

Test Solutions - Programming Manual

ZTM2 Series - Modular Test Systems



ZTM2 Series Rack-Mounted Modular Test Systems



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1 - Overview

This Programming Manual is intended for customers wishing to create their own interface for Mini-Circuits' ZTM2 Series modular test systems. For instructions on using the supplied GUI program, or connecting the hardware, please see the User Guide at:

<https://www.minicircuits.com/softwaredownload/ztm2.html>

Mini-Circuits' software package includes a GUI program, ActiveX and .NET DLL files, Linux support, project examples for third party software, and detailed user manuals. Support is offered for a variety of operating systems, programming environments and third party applications. Support for Windows® operating systems is provided through the Microsoft® .NET® and ActiveX® frameworks to allow the user to develop customized control applications. Support for Linux® operating systems is accomplished using the standard libhid and libusb libraries.

Mini-Circuits has experience with a wide variety of environments including (but not limited to):

- Visual Basic®, Visual C#®, Visual C++®
- Delphi®
- Borland C++®
- CVI®
- LabVIEW®
- MATLAB®
- Python®
- Agilent VEE®

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1.1 - Contact Us

Please contact testsolutions@minicircuits.com if you have any questions or require further support.

2 - Programming with Mini-Circuits' Modular Test Systems

The ZTM2 Series modular concept is a flexible test system that can be easily configured to a user's requirements with custom combinations of high reliability mechanical switches.

2.1 - Control Options

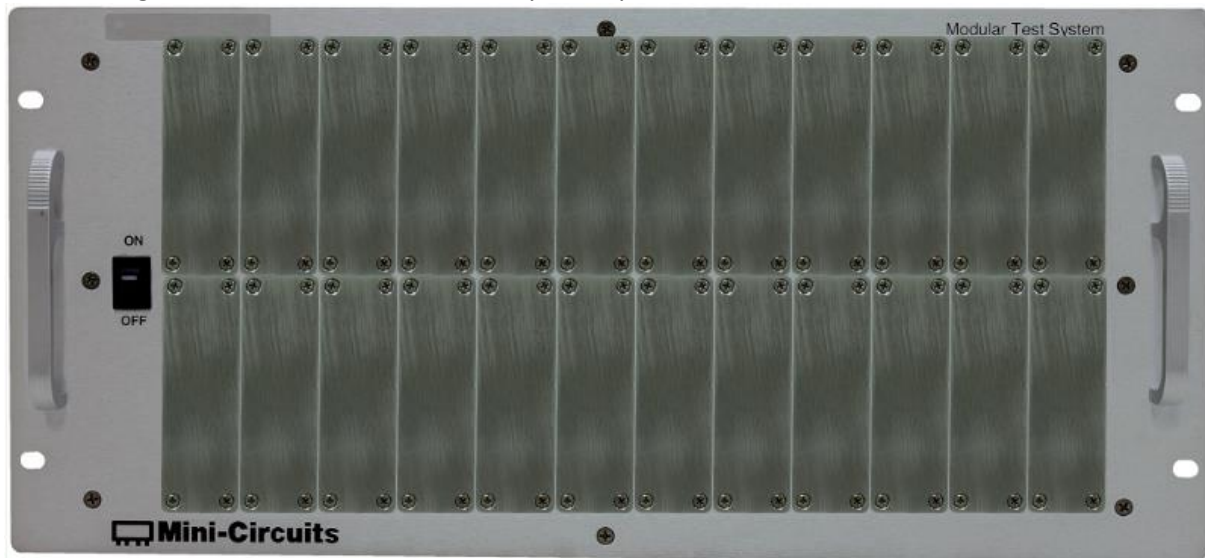
Communication with the system can be accomplished in a number of ways:

1. Using the provided ActiveX or .Net API objects (DLL files) on a Windows operating system (see [Operating in a Windows Environment via USB](#))
2. Using the USB interrupt codes on a Linux operating system (see [Operating in a Linux Environment via USB](#))
3. Using HTTP or Telnet communication over an Ethernet connection (see [Ethernet Control over IP Networks](#)), which is largely independent of the operating system

In all cases the full functionality of the system and the constituent test components is accessible using a command set based on SCPI (see [SCPI Commands for Control of Modular Test Components](#)).

2.2 - Addressing Individual Switch Components

The system is arranged with 2 rows of components and 12 slots per row. The image below shows the initial configuration, with 24 slots covered by blank panels.



The user specified switch options have different widths, defined by the number of slots they occupy on the front panel, from 1 slot for an SPDT switch module, up to 3 slots for an SP8T switch module. The ZTM2 series can also accommodate blank spacer panels in 1 or more slots on the front panel, as well as custom window options housing amplifiers, or passive splitters, combiners and couplers.

The switch addresses are always assigned from left to right and top to bottom, with address 1 as the top left switch module, to address n for the bottom right switch module. Any slots filled with blank panels or custom components (with no software control element) are simply ignored for addressing purposes (no address is assigned).

Switches are referred to programmatically using their address and component designator, as shown below.

Component	Designator	Width (Number of Slots)
SPDT Switch	SPDT	1
SP4T Switch	SP4T	2
SP6T Switch	SP6T	2
SP8T Switch	SP8T	3
Transfer Switch	MTS	1

Table 1: ZTM2 Series Component Designators

2.3 - Example ZTM2 Series Configurations

2.3 (a) - Example of Switches in All Slots

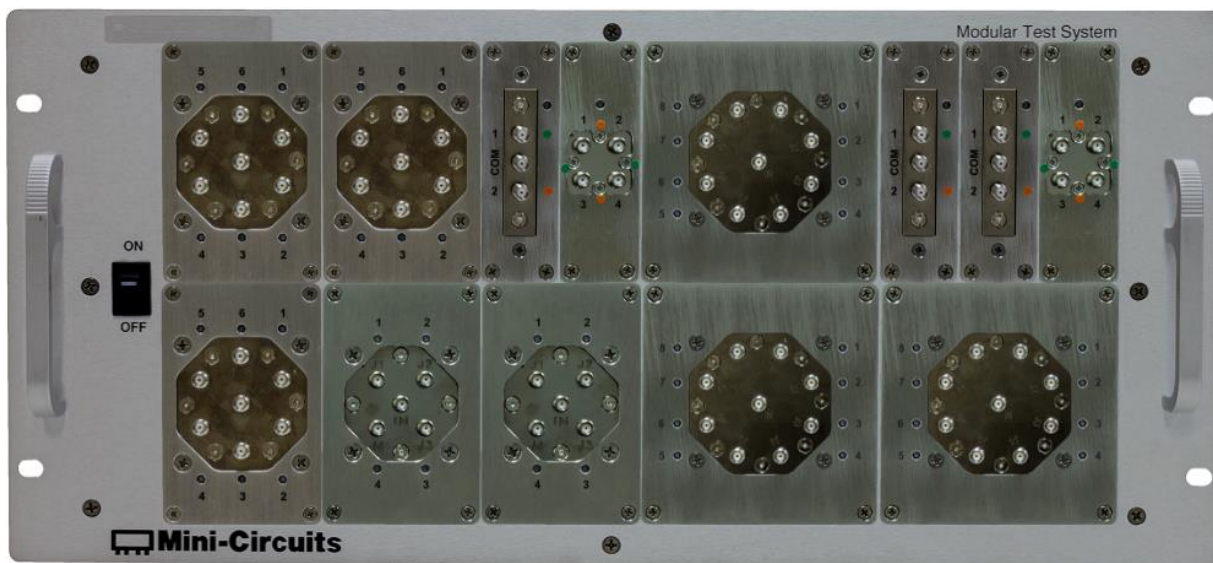


Fig 1: Example ZTM2 Series Front Panel Configuration with All Slots Filled

The example front panel layout of figure 1 includes 13 switches arranged as summarized in the table below. Addresses are assigned from top left to bottom right, from 1 to 13.

Row	Slot	Width (Number of Slots)	Component	Switch Address
1	1	2	SP6T Switch	1
1	3	2	SP6T Switch	2
1	5	1	SPDT Switch	3
1	6	1	Transfer Switch	4
1	7	3	SP8T Switch	5
1	10	1	SPDT Switch	6
1	11	1	SPDT Switch	7
1	12	1	Transfer Switch	8
2	1	2	SP6T Switch	9
2	3	2	SP4T Switch	10
2	5	2	SP4T Switch	11
2	7	3	SP8T Switch	12
2	10	3	SP8T Switch	13

Table 2: Example ZTM2 Series Configuration with Component Window Locations

2.3 (b) - Example with Blank Spacer Panels & Passive Components

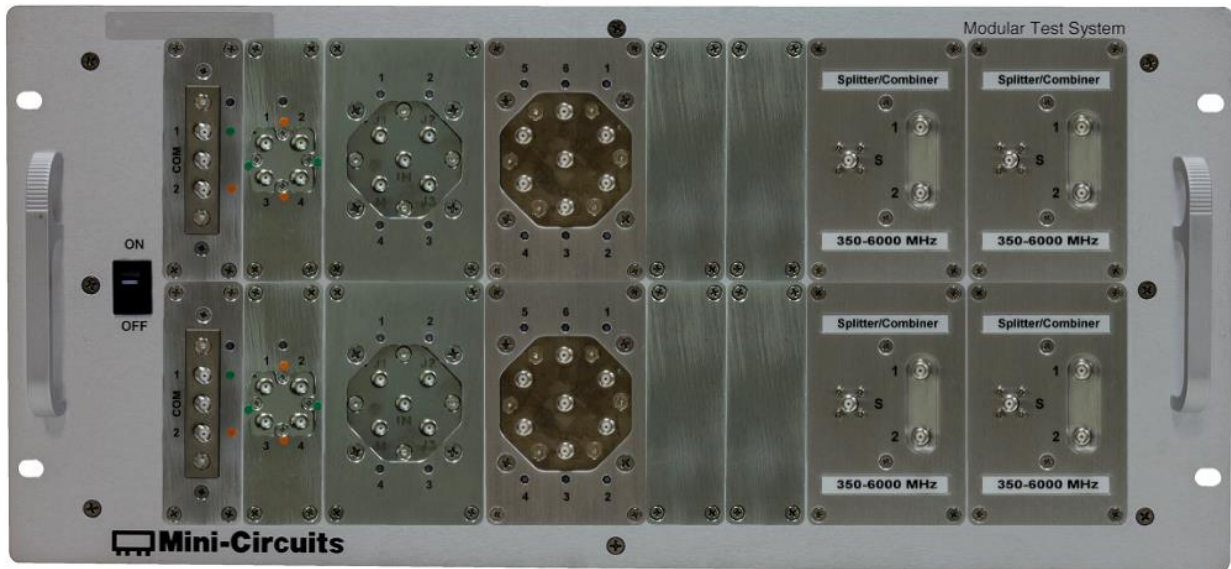


Fig 2: Example ZTM2 Series Front Panel Configuration including Blank Panels and Passive Splitters

The example front panel layout of figure 2 includes 8 switches and 4 splitters arranged as summarized in the table below. Addresses are assigned sequentially and only to the switch components, in order from top left to bottom right, from 1 to 8.

Row	Slot	Width (Number of Slots)	Component	Switch Address
1	1	1	SPDT Switch	1
1	2	1	Transfer Switch	2
1	3	2	SP4T Switch	3
1	5	2	SP6T Switch	4
1	7	1	Blank	---
1	8	1	Blank	---
1	9	2	2-Way Splitter	---
1	11	2	2-Way Splitter	---
2	1	1	SPDT Switch	5
2	2	1	Transfer Switch	6
2	3	2	SP4T Switch	7
2	5	2	SP6T Switch	8
2	7	1	Blank	---
2	8	1	Blank	---
2	9	2	2-Way Splitter	---
2	11	2	2-Way Splitter	---

Table 3: Example ZTM2 Series Configuration with Component Window Locations

3 - SCPI Commands for Control of Modular Test Components

The main method of communication with the ZTM2 Series modular test systems is through a series of SCPI commands. SCPI (Standard Commands for Programmable Instruments) is a common method for controlling instrumentation products.

The SCPI commands are sent as an ASCII text string (up to 63 characters) in the below format:

```
: [designator] : [location] : [command] : [value]
```

Where:

[**designator**] = the short-name of the component to be controlled (see table 1)
[**location**] = the location of the component to be controlled
[**command**] = the command/query to send
[**value**] = the value (if applicable) to set

Where a SCPI command is sent to query a property of the full modular test system, rather than an individual component, the *Designator* and *Window* parameters are not used (for example [Get Internal Temperature](#)).

Commands can be sent in upper or lower case and the return value will be an ASCII text string.

These commands and queries can be sent using the DLL function [Send SCPI Command](#) when the system is connected via the USB interface in a Microsoft Windows environment, or using the USB interrupt commands on a Linux system (see Linux [Send SCPI Command](#)). In addition, SCPI commands can also be sent using HTTP get/post commands or Telnet over a TCP/IP network when the system is connected via the Ethernet RJ45 port (see [Ethernet Communication](#)).

3.1 - ZTM2 Series System Operations

: [query]

The following queries provide information regarding the modular test system rather than the individual test components, so there is no location or component designator to send with the command.

	Description	Command/Query
a	Get Model Name	MN?
b	Get Serial Number	SN?
c	Get Configuration	CONFIG:APP?
d	Get Firmware	FIRMWARE?
e	Get Internal Temperature	T[sensor]?
f	Get Heat Alarm	HEATALARM?
g	Save Counters & States	OPERATIONDATA:SAVE

3.1 (a) - Get Model Name

Description

Returns the full Mini-Circuits part number of the connected system.

Command Syntax

:MN?

Return String

MN=[model]

Variable	Description
[model]	Model name of the system (for example, "ZTM2-1")

Examples

String to Send	String Returned
:MN?	MN=ZTM2-1

DLL Implementation: `Send_SCPI(":MN?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:MN?`

See Also

[Get Serial Number](#)

3.1 (b) - Get Serial Number

Description

Returns the serial number of the connected system.

Command Syntax

`:SN?`

Return String

`SN=[serial]`

Variable	Description
[serial]	Serial number of the system (for example, "11801010001")

Examples

String to Send	String Returned
<code>:SN?</code>	<code>SN=11801010001</code>

DLL Implementation: `Send_SCPI(":SN?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:SN?`

See Also

[Get Model Name](#)

3.1 (c) - Get Configuration

Description

Returns a list of integer codes (separated by semi-colons) indicating the addressable switch components configured in this system. The possible integer codes (returned in address order, from 1 to n) are:

Value	Type	Switch Designator
1	SPDT Switch	SPDT
4	SP4T Switch	SP4T
5	Transfer Switch	MT
11	SP6T Switch	SP6T
12	SP8T Switch	SP8T

Note: No address / switch identification code is returned for slots filled with blank panels or custom passive components as no software control is required for these items.

Command Syntax

:CONFIG:APP?

Return String

APP=[type₀];[type₁]; ...[type_n]

Variable	Description
[type]	Integer code corresponding to the switch type

Examples

String to Send	String Returned
:CONFIG:APP?	APP=11;11;1;5;12;1;1;5;11;4;4;12;12
:CONFIG:APP?	APP=1;5;4;11;1;5;4;11

APP=11;11;1;5;12;1;1;5;11;4;4;12;12 would be returned for the example in figure 1, indicating:

Switch Address	Switch Type Code	Component
1	11	SP6T Switch
2	11	SP6T Switch
3	1	SPDT Switch
4	5	Transfer Switch
5	12	SP8T Switch
6	1	SPDT Switch
7	1	SPDT Switch
8	5	Transfer Switch
9	11	SP6T Switch
10	4	SP4T Switch
11	4	SP4T Switch
12	12	SP8T Switch
13	12	SP8T Switch

APP=1;5;4;11;1;5;4;11 would be returned for the example in figure 2, indicating:

Switch Address	Switch Type Code	Component
1	1	SPDT Switch
2	1	Transfer Switch
3	2	SP4T Switch
4	2	SP6T Switch
5	1	SPDT Switch
6	1	Transfer Switch
7	2	SP4T Switch
8	2	SP6T Switch

DLL Implementation: `Send_SCPI(":CONFIG:APP?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:CONFIG:APP?`

3.1 (d) - Get Firmware

Description

Returns the firmware version of the system.

Command Syntax

`:FIRMWARE?`

Return String

`FIRMWARE=[firmware]`

Variable	Description
[firmware]	Firmware version name (for example, "A1")

Examples

String to Send	String Returned
<code>:FIRMWARE?</code>	<code>FIRMWARE=A1</code>

DLL Implementation: `Send_SCPI(":FIRMWARE?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:FIRMWARE?`

3.1 (e) - Get Internal Temperature

Description

Returns the internal temperature of the modular test system, measured at the control board.

Command Syntax

`:TS0?`

Return String

`[temperature]`

Variable	Description
<code>[temperature]</code>	The temperature returned from the specified sensor in degrees Celsius

Examples

String to Send	String Returned
<code>:TS0?</code>	25.50

DLL Implementation: `Send_SCPI(":TS0?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:TS0?`

See Also

[Get Heat Alarm](#)

3.1 (f) - Get Heat Alarm

Description

Returns an alarm code relating to the internal temperature of the modular test system.

Command Syntax

`:HEATALARM?`

Return String

`[alarm]`

Variable	Value	Description
<code>[alarm]</code>	0	Internal temperature within normal limits
	1	Internal temperature has exceeded the factory defined limit (65°C)

Examples

String to Send	String Returned
<code>:HEATALARM?</code>	0

DLL Implementation: `Send_SCPI(":HEATALARM?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:HEATALARM?`

See Also

[Get Internal Temperature](#)

3.1 (g) - Save Counters & States

Description

Transfers any operation data from temporary to permanent memory. The data includes:

1. Last switch states
2. Latest switch counters

This command should be sent following completion of all switch sequences and prior to powering off the system in order to preserve the latest data. During normal operation, this data is internally stored in volatile memory but automatically updated into permanent memory every 3 minutes.

Command Syntax

:OPERATIONDATA:SAVE

Return String

[status]

Variable	Value	Description
[status]	0 - Failed	Command failed
	1 - Success	Command completed successfully
	2 - Fail	Command already sent within previous 3 minutes (wait and try again)

Examples

String to Send	String Returned
:OPERATIONDATA:SAVE	1 - Success

DLL Implementation: `Send_SCPI(":OPERATIONDATA:SAVE", RetStr)`

HTTP Implementation: `http://10.10.10.10/:OPERATIONDATA:SAVE`

See Also

[Set Switch Start-Up Mode](#)

[Get Switch Start-Up Mode](#)

[Get Switch Counter](#)

3.2 - SPDT Switch Control

```
:SPDT:[address]:[command]:[value]
:SPDT:[address]:[query]?
```

The following commands and queries allow control of a specific SPDT switch within the modular test system. The component designator “SPDT” should be used along with the address of the switch.

	Description	Command/Query
a	Set SPDT Switch State	SPDT:[address]:STATE:[value]
b	Get SPDT Switch State	SPDT:[address]:STATE?

3.2 (a) - Set SPDT Switch State

Description

Set the state of a specific SPDT switch.

Command Syntax

```
:STATE:[value]
```

Variable	Value	Description
[value]	1	Com port connected to port 1
	2	Com port connected to port 2

Return String

```
[status]
```

Variable	Value	Description
[status]	0 - Failed	Command failed (switch not set)
	1 - Success	Command completed successfully

Examples

String to Send	String Returned
:SPDT:1:STATE:2	1 - Success
:SPDT:2:STATE:1	1 - Success

DLL Implementation: `Send_SCPI(":SPDT:1:STATE:2", RetStr)`
 HTTP Implementation: <http://10.10.10.10/:SPDT:1:STATE:2>

See Also

[Get SPDT Switch State](#)

3.2 (b) - Get SPDT Switch State

Description

Read the state of a specific SPDT switch.

Command Syntax

`:STATE?`

Return String

`[value]`

Variable	Value	Description
<code>[value]</code>	1	Com port connected to port 1
	2	Com port connected to port 2

Examples

String to Send	String Returned
<code>:SPDT:1:STATE?</code>	2
<code>:SPDT:2:STATE?</code>	1

DLL Implementation: `Send_SCPI(":SPDT:1:STATE?", RetStr)`

HTTP Implementation: <http://10.10.10.10/:SPDT:1:STATE?>

See Also

[Set SPDT Switch State](#)

3.3 - SP4T Switch Control

```
:SP4T: [address] : [command] : [value]
:SP4T: [address] : [query] ?
```

The following commands and queries allow control of a specific SP4T switch within the modular test system. The component designator "SP4T" should be used along with the address of the switch.

	Description	Command/Query
a	Set SP4T Switch State	SP4T: [address] :STATE: [value]
b	Get SP4T Switch State	SP4T: [address] :STATE?

3.3 (a) - Set SP4T Switch State

Description

Set the state of a specific SP4T switch.

Command Syntax

```
:STATE: [value]
```

Variable	Value	Description
[value]	0	All ports disconnected
	1	Com port connected to port 1
	2	Com port connected to port 2
	3	Com port connected to port 3
	4	Com port connected to port 4

Return String

```
[status]
```

Variable	Value	Description
[status]	0 - Failed	Command failed (switch not set)
	1 - Success	Command completed successfully

Examples

String to Send	String Returned
:SP4T:1:STATE:3	1 - Success
:SP4T:2:STATE:0	1 - Success

DLL Implementation: `Send_SCPI(":SP4T:1:STATE:3", RetStr)`
 HTTP Implementation: `http://10.10.10.10/:SP4T:1:STATE:3`

See Also

[Get SP4T Switch State](#)

3.3 (b) - Get SP4T Switch State

Description

Read the state of a specific SP4T switch.

Command Syntax

:STATE?

Return String

[value]

Variable	Value	Description
[value]	0	All ports disconnected
	1	Com port connected to port 1
	2	Com port connected to port 2
	3	Com port connected to port 3
	4	Com port connected to port 4

Examples

String to Send	String Returned
:SP4T:1:STATE?	1
:SP4T:2:STATE?	0

DLL Implementation: `Send_SCPI(":SP4T:1:STATE?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:SP4T:1:STATE?`

See Also

[Set SP4T Switch State](#)

[Set All SP4T Switch States](#)

[Get All SP4T Switch States](#)

3.4 - SP6T Switch Control

```
:SP6T:[address]:[command]:[value]  
:SP6T:[address]:[query]?
```

The following commands and queries allow control of a specific SP6T switch within the modular test system. The component designator “SP6T” should be used along with the address of the switch within the system.

	Description	Command/Query
a	Set SP6T Switch State	SP6T:[address]:STATE:[value]
b	Get SP6T Switch State	SP6T:[address]:STATE?

3.4 (a) - Set SP6T Switch State

Description

Set the state of a specific SP6T switch.

Command Syntax

:STATE: [value]

Variable	Value	Description
[value]	0	All ports disconnected
	1	Com port connected to port 1
	2	Com port connected to port 2
	3	Com port connected to port 3
	4	Com port connected to port 4
	5	Com port connected to port 5
	6	Com port connected to port 6

Return String

[status]

Variable	Value	Description
[status]	0 - Failed	Command failed (switch not set)
	1 - Success	Command completed successfully

Examples

String to Send	String Returned
:SP6T:1:STATE:3	1 - Success
:SP6T:2:STATE:0	1 - Success

DLL Implementation: `Send_SCPI(":SP6T:1:STATE:3", RetStr)`

HTTP Implementation: `http://10.10.10.10/:SP6T:1:STATE:3`

See Also

[Get SP6T Switch State](#)

3.4 (b) - Get SP6T Switch State

Description

Read the state of a specific SP6T switch.

Command Syntax

:STATE?

Return String

[value]

Variable	Value	Description
[value]	0	All ports disconnected
	1	Com port connected to port 1
	2	Com port connected to port 2
	3	Com port connected to port 3
	4	Com port connected to port 4
	5	Com port connected to port 5
	6	Com port connected to port 6

Examples

String to Send	String Returned
:SP6T:1:STATE?	3
:SP6T:2:STATE?	0

DLL Implementation: `Send_SCPI(":SP6T:1:STATE?", RetStr)`

HTTP Implementation: `http://10.10.10.10/:SP6T:1:STATE?`

See Also

[Set SP6T Switch State](#)

3.5 - SP8T Switch Control

```
:SP8T: [address] : [command] : [value]  
:SP8T: [address] : [query] ?
```

The following commands and queries allow control of a specific SP8T switch within the modular test system. The component designator “SP8T” should be used along with the location of the switch within the system.

	Description	Command/Query
a	Set SP8T Switch State	SP8T: [address] :STATE: [value]
b	Get SP8T Switch State	SP8T: [address] :STATE?

3.5 (a) - Set SP8T Switch State

Description

Set the state of a specific SP8T switch.

Command Syntax

:STATE: [value]

Variable	Value	Description
[value]	0	All ports disconnected
	1	Com port connected to port 1
	2	Com port connected to port 2
	3	Com port connected to port 3
	4	Com port connected to port 4
	5	Com port connected to port 5
	6	Com port connected to port 6
	7	Com port connected to port 7
	8	Com port connected to port 8

Return String

[status]

Variable	Value	Description
[status]	0 - Failed	Command failed (switch not set)
	1 - Success	Command completed successfully

Examples

String to Send	String Returned
:SP8T:1:STATE:3	1 - Success
:SP8T:2:STATE:0	1 - Success

DLL Implementation: `Send_SCPI(":SP8T:1:STATE:3", RetStr)`
 HTTP Implementation: `http://10.10.10.10/:SP8T:1:STATE:3`

See Also

[Get SP8T Switch State](#)

3.5 (b) - Get SP8T Switch State

Description

Read the state of a specific SP8T switch.

Command Syntax

`:STATE?`

Return String

`[value]`

Variable	Value	Description
<code>[value]</code>	0	All ports disconnected
	1	Com port connected to port 1
	2	Com port connected to port 2
	3	Com port connected to port 3
	4	Com port connected to port 4
	5	Com port connected to port 5
	6	Com port connected to port 6
	7	Com port connected to port 7
	8	Com port connected to port 8

Examples

String to Send	String Returned
<code>:SP8T:1:STATE?</code>	3
<code>:SP8T:2:STATE?</code>	0

DLL Implementation: `Send_SCPI(":SP8T:1:STATE?", RetStr)`
 HTTP Implementation: `http://10.10.10.10/:SP8T:1:STATE?`

See Also

[Set SP8T Switch State](#)

3.6 - Transfer Switch Control

`:MTS: [address] : [command] : [value]`
`:MTS: [address] : [query] ?`

The following commands and queries allow control of a specific transfer switch within the modular test system. The component designator “MTS” should be used along with the address of the switch within the system.

	Description	Command/Query
a	Set Transfer Switch State	<code>MTS: [address] : STATE: [value]</code>
b	Get Transfer Switch State	<code>MTS: [address] : STATE?</code>

3.6 (a) - Set Transfer Switch State

Description

Set the state of a specific transfer switch.

Command Syntax

:STATE: [value]

Variable	Value	Description
[value]	1	Transfer switch in state 1: <ul style="list-style-type: none"> Port J1 connected to port J3 Port J2 connected to port J4
	2	Transfer switch in state 2: <ul style="list-style-type: none"> Port J1 connected to port J2 Port J3 connected to port J4

Return String

[status]

Variable	Value	Description
[status]	0 - Failed	Command failed (switch not set)
	1 - Success	Command completed successfully

Examples

String to Send	String Returned
:MTS:1:STATE:2	1 - Success
:MTS:2:STATE:1	1 - Success

DLL Implementation: `Send_SCPI(":MTS:1:STATE:2", RetStr)`

HTTP Implementation: <http://10.10.10.10/:MTS:1:STATE:2>

See Also

[Get Transfer Switch State](#)

3.6 (b) - Get Transfer Switch State

Description

Read the state of a specific transfer switch.

Command Syntax

:STATE?

Return String

[value]

Variable	Value	Description
[value]	1	Transfer switch in state 1: <ul style="list-style-type: none"> Port J1 connected to port J3 Port J2 connected to port J4
	2	Transfer switch in state 2: <ul style="list-style-type: none"> Port J1 connected to port J2 Port J3 connected to port J4

Examples

String to Send	String Returned
:MTS:1:STATE?	1
:MTS:2:STATE?	0

DLL Implementation: `Send_SCPI(":MTS:1:STATE?", RetStr)`

HTTP Implementation: <http://10.10.10.10/:MTS:1:STATE?>

See Also

[Set Transfer Switch State](#)

3.7 - Switch Start-Up and Counter Properties

```

:SPDT:[location]:[command]:[value]
:SP4T:[location]:[command]:[value]
:SP6T:[location]:[command]:[value]
:SP8T:[location]:[command]:[value]
:MTS:[location]:[command]:[value]

```

The following commands and queries enable the user to work with the start-up settings and counter for any given switch in the modular test system. The component designator “SPDT”, “SP4T”, or “MTS” should be used along with the address of the switch within the system.

	Description	Command/Query
a	Set Switch Start-Up Mode	STARTUPSW:INDICATOR:[mode]
b	Get Switch Start-Up Mode	STARTUPSW:INDICATOR?
c	Get Switch Counter	SCOUNTER?

3.7 (a) - Set Switch Start-Up Mode

Description

Sets the start-up state for a specific switch when the system is powered up.

Command Syntax

:STARTUPSW:INDICATOR:[mode]

Variable	Value	Description
[mode]	L	Last Value - the switch will power up with the last remembered switch state See Save Counters & States for correct operation
	N	Normal - the switch will power up in the default state: <ul style="list-style-type: none"> SPDT: Com port connected to port 1 SP4T / SP6T / SP8T: All ports disconnected Transfer: J1 <> J3; J2 <> J4

Return String

[status]

Variable	Value	Description
[status]	0 - Failed	Command failed
	1 - Success	Command completed successfully

Examples

String to Send	String Returned
:SPDT:1:STARTUPSW:INDICATOR:L	1 - Success
:SP4T:1:STARTUPSW:INDICATOR:L	1 - Success
:SP6T:1:STARTUPSW:INDICATOR:L	1 - Success
:MTS:1:STARTUPSW:INDICATOR:L	1 - Success

DLL Implementation:

```
Send_SCPI(":SPDT:1:STARTUPSW:INDICATOR:L", RetStr)
Send_SCPI(":SP4T:1:STARTUPSW:INDICATOR:L", RetStr)
Send_SCPI(":SP6T:1:STARTUPSW:INDICATOR:L", RetStr)
Send_SCPI(":MTS:1:STARTUPSW:INDICATOR:L", RetStr)
```

HTTP Implementation:

```
http://10.10.10.10/:SPDT:1:STARTUPSW:INDICATOR:L
http://10.10.10.10/:SP4T:1:STARTUPSW:INDICATOR:L
http://10.10.10.10/:SP6T:1:STARTUPSW:INDICATOR:L
http://10.10.10.10/:MTS:1:STARTUPSW:INDICATOR:L
```

See Also

[Save Counters & States](#)
[Get Switch Start-Up Mode](#)
[Get Switch Counter](#)

3.7 (b) - Get Switch Start-Up Mode

Description

Returns the start-up state that a specific switch will use when the system is powered up.

Command Syntax

:STARTUPSW:INDICATOR?

Return String

[mode]

Variable	Value	Description
[mode]	L	Last Value - the switch will power up with the last remembered switch state See Save Counters & States for correct operation
	N	Normal - the switch will power up in the default state: <ul style="list-style-type: none"> SPDT: Com port connected to port 1 SP4T / SP6T / SP8T: All ports disconnected Transfer: J1 <> J3; J2 <> J4

Examples

String to Send	String Returned
:SPDT:1:STARTUPATT:INDICATOR?	L
:SP4T:1:STARTUPATT:INDICATOR?	L
:SP6T:1:STARTUPATT:INDICATOR?	L
:MTS:1:STARTUPATT:INDICATOR?	L

DLL Implementation:

```
Send_SCPI(":SPDT:1:STARTUPSW:INDICATOR?", RetStr)
Send_SCPI(":SP4T:1:STARTUPSW:INDICATOR?", RetStr)
Send_SCPI(":SP6T:1:STARTUPSW:INDICATOR?", RetStr)
Send_SCPI(":MTS:1:STARTUPSW:INDICATOR?", RetStr)
```

HTTP Implementation:

```
http://10.10.10.10/:SPDT:1:STARTUPSW:INDICATOR?
http://10.10.10.10/:SP4T:1:STARTUPSW:INDICATOR?
http://10.10.10.10/:SP6T:1:STARTUPSW:INDICATOR?
http://10.10.10.10/:MTS:1:STARTUPSW:INDICATOR?
```

See Also

[Save Counters & States](#)
[Set Switch Start-Up Mode](#)
[Get Switch Counter](#)

3.7 (c) - Get Switch Counter

Description

Returns a counter value indicating the number of switching cycles undertaken in the lifetime of a specific switch.

Note: See [Save Counters & States](#) for correct operation.

Command Syntax

: SCOUNTER?

Return String (SPDT and MTS)

[count]

Variable	Description
[count]	The number of switch cycles undertaken in the lifetime of the specified switch

Return String (SP4T, SP6T & SP8T)

[count₁] ; [count₂] ; ... [count_n]

Variable	Description
[count _{port}]	The number of connections to each port

Examples

String to Send	String Returned
:SPDT:1:SCOUNTER?	9540
:SP4T:1:SCOUNTER?	2000;1253;1500;1685
:SP6T:1:SCOUNTER?	195;452;300;125;850;647
:MTS:1:SCOUNTER?	9540

DLL Implementation:

```
Send_SCPI(":SPDT:1:SCOUNTER?", RetStr)
Send_SCPI(":SP4T:1:SCOUNTER?", RetStr)
Send_SCPI(":SP6T:1:SCOUNTER?", RetStr)
Send_SCPI(":MTS:1:SCOUNTER?", RetStr)
```

HTTP Implementation:

```
http://10.10.10.10/:SPDT:1:SCOUNTER?
http://10.10.10.10/:SP4T:1:SCOUNTER?
http://10.10.10.10/:SP6T:1:SCOUNTER?
http://10.10.10.10/:MTS:1:SCOUNTER?
```

See Also

[Save Counters & States](#)
[Set Switch Start-Up Mode](#)
[Get Switch Start-Up Mode](#)

3.8 - Component Labels

These commands enable the user to set a custom label for easy identification on any given component in the modular test system. The component designator is not needed so the full SCPI commands are as below.

	Description	Command/Query
a	Set Component Label	<code>:LABEL: [location] : " [text] "</code>
b	Get Component Label	<code>:LABEL: [location] ?</code>

3.8 (a) - Set Component Label

Description

Set a custom label for easy identification of a specific component.

Command Syntax

`:LABEL: [location] : " [text] "`

Variable	Description
<code>[text]</code>	A string of ASCII characters to be set as an easy identification label for the component. Up to 24 characters allowed.

Return String

`[status]`

Variable	Value	Description
<code>[status]</code>	0 - Failed	Command failed (switch not set)
	1 - Success	Command completed successfully

Examples

String to Send	String Returned
<code>:LABEL:1:"Input_SPDT_1"</code>	1 - Success
<code>:LABEL:2:"Input_SP4T_1"</code>	1 - Success

DLL Implementation: `Send_SCPI(":LABEL:1:"Input_SPDT_1", RetStr)`

HTTP Implementation: [http://10.10.10.10/:LABEL:2:"Input_SPDT_1"](http://10.10.10.10/:LABEL:2:)

See Also

[Get Component Label](#)

3.8 (b) - Get Component Label

Description

Get the custom label of a specific component (used for easy identification).

Command Syntax

```
:LABEL: [location]?
```

Return String

```
LABEL=" [text] "
```

Variable	Description
[text]	The component label as a string of up to 24 ASCII characters

Examples

String to Send	String Returned
:LABEL:1?	LABEL="Input_SPDT_1"
:LABEL:2?	LABEL="Input_SP4T_1"

DLL Implementation: `Send_SCPI(":LABEL:1?", RetStr)`

HTTP Implementation: <http://10.10.10.10/:LABEL:2?>

See Also

[Set Component Label](#)

3.9 - SCPI - Ethernet Configuration Commands

	Description	Command/Query
a	Set Static IP Address	:ETHERNET:CONFIG:IP:[ip]
b	Get Static IP Address	:ETHERNET:CONFIG:IP?
c	Set Static Subnet Mask	:ETHERNET:CONFIG:SM:[mask]
d	Get Static Subnet Mask	:ETHERNET:CONFIG:SM?
e	Set Static Network Gateway	:ETHERNET:CONFIG:NG:[gateway]
f	Get Static Network Gateway	:ETHERNET:CONFIG:NG?
g	Set HTTP Port	:ETHERNET:CONFIG:HTPORT:[port]
h	Get HTTP Port	:ETHERNET:CONFIG:HTPORT?
i	Set Telnet Port	:ETHERNET:CONFIG:TELNETPORT:[port]
j	Get Telnet Port	:ETHERNET:CONFIG:TELNETPORT?
k	Set Password Requirement	:ETHERNET:CONFIG:PWDENABLED:[enabled]
l	Get Password Requirement	:ETHERNET:CONFIG:PWDENABLED?
m	Set Password	:ETHERNET:CONFIG:PWD:[pwd]
n	Get Password	:ETHERNET:CONFIG:PWD?
o	Set DHCP Status	:ETHERNET:CONFIG:DHCPENABLED:[enabled]
p	Get DHCP Status	:ETHERNET:CONFIG:DHCPENABLED?
q	Get MAC Address	:ETHERNET:CONFIG:MAC?
r	Get Current Ethernet Configuration	:ETHERNET:CONFIG:LISTEN?
s	Update Ethernet Settings	:ETHERNET:CONFIG:INIT

3.9 (a) - Set Static IP Address

Description

Sets the IP address to be used by the system for Ethernet communication when using static IP settings. DHCP must be disabled for this setting to apply, otherwise a dynamic IP address will be in use. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

```
:ETHERNET:CONFIG:IP:[ip]
```

Variable	Description
[ip]	The static IP address to be used by the system; must be valid and available on the network

Return String

```
[status]
```

Variable	Value	Description
[status]	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
:ETHERNET:CONFIG:IP:192.100.1.1	1

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:IP:192.100.1.1
```

See Also

[Get Static IP Address](#)
[Set Static Subnet Mask](#)
[Set Static Network Gateway](#)
[Update Ethernet Settings](#)

3.9 (b) - Get Static IP Address

Description

Returns the IP address to be used by the system for Ethernet communication when static IP settings are in use. DHCP must be disabled for this setting to apply, otherwise a dynamic IP address will be in use.

Command Syntax

`:ETHERNET:CONFIG:IP?`

Return String

`[ip]`

Variable	Description
<code>[ip]</code>	The static IP address to be used by the system

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:IP?</code>	<code>192.100.1.1</code>

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:IP?`

See Also

[Set Static IP Address](#)
[Get Static Subnet Mask](#)
[Get Static Network Gateway](#)
[Get Current Ethernet Configuration](#)

3.9 (c) - Set Static Subnet Mask

Description

Sets the subnet mask to be used by the system for Ethernet communication when using static IP settings. DHCP must be disabled for this setting to apply, otherwise a dynamic IP address will be in use. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

```
:ETHERNET:CONFIG:SM:[mask]
```

Variable	Description
[mask]	The subnet mask for communication on the network

Return String

```
[status]
```

Variable	Value	Description
[status]	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
:ETHERNET:CONFIG:SM:255.255.255.0	1

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:SM:255.255.255.0
```

See Also

[Set Static IP Address](#)
[Get Static Subnet Mask](#)
[Set Static Network Gateway](#)
[Update Ethernet Settings](#)

3.9 (d) - Get Static Subnet Mask

Description

Returns the subnet mask to be used by the system for Ethernet communication when static IP settings are in use. DHCP must be disabled for this setting to apply, otherwise a dynamic IP address will be in use.

Command Syntax

`:ETHERNET:CONFIG:SM?`

Return String

`[mask]`

Variable	Description
<code>[mask]</code>	The subnet mask for communication on the network

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:SM?</code>	<code>255.255.255.0</code>

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:SM?`

See Also

[Get Static IP Address](#)
[Set Static Subnet Mask](#)
[Get Static Network Gateway](#)
[Get Current Ethernet Configuration](#)

3.9 (e) - Set Static Network Gateway

Description

Sets the IP address of the network gateway to be used by the system for Ethernet communication when using static IP settings. DHCP must be disabled for this setting to apply, otherwise a dynamic IP address will be in use. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

```
:ETHERNET:CONFIG:NG:[gateway]
```

Variable	Description
[gateway]	IP address of the network gateway

Return String

```
[status]
```

Variable	Value	Description
[status]	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
:ETHERNET:CONFIG:NG:192.100.1.0	1

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:NG:192.168.100.1.0
```

See Also

[Set Static IP Address](#)
[Set Static Subnet Mask](#)
[Get Static Network Gateway](#)
[Update Ethernet Settings](#)

3.9 (f) - Get Static Network Gateway

Description

Returns the IP address of the network gateway to be used by the system for Ethernet communication when static IP settings are in use. DHCP must be disabled for this setting to apply, otherwise a dynamic IP address will be in use.

Command Syntax

`:ETHERNET:CONFIG:NG?`

Return String

`[gateway]`

Variable	Description
<code>[gateway]</code>	IP address of the network gateway

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:NG?</code>	<code>192.168.1.0</code>

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:NG?`

See Also

[Get Static IP Address](#)
[Get Static Subnet Mask](#)
[Set Static Network Gateway](#)
[Get Current Ethernet Configuration](#)

3.9 (g) - Set HTTP Port

Description

Sets the IP port to be used for HTTP communication. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

```
:ETHERNET:CONFIG:HTTPORT:[port]
```

Variable	Description
[port]	IP port to be used for HTTP communication. The port will need to be included in all HTTP commands if any other than the default port 80 is selected.

Return String

```
[status]
```

Variable	Value	Description
[status]	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
:ETHERNET:CONFIG:HTTPORT:8080	1

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:HTTPORT:8080
```

See Also

[Get HTTP Port](#)
[Set Telnet Port](#)
[Update Ethernet Settings](#)

3.9 (h) - Get HTTP Port

Description

Gets the IP port to be used for HTTP communication.

Command Syntax

```
:ETHERNET:CONFIG:HTTPORT?
```

Return String

```
[port]
```

Variable	Description
[port]	IP port to be used for HTTP communication

Examples

String to Send	String Returned
:ETHERNET:CONFIG:HTTPORT?	8080

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:HTTPORT?
```

See Also

[Set HTTP Port](#)
[Get Telnet Port](#)

3.9 (i) - Set Telnet Port

Description

Sets the IP port to be used for Telnet communication. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

```
:ETHERNET:CONFIG:TELNETPORT:[port]
```

Variable	Description
[port]	IP port to be used for Telnet communication. The port will need to be included when initiating a Telnet session if other than the default port 23 is selected.

Return String

```
[status]
```

Variable	Value	Description
[status]	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
:ETHERNET:CONFIG:TELNETPORT:21	1

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:TELNETPORT:21
```

See Also

[Set HTTP Port](#)
[Get Telnet Port](#)
[Update Ethernet Settings](#)

3.9 (j) - Get Telnet Port

Description

Gets the IP port to be used for Telnet communication.

Command Syntax

```
:ETHERNET:CONFIG:TELNETPORT?
```

Return String

```
[port]
```

Variable	Description
[port]	IP port to be used for Telnet communication

Examples

String to Send	String Returned
:ETHERNET:CONFIG:TELNETPORT?	1

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:TELNETPORT?
```

See Also

[Get HTTP Port](#)
[Set Telnet Port](#)

3.9 (k) - Set Password Requirement

Description

Sets whether or not a password is required for Ethernet communication. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

```
:ETHERNET:CONFIG:PWDENABLED:[enabled]
```

Variable	Value	Description
[enabled]	0	Password not required for Ethernet communication
	1	Password required for Ethernet communication

Return String

```
[status]
```

Variable	Value	Description
[status]	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
:ETHERNET:CONFIG:PWDENABLED:1	1

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:PWDENABLED:1
```

See Also

[Get Password Requirement](#)

[Set Password](#)

[Get Password](#)

[Update Ethernet Settings](#)

3.9 (I) - Get Password Requirement

Description

Indicates whether or not a password is required for Ethernet communication.

Command Syntax

`:ETHERNET:CONFIG:PWDENABLED?`

Return String

`[enabled]`

Variable	Value	Description
<code>[enabled]</code>	0	Password not required for Ethernet communication
	1	Password required for Ethernet communication

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:PWDENABLED?</code>	1

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:PWDENABLED?`

See Also

[Set Password Requirement](#)

[Set Password](#)

[Get Password](#)

3.9 (m) - Set Password

Description

Sets the password for Ethernet communication. The password will only be required for communication with the device when password security is enabled. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

`:ETHERNET:CONFIG:PWD:[pwd]`

Variable	Description
<code>[pwd]</code>	Password to set for Ethernet communication (not case sensitive)

Return String

`[status]`

Variable	Value	Description
<code>[status]</code>	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:PWD:PASS-123</code>	1

HTTP Implementation:

<http://10.10.10.10/:ETHERNET:CONFIG:PWD:PASS-123>

See Also

[Set Password Requirement](#)
[Get Password Requirement](#)
[Get Password](#)
[Update Ethernet Settings](#)

3.9 (n) - Get Password

Description

Returns the password for Ethernet communication. The password will only be required for communication with the device when password security is enabled

Command Syntax

`:ETHERNET:CONFIG:PWD?`

Return String

`[pwd]`

Variable	Description
<code>[pwd]</code>	Password for Ethernet communication (not case sensitive)

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:PWD?</code>	<code>PASS-123</code>

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:PWD?`

See Also

[Set Password Requirement](#)
[Get Password Requirement](#)
[Set Password](#)

3.9 (o) - Set DHCP Status

Description

Enables or disables DHCP (Dynamic Host Control Protocol). When enabled the system will request a valid IP address from the network's DHCP server. When disabled, the system's static IP settings will be used. Changes to the Ethernet configuration only take effect after the [Update Ethernet Settings](#) command has been issued.

Command Syntax

`:ETHERNET:CONFIG:DHCPENABLED:[enabled]`

Variable	Value	Description
<code>[enabled]</code>	0	DHCP disabled (static IP settings will be used)
	1	DHCP enabled (IP address will be requested from DHCP server on the network)

Return String

`[status]`

Variable	Value	Description
<code>[status]</code>	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:DHCPENABLED:1</code>	1

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:DHCPENABLED:1`

See Also

[Set Static IP Address](#)

[Get DHCP Status](#)

[Update Ethernet Settings](#)

3.9 (p) - Get DHCP Status

Description

Indicates whether or not DHCP (Dynamic Host Control Protocol) is enabled. When enabled the system will request a valid IP address from the network's DHCP server. When disabled, the system's static IP settings will be used.

Command Syntax

`:ETHERNET:CONFIG:DHCPENABLED?`

Return String

`[enabled]`

Variable	Value	Description
<code>[enabled]</code>	0	DHCP disabled (static IP settings will be used)
	1	DHCP enabled (IP address will be requested from DHCP server on the network)

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:DHCPENABLED?</code>	1

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:DHCPENABLED?`

See Also

[Set Static IP Address](#)

[Set DHCP Status](#)

[Get Current Ethernet Configuration](#)

3.9 (q) - Get MAC Address

Description

Returns the MAC (Media Access Control) address of the system (a physical hardware address).

Command Syntax

`:ETHERNET:CONFIG:MAC?`

Return String

`[mac]`

Variable	Description
<code>[mac]</code>	MAC address of the system

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:MAC?</code>	<code>D0-73-7F-82-D8-01</code>

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:MAC?`

See Also

[Get Static IP Address](#)
[Get Static Subnet Mask](#)
[Get Static Network Gateway](#)
[Get Current Ethernet Configuration](#)

3.9 (r) - Get Current Ethernet Configuration

Description

Returns the Ethernet configuration (IP address, subnet mask and network gateway) that is currently active for the device. If DHCP is enabled this will be the settings issued dynamically by the network's DHCP server. If DHCP is disabled this will be the user configured static IP settings.

Command Syntax

```
:ETHERNET:CONFIG:LISTEN?
```

Return String

```
[ip];[mask];[gateway]
```

Variable	Description
[ip]	Active IP address of the device
[mask]	Subnet mask for the network
[gateway]	IP address of the network gateway

Examples

String to Send	String Returned
:ETHERNET:CONFIG:LISTEN?	192.100.1.1;255.255.255.0;192.100.1.0

HTTP Implementation:

```
http://10.10.10.10/:ETHERNET:CONFIG:LISTEN?
```

See Also

[Get Static IP Address](#)
[Get Static Subnet Mask](#)
[Get Static Network Gateway](#)
[Update Ethernet Settings](#)

3.9 (s) - Update Ethernet Settings

Description

Resets the Ethernet controller so that any recently applied changes to the Ethernet configuration can be loaded. Any subsequent commands / queries to the system will need to be issued using the new Ethernet configuration.

Note: If a connection cannot be established after the INIT command has been issued it may indicate an invalid configuration was created (for example a static IP address which clashes with another device on the network). The Ethernet settings can always be overwritten by connecting to the system using the USB connection.

Command Syntax

`:ETHERNET:CONFIG:INIT`

Return String

`[status]`

Variable	Value	Description
<code>[status]</code>	0	Command failed
	1	Command completed successfully

Examples

String to Send	String Returned
<code>:ETHERNET:CONFIG:INIT</code>	1

HTTP Implementation:

`http://10.10.10.10/:ETHERNET:CONFIG:INIT`

See Also

[Get Current Ethernet Configuration](#)

4 - Operating in a Windows Environment via USB

4.1 - The DLL (Dynamic Link Library) Concept

The Dynamic Link Library concept is Microsoft's implementation of the shared library concept in the Windows environment.

DLLs provide a mechanism for shared code and data, intended to allow a developer to distribute applications without requiring code to be re-linked or recompiled.

Mini-Circuits' software package provides DLL objects designed to allow your own application to interface with the functions of the ZTM2 Series test system.

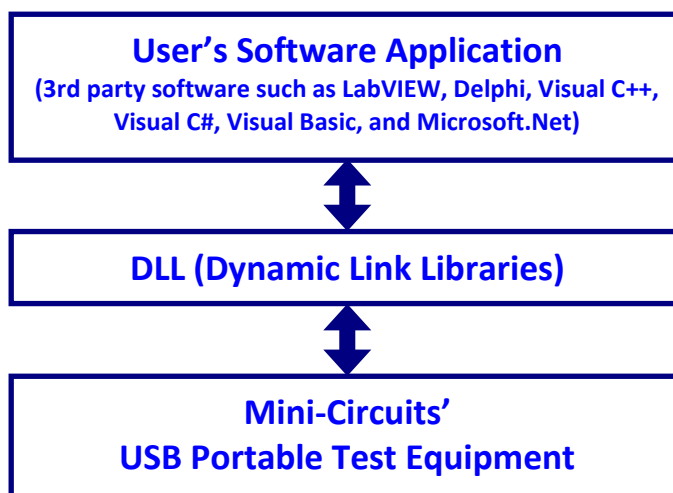


Fig 4.1-a: DLL Interface Concept

The software package provides two DLL files, the choice of which file to use is dictated by the user's operating system:

1. ActiveX com object

Designed to be used in any programming environment that supports third party ActiveX COM (Component Object Model) compliant applications. The ActiveX file should be registered using RegSvr32 (see following sections for details).

2. Microsoft.NET Class Library

A logical unit of functionality that runs under the control of the Microsoft.NET system.

4.1 (a) - ActiveX COM Object

ActiveX COM object DLL files are designed to be used with both 32-bit and 64-bit Windows operating systems. A 32-bit programming environment that is compatible with ActiveX is required. To develop 64-bit applications, the Microsoft.NET Class library should be used instead.

Supported Programming Environments

Mini-Circuits' ZTM2 Series test systems have been tested in the following programming environments. This is not an exhaustive list and the DLL file is designed to operate in most environments that support ActiveX functionality. Please contact Mini-Circuits for support.

- Visual Studio® 6 (Visual C++ and Visual Basic)
- LabVIEW 8.0 or newer
- MATLAB 7 or newer
- Delphi
- Borland C++
- Agilent VEE
- Python 32-bit distributions

Installation

1. Copy the DLL file to the correct directory:
For 32-bit Windows operating systems this is C:\WINDOWS\System32
For 64-bit Windows operating systems this is C:\WINDOWS\SysWOW64
2. Open the Command Prompt:
 - a. For Windows XP® (see *Fig 4.1-b*):
 - i. Select "All Programs" and then "Accessories" from the Start Menu
 - ii. Click on "Command Prompt" to open
 - b. For later versions of the Windows operating system you will need to have Administrator privileges in order to run the Command Prompt in "Elevated" mode (see *Fig 4.1-c* for Windows 7 and Windows 8):
 - i. Open the Start Menu/Start Screen and type "Command Prompt"
 - ii. Right-click on the shortcut for the Command Prompt
 - iii. Select "Run as Administrator"
 - iv. You may be prompted to enter the log in details for an Administrator account if the current user does not have Administrator privileges on the local PC
3. Use regsvr32 to register the DLL:
For 32-bit Windows operating systems type (see *Fig 4.1-d*):
 \WINDOWS\System32\Regsvr32 \WINDOWS\System32\MCL_ZTM2.dll
For 64-bit Windows operating systems type (see *Fig 4.1-e*):
 \WINDOWS\SysWOW64\Regsvr32 \WINDOWS\SysWOW64\MCL_ZTM2.dll
4. Hit enter to confirm and a message box will appear to advise of successful registration.

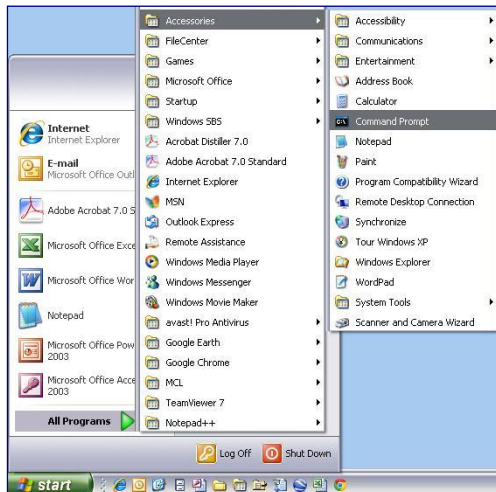


Fig 4.1-b: Opening the Command Prompt in Windows XP

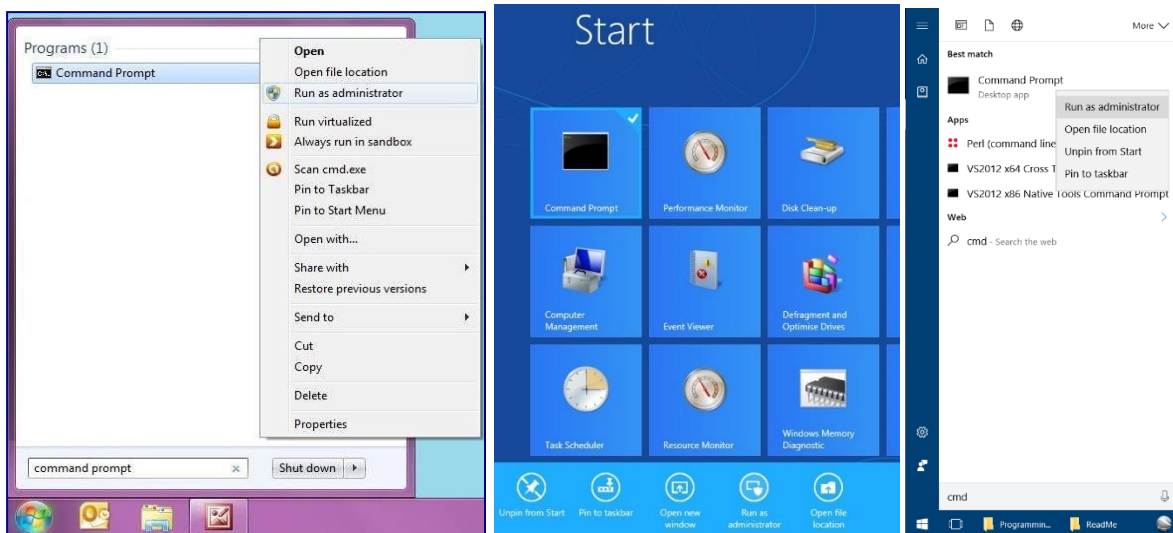


Fig 4.1-c: Opening the Command Prompt in Windows 7 (left), Windows 8 (middle) and Windows 10 (right)

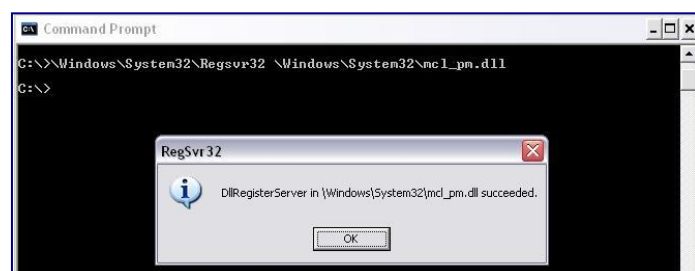


Fig 4.1-d: Registering the DLL in a 32-bit environment

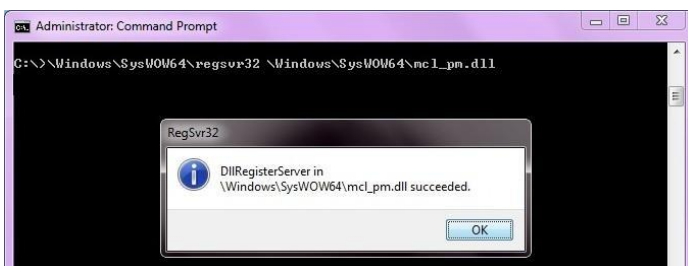


Fig 4.1-e: Registering the DLL in a 64-bit environment

4.1 (b) - Microsoft.NET Class Library

Microsoft.NET class libraries are designed to be used with both 32-bit and 64-bit Windows operating systems. To develop 64-bit applications the user must have both a 64-bit operating system and 64-bit programming environment. However, the Microsoft.NET class library is also compatible with 32-bit programming environments.

Supported Programming Environments

Mini-Circuits' ZTM2 Series test systems have been tested in the following programming environments. This is not an exhaustive list and the DLL file is designed to operate in most environments that support Microsoft.NET functionality. Please contact Mini-Circuits for support.

- National Instruments CVI
- Microsoft.NET (Visual C++, Visual Basic.NET, Visual C# 2003 or newer)
- LabVIEW 2009 or newer
- MATLAB 2008 or newer
- Delphi
- Borland C++

Installation

1. Copy the DLL file to the correct directory
 - a. For 32 bit Windows operating systems this is C:\WINDOWS\System32
 - b. For 64 bit Windows operating systems this is C:\WINDOWS\SysWOW64
2. **No registration is required**

4.2 - Referencing the DLL (Dynamic Linked Library)

In order to use the DLL functionality, some programming environments will require the user to set a reference to the relevant DLL file. Once this is done, the user just needs to declare a new instance of the USB Control class (defined within the DLL) for each modular test system to be controlled. The class is assigned to a variable which is used to call the DLL functions as needed. In the following examples, the variable names MyPTE1 and MyPTE2 have been used to represent 2 connected modular test systems.

Example Declarations using the ActiveX DLL (modularzt.dll)

Visual Basic

```
Public MyPTE1 As New MCL_ZTM2.USB_Control
    ' Declare new ZTM2 Series control object, assign to MyPTE1
Public MyPTE2 As New MCL_ZTM2.USB_Control
    ' Declare new ZTM2 Series control object, assign to MyPTE2
```

Visual C++

```
MCL_ZTM2::USB_Control ^MyPTE1 = gcnew MCL_ZTM2::USB_Control();
    // Declare new ZTM2 Series control object, assign to MyPTE1
MCL_ZTM2::USB_Control ^MyPTE2 = gcnew MCL_ZTM2::USB_Control();
    // Declare new ZTM2 Series control object, assign to MyPTE2
```

Visual C#

```
public MCL_ZTM2.USB_Control MyPTE1 = new MCL_ZTM2.USB_Control();
    // Declare new ZTM2 Series control object, assign to MyPTE1
public MCL_ZTM2.USB_Control MyPTE2 = new MCL_ZTM2.USB_Control();
    // Declare new ZTM2 Series control object, assign to MyPTE2
```

Matlab

```
MyPTE1 = actxserver('MCL_ZTM2.USB_Control')
    % Initialize new ZTM2 Series control object, MyPTE1
MyPTE2 = actxserver('MCL_ZTM2.USB_Control')
    % Initialize new ZTM2 Series control object, MyPTE2
```

Example Declarations using the .NET DLL (modularzt64.dll)

Visual Basic

```
Public MyPTE1 As New mcl_ZTM2_64.USB_ZT
    ' Declare new ZTM2 Series control object, assign to MyPTE1
Public MyPTE2 As New mcl_ZTM2_64.USB_ZT
    ' Declare new ZTM2 Series control object, assign to MyPTE2
```

Visual C++

```
mcl_ZTM2_64.USB_ZT ^MyPTE1 = gcnew mcl_ZTM2_64.USB_ZT();
    // Declare new ZTM2 Series control object, assign to MyPTE1
mcl_ZTM2_64.USB_ZT ^MyPTE2 = gcnew mcl_ZTM2_64.USB_ZT();
    // Declare new ZTM2 Series control object, assign to MyPTE2
```

Visual C#

```
public mcl_ZTM2_64.USB_ZT MyPTE1 = new mcl_ZTM2_64.USB_ZT();
    // Declare new ZTM2 Series control object, assign to MyPTE1
public mcl_ZTM2_64.USB_ZT MyPTE2 = new mcl_ZTM2_64.USB_ZT();
    // Declare new ZTM2 Series control object, assign to MyPTE2
```

Matlab

```
MCL_ATT=NET.addAssembly('C:\Windows\SysWOW64\mcl_ZTM2_64.dll')
MyPTE1 = mcl_ZTM2_64.USB_ZT          % Initialize new ZTM2 object
MyPTE1 = mcl_ZTM2_64.USB_ZT          % Initialize new ZTM2 object
```

4.3 - Summary of DLL Functions

The following functions are defined in both the ActiveX and .Net DLL files. Please see the following sections for a full description of their structure and implementation.

4.3 (a) - USB Control Functions

- a) Short `Connect` (Optional String `SN`)
- b) Short `ConnectByAddress` (Optional Short `Address`)
- c) Void `Disconnect` ()
- d) Short `Read_ModelName` (String `ModelName`)
- e) Short `Read_SN` (String `SN`)
- f) Short `Set_Address` (Short `Address`)
- g) Short `Get_Address` ()
- h) Short `Get_Available_SN_List` (String `SN_List`)
- i) Short `Get_Available_Address_List` (String `Add_List`)
- j) Short `GetConnectionStatus` ()
- k) Short `GetUSBConnectionStatus` ()
- l) Short `Send_SCPI` (String `SndSTR`, String `RetSTR`)
- m) Short `GetExtFirmware` (Short `A0`, Short `A1`, Short `A2`, String `Firmware`)
- n) Short `GetFirmware` ()

4.3 (b) - Ethernet Configuration Functions

- a) Short `GetEthernet_CurrentConfig` (Int `IP1`, Int `IP2`, Int `IP3`, Int `IP4`, Int `Mask1`, Int `Mask2`, Int `Mask3`, Int `Mask4`, Int `Gateway1`, Int `Gateway2`, Int `Gateway3`, Int `Gateway4`)
- b) Short `GetEthernet_IPAddress` (Int `b1`, Int `b2`, Int `b3`, Int `b4`)
- c) Short `GetEthernet_MACAddress` (Int `MAC1`, Int `MAC2`, Int `MAC3`, Int `MAC4`, Int `MAC5`, Int `MAC6`)
- d) Short `GetEthernet_NetworkGateway` (Int `b1`, Int `b2`, Int `b3`, Int `b4`)
- e) Short `GetEthernet_SubNetMask` (Int `b1`, Int `b2`, Int `b3`, Int `b4`)
- f) Short `GetEthernet_TCPIPPort` (Int `port`)
- g) Short `GetEthernet_UseDHCP` ()
- h) Short `GetEthernet_UsePWD` ()
- i) Short `GetEthernet_PWD` (string `Pwd`)
- j) Short `SaveEthernet_IPAddress` (Int `b1`, Int `b2`, Int `b3`, Int `b4`)
- k) Short `SaveEthernet_NetworkGateway` (Int `b1`, Int `b2`, Int `b3`, Int `b4`)
- l) Short `SaveEthernet_SubnetMask` (Int `b1`, Int `b2`, Int `b3`, Int `b4`)
- m) Short `SaveEthernet_TCPIPPort` (Int `port`)
- n) Short `SaveEthernet_UseDHCP` (Int `UseDHCP`)
- o) Short `SaveEthernet_UsePWD` (Int `UsePwd`)
- p) Short `SaveEthernet_PWD` (String `Pwd`)
- q) Int `SaveEthernet_PromptMN` (Int `Enable_Prompt`)
- r) Int `GetEthernet_PromptMN` ()

4.4 - DLL Functions for USB Control

These functions apply to all Mini-Circuits ZTM2 Series systems and provide a means to control the device over a USB connection.

4.4 (a) - Connect by Serial Number

Declaration

```
Short Connect(Optional String SN)
```

Description

Initializes the USB connection. If multiple modular test systems are connected to the same host computer, then the serial number should be included, otherwise this can be omitted. The system should be disconnected on completion of the program using the [Disconnect](#) function.

Parameters

Data Type	Variable	Description
String	SN	Optional. The serial number of the test system. Can be omitted if only one modular test system is connected.

Return Values

Data Type	Value	Description
Short	0	No connection was possible
	1	Connection successfully established
	2	Connection already established (Connect has been called more than once). The system will continue to operate normally.

Examples

Visual Basic

```
status = MyPTE1.Connect(SN)
```

Visual C++

```
status = MyPTE1->Connect(SN);
```

Visual C#

```
status = MyPTE1.Connect(SN);
```

Matlab

```
status = MyPTE1.Connect(SN)
```

See Also

[Connect by Address](#)
[Disconnect](#)

4.4 (b) - Connect by Address

Declaration

Short **ConnectByAddress** (**Optional Short** **Address**)

Description

This function is called to initialize the USB connection to a modular test system by referring to a user defined address. The address is an integer number from 1 to 255 which can be assigned using the [Set_Address](#) function (the factory default is 255). The connection process can take a few milliseconds so it is recommended that the connection be made once at the beginning of the routine and left open until the test sequence is no completed. The system should be disconnected on completion of the program using the [Disconnect](#) function.

Parameters

Data Type	Variable	Description
Short	Address	Optional. The address of the system. Can be omitted if only one modular test system is connected.

Return Values

Data Type	Value	Description
Short	0	No connection was possible
	1	Connection successfully established
	2	Connection already established (Connect has been called more than once)

Examples

Visual Basic

```
status = MyPTE1.ConnectByAddress(5)
```

Visual C++

```
status = MyPTE1->ConnectByAddress(5);
```

Visual C#

```
status = MyPTE1.ConnectByAddress(5);
```

Matlab

```
status = MyPTE1.connectByAddress(5)
```

See Also

[Connect by Serial Number](#)

[Disconnect](#)

4.4 (c) - Disconnect

Declaration

```
Void Disconnect()
```

Description

This function is called to close the connection to modular test system after completion of the test sequence. It is strongly recommended that this function is used prior to ending the program. Failure to do so may result in a connection problem with the device. Should this occur, shut down the program and unplug the system from the computer, then reconnect to start again.

Parameters

Data Type	Variable	Description
None		

Return Values

Data Type	Value	Description
None		

Examples

Visual Basic

```
MyPTE1.Disconnect()
```

Visual C++

```
MyPTE1->Disconnect();
```

Visual C#

```
MyPTE1.Disconnect();
```

Matlab

```
MyPTE1.Disconnect
```

See Also

[Connect by Serial Number](#)

[Connect by Address](#)

4.4 (d) - Read Model Name

Declaration

```
Short Read_ModelName (String ModelName)
```

Description

This function is called to determine the full Mini-Circuits part number of the connected modular test system. The user passes a string variable which is updated with the part number.

Parameters

Data Type	Variable	Description
String	ModelName	Required. A string variable that will be updated with the Mini-Circuits part number for the modular test system.

Return Values

Data Type	Value	Description
Short	0	Command failed
	1	Command completed successfully

Examples

Visual Basic

```
If MyPTE1.Read_ModelName(ModelName) > 0 Then
    MsgBox ("The connected system is " & ModelName)
    ' Display a message stating the model name
End If
```

Visual C++

```
if (MyPTE1->Read_ModelName(ModelName) > 0 )
{
    MessageBox::Show("The connected system is " + ModelName);
    // Display a message stating the model name
}
```

Visual C#

```
if (MyPTE1.Read_ModelName(ref(ModelName)) > 0 )
{
    MessageBox.Show("The connected system is " + ModelName);
    // Display a message stating the model name
}
```

Matlab

```
[status, ModelName] = MyPTE1.Read_ModelName(ModelName)
if status > 0
    h = msgbox('The connected switch is ', ModelName)
    % Display a message stating the model name
end
```

See Also

[Read Serial Number](#)

SCPI: [Get Model Name](#)

4.4 (e) - Read Serial Number

Declaration

```
Short Read_SN(String SN)
```

Description

This function is called to determine the serial number of the connected modular test system. The user passes a string variable which is updated with the serial number.

Parameters

Data Type	Variable	Description
String	ModelName	Required. String variable that will be updated with the Mini-Circuits serial number for the test system.

Return Values

Data Type	Value	Description
Short	0	Command failed
	1	Command completed successfully

Examples

Visual Basic

```
If MyPTE1.Read_SN(SN) > 0 Then
    MsgBox ("The connected system is " & SN)
    ' Display a message stating the serial number
End If
```

Visual C++

```
if (MyPTE1->Read_SN(SN) > 0 )
{
    MessageBox::Show("The connected system is " + SN);
    // Display a message stating the serial number
}
```

Visual C#

```
if (MyPTE1.Read_SN(ref(SN)) > 0 )
{
    MessageBox.Show("The connected system is " + SN);
    // Display a message stating the serial number
}
```

Matlab

```
[status, SN] = MyPTE1.Read_SN(SN)
if status > 0
    h = msgbox('The connected switch is ', SN)
    % Display a message stating the serial number
end
```

See Also

[Read Model Name](#)

SCPI: [Get Serial Number](#)

4.4 (f) - Set USB Address

Declaration

```
Short Set_Address (Short Address)
```

Description

This function allows the internal address of the connected modular test system to be changed from the factory default of 255. The system can be referred to by the address instead of the serial number (see [Connect by Address](#)).

Parameters

Data Type	Variable	Description
Short	Address	Required. An integer value from 1 to 255

Return Values

Data Type	Value	Description
Short	0	Command failed
	1	Command completed successfully

Example

Visual Basic

```
status = MyPTE1.Set_Address(1)
```

Visual C++

```
status = MyPTE1->Set_Address(1);
```

Visual C#

```
status = MyPTE1.Set_Address(1);
```

Matlab

```
status = MyPTE1.Set_Address(1)
```

See Also

[Get USB Address](#)

[Get List of Available Addresses](#)

4.4 (g) - Get USB Address

Declaration

```
Short Get_Address ()
```

Description

This function returns the address of the connected modular test system.

Parameters

Data Type	Variable	Description
None		

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1-255	Address of the modular test system

Examples

Visual Basic

```
addr = MyPTE1.Get_Address ()
```

Visual C++

```
addr = MyPTE1->Get_Address ();
```

Visual C#

```
addr = MyPTE1.Get_Address ();
```

Matlab

```
addr = MyPTE1.Get_Address
```

See Also

[Set USB Address](#)

[Get List of Available Addresses](#)

4.4 (h) - Get List of Connected Serial Numbers

Declaration

```
Short Get_Available_SN_List(String SN_List)
```

Description

This function takes a user defined variable and updates it with a list of serial numbers for all available (currently connected) modular test systems.

Parameters

Data Type	Variable	Description
String	SN_List	Required. String variable which will be updated with a list of all available serial numbers, separated by a single space character; for example "11301020001 11301020002 11301020003".

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.Get_Available_SN_List(SN_List) > 0 Then
    array_SN() = Split(SN_List, " ")
    ' Split the list into an array of serial numbers
    For i As Integer = 0 To array_SN.Length - 1
        ' Loop through the array and use each serial number
    Next
End If
```

Visual C++

```
if (MyPTE1 ->Get_Available_SN_List(SN_List) > 0)
{
    // split the List into array of SN's
}
```

Visual C#

```
if (MyPTE1.Get_Available_SN_List(ref(SN_List)) > 0)
{
    // split the List into array of SN's
}
```

Matlab

```
[status, SN_List] = MyPTE1.Get_Available_SN_List(SN_List)
if status > 0
    % split the List into array of SN's
end
```

See Also

[Connect by Serial Number](#)
[Get List of Available Addresses](#)

4.4 (i) - Get List of Available Addresses

Declaration

```
Short Get_Available_Address_List(String Add_List)
```

Description

This function takes a user defined variable and updates it with a list of addresses of all connected modular test systems.

Parameters

Data Type	Variable	Description
String	Add_List	Required. String variable which the function will update with a list of addresses separated by a single space character, for example, "5 101 254 255"

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.Get_Available_Add_List(st_Ad_List) > 0 Then
    ' Get list of available addresses
    array_Ad() = Split(st_Ad_List, " ")
    ' Split the list into an array of addresses
    For i As Integer = 0 To array_Ad.Length - 1
        ' Loop through the array and use each address
    Next
End If
```

Visual C++

```
if (MyPTE1->Get_Available_Address_List(Add_List) > 0);
{
    // split the List into array of Addresses
}
```

Visual C#

```
if (MyPTE1.Get_Available_Address_List(ref(Add_List)) > 0)
{
    // split the List into array of Addresses
}
```

Matlab

```
[status, Add_List] = MyPTE1.Get_Available_Address_List(Add_List)
if status > 0
    % split the List into array of Addresses
end
```

See Also

[Connect by Address](#)

[Get List of Connected Serial Numbers](#)

4.4 (j) - Get Software Connection Status

Declaration

```
Short GetConnectionStatus ()
```

Description

This function checks whether there is an open software connection to the modular test system. This will be true if the [Connect](#) function (or similar) has previously been called.

Parameters

Data Type	Variable	Description
None		

Return Values

Data Type	Value	Description
Short	0	No connection
Short	1	ZTM2 Series is connected

Examples

Visual Basic

```
Status = MyPTE1.GetConnectionStatus ()
```

Visual C++

```
Status = MyPTE1->GetConnectionStatus ();
```

Visual C#

```
Status = MyPTE1.GetConnectionStatus ();
```

Matlab

```
Status = MyPTE1.GetConnectionStatus ()
```

See Also

[Get USB Connection Status](#)

4.4 (k) - Get USB Connection Status

Declaration

```
Short GetUSBConnectionStatus ()
```

Description

This function checks whether the USB connection to the modular test is still active.

Parameters

Data Type	Variable	Description
None		

Return Values

Data Type	Value	Description
Short	0	No connection
Short	1	USB connection to modular test system is active

Examples

Visual Basic

```
If MyPTE1.GetUSBConnectionStatus = 1 Then
    ' Modular test system is connected
End If
```

Visual C++

```
if (MyPTE1->GetUSBConnectionStatus() == 1)
{
    // Modular test system is connected
}
```

Visual C#

```
if (MyPTE1.GetUSBConnectionStatus() == 1)
{
    // Modular test system is connected
}
```

Matlab

```
usbstatus = MyPTE1.GetUSBConnectionStatus
if usbstatus == 1
    % Modular test system is connected
end
```

See Also

[Get Software Connection Status](#)

4.4 (I) - Send SCPI Command

Declaration

```
Short Send_SCPI (String SndSTR, String RetSTR)
```

Description

This function sends a SCPI command to the test system and collects the returned acknowledgement. SCPI (Standard Commands for Programmable Instruments) is a common method for communicating with and controlling instrumentation products and provides the main method for interfacing with the modular test system's internal test components.

Parameters

Data Type	Variable	Description
String	SndSTR	Required. The SCPI command to send.
String	RetSTR	Required. User defined string which will be updated with the value returned from the test system.

Return Values

Data Type	Value	Description
Short	0	Command failed
	1	Command completed successfully

Examples

Visual Basic

```
Status = MyPTE1.Send_SCPI(":SP4T:2:STATE:3", RetStr)
' Set SP4T 2 to state 3
```

Visual C++

```
Status = MyPTE1->Send_SCPI(":SP4T:2:STATE:3", RetStr);
// Set SP4T 2 to state 3
```

Visual C#

```
Status = MyPTE1.Send_SCPI(":SP4T:2:STATE:3", RetStr);
// Set SP4T 2 to state 3
```

Matlab

```
[Status, RetStr] = MyPTE1.Send_SCPI(":SP4T:2:STATE:3", RetStr)
% Set SP4T 2 to state 3
```

See Also

[SCPI Commands for Control of Modular Test Components](#)

4.4 (m) - Get Firmware

Declaration

```
Short GetExtFirmware(Short A0, Short A1, Short A2, String Firmware)
```

Description

This function returns the internal firmware version of the modular test system along with three reserved variables (for factory use).

Parameters

Data Type	Variable	Description
Short	A0	Required. User defined variable for factory use only.
Short	A1	Required. User defined variable for factory use only.
Short	A2	Required. User defined variable for factory use only.
String	Firmware	Required. User defined variable which will be updated with the current firmware version, for example "B3".

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Examples

```
Visual Basic
If MyPTE1.GetExtFirmware(A0, A1, A2, Firmware) > 0 Then
    MsgBox ("Firmware version is " & Firmware)
End If

Visual C++
if (MyPTE1->GetExtFirmware(A0, A1, A2, Firmware) > 0 )
{
    MessageBox::Show("Firmware version is " + Firmware);
}

Visual C#
if (MyPTE1.GetExtFirmware(ref(A0, A1, A2, Firmware)) > 0 )
{
    MessageBox.Show("Firmware version is " + Firmware);
}

Matlab
[status, A0, A1, A2, Firmware] = MyPTE1.GetExtFirmware(A0, A1, A2, Firmware)
if status > 0
    h = msgbox('Firmware version is ', Firmware)
end
```

See Also

SCPI: [Get Firmware](#)

4.4 (n) - Get Firmware Version (Antiquated)

Declaration

```
Short GetFirmware()
```

Description

This function is antiquated, [GetExtFirmware](#) should be used instead. The function returns a numeric value corresponding to the internal firmware version of the test system.

Parameters

Data Type	Variable	Description
None		

Return Values

Data Type	Value	Description
Short	Firmware	Version number of the firmware

Examples

Visual Basic

```
FW = MyPTE1.GetFirmware()
```

Visual C++

```
FW = MyPTE1->GetFirmware();
```

Visual C#

```
FW = MyPTE1.GetFirmware();
```

Matlab

```
FW = MyPTE1.GetFirmware()
```

See Also

[Get Firmware](#)

4.5 - DLL Functions for Ethernet Configuration

These functions provide a means for identifying and configuring the Ethernet settings such as IP address, TCP/IP port and network gateway. They can only be called while the system is connected via the USB interface. In order to determine the current connection status (for example the IP address of the network gateway) the test system must also be connected to the network via the RJ45 port.

4.5 (a) - Get Ethernet Configuration

Declaration

```
Short GetEthernet_CurrentConfig(Int IP1, Int IP2, Int IP3, Int IP4,
                                Int Mask1, Int Mask2, Int Mask3, Int Mask4,
                                Int Gateway1, Int Gateway2, Int Gateway3, Int Gateway4)
```

Description

This function returns the current IP configuration of the connected modular test system in a series of user defined variables. The settings checked are IP address, subnet mask and network gateway.

Parameters

Data Type	Variable	Description
Int	IP1	Required. Integer variable which will be updated with the first (highest order) octet of the IP address.
Int	IP2	Required. Integer variable which will be updated with the second octet of the IP address.
Int	IP3	Required. Integer variable which will be updated with the third octet of the IP address.
Int	IP4	Required. Integer variable which will be updated with the last (lowest order) octet of the IP address.
Int	Mask1	Required. Integer variable which will be updated with the first (highest order) octet of the subnet mask.
Int	Mask2	Required. Integer variable which will be updated with the second octet of the subnet mask.
Int	Mask3	Required. Integer variable which will be updated with the third octet of the subnet mask.
Int	Mask4	Required. Integer variable which will be updated with the last (lowest order) octet of the subnet mask.
Int	Gateway1	Required. Integer variable which will be updated with the first (highest order) octet of the network gateway.
Int	Gateway2	Required. Integer variable which will be updated with the second octet of the network gateway.
Int	Gateway3	Required. Integer variable which will be updated with the third octet of the network gateway.
Int	Gateway4	Required. Integer variable which will be updated with the last (lowest order) octet of the network gateway.

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.GetEthernet_CurrentConfig(IP1, IP2, IP3, IP4, M1, M2, M3, M4,
    _ GW1, GW2, GW3, GW4) > 0 Then

    MsgBox ("IP address: " & IP1 & "." & IP2 & "." & IP3 & "." & IP4)
    MsgBox ("Subnet Mask: " & M1 & "." & M2 & "." & M3 & "." & M4)
    MsgBox ("Gateway: " & GW1 & "." & GW2 & "." & GW3 & "." & GW4)

End If
```

Visual C++

```
if (MyPTE1->GetEthernet_CurrentConfig(IP1, IP2, IP3, IP4, M1, M2, M3, M4,
    _ GW1, GW2, GW3, GW4) > 0)
{
    MessageBox::Show("IP address: " + IP1 + "." + IP2 + "." + IP3 + "." +
        _ + IP4);
    MessageBox::Show("Subnet Mask: " + M1 + "." + M2 + "." + M3 + "." +
        _ M4);
    MessageBox::Show("Gateway: " + GW1 + "." + GW2 + "." + GW3 + "." +
        _ GW4);
}
```

Visual C#

```
if (MyPTE1.GetEthernet_CurrentConfig(IP1, IP2, IP3, IP4, M1, M2, M3, M4,
    _ GW1, GW2, GW3, GW4) > 0)
{
    MessageBox.Show("IP address: " + IP1 + "." + IP2 + "." + IP3 + "." +
        _ + IP4);
    MessageBox.Show("Subnet Mask: " + M1 + "." + M2 + "." + M3 + "." +
        _ M4);
    MessageBox.Show("Gateway: " + GW1 + "." + GW2 + "." + GW3 + "." +
        _ GW4);
}
```

Matlab

```
[status, IP1, IP2, IP3, IP4, M1, M2, M3, M4, GW1, GW2, GW3, GW4] =
MyPTE1.GetEthernet_CurrentConfig(IP1, IP2, IP3, IP4, M1, M2, M3, M4, GW1,
GW2, GW3, GW4)
if status > 0
    h = msgbox ("IP address: ", IP1, ".", IP2, ".", IP3, ".", IP4)
    h = msgbox ("Subnet Mask: ", M1, "." & M2, "." & M3, ".", M4)
    h = msgbox ("Gateway: ", GW1, ".", GW2, ".", GW3, ".", GW4)
end
```

See Also

[Get MAC Address](#)

[Get TCP/IP Port](#)

4.5 (b) - Get IP Address

Declaration

```
Short GetEthernet_IPAddress(Int b1, Int b2, Int b3, Int b4)
```

Description

This function returns the current IP address of the connected system in a series of user defined variables (one per octet).

Parameters

Data Type	Variable	Description
Int	IP1	Required. Integer variable which will be updated with the first (highest order) octet of the IP address (for example "192" for the IP address "192.168.1.0").
Int	IP2	Required. Integer variable which will be updated with the second octet of the IP address (for example "168" for the IP address "192.168.1.0").
Int	IP3	Required. Integer variable which will be updated with the third octet of the IP address (for example "1" for the IP address "192.168.1.0").
Int	IP4	Required. Integer variable which will be updated with the last (lowest order) octet of the IP address (for example "0" for the IP address "192.168.1.0").

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.GetEthernet_CurrentConfig(IP1, IP2, IP3, IP4) > 0 Then  
    MsgBox ("IP address: " & IP1 & "." & IP2 & "." & IP3 & "." & IP4)  
End If
```

Visual C++

```
if (MyPTE1->GetEthernet_CurrentConfig(IP1, IP2, IP3, IP4) > 0)  
{  
    MessageBox::Show("IP address: " + IP1 + "." + IP2 + "." + IP3 + "."  
                     + IP4);  
}
```

Visual C#

```
if (MyPTE1.GetEthernet_CurrentConfig(IP1, IP2, IP3, IP4) > 0)  
{  
    MessageBox.Show("IP address: " + IP1 + "." + IP2 + "." + IP3 + "."  
                   + IP4);  
}
```

Matlab

```
[status, IP1, IP2, IP3, IP4] = MyPTE1.GetEthernet_CurrentConfig(IP1, IP2,  
IP3, IP4)  
if status > 0  
    h = msgbox ("IP address: ", IP1, ".", IP2, ".", IP3, ".", IP4)  
end
```

See Also

[Get Ethernet Configuration](#)

[Get TCP/IP Port](#)

[Save IP Address](#)

[Save TCP/IP Port](#)

4.5 (c) - Get MAC Address

Declaration

```
Short GetEthernet_MACAddress (Int MAC1, Int MAC2, Int MAC3, Int MAC4,  
                              Int MAC5, Int MAC6)
```

Description

This function returns the MAC (media access control) address, the physical address, of the connected system as a series of decimal values (one for each of the 6 numeric groups).

Parameters

Data Type	Variable	Description
Int	MAC1	Required. Integer variable which will be updated with the decimal value of the first numeric group of the MAC address. For example: MAC address =11:47:165:103:137:171 MAC1=11
Int	MAC2	Required. Integer variable which will be updated with the decimal value of the second numeric group of the MAC address. For example: MAC address =11:47:165:103:137:171 MAC2=47
Int	MAC3	Required. Integer variable which will be updated with the decimal value of the third numeric group of the MAC address. For example: MAC address =11:47:165:103:137:171 MAC3=165
Int	MAC4	Required. Integer variable which will be updated with the decimal value of the fourth numeric group of the MAC address. For example: MAC address =11:47:165:103:137:171 MAC4=103
Int	MAC5	Required. Integer variable which will be updated with the decimal value of the fifth numeric group of the MAC address. For example: MAC address =11:47:165:103:137:171 MAC5=137
Int	MAC6	Required. Integer variable which will be updated with the decimal value of the last numeric group of the MAC address. For example: MAC address =11:47:165:103:137:171 MAC6=171

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.GetEthernet_MACAddress(M1, M2, M3, M4, M5, M6) > 0 Then
    MsgBox ("MAC address: " & M1 & ":" & M2 & ":" & M3 & ":" & M4 & ":" & M5 & ":" & M6)
End If
```

Visual C++

```
if (MyPTE1->GetEthernet_MACAddress(M1, M2, M3, M4, M5, M6) > 0)
{
    MessageBox::Show("MAC address: " + M1 + "." + M2 + "." + M3 + "." + M4 + "." + M5 + "." + M6);
}
```

Visual C#

```
if (MyPTE1.GetEthernet_MACAddress(M1, M2, M3, M4, M5, M6) > 0)
{
    MessageBox.Show("MAC address: " + M1 + "." + M2 + "." + M3 + "." + M4 + "." + M5 + "." + M6);
}
```

Matlab

```
[status, M1, M2, M3, M4, M5, M6] = MyPTE1.GetEthernet_MACAddress(M1, M2, M3, M4, M5, M6)
if status > 0
    h=msgbox("MAC address: ", M1, ".", M2, ".", M3, ".", M4, ".", M5, ".", M6)
end
```

See Also

[Get Ethernet Configuration](#)

4.5 (d) - Get Network Gateway

Declaration

```
Short GetEthernet_NetworkGateway(Int b1, Int b2, Int b3, Int b4)
```

Description

This function returns the IP address of the network gateway to which the system is currently connected. A series of user defined variables are passed to the function to be updated with the IP address (one per octet).

Parameters

Data Type	Variable	Description
Int	IP1	Required. Integer variable which will be updated with the first (highest order) octet of the IP address (for example "192" for the IP address "192.168.1.0").
Int	IP2	Required. Integer variable which will be updated with the second octet of the IP address (for example "168" for the IP address "192.168.1.0").
Int	IP3	Required. Integer variable which will be updated with the third octet of the IP address (for example "1" for the IP address "192.168.1.0").
Int	IP4	Required. Integer variable which will be updated with the last (lowest order) octet of the IP address (for example "0" for the IP address "192.168.1.0").

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.GetEthernet_NetworkGateway(IP1, IP2, IP3, IP4) > 0 Then  
    MsgBox ("Gateway: " & IP1 & "." & IP2 & "." & IP3 & "." & IP4)  
End If
```

Visual C++

```
if (MyPTE1->GetEthernet_NetworkGateway(IP1, IP2, IP3, IP4) > 0)  
{  
    MessageBox::Show("Gateway: " + IP1 + "." + IP2 + "." + IP3 + "."  
                      + IP4);  
}
```

Visual C#

```
if (MyPTE1.GetEthernet_NetworkGateway(IP1, IP2, IP3, IP4) > 0)  
{  
    MessageBox.Show("Gateway: " + IP1 + "." + IP2 + "." + IP3 + "."  
                    + IP4);  
}
```

Matlab

```
[status, IP1, IP2, IP3, IP4] = MyPTE1.GetEthernet_NetworkGateway(IP1, IP2,  
IP3, IP4)  
if status > 0  
    h = msgbox ("Gateway: ", IP1, ".", IP2, ".", IP3, ".", IP4)  
end
```

See Also

[Get Ethernet Configuration](#)

[Save Network Gateway](#)

4.5 (e) - Get Subnet Mask

Declaration

```
Short GetEthernet_SubNetMask(Int b1, Int b2, Int b3, Int b4)
```

Description

This function returns the subnet mask used by the network gateway to which the system is currently connected. A series of user defined variables are passed to the function to be updated with the subnet mask (one per octet).

Parameters

Data Type	Variable	Description
Int	b1	Required. Integer variable which will be updated with the first (highest order) octet of the subnet mask (for example "255" for the subnet mask "255.255.255.0").
Int	b2	Required. Integer variable which will be updated with the second octet of the subnet mask (for example "255" for the subnet mask "255.255.255.0").
Int	b3	Required. Integer variable which will be updated with the third octet of the subnet mask (for example "255" for the subnet mask "255.255.255.0").
Int	b4	Required. Integer variable which will be updated with the last (lowest order) octet of the subnet mask (for example "0" for the subnet mask "255.255.255.0").

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.GetEthernet_SubNetMask(b1, b2, b3, b4) > 0 Then  
    MsgBox ("Subnet mask: " & b1 & "." & b2 & "." & b3 & "." & b4)  
End If
```

Visual C++

```
if (MyPTE1->GetEthernet_SubNetMask(b1, b2, b3, b4) > 0)  
{  
    MessageBox::Show("Subnet mask: " + b1 + "." + b2 + "." + b3 + "."  
                      + b4);  
}
```

Visual C#

```
if (MyPTE1.GetEthernet_SubNetMask(b1, b2, b3, b4) > 0)  
{  
    MessageBox.Show("Subnet mask: " + b1 + "." + b2 + "." + b3 + "."  
                    + b4);  
}
```

Matlab

```
[status, b1, b2, b3, b4] = MyPTE1.GetEthernet_SubNetMask(b1, b2, b3, b4)  
if status > 0  
    h = msgbox ("Subnet mask: ", b1, ".", b2, ".", b3, ".", b4)  
end
```

See Also

[Get Ethernet Configuration](#)

[Save Subnet Mask](#)

4.5 (f) - Get TCP/IP Port

Declaration

```
Short GetEthernet_TCPIPPort(Int port)
```

Description

This function returns the TCP/IP port used by the test system for HTTP communication. The default is port 80.

Note: Port 23 is reserved for Telnet communication and cannot be set as the HTTP port.

Parameters

Data Type	Variable	Description
Int	port	Required. Integer variable which will be updated with the TCP/IP port.

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

```
Visual Basic
If MyPTE1.GetEthernet_SubNetMask(port) > 0 Then
    MsgBox ("Port: " & port)
End If

Visual C++
if (MyPTE1->GetEthernet_SubNetMask(port) > 0)
{
    MessageBox::Show("Port: " + port);
}

Visual C#
if (MyPTE1.GetEthernet_SubNetMask(port) > 0)
{
    MessageBox.Show("Port: " + port);
}

Matlab
[status, port] = MyPTE1.GetEthernet_SubNetMask(port)
if status > 0
    h = msgbox ("Port: ", port)
end
```

See Also

[Get Ethernet Configuration](#)
[Save TCP/IP Port](#)

4.5 (g) - Get DHCP Status

Declaration

```
Short GetEthernet_UseDHCP ()
```

Description

This function indicates whether the test system is using DHCP (dynamic host control protocol), in which case the IP configuration is derived from a network server; or user defined “static” IP settings.

Parameters

Data Type	Variable	Description
None		

Return Values

Data Type	Value	Description
Short	0	DHCP not in use (IP settings are static and manually configured)
Short	1	DHCP in use (IP settings are assigned automatically by the network)

Example

Visual Basic

```
DHCPstatus = MyPTE1.GetEthernet_UseDHCP ()
```

Visual C++

```
DHCPstatus = MyPTE1->GetEthernet_UseDHCP ();
```

Visual C#

```
DHCPstatus = MyPTE1.GetEthernet_UseDHCP ();
```

Matlab

```
DHCPstatus = MyPTE1.GetEthernet_UseDHCP
```

See Also

[Get Ethernet Configuration](#)

[Use DHCP](#)

4.5 (h) - Get Password Status

Declaration

```
Short GetEthernet_UsePWD ()
```

Description

This function indicates whether the modular test system is currently configured to require a password for HTTP/Telnet communication.

Parameters

Data Type	Variable	Description
None		

Return Values

Data Type	Value	Description
Short	0	Password not required
Short	1	Password required

Example

Visual Basic

```
PWDstatus = MyPTE1.GetEthernet_UsePWD ()
```

Visual C++

```
PWDstatus = MyPTE1->GetEthernet_UsePWD ();
```

Visual C#

```
PWDstatus = MyPTE1.GetEthernet_UsePWD ();
```

Matlab

```
PWDstatus = MyPTE1.GetEthernet_UsePWD
```

See Also

[Get Password](#)

[Use Password](#)

[Set Password](#)

4.5 (i) - Get Password

Declaration

```
Short GetEthernet_PWD (String Pwd)
```

Description

This function returns the current password used by the modular test system for HTTP/Telnet communication. The password will be returned even if the device is not currently configured to require a password.

Parameters

Data Type	Variable	Description
String	Pwd	Required. String variable which will be updated with the password.

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
If MyPTE1.GetEthernet_PWD(pwd) > 0 Then
    MsgBox ("Password: " & pwd)
End If
```

Visual C++

```
if (MyPTE1->GetEthernet_PWD(pwd) > 0)
{
    MessageBox::Show("Password: " + pwd);
}
```

Visual C#

```
if (MyPTE1.GetEthernet_PWD(pwd) > 0)
{
    MessageBox.Show("Password: " + pwd);
}
```

Matlab

```
[status, pwd] = MyPTE1.GetEthernet_PWD(pwd)
if status > 0
    h = msgbox ("Password: ", pwd)
end
```

See Also

[Get Password Status](#)

[Use Password](#)

[Set Password](#)

4.5 (j) - Save IP Address

Declaration

```
Short SaveEthernet_IPAddress(Int b1, Int b2, Int b3, Int b4)
```

Description

This function sets a static IP address to be used by the connected test system.

Note: this could subsequently be overwritten automatically if DHCP is enabled (see [Use DHCP](#)).

Parameters

Data Type	Variable	Description
Int	IP1	Required. First (highest order) octet of the IP address to set (for example "192" for the IP address "192.168.1.0").
Int	IP2	Required. Second octet of the IP address to set (for example "168" for the IP address "192.168.1.0").
Int	IP3	Required. Third octet of the IP address to set (for example "1" for the IP address "192.168.1.0").
Int	IP4	Required. Last (lowest order) octet of the IP address to set (for example "0" for the IP address "192.168.1.0").

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
status = MyPTE1.SaveEthernet_IPAddress(192, 168, 1, 0)
```

Visual C++

```
status = MyPTE1->SaveEthernet_IPAddress(192, 168, 1, 0);
```

Visual C#

```
status = MyPTE1.SaveEthernet_IPAddress(192, 168, 1, 0);
```

Matlab

```
status = MyPTE1.SaveEthernet_IPAddress(192, 168, 1, 0)
```

See Also

[Get Ethernet Configuration](#)

[Get IP Address](#)

4.5 (k) - Save Network Gateway

Declaration

```
Short SaveEthernet_NetworkGateway(Int b1, Int b2, Int b3, Int b4)
```

Description

This function sets the IP address of the network gateway to which the system should connect.

Note: this could subsequently be overwritten automatically if DHCP is enabled (see [Use DHCP](#)).

Parameters

Data Type	Variable	Description
Int	IP1	Required. First (highest order) octet of the network gateway IP address (for example "192" for the IP address "192.168.1.0").
Int	IP2	Required. Second octet of the network gateway IP address (for example "168" for the IP address "192.168.1.0").
Int	IP2	Required. Third octet of the network gateway IP address (for example "1" for the IP address "192.168.1.0").
Int	IP4	Required. Last (lowest order) octet of the network gateway IP address (for example "0" for the IP address "192.168.1.0").

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
status = MyPTE1.SaveEthernet_NetworkGateway(192, 168, 1, 0)
```

Visual C++

```
status = MyPTE1->SaveEthernet_NetworkGateway(192, 168, 1, 0);
```

Visual C#

```
status = MyPTE1.SaveEthernet_NetworkGateway(192, 168, 1, 0);
```

Matlab

```
status = MyPTE1.SaveEthernet_NetworkGateway(192, 168, 1, 0)
```

See Also

[Get Ethernet Configuration](#)

[Get Network Gateway](#)

4.5 (I) - Save Subnet Mask

Declaration

```
Short SaveEthernet_SubnetMask(Int b1, Int b2, Int b3, Int b4)
```

Description

This function sets the subnet mask of the network to which the system should connect.

Note: this could subsequently be overwritten automatically if DHCP is enabled (see [Use DHCP](#)).

Parameters

Data Type	Variable	Description
Int	IP1	Required. First (highest order) octet of the subnet mask (for example "255" for the subnet mask "255.255.255.0").
Int	IP2	Required. Second octet of the subnet mask (for example "255" for the subnet mask "255.255.255.0").
Int	IP3	Required. Third octet of the subnet mask (for example "255" for the subnet mask "255.255.255.0").
Int	IP4	Required. Last (lowest order) octet of the subnet mask (for example "0" for the subnet mask "255.255.255.0").

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
status = MyPTE1.SaveEthernet_SubnetMask(255, 255, 255, 0)
```

Visual C++

```
status = MyPTE1->SaveEthernet_SubnetMask(255, 255, 255, 0);
```

Visual C#

```
status = MyPTE1.SaveEthernet_SubnetMask(255, 255, 255, 0);
```

Matlab

```
status = MyPTE1.SaveEthernet_SubnetMask(255, 255, 255, 0)
```

See Also

[Get Ethernet Configuration](#)

[Get Subnet Mask](#)

4.5 (m) - Save TCP/IP Port

Declaration

```
Short SaveEthernet_TCIPPort(Int port)
```

Description

This function sets the TCP/IP port used by the system for HTTP communication. The default is port 80.

Note: Port 23 is reserved for Telnet communication and cannot be set as the HTTP port.

Parameters

Data Type	Variable	Description
Int	port	Required. Numeric value of the TCP/IP port.

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
status = MyPTE1.SaveEthernet_TCIPPort(70)
```

Visual C++

```
status = MyPTE1->SaveEthernet_TCIPPort(70);
```

Visual C#

```
status = MyPTE1.SaveEthernet_TCIPPort(70);
```

Matlab

```
status = MyPTE1.SaveEthernet_TCIPPort(70)
```

See Also

[Get TCP/IP Port](#)

4.5 (n) - Use DHCP

Declaration

```
Short SaveEthernet_UseDHCP (Int UseDHCP)
```

Description

This function enables or disables DHCP (dynamic host control protocol). When enabled the IP configuration of the system is assigned automatically by the network server; when disabled the user defined “static” IP settings apply.

Parameters

Data Type	Variable	Description
Int	UseDHCP	Required. Integer value to set the DHCP mode: 0 - DHCP disabled (static IP settings used) 1 - DHCP enabled (IP setting assigned by network)

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

```
Visual Basic
    status = MyPTE1.SaveEthernet_UseDHCP(1)
Visual C++
    status = MyPTE1->SaveEthernet_UseDHCP(1);
Visual C#
    status = MyPTE1.SaveEthernet_UseDHCP(1);
Matlab
    status = MyPTE1.SaveEthernet_UseDHCP(1)
```

See Also

[Get DHCP Status](#)

4.5 (o) - Use Password

Declaration

```
Short SaveEthernet_UsePWD (Int UsePwd)
```

Description

This function enables or disables the password requirement for HTTP/Telnet communication with the system.

Parameters

Data Type	Variable	Description
Int	UseDHCP	Required. Integer value to set the password mode: 0 – Password not required 1 – Password required

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
status = MyPTE1.SaveEthernet_UsePWD(1)
```

Visual C++

```
status = MyPTE1->SaveEthernet_UsePWD(1);
```

Visual C#

```
status = MyPTE1.SaveEthernet_UsePWD(1);
```

Matlab

```
status = MyPTE1.SaveEthernet_UsePWD(1)
```

See Also

[Get Password Status](#)

[Get Password](#)

[Set Password](#)

4.5 (p) - Set Password

Declaration

```
Short SaveEthernet_PWD (String Pwd)
```

Description

This function sets the password used by the system for HTTP/Telnet communication. The password will not affect switch operation unless [Use Password](#) is also enabled.

Parameters

Data Type	Variable	Description
String	Pwd	Required. The password to set (20 characters maximum).

Return Values

Data Type	Value	Description
Short	0	Command failed
Short	1	Command completed successfully

Example

Visual Basic

```
status = MyPTE1.SaveEthernet_PWD("123")
```

Visual C++

```
status = MyPTE1->SaveEthernet_PWD("123");
```

Visual C#

```
status = MyPTE1.SaveEthernet_PWD("123");
```

Matlab

```
status = MyPTE1.SaveEthernet_PWD("123")
```

See Also

[Get Password Status](#)

[Get Password](#)

[Use Password](#)

4.5 (q) - Set Telnet Prompt

Declaration

```
Int SaveEthernet_PromptMN(Int Enable_Prompt)
```

Description

Determines the prompt to be returned by the test system for Telnet communication. By default the prompt is disabled so the response for Telnet communication is a new line character. When enabled, a full prompt is returned to the unit in response to all Telnet communication, taking the form "MODEL_NAME>".

Parameters

Data Type	Variable	Description
Int	Enable_Prompt	0 = Disabled (new line character returned) 1 = Enabled (full model name prompt returned)

Return Values

Data Type	Value	Description
Int	0	Command failed
	1	Command completed successfully

Example

```

Visual Basic
    status = MyPTE1.SaveEthernet_PromptMN(1)
Visual C++
    status = MyPTE1->SaveEthernet_PromptMN(1);
Visual C#
    status = MyPTE1.SaveEthernet_PromptMN(1);
Matlab
    status = MyPTE1.SaveEthernet_PromptMN(1)

```

See Also

[Get Telnet Prompt Status](#)

4.5 (r) - Get Telnet Prompt Status

Declaration

```
Int GetEthernet_PromptMN()
```

Description

Indicates whether a full prompt is to be returned by the test system for Telnet communication. By default the prompt is disabled so the response for Telnet communication is a new line character. When enabled, a full prompt is returned to the unit in response to all Telnet communication, taking the form "MODEL_NAME>".

Return Values

Data Type	Value	Description
Int	0	Disabled (new line character returned)
	1	Enabled (full model name prompt returned)

Example

Visual Basic

```
status = MyPTE1.GetEthernet_PromptMN()
```

Visual C++

```
status = MyPTE1->GetEthernet_PromptMN();
```

Visual C#

```
status = MyPTE1.GetEthernet_PromptMN();
```

Matlab

```
status = MyPTE1.GetEthernet_PromptMN()
```

See Also

[Set Telnet Prompt](#)

5 - Operating in a Linux Environment via USB

To open a USB connection to Mini-Circuits ZTM2 Series modular test systems, the Vendor ID and Product ID are required:

- Mini-Circuits Vendor ID: 0x20CE
- ZTM2 Series Product ID: 0x22

Communication with the test system is carried out by way of USB Interrupt. The transmitted and received buffer sizes are 64 Bytes each:

- Transmit Array = [Byte 0][Byte1][Byte2]...[Byte 63]
- Returned Array = [Byte 0][Byte1][Byte2]...[Byte 63]

In most cases, the full 64 byte buffer size is not needed so any unused bytes become “don’t care” bytes; they can take on any value without affecting the operation of the system.

5.1 - Summary of Commands

The commands that can be sent to the ZTM2 Series are summarized in the table below and detailed on the following pages.

	Description	Command Code (Byte 0)	Comments
a	Get Device Model Name	40	
b	Get Device Serial Number	41	
c	Send SCPI Command	1 or 2 or 42	
d	Get Firmware	99	
e	Get Internal Temperature	114 115 118	Sensor 1 Sensor 2 Sensor 3

5.2 - Detailed Description of Commands

5.2 (a) - Get Device Model Name

Description

Returns the Mini-Circuits part number of the connected modular test system.

Transmit Array

Byte	Data	Description
0	40	Interrupt code for Get Device Model Name
1- 63	Not significant	"Don't care" bytes, can be any value

Returned Array

Byte	Data	Description
0	40	Interrupt code for Get Device Model Name
1 to (n-1)	Model Name	Series of bytes containing the ASCII code for each character in the model name
n	0	Zero value byte to indicate the end of the model name
(n+1) to 63	Not significant	"Don't care" bytes, can be any value

Example

The following array would be returned for ZTM-999 (see [Appendix A](#) for conversions between decimal, binary and ASCII characters):

Byte	Data	Description
0	40	Interrupt code for Get Device Model Name
1	90	ASCII character code for Z
2	84	ASCII character code for T
3	77	ASCII character code for M
4	50	ASCII character code for 2
5	45	ASCII character code for -
6	57	ASCII character code for 9
7	0	Zero value byte to indicate end of string

See Also

[Get Device Serial Number](#)
 SCPI: [Get Model Name](#)

5.2 (b) - Get Device Serial Number

Description

Returns the serial number of the connected modular test system.

Transmit Array

Byte	Data	Description
0	41	Interrupt code for Get Device Serial Number
1 - 63	Not significant	"Don't care" bytes, can be any value

Returned Array

Byte	Data	Description
0	41	Interrupt code for Get Device Serial Number
1 to (n-1)	Serial Number	Series of bytes containing the ASCII code for each character in the serial number
n	0	Zero value byte to indicate the end of the serial number
(n+1) to 63	Not significant	"Don't care" bytes, can be any value

Example

The following example indicates that the connected ZTM2 Series system has serial number 1180922011 (see [Appendix A](#) for conversions between decimal, binary and ASCII characters):

Byte	Data	Description
0	41	Interrupt code for Get Device Serial Number
1	49	ASCII character code for 1
2	49	ASCII character code for 1
3	56	ASCII character code for 8
4	48	ASCII character code for 0
5	57	ASCII character code for 9
6	50	ASCII character code for 2
7	50	ASCII character code for 2
8	48	ASCII character code for 0
9	49	ASCII character code for 1
10	49	ASCII character code for 1
11	0	Zero value byte to indicate end of string

See Also

[Get Device Model Name](#)
 SCPI: [Get Serial Number](#)

5.2 (c) - Send SCPI Command

Description

This function sends an SCPI command to the modular test system and collects the returned acknowledgement. SCPI (Standard Commands for Programmable Instruments) is a common method for communicating with and controlling instrumentation products and provides the main method for interfacing with the ZTM2 Series system's internal test components.

Transmit Array

Byte	Data	Description
0	1 or 2 or 42	Interrupt code for Send SCPI Command Note: Any of 1, 2 or 42 can be used as the command byte and the same value will be received in byte 0 of the returned array. 42 can be convenient in some environments since it can easily be represented by its character value of "**".
1 - 63	SCPI Transmit String	The SCPI command to send represented as a series of ASCII character codes, one character code per byte

Returned Array

Byte	Data	Description
0	1 or 2 or 42	Interrupt code for Send SCPI Command
1 to (n-1)	SCPI Return String	The SCPI return string, one character per byte, represented as ASCII character codes
n	0	Zero value byte to indicate the end of the SCPI return string
(n+1) to 63	Not significant	"Don't care" bytes, can be any value

Example 1 (Get Model Name)

The SCPI command to request the model name is `:MN?` (see [Get Model Name](#))

The ASCII character codes representing the 4 characters in this command should be sent in bytes 1 to 4 of the transmit array as follows (see [Appendix A](#) for conversions between decimal, binary and ASCII characters):

Byte	Data	Description
0	1	Interrupt code for Send SCPI Command
1	58	ASCII character code for :
2	77	ASCII character code for M
3	78	ASCII character code for N
4	63	ASCII character code for ?

The returned array for ZTM-999 would be as follows:

Byte	Data	Description
0	1	Interrupt code for Send SCPI Command
1	90	ASCII character code for Z
2	84	ASCII character code for T
3	77	ASCII character code for M
4	50	ASCII character code for 2
5	45	ASCII character code for -
6	57	ASCII character code for 9
8	0	Zero value byte to indicate end of string

Example 2 (Set Attenuator)

The SCPI command to set an SPDT with address 1 to state 1 is `:SPDT:1:STATE:1` (see [Set SPDT Switch State](#)). The ASCII character codes representing the 15 characters in this command should be sent in bytes 1 to 15 of the transmit array as follows:

Byte	Data	Description
0	1	Interrupt code for Send SCPI Command
1	58	ASCII character code for :
2	83	ASCII character code for S
3	80	ASCII character code for P
4	68	ASCII character code for D
5	84	ASCII character code for T
6	58	ASCII character code for :
7	49	ASCII character code for 1
8	58	ASCII character code for :
9	83	ASCII character code for S
10	84	ASCII character code for T
11	65	ASCII character code for A
12	84	ASCII character code for T
13	69	ASCII character code for E
14	58	ASCII character code for :
15	49	ASCII character code for 1

The returned array to indicate success would be:

Byte	Data	Description
0	1	Interrupt code for Send SCPI Command
1	49	ASCII character code for 1
2	32	ASCII character code for space character
3	45	ASCII character code for -
4	32	ASCII character code for space character
5	83	ASCII character code for S
6	85	ASCII character code for U
7	67	ASCII character code for C
8	67	ASCII character code for C
9	69	ASCII character code for E
10	83	ASCII character code for S
11	83	ASCII character code for S
12	0	Zero value byte to indicate end of string

See Also

[SCPI Commands for Control of Modular Test Components](#)

5.2 (d) - Get Firmware

Description

This function returns the internal firmware version of the modular test system.

Transmit Array

Byte	Data	Description
0	99	Interrupt code for Get Firmware
1- 63	Not significant	"Don't care" bytes, can be any value

Returned Array

Byte	Data	Description
0	99	Interrupt code for Get Firmware
1	Reserved	Internal code for factory use only
2	Reserved	Internal code for factory use only
3	Reserved	Internal code for factory use only
4	Reserved	Internal code for factory use only
5	Firmware Letter	ASCII code for the first character in the firmware revision identifier
6	Firmware Number	ASCII code for the second character in the firmware revision identifier
7-63	Not significant	"Don't care" bytes, could be any value

Example

The below returned array indicates that the system has firmware version "C3" (see [Appendix A](#) for conversions between decimal, binary and ASCII characters):

Byte	Data	Description
0	99	Interrupt code for Get Firmware
1	49	Not significant
2	77	Not significant
3	78	Not significant
4	63	Not significant
5	67	ASCII character code for C
6	51	ASCII character code for 3

See Also

SCPI: [Get Firmware](#)

5.2 (e) - Get Internal Temperature

Description

Returns the internal temperature of the modular test system in degrees Celsius to 2 decimal places.

Transmit Array

Byte	Data	Description
0	114, 115 or 118	Interrupt code for Get Internal Temperature: 114 = Check temperature sensor 1 115 = Check temperature sensor 2 (if available) 118 = Check temperature sensor 3 (if available)
163	Not significant	"Don't care" bytes, can be any value

Returned Array

Byte	Data	Description
0	114, 115 or 118	Interrupt code for Get Internal Temperature: 114 = Check temperature sensor 1 115 = Check temperature sensor 2 (if available) 118 = Check temperature sensor 3 (if available)
1	43 or 45	ASCII code for the first character of the temperature: 43 = positive (+) 45 = negative (-)
2	Temperature Digit 1	ASCII character code for the first digit of the temperature reading
3	Temperature Digit 2	ASCII character code for the second digit of the temperature reading
4	46	ASCII character code for the decimal point symbol (".")
5	Temperature Decimal Place 1	ASCII character code for the first decimal place of the temperature reading
6	Temperature Decimal Place 2	ASCII character code for the second decimal place of the temperature reading
7-63	Not significant	"Don't care" bytes, can be any value

Example

To check the internal temperature measured by sensor 2, send the following transmit array:

Byte	Data	Description
0	115	Interrupt code for Get Internal Temperature @ Sensor 2

The below returned array would indicate a temperature of +28.43°C (see [Appendix A](#) for conversions between decimal, binary and ASCII characters):

Byte	Data	Description
0	115	Interrupt code for Get Internal Temperature @ Sensor 2
1	43	ASCII character code for +
2	50	ASCII character code for 2
3	56	ASCII character code for 8
4	46	ASCII character code for .
5	52	ASCII character code for 4
6	51	ASCII character code for 3

See Also

SCPI: [Get Internal Temperature](#)

6 - Ethernet Control over IP Networks

Mini-Circuits' ZTM2 Series modular test systems have an RJ45 connector option for remote control over Ethernet TCP/IP networks. HTTP (Get/Post commands) and Telnet communication are supported. UDP transmission is also supported for discovering available ZTM2 Series systems on the network.

The system can be configured manually with a static IP address or automatically by the network using DHCP (Dynamic Host Control Protocol):

- Dynamic IP (factory default setting)
 - Subnet Mask, Network Gateway and local IP Address are assigned by the network server on each connection
 - The only user controllable parameters are:
 - TCP/IP Port (the port used for HTTP communication with the network; default is port 80)
 - Password (up to 20 characters; default is no password)
- Static IP
 - All parameters must be specified by the user:
 - IP Address (must be a legal and unique address on the local network)
 - Subnet Mask (subnet mask of the local network)
 - Network gateway (the IP address of the network gateway/router)
 - TCP/IP port (the port used for HTTP communication with the network; default is port 80)
 - Password (up to 20 characters; default is no password)

Notes:

1. The TCP/IP port must be included in every HTTP command to the ZTM2 Series system unless the default port 80 is used
2. Port 23 is reserved for Telnet communication

6.1 - Ethernet Communication

Communication over Ethernet can be accomplished using HTTP Get/Post commands or Telnet communication to send the SCPI commands outlined in [SCPI Commands for Control of Modular Test Components](#). These communication protocols are both commonly supported and simple to implement in most programming languages. Any Internet browser can be used as a console/tester for HTTP control by typing the commands/queries directly into the address bar.

6.1 (a) - Sending SCPI Commands/Queries Using HTTP

The basic format of the HTTP command to send to the modular test system is:

<http://ADDRESS:PORT/PWD;COMMAND>

Where

- `http://` is required
- `ADDRESS` = IP address (required)
- `PORT` = TCP/IP port (can be omitted if port 80 is used)
- `PWD` = Password (can be omitted if password security is not enabled)
- `COMMAND` = Command to send to the switch

Example 1:

<http://192.168.100.100:800/PWD=123;;SPDT:1:STATE:2>

Explanation:

- The ZTM2 Series has IP address 192.168.100.100 and uses port 800
- Password security is enabled and set to “123”
- The command is to set an SPDT in location 1 to state 2

Example 2:

<http://10.10.10.10/:SP4T:1:STATE?>

Explanation:

- The switch has IP address 10.10.10.10 and uses the default port 80
- Password security is disabled
- The command is to query the switch state of an SP4T in location 1

The system will return the result of the command/query as a string of ASCII characters.

6.1 (b) - Sending SCPI/Commands/Queries Using Telnet

Communication is started by creating a Telnet connection to the system's IP address. On successful connection the "line feed" character will be returned. If the system has a password enabled then this must be sent as the first command after connection.

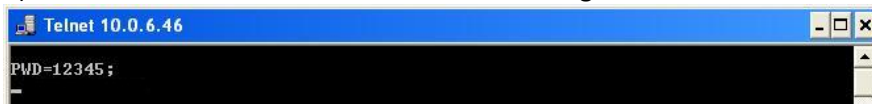
The system can be optionally configured to return a full prompt to the user with each Telnet response. The prompt will take the form ZTM2-X> where ZTM2-X is the model name of the connected system. This feature can be enabled using the GUI application software or programmatically via the DLL.

The full list of all commands and queries is detailed in the following sections. A basic example of the Telnet communication structure using the Windows Telnet Client is summarized below:


- 1) Set up Telnet connection to a modular test system with IP address 10.0.6.46:



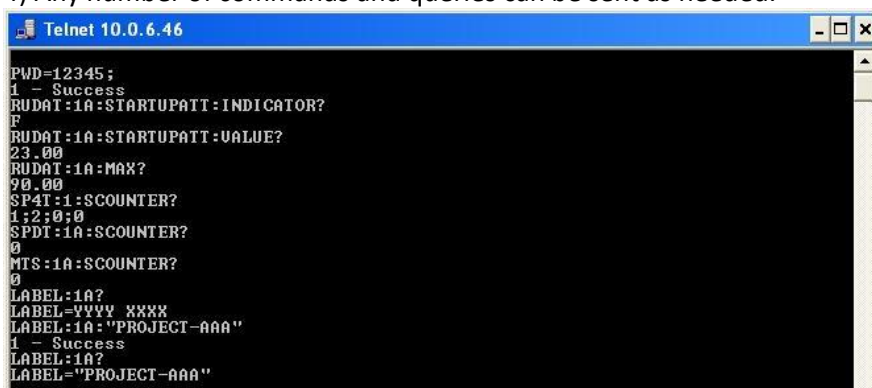
- 2) The "line feed" character is returned indicating the connection was successful:



- 3) The password (if enabled) must be sent as the first command in the format "PWD=x;". A return value of "1 - Success" indicates success:



- 4) Any number of commands and queries can be sent as needed:



6.1 (c) - Device Discovery Using UDP

In addition to HTTP and Telnet, ZTM2 Series test systems also provide limited support of the UDP protocol for the purpose of “device discovery.” This allows a user to request the IP address and configuration of all Mini-Circuits modular test systems connected on the network; full control of those units is then accomplished using HTTP or Telnet, as detailed previously.

Alternatively, the IP configuration can be identified or changed by connecting the system with the USB interface (see [Configuring Ethernet Settings](#)).

Note: UDP is a simple transmission protocol that provides no method for error correction or guarantee of receipt.

UDP Ports

Mini-Circuits’ modular test systems are configured to listen on UDP port 4950 and answer on UDP port 4951. Communication on these ports must be allowed through the computer’s firewall in order to use UDP for device discovery. If the test system’s IP address is already known it is not necessary to use UDP.

Transmission

The command **MODULAR-ZT?** should be broadcast to the local network using UDP protocol on port 4950.

Receipt

All Mini-Circuits ZTM2 Series systems that receive the request will respond with the following information (each field separated by CrLf) on port 4951:

- Model Name
- Serial Number
- IP Address/Port
- Subnet Mask
- Network Gateway
- MAC Address

Example

Sent Data:

MODULAR-ZT?

Received Data:

Model Name: ZTM2-1
Serial Number: 11802120001
IP Address=192.168.9.101 Port: 80
Subnet Mask=255.255.0.0
Network Gateway=192.168.9.0
Mac Address=D0-73-7F-82-D8-01

Model Name: ZTM2-1
Serial Number: 11802120002
IP Address=192.168.9.102 Port: 80
Subnet Mask=255.255.0.0
Network Gateway=192.168.9.0
Mac Address=D0-73-7F-82-D8-02

Model Name: ZTM2-1
Serial Number: 11802120003
IP Address=192.168.9.103 Port: 80
Subnet Mask=255.255.0.0
Network Gateway=192.168.9.0
Mac Address=D0-73-7F-82-D8-03

7 - Program Examples & Tutorials

These examples are intended to demonstrate the basics of programming with Mini-Circuits' ZTM2 Series test systems. If support is required for a specific programming example which isn't covered below then please contact Mini-Circuits for support (testsolutions@minicircuits.com).

7.1 - Perl Programming

7.1 (a) - Ethernet HTTP Connection Using Perl's LWP Simple Interface

Perl's LWP Simple interface can be used to send HTTP commands to the ZTM2 Series when programming with Perl. The below code example demonstrates the process.

```
#!/usr/bin/perl
use strict;
use warnings;
use LWP::Simple;          # Use the LWP::Simple interface for HTTP

my $value = 1;
my $ip_address = "192.168.9.74";    # IP address of the ZTM2 Series to control

my $sw_list = "1,2,3,4";    # The list of switch addresses in the ZTM2
my @sw_location = split /\,/, $sw_list;

foreach my $sw_location (@sw_location) {

    # Loop for each switch address

    # Set switch in this address
    my $return_value = get("http://$ip_address/:SPDT:$sw_location:STATE:$value");
    print "ZTM2 Series response: $return_value\n";

    # Confirm switch state setting for this address
    $return_value = get("http://$ip_address/:SPDT:$sw_location:STATE?");
    print "Switch $sw_location set to $return_value\n";

}
```

7.1 (b) - USB Connection Using the ActiveX DLL in 32-bit Perl Distributions

The majority of 32-bit Perl distributions for Windows operating systems provide support for ActiveX, meaning Mini-Circuits' ActiveX DLL can be used to control the modular test system in these environments. The below simple code segment demonstrates the process for this; any number of commands can be sent between the Connect and Disconnect functions.

```
use feature ':5.10';
use Win32::OLE;
use Win32::OLE::Const 'Microsoft ActiveX Data Objects';

my $ztm = Win32::OLE->new('MCL_ZTM2.USB_Control');

$ztm->Connect();
$ztm->Send_SCPI(":SP4T:1:STATE:4", $ztm_return)
$ztm->Send_SCPI(":SP4T:1:STATE?", $ztm_return)
$ztm->Disconnect;
```


7.1 (c) - Work-Around for 64-bit Perl Distributions Using USB Connection

The majority of 64-bit Perl distributions do not provide support for either ActiveX or .Net so in these cases Mini-Circuits' DLLs cannot be used directly. The work-around when a USB connection is required is to create a separate executable program in another programming environment which can sit in the middle. The function of the executable is to use the .Net DLL to connect to the ZTM2 Series, send a single user specified command, return the response to the user, and disconnect from the DLL. This executable can then be easily called from Perl script to send the required commands to the system, without Perl having to directly interface with the DLL.

Mini-Circuits can supply on request an executable to interface with the DLL. See [Creating an Executable Using the .Net DLL in C# for USB Control](#) for the example source code for such an executable (developed using C#). The below script demonstrates use of this executable in Perl script to send a SCPI command to a ZTM2 Series test system (specified by serial number or address) and read the response.

```
#!/usr/bin/perl
use strict;
use warnings;

my $serial_number = 11804280010;    # The ZTM Series serial number
my $sw_list = "1A,2A,3A,4A";        # The list of attenuator locations in the ZTM
my @sw_location = split /,/, $sw_list;
my $value = 3;

my $exe = "ZTM2.exe";               # The .exe providing an interface to the ZTM2 DLL
my @cmd;

foreach my $sw_location (@sw_location) {

    # Loop for each switch address

    # Set switch in this address
    @cmd = ($exe, "-s $serial_number :SP4T:$sw_location:STATE:$value");
    my $return_value = qx{@cmd};
    print "ZTM2 Series response: $return_value\n";

    # Confirm switch state setting for this address
    @cmd = ($exe, "-s $serial_number :SP4T:$sw_location:STATE?");
    $return_value = qx{@cmd};
    print "Switch $sw_location set to $return_value\n";

}
```

7.2 - C# Programming

7.2 (a) - Creating an Executable Using the .Net DLL in C# for USB Control

The below example is a simple executable program that connects to the .Net DLL, sends a user specified SCPI command to the test system, returns the response, then disconnects from the DLL and terminates. It requires the .Net DLL to be installed on the host operating system and the ZTM2 Series test system to be connected to the PC via USB.

```
namespace ZTM2
{
    class Program
    {
        static int Main(string[] args)
        {
            int x = 0;
            string SN = null;
            string SCPI = null;
            string RESULT = null;
            int Add = 0;
            mcl_ZTM2_64.USB_ZT ZT;           // Reference the DLL
            if (args.Length == 0) return 0;
            ZT = new mcl_ZTM2_64.USB_ZT (); // Declare a class (defined in the DLL)
            SCPI = args[2];
            if (args[0].ToString().Contains("-help")) // Print a help file
            {
                Console.WriteLine("Help ZTM2.exe");
                Console.WriteLine("-----");
                Console.WriteLine("ZTM2.exe -s SN command :Send SCPI command to S/N");
                Console.WriteLine("ZTM2.exe -a add SCPI :Send SCPI command to Address");
                Console.WriteLine("-----");
            }
            if (args[0].ToString().Contains("-s")) // User want to connect by S/N
            {
                SN = args[1];
                x = ZT.Connect(ref SN);           // Call DLL connect function
                x = ZT.Send_SCPI(ref SCPI, ref RESULT); // Send SCPI command
                Console.WriteLine(RESULT);        // Return the result
            }
            if (args[0].ToString().Contains("-a")) // User wants to connect by address
            {
                Add = Int16.Parse(args[1]);
                x = ZT.ConnectByAddress(ref Add);
                x = ZT.Send_SCPI(ref SCPI, ref RESULT);
                Console.WriteLine(RESULT);
            }
            ZT.Disconnect(); // Call DLL disconnect function to finish
            return x;
        }
    }
}
```

This executable can be called from a command line prompt or within a script. The following command line calls demonstrate use of the executable (compiled as ZTM2.exe), connecting by serial number or address, to set and read attenuation:

- `ZTM2.exe -s 11801250027 :SP8T:3:STATE:8` (serial number 11801250027)
- `ZTM2.exe -a 255 :SP8T:3:STATE?` (USB address 255)