H & L Associates' UPG3696
Upgrade Kit for the
GCA 3696/4800/6000 Steppers
(9280 Interface)

Installation, Operation and Technical Manual

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Document Conventions

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>upg3696 {/m=$CC00}

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Section A - Introduction

A.1 Product Description

The GCA 3696/4800/6000 stepper (also referred to as a photorepeater or a step-and-repeat camera) produces master patterns for integrated circuit fabrication and consists of a system controller, a rack of electronics (with a GCA 9280 interface chassis) and a micro-reduction camera.

H&L Associates' UPG3696 package is designed to increase the efficiency and reliability of the stepper by providing the hardware and software necessary to replace the original Digital Equipment Corporation (DEC) PDP-11 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, floppy disk 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 UPG3696 package comprises the following:

- UPG3600-PIOA printed circuit board for installation inside the PC
- UPG3600-PIOB printed circuit board for installation inside the stepper
- 3 (three) 40-conductor ribbon cables to connect these boards together

The companion UPG3696 System Software duplicates the operation of the original equipment software, but differs from the original in that:

- 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.
- floppy disk (RX02 style, 8" size) 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

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

A.3 System Requirements

A.3.1 Hardware

In order to install the UPG3696 software and accompanying I/O board, the user must provide a PC/MS DOS compatible, Intel 80x86 based computer with the following ***minimum*** specifications :

- a Pentium II CPU with a clock speed of 200 MHz or greater
- one 16-bit ISA bus expansion slot
- PC/MS DOS Version 6.0 or higher, including Win9x DOS
- CGA,EGA/VGA or Monochrome video display
- one 1.44M floppy disk drive or network connection

The UPG3696 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:

- NO Interrupt Request (IRQ) jumpers installed
- Port I/O base address 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

UPG3696 programmes should be run under a version of PC/MS-DOS greater than or equal to 6.0. This includes Windows 95/98 running in DOS ‘Command prompt only’ mode. It is recommended that the entire contents of the UPG3696 System Software diskette be copied to a suitably named directory (e.g. C:\UPG3696) on the user's hard disk. The supplied INSTALL.EXE programme will perform this operation, as well as modify certain system files in order to simplify the operation of the software.

NOTE

Since the control and test software operate in real time, it is recommended that the UPG3696 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. As well, **DO NOT** operate the photorepeater software in the 'DOS box' of a multitasking operating system e.g. MS Windows. Either of these situations may slow system response and produce erroneous photomasks.

The stepper control software works best in DOS real mode (Command prompt only mode if running Windows 95/98). Since the UPG3600-PIOA board is a legacy ISA device, users running Windows 95/98 should also manually reserve I/O port space (using the Device Manager of the Control Panel) in the range CC00 to CCFF for the sole use of the UPG3600-PIOA board.

Section B - Installation

B.1 Introduction

Before beginning the UPG3696 installation, the installer should have a basic knowledge of IBM-PC hardware and PC/MS DOS software. The original instruction manual for the stepper will be required in the future for regular system maintenance and calibration. Before making any changes, it may also be necessary to consider the method that will be used to transfer job files from the current stepper system to the PC upgraded system (see Section D.2.5). If the method used involves capturing job files from the existing system then that should be done first before any changes are made to the stepper installation.

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

Appendix III describes the UPG3696 user interface and how to invoke commands using a mouse or the keyboard.

B.2 Software Installation

It is recommended that the entire contents of the UPG3696 System Software diskette be copied to a suitably named directory (e.g. C:\UPG3696) on the user's hard disk. Alternatively, the upgrade software comes with an INSTALL programme which can be run. Inserting the floppy in the diskette drive and typing ‘install’ at the DOS command line:

e.g. A:\>install e or B:\>install e

will invoke the software install programme and a user screen similar to Figure B.1 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.

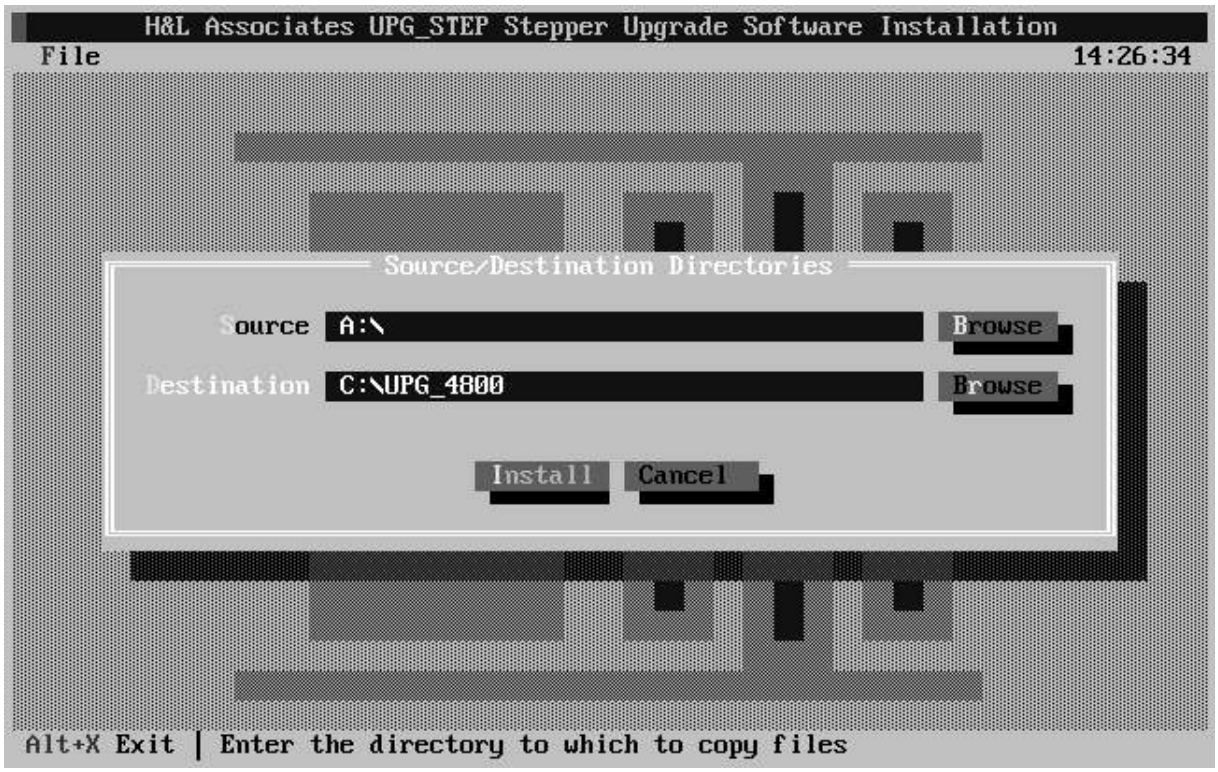
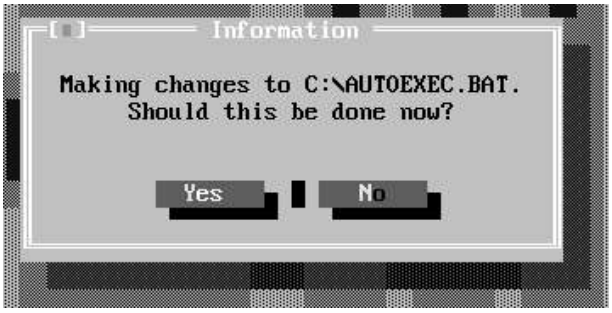
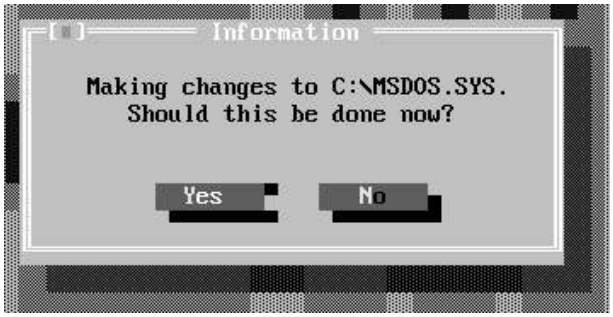


Figure B.1 : Software Installation User Dialogue

The install programme will also optionally make changes to two system files in the user's root directory (C:\) - AUTOEXEC.BAT and, if Win9x is installed, MSDOS.SYS.



The changes to AUTOEXEC.BAT will cause an ANSI display driver to be installed on startup and a modification of the PATH environment variable to include the upgrade destination directory. The user should then be able to invoke the stepper control software from the DOS command line by simply typing 'STEPPER'. 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 again.



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 stepper 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 again.

B.3 Hardware Installation

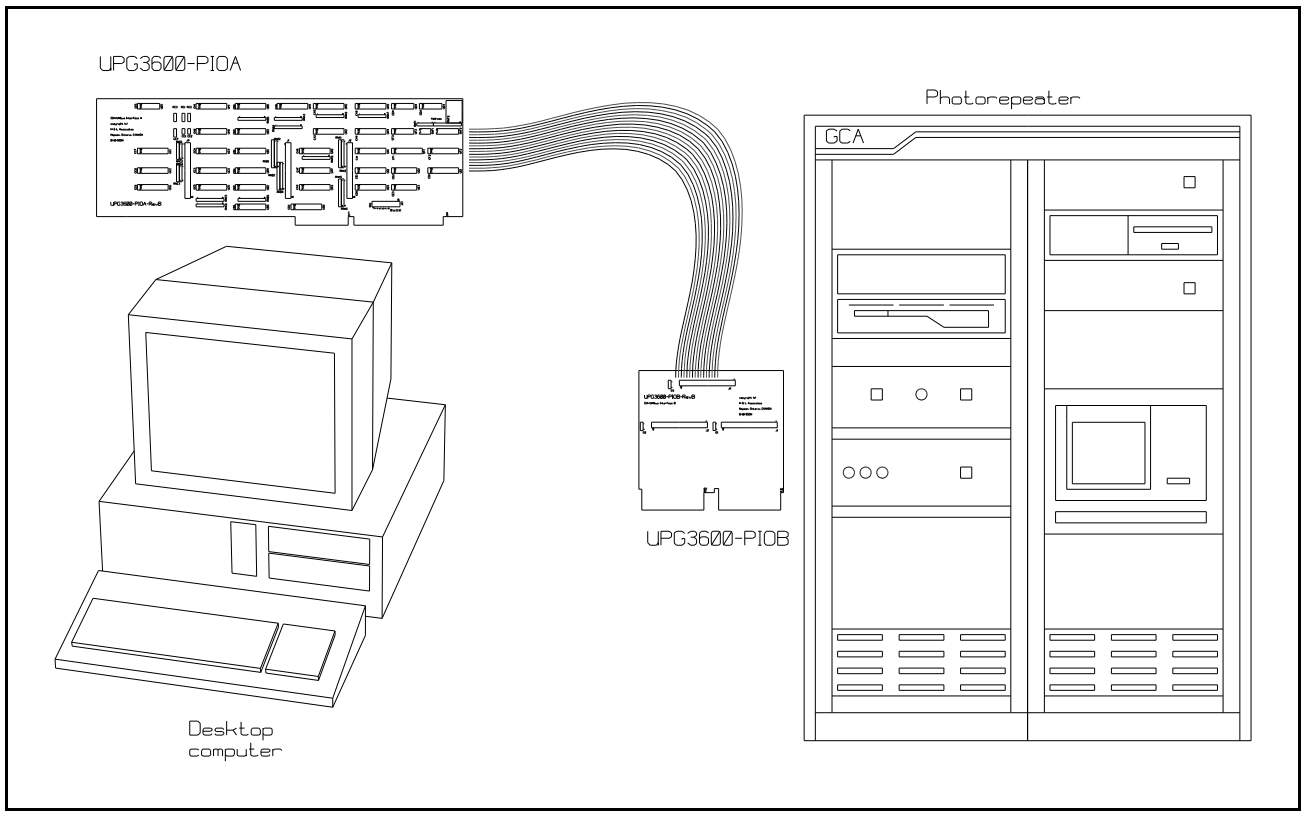


Figure B.2 : Typical UPG3696 Hardware Installation

The UPG3600-PIOA card is installed in the IBM-PC and serves as the interface to the electronics within the stepper. Ribbon cables running from this card plug into the UPG3600-PIOB card which, in turn, plugs into the 9280 Computer Interface Unit of the stepper, at the same location as the original PDP-11 cable (see Figure B.2). The installation process involves the following steps:

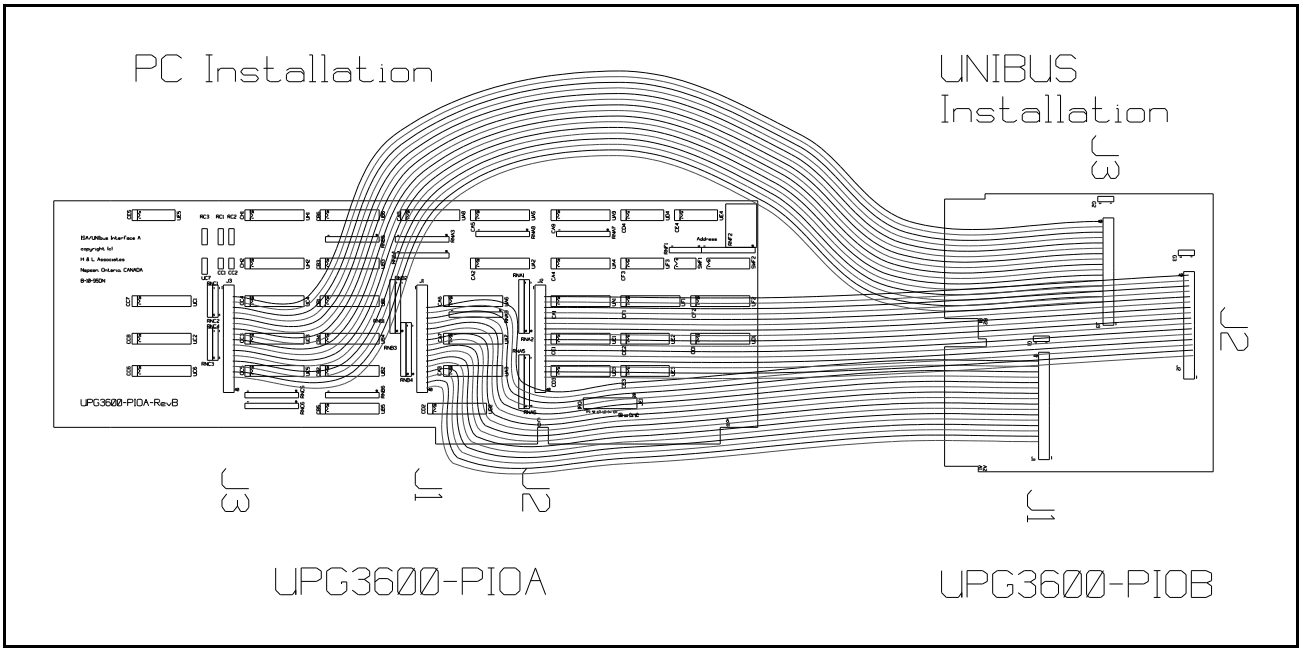


Figure B.3 : UPG3600-PIOA and UPG3600-PIOB Interface Boards

| Confirm the proper configuration of the UPG3600-PIOA card (see Appendix I) so that it doesn't interfere with the operation of any cards 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.3. 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.3.1 Optional Hardware

For those stepper installations having the optional Programmable Focus Control (PFC) feature or the Programmable Offset Control (POC) feature, refer to Appendix II for the installation instructions. The UPG_PFC is required for PFC operation and is a small unit that attaches to one of the parallel printer ports on the PC. The UPG_POC is required for POC operation and is a 16-bit ISA board which is installed in the PC much like the UPG3600-PIOA board. A stepper installation may have a PFC or a POC but not both.

B.3.2 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 UPG3696.EXE (with the optional */m=$xxxx* parameter if required) by typing **'UPG3696'** after the DOS prompt

e.g. C>**UPG3696** e

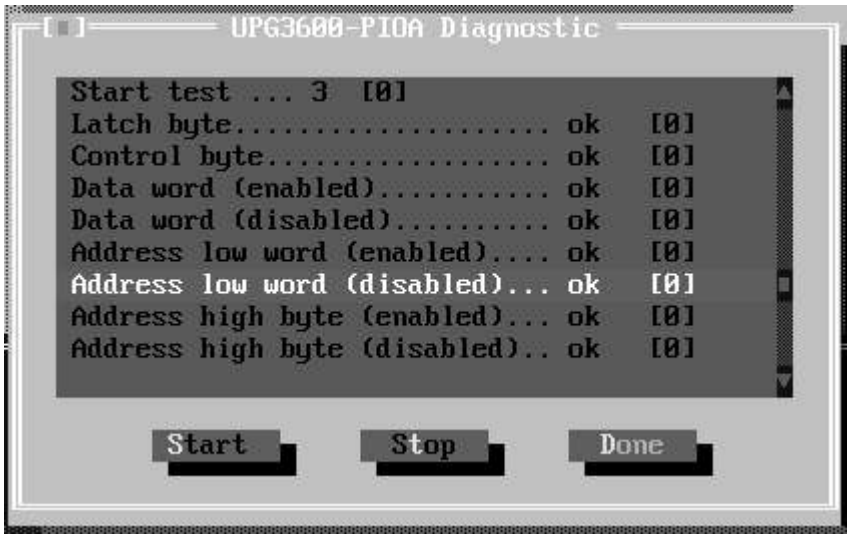
See Section C for more complete information about the commands available in this software. The portions relevant to checking out the hardware installation are summarised below.

The introductory screen of Figure C.1 will appear. Press e 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 UPG3696.EXE.

| 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 stepper

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



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.4 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 stepper.

B.3.3 Stepper Connections

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

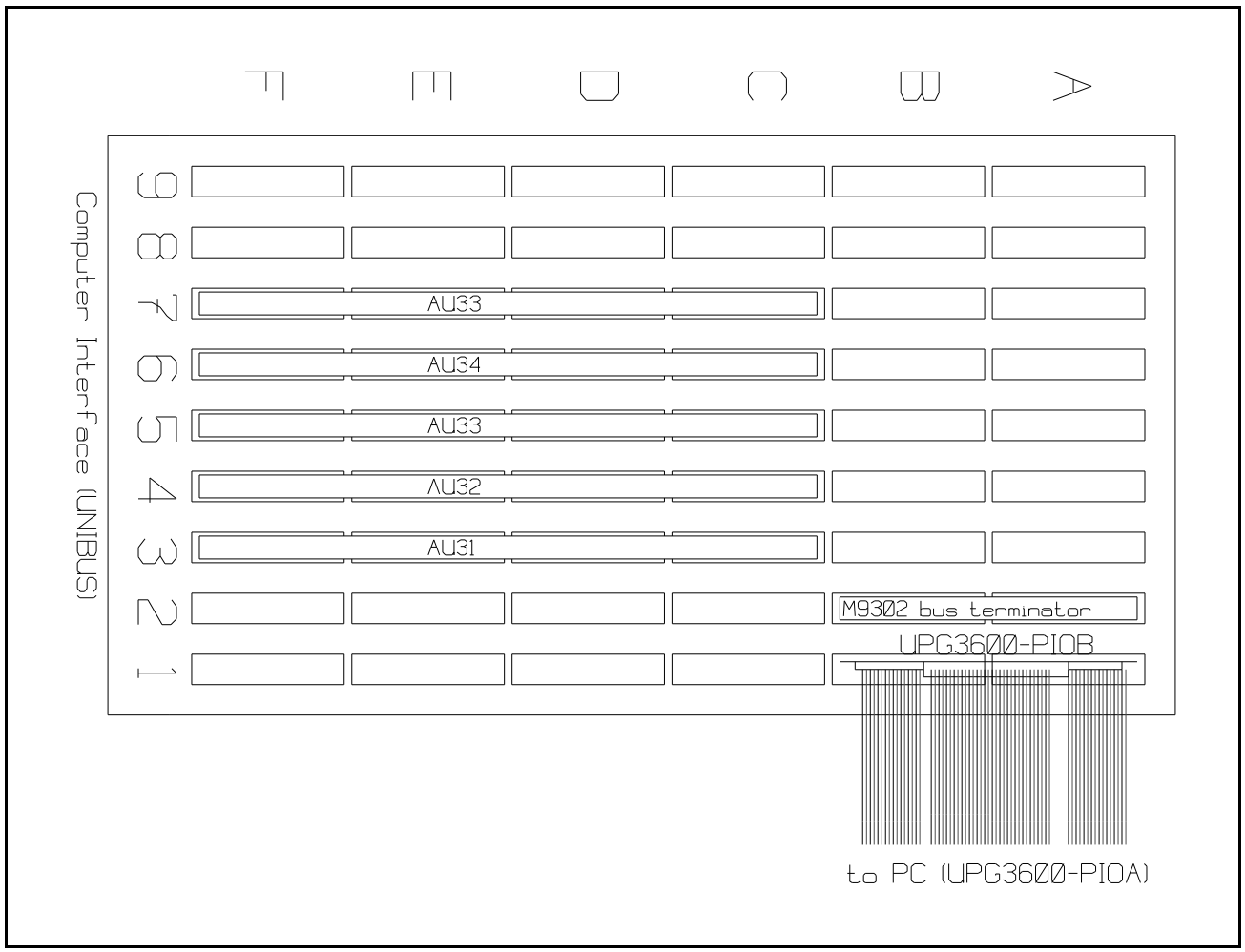


Figure B.4 : Typical Stepper Computer Interface Connection

- At the stepper, ensure that the main power switch is off i.e. the stepper 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 9280 Computer Interface (CI). 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 UPG3696.EXE as before. The normal startup message (Figure C.1) should again appear.

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

| Turn on the main power to the stepper

| Acknowledge the message by pressing e .

| 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 stepper

The UPG3696 software will perform a basic functionality check of the boards inside the computer interface of the stepper. Proper access to the stepper will be indicated by items (octal address ranges and decimal word counts) appearing in the dialogue box on the screen. A typical stepper installation will show some or all of the interface boards shown in Figure B.5.

767500..767506	4 words	programmable focus control
767510..767512	2 words	site by site aligner
767600..767616	8 words	ARC auto reticle changer
767700..767736	16 words	XY stages and laser, shutter

Figure B.5 : Typical UNIBUS Scan Results

If the stepper 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 stepper and creating photomasks.

Once the user is satisfied that the UPG3696 Upgrade Kit is operating properly, the original equipment's PDP-11/04 controller and related peripheral devices (e.g. floppy disk drives, VT100 console terminal, lineprinter etc.) can be removed.

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

B.4 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 port base address of the UPG3600-PIOA board does not conflict with any other device in the desktop PC. The UPG3600-PIOA board is not 'Plug-n-Play', so accommodation of this legacy device must be made. Under Windows 95/98 , the Device Manager can be used to manually reserve resources for the UPG3600-PIOA board (I/O range CC00-CCFF)

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 UPG3696.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