

# IEEE 488

## APPLICATION BULLETIN

### How to Configure ICS's Ethernet Interfaces using the internal WebServer

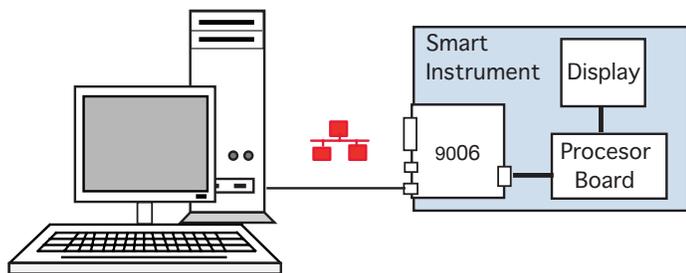
#### INTRODUCTION

In many cases, it is desirable to change the configuration settings in ICS's Ethernet Interface programmatically. In some of the interfaces, this is done with SCPI commands using the VXI-11 protocol, or with the RPC commands documented in the Interface's Instruction Manual. In all units, some of the configuration parameters can be changed manually using a web browser. Most of ICS's Ethernet Interfaces will let you change the Network and GPIB Address setting using the web browser.

This Application Note describes how a user can take advantage of the Interface's internal web server to programmatically change the Interface's settings using port 80.

#### EXAMPLE APPLICATION

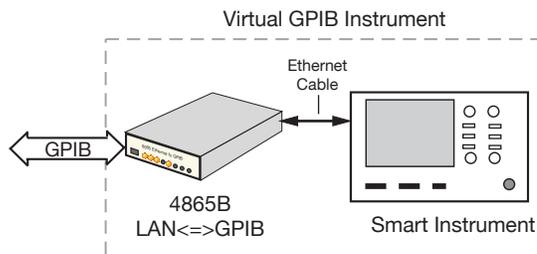
ICS's Ethernet equipped Interfaces use the Ethernet port to communicate with a PC or a smart instrument. Figure 1 shows a smart instrument with an embedded processor board that uses an ICS 9006 board with multiple interfaces to talk to the outside world. The PC in Figure 1 is connected to the 9006's Ethernet port. The user can configure some 9006 parameters with SCPI commands using VXI-11 protocol and others manually using a web browser.



**Figure 1 An embedded processor board paired with a 9006 to create a smart instrument with Ethernet, GPIB and USB Interfaces**

Many instruments are now being built with an embedded PC card and have a Windows or some other operating system to run the instrument. These 'smart' instruments often include a touch screen panel or another way for a user to input data or commands.

Figure 2 shows an ICS 4865B GPIB to Ethernet Instrument Interface communication with the Instrument over an Ethernet link.



**Figure 2 A Smart Instrument paired with a 4865B to create a GPIB controlled instrument**

In this example, all 4865B configuration is done with a web browser.

In both examples, it is advantageous for the designer to want to include the capability for the smart instrument or PC to configure the ICS Interface network and/or GPIB address.

#### GENERAL CONCEPTS

The web server in ICS's Ethernet equipped Interfaces uses the well known port 80 to communicate with a browser. A programmer can duplicate the actions of a human checking radio buttons or entering values into a web page text box and then clicking 'Submit' by opening a socket to port 80 and sending the appropriate commands to the Interface. Instead of sending the full page, this Application Note will show you how to send only the items that you want changed.

## PROGRAMMABLE PARAMETERS

The more common parameters that can be changed via port 80 on an ICS Ethernet interface are:

Name	Description	Values
ip	IP Address,	0.0.0.0 - 255.255.255.255
net	Netmask	0.0.0.0 - 255.255.255.255
gate	Gateway	0.0.0.0 - 255.255.255.255
static	Static mode	On = Static, Off = DHCP.
desc	Description	60 characters
gpibaddr	GPIB Address,	0 - 30
keep	KeepAlive,	On or Off
commtimo	COMM_timeout	0 to 2 <sup>31</sup> seconds
agilent	Auto Disconnect	On or Off

Check your units manual or examine the unit's Configuration page to verify the web server parameters in the interface.

## COMMAND STEPS

Unlike VXI-11 communication where you open the socket at the beginning and close it only when done with the application, webserver communication via port 80 is a four step process. Each command requires the following steps:

1. Open a socket to port 80.
2. Send a URL with the appropriate command string.
3. Web server returns all requested data.
4. Both sides close the socket.

After the socket is opened, you have approximately 2 seconds to send the command. If you do nothing, the Interface's web server will time out and close the socket.

## COMMAND DESCRIPTION

The Command string lists the parameter names with the new values. A typical parameter command string appears as follows:

```
GET /cgi?ip=192.168.0.254&net=255.255.255.0&gate=192.168.0.1&static=On&flash\r\n
```

All parameters are followed by a '=' sign and then the value. Each parameter command can have its own acceptable values and ranges. There is little to no error checking and feedback. Verify the command string carefully before sending it.

The '&' signals the end of one value and the start of the next command. There are no spaces in or between the commands. The following are acceptable commands

```
ip=0.0.0.0 - 255.255.255.255
net=0.0.0.0 - 255.255.255.255
gate=0.0.0.0 - 255.255.255.255
static=On or static=Off
desc=any string of 64 characters
gpibaddr= 0 - 30
```

flash Flash saves the current configuration to flash. Make sure this is your last command unless you plan on a reboot as well.

reboot Reboot does not return any response.

submit=reboot Reboots the unit after replying with "Rebooting in process. Please wait 30 seconds and then reconnect. \n".

Note that web browsers do not accept all printable characters. Some characters are converted. '+' is used in place of a space and %xx converts a hex value into a printable or non-printable character (from 0 to 255 decimal).

Changed parameters need to be saved in flash memory and the unit must be rebooted for all of the commands to take affect. If the changed parameters are not saved, they will be lost at the next power cycle or when the unit is reset.

## EXAMPLE WRITE COMMAND STRINGS

To set the IP Address, Mask and Gateway, send three commands to the webserver. The first command is the parameter command which sets the parameters and saves them in flash. The second command reboots the unit. The third command is the done command to tell the webserver that your are done. The 'done' string is a carriage return and linefeed. "\r\n"

```
GET /cgi?ip=192.168.0.254&net=255.255.255.0&gate=192.168.0.1&static=On&flash\r\n
```

```
GET /cgi?reboot\r\n
```

```
\r\n
```

To set the Interface's GPIB address, use the gpibaddr parameter command as shown in the following example. Change 4 to the desired address from 0 to 30. Address 0 should only be used for a GPIB Controller, addresses 1-30 for devices like the 4865B.

```
GET /cgi?gpibaddr=4&flash\r\n
```

```
GET /cgi?reboot\r\n
```

```
\r\n
```

## QUERY STRINGS

The webserver parameters can be queried by deleting the "=" sign and the value following the parameter and adding an '&' immediately after the parameter command. An example is:

```
GET /cgi?ip&\r\n      Returns the current ip value.
```

## PROGRAM EXAMPLE

WebClient.cpp is a C Language example program that provides write and a query command examples. It includes the functions that you need to open the socket and to transfer data. Note that you will need to include and link to the required socket coding library for your language development system. A copy of the WebClient.cpp program can be downloaded from the ICS website.

You will see by the notes in the WebClient program, that the following information is returned by the web server when it is sent a write command to set the ip address.

```
HTTP/1.1 200 OK
Content-Length: 13
Content-Type: text/plain
Connection: close
```

```
192.168.0.254
```

Similarly, the web server returns the following when the ip address is queried.

```
HTTP/1.1 200 OK
Content-Length: 13
Content-Type: text/plain
Connection: close
```

```
192.168.0.254
```

Note that all parameters written to the interface are only stored in RAM. A flash save and reboot are required to save them and to make them the working values.

## SUMMARY

This Application Note has described how to programmatically change the network settings, description and GPIB address in ICS's Ethernet capable Interfaces by using the internal web server and port 80. While this Application Note shows the more common parameters for an ICS Ethernet enabled interface, consult your interface manual for a list of the configurable parameters.

This Application note only listed the parameter commands that are common to most ICS Interfaces. They are not necessarily those you might find in another company's instrument.