Installing the GPIB-1014P and NI-488M Handler in Sun Workstations

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Part Number 370955A-01

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Section One
Introduction

This guide details the steps necessary to install National Instruments NI-488M SunOS software and the GPIB-1014P-1 interface board in Sun Workstations.

What Your Kit Should Contain

Your NI-488M Handler kit should contain the following items:

Item	Part Number
Installing the GPIB-1014P and NI-488M Handler in Sun Workstations	320170-01
NI-488M Software Reference Manual	320062-01
One of these software media:	
• Streaming tape for the NI-488M SunOS software	460130-14
• 9 track tape for the NI-488M SunOS software	430130-14

Make sure each of these items is in your kit. If any item is missing, contact National Instruments.

Distribution Software

The distribution medium is in tar format. The file structure of the distribution tape is shown below

```
SUN3s        SUN4s        install_gpib
```

Each Sun directory contains seven files, which are listed and described briefly below. An interactive program, install_gpib, will install the GPIB software automatically.

```
gpibx.o       NI-488M handler (where x refers to the type of Sun machine)
cib.c         C language library
ugpib.h       Include file for user programs
ibtsta        Installation test part A
ibtstb        Installation test part B
ibic          Interactive control utility
ibconf        Software configuration utility
```

Related Documents

This guide is to be used with the following manuals:

- National Instruments *GPIB-1014P User Manual*, Part Number 320026-01

- Sun System manuals for the SunOS 4.x operating systems

Section Two
Hardware and Software Installation

Considerations

This guide assumes that the user has super-user privileges (logged in as `root`) and that all the software needed for adding device drivers is already installed.

Set Up a Working Directory

1. Log on as super-user (`root`).

2. Create a working directory (for example, `/usr/gpib`) and change to that directory.

3. Extract the distribution files from the distribution medium using the `tar` command.

Install the GPIB Software

For easy, automatic installation of the software, run the install program. Otherwise, refer to the steps for manual installation.

Automatic Installation

Run the program `install_gpib`. The program will prompt you for the information it needs to install the GPIB software.

Manual Installation

Install the Utility Files

1. Copy the file `ugpib.h` to `/usr/include/sys/ugpib.h`.

2. If you have a Sun-3 machine, copy the file `gpib3.o` to `/sys/sun3/OBJ/gpib.o`.
   If you have a Sun-4 machine, copy the file `gpib4.o` to `/sys/sun4/OBJ/gpib.o`.

3. Copy the files `ibic` and `ibconf` to a directory in the command search path (for example, `/bin` or `/usr/bin`).

Refer to subsequent steps for instructions on the remaining files.

Install the C Library

The file `cib.c` should be compiled and turned into a library as demonstrated in the following steps. This is necessary because the information in the *NI-488M Software Reference Manual* assumes that a library has already been created for the C language interface.

```
cc -c cib.c
ar r /lib/libgpib.a cib.o
ranlib /lib/libgpib.a
```

Alternately, `cib.o` can be added to an existing library or included during the link phase of each compile operation.

Install the NI-488M Driver for SunOS 4.x

The following steps build a new SunOS 4.x UNIX kernel with the NI-488M driver installed.

1. Change to `/sys/sun` directory and edit the file `conf.c`. Find the block of function definitions preceding the character device table *cdevsw* and add the following lines:

```
#include "ib.h"
#if NIB > 0
int ibopen(), ibclose(), ibread(), ibwrite(), ibioctl();
#else
#define ibopen      nodev
#define ibclose     nodev
#define ibread      nodev
#define ibwrite     nodev
#define ibioctl     nodev
#endif
```

The file `ib.h` is a file created automatically by the system in step 6. The file `ib.h` will contain the single line:

```
#define NIB x
```

where x is the number of GPIB boards configured in the UNIX kernel.

At the end of the character device table *cdevsw*, located in the file `conf.c`, add the following lines:

```
{ ibopen,      ibclose,     ibread,     ibwrite,    /*xx*/
  ibioctl,     nodev,       seltrue,    0,
  0,
},
```

Note: This table has the same structure as the character device table *cdevsw* in `/usr/include/sys/conf.h`.

Each device in the system has a major device number. To determine the major device number of the GPIB board, choose the number after the largest device number currently in your system. All GPIB boards and devices use the same device number. In this example, the major device number is xx, as shown in the comment `/*xx*/` previously.

2. Use the following command, replacing *xx* with your major device number from step 1, to create a special node for device gpib0:

   ```
   mknod /dev/gpib0 c xx 255
   ```

3. If you have a Sun-3 machine, change to /sys/sun3/conf. If you have a Sun-4 machine, change to /sys/sun4/conf. Edit the file files. Add the line:

   ```
   sundev/gpib.c  optional ib device-driver
   ```

4. Create a configuration file named GPIB by copying an existing configuration. GENERIC is the default generic Sun configuration file. If you already have a local configuration different from GENERIC, copy it instead.

   ```
   cp GENERIC GPIB
   ```

5. Edit the file GPIB and add the following line to the end of the file:

   ```
   device ib0 at vme16d16 ? csr 0x2000 priority 2 vector ibintr 0xC8
   ```

   This line indicates a GPIB controller is at VME address 0x2000, interrupt level 2, and interrupt vector 0xC8. The GPIB-1014P-1 uses addresses 0x2000 through 0x2010. If any of these addresses is already in use, select a different base address. For an additional GPIB controller, add another line similar to the one above. The device name would be ib1, the interrupt level can stay the same but the VME address and the interrupt vector would have to change.

6. Create the new system and be sure to save the old version of /vmunix as shown below.

   ```
   config GPIB
   cd ../GPIB
   make
   cp /vmunix /vmunix.old
   cp vmunix /vmunix
   ```

Turn the System Off

1. The new UNIX kernel, /vmunix, is ready to be started. Halt the system:

   ```
   halt
   ```

2. Shut down the system and turn the power off.

Configure and Install the Hardware

Refer to Section Three of the *GPIB-1014P User Manual* for the following steps.

1. Jumper the board to select the following configuration:

    *   privileged access upon power up

    *   the same base address as in the software configuration

    *   interrupt request line IRQ2*

    *   interrupt priority code for IRQ2*

    *   Status/ID Byte of C8 (hex)

    *   GPIB cable shield isolated

2. With the power off, remove the panel from the rear of the machine.

3. Plug the GPIB-1014P-1 into an empty slot. This slot should be higher than 6 (7 through 12) if the card cage has 12 slots.

4. Open the front hatch of the Sun and remove all jumpers for this slot.

5. Reattach the front and rear panels.

Verify the Software Installation

Restart the Sun computer. The following message should appear on the screen:

```
ib0 at vme16d16 csr 0x2000 pri 2 vector 0xC8
```

If it does not appear, check that the GPIB-1014P-1 address jumper settings are the same as specified in step 5.

There are two software installation tests: `ibtsta` and `ibtstb`. `ibtsta` checks for a correct node `/dev/gpib0` and correct access to the device driver. `ibtstb` checks for correct Direct Memory Access (DMA) and interrupt operation. It requires a GPIB bus analyzer and can be omitted if an analyzer is not available.

Change to `/usr/gpib` and run `ibtsta` with the command:

```
ibtsta
```

If `ibtsta` completes with no errors, and a bus analyzer is available, run `ibtstb` with the command:

```
ibtstb
```

Configure the Software

Once the software is correctly installed, run the software configuration program `ibconf` (you must have super-user privileges). `ibconf` is a screen-oriented utility that you can use to inspect and modify default software parameters. In addition, it creates all the other device nodes needed by the software.

`ibconf` is largely self-explanatory; it has help screens to explain all commands and options. Run `ibconf` with the command:

```
ibconf /vmunix
```

where `/vmunix` can be any UNIX kernel with the NI-488M driver installed. Refer to the *NI-488M Software Reference Manual* for more details.

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Edition Date   **April 1990**

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Mail to: Technical Publications
            National Instruments Corporation
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