

PC-HELPER

High-performance High-Speed
GPIB Communication Board for PCI Express
Low Profile

GPIB-F-LPE

High-Speed GPIB Communication Board
for PCI Express
Low Profile

GPIB-FL-LPE

User's Guide

CONTEC CO.,LTD.

Check Your Package

Thank you for purchasing the CONTEC product.

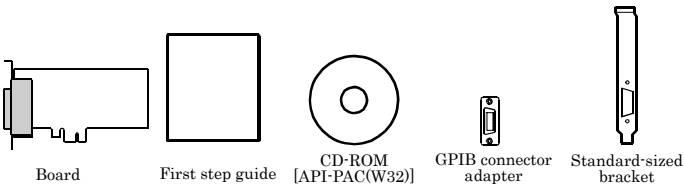
The product consists of the items listed below.

Check, with the following list, that your package is complete. If you discover damaged or missing items, contact your retailer.

Product Configuration List

- Board (One of the following)
[GPIB-F-LPE, or GPIB-FL-LPE]
- First step guide ...1
- CD-ROM *1 [API-PAC(W32)] ...1
- GPIB connector adapter [CN-GP/C] ...1
- Standard-sized bracket ...1

*1 The CD-ROM contains the driver software and User's Guide (this guide)



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1. Before Using the Product

About the Board

This product is a PCI Express bus-compatible interface board with support for bus master operation and which complies with IEEE-488.1 and IEEE-488.2. This product can be used in a PC to control communications with devices that support the GPIB interface and read GPIB bus line data.

The GPIB-F-LPE can also analyze the signal on the GPIB bus using the built-in memory (GPIB bus analyzer function).

This product supports a low-profile size slot and, if replaced with the supplied bracket, supports a standard size slot, too.

You can use the supplied driver library to develop application software using any programming language that supports the Win32 API routines (such as Visual Basic or Visual C++), or using LabVIEW.

Features

Complies with the IEEE-488.2 standard

- As the board complies with the IEEE-488.2 standard, you can control any external device that supports this standard.

Data transfer speed 1.5Mbyte/sec max.

- The maximum data transfer speed for communications is 1.5Mbyte/sec.

Supports bus master operation

- The bus master data transfer function enables large quantities of data to be transferred between the board and PC without loading the CPU.

Internal 2Kbyte FIFO buffers for send and receive

- The board has separate 2Kbyte FIFO buffers for sending and receiving data, allowing both small and large volumes of data to be transferred at high speed.
- Interface messages also use a FIFO to enable high-speed transmission.

Built-in GPIB bus analyzer function [only GPIB-F-LPE]

- The board features a bus analyzer function.
This not only allows the signals on the GPIB bus to be analyzed, but also permits signal analysis to be performed while this product is performing GPIB communications

Built-in SPAS event function

- In addition to the functions of the earlier GPIB controller (μ PD7210), the board also supports the SPAS event generated when a serial poll occurs. This gives you a high level of flexibility in constructing your system.

Internal high-precision timer

- The board includes a high-precision application timer to allow accurate time monitoring to be performed under Windows.

Long term availability

- As the board uses a high-speed GPIB controller developed by CONTEC (compatible with the μ PD7210 register), reliable long term availability is ensured.

Diagnosis program

- A diagnosis program is supplied to support system development. The diagnostic program can be used to check hardware operation (interrupts and I/O addresses) and to perform simple communication tests with connected devices.

Other

- You can read the data from the application using all control lines (with the latch function) and data lines. [Data lines are only supported on the GPIB-F-LPE.]

- Supports both Low Profile size slots and standard size slots (use the supplied bracket as an adaptor).

Support Software

You should use CONTEC support software according to your purpose and development environment.

NOTE:

This hardware does not support Windows 95, Windows 98 and Windows NT 4.0/3.51.

Driver Library **API-PAC(W32)** (Bundled)

API-PAC(W32) is the library software that provides the commands for CONTEC hardware products in the form of Windows standard Win32 API functions (DLL). It makes it easy to create high-speed application software taking advantage of the CONTEC hardware using various programming languages that support Win32 API functions, such as Visual Basic and Visual C++.

It can also be used by the installed diagnosis program to check hardware operations.

See <http://www.contec.com/apipac/> for details and download of API-PAC(W32).

< Operating environment >

OS Windows XP, Server 2003, 2000
Adaptation language Visual C++ .NET, Visual C# .NET, Visual Basic .NET, Visual C++, Visual Basic, Delphi, C++Builder, etc..

API-GPLV(W32) library supporting LabVIEW (Supplied: Stored on the API-PAC(W32) CD-ROM)

API-GPLV(W32) is a driver created according to the National Instruments Corporation's GPIB function style. The driver is software to control the CONTEC GPIB board (PC Cards) using a LabVIEW-based GPIB system or existing application program.

It can also be used by the installed diagnosis program to check hardware operations.

CONTEC provides download services (at <http://www.contec.com/gplv/>) to supply the updated drivers and differential files.

For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

< Operating environment >

OS Windows XP, Server 2003, 2000
Adaptation language LabVIEW, Visual C++ .NET, Visual C# .NET, Visual Basic .NET, Visual C++, Visual Basic, Delphi, C++Builder, etc..

Linux version of general-purpose count driver: **API-GPIB(LNX)**

(Supplied: Stored on the API-PAC(W32) CD-ROM)

This driver is used to control CONTEC GPIB boards (PC Cards) from within Linux.

You can control CONTEC GPIB boards easily using the shared library called from the user application, the device driver (module) for each kernel version, and the board (PC Cards) configuration program (config).

CONTEC provides download services (at <http://www.contec.com/apipac/>) to supply the updated drivers and differential files.

For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

< Operating environment >

OS RedHatLinux, TurboLinux, etc..
(For details on supported distributions, refer to Help available after installation.)

Adaptation language gcc, etc..

Cable & Connector (Option)

GPIB cable (2m) : PCN-T02

GPIB cable (4m) : PCN-T04

GPIB Connector : CN-GP/C *1

Effective when the cable being plugged into the board interfere with the PC's main unit. See the troubleshooting section at the end of Chapter 2.

*1 The GPIB connector adapter [CN-GP/C] is bundled with this product as a standard feature.

* Check the CONTEC's Web site for more information on these options.

Customer Support

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

Web Site

Japanese <http://www.contec.co.jp/>
English <http://www.contec.com/>
Chinese <http://www.contec.com.cn/>

Latest product information

CONTEC provides up-to-date information on products.

CONTEC also provides product manuals and various technical documents in the PDF.

Free download

You can download updated driver software and differential files as well as sample programs available in several languages.

Note! For product information

Contact your retailer if you have any technical question about a CONTEC product or need its price, delivery time, or estimate information.

Limited Three-Years Warranty

CONTEC products are warranted by CONTEC CO., LTD. to be free from defects in material and workmanship for up to three years from the date of purchase by the original purchaser.

Repair will be free of charge only when this device is returned freight prepaid with a copy of the original invoice and a Return Merchandise Authorization to the distributor or the CONTEC group office, from which it was purchased.

This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original boards. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization Number (RMA) from the CONTEC group office where you purchased before returning any product.

* No product will be accepted by CONTEC group without the RMA number.

Liability

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from inexperienced usage, misuse, or malfunction of this device.

Safety Precautions

Understand the following definitions and precautions to use the product safely.

Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources. Understand the meanings of these labels to operate the equipment safely.

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Handling Precautions

DANGER

Do not use the product where it is exposed to flammable or corrosive gas. Doing so may result in an explosion, fire, electric shock, or failure.

CAUTION

- There are switches and jumpers on the board that need to be set in advance.
Be sure to check these before installing the board.
 - Only set the switches and jumpers on the board to the specified settings.
Otherwise, the board may malfunction, overheat, or cause a failure.
 - Do not strike or bend the board.
Otherwise, the board may malfunction, overheat, cause a failure or break.
 - Do not touch the board's metal plated terminals (edge connector) with your hands.
Otherwise, the board may malfunction, overheat, or cause a failure.
If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
 - When you use the board in a noisy environment or are nervous about noise, attach ferrite cores to the connection cable.
 - Do not install or remove the board to or from the extension slot while the computer's power is turned on.
And also do not connect the board and external device while the power is turned on.
Otherwise, the board may malfunction, overheat, or cause a failure.
Be sure that the personal computer or the I/O extension unit power is turned off.
 - Make sure that your PC or extension unit can supply ample power to all the boards installed.
Insufficiently energized boards could malfunction, overheat, or cause a failure.
 - The specifications of this product are subject to change without notice for enhancement and quality improvement.
Even when using the product continuously, be sure to read the manual and understand the contents.
 - Do not modify the product. CONTEC will bear no responsibility for any problems, etc., resulting from modifying this product.
 - Regardless of the foregoing statements, CONTEC is not liable for any damages whatsoever (including damages for loss of business profits) arising out of the use or inability to use this CONTEC product or the information contained herein.
 - Points to note when installing the GPIB-F-LPE and the GPIB-FL-LPE is listed in "Chapter 6 Restrictions and Notes". Please read these beforehand.
-

Environment

Use this product in the following environment. If used in an unauthorized environment, the board may overheat, malfunction, or cause a failure.

Operating temperature

0 - 50°C

Humidity

10 - 90%RH (No condensation)

Corrosive gases

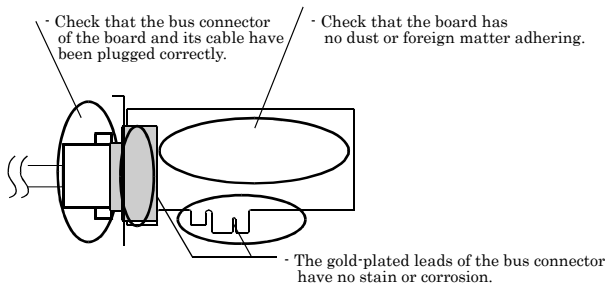
None

Floating dust particles

Not to be excessive

Inspection

Inspect the product periodically as follows to use it safely.



Storage

When storing this product, keep it in its original packing form.

- (1) Put the board in the storage bag.
- (2) Wrap it in the packing material, then put it in the box.
- (3) Store the package at room temperature at a place free from direct sunlight, moisture, shock, vibration, magnetism, and static electricity.

Disposal

When disposing of the product, follow the disposal procedures stipulated under the relevant laws and municipal ordinances.

2. Setup

This chapter explains how to set up the board.

What is Setup?

Setup means a series of steps to take before the product can be used.

Different steps are required for software and hardware.

The setup procedure varies with the OS and applications used.

Using the Board under Windows

Using the Driver Library API-PAC(W32)

This section describes the setup procedure to be performed before you can start developing application programs for the board using the bundled CD-ROM “Driver Package API-PAC(W32)”.

Taking the following steps sets up the software and hardware. You can use the diagnosis program later to check whether the software and hardware function normally.

Step 1 Installing the Software

Step 2 Setting the Hardware

Step 3 Installing the Hardware

Step 4 Initializing the Software

Step 5 Checking Operations with the Diagnosis Program

If Setup fails to be performed normally, see the “Setup Troubleshooting” section at the end of this chapter.

Using the Board under Windows

Using Software Other than the Driver Library

API-PAC(W32)

For setting up software other than API-PAC(W32), refer to the manual for that software. See also the following parts of this manual as required.

This chapter Step 2 Setting the Hardware

This chapter Step 3 Installing the Hardware

Chapter 3 External Connection

Chapter 6 About Hardware

Using the Board under an OS Other than Windows

For using the board under an OS other than Windows, see the following parts of this manual.

This chapter Step 2 Setting the Hardware

Chapter 3 External Connection

Chapter 5 About Software

Chapter 6 About Hardware

Step 1 Installing the Software

This explains how to install the driver library.

Before installing the hardware on the PC, install the driver library from the API-PAC(W32) CD-ROM provided with the board.

The following description assumes the operating system as Windows XP. Although some user interfaces are different depending on the OS used, the basic procedure is the same.

About the driver to be used

Two GPIB communication drivers come with your board: API-GPIB(98/PC) and API-GPLV(W32).

API-GPIB(98/PC) provides a CONTEC proprietary function interface.

API-GPLV(W32) provides a function interface equivalent to that from National Instruments Corporation (hereafter NI), allowing the GPIB488, GPIB488.2, and VISA functions of LabVIEW to be used directly and application programs created for NI boards to run without modification.

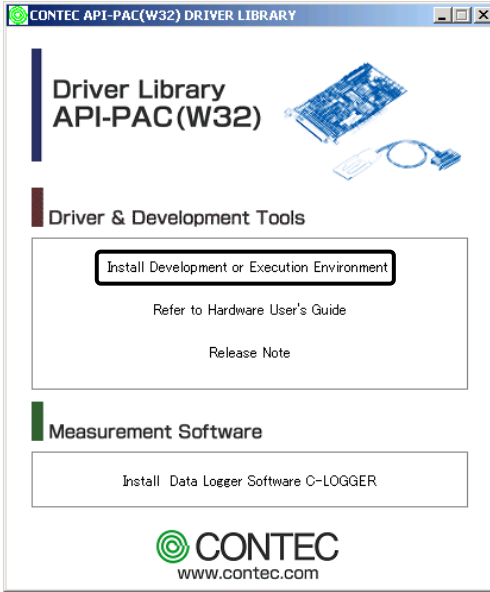
Selection guide

Given below is a guideline for easily selecting the appropriate driver for the board.

Driver to be used	Purpose
API-GPIB(98/PC)	<ul style="list-style-type: none"> · Used to use CONTEC functions · To make the board operate as fast as possible · To convert (digitize) binary and string data easily
API-GPLV(W32)	<ul style="list-style-type: none"> · To use existing applications for NI boards · To use LabVIEW · Familiar with NI functions but not with CONTEC functions

Starting the Install Program

- (1) Load the CD-ROM [API-PAC(W32)] on your PC.
- (2) The API-PAC(W32) Installer window appears automatically.
If the panel does not appear, run (CD-ROM drive letter):\AUTORUN.exe.
- (3) Click on the [Install Development or Execution Environment] button.



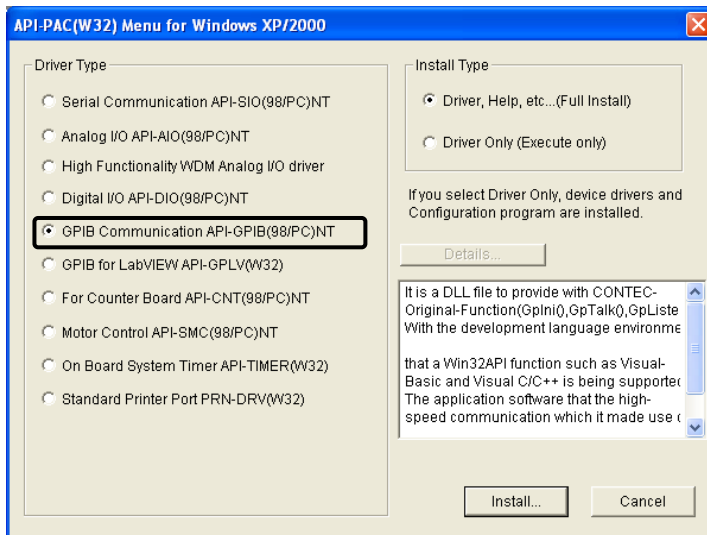
CAUTION

Before installing the software in Windows XP, 2000, log in as a user with administrator privileges.

For using API-GPIB(98/PC)

Select API- GPIB(98/PC)

- (1) The following dialog box appears to select “Driver Type” and “Install Type”.
- (2) Select “GPIB Communication API-GPIB (98/PC)”.
- (3) Select “Driver, Help, etc..(Full Install)”.
- (4) Click on the [Install] button.



Executing the Installation

- (1) Follow the on-screen instructions to proceed to install.
- (2) When the required files have been copied, the “Perform a hardware setup now” and “Show readme file” check boxes are displayed.

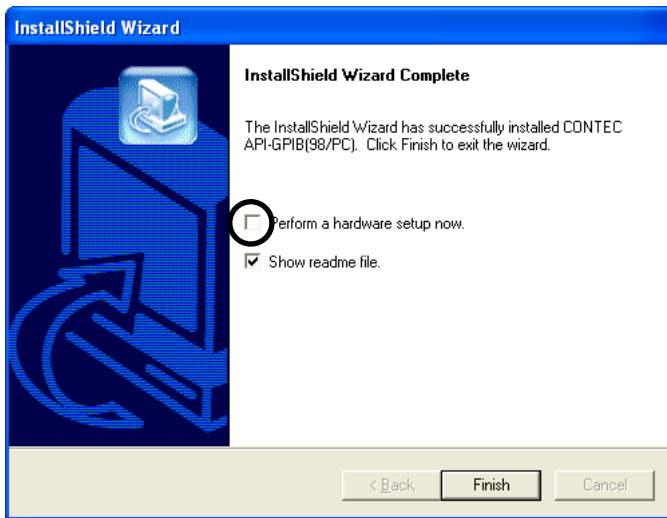
When you are installing the software or hardware for the first time:

1) Uncheck “Perform a hardware setup now”.

2) Click on the [Finish] button. Go to Step 2 to set and plug the hardware.

* When the hardware has already been installed:

Check “Perform a hardware setup now”, then go to Step 4 “Initializing the Software”.

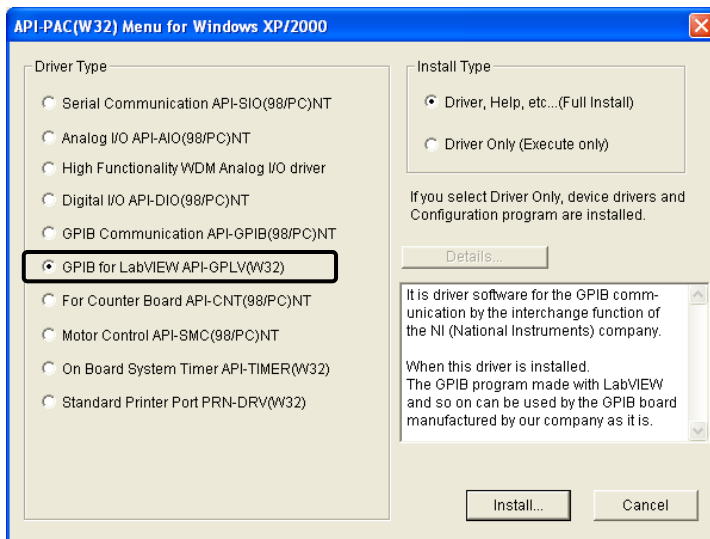


You have now finished installing the software.

For using API-GPLV(W32)

Select API-GPLV(W32)

- (1) **The following dialog box appears to select “Driver Type” and “Install Type”.**
- (2) **Select “GPIO for LabVIEW API-GPLV(W32)”.**
- (3) **Select “Driver, Help, etc..(Full Install)”.**
- (4) **Click on the [Install] button.**



Executing the Installation

- (1) **Follow the on-screen instructions to proceed to install.**
 - (2) **The driver installation is completed when the GPIB setup utility is started.**
 - If you are installing the software and hardware for the first time, click on the [Cancel] button in this step to terminate the installation procedure.
- * When the hardware has already been installed:
Go to “For Using API-GPLV(W32)” in Step 4 "Initializing the Software".

Step 2 Setting the Hardware

This section describes how to set the board and plug it on your PC.

The board has some switches to be preset.

Check the on-board switches before plugging the board into an extension slot.

The board can be set up even with the factory defaults untouched. You can change board settings later.

Replacing the Bracket

This board is shipped with a Low Profile size bracket mounted. To plug the board into a standard size slot, replace the bracket with the bundled standard size bracket. The replacing method is as follows :

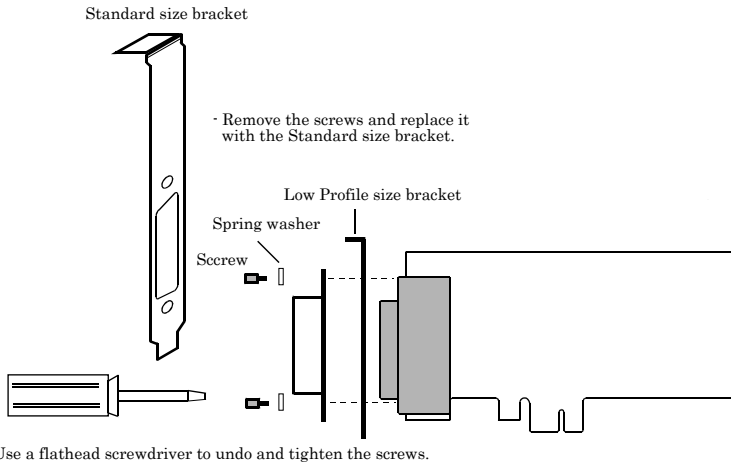


Figure 2.1. Replacing the Bracket

Parts of the Board and Factory Defaults

Figure 2.2. to show the names of major parts on the board.

Note that the switch setting shown below is the factory default.

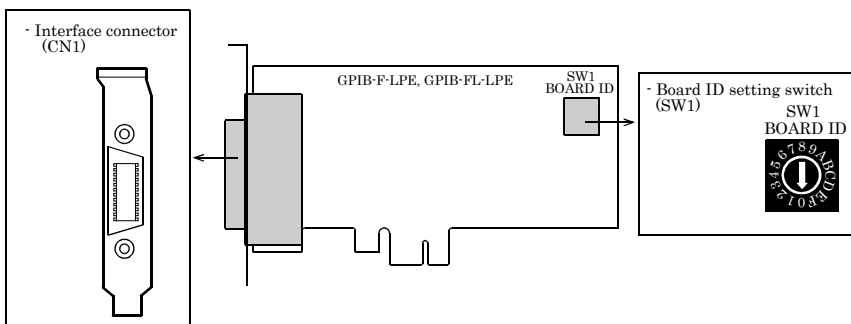


Figure 2.2. Part Names < GPIB-F-LPE, GPIB-FL-LPE >

Setting the Board ID

If you install two or more boards on one personal computer, assign a different ID value to each of the boards to distinguish them.

The board IDs can be set from 0 to Fh to identify up to sixteen boards.

If only one board is used, the original factory setting (Board ID = 0) should be used.

Setting Procedure

To set the board ID, use the rotary switch on the board. Turn the SW1 knob to set the board ID as shown below.

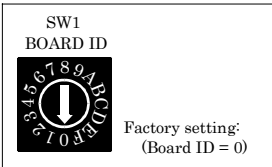
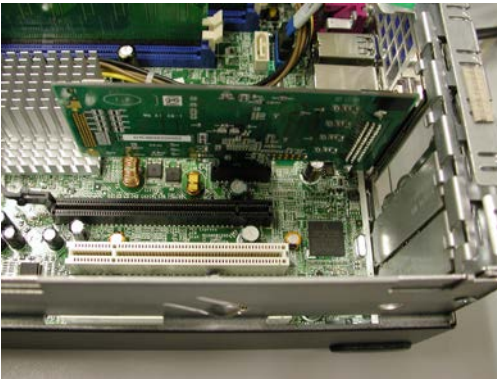


Figure 2.3. Board ID Settings (SW1)

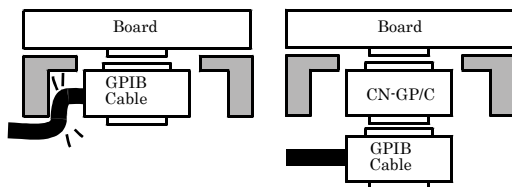
Plugging the Board

- (1) Before plugging the board, shut down the system, unplug the power code of your PC.
- (2) Remove the cover from the PC so that the board can be mounted.
- (3) Plug the board into an extension slot.
- (4) Fasten the board bracket to the PC.
- (5) Put the cover back into place.



Using the Connector Adaptor

When connecting the GPIB cable to the GPIB-F-LPE and GPIB-FL-LPE, the cable may be obstructed by the PC case. To avoid this, fit the supplied CN-GP/C connector adaptor as shown below.



⚠ CAUTION

- Do not touch the board's metal plated terminals (edge connector) with your hands. Otherwise, the board may malfunction, overheat, or cause a failure. If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- Do not install or remove the board to or from the slot while the computer's power is turned on. Otherwise, the board may malfunction, overheat, or cause a failure. Doing so could cause trouble. Be sure that the personal computer or the I/O extension unit power is turned off.
- Make sure that your PC or extension unit can supply ample power to all the boards installed. Insufficiently energized boards could malfunction, overheat, or cause a failure.

Step 3 Installing the Hardware

For using an extension board under Windows, you have to let the OS detect the I/O addresses and IRQ to be used by the board. The process is referred to as installing the hardware.

In the case of using two or more boards, make sure you install one by one with the Found New Hardware Wizard.

Turning on the PC

Turn on the power to your PC.

CAUTION

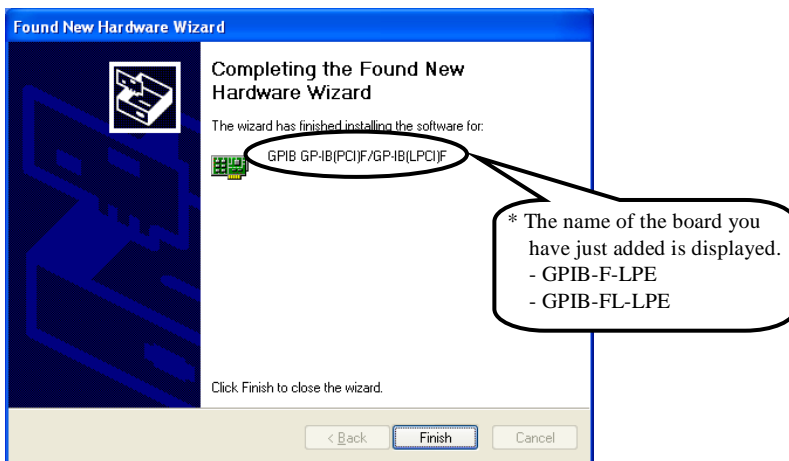
- The board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the board, first determine what PC resources are free to use.
 - The resources used by each board do not depend on the location of the PCI Express bus slot or the board itself. If you remove two or more boards that have already been installed and then remount one of them on the computer, it is unknown that which one of the sets of resources previously assigned to the two boards is assigned to the remounted board. In this case, you must check the resource settings.
-

Setting with the Found New Hardware Wizard

- (1) First, “PCI Standard PCI to PCI Bridge” will be checked and end automatically.
- (2) The “Found New Hardware Wizard” will be started.
Select “Install from a list or specific location [Advanced]”, then click on the [Next] button.



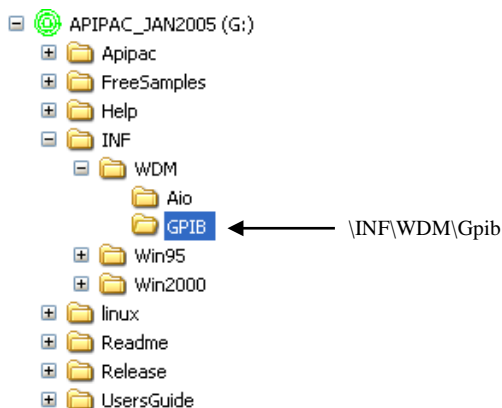
- (3) Specify that folder on the CD-ROM which contains the setup information (INF) file to register the board.



Source folder

The setup information (INF) file is contained in the following folder on the bundled CD-ROM.

\INF\WDM\Gpib



You have now finished installing the hardware.

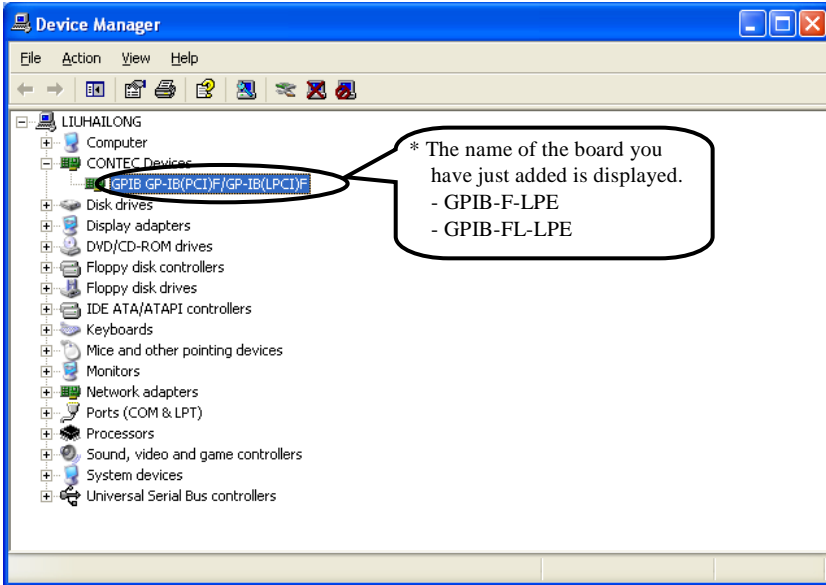
Step 4 Initializing the Software

The driver library requires the initial setting to recognize the execution environment. It is called the initialization of the driver library.

Setting the device name

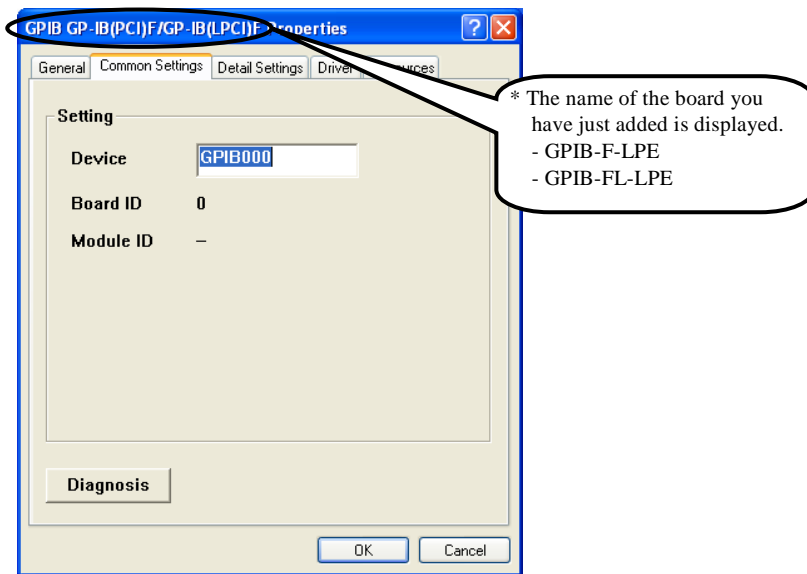
- (1) Start Device Manager. Select [My Computer] - [Control Panel] - [System], then select the [Device Manager] tab.

(Alternatively, right click on My Computer and select Properties.)



- (2) The installed hardware appears under the "CONTEC Devices" node in the tree. Open the device tree and select the device (the selected device appears highlighted). Click [Properties].

- (3) The device property page appears.
Enter the device name in the common settings tab page.

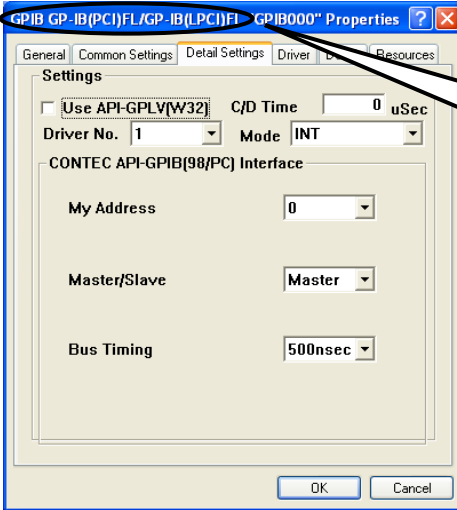


- * The device name displayed initially is a default value. You can leave this default name if you wish.
- * Ensure that the same device name is not used for more than one device.

For using API-GPIB(98/PC)

Advanced settings (for the API-GPIB(98/PC))

- (1) Open the advanced settings tab page and specify the settings.
Specify a "Driver No." that is not used by any other CONTEC GPIB board. The "Driver No." determines the API routine names to use.



* The name of the board you have just added is displayed.
- GPIB-F-LPE
- GPIB-FL-LPE

- (2) When you have finished, click [OK].

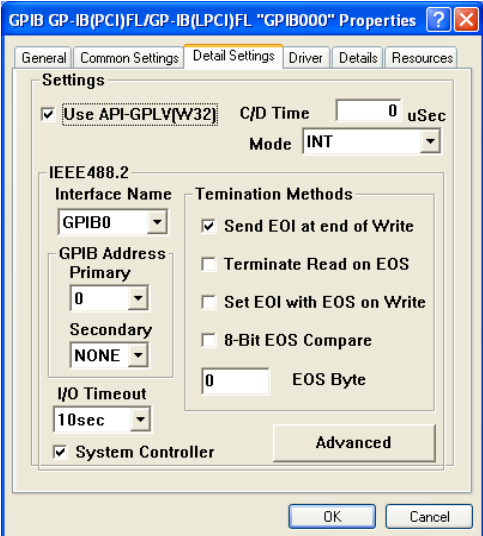
You have now finished installing the initial setting of Software.

For using API-GPLV(W32)

Advanced settings (for the API-GPLV(W32))

- (1) Open the advanced settings tab page and specify the settings.

The following window opens if "Use API-GPLV(W32)" is selected.



- Interface Name :
From the list, select the board to be set up.
- GPIB Address :
Set the device address of the board.
The primary address can be set to 0 - 30.
- Termination Methods :
Set the termination format.
- I/O Timeout :
Set the transmit/receive time-out period.
- System Controller :
Select whether to use the board as a system controller.

- (2) When you have finished, click [OK].

You have now finished installing the initial setting of Software.

Step 5 Checking Operations with the Diagnosis Program

Use the diagnosis program to check that the board and driver software work normally, thereby you can confirm that they have been set up correctly.

What is the Diagnosis Program?

The diagnosis program diagnoses the states of the board and driver software.

It can also be used as a simple checker when an external device is actually connected.

Using the “Diagnosis Report” feature reports the driver settings, the presence or absence of the board, I/O status, and interrupt status.

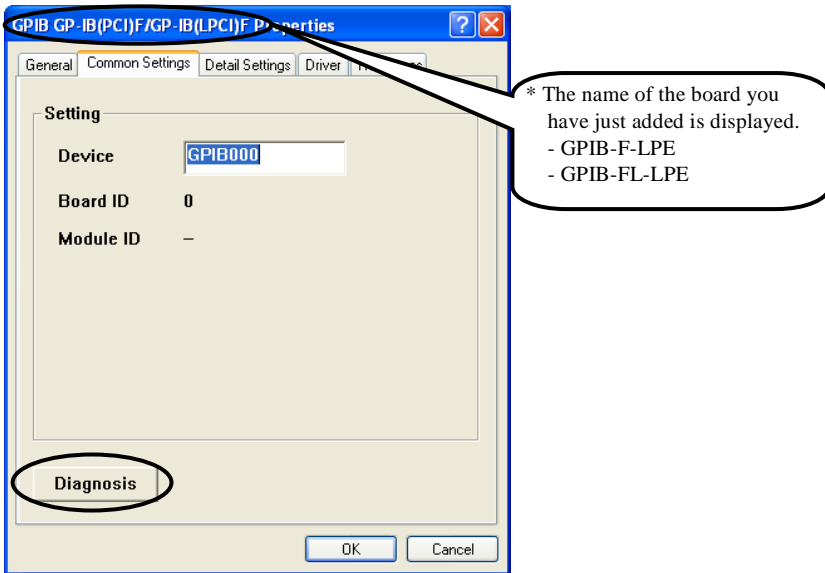
Check Method

Perform the transmit/receive test and check the execution environment with the board connected to the remote device.

Before diagnosis, check the address of the remote device. Prepare the user’s guide and command reference for the remote device as required (to perform testing smoothly).

Starting the Diagnosis Program

Click the [Diagnosis] button on the device property page to start the diagnosis program.



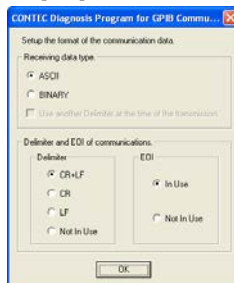
Check of GPIB communication

The remote device address setting, communication data format setting, and main dialog boxes are displayed.

- (1) Specify the remote device address and click on the [OK] button.



- (2) Specify the communication format and click on the [OK] button.



- (3) The main dialog box appears.



* The name of the board you have just added is displayed.
- GPIB-F-LPE
- GPIB-FL-LPE

The following commands can be used to check GPIB operations.

- ”Send”:
Sends the typed character string with a delimiter to the remote device.
- ”Receive”:
Receives data from the remote device and displays it along with the number of data items.
- ”Trigger”:
Sends a trigger command to the remote device.
- ”Polling”:
Polls the remote device and displays the obtained status byte.

Note

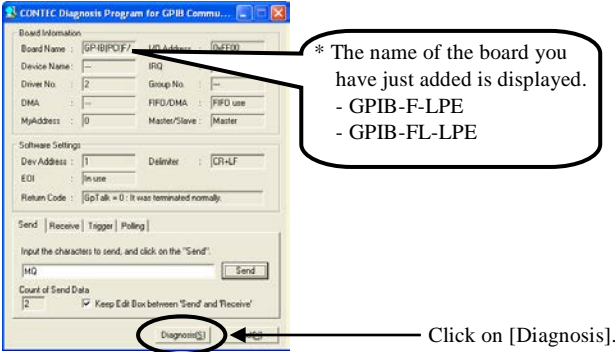
When communication has been completed successfully, “xxxxx completed normally” is displayed as the “return value”.

Diagnosis Report

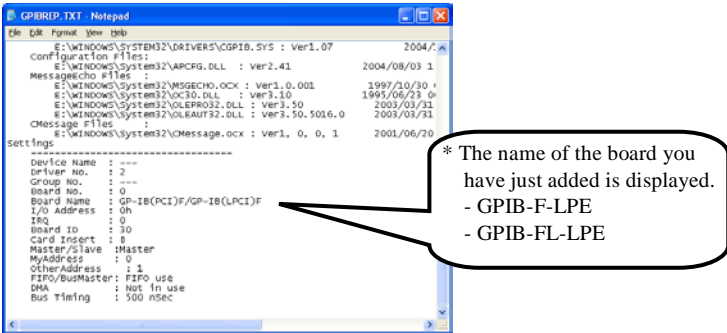
- (1) Clicking on [Diagnosis] displays detailed data including board settings and the diagnosis results while saving them in text format.

The results are saved and displayed as a text file (GpibRep.txt) in the install folder (Program Files\CONTEC\API-PAC(W32)).

The diagnosis program performs "board presence/absence check", "driver file test", "board setting test", and so on.



- (2) A diagnosis report is displayed as shown below.



Setup Troubleshooting

Symptoms and Actions

A GPIB error occurs.

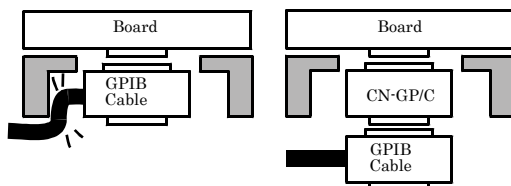
The remote device address may be incorrect or the GPIB cable may not yet be connected.

The GPIB cable cannot be connected.

The GPIB cable may interfere with the chassis of your PC and not be plugged correctly into the interface connector of the board depending on the structure of your PC, for example, when the slots are located in the rear panel of the PC too deeply.

You can use the GPIB connector adapter (CN-GP/C) to work around this problem.

As this problem occurs on most PCs with Low Profile PCI Express slots, a CN-GP/C is included with the GPIB-F-LPE and the GPIB-FL-LPE.



The OS won't normally get started or detect the board.

Turn off the power to the PC and remove the board. Reboot the OS and use [Control Panel] - [Add/Remove Applications] to uninstall the "CONTEC API-GPIB(WDM) driver".

Turn off the PC again, plug the board, and restart the OS. Let the OS detect the board and use API-TOOL Configuration to make board settings over again.

If your problem cannot be resolved

Contact your retailer.

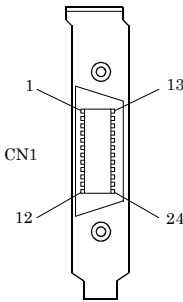
3. External Connection

This chapter describes the interface connectors on the board and the external I/O circuits. Check the information available here when connecting an external device.

How to connect the connectors

Connecting a Device to a Connector

To connect an external device to this board, plug the cable from the device into the interface connector (CN1) shown below.



On-board connector : 5555139-1(AMP)
Compatible connector(cable): GPIB cable(IEEE-488 rated)

Figure 3.1. Interface Connectors and Mating Connectors

Connector Pin Assignment

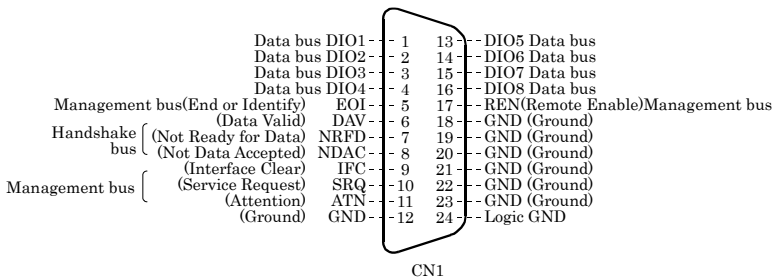


Figure 3.2. Pin Assignment of CN1

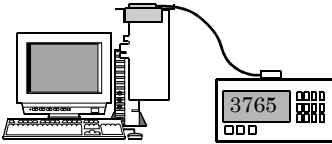
Notes on cable connection

The GPIB has restrictions on the number of devices connected and the cable length according to the standard.

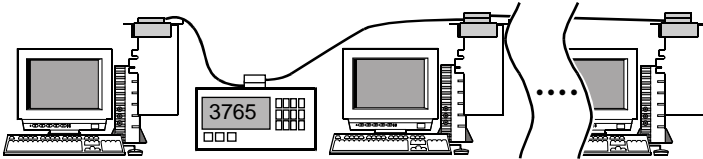
- (1) The maximum number of interfaces (external devices) is 15, which can be connected to one system.
- (2) The maximum total length of cables that can be used to interconnect a group of devices in one bus system is “2 m x (the number of devices)” or 20 m, whichever is shorter. (JIS C1901-1987).

Note, however, the individual cables between devices must be within 4 m long. Some examples are given below.

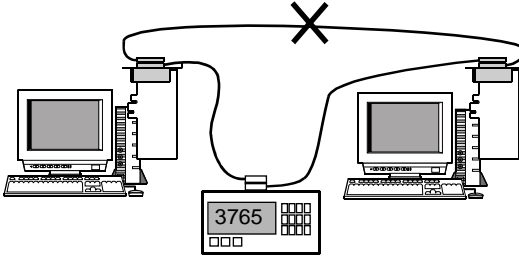
- System with a total of two devices
 $2 \text{ m} \times (\text{Number of devices} = 2) < 20 \text{ m}$
The maximum total length of cables for this system is therefore 4 m.



- System with a total of three devices
 $2 \text{ m} \times (\text{Number of devices} = 3) < 20 \text{ m}$
The maximum total length of cables for this system is therefore 6 m. The two cables used in the system must be [2 m + 4 m] or [2 m + 2 m] in length so that neither is longer than 4 m.
- System with a total of fifteen devices
 $2 \text{ m} \times (\text{Number of devices} = 15) > 20 \text{ m}$
The maximum total length of cables for this system is therefore 20 m.



- (3) The cables in the system must not form a loop.



- (4) Unplug the cable from any device which is left off for some reason such as a fault.
- (5) When powering the measurement system, turn on the measuring instrument first and then on the PC.
- (6) Neither unplug/plug the cable nor turn on/off the device during communication. Doing so stops the operation or causes an error, resulting in trouble.
- (7) The talker and listener must be addressed to talk and to listen, respectively, by the controller before the talker can send messages to the listener.
- (8) At least two thirds of all the devices connected must be turned on.

4. Functions

This section describes the functions of the board.

Bus Master Function

Bus Master Transfer

The bus master data transfer function uses time when the bus is idle to perform direct DMA transfer of data between the board and the application memory space. The application memory space means a static area defined using a normal variable declaration. Under Windows, the application memory space is represented using logical addresses and does not necessarily map on to a continuous physical address space. However, the board is able to transfer data consecutively to the discontinuous physical address space. Bus master data transfer can be performed for a maximum 64MBytes physical memory area. The actual memory size able to be used when setting up a data transfer in an application depends on the OS type and the size of memory in the PC.

Basic GPIB Functions

Master/slave function

The board can be used as either the master (controller) or slave, depending on a setting in the property page. When used as the master, the board can send IFC (InterFace Clear) at any timing and control the REN (Remote ENable) line.

Communication function

The board can send and receive data in accordance with the IEEE 488 Standard. You can add delimiters and EOI (End of Identify) to outgoing data depending on the software settings.

Serial poll/parallel poll/SRQ send functions

The following functions can be used depending on the master/slave configuration.

Master

Serial poll

Parallel poll

Slave

Status byte setting

SRQ (Service ReQuest) transmission

Response to parallel polling

My address setting

It is possible to set the board GPIB address (my address) on a property page. No setting is required on the board.

Additional Functions

Line monitor function

The states of all control lines (IFC, ATN, SRQ, REN, EOI, DAV, NRFD, and NDAC) can be read. The latch data can also be read.

The states of the data lines (DIO1 to DIO8) can be read on the GPIB-F-LPE.

Communication using FIFO memory

The board can use on-board FIFO memory for communication. As the board controls this form of communication, it can be performed at high speed irrelevant to the PC's CPU speed.

Note, however, that the actual communication speed is set to the speed of the slowest device in compliance with the GPIB standard.

Analyzer function (GPIB-F-LPE)

The state transition of all lines in the GPIB cable can be analyzed by using the on-board FIFO memory. (A maximum of 64K data items can be collected.)

This function can be used to locate the cause of a failure or to check data flowing on lines.

The function is provided by the analyzer utility (Analyzer.exe).

Open the Start Menu, then select "CONTEC API-PAC(W32)" – "GPIB" – "GPIB ANALYZER".

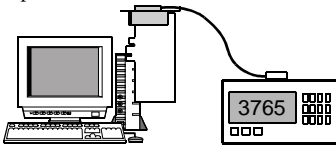
Otherwise, directly execute "Program Files\API-PAC(W32)\GPIB\ANALYZER\Analyzer.exe".

Running Method

- (1) Install the board on your PC according to Step 2 "Setting the Hardware" and Step 3 "Installing the Hardware" in Chapter 2 "Setup".

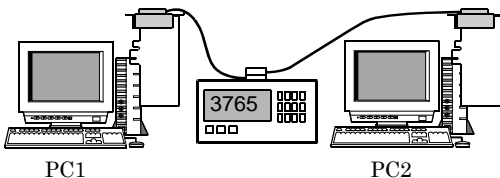
After having installed the board, connect the board to an instrument for analysis. The board can communicate with the instrument while executing analysis.

Example 1 of Connection:



One board communicating the instrument while analyzing

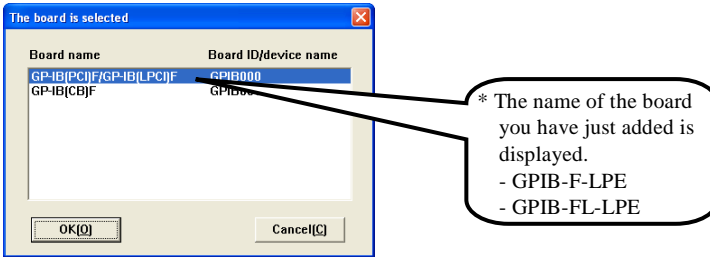
Example 2 of Connection:



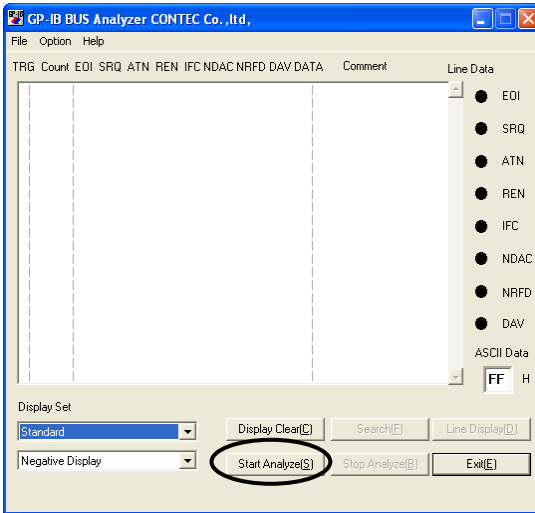
PC1: Only the analyzer is executed.

PC2: Communicating with the measuring instrument

- (2) If more than one board (device) that supports the analyzer function is installed in the PC, the following window appears when you start the analyzer utility. Select the device name set for the hardware in the property page, then click [Select Board]. (This window does not appear if only one board is present that supports the analyzer function.)



- (3) Click on the [Start Analyze] button. The analyzer utility analyzes the subsequent changes to lines. When the communication you want to analyze has been completed, click on the [Stop Analyze] button. The analysis results will be displayed on the screen.



Convenient usage

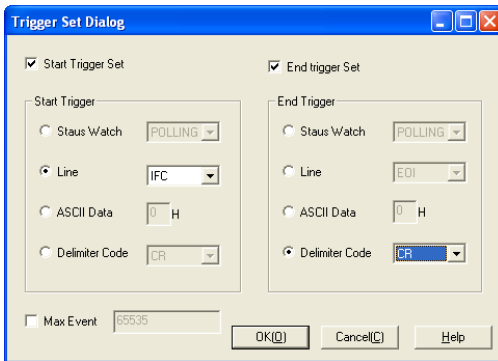
(1) Using the start and end triggers

During analysis, the analyzer utility can obtain data only when a specific condition is satisfied in the entire session of communication. The condition that can be specified is a communication status (polling, transmit/receive, etc.), a change to the control line (EOL, SRQ, ATN, etc.), a data line match (specified ASCII code), or a delimiter match.

Select "Set Trigger Condition" from the "Set" menu.

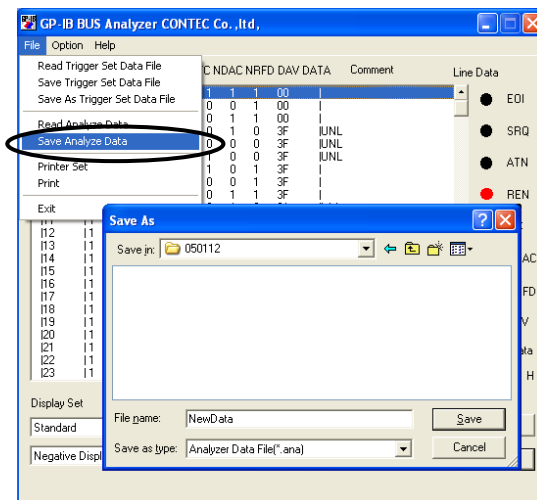
The analyzer utility works as follows with the settings made on the Trigger Set Dialog below.

- The analyzer utility starts analysis the moment IFC changes.
- The analyzer utility ends analysis upon transmit/receive of data "CR" (ODH).



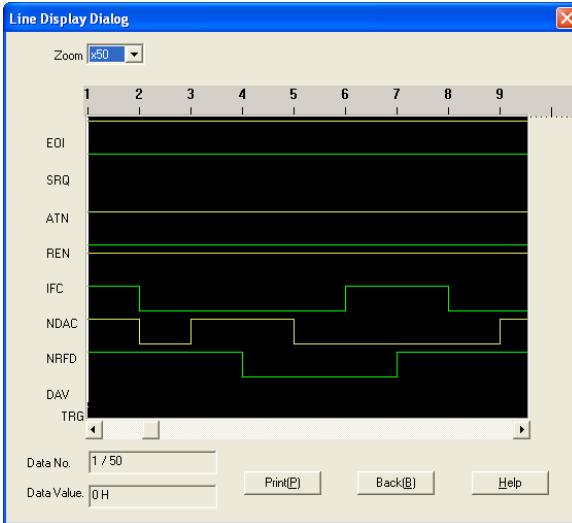
(2) Saving analysis data

Once saved, obtained analysis data can be opened again with the analyzer utility. Since analysis data is saved in CSV format as well, you can reference and edit the data using a proper program such as Excel.



(3) Viewing analysis data in a chart

The analysis utility can display analysis data in a chart.



5. About Software

CD-ROM Directory Structure

\	
— Autorun.exe	Installer Main Window
Readmej.html	Version information on each API-TOOL (Japanese)
Readmeu.html	Version information on each API-TOOL (English)
.	
.	
— APIPAC	Each installer
— AIO	
— DISK1	
— DISK2	
—	
— DISKN	
— AioWdm	
— CNT	
— DIO	
—	
.	
.	
— HELP	HELP file
— Aio	
— Cnt	
—	
.	
.	
— INF	OS-specific INF file
— WDM	
— Win2000	
— Win95	
.	
.	
— Readme	Driver readme file folder
.	
.	
— Release	Driver file on each API-TOOL
— API_NT	(For creation of a user-specific install program)
— API_W95	
.	
.	
— UsersGuide	Hardware User's Guide (PDF files)

About Software for Windows

The bundled CD-ROM “Driver library API-PAC(W32)” contains the functions that provide the following features:

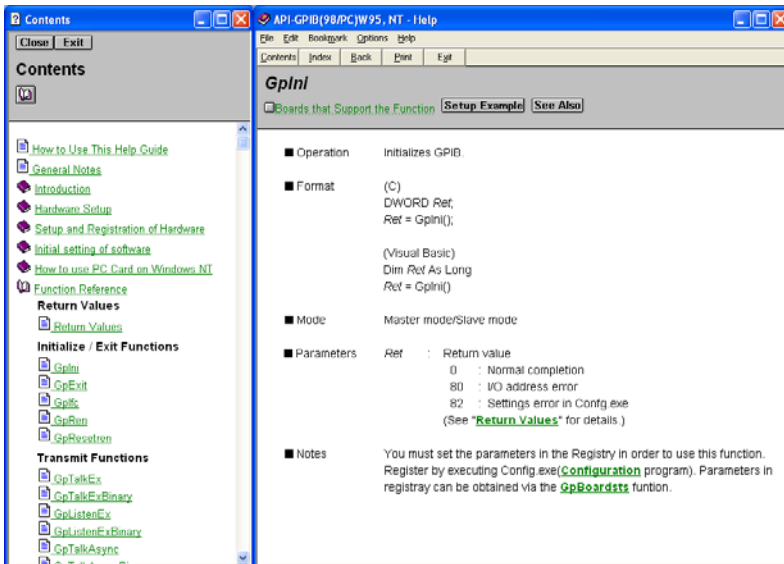
- All of the master mode, slave mode, and interrupt level can be set by software.
- Three-wire handshaking is employed to assure transfer even between the sending and receiving devices different in speed.

For details, refer to the help file. The help file provides various items of information such as “Function Reference”, “Sample Programs”, and “FAQs”. Use them for program development and troubleshooting.

For using API-GPIB(98/PC)

Accessing the Help File

- (1) Click on the [Start] button on the Windows taskbar.
- (2) From the Start Menu, select “Programs” – “CONTEC API-PAC(W32)” – “GPIB” – “API-GPIB HELP” to display help information.

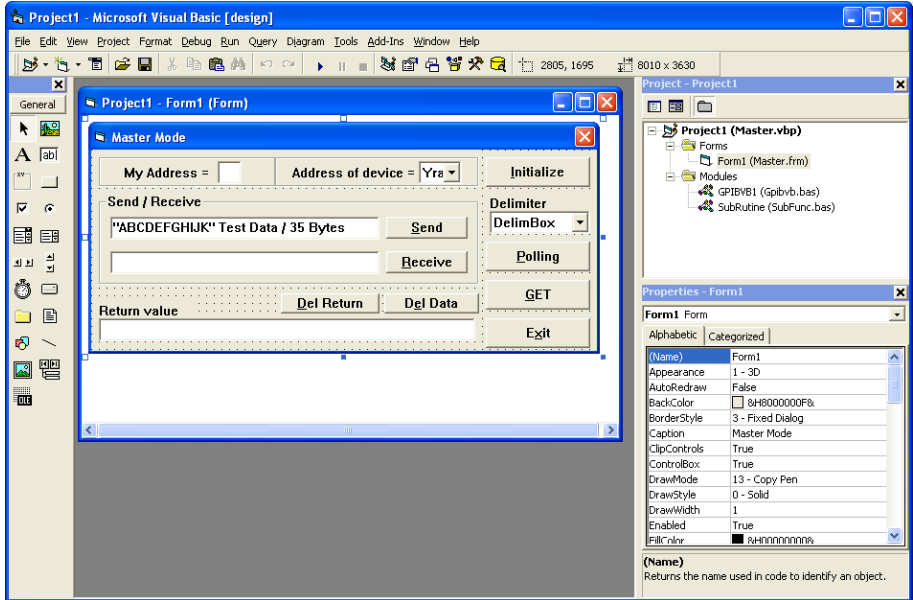


Using Sample Programs

Bundled sample programs cover basic transmit/receive and polling in master and slave modes and support ADVANTEST Multimeters, YEW voltage generators, and SONY Tektronix oscilloscopes.

Use these sample programs as references for program development and operation check.

The sample programs are stored in \Program Files\CONTEC\API-PAC(W32)\GPIB\Samples.



Running a Sample Program

- (1) Click on the [Start] button on the Windows taskbar.
- (2) From the Start Menu, select "Programs" – "CONTEC API-PAC(W32)" – "GPIB" – "SAMPLE...".
- (3) A sample program is invoked.

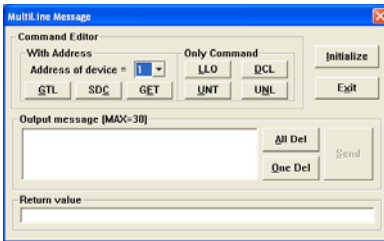
Sample Programs - Examples

- Master Mode : Executes a series of operations in master mode.
- Slave Mode : Executes a series of operations in slave mode.
- Multi-meter : Triggers a multimeter periodically (based on the timer and events) to sample and display data.
- Voltage Source control : Allows the master to gain control of a digital voltmeter at fixed intervals.
- Oscilloscope 1 : Receives screen data from an oscilloscope and displays it in a graph.
- Oscilloscope 2 : Receives screen data from an oscilloscope and saves it in CSV format.
- MultiLine Message : Creates a multiline message for the remote device.

[Master Mode]



[MultiLine Message]



[Slave Mode]



[Oscilloscope 2]



[Voltage Source control]



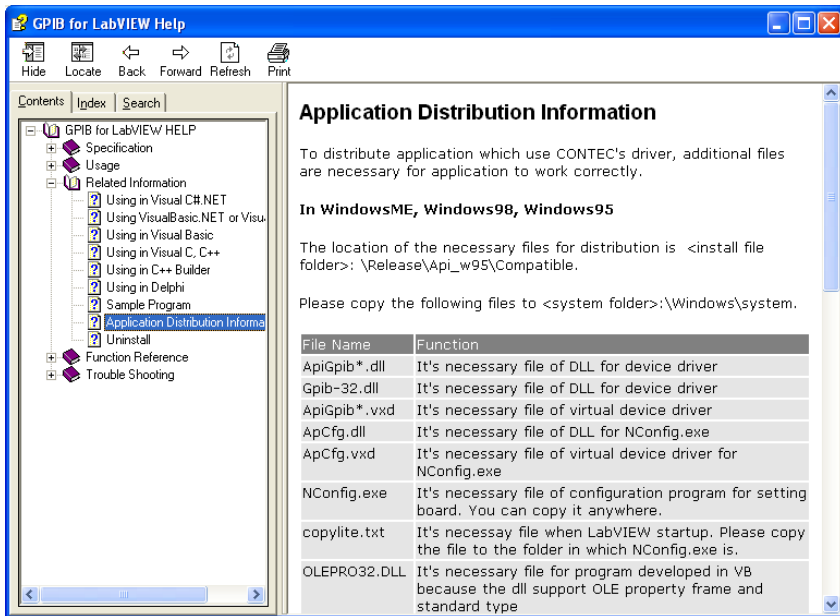
For using API-GPLV(W32)

API-GPLV(W32) is a driver created in NI's GPIB function style as the software for controlling CONTEC GPIB boards.

When the driver is installed, existing applications such as LabVIEW can operate CONTEC GPIB boards. For details, refer to the help file. The help file provides information such as "operation specifications", "additional information", and "troubleshooting".

Accessing the Help File

- (1) Click on the [Start] button on the Windows taskbar.
- (2) From the Start Menu, select "Programs" – "CONTEC API-PAC(W32)" – "GPLV" – "API-GPLV HELP" to display help information.



Function List

Up to now the NI-488.2 Board-Level Calls

Function Name	Action Outline
ibask	Return information about software configuration parameters.
ibcac	Become Active Controller.
ibcmd	Send GPIB commands.
ibcmda	Send GPIB commands asynchronously.
ibconfig	Change the software configuration parameters.
ibdma	Enable or disable DMA.
ibeos	Configure the end-of-string (EOS) termination mode or character.
ibeot	Enable/disable auto-assertion of GPIB EOI line at the end of write.
ibfind	Open and initialize a GPIB board.
ibgts	Go from Active Controller to Standby.
ibist	Set or clear the board individual status bit for parallel polls.
iblines	Return the status of the eight GPIB control lines.
ibln	Check for the presence of a device on the bus.
ibloc	Go to local.
ibnotify	Asynchronously notify user when one or more GPIB events occur.
ibonl	Place the device online or offline.
ibpad	Change the primary address.
ibppe	Parallel poll configure.
ibrd	Read data from a device into a user buffer.
ibrda	Read data asynchronously from a device into a user buffer.
ibrdf	Read data from a device into a file.
ibrpp	Conduct a parallel poll.
ibrsc	Request or release system control.
ibrsv	Request service and change the serial poll status byte.
ibsad	Change or disable the secondary address.
ibsic	Assert IFC (Interface Clear).
ibstre	Set or clear the Remote Enable (REN) line.
ibstop	Abort asynchronous I/O operation.
ibtmo	Change or disable the I/O timeout period.
ibwait	Wait for GPIB events.
ibwrt	Write data to a device from a user buffer.
ibwrta	Write data asynchronously to a device from a user buffer.
ibwrtf	Write data to a device from a file.

Up to now the Ni-488.2 Device-Level Calls

Function Name	Action Outline
ibask	Return information about software configuration parameters.
ibbna	Change the access board of a device.
ibclr	Clear a specific device.
ibconfig	Change the software configuration parameters.
ibdev	Open and initialize a device
ibeos	Configure the end-of-string (EOS) termination mode or character.
ibeot	Enable/disable auto-assertion of GPIB EOI line at the end of write.
ibln	Check for the presence of a device on the bus.
ibloc	Go to local.
ibnotify	Asynchronously notify user when one or more GPIB events occur.
ibonl	Place the device online or offline.
ibpad	Change the primary address.
ibpct	Pass control to another GPIB device with Controller capability.
ibppe	Parallel poll configure.
ibrd	Read data from a device into a user buffer.
ibrda	Read data asynchronously from a device into a user buffer.
ibrdf	Read data from a device into a file.
ibrpp	Conduct a parallel poll.
ibrsp	Conduct a serial poll.
ibsad	Change or disable the secondary address.
ibstop	Abort asynchronous I/O operation.
ibtmo	Change or disable the I/O timeout period.
ibtrg	Trigger selected device.
ibwait	Wait for GPIB events.
ibwrt	Write data to a device from a user buffer.
ibwrta	Write data asynchronously to a device from a user buffer.
ibwrtf	Write data to a device from a file.

NI-488.2 Calls for Multiple Devices

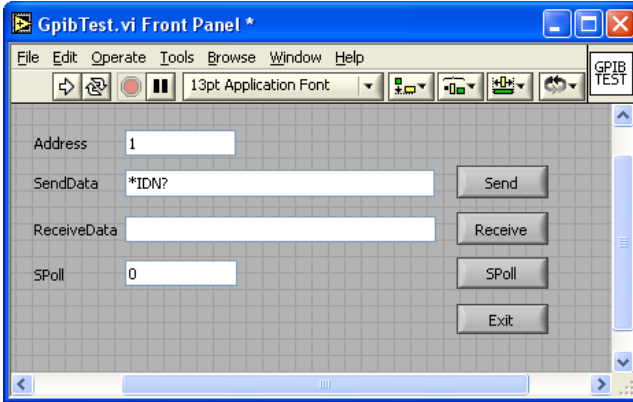
Function Name	Action Outline
AllSpoll	Serial poll all devices.
DevClear	Clear a single device.
DevClearList	Clear multiple devices.
EnableLocal	Enable operations from the front panel of devices (leave remote programming mode).
EnableRemote	Enable remote GPIB programming for devices.
FindListn	Find listening devices on the GPIB.
FindRQS	Determine which device is requesting service.
PassControl	Pass control to another device with Controller capability.
PPoll	Perform a parallel poll on the GPIB.
PPollConfig	Configure a device to respond to parallel polls.
PPollUnconfig	Unconfigure devices for parallel polls.
RcvRespMsg	Read data bytes from a device that is already addressed to talk.
ReadStatusByte	Serial poll a single device.
Receive	Read data bytes from a device.
ReceiveSetup	Address a device to be a Talker and the interface board to be a Listener in preparation for RcvRespMsg.
ResetSys	Reset and initialize IEEE 488.2-compliant devices.
Send	Send data bytes to a device.
SendCmds	Send GPIB command bytes.
SendDataBytes	Send data bytes to devices that are already addressed to listen.
SendIFC	Reset the GPIB by sending interface clear.
SendList	Send data bytes to multiple GPIB devices.
SendLLO	Send the Local Lockout (LLO) message to all devices.
SendSetup	Set up devices to receive data in preparation for SendDataBytes.
SetRWLS	Place devices in Remote With Lockout State.
TestSRQ	Determine the current state of the GPIB Service Request (SRQ) line.
TestSys	Cause IEEE 488.2-compliant devices to conduct self-test.
Trigger	Trigger a device.
TriggerList	Trigger multiple devices.
WaitSRQ	Wait until a device asserts the GPIB Service Request (SRQ) line.

Using Sample Programs

Sample programs can execute basic transmit/receive and polling.

Use these sample programs as references for program development and operation check.

The sample programs are stored in \Program Files\CONTEC\API-PAC(W32)\GPLV\Samples.

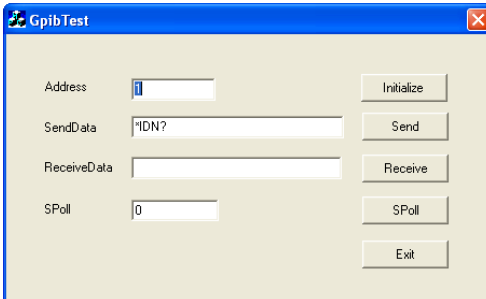


Running a Sample Program

- (1) Click on the [Start] button on the Windows taskbar.
- (2) From the Start Menu, select “Programs” – “CONTEC API-PAC(W32)” – “GPLV” – “SAMPLE GPLV”.
- (3) A sample program is invoked.

Program example

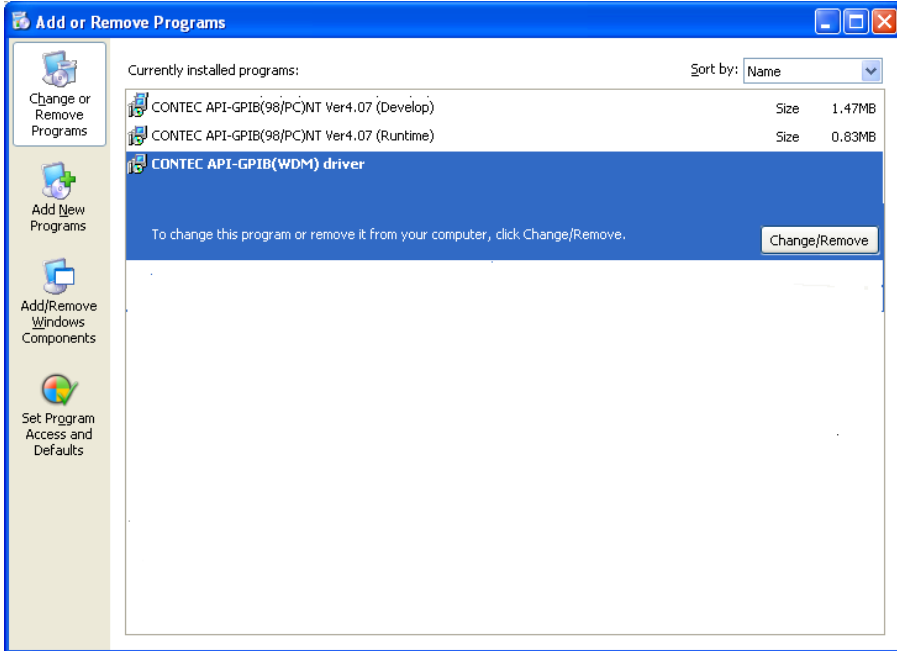
- GpibTest : Executes initialization, transmission, reception, and polling.



Uninstalling the API Function Libraries

To uninstall API-PAC(W32), follow the procedure below.

- (1) Click on the [Start] button on the Windows taskbar. From the Start Menu, select “Settings” – “Control Panel”.
- (2) Double-click on “Add/Remove Programs” in the Control Panel.
- (3) Select “CONTEC API-GPIB(WDM) driver” , “CONTEC API-GPIB(98/PC)” or “CONTEC API-GPLV(W32) xx”. [Change/Remove] button. Follow the on-screen instructions to uninstall the function libraries.



About Software for Linux

The Linux version GPIB communication driver API-GPIB(LNX) contains the functions that provide the following features:

- All of the master mode, slave mode, and interrupt level can be set by software.
- Three-wire handshaking is employed to assure transfer even between the sending and receiving devices different in speed.

For details, refer to the help file. The help file provides various items of information such as “Function Reference”, “Sample Programs”, and “FAQs”. Use them for program development and troubleshooting.

Driver Software Install Procedure

The Linux version for GPIB communication driver, API-GPIB(LNX), is supplied as a compressed file /linux/gpib/cgpibXXX.tgz on the bundled API-PAC(W32)CD-ROM. (Note: XXX represents the driver version.)

Mount the CD-ROM as shown below, copy the file to an arbitrary directory, and decompress the file to install the driver.

For details on using the driver, refer to readme.txt and the help file in HTML format extracted by installation.

To install the driver, log in as a superuser.

Decompression and setup procedure

```
# cd
# mount /dev/cdrom /mnt/cdrom           Mount the CD-ROM.
# cp /mnt/cdrom/linux/gpib/cgpibXXX.tgz ./ Copy the compressed file.
# tar xvfz cgpibXXX.tgz                 Decompress the compressed file.
.....
# cd contec/cgpib
# make                                  Compile the file.
.....
# make install                           Install.
.....
# cd config
# ./config                               Set up the board to be used.
..... Set as follows .....
# ./contec_gpib_start.sh                 Start the driver.
# cd
```

Accessing the Help File

- (1) Invoke a web browser in your X-Window environment.
- (2) In the browser, open gpibhelp.htm in the contec/cgpib/help directory.

Using Sample Programs

Sample programs have been prepared for specific basic applications.

Sample programs for each language are contained in the contec/cgpib/samples directory. For compiling them, refer to the manual for the desired language.

Uninstalling the driver

To uninstall the driver, use the uninstall shell script contained in the contec/cgpib directory. For details, check the contents of the script.

6. About Hardware

This chapter provides hardware specifications and hardware-related supplementary information.

For detailed technical information

For further detailed technical information (“Technical Reference” including the information such as an I/O map, configuration register, etc.), visit the Contec’s web site (<http://www.contec.com/support/>) to call for it.

Hardware specification

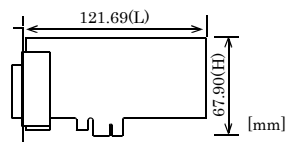
The following tables list the hardware specifications of the board.

Table 6.1. Specification

Item	GPIB-F-LPE	GPIB-FL-LPE
GPIB		
Number of channel	1 channel Conforms to IEEE-488.1, 488.2(GPIB) standards	
Transfer format	8-bit parallel, 3-wire handshake system	
Transfer rate	1.5Mbyte/sec	
Data buffer size	2Kbyte send, 2Kbyte receive	
Signal logic	Negative logic L level : 0.8V or less, H level : 2.0V or more	
Cable length between device	4m or less *1	
Total cable length	20m or less	
Connectable number of device	15 devices	
Analyzer buffer size	64K data points (1 data point : Control signals + DIO1 - 8)	None
Bus master section		
DMA channels	2 channels	
Transfer bus width	32-bit	
Transfer data length	8 PCI Words length (Max.)	
Transfer rate	80Mbyte/sec	
Scatter/Gather function	64Mbyte/ch	
Common section		
I/O address	Any 128-byte boundary	
Interrupt	1 level use	
Consumed current (Max.)	3.3VDC 600mA	
Operating conditions	0 - 50°C, 10 - 90%RH (No condensation)	
Bus specification	PCI Express Base Specification Rev. 1.0a x1	
External dimensions (mm)	121.69(L) x 67.90(H)	
Connector used	Micro ribbon connector (24-pin) 5555139-1 [made by AMP] or equivalent	
Weight	80g	

*1 For details, see item (2) in Chapter3, "Connecting Cables".

Board dimensions <GPIB-F-LPE, GPIB-FL-LPE>



The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

Table 6.2. Interface function

Code	Function
SH1	Source handshake functions
AH1	Acceptor handshake functions
T6	Basic talker, serial polling, MLA talker release
L4	Basic listener MTA listener release
TE0	No extended talker functions
LE0	No extended listener functions
SR1	Service request function
RL1	Remote function
DC1	Device clear function
DT1	Device trigger function
PP1	Configuration by remote message
C1	System controller function
C2	IFC send
C3	REN send
C4	Response to SRQ
C26	Interface message send, parallel polling

Restrictions and Notes

Positioning the GPIB Connector for the GPIB-F-LPE, GPIB-FL-LPE

Although the GPIB connector on the GPIB-F-LPE, GPIB-FL-LPE exceed the specified bracket opening size for Low Profile size by approximately 1.5mm, this rarely causes a problem in practice.

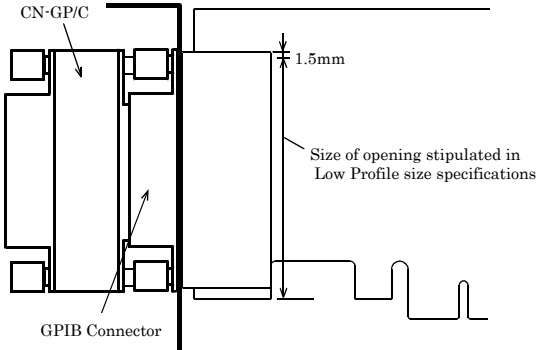


Figure 6.1. Position for Installing the GPIB Connector

GPIB-F-LPE GPIB-FL-LPE User's Manual

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