GPIB-LAN Converter for OSP

External GPIB to LAN converter for R&S®OSP
and other Rohde & Schwarz instruments

Application Note

Products:

| R&S®OSP

| Rohde & Schwarz devices with
Ethernet interface only

This application note describes how to
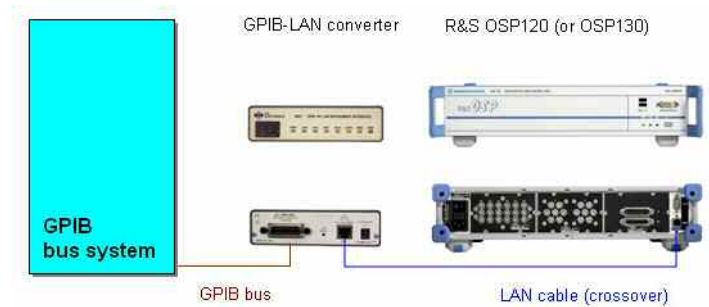control devices with a pure GPIB interface
via Ethernet

ROHDE&SCHWARZ

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1   Introduction

Some of the new Rohde & Schwarz instruments, such as the R&S$^{®}$OSP and R&S$^{®}$FSC, only have a LAN interface.
To be able to operate these instruments in a purely GPIB system, a converter must be connected between the instrument and the GPIB. Rohde & Schwarz now offers such a GPIB to LAN converter.

1.1   General Description of the GPIB to LAN Converter

The GPIB to LAN converter solves the problem of how to connect an instrument that has an Ethernet interface to the GPIB bus. The converter adds a GPIB interface to VXI-11.3 compatible LAN or LXI instruments that do not have a GPIB interface. Applications include replacing obsolete or failed GPIB instruments with a newer instrument that may not have a GPIB interface or just adding a new LAN instrument to a GPIB bus system.

You can use the converter:

- as a direct instrument connection
- with hub instrument connections
- on the computer network
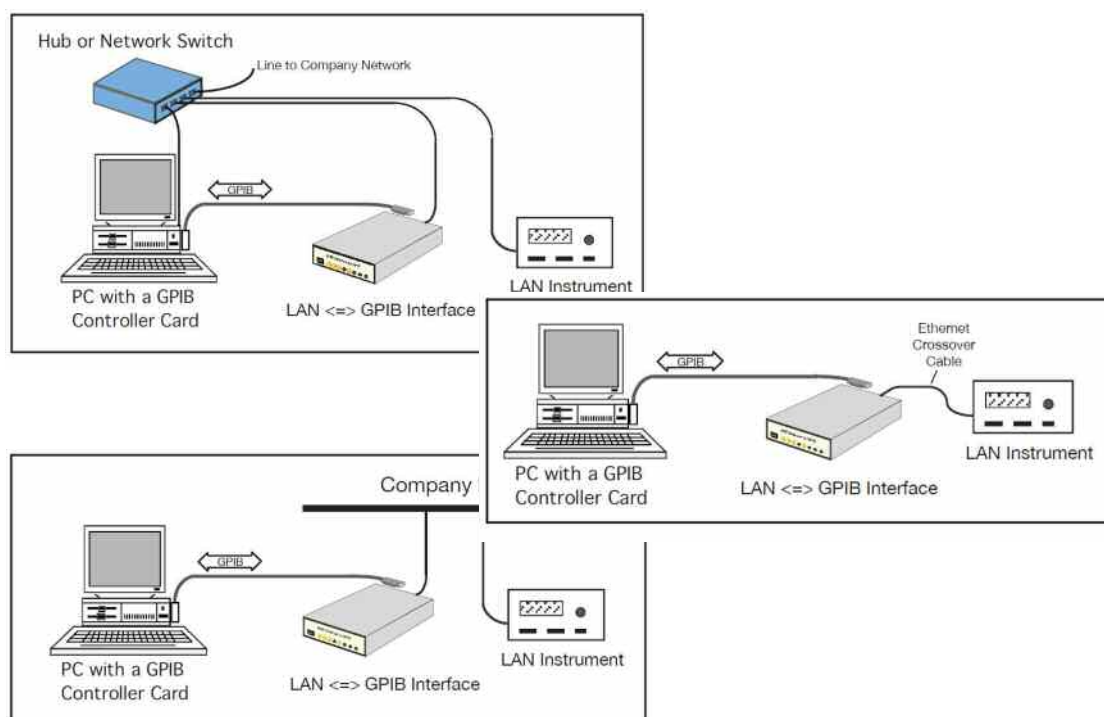
1.2 Description of the 4865 Converter

The 4865 is a GPIB-to-LAN instrument interface that enables a VXI-11.3 compatible LAN instrument to be controlled from a GPIB bus. Using the 4865, GPIB applications running on a computer can transparently interface to a LAN-based instrument just as if it were a GPIB instrument. The 4865 converts 488.1 GPIB commands into the equivalent VXI-11 RPC and sends them to the instrument. Device messages are transparently sent to the instrument and instrument replies are returned to the GPIB controller, just like a GPIB instrument.

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Linking to the Instrument

The 4865 operates with any VXI-11.3 compatible instrument which includes most LAN and some LXI instruments (The LXI specification requires a minimum VXI-11 compatibility in all LXI instruments so check compatibility with your instrument manufacturer.)

The 4865 can be set to operate with an instrument at a specific IP address or to automatically find the instrument. Either method can be used in the direct connection shown in Figure 1 below. If AutoFind is selected, 4865 starts an instrument discovery process as soon as it completes its power turn-on and self-test sequence. When the 48656 finds a VXI-11.3 instrument it opens a core and abort channel to the instrument. The 4865 will also set up a Reverse Interrupt Channel if the instrument supports it.

If the 4865 has been given a specific instrument's IP address, the 4865 only looks for an instrument at that address. Static addresses are recommended when the 4865 is connected to the company network or when multiple instruments may respond to the 4865.

Minimal Programming Changes

In most cases, existing programs that controlled the instrument in a LAN environment or ran the old version of the instrument through its GPIB interface can be used with the 4865 and the new instrument. The only requirement is that the new instrument must understand your existing commands. The 4865 works with any IEEE-488.2 compatible GPIB controller and can be used with LabVIEW, VEE, Visual Basic and C language programs. The 4865 and VXI-11.3 instruments support most 488.1 GPIB commands except for Remote with Lockout and Local with Lockout. You will have to be sure that the instrument supports the device commands used in the existing program and that the device messages sent to the 4865 are terminated with EOI asserted on the last character.

Connections

While the 4865 is normally used in a back-to-back connection with its companion instrument as shown in Figure 1, it can be connected to the instrument in other ways. Figure 2 shows the 4865 connected to the instrument through a hub. This is a typical lab bench connection. It lets you configure the 4865 through the hub and then develop the GPIB program.

Figure 3 shows the 4865 connected to the instrument over a company network. The 4865 gives you standard GPIB control over a LAN instrument no matter where it is located.

4865's Operation

The 4865 transparently passes all device commands and IEEE-488.2 common commands on to the instrument and returns all instrument responses to the client application. The 4865 also does such familiar GPIB tasks as sending Selected Device Clears and Device Triggers to the instrument, set Local or Remote modes and perform Serial Polls. Interface Clears (IFCs) only affect the 4865's GPIB interface and are not passed on to the companion instrument.

SRQs can be passed back to the test application if the instrument has created a Reverse Interrupt Channel. When the 4865 detects a Service Request, the instrument is sent a *device_readSTB* RPC and the response is set into the 4865's GPIB interface and used to assert the SRQ line.

Setup & Installation

The 4865 is very easy to install. Plug the 4865 into a network access point adjacent to your computer as shown in Figure 2 or use an Ethernet crossover cable to connect the 4865 directly to a PC's network port. Launch a web browser and point it to the 4865's default AutoIP address of 169.254.48.65. The 4865's welcome page provides all of the information about the 4865's current settings. On the Configuration, you can set the 4865 to a static IP address or enable the 4865 to accept an DHCP address setting if the network has a server that can assign network addresses. You can also set the 4865's GPIB address and a fixed IP address for the companion instrument if that works better in your environment. Set the remaining network parameters, save the settings and the 4865 is ready to be connected to the instrument and to the network. A rear panel LAN Reset button is provided to reset the 4865's network settings to the factory default settings in case the 4865's configuration needs to be reset.

Easy Firmware Updates

The 4865 has a program download and store function which lets the 4865 receive program changes through its Ethernet interface. If a future firmware change is necessary, the new firmware and upgrade utility program can be downloaded from ICS's website. The 4865 validates the new code before saving it in its Flash memory. The original factory code is never overwritten so you can always revert back to the factory code.

Network Features

The 4865 uses the VXI-11 protocol or RPC over TCP/IP to communicate with the test program (client application). The TCP transportation layer and IP protocol guarantees error-free communication with the 4865 over the network or Internet as long as the connection is maintained.
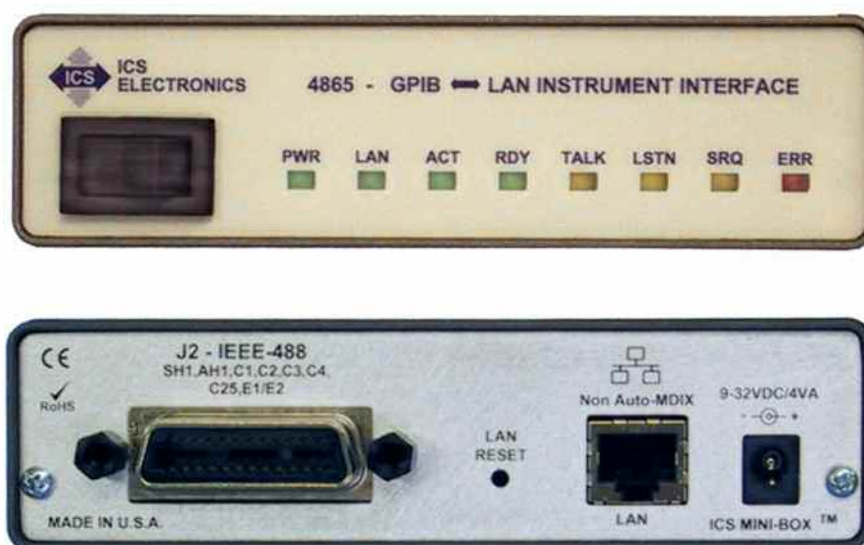
2   Application Example with R&S®OSP

2.1 Introduction

The base units of the R&S®OSP120 and R&S®OSP130 open switch and control platform only have the state-of-the-art Ethernet interface. For integration into older systems that use the GPIB bus, the converter is an ideal way to connect the R&S®OSP.
The following steps are necessary:

- Connect the converter to a PC with an Ethernet interface to configure it (for instance, GPIB and TCP/IP address).
- Set up the configuration and software control (wait cycles may need to be added).

Controlling the R&S®OSP with a GPIB bus system
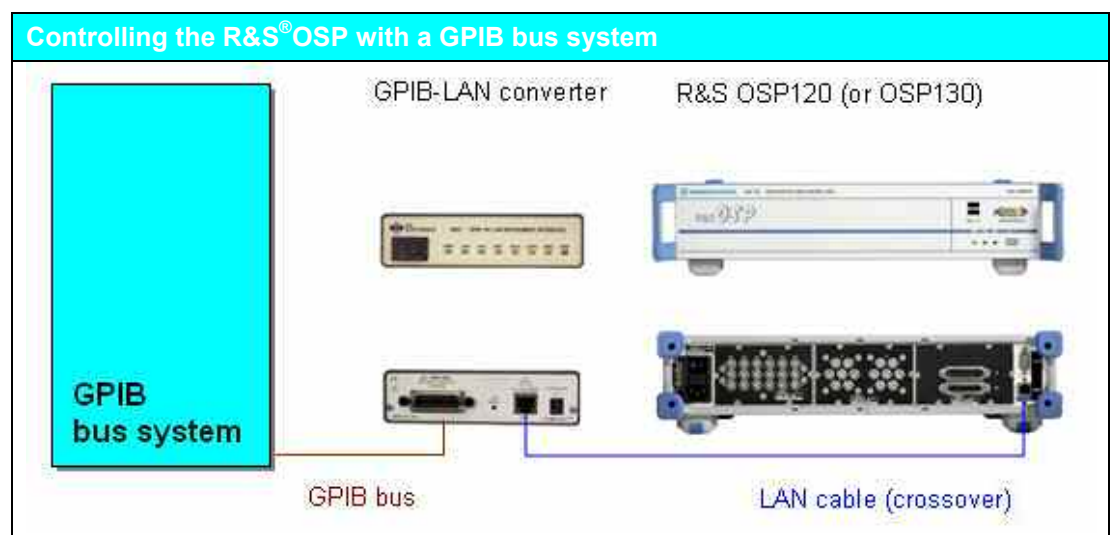
2.1.1   Configuring the Converter

To contact the ICS-4865 (in the reset state) via LAN, the network configuration of the controlling PC must be set up as follows:
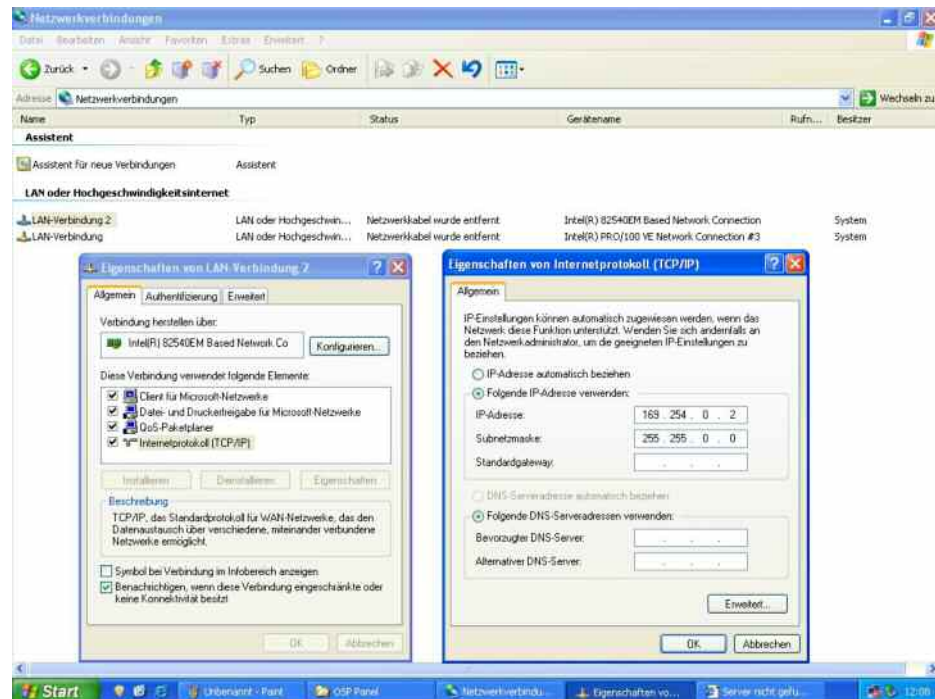
Connect the ICS-4865 to the PC's network card with a **crossover Ethernet cable**. Then turn on the ICS-4865 and wait until it finishes booting up (approx. 20 seconds).
In a web browser, enter the IP address http://169.254.48.65.
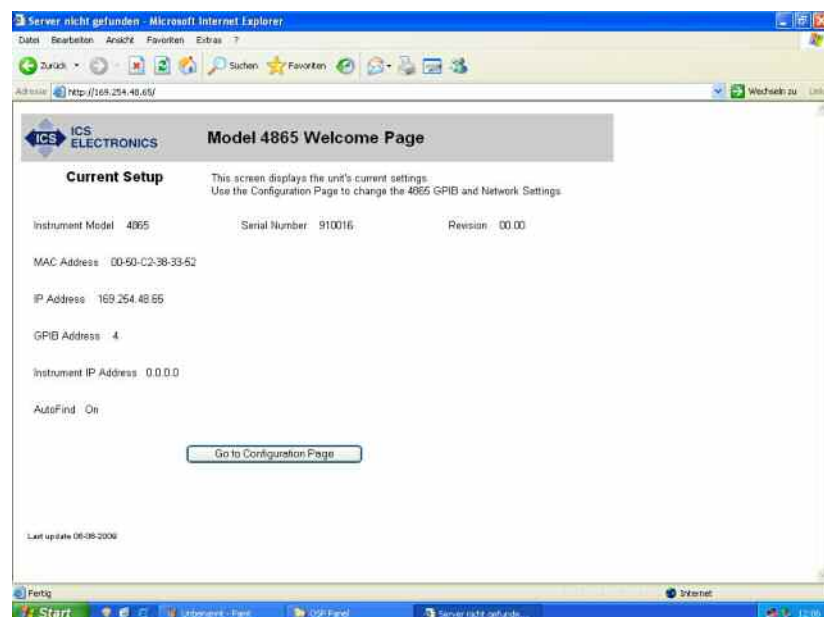
The configuration page opens. Make the following changes:
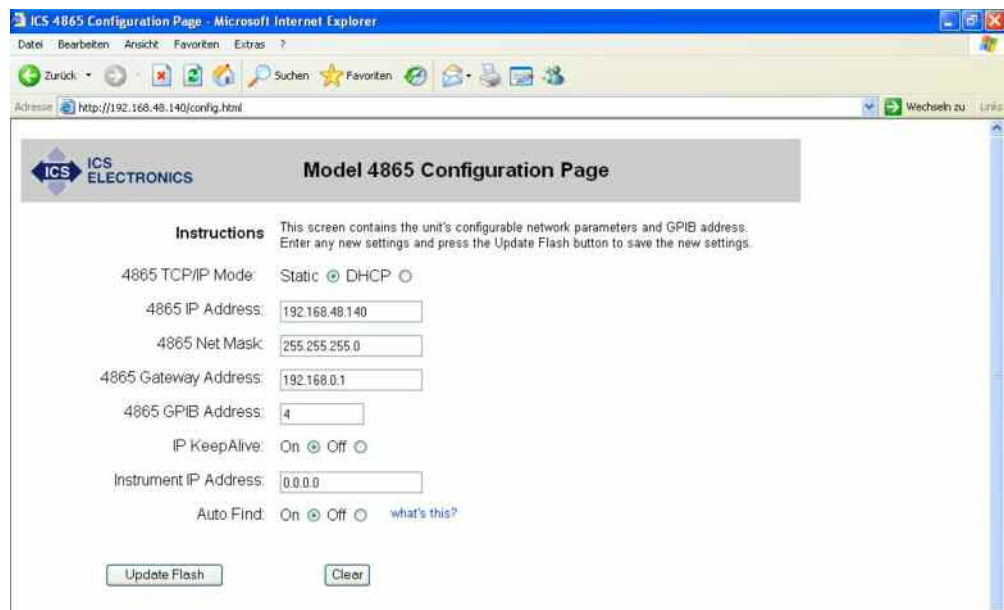
Click 'Update Flash' to save the changes to the ICS-4865.

With these settings, the ICS-4865 will later automatically search in its own address range for a VXI-11.3 instrument (instrument with a LAN interface), and contact the first instrument found. If only the R&S®OSP (default IP address: 192.168.48.147) is connected to the ICS-4865 with the crossover cable, it will be automatically found. The 'RDY' LED on the ICS-4865 stops blinking and will be continuously on.

The ICS-4865 now has a new IP address. To be able to contact it from the PC in the future, the network configuration of the controlling PC must be set up as follows:
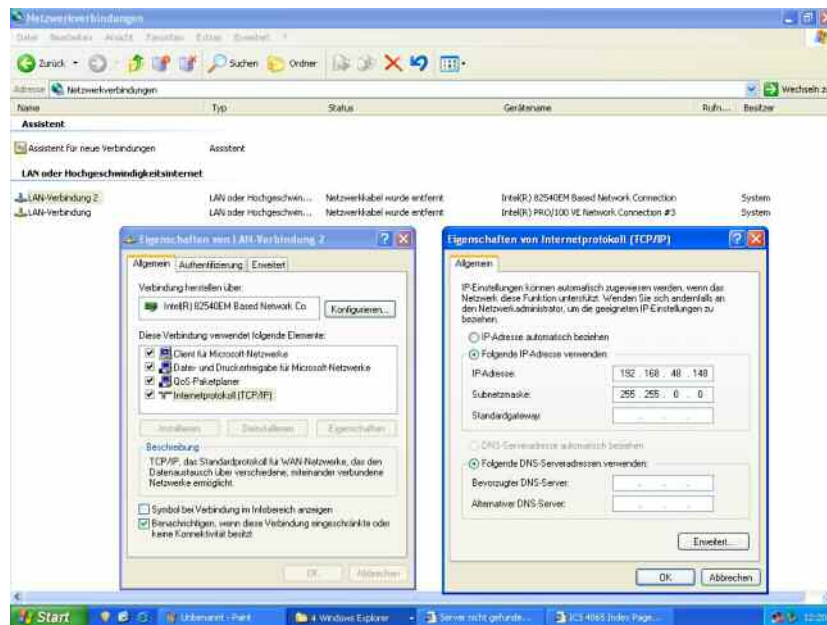

When you enter the new IP address of the ICS-4865 in a web browser, the following Welcome page appears:
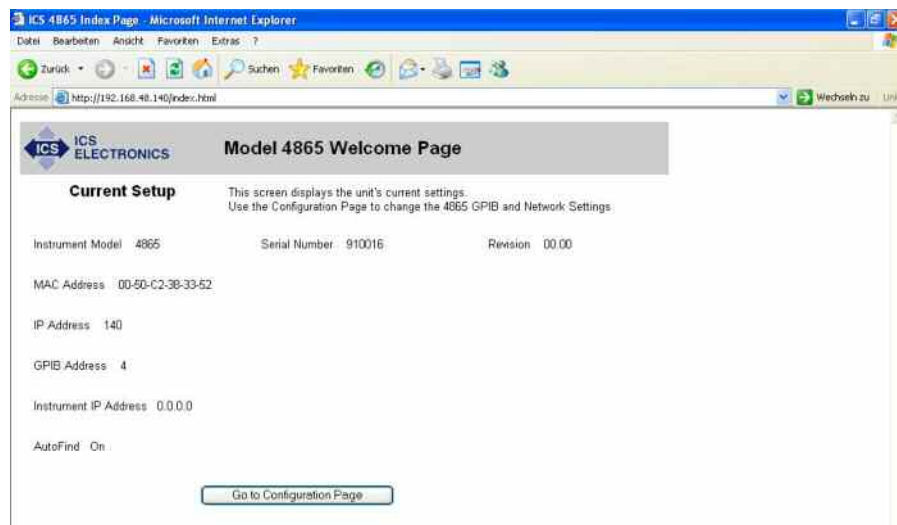
The ICS-4865 can also be configured so that instead of looking for a connected instrument in its own address range, it only looks for a set IP address and expects to find a VXI-11.3 instrument there (e.g. the R&S®OSP) (see the following screenshot).
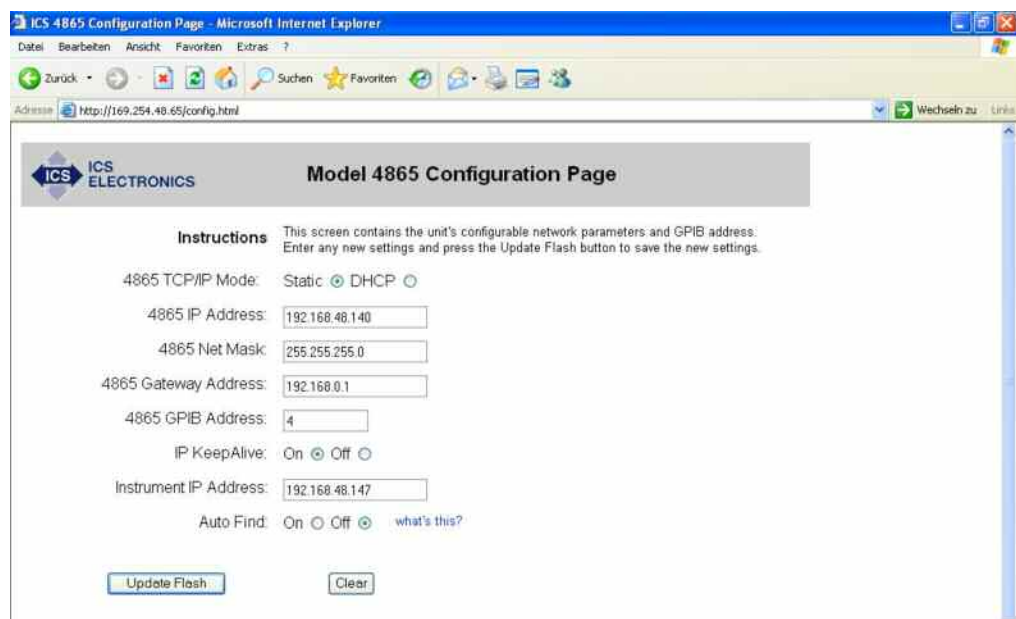
If this configuration is saved by clicking 'Update Flash', the ICS-4865 welcome page is again called up and the following screen appears. The set 'Instrument IP Address' is not shown, but internally this instrument address is still set and still functions.
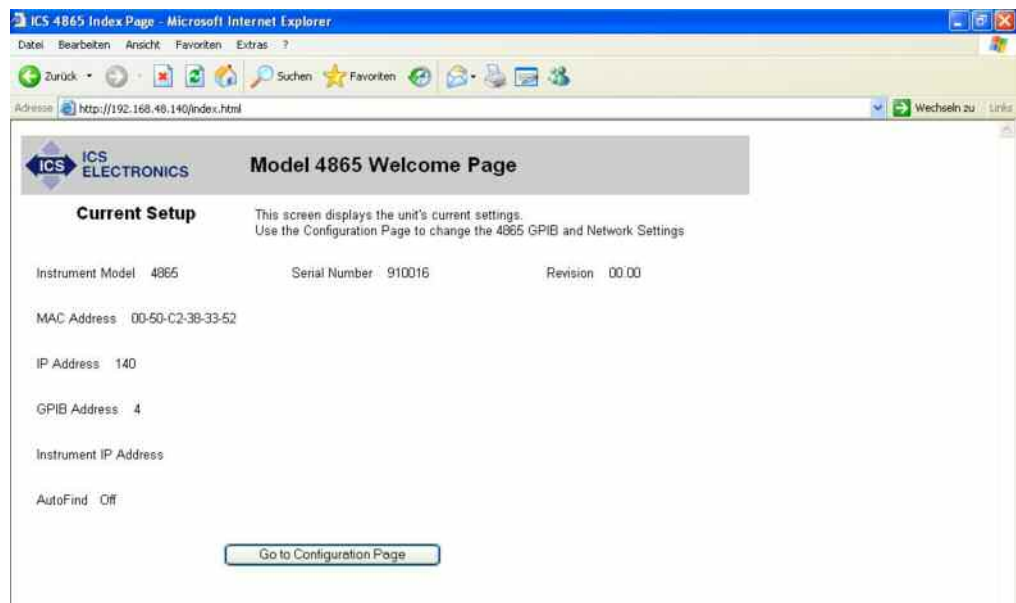
After configuring the ICS-4865 via the PC's web browser, connect the ICS-4865 to the R&S®OSP with the crossover cable. Then, turn on the R&S®OSP and the ICS-4865 and wait for both instruments to boot up. It does not matter which instrument is turned on first. The 'RDY' LED on the ICS-4865 must be continuously on. Connect the controlling PC to the ICS-4865 with a GPIB cable. With the Resource Descriptor, GPIB::4::INSTR, the R&S®OSP panel (version 1.16 or later) can now contact the OSP via the ICS-4865.
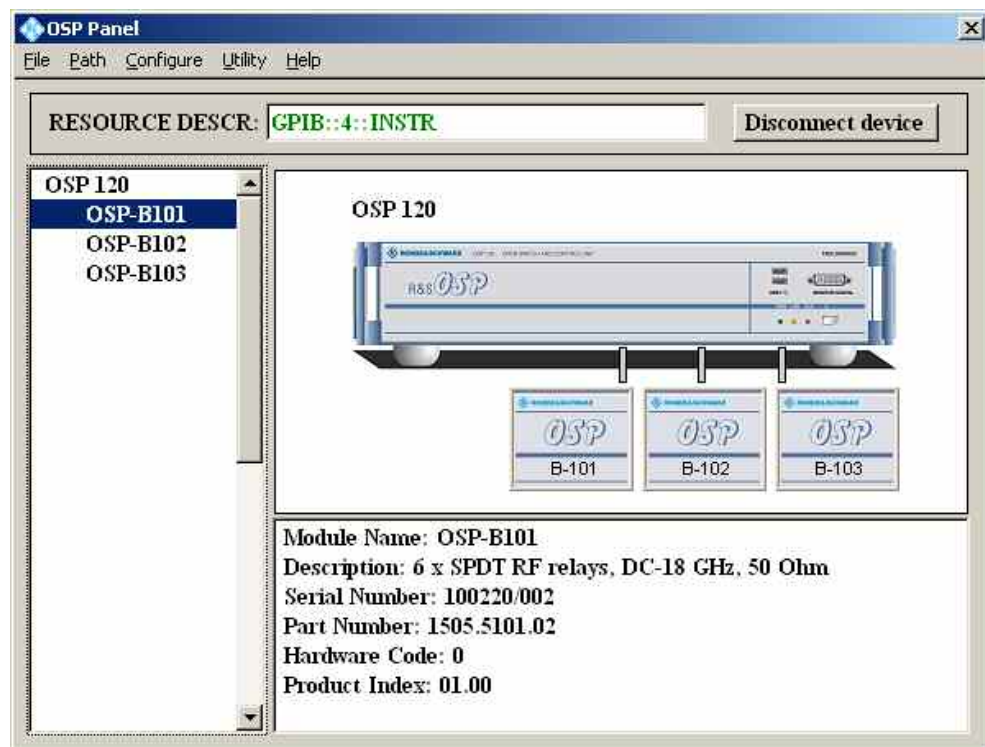
2.1.2 Tips for Your Applications

When setting up the OSP panel software for operation with the ICS-4865 GPIB-LAN converter, a 10 ms waiting time has to be entered before the VISA viRead. Without this short delay, sporadic read timeouts occurred during long-term testing.

SCPI commands that are sent with the viWrite VISA function via the IEC/IEEE bus interface to the ICS-4865 GPIB-LAN converter, have to end with a (only one!) new line character (‚\n'). When communicating directly via the LAN interface without the 4865 GPIB to LAN converter, it was possible to have several new line characters at the end of the SCPI command without causing communications errors.

3   Ordering Information

Ordering Information		
Description	**Type**	**Order No.**
GPIB-LAN Converter (converter, crossover LAN cable, 230 V power supply (Europe, German plug), documentation, CD)	R&S®GPIB-LAN	1505.4686.02

3.1 References

GPIB-LAN converter data sheet

GPIB-LAN converter application card from Rohde & Schwarz

4   A1: Technical Parameters

Physical

Size   (L x W x H): 7.45" x 5.57" x 1.52" (18.92 cm x 14.15 cm x 3.86 cm)
Weight 1.6 lbs (0.73 kg), plus power adapter
Temperature: operating –10 °C to +65 °C, storage –40 °C to +70 °C

Supported Standards

IEEE 488.1 Capabilities:
The 488-USB meets IEEE-STD-488.1 with the following capabilities: AH1, SH1, C1, C2, C3, C4, C9.
E2 drivers incorporate power up/down protection. Converter address 0 to 30 [0].

488 Bus Performance
Long-term GPIB transfer rates are limited by the LAN data transfer rate, the client-computer performance, the GPIB controller and the LAN instrument or device. Internal delays vary with the amount of data transferred and the converter activity when the message is received.
Short-term transfer rates: GPIB to converter >20 kbyte/s, converter to GPIB >18 kbyte/s
Internal delays: *IDN? query 46 ms typical, *CLS command 18 ms typical

Supported GPIB (IEEE-488.1) Commands
Device Clear, Device Trigger, Local, Remote, Serial Poll

VXI-11 Capabilities
Fully VXI-11.3 compliant; VXI-11.3 client side; data, abort and interrupt channel types; max. 64 instrument links. Locking by instrument link

RPC Protocol
Conforms to ONC RPC Version 2

Ethernet Interface
Type IEEE 802.3 compliant; speeds: 10BaseT (10 Mbit/s), 100BaseT (100 Mbit/s)
IP Address: Static or DHCP (AutoIP)
Factory setting: DHCP with default to 169.254.48.65 if no DHCP server found.
Net mask: 255.255.0.0; interface name: inst0

Companion Instrument

The converter supports a single instrument that is VXI-11.3 and IEEE-488.2 compatible.

System Requirements

Computer with an IEEE-488.2 GPIB controller. Device messages must be terminated with the IEEE-488.2 new line terminator (line feed with EOI asserted) or with just EOI asserted if the LAN instrument does not require a terminator.
Computer with an IEEE 802.3 LAN interface and a web browser for configuring the converter.

Internal Web Server
The internal Web Server provides HTML web pages for viewing and setting the converter's network settings.

Controls and Indicators

CONTROLS: front panel power switch; rear-panel LAN reset push button
LEDs
- o   PWR: power on
- o   LAN: unit connected to an active network or network device
- o   ACT: transferring messages to/from the network
- o   TALK: converter is addressed to talk
- o   LSTN: converter is addressed to listen
- o   ERR: unit has detected an error

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

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