BIT-2100 Series Switch System

User Manual 1.11

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Notices

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CAUTION

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Product Labels

CE This electronic product is in compliance with the EMC and Safety regulations of the European Community.

This electronic product must not be disposed of in domestic household waste.

Technical Assistance

If you need product assistance or if you have suggestions, contact BitifEye. You will find the contact information on the BitifEye homepage at:

http://www.bitifeye.com

Representatives of BitifEye are available during standard German business hours.

Before you contact BitifEye, please note the actions you took before you experienced the problem. Then describe those actions and the problem to the technical support engineer.

Find a Mistake?

We encourage comments about this publication. Please report any mistakes to BitifEye (support@bitifeye.com)

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1. Introduction

Safety Precautions

WARNING

This manual describes the specifications and the proper usage of the BIT-2100A. All usage beyond the specifications or the intended use is not recommended and might cause impaired safety for the user.

Overview

The BIT-2100 Series Switch System consists of a frame, a controller module, and up to five switch modules. It is intended to route RF signals through user-selectable paths. There are different switch modules available for different applications. The paths can be set via an LXI compliant network interface or a USB interface.

Components

The BIT-2100 Series is a modular system. Each instrument consists of a master frame and optionally up to seven slave frames. The master frame always has the address 0 assigned, whereas the user can assign the addresses 1 through 7 to the slave frames.

The master module is connected to a PC which controls the entire instrument. All slave frames are connected to the master frame.

Each frame contains up to five switch modules of different types:

- An SP4T (single-pole, four-throw) module routes an incoming connector to one of four outgoing connectors. The other outgoing connectors are terminated with 50 Ω into ground. Alternatively, all outgoing connectors can be disconnected, and the incoming connector leads into open
- An SP6T (single-pole, six-throw) module routes an incoming connector to one of four outgoing connectors. The other outgoing connectors are terminated with 50 Ω into ground. Alternatively, all outgoing connectors can be disconnected, and the incoming connector leads into open
- An SPDT module has two, four, or six independent single-pole, double-throw switches. Each switch routes an incoming connector to one of two outgoing connectors; the other outgoing connector leads into open

An example configuration is shown in Figure 1.

Figure 1: Example system configuration

2. Specifications

Environmental Conditions

Temperature	+5°C to +40°C
Humidity	up to 80% relative humidity (non-condensing)
Altitude	up to 2000 m above sea level
Weight	Approx. 4 kg to 6 kg, depending on equipped modules
Dimensions	482 mm wide, 147 mm tall, 261 mm deep
Pollution Degree	2

Electrical Specifications

Supply Voltage	100–240 V AC, 50/60 Hz
Electrical Power	80 VA
Overvoltage Category	II
Fuses	2× 1.6AT 250 V

Electromagnetic Compatibility

The BIT-2100 Series is compliant with the following EMC specifications:

- DIN EN 61000-6-2 part 6-2: 2005
- DIN EN 61000-6-3 part 6-3: 2007+A1:2011
- DIN EN 61000-6-4 part 6-4: 2007+A1:2011
- DIN EN 55022: 2010
- DIN EN 61000-4-2 part 6-2: 2009
- DIN EN 61000-4-3 part 6-3: 2006+A1:2008+A2:2010
- DIN EN 61000-4-4 part 6-4: 2004+A1:2010
- DIN EN 61000-4-5 part 6-5: 2006
- DIN EN 61000-4-6 part 6-6: 2009
- DIN EN 61000-4-11 part 6-11: 2004

Safety

The BIT-2100 Series is compliant with the following safety specifications:

- IEC/EN 61010-1:2010

RF Switches

The RF switch modules (listed in Chapter 3) are manufactured by Agilent Technologies and built into the BIT-2100 Series Switch System without any modifications. For the specifications of the switch modules please refer to the Agilent data sheets.

3. Options

The following components are available for the BIT-2100 Series Switch System:

- BIT-2100A Mainframe
- BIT-2101A Master Controller
- BIT-2102A Expansion Mainframe Controller w/ expansion cable
- BIT-2105A Filler Panel
- BIT-2114A SP4T Switch Module
- BIT-2116A SP6T Switch Module
- BIT-2122A 2xSPDT Switch Module
- BIT-2142A 4xSPDT Switch Module
- BIT-2162A 6xSPDT Switch Module

Frame Components

Each BIT-2100 system consists of a BIT-2100A Mainframe, which has a built-in power supply, and a controller module.

The controller module can either be a BIT-2101A Master Controller, which provides an LXI-compliant network interface, or a BIT-2102A Expansion Mainframe Controller, which extends an existing frame. A frame with an Expansion Control Module can only be connected to another frame that includes a Master Control Module.

Switch Modules

Each frame can be equipped with up to five switch modules or filler panels. The switch modules contain RF switches from Agilent Technologies. Note that the RF switches are available with different options.

BitifEye Product Number	RF Switch Modules	RF Switch Functionality
BIT-2114A	1	SP4T
BIT-2116A	1	SP6T
BIT-2162A	6	SPDT
BIT-2142A	4	SPDT
BIT-2122A	2	SPDT

The following sections describe which RF switches from Agilent Technologies can be used with the BIT-2100 Switch System. By default, the 26.5 GHz options of the RF switches are used. Other options are available on request.

Note that only the RF switches listed in these tables are supported; other product numbers or other options or combinations of options are not supported.

SPDT RF Switches

For the BIT-2162A, BIT-2142A, and BIT-2122A modules, the following RF switches from Agilent Technologies can be used:

Agilent Product Number	Bandwidth
N1810UL opt. 004, 124, 201, 402	4 GHz
N1810UL opt. 020, 124, 201, 402	20 GHz
N1810UL opt. 026, 124, 201, 402 (default)	26.5 GHz
N1810UL opt. 040, 124, 201, 402	40 GHz
N1810UL opt. 050, 124, 201, 402	50 GHz
N1810UL opt. 067, 124, 201, 402	67 GHz

All switches leave the disconnected path open.

SP4T RF Switches

For the BIT-2114A module, the following RF switches from Agilent Technologies can be used:

Agilent Product Number	Bandwidth	Termination
L7204A opt. 024, 161	4 GHz	Unterminated
L7204B opt. 024, 161	20 GHz	Unterminated
L7204C opt. 024, 161	26.5 GHz	Unterminated
L7104A opt. 024, 161	4 GHz	Terminated
L7104B opt. 024, 161	20 GHz	Terminated
L7104C opt. 024, 161 (default)	26.5 GHz	Terminated
87104D opt. 024, 161	40 GHz	Terminated

All “terminated” switches terminate the disconnected paths with 50 Ω into GND. All “unterminated” switches leave the disconnected paths open.

SP6T RF Switches

For the BIT-2116A, the following RF switches from Agilent Technologies can be used:

Agilent Product Number	Bandwidth	Termination
L7206A opt. 024, 161	4 GHz	Unterminated
L7206B opt. 024, 161	20 GHz	Unterminated
L7206C opt. 024, 161	26.5 GHz	Unterminated
L7106A opt. 024, 161	4 GHz	Terminated
L7106B opt. 024, 161	20 GHz	Terminated
L7106C opt. 024, 161 (default)	26.5 GHz	Terminated
87106D opt. 024, 161	40 GHz	Terminated

All “terminated” switches terminate the disconnected paths with 50 Ω into GND. All “unterminated” switches leave the disconnected paths open.

4. Basic Setup

Initial Inspection

Before using the switch system, make sure that the following parts are included in the package:

- BIT-2100A Mainframe
- One BIT-2101A Master Controller, or one BIT-2102A Extension Mainframe Controller, mounted in the Mainframe
- Switch Modules and/or BIT-2105A Filler Panels according to order, mounted in the Mainframe

Setup

The BIT-2100 Series Switch System can be operated as a desk-top instrument or can be mounted in a standard 19" rack.

When the system is mounted in a rack, the rack system must provide a switchable outlet in order to enable the device to be turned off. Make sure the specified environmental conditions are met. At least four rack units are required in height to provide proper air flow.

To connect frames to a master-slave configuration, first make sure all devices have the power turned off. Connect the “Extension Out” connector of the master frame to the “Extension In” connector of the slave frame using an apppropriate cable.

Power

WARNING

Only connect the AC connector at the rear side of the instrument to a power outlet using an appropriate 3-wire cable! Make sure you use a power outlet with a grounding terminal!

To turn the device on, turn the switch on the rear side of the instrument to the “I” position. The switch glows to indicate the power state. When slave frames are used, make sure that the slave frames are turned on before the master frame.

Note that the switches in all frames remain untouched, i.e., the switch position does not change between power-cycles.

To turn the device off, turn the switch on the rear side of the instrument to the “O” position. When slave frames are used, make sure that the master frame is turned off before the slave frames are turned off.

Controls

The BIT-2100 Series is intended to be entirely controlled via the LXI-compliant interface. The only available local controls are:

- The power switch on the rear side of the instrument
- The LXI LAN Reset button on the master control module

Please refer to the next section for details of operation.

5. General Operation

Preface

The following instructions and feature descriptions apply to a BIT-2100 Series Switch System with firmware revision 3.4-1.10 or later.

Module Addressing and Switching

The electrical path of each switch module can be changed either via the web interface, or via remote programming with SCPI commands.

To address a specific switch module, the following scheme is used:

- Each frame is identified by an address. The master frame's address is always zero, the slave frame's address is shown in the seven-segment LED display
- Each module within a frame is identified by an address as shown in Figure 2:
  - The module addresses are counted from left to right
  - the address of the first module is zero
  - the following modules are addressed subsequently from one through four
  - note that empty modules (BIT-2105A Filler Panels) are also counted
  - 2x/4x/6x SPDT modules count as one module with multiple switches

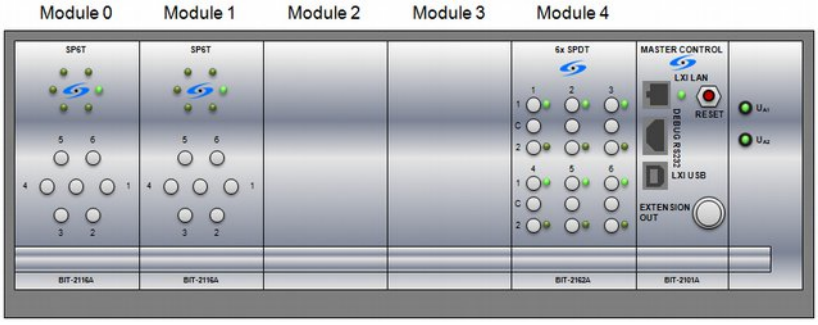

Figure 2: Example Frame with Module Addresses

Network Connection

The BIT-2100 can be controlled from any PC via a LAN connection. In order to use the instrument, the following steps are required:

- Connect the BIT-2100 to a PC via LAN
- Determine the instrument's network address
- Operate the instrument by

- Using the instrument's web interface, or
- Sending SCPI commands to the instrument

The web interface provides a graphical user interface to control the instrument. For automated control of the BIT-2100, SCPI commands can be sent through a VISA connection.

Connecting to LAN

Connecting to a BIT-2100 Series Switch System can simply be done via Ethernet. You can connect over a company network, or directly to a PC. You can use cross-link cables as well as regular cables.

The controller will automatically acquire an IP address if a DHCP server is present in the network, as it is in most company networks. If no DHCP server is present, a random, non-colliding IP address is automatically chosen. Alternatively, the user can define a static IP for the instrument.

Determining the Network Address

Since the BIT-2100A frame does not feature a display to show its IP address, the instrument must be found in the network. The simplest way is to use the Agilent Connection Expert tool to find the instrument in the network.

As shown in Figure 3, select the "LAN" interface in the instruments list, then click "Add instrument". The dialog shown in the Figure 4 will open, where the instrument will be listed as "BIT2100". From here, you can access the instrument's web page, which is shown in Figure 5.

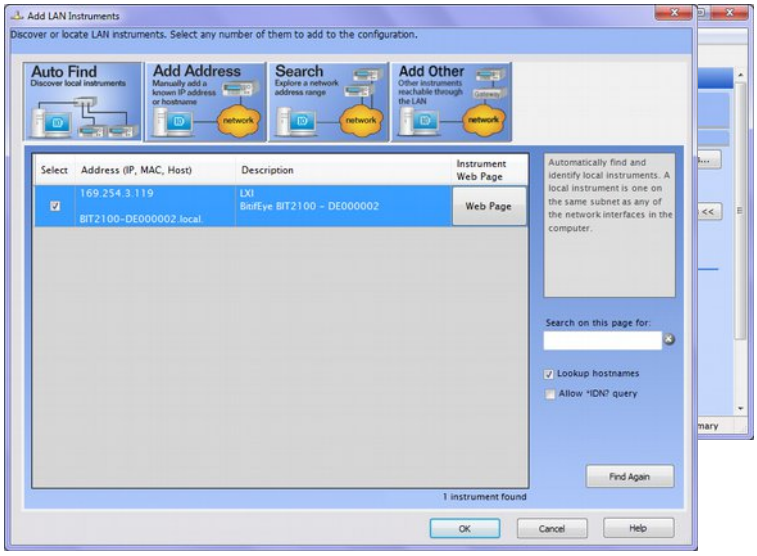

Figure 4: Finding the instrument in the network

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From the web interface, the instrument's VISA address can be determined. The VISA address is required by software to establish a connection for sending SCPI commands.

Adding to the Instrument List

Adding the instrument to the instrument list in the Agilent Connection Expert is optional. However, the following additional steps are required if this is desired.

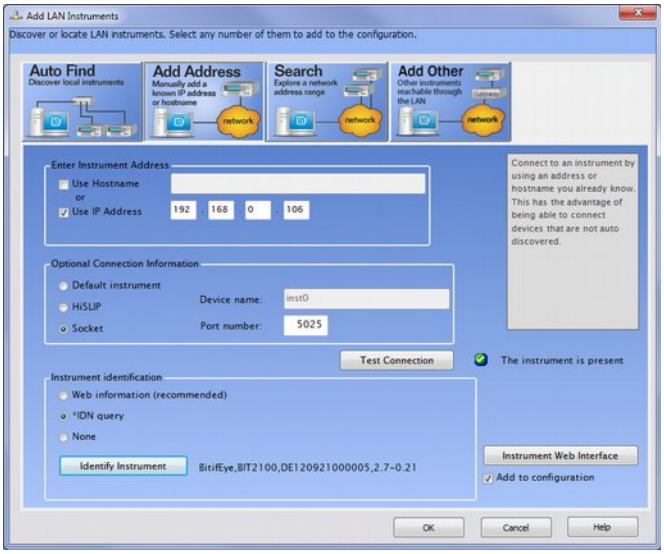

Figure 4: Adding the BIT-2100 as a LAN instrument

If you want to add the BIT-2100 to the instrument list, please use the “Add Address” button in the “Add LAN Instrument” dialog. Here you can enter the IP address manually. An example is shown in Figure 4.

Accessing the Web Interface

The web page of the BIT-2100 Series Switch System can be accessed from every web browser in the local network by entering the device’s IP address in the browser's address bar.

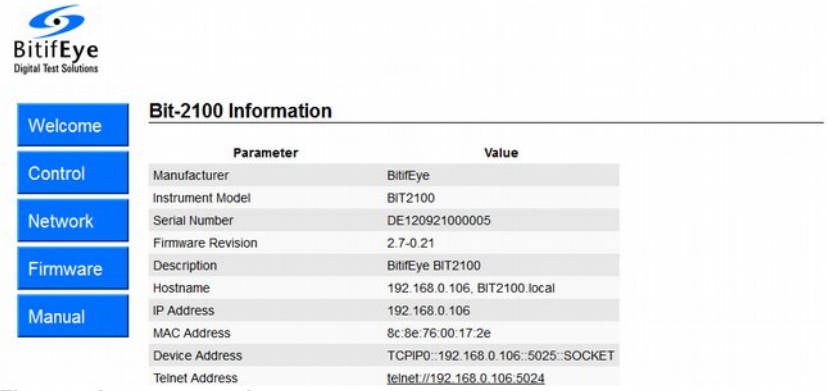

Figure 5: Instrument web page

On the instrument web page the instrument address is shown (“Device Address”, see Figure 5). The instrument address is required in order to be able to connect to the instrument to issue SCPI commands.

The VISA address looks like “TCPIP0::169.254.3.119::5025::SOCKET” (where the IP address may be different from the example). Note that this indicates a socket connection; the BIT-2100 series switch system also supports the VXI-11 protocol. In that case the VISA address would look like “TCPIP0::169.254.3.119::inst0::INSTR”.

Instrument Control

To access the web control interface, click the “Control” button on the left side of the web page. Note that your browser must support Java for this feature.

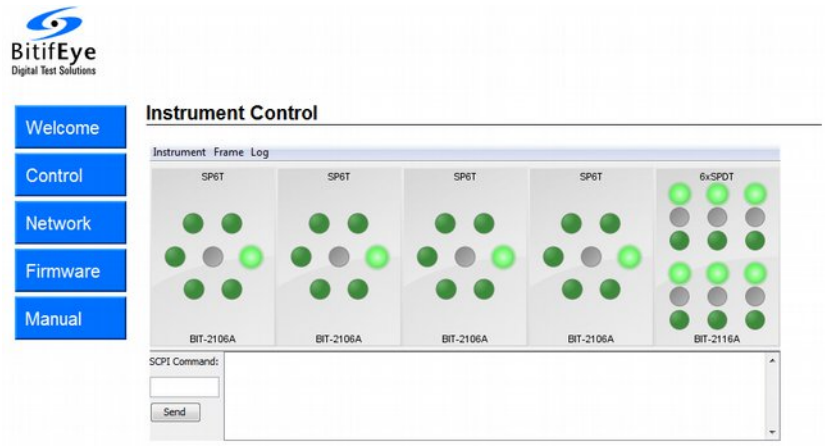

Figure 6: Instrument web control interface

The instrument web control interface allows you to control the switch paths manually (see Figure 6). Each switch module is represented by a panel in the interface. Click on the green LED symbols to set a switch path. A bright glowing LED symbol means that this path is currently set. You can also use the web interface to issue remote commands.

Network Settings

To access the network configuration, click the “Network” button on the left side of the web page.

Here you can view and edit the network settings of the system. When a DHCP server is present in the system, it is not usually necessary to change these settings.

Note that when you change the network settings, the connection to the instrument might be lost until the control PC is set into a compatible configuration.

When you change the IP address of the instrument, the address for remote programming will also change. For example, when you set the IP address to“192.168.0.2” the instrument address would be “TCPIP0::192.168.0.2::5025::SOCKET” (socket protocol) or “TCPIP0::192.168.0.2::inst0::INSTR” (VXI-11 protocol).

Firmware Update

To access the firmware update page, click the “Firmware” button on the left side of the web page.

To conduct a firmware update, please follow the instructions on the web page.

CAUTION

Only use appropriate firmware update files from BitifEye. Do not disconnect power during the update process.

Connection Troubleshooting

When the instrument is not able to acquire a valid IP address, the “LXI LAN” LED at the front of the instrument will be either off (no connection) or light red (invalid configuration). In this case, you can press and hold the “RESET” button at the front of the instrument for approximately ten seconds until the LED changes. This resets the LAN configuration and will start the following configuration routine, which can take a few minutes:

1. The instrument tries to acquire an IP address from a DHCP server.
2. If there is no DHCP server, for example because you're directly connected to the instrument, an IP address in the range 169.254.###.### will automatically be assigned.

In the latter case, it is recommended that the control PC is configured to use the same address range. Alternatively, configure the PC to use DHCP; it will automatically acquire an IP address in that range. An example of this configuration with Windows is shown in Figure 7.

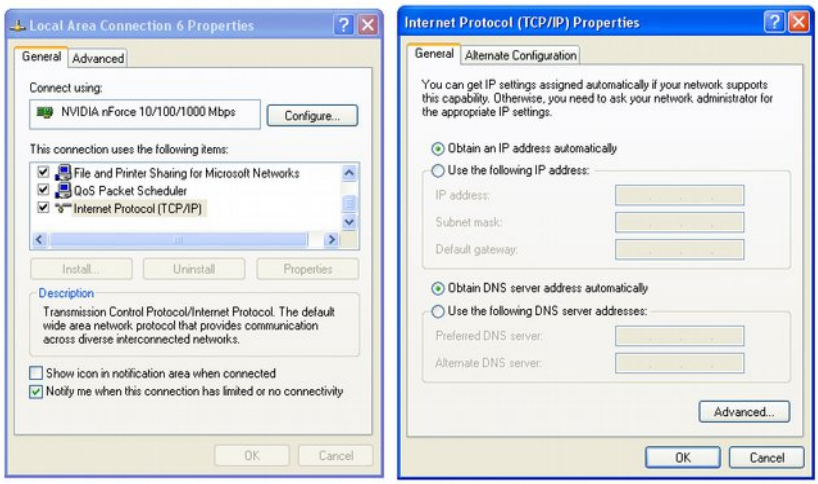

Figure 7: PC network configuration for direct connection

USB Connection

The BIT-2100 can be controlled from any PC via a USB connection. In order to use the instrument, the following steps must be conducted:

- Connect the BIT-2100 to a PC via USB
- Determine the instrument's VISA address
- Send SCPI commands to the instrument

Connecting to USB

Connecting to a BIT-2100 Series Switch System can be done simply via USB. This only requires a standard USB type A to USB type B connector cable. Note that USB connections require firmware version 1.10 or later.

When a BIT-2100 Series Switch system is connected to a PC for the first time, drivers are required. The BIT-2100 registers as a USBTMC device ("USB Test & Measurement Class"). These drivers are automatically installed without any user interaction when the Agilent IO Libraries are installed on the PC.

Determining the VISA address

The VISA address is required to connect to the instrument. When the BIT-2100 is connected via USB, it is automatically listed in the Agilent Connection Expert, as shown in Figure 8.

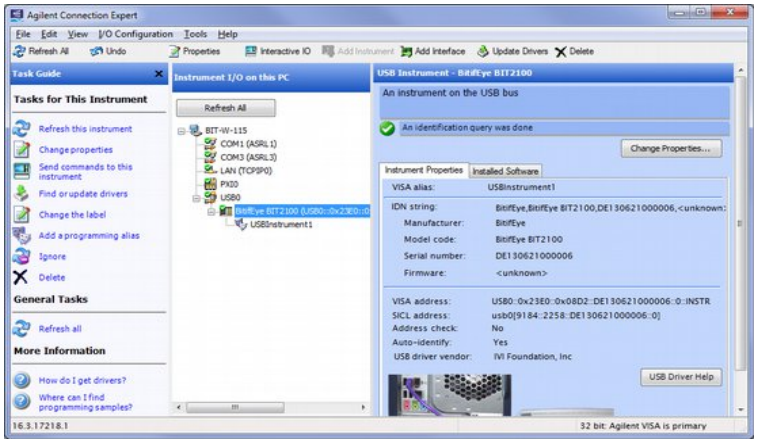

Figure 8: USB connection with the Agilent Connection Expert

With the VISA address shown in the Agilent Connection Expert, a VISA connection can be established to send SCPI commands.

6. Remote Programming

This section describes the commands that are available for remote programming. Any language/framework that is capable of handling such instructions can be used for programming the BIT-2100 Series.

If no such language is available, the control interface on the web page of the instrument can be used when connected via LAN. Alternatively, you can use the Agilent Interactive IO tool, which is part of the Agilent IO Libraries.

Note that optional parts of the SCPI syntax are written in square brackets `[ ]`, and parameters are written in angle brackets `< >`. Parameter selections are separated by pipes `|`. The upper-case parts of a name are required, the lower-case parts are optional.

IEEE-488 Commands

The following list explains all available IEEE-488 commands. Note that these commands must start with an asterisk (unlike regular SCPI commands), as shown in the syntax descriptions and in the examples.

**IDN?*

Syntax: `*IDN?`

Returns the instrument's manufacturer, product number, serial number and firmware revision. The values are separated by commas.

The manufacturer is "BitifEye", the product number is "BIT2100". The serial number consists of letters and digits. The firmware revision consists of the major revision, a dot, and the minor revision.

Example request: `*IDN?`

Example response: `BitifEye,BIT2100,DE120621000001,1.00`

**RST*

Syntax: `*RST`

Resets the device. The following steps are conducted:

- Find system configuration
- Open/reset all switches (note that this is not done after power-up)
- Select frame 0 (the master frame)

Example command: `*RST`

**TST?*

Syntax: `*TST?`

Conducts a self-test. Returns `0` if successful, or a negative integer error code if a failure occurs.

For more details, refer to `SYSTem:SELFtest?`. `*TST?` conducts the same self-tests, but only returns an integer error instead of a detailed error message.

Example request: `*TST?`

Example response: `0`

Error Status

SYSTem:ERRor?

Syntax: `SYSTem:ERRor?`

Returns the first error in the error queue. The error will be removed from the error queue.

The error message consists of an error code (non-negative integer), a comma, and an error message. When no error is in the queue, the error code is positive zero and the message is “No Error” (with space between “No” and “Error”, but not after the comma).

Example request: `SYST:ERR?`

Example response: `+0,"No Error"`

SYSTem:ERRor:COUNt?

Syntax: `SYSTem:ERRor:COUNt?`

Returns the number of errors (non-negative integer) in the error queue.

Example request: `SYST:ERR:COUN?`

Example response: `0`

Switch Control

This section describes the SCPI commands that control the switch positions.

CAUTION

Note that the switch modules have a limited number of specified switching cycles. Even though the specified switch cycle count is very high, it is recommended that care is taken that no switching is conducted when not necessary.

SELect[:FRAMe][?]

Command syntax: `SELect[:FRAMe] <frame number>`

Selects a specific frame. The frame number is a non-negative integer. The master frame is always zero, the slave frame address is user-defined.

Example command: `SEL:FRAM 0`

Query syntax: `SELect[:FRAMe]?`

Returns the currently selected frame (non-negative integer). After start-up or reset, frame 0 (the master module) is selected.

Example request: `SEL:FRAM?`

Example response: `0`

PATH[?]

Command syntax: `PATH <module>,<path>`

Sets the switch path of a specific switch module in the currently selected frame.

The module is specified by a non-negative integer number, where the first module has the module number zero.

The value for the switch path is a non-negative integer number; its possible values depend on the switch module type:

SP6T: the values 1 through 6 specify a switch path; the value 0 opens all paths

SP4T: the values 1 through 4 specify a switch path; the value 0 opens all paths

6x SPDT: each of six switches is controlled by one bit in the path value, where the LSB corresponds to switch 1. A bit cleared to zero routes the corresponding switch to path “1”, a bit set to one routes the corresponding switch to path “2”. For example, the value 26, which is binary 0b100110, routes switch 1, 4 and 5 to path “1” and switch 2, 3 and 6 to path “2”

4x SPDT: each of four switches is controlled by one bit in the path value, where the LSB corresponds to switch 1. A bit cleared to zero routes the corresponding switch to path “1”, a bit set to one routes the corresponding switch to path “2”. For example, the value 6, which is binary 0b0110, routes switch 1 and 4 to path “1” and switch 2 and 3 to path “2”

2x SPDT: each of two switches is controlled by one bit in the path value, where the LSB corresponds to switch 1. A bit cleared to zero routes the corresponding switch to path “1”, a bit set to one routes the corresponding switch to path “2”. For example, the value 2, which is binary 0b10, routes switch 1 to path “1” and switch 2 to path “2”

Note that before using the PATH command, a frame must have been selected before, using the SEL:FRAM command. This has to be done at least once; subsequent accesses to the same frame don’t need another SEL:FRAM command.

Example command: `PATH 2,5`

Query syntax: `PATH <module>?`

Returns the current path of a specific switch module in the currently selected frame.

The module is specified by a non-negative integer number, where the first module has the module number zero.

The return value is a non-negative integer; its value is as defined for the `PATH` command.

Note that before using the `PATH` command, a frame must have been selected previously, using the `SEL:FRAM` command. This has to be done at least once; subsequent accesses to the same frame don’t need another `SEL:FRAM` command.

Example request: `PATH? 2`

Example response: `5`

CONFiguration?

Syntax: `CONFiguration?`

Returns the configuration of the frames and switches. The configuration is represented in the following format:

Frame 0: <type>, <type>, <type>, <type>, <type>[; Frame #: <type>, <type>, <type>, <type>, <type>]

Where type can be “SP4T”, “SP6T”, “6xSPDT”, “4xSPDT”, “2xSPDT” or “Empty”. The configuration is reported for the master frame and for each slave frame; the frame configurations are separated by semicolons.

The `CONF` command works regardless of the currently selected frame. After issuing the `CONF` command, the same frame is selected as before.

Example request: `CONF?`

Example response: `"Frame 0: SP6T, SP6T, SP6T, SP6T, 6xSPDT; Frame 2: SP4T, SP4T, Empty, Empty, Empty"`

SYSTem:SELFtest?

Syntax: `SYSTem:SELFtest?`

Conducts a self-test. All switches in all frames are tested; if a switch relay is stuck, an error is reported.

Returns `"pass"` if successful, or an error message. The error message consists of a negative integer error code, followed by a comma and a plain-text error. If multiple issues were discovered, multiple semicolon-separated error messages are returned.

The `SYST:SELF` command works regardless of the currently selected frame. After issuing the `SYST:SELF` command, the same frame is selected as before.

Example request: `SYST:SELF?`

Example response: `"-200, Frame0, switch4 set to 1 but reports 0; -200, Frame0, switch4 set to 2 but reports 0"`

Ethernet/IP Configuration

This section describes the SCPI commands that control the network configuration.

NETwork:AUTOIP[?]

Command syntax: `NETwork:AUTOIP <on|off>`

Enables or disables the auto-IP feature. Possible values are `on` and `off`. The auto-IP feature utilizes Zeroconf (RFC 3927) as defined in the LXI standard. After an LXI LAN reset, auto-IP is enabled.

Example command: `NET:AUTOIP on`

Query syntax: `NETwork:AUTOIP?`

Returns the status of the auto-IP feature. Possible values are `on` and `off`.

Example request: `NET:AUTOIP?`

Example response: `on`

NETwork:DHCP[?]

Command syntax: `NETwork:DHCP <on|off>`

Enables or disables IP acquisition via DHCP. Possible values are `on` and `off`. After an LXI LAN reset, DHCP is enabled.

Example command: `NET:DCHP on`

Query syntax: `NETwork:DHCP?`

Returns the DHCP status. Possible values are `on` and `off`.

Example request: `NET:DHCP?`

Example response: `on`

NETwork:DNS:ALTernate[?]

Command syntax: `NETwork:DNS:ALTernate <IP address>`

Sets the IP address of the secondary DNS server.

Example command: `NET:DNS:ALT 217.237.159.42`

Query syntax: `NETwork:DNS:ALTernate?`

Returns the current IP address of the secondary DNS server.

Example request: `NET:DNS:ALT?`

Example response: `217.237.159.42`

NETwork:DNS:DOMain[?]

Command syntax: `NETwork:DNS:DOMain <domain name>`

Sets the domain name.

Example command: `NET:DNS:DOM "example.domain"`

Query syntax: `NETwork:DNS:DOMain?`

Returns the current domain name.

Example request: `NET:DNS:DOM?`

Example response: `"example.domain"`

NETwork:DNS:MANual[?]

Command syntax: `NETwork:DNS:MANual <on|off>`

Enables or disables manual configuration of the DNS server. Possible values are `on` and `off`.

Example command: `NET:DNS:MAN on`

Query syntax: `NETwork:DNS:MANual?`

Returns the current status of the manual configuration of the DNS server. Possible values are `on` and `off`.

Example request: `NET:DNS:MAN?`

Example response: `on`

NETwork:DNS:PREFerred[?]

Command syntax: `NETwork:DNS:PREFerred <IP address>`

Sets the IP address of the primary DNS server.

Example command: `NET:DNS:PREF 217.237.159.41`

Query syntax: `NETwork:DNS:PREFerred?`

Returns the current IP address of the primary DNS server.

Example request: `NET:DNS:PREF?`

Example response: `217.237.159.41`

NETwork:DNS:UPDate[?]

Command syntax: `NETwork:DNS:UPDate <on|off>`

Enables or disables dynamic DNS updates. Possible values are `on` and `off`.

Example command: `NET:DNS:UPD on`

Query syntax: `NETwork:DNS:UPDate?`

Returns the current status of automatic DNS updates. Possible values are `on` and `off`.

Example request: `NET:DNS:UPD?`

Example response: `on`

NETwork:GATEway[?]

Command syntax: `NETwork:GATEway <IP address>`

Sets the IP address of the gateway.

Example command: `NET:GATE 192.168.0.1`

Query syntax: `NETwork:GATEway?`

Returns the current IP address of the gateway.

Example request: `NET:GATE?`

Example response: `192.168.0.1`

NETwork:HOSTname[?]

Command syntax: `NETwork:HOSTname <host name>`

Sets the host name of the instrument.

Example command: `NET:HOST "BIT2100"`

Query syntax: `NETwork:HOSTname?`

Returns the current host name of the instrument.

Example request: `NET:HOST?`

Example response: `"BIT2100"`

NETwork:IPaddress[?]

Command syntax: `NETwork:IPaddress <IP address>`

Sets the IP address of the instrument.

Example request: `NET:IP 192.168.0.2`

Query syntax: `NETwork:IPaddress?`

Returns the current IP address of the instrument.

Example request: `NET:IP?`

Example response: `192.168.0.2`

NETwork:NETMask[?]

Command syntax: `NETwork:NETMask <IP mask>`

Sets the IP subnet mask of the instrument.

Example command: `NET:NETM 255.255.255.0`

Query syntax: `NETwork:NETMask?`

Returns the current IP subnet mask of the instrument.

Example request: `NET:NETM?`

Example response: `255.255.255.0`

Programming Example

The following listing of SCPI commands shows a typical programming scenario. It resets the switch, queries the configuration, then sets the switch modules into different positions. In this example, it is assumed that slots 1 through 4 are equipped with SP6T switch modules, and the 5th slot is equipped with a 6xSDPT switch module.

`*IDN?`	query IDN string
`CONF?`	query system configuration
`*RST`	reset instrument
`SEL:FRAM 0`	select frame 0
`PATH 0,0`	set 1st module to all-open state
`PATH 1,1`	set 2nd module to path 1
`PATH 2,2`	set 3rd module to path 2
`PATH 3,3`	set 4th module to path 3
`PATH 4,11`	set 5thmodule to path 11

Note that the value “11” for the 6xSPDT module represents the binary value 001011, where the right-most digit represents switch 1. This means that switch 1 is set to path 2, switch 2 is set to path 2, switch 3 is set to path 1, switch 4 is set to path 2, switch 5 is set to path 1, and switch 6 is set to path 1.

7. User Serviceable Parts

Changing Fuses

WARNING

Before changing fuses, make sure the device is physically disconnected from AC power! Never operate the BIT-2100 Series Switch System with the fuses or the fuse holder removed!

To change the fuses, follow these instructions:

1. Make sure the device is powered off and all cables are disconnected
2. Open the fuse holder on the back side of the instrument by pulling it out of the power inlet (see Figure 9)
3. Replace both fuses with 1.6AT 250 V each
4. Close the fuse holder properly

Figure 9: Fuse holder

Dismounting Modules

WARNING

Before removing a module, make sure the device is physically disconnected from AC power! Never operate the BIT-2100 Series Switch System when one or more slots are unmounted!

CAUTION

Always use proper ESD (electrostatic discharge) protective equipment when preparing, mounting or dismounting modules. EDS can destroy the electronic components of the BIT-2100 Series Switch System.

To dismount a switch module or a filler panel, follow these instructions:

1. Make sure the device is powered off and all cables are disconnected
2. Dismount the two screws at the very top of the module and the two screws at the very bottom of the module (below the handle) using a cross-recess (Phillips) screwdriver (see Figure 10)
3. Carefully remove the module
   - Note that switch modules are connected to a flat ribbon cable
4. Remove the flat ribbon cable (see Figures 11 and 12)
5. Close the opened slot, either by a dummy plate or another module

Figure 10: Front panel screws

Figure 11: Flat ribbon cable on a SP6T module

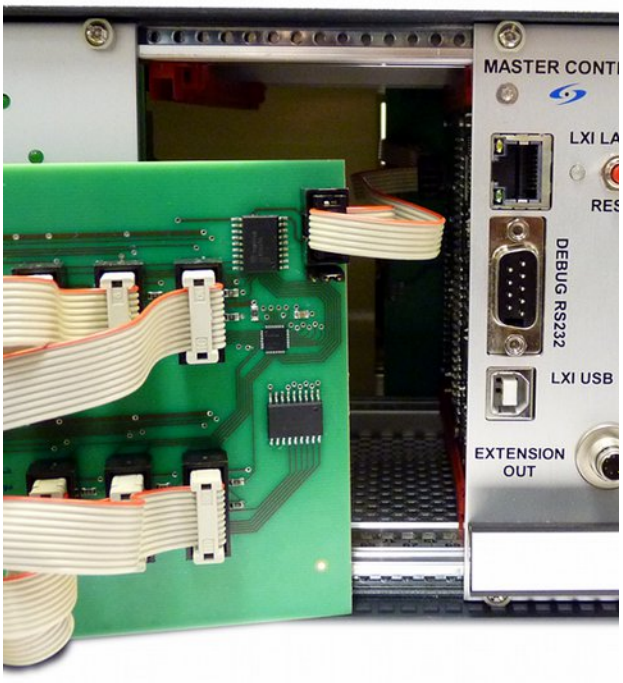

Figure 12: Flat ribbon cable on a 6xSPDT module

Mounting Modules

CAUTION

Always use proper ESD (electrostatic discharge) protective equipment when preparing, mounting or dismounting modules. EDS can destroy the electronic components of the BIT-2100 Series Switch System.

Preparing SP4T/SP6T Modules

Before an SP4T/SP6T switch module is mounted, the Agilent RF switch must be properly mounted on the front plate, and the printed circuit board (PCB) must be mounted and connected to the RF switch.

If the BitifEye switch module and the Agilent RF switch were ordered separately, the RF switch must be mounted on the front plate first. The RF switch is mounted with four screws. Make sure the switch positions on the RF switch (“1” through “6”) match the switch positions on the front plate. Figure 13 shows a properly mounted RF switch.

Figure 13: Mounting an SP4T/SP6T – Step 1

When the RF switch is mounted, the PCB must be mounted using the two top side screws that hold the RF switch. Note that the green LEDs on the PCB go through the holes in the front plate. Figure 14 shows a properly mounted PCB.

Figure 14: Mounting an SP4T/SP6T – Step 2

When the PCB is mounted, the flat ribbon cable that is shipped with the RF switch must be connected to the RF switch and the PCB. Note that the connectors only match in one direction. Figure 15 shows a properly connected flat ribbon cable.

Figure 15: Mounting an SP4T/SP6T – Step 3

After the switch is physically mounted to the front plate, the jumpers on the PCB must be set properly. There are five jumpers; three to define the hardware address, one to define the module function, and one reserved jumper (see Figure 16).

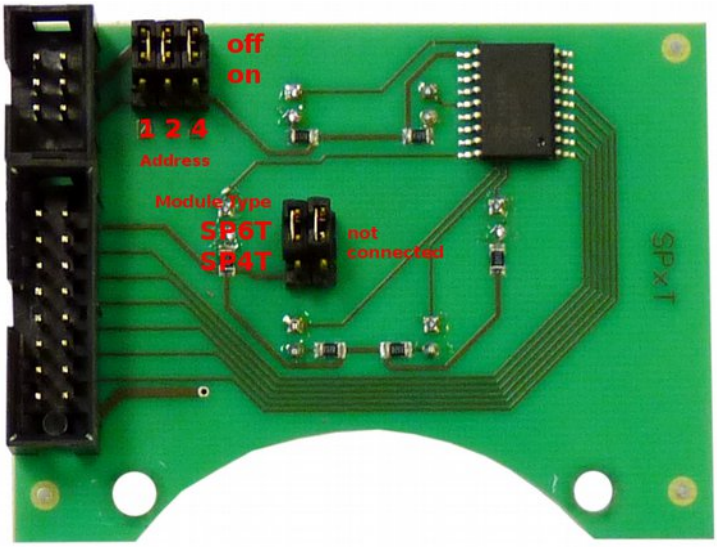

Figure 16: SP4T/SP6T board and jumpers

The hardware address must be set according to the slot where the module will be mounted. An address jumper is ”off” when it is put into the position next to the board edge, and ”on” when it is put into the position away from the board edge. The LSB (=1) jumper is next to the cable connectors, the MSB (=4) jumper is away from those connectors.

Note that the hardware address that is configured with the jumpers does not exactly match the module address (0 through 4). The following table shows the addressing scheme:

Slot Address	Hardware Address	Jumpers
0 (left-most)	0	1=off, 2=off, 4=off
1	1	1=on, 2=off, 4=off
2	4	1=off, 2=off, 4=on
3	5	1=on, 2=off, 4=on
4 (right-most)	6	1=off, 2=on, 4=on

The module type is set with the left jumper in the middle of the board (the jumper that is towards the cable connectors). In the top position (away from the curve-shaped side of the PCB) the module is configured for an SP6T module, in the bottom position the module is configured for an SP4T module. However, note that you cannot simply convert a SP4T module into a SP6T module or vice versa by moving the jumper, as the mounted LEDs are different.

The PCB in Figure 16 is configured for an SP6T module in the left-most slot.

CAUTION

Make sure the jumpers are set correctly, otherwise communication with the switches will fail or lead to unexpected results.

Preparing 2x/4x/6x SPDT Modules

Before a 2x/4x/6xSPDT switch module is mounted, the Agilent RF switches must be properly mounted on the front plate, and the PCB must be mounted and connected to the RF switches.

If the BitifEye switch module and the Agilent RF switches were ordered separately, the RF switches must be mounted to the front plate first. Make sure the switch positions on the RF switches (“1” and “2”) match the switch positions on the front plate. Figure 17 shows a properly mounted RF switch.

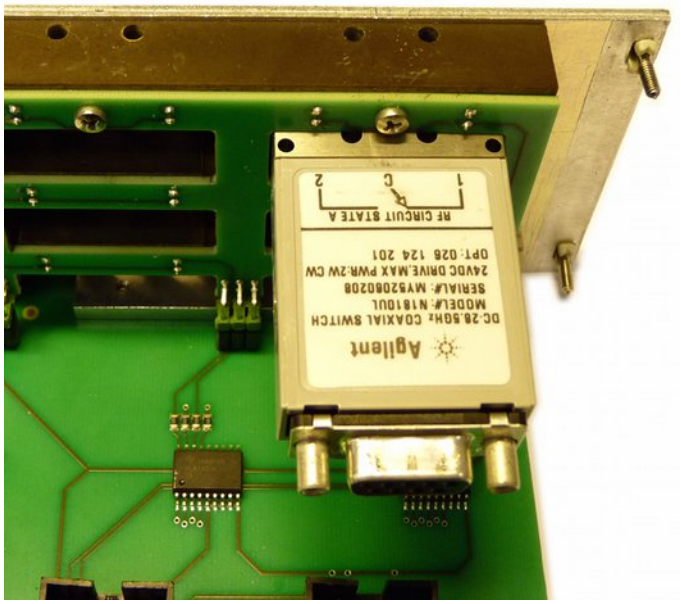

Figure 17: SPDT switch mounting direction

When all SPDT RF switch modules are properly placed in the front panel, they are fixed with four screws (see Figure 18).

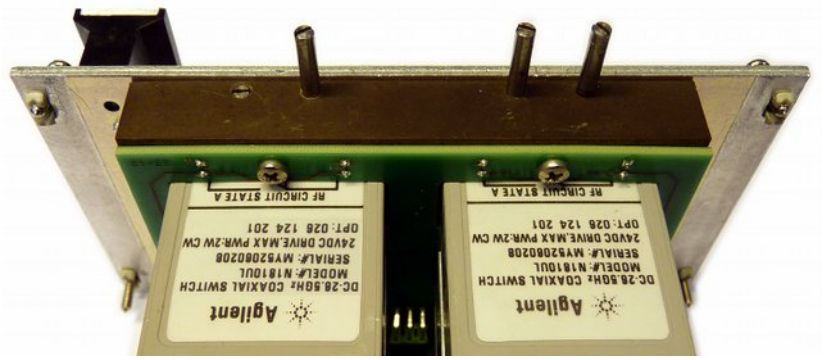

Figure 18: 2x/4x/6x SPDT switch mounting

When the switches are mounted, the flat ribbon cables that are shipped with the RF switches must be connected to the PCB. Note that the connectors only match in one direction. Figure 19 shows how the flat ribbon cables of a 6x SPDT module are connected to the PCB. Make sure that each switch is connected to the correct connector on the PCB as shown in the figure; otherwise the software will control the wrong switch modules.

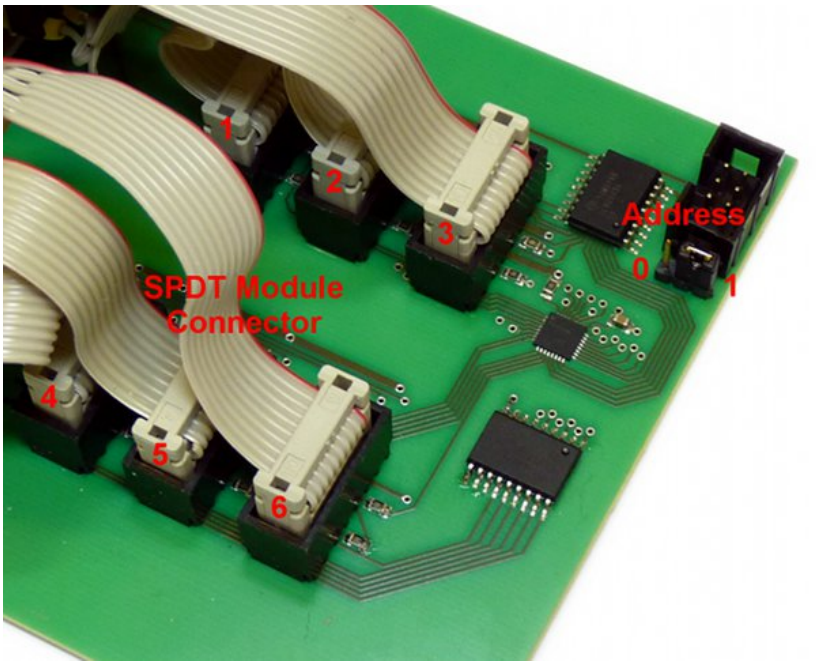

Figure 19: 2x/4x/6x SDPT module connection and jumper

For a 4x SPDT module, connect the switches as follows:

Module number on front panel	Connector as labeled in Figure 19
1	1
2	3
3	4
4	6

For a 2x SPDT module, connect the switches as follows:

Module number on front panel	Connector as labeled in Figure 19
1	2
2	5

Finally, the hardware address must be set with the address jumper. Note that 2x/4x/6x SPDT modules can only be mounted in the two right-most slots. The following table shows how the jumper must be configured:

Slot Address	Jumper Position
0 (left-most)	N/A
1	N/A
2	N/A
3	0
4 (right-most)	1

CAUTION

Make sure the jumpers are set correctly, otherwise communication with the switches will fail or lead to unexpected results.

Mounting the Modules

WARNING

Before mounting a module, make sure the device is physically disconnected from AC power! Never operate the BIT-2100 Series Switch System when one or more slots are unmounted!

To mount a switch module or a filler plate, follow these instructions:

1. Make sure the device is powered off and all cables are disconnected
2. Make sure the jumpers on the module are properly set
3. Connect the new module to the flat ribbon cable inside the instrument (see Figure 11)
    - Omit steps 2 and 3 if you are mounting a filler panel
4. Carefully insert the module into its slot
5. Mount the two screws at the very top of the module and the two screws at the very bottom of the module (below the handle) using a cross-recess (Phillips) screw driver (see Figure 10)

8. List Of Acronyms

DHCP	dynamic host configuration protocol
DNS	domain name system
EMC	electromagnetic compatibility
ESD	electrostatic discharge
IP	internet protocol
LAN	local area network
LED	light-emitting diode
LSB	least significant bit
LXI	LAN extensions for instrumentation
MSB	most significant bit
PC	personal computer
PCB	printed circuit board
RF	radio frequency
SCPI	standard commands for programmable instruments
SP4T	single-pole four-throw
SP6T	single-pole six-throw
SPDT	single-pole double-throw
USB	universal serial bus
USBTMC	USB test and measurement class
VISA	virtual instrument software architecture