocked by turning the knob clockwise to the OFF position, using a screwdriver, before the unit is inserted in its housing.

N.B.: It must be emphasised that, with the XU 1703 (120 MB HD, the heads are unlocked automatically when the unit is powered.

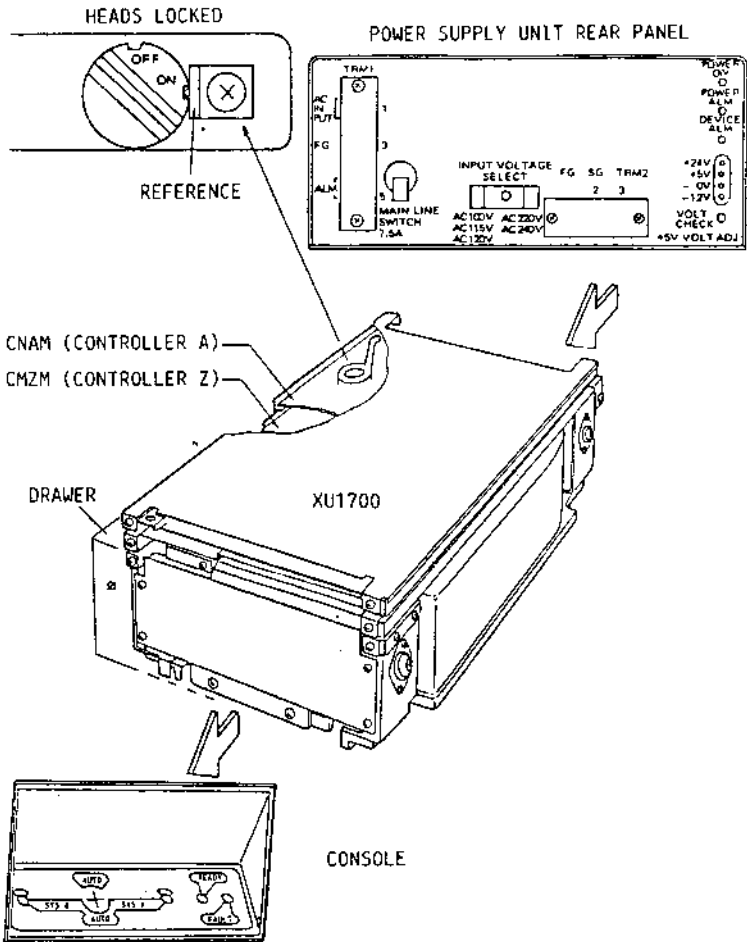


Fig. 5-11 XU 1700 - head locking system

Connection between controller and peripheral units

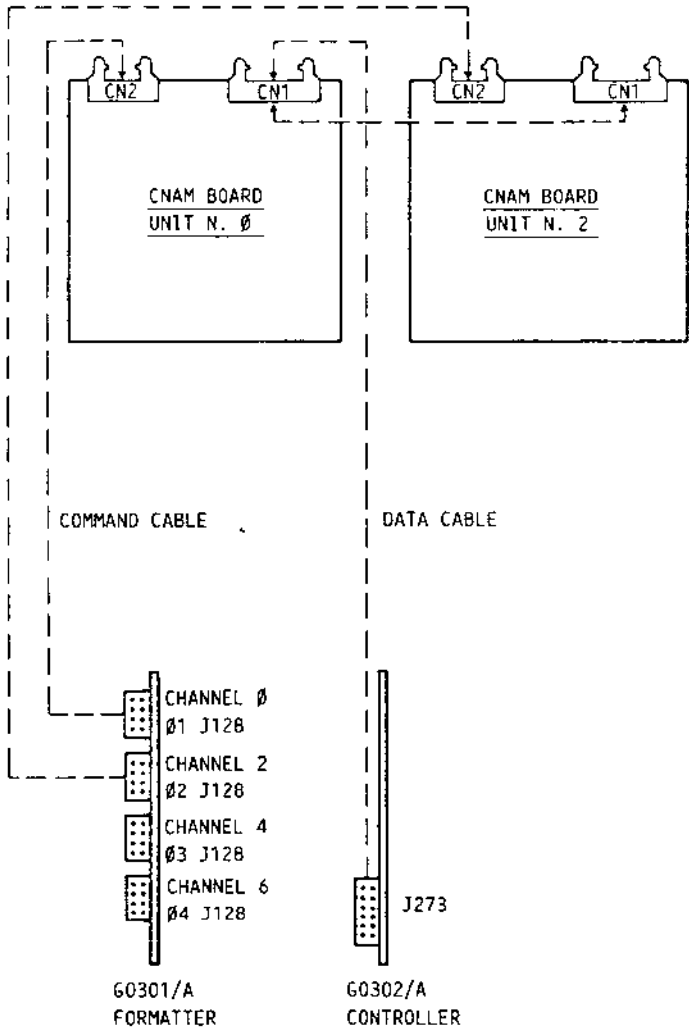


Fig. 5-12 Diagram of interconnection between HD controller and XU1700 unit

CNAM Board settings

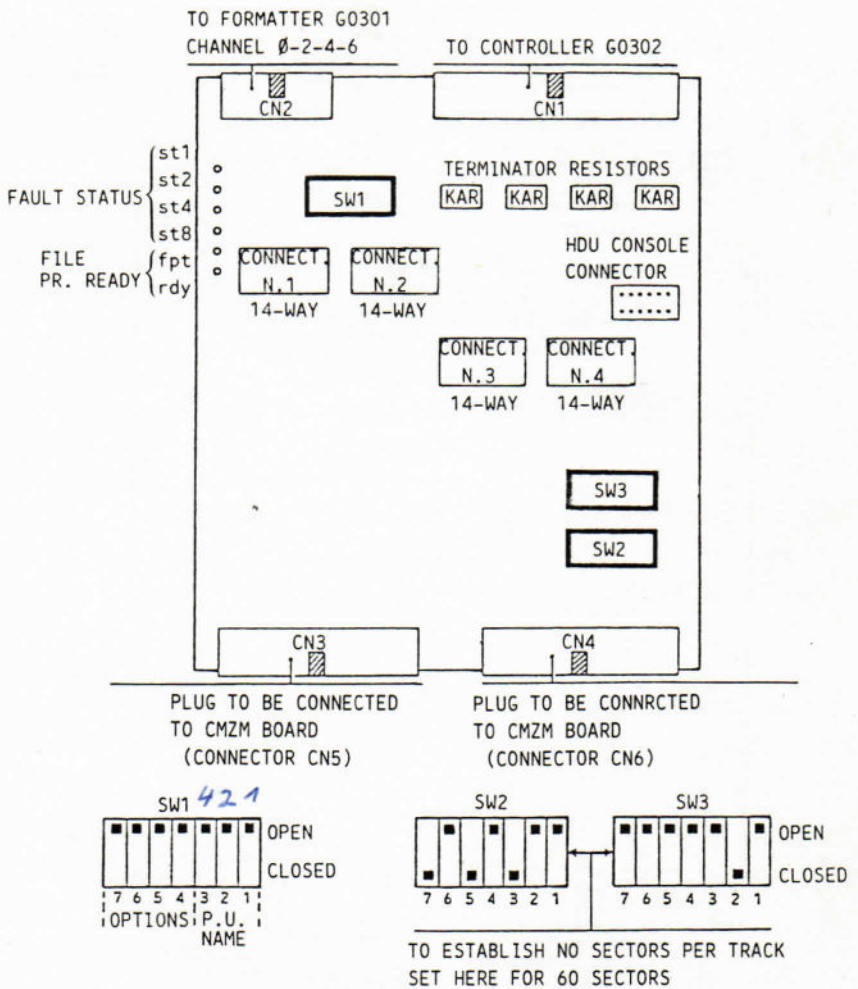


Fig. 5-13 Diagram of CNAM board and settings

CMZM board settings

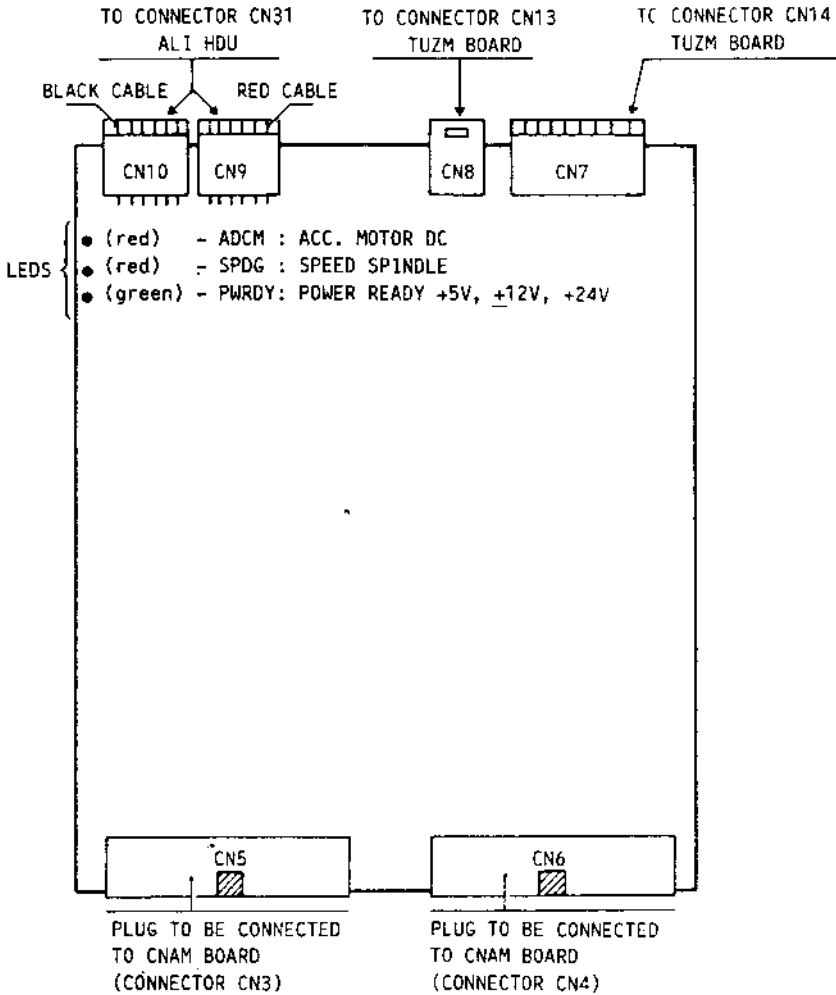
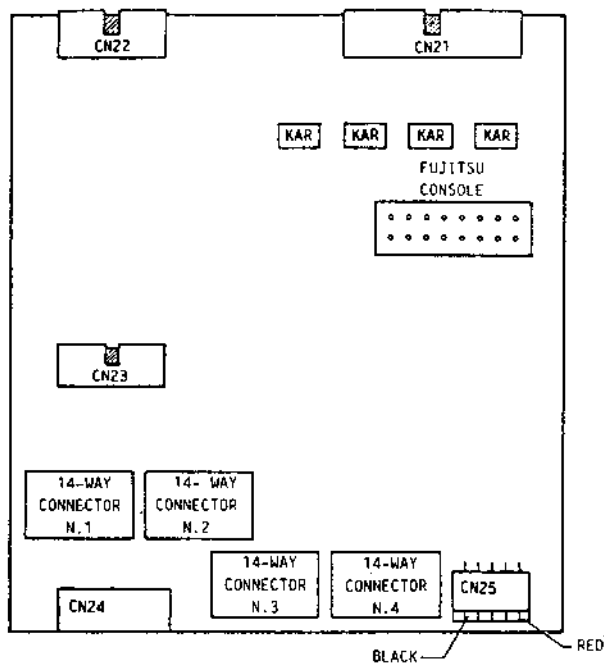


Fig. 5-14 Diagram of CMZM board and settings

5.2.7 DUAL-PORT BOARD: XU 1702

This module is used to allow a 60/120 MB HD unit to be shared by two systems. The diagram below illustrates this principle.



KEY TO SYMBOLS USED:

CN21 = Connector for system B commands channel

CN22 = Connector for system B data channel

CN23 = Connector for system A data channel

CN24 = Connector to be connected to CN2 of CNAM board

CN25 = Power connector to be connected to CN33 of power supply unit XU 1701

14-way The 14-way connectors are connected to their equivalents on the CNAM board

KAR = The name KAR denotes terminator resistors.

Fig. 5-15 Dual-Port board

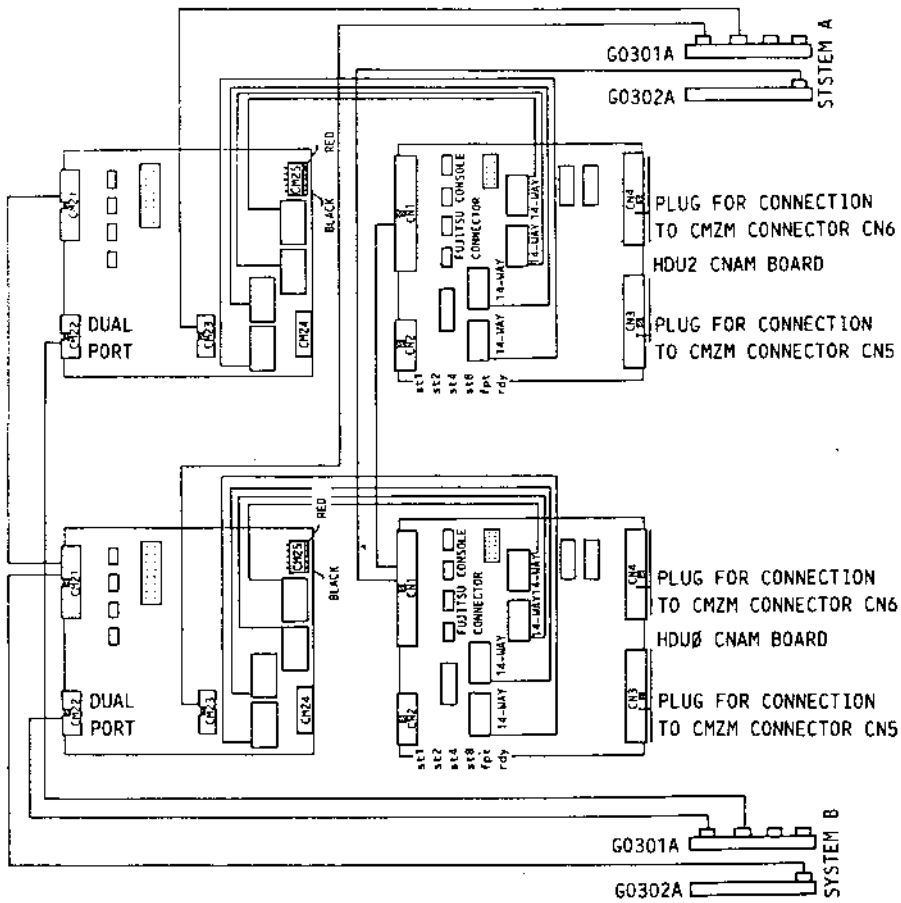


Fig. 5-16 Diagram of connection of a HDU to two systems

N.B.: The CNAM and DUAL-PORT boards will be seen in greater detail in figures 5-13 and 5-15.

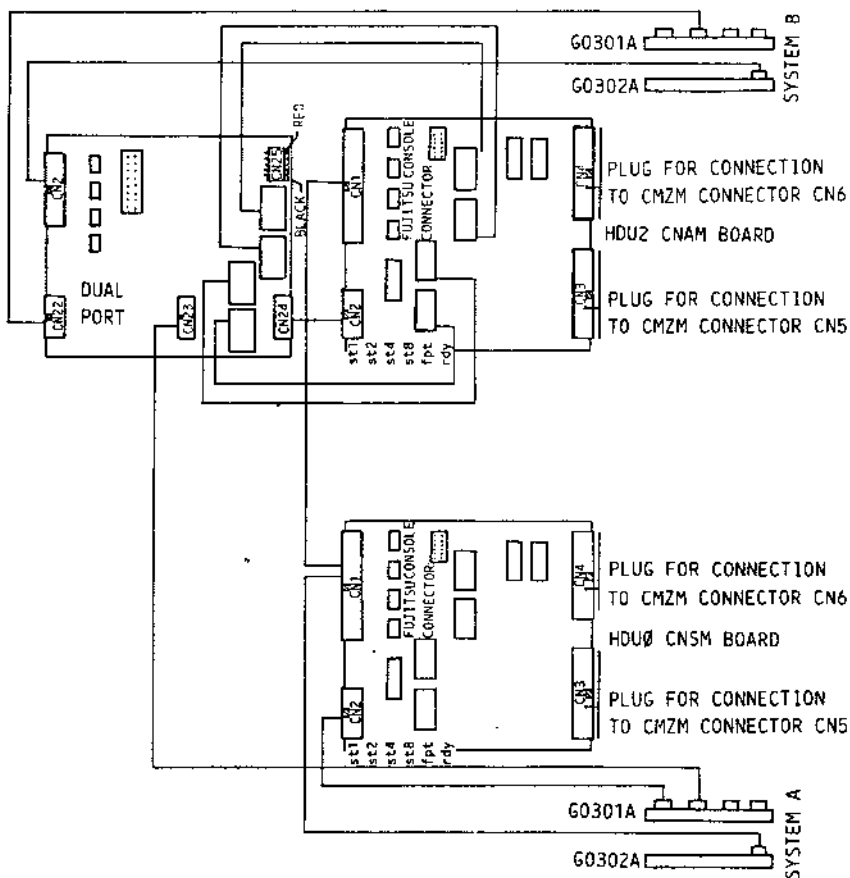


Fig. 5-17 Diagram of connection of two HDUs to two systems

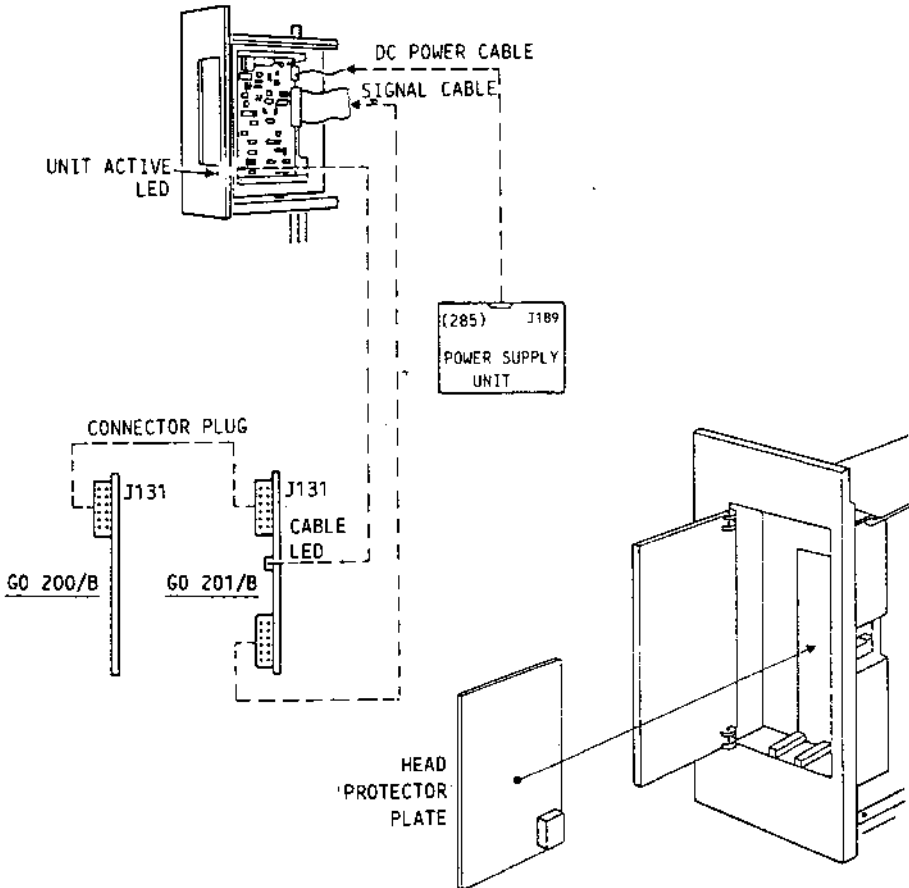
N.B.: - The CNAM and Dual-Port boards will be seen in greater detail in figures 5-13 and 5-15.

- Remove the KAR resistor packs from the Dual-Port and CNAM boards of HDU 0.

5.2.8 20 MB STREAMING TAPE UNIT: XU 1120/XU 1130

Before switching peripheral unit on, the metal head protector must first be removed.

A diagram illustrating interconnection of STC controller, peripheral unit and power supply unit LA40 is shown below.



N.B.: With the XU1130 streaming unit, the GO 342 takes the place of the formatter board GO201/B and the LED connection, illustrated in the figure above, no longer exists.

Fig. 5-18. Diagram of connection between STC controller and peripheral

5.2.9 40 MB MAGNETIC TAPE UNIT: XU 1705

Peripheral unit settings

Remove the protector plates marked 1 in the figure

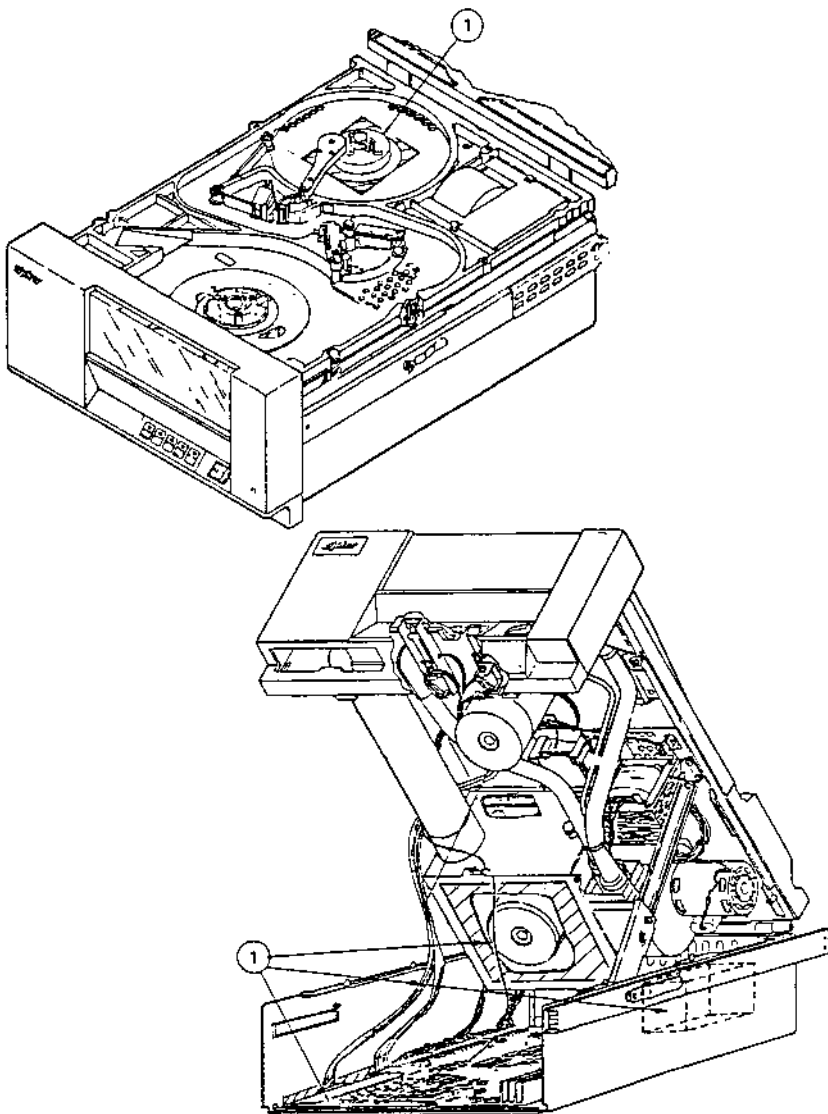


Fig. 5-19 Removing the peripheral protections

Diagram of interconnection between MTU controller and peripheral

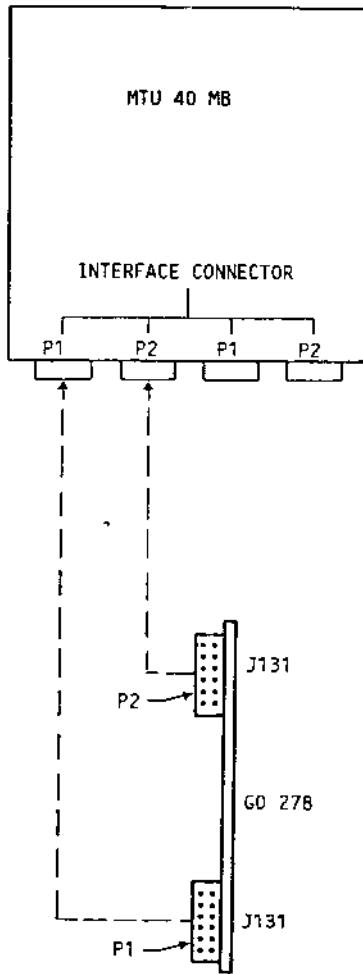


Fig. 5-20 Connection between MTU controller and peripheral

Settings to be made on DIP-switch U8W

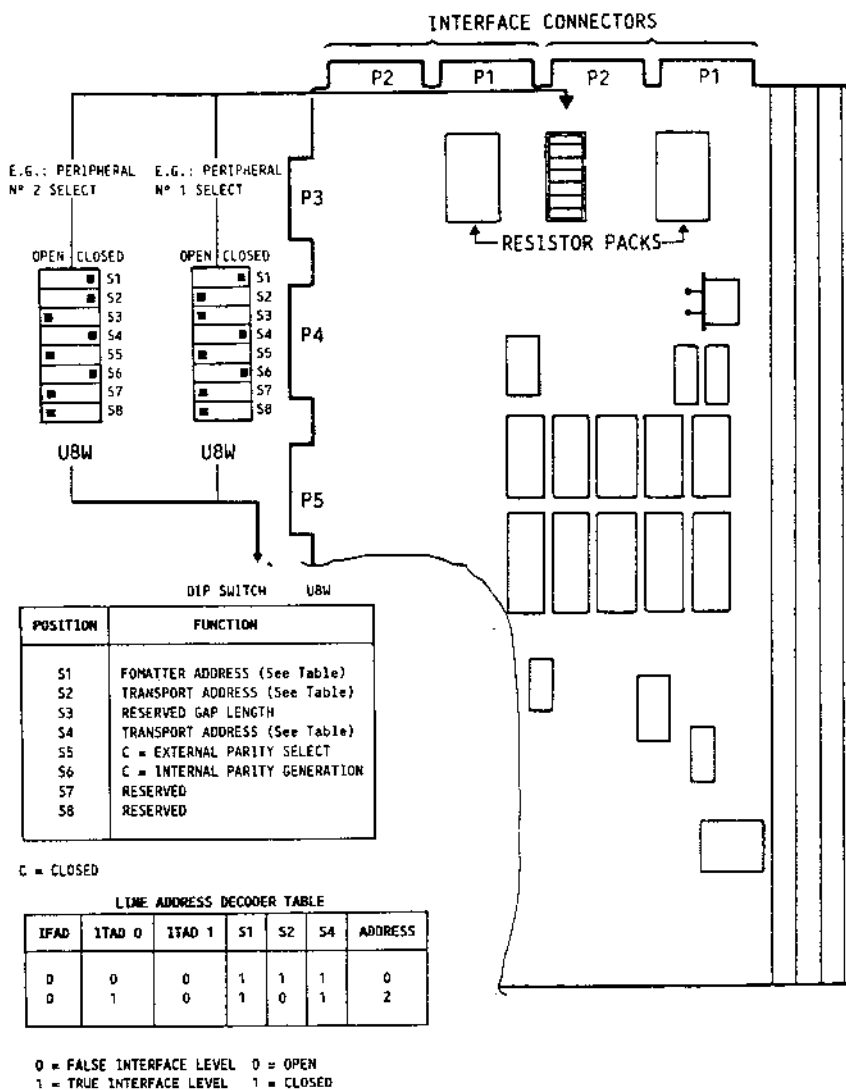
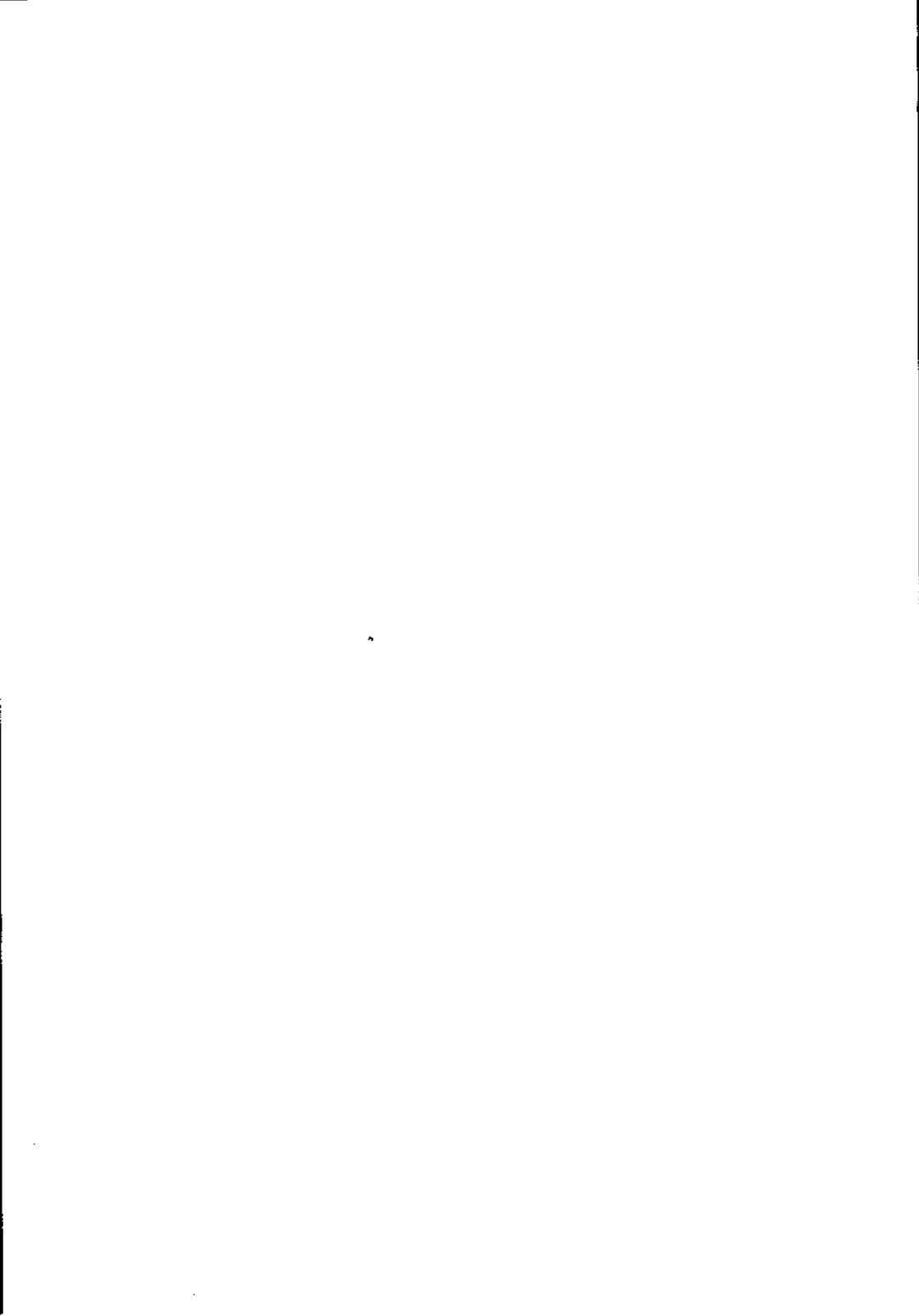


Fig. 5-21 DIP-switch U8W setting



6. AUTODIAGNOSTIC AND DIAGNOSTIC

6.1 RESIDENT AUTODIAGNOSTIC

The ROM resident autodiagnostic is designed to test the program loading circuitry; it is activated automatically at machine power-on and is performed in consecutive steps.

Any errors found are signalled by way of a code displayed on the diagnostic console, the display connected to the system or both.

6.1.1 AUTODIAGNOSTIC ORGANIZATION

The autodiagnostic consists of:

- Central unit board test
- RAM storage modules test
- Loading controller identification and test
- Program loading

6.1.2 CENTRAL UNIT BOARD TEST

Designed to check operation of those sections involved in IPL. It is subdivided into:

- CPU Z8001 test (microprocessor)
- ROM test
- Z8001 MMU (Memory Management Unit) test
- 8253 (timer) and interrupt timer logic test
- Non-vectored interrupt test

CPU Z8001 TEST

The test consists simply of ROM loader execution, in which the first operation is to display code "T" on the diagnostic console, thus providing a basic check of processor first level operation.

Faults such as no clock, CU internal address/data bus errors, power supply (+5V) defects, NMI signals, seg trap and bus req errors, etc., halt RAM loader execution and mean that the diagnostic code is not displayed on the console.

ROM TEST

This test consists of a check of the CRC in the ROM. If an error is found, the test is interrupted and code "1" displayed on the console.

MMU Z8010 TEST

In this test, all the segment descriptor registers are read and written. If errors are found, the test is interrupted and code "1" displayed on the code.

6.1.3 SYSTEM RAM TEST

This test identifies faulty RAM zones and then calculates the widest address area of good RAM and re-programs the MMU.

If the maximum space found is less than 16 Kbytes (RAM board missing or faulty), the test is interrupted and error code "2" displayed.

6.1.4 SYSTEM CONFIGURATION

In the load controller search, all slots are addressed in order and the controller type port read in each case. At each I/O addressing, the configuration table is compiled with 4 data bytes for each slot.

⋮

6.1.5 LOADING CHANNEL

The channel for loading of the operating system (IPL) or diagnostic monitor (for stand alone diagnostic) is selected in an order which is established by the position of the ISL switch on the console.

Primary sequence (switch in position 1)

- SMD interface HDU: XU 1700/1703
- OPE interface HDU: XU 5010
- ST506 interface HDU: XU 1709

Secondary sequence (switch in position 2)

- FDU: XG 6030
- MFDU: XU 4305
- STC: XU 1120/1130
- MTU: XU 1705

If loading is concluded successfully, the ROM_loader hands control to the program loaded (bootstrapper).

If loading is not successful, the next device (in order of priority) is selected and the operation repeated.
To avoid damage to the medium, floppy_disk or tape, load attempts are limited to 8.

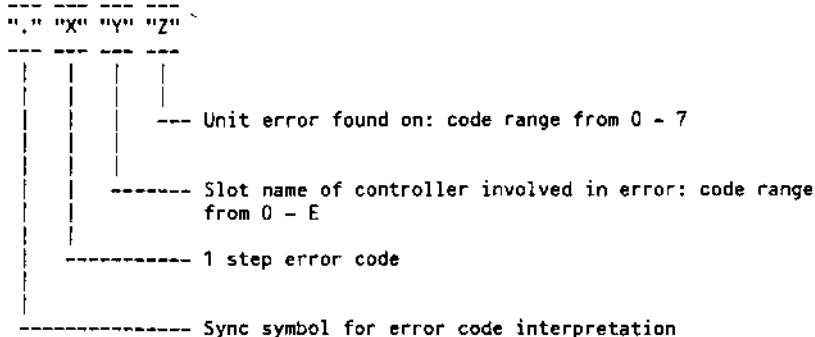
6.1.6 AUTODIAGNOSTIC MESSAGES

Errors are signalled by way of a code displayed on diagnostic console, or on console and monitor.

The messages are listed in the table:

CODE	CAUSE	ACTION TO BE TAKEN
1	CU board fault	Replace CU board
2	RAM board(s) fault di memoria RAM	Check addressing; if correct, replace the memory board(s)
3	Unexpected vector received in interrupt time	Replace all the boards, one at a time, and run autodiagnostic after each replacement until faulty controller is found
4	ROM DEBUGGER activated	If system fails to start up again after ROM DEBUGGER GO key is hit, replace ROM DEBUGGER
5	Delay for result of 1st IPL attempt	Occurs in IPL attempt; the bootstrap should then be activated; For subsequent errors, see the table below
6	Segment trap after bootstrapper is activated	
7	Non-Maskable Interrupt after bootstrapper is activated	
9	Instruction not implemented after bootstrapper is activated	
A	Privileged instruction after bootstrapper is activated	
B	System Call after bootstrapper is activated	
C	Non-vectored interrupt after bootstrapper is activated	
D	Delay before IPL switch commutates (3 sec. approx) if the "Total Memory Dump" procedure is required	If IPL switch does not commutate or if the "Total Memory Dump" module (resident in RAM) is not accessible, activity starts again with normal IPL.

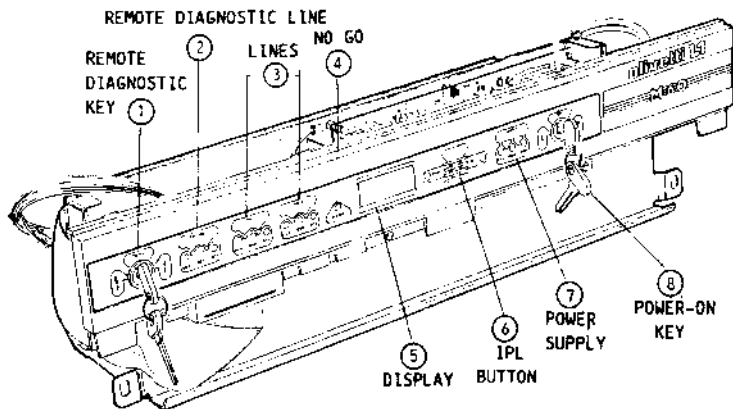
The 4-digit error codes and a key to aid comprehension of the codes will be found below:



CODE "X"	DESCRIPTION OF ERROR	CODE Y	CODE Z	FAULT TYPE AND FORM OF ACTION RECOMMENDED
1	Controller fault	Name of slot error found in and, hence, the faulty board is displayed	Not valid	Fault on controller performing the IPL: replace board. Possible controllers are: floppy/mini-floppy, HDU, or STC controllers
2	Peripheral unit fault	Indicates slot name of board to which the faulty peripheral is connected	Indicates unit with fault and displays its code	For all peripheral unit faults, see specific manual

6.1.7 DIAGNOSTIC CONSOLE

A detailed drawing of the system console is shown in the figure below.



- ①

{	TD OFF = Disables remote diagnostic
	TD ON = Enables remote diagnostic on-line
	TD S.A. = Enables remote diagnostic stand alone

- ② TD LINE = Memorizes remote diagnostic signal

- ③ LINE 1 & LINE 2 = Series of LED for line signal memorizing

- ④ NO GO

{	ON = Malfunction blocking system
	FLASHING = Malfunction not blocking system
	OFF = System functioning

- ⑤ DISPLAY = 4 digit indicating error information

- ⑥

{	ISL PRIM = Primary (HDU) IPL channel selection
	SEC = Secondary (MTU, STC) IPL channel selection

- ⑦ SUPPLY

{	SYS = CPU power on
	MEM = Memory power on
	PWR = Power not OK

- ⑧

{	OFF = System off
	SBY = System unattended (remote)
	RUN = System on

NOTE: Items 6 and 7 refer to LEDS ON

Fig. 6-1 System console

6.1.8 ROM INTERFACE MULTIPROCESSOR

The multiprocessor M60 system is handled by the C.U. ROM as follows:

- the ROM identifies if system is mounted on a board connected to the REDAC. If so, it runs the CPU autodiagnostic, the RAM autodiagnostic and then performs the IPL (as with monoprocessor M60).
- On central units not connected to REDAC, the CPU autodiagnostic only is run; RAM size is then calculated, so that segment <<1>> can be mapped on the last Kbyte.
- The CPU which loaded the system IPL will have to:
 - . Load in memory the code to be processed by the other CPU's
 - . Initialize the IPC parameters in RAM
 - . Send out the IPC command to the other CPU's.

6.2 STAND ALONE DIAGNOSTIC PROGRAMS

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

If there are errors, they will be accompanied by error messages which will be found and described in the relative Functional Checks manual.

This manual should be consulted for all details of these programs; a list of all the programs available as of diagnostic release 8.2 is given below.

1. MONIT * L1 Diagnostic Monitor
2. UTILITY * Utility program
3. LDHSE2 * HDU (with integrated KDC) Environment Activator Installation
4. SYSINS * Transfer of programs from SCT/FDU to XU 5010
5. HDSC14 * Transfer of programs from XU 5010 to SCT
6. HDMTU2 * Transfer of programs from XU 5010 to MTU
7. HDUFD1 * Transfer of programs from XU 5010 to FDU
8. LDHMU0 * HDU (KDC and workstation) Environment Activator Installation
9. UC3002 * CU Test (UC051 without gate array)
10. UCG302 * CU Test (UC042 with gate array)
11. EARUT3 * Installation of line parameters on Earom
12. RS232R * RS232 controller on CU board test
13. PRT.UC * Printer test
14. PRTWIN * Test of printer connected to twin
15. PRTELB * Test of printer connected to ELB
16. PINBDG * Pinpad and badge reader test
17. PINELB * Pinpad and badge reader connected via ELB test
18. CA2T51 * CA 2000 connected via twin RS232 test
19. FEEDER * Magnetic front feeder test program
20. ENCDE4 * Encryption and Real Time Clock module test
21. SOVRA7 * Overlapping
22. UCV301 * UC048 test
23. ENCSE0 * Encryption module (shared segment) test
24. PINCK0 * Encryption module (pin check) test
25. MEMB10 * RAM test
26. RAMVID * Video RAM test
27. CRTANS * Alphanumeric video test
28. CRTGR2 * Graphic video test
29. KEYTE * Keyboard test
30. GRAPH3 * Graphic/colour video controller test

31. T31103 * Graphic/colour video test
32. TKEY02 * Keyboard connected to graphic colour controller test
33. MFDMA1 * MFDU eccentricity and alignment check
34. 4301T3 * 320 KB MFDU test
35. E43014 * 320 KB MFDU Error Rate
36. 4305T3 * 1 MB MFDU test
37. E43056 * 1 MB MFDU error rate
38. FDUMA2 * FDU alignment and eccentricity test
39. 6030T3 * 1 MB FDU test
40. E60306 * 1 MB FDU error rate
41. TS5016 * HDU 5010 (integrated controller) test
42. S24151 * XU 5010 (integrated controller) initialization
43. DI5011 * XU 5010 (integrated controller) registration
44. ER5013 * XU 5010 (integrated controller) error rate
45. VC5012 * XU 5010 (integrated controller) test
46. 501TM1 * XU 5010 rotation time measurement
47. 50SCT9 * SCT to XU 5010 (integrated controller) Save-restore
48. SCTER7 * SCT sub-system error rate
49. SCT303 * G0200B and G0201B boards test
50. EPCOV3 * PCOV SCT error rate
51. GLAV27 * V24 line controller test
52. LCUTT4 * TFL line controller test
53. LCUM04 * MOIN5 line controller test
54. W24D06 * V24+V24 (dedicated segment) LCU test
55. TWIN05 * TWIN controller test
56. MOINV2 * MOIN 5.2 modem test
57. TW1005 * RS 422 twin line controller test
58. LIONV4 * LION 9.6 controller test
59. 96ERM5 * LION 9.6 master error rate
60. 96ERS5 * LION 9.6 slave error rate
61. ER2005 * LION 200 (dedicated segment) error rate
62. L2V245 * LION 200 + V24 (dedicated segment) controller test
63. LCUX26 * X24 line controller test
64. OMNIN3 * Omninet controller test
65. OMNSHO * Omninet (shared segment) controller test
66. W24S03 * V24 + V24 (shared segment) LCU test
67. V24L22 * LION 200 + V24 (shared segment) LCU test
68. ER5202 * LION 200 (shared segment) error rate
69. L9V241 * LION 9.6 + V24 controller test
70. MOW240 * MOIN 5.2 with V24+V24 line controller test
71. ETHER0 * Ethernet controller error rate
72. SAS1T4 * XU 5006 (14MB HDU via SAS13) test
73. C50062 * 14 MB HDU Certification
74. 5006F3 * 14 MB HDU Formatting
75. ES3563 * 14 MB HDU error rate
76. SAS243 * Standard 24 write 14 MB HDU
77. DRSMF4 * 14 MB HDU/1 MB MFD (XU4305) Dump-restore
78. 5006V1 * Verify and correction
79. SM23F6 * 60 MB HDU formatting
80. ST2455 * Track 0 for 60 MB HDU initialization

- 81. 2312E8 * 60 MB HDU error rate
- 82. 23SCT2 * 60 MB HDU/SCT Save-restore
- 83. SMD607 * 60 MB HDU driver test
- 84. F60TM2 * 60 MB HDU rotation time measurement
- 85. SM12V2 * 60 MB HDU verify and correction
- 86. MTUER6 * 40 MB MTU error rate
- 87. MTC304 * G0278 controller for 40 MB MTU test
- 88. FJMTU5 * MTU/60 MB HDU Dump-restore
- 89. 120FC3 * MTU/120 MB HDU Dump-restore
- 90. UCM801 * M60 CPU test (UC040)
- 91. CACH84 * M60 Cache memory test
- 92. TCB805 * M60 Timing Control Board test
- 93. MREDA1 * M60 REDAC board test
- 94. MEM810 * M60 RAM board test
- 95. CACH61 * M60 CACHE (on 60 MB HDU) test
- 96. CAC121 * M60 CACHE (on 120 MB HDU) test
- 97. TMULT0 * Verify M60 multiprocessor (MOS-resident)
- 98. 2322F5 * 120 MB HDU disk formatting
- 99. 120ST0 * Track 0 for 120 MB HDU initialization
- 100. 2322E3 * 120 MB HDU error rate
- 101. FJSCT2 * 120 MB HDU Save-restore
- 102. SM1207 * 120 MB HDU driver test
- 103. F12TM2 * 120 MB HDU rotation time measurement
- 104. SM22V1 * 120 MB HDU verify and correction
- 105. MULT12 * Serial channel multiplexer test
- 106. MULT21 * MULTIPLEXER controller test
- 107. WSVID2 * ELB 3683 video test
- 108. WSKEY1 * L1 WS keyboard test
- 109. HDC5F1 * 30 MB HDU disk formatting
- 110. S24W13 * Standard 24 installation on 30 MB HDU
- 111. HDC5E3 * 30 MB HDU error rate
- 112. HD5ST1 * 30 MB HDU Save-restore
- 113. HDC500 * HDC5 controller test program

A. APPENDIX

A.1 LIST OF HARDWARE MODULES

A.1.1 BASIC UNIT

The list that follows and the accompanying data are taken from the "Progetto di Gestione", the product status and evolution plan, and provide a summary of products available for M60.

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
BASIC UNIT: - Monoprocessor (M60) - No telediagnostic	Basic cabinet S80 CPU UC040/A CACHE UC041 TCB82 Power supply unit LB30 Board rack Console: FEC + REDAC MR Power supply LA04 Fans Cables	BU 6011
BASIC UNIT: - Monoprocessor (M60) - With telediagnostic	As for BU 6011: REDAC 3R replaced by REDAC 3C	BU 6012
BASIC UNIT: - Biprocessor (M60/2) - No telediagnostic	As for BU 6011 with: CPU UC040/A CACHE UC041 IF 300 board and cables	BU 6201
BASIC UNIT: - Biprocessor (M60/2) - With telediagnostic	As for BU 6012 with: CPU UC040/A CACHE UC041 IF 300 board and cables	BU 6202
BASIC UNIT: - Triprocessor (M60/3) - No telediagnostic	As for BU 6011 with: Two CPU UC040/A Two CACHE UC041 IF 300 board and cables	BU 6301
BASIC UNIT: - Triprocessor (M60/3) - With telediagnostic	As for BU 6012 with: Two CPU UC040/A Two CACHE UC041 IF 300 board and cables	BU 6302

A.1.2 MEMORIES AND OTHER MODULES

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
LICENCE TO USE basic software	Operating system MOS run-time	SWB 6061
RAM 1.0 MB	RA80C: 256 Kbit chips	MEM 6031
RAM 2.0 MB	RA80B: " " "	MEM 6032
RAM 3.0 MB	RA80A: " " "	MEM 6033
RAM 4.0 MB	RA80N: " " "	MEM 6034
RAM 1.0 MB	RA80D: 64 Kbit chips	MEM 6021
DATA ENCRYPTION CONTROLLER with real time clock for pin check	Board G0 257/B Lock	DEM 3377
CABINET (SB3)	SB3 Cabinet Automatic start device	CAB 3558
POWER SUPPLY UNIT for SB3	ALI LA40	PSU 3545
EXTENSION to main power supply unit	ALI LA17 (con TCB82/A) (absorption >50A on +5V)	PSE 6050
SB3 SUPPORT	In practise, an empty SB3	KIT 3553
KIT for upgrading BU 6011/6201/ 6301 to BU 6012/6202/6302	Redac board Cables ROM	TEL 6047
Set for upgrading BU 6011/6012 (monoprocessor) to BU 6201/6202 (biprocessor)	CPU + CACHE with ROM multiprocessor Console board Cable from CPU to board Board structures ROM multiprocessor M60/2 label	SET 6211
Set for upgrading BU 6201/6202 (biprocessor) to BU 6301/6302 (triprocessor)	CPU + CACHE with ROM multiprocessor Cable from CPU to board M60/3 label	SET 6311

A.1.3 MAGNETIC PERIPHERALS IN SB3

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
1MB MFU/FDU CONTROL (in SB0) (montato in SB0)	Board GO 280/D	FDC 3593
1MB MINIFLOPPY DISK (1st drive)	XU 430r drive Signal cables	MFU 3594
1MB MINIFLOPPY DISK (2nd drive)	XU 4305 drive Signal cables	MFE 3577
1MB SLIM MINIFLOPPY DISK (1/86) (1st drive)	ND-08DE slim drive Signal cables	MFU 3672
1MB SLIM MINIFLOPPY DISK (1/86) (2nd drive)	ND-08DE slim drive Signal cables	MFE 3673
1MB FLOPPY DISK (1st drive)	XG 6030 drive Signal cables	FDU 3595
1MB FLOPPY DISK (2nd drive)	XG 6030 drive Signal cables	FDE 3582
18 MB HDU Control, OPE.interface (two boards in SB0)	GO 230 & GO 231/A boards	HDC 3555
18 MB HDU (1st drive)	XU 5010 drive MAPSS board, GO 306 Cables	HDU 3572
18 MB HDU (2nd drive)	XU 5010 drive Cables	HDU 3573
SWITCH for 18 MB HDU	Switch	SET 3563
HDU Control, ST506 interface (mounted in SB0)	GO 363 board	HDC 3544
65 MB HDU (1st drive)	XU 1709 drive DC converter (XU 1708) Cables	HDU 3668
65 MB HDU (2nd drive)	XU 1709 drive DC Converter (XU 1708) Cables	HDE 3669

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MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
60/120 MB HDU Control, SMD interface (two boards mounted in SBO)	Controller G0 302/A Formatter G0 301/A	HDC 3527
60 MB HDU (1st drive)	XU 1700 drive XU 1701 power supply unit Cables	HDU 3560
60 MB HDU (2nd drive)	XU 1700 drive XU 1701 power supply Cables	HDE 3578
120 MB HDU (1st drive)	XU 1703 drive XU 1701 power supply Cables	HDU 3516
120 MB HDU (2nd drive)	XU 1703 drive XU 1701 power supply Cables	HDE 3579
20 MB STC Control, DEI interface (two boards mounted in SBO)	Controller G0 200/B Formatter G0 201/B	STC 3588
20 MB STC Control, QIC 36 interf. (two boards mounted in SBO)	Controller G0 200/B Formatter G0 342	STC 3598
20 MB STREAMING TAPE	XU 1130 drive Cables	STU 3599

A.1.4 MAGNETIC PERIPHERALS IN SB2

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
40 MB MAGNETIC TAPE UNIT Pertec interface	Cabinet SB2 Remote switch-on device XU 1705 tape unit Power supply unit Signal cables	MTU 3541
40 MB MTU Control (mounted in SB0)	GO 278/B board	MTC 3543
60/120 MB HDU Control, SMD interface (two boards mounted in SB0)	Controller GO 302/A Formatter GO 301/A	HDC 3527
60 MB HDU (1st drive)	XU 1700 drive XU 1701 power supply unit Cables Cassette	HDU 3565
60 MB HDU (2nd drive)	Xu 1700 drive XU 1701 power supply unit Cables	HDE 3566
120 MB HDU (1st drive)	XU 1703 drive XU 1701 power supply unit Cables Cassette	HDU 3523
120 MB HDU (2nd drive)	XU 1703 drive XU 1701 power supply unit Cables	HDE 3524
DUAL PORT for HDU 60/120 MB	Struttura Electronics board Keys Signal cables	SET 3569

A.1.5 LINE CONTROLLERS

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
V24 + V24 (*) Line Control (with microprocessor)	Board G0 236 Cables	LPU 3348
MOIN 5.2 Integrated Modem for LPU 3348	Board IF 192 Cable	LTU 3395
V24 + LION 200 (*) Line Control (with microprocessor)	Board G0 256 Cables	LPU 3390
V24 + LION 9.6 Line Control (with microprocessor)	Board G0 340/A Cable	LPU 3398
Cable for Unattended operation	Cable	CBL 6071
Cable for line status display	Cable	CBL 6072
Serial Interface Control 2 way: RS 232C and Current loop	Board G0 327	SIC 3367
OMNINET Local Network Control	Board G0 308 2.5 metre cable	LCU 3345
ETHERNET Internal Line Control	Piastra G0 212/A	LCU 3323
DROP Cable (Ethernet line)	5 metre cable 10 metre cable 20 metre cable 30 metre extension cable	CBL 3391 CBL 3392 CBL 3393 CBL 3394
JUNCTION Box (Current loop)	Tap-Box	TBX 9020
JUNCTION Box for LION and Omnet networks	Tap-Box	TAP 1070
LINE Discharger for LION and Omnet networks	Discharger	LSS 9021
Omnet Repeater	Box	SET 3364
TRANCEIVER BOX for Ethernet line	Box	SET 3364

(*) N.b.: In the near future, the G0236 and G0256 boards will be replaced, respectively, by the G0331 and G0340.

A.1.6 WORKSTATION MODULES

MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
KEYBOARD/DISPLAY mono/trivalent Cont. for DSM3605/19/15/16 Displays	GO 252 board Cable	KDC 3341
Graphic Expansion Module	GO 255/A board	MEG 3354
5" DISPLAY, alphanumeric trivalent	Display - Filter Tilt suport	DSM 3605
9" DISPLAY, alphanumeric trivalent	Display - Filter Tilt support	DSM 3619
15" DISPLAY, alphanumeric, B/W, tilting	Display with tilting base - Filter	DSM 3615
15" DISPLAY, alphanumeric and graphic, monochrome green, tilting	Display with tilting base Non-glare screen	DSM 3616
Spacing/securing collar, 15" display	Collar	SET 1245
KEYBOARD/DISPLAY 14" colour alphanumeric Controller	GO 224 board Cable	KDC 3335
KEYBOARD/DISPLAY 14" colour alphanumeric and graphic Controller	Boards: - GO 259 - GO 260 - GO 261 Cable	KDC 3336
14" DISPLAY colour, alphanumeric	Display	DSM 1214
14" DISPLAY colour, alphan. and graphic	Display	DSM 1244
ADAPTER UNIT (connecting display and keyboard)	Box adapter with: - Board IF141 - Power supply unit	ELB 1381
ADAPTER UNIT (can connect: display, keyboard, badge reader, pin pad, two serial peripheral units)	Box adapter with: - Board GO 269 - Power supply unit	ELB 1382
CONNECTION CABLE from Adapter Unit to Central Unit	15 metre cable 25 " " 50 " " 100 " "	CBL 2614 CBL 2624 CBL 2649 CBL 2698

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MODULE DESCRIPTION	COMPOSITION	PROGETTO GESTIONE
MULTIPLEXER CONTROLLER 4-way	Board GO 322	MUX 3388
Signal Distribution Box for MUX 3388	Box 5 metre cable	DBX 3389
WORKSTATION alphanumeric, mono- chrome, can connect: display, multi- function keyboard for two serial peripheral units, option board for pin pada and badge reader	Box BA 126 board Power supply unit Display-keyboard cable ELB mains cable Display mains cable	ELB 3683
OPTION BOARD pin pad and badge reader (mounted only on ELB 3683)	GO 329 board	EXF 3686
JUNCTION CABLE C.L. for ELB 3683	10 metre cable	CBL 3610
SERIAL INTERFACE CABLE for connect- ion of peripherals to DBX 3389	Cable	CBL 3378
REMOTE WORKSTATION graphic mono- chrome based on M31 (BU 3111) (BU 3111)	BU 3111 512 KB RAM MEG 3354 (graph. expans.) SIC 3367 (serial interf.) DSM 3616 (graph. display) ANK 1401 (keyboard)	WSG 3622
REMOTE WORKSTATION graphic colour based on M30 (BU 3415)	BU 3415 MEM 3352 (512 KB RAM) MFU 3420 (minifloppy) SIC 3367 (serial interf.) KDC 3336 (display contr.) DSM 1244 (graph. display) ANK 1401 (keyboard)	WSG 3623
STATIC SWITCH for RS 232 interface	Switch 2 male-male adapter cables Screws for adapting modem extension cable	MSW 3369
DYNAMIC MULTIPLIER V24 interface V24	Electronics box Cables	D1M 3379

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DESCRIPTION OF KEYBOARDS	PROGETTO GESTIONE
Alphanumeric + function (S.T. with BASIC verbs)	ANK 1426
Alphanumeric + function (accounting,business,data entry,D.P.)	ANK 1427
Alphanumeric + function + 3 keys (D.P. terminals)	ANK 1428
Numeric + function (D.P. terminals)	NKB 1435
Numeric + function + 3 keys (D.P. terminals)	NKB 1436
Numeric + function	NKB 1411
Numeric + function + keys	NKB 1412
Alphabet (NKB 1411 or 1412 essential)	AKB 1413
Alphanumeric + function (multifunction, unified)	ANK 1401
Alphanumeric + function + keys (multifunction, unified)	ANK 1402
Numeric + function (multifunction, unified)	ANK 1405
Numeric + function + keys (multifunction, unified)	ANK 1406
Pin Pad (with 1.5 metre cable)	PIN 1440

A.1.7 CABLES FOR AUXILIARY PERIPHERAL UNITS

DESCRIPTION OF CABLE	PROGETTO GESTIONE
EIA single channel Cable for serial peripherals	CBL 2657
EIA twin channel cable for STD 13 serial peripherals	CBL 2658
PR3300/3600 Adapter Cable read/stamp modules (5 cms.)	CBL 2661
Adapter Cable for non-STD 13 peripherals (10 cms.)	CBL 3349
MODEM Extension Cable	CBL 3558
TTL single channel Cable	CBL 2659
TTL twin channel cable	CBL 2660

A.2 SYSTEM DOCUMENTATION

This section contains a list of the English language manuals relating to M60-M60/2-M60/3 systems.

M60 MANUALS

- M60 - Theory of operation4102130 Z
- M60 - Service Manual4102050 A
- M60 - Hardware Architecture and functioning4102090 N
- M60 - Spare parts Catalogue4102140 S
- M60 - Schematics4102150 T

THEORY OF OPERATION - CONTROLLERS

- Encryption controller3963920 T
- Minifloppy/floppy disk controllers3963500 N
- Hard disk controllers3963760 A
- Streaming Tape Cartridge controller3963820 Z
- MTU controller4101140 N
- Line controllers3963640 E
- Serial interface controllers3963580 Q
- Multiplexer controller4105710 Y
- Keyboard/Display controllers3963560 E

WORKSTATIONS

- Self-powered displays: - Service Manual3963460 C
- Theory of Operation3963680 J
- Low profile keyboards: - Service Manual3963480 N
- Theory of Operation3963600 Q
- ELB 1381/1382 - General Service Manual3963780 L
- ELB 3683 - General Service Manual4105690 E

MAGNETIC PERIPHERALS

- XU 4305 (mFDU 1MB) - Service Manual	4262680 A
- ND 08DE (mFDU 1MB Slim) - Service Manual (*)	4107830 V
- XG 6030 (FDU 1MB) - Service Manual	3961620 U
- XU 5010 (HDU 18MB) - Service Manual	3964450 Y
- XU 1709 (HDU 65MB) - General Service Manual	4107590 L
- XU 1700 (HDU 60MB) - General Service Manual	4102510 F
- XU 1703 (HDU 120MB) - General Service Manual	4102530 N
- XU 1120 (SCT 20MB DEI) - General Service Manual	3964630 S
- XU 1130 (SCT 20MB CIPHER) - General Service Manual	4105920 N
- XU 1705 (MTU 40MB) - General Service Manual (supplied by manufacturer)	

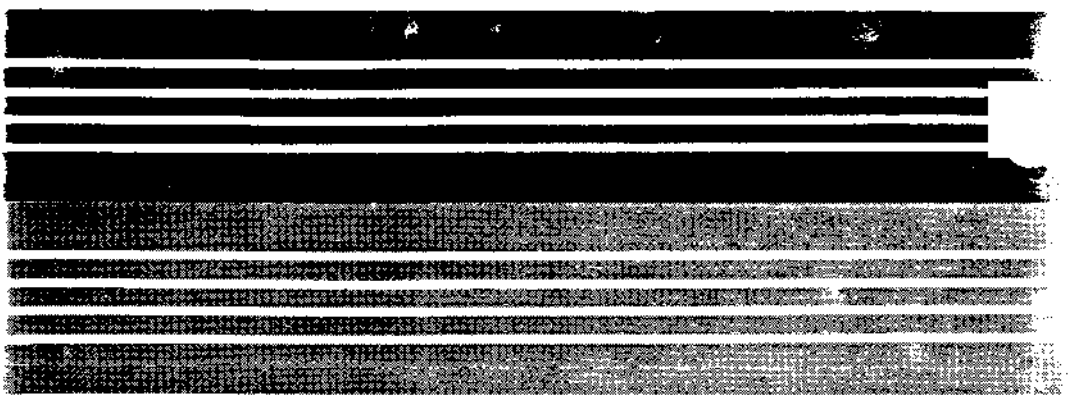
(*) N.B.: Manual to be issued in the near future.

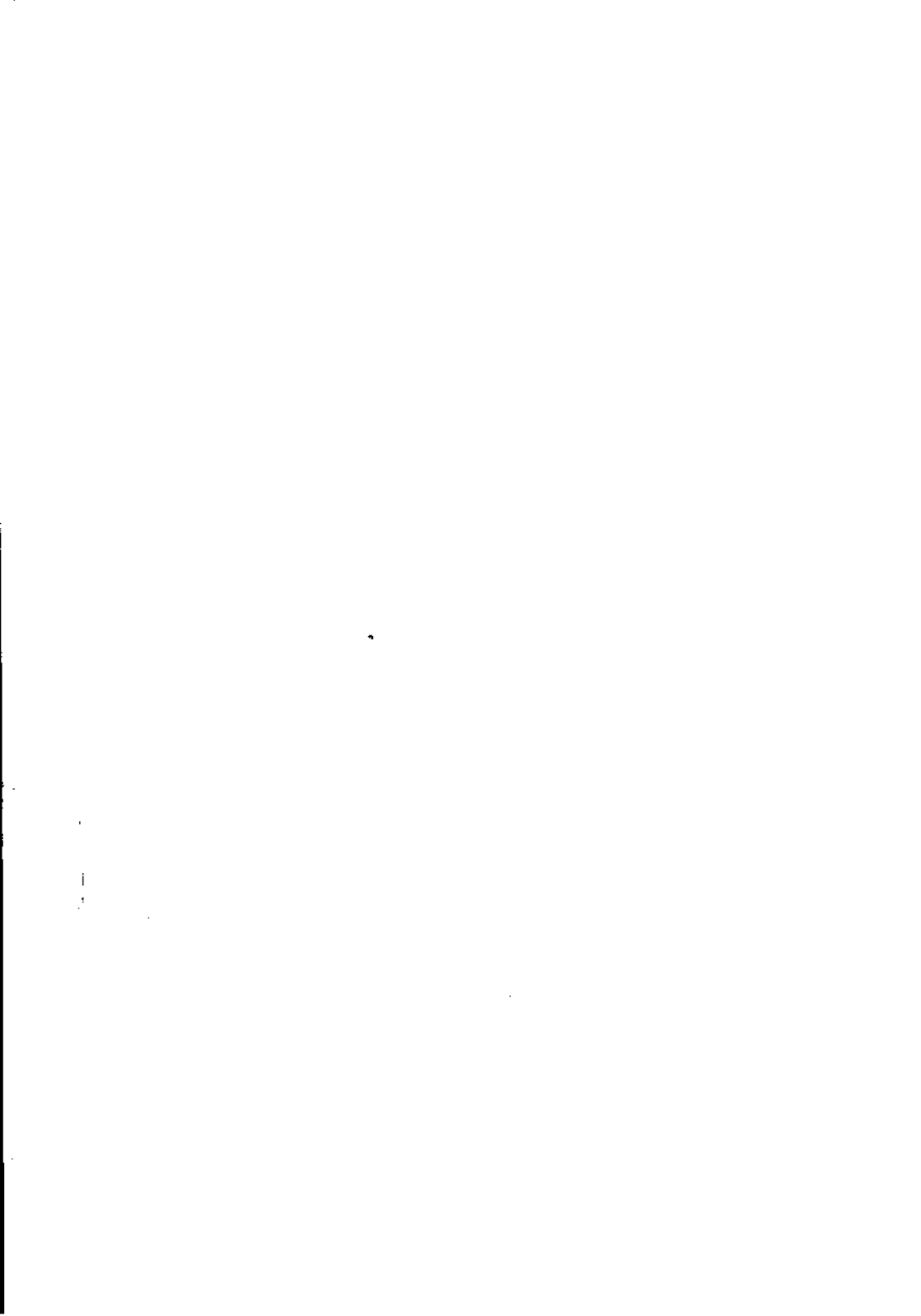
PRINTERS

- PR 15 - General Service Manual	4101200 S
- PR 17 - General Service Manual	4101350 K
- PR 19 - General Service Manual	4101300 C
- PR 340 - General Service Manual	4103550 V
- PR 1470 - Service Manual	3930470 Z
- PR 1480 - General Service Manual	3964010 V
- PR 1580 - General Service Manual	4101380 W
- PR 2835 - Service Manual	3964070 T
- PR 2845 - Service Manual	4101910 L
- PR 2850 - Service Manual	3956170 T
- PR 2880 - General Service Manual	4151580 T
- PR 2890 - Service Manual	4101000 D
- PR 3300/3600 - General Service Manual	3963500 L

OTHER MODULES

- Functional Checks Manual: - Stand alone3963560 S
 - I/O routines4102070 C
- Site Preparation Guide3932800 C
- Hardware Configuration Guide3986230 C
- M34/M44 - Service Manual4105740 T
- Modular power supply units - Theory of Operation3963720 E
- MAPSS Board - Theory of Operation4107130 W
- V24 DIM - General Service Manual4107970 T
- Omrinet Repeater - General Service Manual4107990 D







Code 4102050 A (1)
Printed in Italy