H & L Associates' UPG3600
Upgrade Kit for
GCA 3600/3600F Pattern Generators

Installation, Operation and Technical Manual

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keys
A keyboard font is used for single key descriptions.

e.g.

'Press e ' indicates the user should press the large key marked Enter or Return

e.g.

'Press a X ' indicates the user should hold down the a key and then press the X key

numbers
Numeric data may be entered as a normal decimal number or as a hexadecimal (base 16) number if preceded by a dollar sign ($) character

e.g.

I/O base segment = 52224

e.g.

I/O base segment = $CC00

{options}
Command line entries which are optional are enclosed in curly brackets {}

e.g.

C>upg3600 {/m=$CC00}

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Section A - Introduction

A.1 Product Description

The GCA/D.W.Mann 3600 pattern generator produces master patterns for integrated circuit fabrication and consists of a system controller, a rack of electronics and a micro-reduction camera.

H&L Associates' UPG3600 package is designed to increase the efficiency and reliability of the pattern generator (PG) by providing the hardware and software necessary to replace the original Digital Equipment Corporation (DEC) PDP-11/04 system controller with an IBM-PC/MS-DOS compatible desktop computer (IBM-PC).

The IBM-PC will completely replace the PDP-11, its console terminal, magnetic tape drives, printer and other peripherals. The maintenance problems associated with the PDP-11 are eliminated, and the features of an IBM-PC are made available to the user e.g. hard disk storage, local area networks, PC-based IC design software.

The hardware in the UPG3600 package comprises the following:

Q   UPG3600-PIOA printed circuit board for installation inside the PC

Q   UPG3600-PIOB printed circuit board for installation inside the pattern generator

Q   3 (three) 40-conductor ribbon cables to connect these boards together

The companion UPG3600 System Software duplicates the operation of the original equipment software, but differs from the original in that:

Q   a text mode user interface (TMUI), with windows, dialogue boxes,
         pull-down menus and mouse support is used for most configuration,
         data file and setup operations. Context sensitive on-line help is
         available.

Q   job queues, normally constructed with the SETUP and MODE commands of the
         original system, can now be built 'off-line' (without operating the pattern generator)
         using the TMUI.

Q   magnetic tape support is no longer required. Data files can be
         generated from several sources and may reside on local or network
         drives.

A.2 Package Contents

- Q   one UPG3600-PIOA printed circuit board (16-bit ISA bus)
- Q   one UPG3600-PIOB printed circuit board (UNIBUS)
- Q   three 40-conductor ribbon cables
- Q   System Software on a PC/MS DOS compatible diskette (3.5")
- Q   Installation, Operation and Technical manual

A.3 System Requirements

A.3.1   Hardware

In order to install the UPG3600 software and accompanying I/O board, the user must provide a PC/MS DOS compatible, Intel 80x86 based computer with the following *minimum* specifications :

- Q   a 486 CPU with a clock speed of 66 MHz or greater
- Q   one 16-bit ISA bus expansion slot
- Q   PC/MS DOS Version 5.0 or higher
- Q   CGA,EGA/VGA or Monochrome video display
- Q   one 1.44M floppy disk drive or network connection

The UPG3600 upgrade kit supplies the additional printed circuit boards and cabling required to complete the installation.

The H&L supplied UPG3600-PIOA board is shipped with the following jumper settings:

- Q   NO Interrupt Request (IRQ) jumpers installed
- Q   Port I/O starting at hexadecimal address CC00

If these settings conflict with those of other devices installed in the desktop PC, then the UPG3600-PIOA board must be reconfigured. Information on reconfiguring the UPG3600-PIOA board will be found in Appendix I of this document.

A.3.2   Software

UPG3600 programmes should be run under a version of PC/MS-DOS greater than or equal to 5.0. It is recommended that the entire contents of the UPG3600 System Software diskette be copied to a suitably named directory (e.g. C:\UPG3600) on the user's hard disk. Alternatively, there is an INSTALL.EXE programme supplied which can be run and which will automate the installation process and configure certain system files.

The UPG3600 software also requires that the device driver ANSI.SYS (or its equivalent) be resident in memory. A line similar to

device=ansi.sys or *device=c:\dos\ansi.sys*

should appear in the user's CONFIG.SYS file. Alternatively, the programme ANSI.COM (supplied on the UPG3600 System Software diskette) can be executed before running UPG3600.EXE. This will install ANSI screen support, much as ANSI.SYS would.

NOTE

Since the control and test software operate in real time, it is recommended that the UPG3600 software be run directly from the PC/MS-DOS prompt (e.g. C>). **DO NOT** install memory resident programmes which intercept the system timer interrupt. In addition, try not to operate the pattern generation software in the 'DOS box' of a multitasking operating system e.g. MicroSoft Windows® 3.x/9x (the UPG3600 software will attempt to disable multitasking when controlling the pattern generator). Either of these situations may slow system response and produce erroneous photomasks.

Section B - Installation

B.1 Introduction

Before beginning the UPG3600 installation, the installer should have a basic knowledge of IBM-PC hardware and PC/MS DOS software. The original instruction manual for the pattern generator will be required in the future for regular system maintenance and calibration.

Appendix I describes how to configure the UPG3600-PIOA board.

Appendix II describes the UPG3600 user interface and how to invoke commands using a mouse or the keyboard.
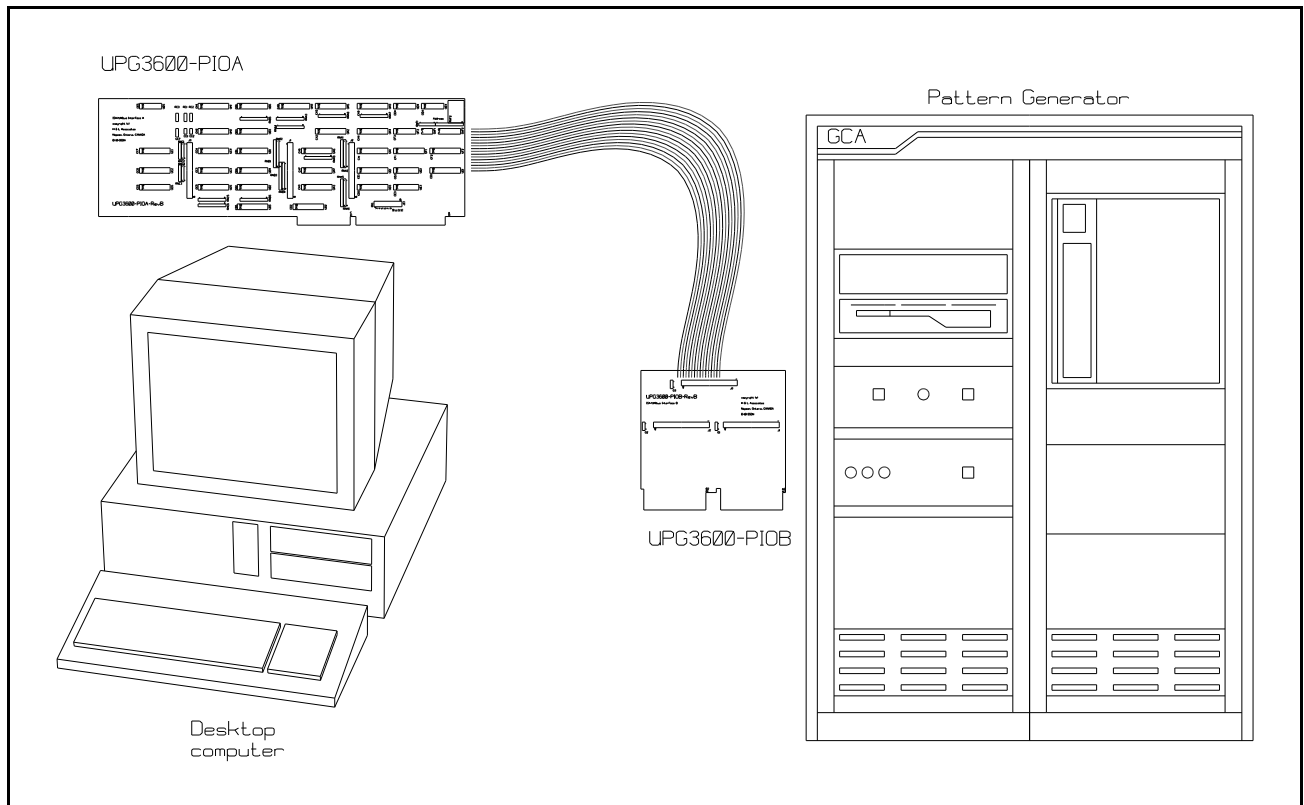
Figure B.1 : Typical UPG3600 Hardware Installation

B.2 Desktop Computer Connections

The UPG3600-PIOA card is installed in the IBM-PC and serves as the interface to the electronics within the pattern generator. Ribbon cables running from this card plug into the UPG3600-PIOB card which, in turn, plugs into the Computer Interface Unit of the pattern generator, at the same location as the original PDP-11 cable (see Figure B.1). The installation process involves the following steps:
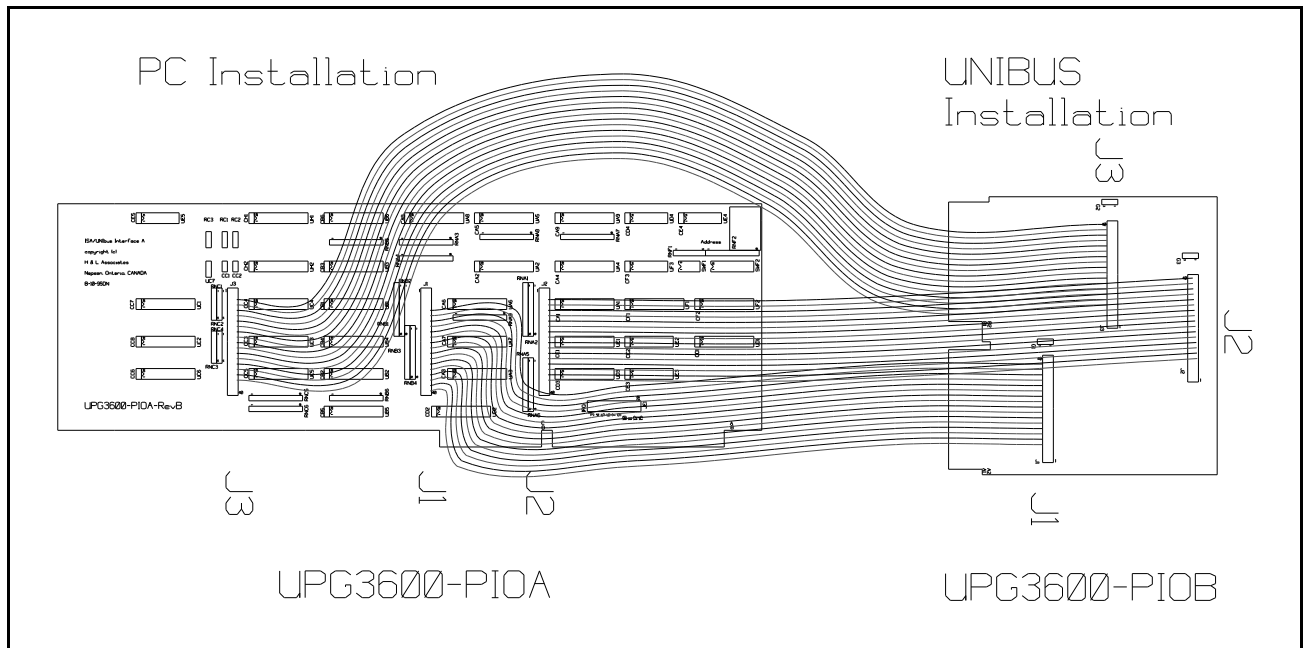
Figure B.2 : UPG3600-PIOA and UPG3600-PIOB Interface Boards

| Confirm the proper configuration of the UPG3600-PIOA card (see Appendix I) so that it doesn't interfere with the operation of any cards or memory already in the PC.

| Power down the IBM-PC and open the cover. It is recommended that the computer also be unplugged from the wall outlet.

| Plug the UPG3600-PIOA board into any empty 16-bit ISA compatible backplane slot. Tighten the hold down screw of the board's rear bracket to ensure a solid connection.

| Lead the three supplied ribbon cables through the back of the computer and plug them into the three connectors J2, J1 and J3 (in that order) on the UPG3600-PIOA card as shown in Figure B.2. Then plug the other end of each ribbon cable into the corresponding connector on the smaller UPG3600-PIOB card. Note that each ribbon cable header on the UPG3600-PIOA and -PIOB boards has a small V-shaped marking to indicate pin 1 on the header. The red line on the ribbon cable should line up with this marking on the header. Keyed connectors will force this alignment.

| For now, place the UPG3600-PIOB carefully on a non-conducting surface and continue to
        check out the installation

B.3 Software Installation

It is recommended that the entire contents of the UPG360 System Software diskette be copied to a
suitably named directory (e.g. C:\UPG3600) on the user's hard disk. Alternatively, the upgrade
software comes with an INSTALL programme which can be run. Inserting the UPG3600 System
Software floppy diskette into the floppy drive and typing 'install' at the DOS command line:

    e.g.   A:\>install℮   or   C:\>a:install℮

will invoke the software install programme and a user screen similar to Figure B.3 will appear.

The install programme will copy the necessary programmes from the specified source directory to
the specified destination directory. The default names for the source and destination directories
should work for most installations but the user can change them if so desired. Pressing the [Install]
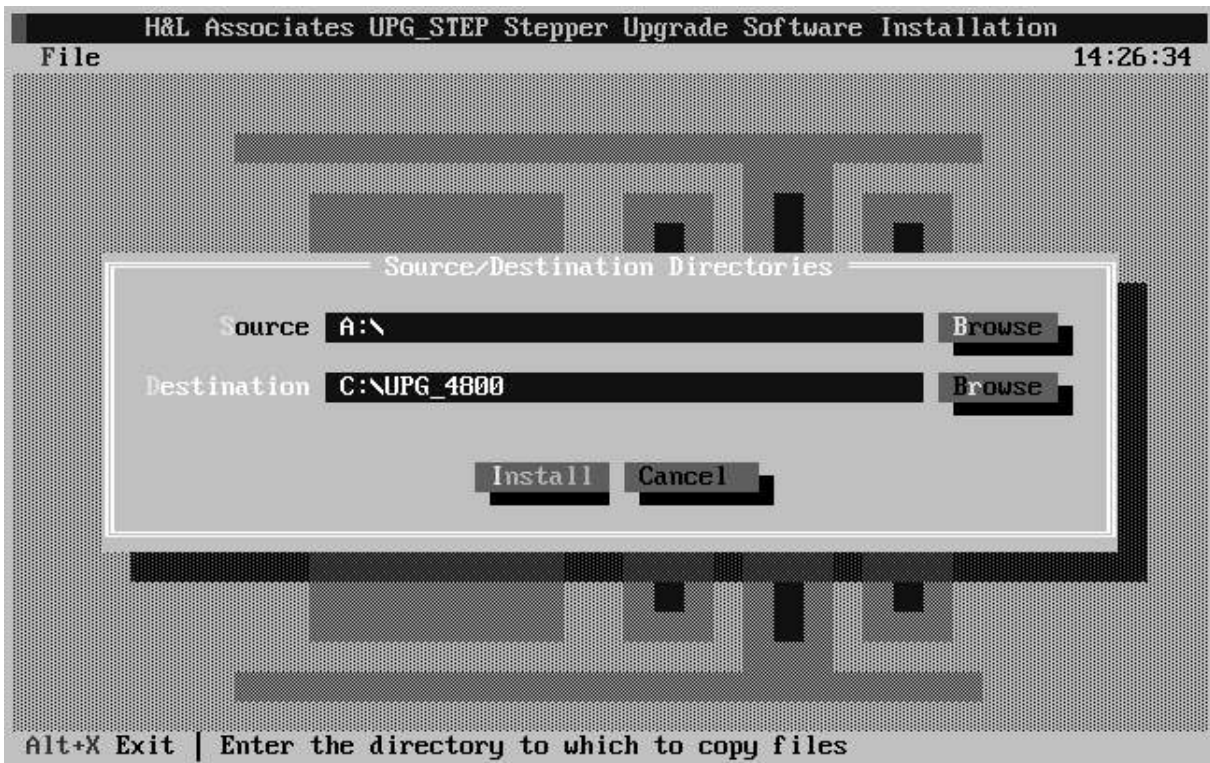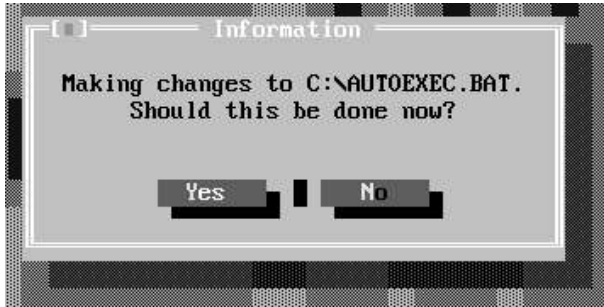button (or a l) will start the installation process.

Figure B.3 : Typical Software Installation User Dialogue

The install programme will also optionally make changes to two system files in the user's root

Making changes to C:\AUTOEXEC.BAT.
Should this be done now?

Yes   No

directory (C:\) - AUTOEXEC.BAT and, if Win9x is installed, MSDOS.SYS.

The changes to AUTOEXEC.BAT will cause a modification of the PATH environment variable to include the upgrade destination directory. The user should then be able to invoke the pattern generator control software from the DOS command line by simply typing 'PG'. Additionally, the programme ANSI.COM will be configured to run the next time the PC is powered up.

If this is the first time that the install programme has been run, then it is recommended that the changes be made. If an install has already been done and the files are being copied again, the changes to the AUTOEXEC.BAT file don't need to be made.

Making changes to C:\MSDOS.SYS.
Should this be done now?

Yes   No
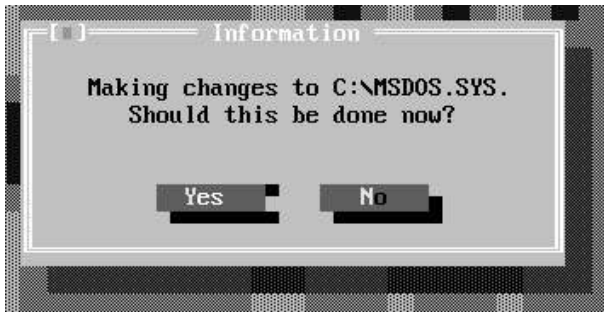
If DOS 7.x (i.e. Win9x DOS) is installed, then modifications will optionally be made to MSDOS.SYS. The changes will cause a startup menu to be invoked after a system reboot which will give the user the option of booting the system normally (into Windows), or into 'Command prompt only' mode (DOS real mode). DOS real mode is the desired mode when operating and controlling the pattern generator in real-time. Again, if this is the first time that the install programme has been run, then it is recommended that the changes be made. If an install has already been done and the files are being copied again, the changes to the MSDOS.SYS file don't need to be made.

B.4 Desktop Computer Installation Check

The desktop computer can now be closed and powered up normally. Performing the UPG3600-PIOA diagnostics involves the following steps:

| Run the programme UPG3600.EXE (with the optional */m=$xxxx* parameter if required) by typing **'upg3600'** after the DOS prompt

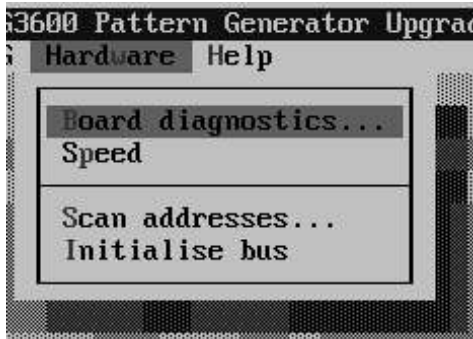   e.g.   C>**upg3600** ⏎   or   C>**pg** ⏎

See Section C for more complete information about the commands available in this software. The portions relevant to checking out the hardware installation are summarised below.

The introductory screen of Figure C.1 will appear. Press ⏎   to acknowledge the message.

If a message appears at startup indicating a problem in accessing the UPG3600-PIOA card, recheck the board configuration (see Appendix I) and then rerun UPG3600.EXE.
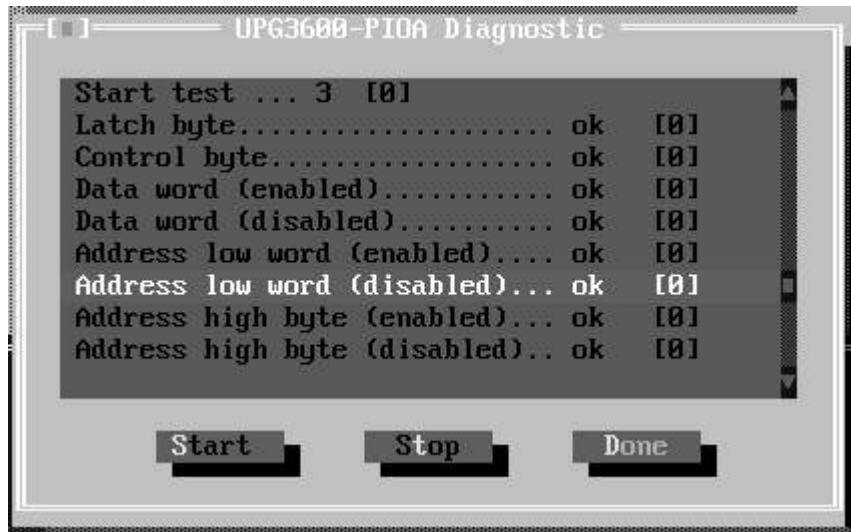
```
┌─[■]══════════════ Error ══════┐
│                                │
│   Unable to identify UPG3600-PIOA  │
│         board at port CC00      │
│      [ID number not detected]   │
│                                │
│            ┌─────────┐          │
│            │   OK    │          │
│            └─────────┘          │
│                                │
└────────────────────────────────┘
```

The normal 'System Loaded' message (Figure C.2) will appear. Press e   to accept this message and then continue as follows:

```
3600 Pattern Generator Upgrad
  Hardware  Help

     ┌──────────────────────┐
     │ Board diagnostics...  │
     │ Speed                 │
     │──────────────────────│
     │ Scan addresses...     │
     │ Initialise bus        │
     └──────────────────────┘
```

| press a   W or select *__Hardware__* from the menu
| press B or select *__Board diagnostics ...__* from the menu
| press e   to acknowledge the warning to remove the UPG3600-PIOB card from the pattern generator

| press S or select the [Start] button to begin a series of repetitive tests of the operation of the UPG3600-PIOA board.

```
┌─[■]═══════ UPG3600-PIOA Diagnostic ═══════┐
│                                            │
│  Start test ... 3 [0]                      │
│  Latch byte...................... ok   [0] │
│  Control byte.................... ok   [0] │
│  Data word (enabled).......... ok   [0] │
│  Data word (disabled)......... ok   [0] │
│  Address low word (enabled).... ok   [0] │
│  Address low word (disabled)... ok   [0] │
│  Address high byte (enabled)... ok   [0] │
│  Address high byte (disabled).. ok   [0] │
│                                            │
│    ┌────────┐   ┌────────┐   ┌────────┐   │
│    │ Start  │   │  Stop  │   │  Done  │   │
│    └────────┘   └────────┘   └────────┘   │
└────────────────────────────────────────────┘
```

The testing will run continuously until the user selects the [Stop] or [Done] button. All tests should show **'ok'** in a properly functioning board.

If any of the tests show *FAIL* instead of the normal *ok* message, then do the following:

> | Select the [Done] button to return to the empty desktop
> | Press a   X to exit the programme
> | Return to Section B.2, check for proper configuration of the UPG3600-PIOA board
>   and repeat the installation
> | Refer to Section B.6 if proper recognition of the interface card cannot be
>   accomplished or if failures are noticed during any of the diagnostic tests.

If the hardware repeatedly passes all tests, then stop the test (select the [Done] button), exit the programme (press a   X) and power down the IBM-PC. The UPG3600-PIOB card can now be installed in the pattern generator.

B.5 Pattern Generator Connections

In order to make the connection between the PC and the pattern generator, refer to Figure B.4 and perform the following steps :
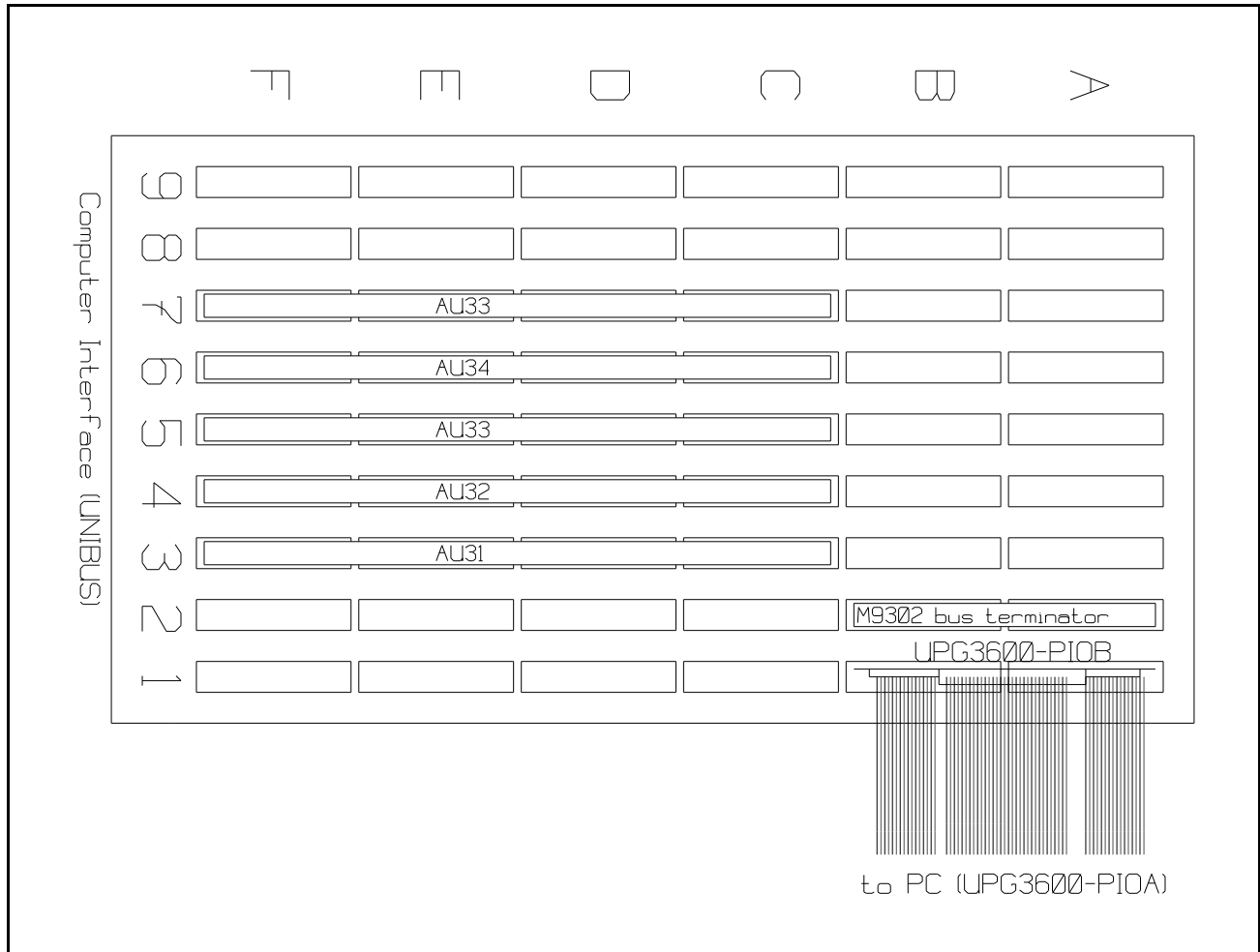

Figure B.4 : Typical Pattern Generator Computer Interface Connection

| At the pattern generator, ensure that the main power switch is off i.e. the pattern generator is completely powered down.

| Locate the large, usually white, ribbon cable that extends the UNIBUS from the PDP-11 controller to the expansion chassis inside the Computer Interface (CI) (typically designated as 9280). Note the position of this cable in the CI chassis, then remove it and replace it with the UPG3600-PIOB card. Note also that the UPG3600-PIOB edge connector is keyed and should be inserted so that its component side is facing the same direction as the component sides of all other boards in the chassis (see Figure B.4).

| Return to the IBM-PC, power it up and run the programme UPG3600.EXE as before. The
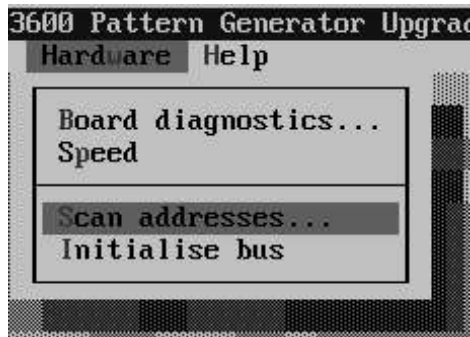   normal startup message (Figure C.1) should again appear.

An additional message should appear noting that the pattern generator has not been powered up.

| Turn on the main power to the pattern
       generator

| Acknowledge the message by pressing
       e   .
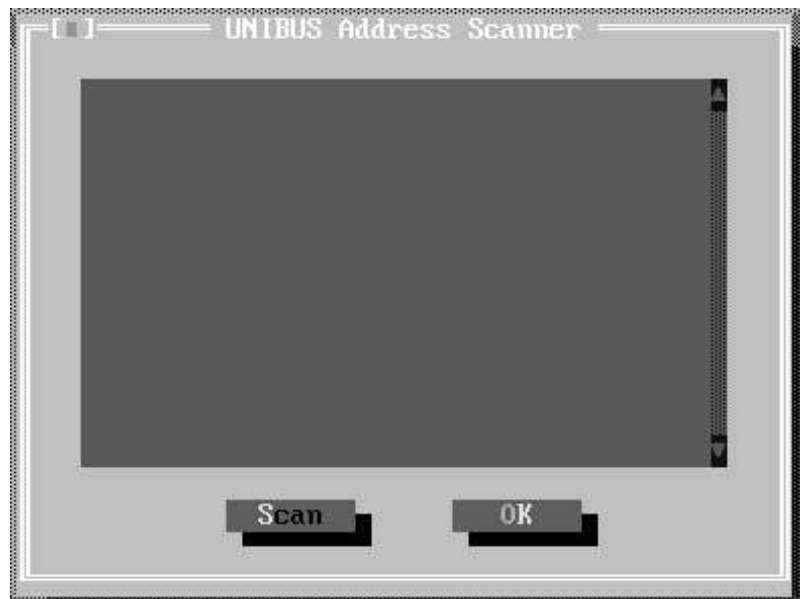

Press e   to acknowledge the message that appears concerning loading of the operating system,
then continue as follows:

| press a   W or select ***Hardware*** from the menu
| press S   or select ***Scan addresses...*** from the menu

| press S   or select the [Start]
       button to start scanning the
       interface electronics of the
       pattern generator

The UPG3600 software will perform a basic functionality check of the boards inside the computer interface of the pattern generator. Proper access to the pattern generator will be indicated by items (octal address ranges and decimal word counts) appearing in the dialogue box on the screen. A typical pattern generator installation will show some or all of the interface boards shown in Figure B.5.

767700..767756	24 words	XY stages and laser, shutter
767762..767764	2 words	3600PQ, aperture, flash, APC auto plate changer
767770..767776	4 words	3600PQ, aperture, flash, APC auto plate changer

Possible Options		
767500..767502	2 words	programmable focus control
767510..767512	2 words	site by site aligner
767600..767616	8 words	ARC auto reticle changer
767672..767674	2 words	AWH aperture joystick

Figure B.5 : Typical UNIBUS Scan Results

The scan list may also simply indicate 32 words occupying the addresses from 767700 through 767776, with an accompanying message indicating that 2 addresses responded only to DATIP UNIBUS read cycles. This is normal for some machines. If the pattern generator boards are properly recognised and listed, then the installation is complete. Select the [OK] button to dispose of the diagnostics dialogue.

The user can now refer to Section C of this document to begin operating the pattern generator and creating photomasks.

Once the user is satisfied that the UPG3600 Upgrade Kit is operating properly, the original equipment's PDP-11/04 controller and related peripheral devices (e.g. magnetic tape drive, VT100 console terminal, lineprinter etc.) can be removed.

The original documentation related to operation of the pattern generator should be retained as the new installation will accept the same commands and operate in the same manner as the original.

B.6 Problems

If the system fails to show proper operation at any stage, then check to ensure the following before calling H&L Associates for help:

IBM-PC
☞   the I/O area of the UPG3600-PIOA board is reserved for use by only the UPG3600-PIOA card

The UPG3600-PIOA card is not 'Plug and Play' (PnP) compatible so care should be taken to ensure that the I/O range occupied by the board is not assigned to some other device. Under Windows 95/98 (Win9x), an I/O range of CC00 to CCFF can be reserved using the Device Manager under Control Panel. The PC can then be re-started in DOS or Command Prompt Only mode.

UPG3600-PIOA Board
☞   the board is properly addressed

☞   if the address of the board has been changed, then the */m=$xxxx* command line option has been specified when running UPG3600.EXE

☞   the board is properly seated in the 16-bit ISA slot of the IBM-PC

☞   the ribbon cables are properly seated and oriented with the red line on the cable lining up with the pin-1 indicator on the header

UPG3600-PIOB Board
☞   the ribbon cables are properly seated and oriented with the red line on the cable lining up with the pin-1 indicator on the header

☞   the ribbon cables are going to the correct headers on the UPG3600-PIOA board