TAMS
Test & Measurement Systems Inc.

TAMS 83488
USB/GPIB Controller for Linux

Installation & Operation

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Introduction

The TAMS x3488 USB/GPIB controller is intended to add IEEE-488 (General Purpose Instrument Bus - GPIB) capabilities to any computer with a USB port running a supported version of Linux.

The TAMS USB/GPIB Controller takes full advantage of High Speed USB 2.0 bus performance and delivers the highest possible level of throughput.

Whether you are using TAMS BASIC/LX or programming in C with the TAMS I/O Libraries, your code will now run at full performance.

Hardware Warranty

All TAMS products use the highest quality components and are assembled to the highest specifications. Should a defect exist, or a failure occur, we apologize. Any defective unit will be repaired or replaced immediately.

Please follow the instructions below for service response.

- In the US please return it to TAMS. Please call or Fax for return instructions.
- Internationally, please contact the local distributor for return instructions.

Any customer may contact TAMS, or return products directly to TAMS, but for customers outside the US, this may cause a delay, which could be avoided by working with the local distributor listed in Appendix G.

The complete hardware warranty information is in Appendix C.

For software warranty information see the Software License in Appendix B.

Software Installation

Please install the TAMS 83488 software *before* connecting the USB/GPIB Controller to the computer's USB port. The TAMS 83488 software depends upon the TAMS I/O Libraries (82091). You need to have installed the TAMS I/O Libraries before you can install the TAMS 83488 software.

Note You must have root permission to install the software. In addition, you must have permission to write to the directories in Appendix A.

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1. Make sure that the I/O Libraries (T82091) for Linux is installed.

   ```
   rpm –q T82091
   ```

2. Insert the installation media into the drive and wait for the busy light to remain off.

3. If your system does not automount the CD-ROM, mount the CD-ROM, for example:

   ```
   /bin/mount  /dev/cdrom /mnt/cdrom
   ```

   `/dev/cdrom` is the device file for your CD-ROM drive and `/mnt/cdrom` is a directory used as a mount point.

4. Change to the directory where the driver is.

   ```
   cd /mnt/cdrom/83488
   ```

5. Use RPM to install the driver. Architecture-specific versions of the software have been provided for systems running the supported kernels; the `whichrpm.sh` program returns the name of the correct RPM for your system. (Note the use of backquotes rather than single quotes.)

   ```
   /bin/rpm -Uvh `./whichrpm.sh`
   ```

6. The T83488 RPM will automatically load the t83488 kernel module and create the necessary device files. Each time you start up your computer after this, the t83488 kernel module will be loaded and related device files will be created.

7. Once the installation is complete, unmount the CD.

```
cd /
/bin/umount /mnt/cdrom
```

8. Once the CD is unmounted, remove the media from the drive and store it in a safe place.

In general, the installation procedure places the files in the necessary directories by default. Appendix A is a reference for the Linux systems administrator, who might wish to know where these files are placed.

You will still need to configure the new TAMS USB/GPIB Controller as a SICL interface, as covered in section **Configuring the Interface**.

Hardware Installation

Once the TAMS 83488 software installed, the TAMS x3488 USB/GPIB Controller can be connected to the computer. Connect the USB cable to the TAMS x3488 USB/GPIB controller and to the host computer's USB port.

ESD Warning Most interfaces contain components that are sensitive to damage from electrostatic discharge. Use protective measures including an anti-static workstation and a personal grounding device, if possible.

If there are not enough USB ports on the computer, the TAMS x3488 USB/GPIB Controller can be connected to a self powered USB hub. The self powered hub should then be connected to the computer's USB port with a separate USB cable. It is also necessary to apply power to the hub.

The TAMS x3488 is a USB High Speed capable device. You may plug your TAMS x3488 USB/GPIB Controller into either a full speed (12Mbps) or a high speed (480Mbps) port. The TAMS x3488 will automatically switch to Full Speed (12Mps), if it is plugged into a Full Speed port or a Full Speed hub.

Once the TAMS x3488 USB/GPIB Controller is connected to the computer or USB hub, the lights will flash green, then red, and then the power light will glow green. This indicates that the TAMS x3488 USB/GPIB controller is ready.

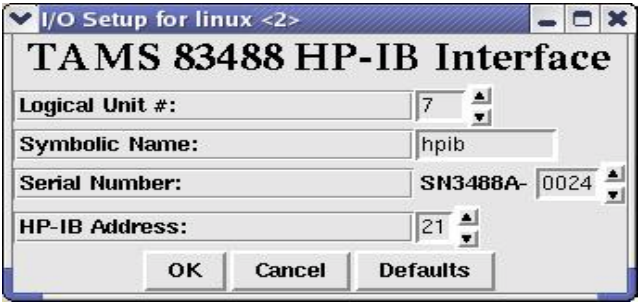
Configuring the Interface

There are two methods for configuring the card. Using the iosetup tool is the recommended method. Alternately, the hwconfig.cf file can be manually edited.

Configuring the Interface Using iosetup

After installation of the driver software and loading of the t83488 kernel module (handled automatically by the RPM package), the SICL iosetup command must be executed to configure the TAMS controller as a SICL instrument card. See the man page on iosetup (1M).

The t83488 driver is implemented as a custom TULIP driver. Therefore, the system does NOT need to be rebooted after changing the configuration using iosetup. However, the SICL iclear command should be used after making changes to ensure that the configuration changes have taken effect. See the man page on iclear (1).



t83488 Driver Configuration

The following information must be supplied by the user during the iosetup process:

1. Logical Unit #: the user must supply a logical unit number for the TAMS card that is distinct from all other logical unit numbers currently configured under SICL.

2. Symbolic Name: the user must supply a symbolic name for the TAMS card that is distinct from all other symbolic names currently configured under SICL.

3. Serial Number: the user must enter the serial number printed on your TAMS x3488. This is of the form SN3488A-0000. The last 4 digits will vary with each unit.

4. HP-IB Address: the user must specify the HP-IB bus address that the TAMS card is to use on the HP-IB bus. This value must not be the same as any other device connected to the HP-IB buss being controlled by the TAMS x3488. It may be the same as other HP-IB interfaces in the computer, so long as those other interfaces are not attached to the TAMS x3488 via the HP-IB cables.

   Since the TAMS x3488 will be the system controller, it is traditional to give it HP-IB buss address 21. This is not required, but does serve to reduce confusion.

Configuring the Interface Manually

Alternatively one can edit `/etc/opt/sicl/hwconfig.cf` directly.

In `/etc/opt/sicl/hwconfig.cf` the configuration lines have the form:

<lu> <name> t83488 0 <hpib_addr> <serial_number>

The fields are defined as:

1. Logical Unit (lu): the user must supply a logical unit number for the TAMS card that is distinct from all other logical unit numbers currently configured under SICL. A good choice for this, if your system only has one HP-IB card, is 7.

2. Symbolic Name (name): the user must supply a symbolic name for the TAMS card that is distinct from all other symbolic names currently configured under SICL. A good choice for this, if your system only has one HP-IB card, is “hpib” (without the quotes).

3. HP-IB Address: the user must specify the HP-IB bus address that the TAMS card is to use on the HP-IB buss. This value must not be the same as any other device connected to the HP-IB cable. It may be the same as other HP-IB interfaces in the computer, so long as those other interfaces are not attached to the TAMS x3488 via the HP-IB cables.

   Since the TAMS x3488 will be system controller, it is traditional to give it HP-IB bus address 21. This is not required, but does serve to reduce confusion.

4. Serial Number: the user must enter the serial number printed on your TAMS x3488. This is of the form SN3488A-0000. The last 4 digits will vary with each unit.

The system does not need to be rebooted after editing the `hwconfig.cf` file.

Connecting GPIB Instruments

Once the TAMS 83488 USB/GPIB Controller software and hardware has been successfully installed, instrument communications can begin by connecting the GPIB instruments to the controller's GPIB connector.

If you are communicating with one GPIB instrument, the TAMS x3488 USB/GPIB Controller can be connected directly to the instrument's GPIB connector. If you want to communicate with multiple GPIB instruments then you need to use additional GPIB cables. The GPIB cables should be used to daisy chain multiple instruments together. The TAMS x3488 USB/GPIB Controller should be the last item connected. An example configuration is shown below:

Supplemental Information

This section provides supplementary information on the TAMS x3488 USB/GPIB Controller. The TAMS x3488 only functions as the GPIB System Controller.

The TAMS x3488 supports standard GPIB modes of operation, except for:

- Passing of Active Controller
- Non-System Controller Mode, which prevents using SICL Commander sessions or VISA Servant Sessions.

The T1 delay is set at 350 nsec. This cannot be changed.

There is a minimum timeout period. If you set a timeout value smaller then the minimum timeout, then the timeout value will be raised to the timeout floor. The minimum timeout period is needed to ensure reliable USB transactions when running at Full Speed.

USB High Speed and Full Speed

The USB standard defines three speeds: High Speed (480Mbs), Full Speed (12Mbs), and Low Speed (1.5Mbs). The TAMS x3488 USB/GPIB Controller will operate in either High Speed or Full Speed and will automatically use the highest speed possible.

In order to use High Speed, the Computer and USB Hub (if used) must support High Speed.

USB Hubs

USB Hubs can be bus powered or self powered. Bus powered means that power is supplied from the USB Bus and typically each port on the hub can only provide 100mA. Self powered hubs means that they supply their own power and typically have an external power supply that is connected to an outlet. Self powered hubs typically provide 500mA of power per port.

The TAMS x3488 USB/GPIB Controller requires 500mA. Because of this reason, the TAMS x3488 USB/GPIB can not be used with bus powered hubs.

Troubleshooting

This section describes some troubleshooting techniques for the TAMS x3488. The latest information is available at the TAMS website at: http://www.tamsinc.com/hpib/83488/

Problem: The lights on the TAMS x3488 USB/GPIB Controller do not light up or do not flash on startup.

Solution: The most likely cause of this problem is the x3488 is not connected to the computer and thus does not have power.

Is the USB cable securely connected between the x3488 and the computer? Try unplugging the USB cable and reconnecting it. Try a different USB port on the computer.

Is the x3488 USB/GPIB Controller connected to a USB hub? If it is connected to a hub, is the hub connected to the computer? Does the USB hub have power connected to it?

Does Linux detect a new USB device, but the lights are off on the x3488? The most likely situation is that your computer's USB port is not supplying 500 mA. Please contact your computer manufacturer for information on your USB ports. You may have to use an external powered USB hub.

Problem: The green power light on the TAMS x3488 unit is on, but the program is unable to communicate with instrument through SICL or VISA.

The most likely cause of this problem is an incorrect configuration setting.

Is the instrument connected to the TAMS x3488? Verify the physical connection between the instrument(s) and the TAMS x3488 USB/GPIB controller.

Did you run iosetup? SICL (and, if being used, VISA) need to be configured before the TAMS x3488 USB/GPIB Controller is operational.

If you are using multiple GPIB instruments, make sure that each device has its own unique GPIB address. Each GPIB device must has a unique GPIB address. The GPIB Address for the TAMS x3488 can be found using the iosetup utility.

Is the address string correct? (e.g. "gpib0,20" for SICL or "GPIB0::20::instr" for VISA) Existing programs may have hard coded address strings. You can use the iosetup utility to change the SICL or VISA names to match what the program is expecting.

Appendix A: Systems Administration Reference

The installation procedure places files in the following directories:

File	Location	Description
t83488.so	/opt/sicl/lib	t83488 shared library for SICL
t83488.o	/lib/modules/<kernel version>/ kernel/drivers/char	kernel driver module
t83488	/etc/init.d	start/stop scripts for (un)loading the kernel module and (un)creating the device files
S95t83488 K05t83488	/etc/rc.d/rc*.d	Links to /etc/init.d/t83488
t83488.SN3488A-*	/dev	t83488 device files
t83488.ctl	/dev	Special device file for driver

Appendix B: Software License Agreement

Software License Agreement

Please carefully read this License Agreement before installing the software. Rights in the software are offered only on the condition that the Customer agrees to all terms and conditions of the License Agreement. If you do not agree to the terms of the License Agreement, you may return the unopened software package and the hardware for a full refund.

In return for the payment of fee TAMS grants the Customer a license to use the software, until terminated subject to the following

Customer may use the software on any one computer.
Customer may not reverse assemble or decompile the software.
Customer may make copies for archival purposes.
Customer has no other rights to copy.
All copies of the software must bear the copyright notice(s) contained on the original.

OWNERSHIP: Customer agrees that they do not have any title or ownership of the software, other than ownership of the physical media. Customer acknowledges and agrees that the software is copyrighted and protected under the copyright laws.

Customer Acknowledges and agrees that the software may have been developed by a third party software supplier named in the copyright notice(s) included with the software, who shall be authorized to hold Customer responsible for any copyright infringement or violation of this License Agreement.

TRANSFER OF RIGHTS IN SOFTWARE: Customer may transfer rights in the software to a third party only as part of the transfer of all their rights and only if Customer obtains the prior agreement of the third party to be bound buy the terms of this License Agreement.

Upon such transfer, Customer agrees that their rights in the software are terminated and that they will either destroy their copies and adaptations or they will deliver them to the third party.

Transfer to a US government department or agency or to a prime or lower tier contractor in connection with a US government contract shall be made only upon their prior written agreement to terms required by TAMS.

SUBLICENSING AND DISTRIBUTION: Customer may not subliscence the software or distribute copies or adaptations of the software to the public in physical media or by telecommunications without the prior written consent of TAMS

TERMINATION: TAMS May terminate this software license for failure to comply with any of these terms provided TAMS has requested Customer to cure the failure and Customer has failed to do so within thirty (30) days of such notice.

UPDATES AND UPGRADES: Customer agrees that the software does not include updates and upgrades which may be available from TAMS under a separate support agreement.

EXPORT CLAUSE: Customer agrees not to export or re-export the software or any copy or adaptation in violation of the US Export Administration regulations or other applicable regulations.

LIMITED WARRANTY

TAMS warrants for a period of 90 days from the date of purchase that the software product will execute it's programming instructions when properly installed on the computer or workstation with a supported version of the Operating System. TAMS does not warrant that the operation of the software will be uninterrupted or error free. In the event that this software product fails to execute it's programming instructions during this warranty period , Customer's remedy shall be to return the CD media to TAMS for replacement. Should TAMS be unable to replace the media within a reasonable amount of time, Customer's alternate remedy shall be a refund of the purchase price upon return of the entire product and all copies.

TAMS warrants the media upon which the product is recorded top be free from defects in materials and workmanship under normal use for a period of 90 days from the date of purchase. In the event any media prove to be defective during the warranty period, Customer's remedy shall be to return the media to TAMS for replacement. Should Tams be unable to replace the media within a reasonable amount of time, Customer's alternate remedy shall be a refund of the purchase price upon return of the entire product and all copies.

NOTICE OF WARRANTY CLAIMS Customer must notify TAMS in writing of any warranty claim within the warranty period.

LIMITATION OF WARRANTY: TAMS makes no other express warranty, whether written or oral , with respect to this product. Any implied warranty of merchantability or fitness is limited to the 90-day duration of this written warranty. Some sates or provinces do not allow limitations on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you.

This warranty gives specific legal rights, and you may also have other rights which vary from state to state, province to province or country to country.

EXCLUSIVE REMEDIES : The remedies provided above are Customer's sole and exclusive remedies. In no event shall TAMS be liable for any direct, indirect special, incidental, or consequential damages (including lost profit) whether based on warranty, contract, tort or any other legal theory. Some states provinces or countries do not allow the exclusion or limitation of incidental or consequential damages, so the limitation or exclusion may not apply to you.

WARRANTY SERVICE: Warranty service may be obtained directly from TAMS or from any of it's Distributors.

Appendix C: Hardware Warranty Information

ONE YEAR LIMITED WARRANTY

Test & Measurement Systems, Inc. warrants to the purchaser that the Interface card will be free of all defects in material and/or workmanship for one year from the date of shipment to the customer.

In the event of malfunction or failure attributable directly to faulty material and/or workmanship, TAMS will at it's option, repair or replace the defective product or components, to whatever extent it shall deem necessary to restore the product or component, to proper operating condition. TAMS may at its option repair or replace, a defective unit with a new or refurbished unit.

The customer shall be solely responsible for the failure of any TAMS product, resulting from accident abuse, or misapplication of the product, and TAMS assumes no liability as a consequence of such events under the terms of this warranty.

While TAMS has made every effort to provide clear and accurate technical information about the application of this product, TAMS assumes no liability for any events arising out of the use of this technical information.

This Warranty gives you specific legal rights and you may also have other rights which vary from state to state, and from country to country.

This Warranty is in Lieu of all other express warranties which now or hereafter might otherwise arise with respect to this product. ANY AND ALL IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR PARTICULAR USE, SHALL HAVE NO GREATER DURATION THAN THE PERIOD FOR THE EXPRESS WRITTEN WARRANTY APPLICABLE TO THIS PRODUCT AS SHOWN ABOVE, AND SHALL TERMINATE AUTOMATICALLY AT THE EXPIRATION OF SUCH PERIOD.

(Some states and countries do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you) No action shall be brought for breach of any implied or express warranty after one year subsequent to the expiration of the period of the express written warranty.

Incidental and consequential damages caused by malfunction, defect, or otherwise and with respect to breach of any express or implied warranty, are not the responsibility of TAMS, and to the extent permitted by law, are hereby excluded both for property and to the extent not unconscionable, for personal injury damage. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.)

Appendix D: Specifications

General Requirements:

Minimum System Requirements	A supported Linux distribution, USB Port (OS may require additional resources)
Required Software	TAMS I/O Libraries, Version 3.0 or later
Supported Standards	USB 2.0, IEEE-488.1 and IEEE-488.2 compatible, SICL, VISA
Supported Software Development	gcc/g++, RMB

General Characteristics:

Power (typical)	USB bus powered device, +5V 500 mA (max), 280 mA
Connectors	Standard 24-pin IEEE-488, Standard USB B
Dimensions	9.53 cm x 6.35 cm x 2.54 cm (including connectors)
Weight	227 grams
Cable	6 foot, shielded, USB 2 certified
Indicators	Power, Activitiy
Warranty	1 Year

Environmental Specifications

Operating Environment	0 degrees C to +40 degress C
Storage Environment	-20 degrees C to +60 degrees C
Humidity	20-80% (0 degrees C to +40 degrees C)
Storage Humidity	20-80% (0 degrees C to +55 degrees C)

Ordering Information

Interface	TAMS 83488 USB/GPIB Controller
URL:	http://www.tamsinc.com/hpib/83488/

Appendix E: Safety

This symbol indicates a caution. See the manual for a complete explanation, and only continue when all conditions are fully understood and met.

This symbol indicates that the product complies with the requirements of the Low Voltage Directive and the EMC Directive, and carries the CE Mark accordingly.

Ordinary protection: This unit is for indoor use only. It is not protected against a harmful ingress of moisture.

This product uses components that may be damaged by electrostatic discharge. Although all such components are protected, take precautions to avoid electrostatic discharge into the connectors.

Do not use this product in a manner not specified by TAMS.

Only qualified, TAMS-trained personnel may service this product.

The USB cord is the means of disconnect. If the USB cord is not accessible to the operator, then another means of disconnect (i.e. power switch on the rack) must be provided by the user.

Appendix F: Declaration of Conformity

Manufacturer's Name: Test & Measurement Systems Inc. (TAMS)

Manufacturer's Address: 750 14th Street SW
Loveland, CO 80537
USA

Declares, that the product:

Product Name: TAMS x3488A USB/GPIB Controller
Model Number: TAMS x3488A

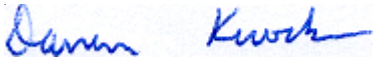
Conforms with the following European Directives:

The product herewith complies with the requirements of the Low Voltage Directive and the EMC Directive and carries the CE Marking accordingly.

Conforms with the following product standards:

EMC **IEC 61326:2000, Electrical Equipment for Measurement, Control and**
Laboratory Use – Part 1: General Requirements

Specification	Test Method	Test Conditions	Result
Emissions	EN 61326-1	Group 1 Class A	Compliant
Electrostatic Discharge	EN61000-4-2	+-4kV Contact / VCP / +-4 kV Air	Compliant
Radiated RF Immunity	EN 61000-4-3	80 – 1000 MHz, 3 V/m, 80% 1kHz AM	Compliant
EFT/Burst	EN 61000-4-4	+-0.5kV I/O (>3 meters), +-1kV AC mains	Compliant
Conducted FR Immunity	EN 61000-4-6	150 kHz to 80 MHz, 3Vrms, 80% 1kHz AM, power and I/O > 3 meters	Compliant



17 December 2004

Darren Kwock — Date

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