



THE BIG DEAL

- 5 x mechanical SP4T absorptive switches
- High isolation and low insertion loss to 40 GHz
- Convenient rack-mountable chassis
- Ethernet & USB control
- Fail-safe / redundancy switching



Generic photo used for illustration purposes only

APPLICATIONS

- Benchtop and rack mounted automated test systems
- 5G FR1 & FR2 node / device testing
- Military radio, radar & electronic warfare
- Test & measurement systems

PRODUCT OVERVIEW

Mini-Circuits' ZTM-5SP4T-40 houses 5 independently controlled electro-mechanical SP4T switches. Each switch operates over an extremely wide bandwidth, from DC to 40 GHz with high isolation and low insertion loss. The absorptive switches are fail-safe, with a break before make configuration, and lifetime of 2 million switching cycles when used within the noted specifications.

The switches are housed in a compact 19-inch rack chassis with all 2.92 mm (female) RF connectors and LED switch state indicators on the front panel. The system can be controlled via USB or Ethernet (supporting both HTTP and Telnet network protocols). Full software support is provided, including our user-friendly GUI application for Windows and a full API with programming instructions for Windows and Linux environments.

Custom switch configurations can be configured to fit any requirement, using Mini-Circuits' online configurator tool at www.minicircuits.com/WebStore/ztm.html.

KEY FEATURES

Feature	Advantages
High performance switches	Mechanical absorptive switches provide high reliability, repeatable performance and internal termination of input signals on the disconnected paths
Fail-safe design	The switches revert to a known default state when the DC supply is removed, allowing their use in systems that must continue to operate safely in the event of power failure
Break-before-make configuration	Prevents a momentary connection of the old and new signal paths, reducing the inconsistent transient effects that could otherwise be observed during switching
Rack-mount chassis	Compact 3U height, 19" rack-mountable chassis suits integration in automated production test environments.
Ethernet & USB control	USB HID and Ethernet (HTTP / Telnet) interfaces ensure compatibility with most software environments and connection requirements.

**ELECTRICAL SPECIFICATIONS @ 25°C (EACH SWITCH)**

Parameter	Conditions	Min	Typ	Max	Units
Frequency		DC	-	40	GHz
Path Loss	DC – 12 GHz	-	0.2	0.5	dB
	12 – 26 GHz	-	0.3	0.7	
	26 – 40 GHz	-	0.6	1.1	
Isolation	DC – 12 GHz	60	80	-	dB
	12 – 26 GHz	55	75	-	
	26 – 40 GHz	50	65	-	
VSWR	DC – 12 GHz	-	1.25	-	:1
	12 – 26 GHz	-	1.30	-	
	26 – 40 GHz	-	1.50	-	
Switching Time			25		ms
RF Input Power (Cold Switching)¹	DC – 12 GHz			20	W
	12 – 26 GHz			10	
	26 – 40 GHz			5	
Switch Lifetime	100 mW hot switching ²	2			million cycles
	1 W hot switching		1		

¹ Maximum power for any connected through path as stated; maximum power into any internal termination is 1W per port, 3W total per switch² Hot switching power above this level will degrade the switch lifetime



CONTROL INTERFACES

Ethernet Control	Supported Protocols	TCP / IP, HTTP, Telnet, DHCP, UDP (limited)
	Max Data Rate	10 Mbps (10Base-T Half Duplex)
USB Control	Supported Protocols	HID – Full Speed
	Min Communication Time¹	3 ms typ

¹ Based on the USB HID protocol polling interval (1 ms with 64 bytes per packet) and no other significant CPU or USB activity

SOFTWARE & DOCUMENTATION

Mini-Circuits' full software and support package including user guide, Windows GUI, API, programming manual and examples can be downloaded free of charge (refer to the last page for the download path).

A comprehensive set of software control options is provided:

- GUI for Windows – Simple software interface for control via Ethernet and USB
- Programming / automation via Ethernet
 - Complete set of control commands which can be sent via any supported protocol – simple to implement in the majority of modern programming environments
- Programming / automation via USB
 - DLL files provide a full API for Windows with a set of intuitive functions which can be implemented in any programming environment supporting .Net Framework or ActiveX
 - Direct USB programming is possible in any other environment (not supporting .Net or ActiveX)

Please contact testsolutions@minicircuits.com for support

MINIMUM SYSTEM REQUIREMENTS

	Requirements
Hardware	Intel i3 (or equivalent) or later
GUI (USB or Ethernet Control)	Windows 7 or later
USB API DLL	Windows 7 or later with support for Microsoft .Net Framework or ActiveX
USB Direct Programming	Windows 7 or later; Linux
Ethernet	Windows, Linux or macOS with Ethernet TCP / IP support

PROGRAMMING COMMANDS

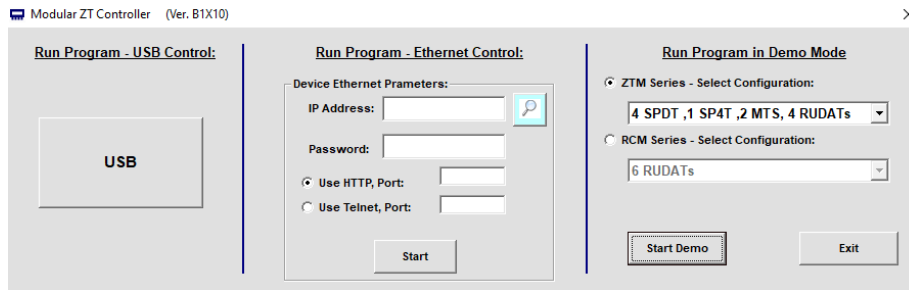
The key ASCII / SCPI commands for control of the system for control via the Ethernet or USB API are summarized below (refer to the programming manual for full details):

Command / Query	Description
<code>:MN?</code>	Read model name
<code>:SN?</code>	Read serial number
<code>:FIRMWARE?</code>	Read firmware version
<code>:SP4T:[sw_number]:STATE:[port]</code>	Set a single switch state: <ul style="list-style-type: none"> • <code>[sw_number]</code> = 1 to 3 • <code>[port]</code> = 1 (J1 to J2) or 2 (J1 to J3) • Example <code>:SP4T:1:STATE:2</code> (set SPDT 1 with Com to 2)
<code>:SP4T:[sw_number]:STATE?</code>	Return a single switch state: <ul style="list-style-type: none"> • <code>[sw_number]</code> = 1 to 3 • Example <code>:SP4T:1:STATE?</code> (return the state of SP4T 1)

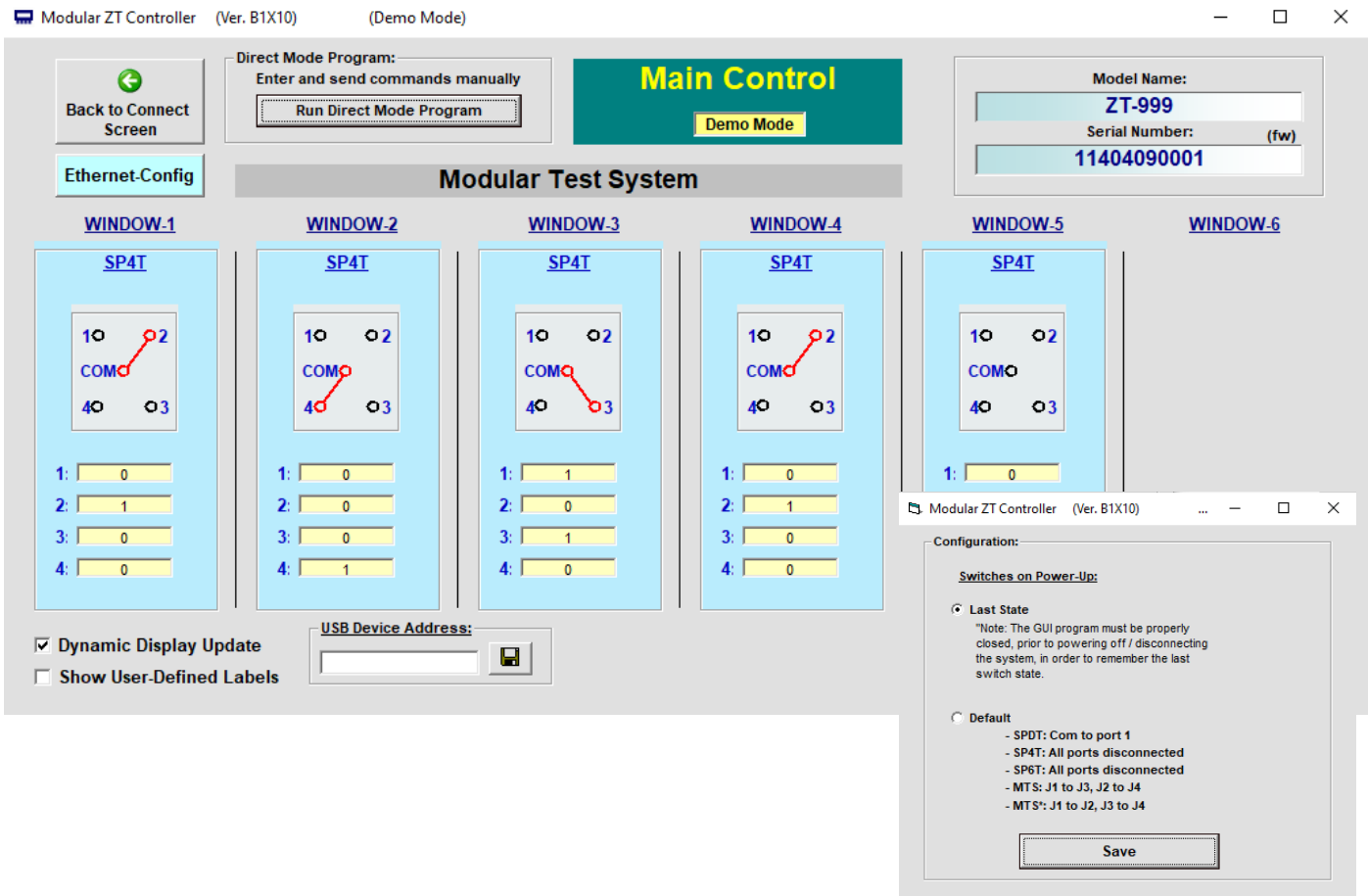


GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS

- Connect via USB or Ethernet
- Run GUI in "demo mode" to evaluate software without a hardware connection



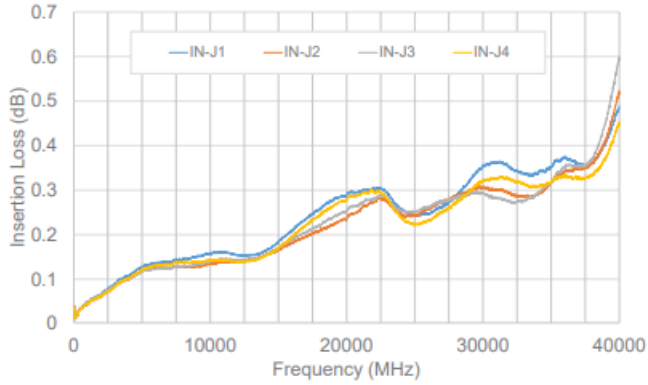
- View and set all switch states at the click of a button
- Configure switch power-up states
- Send programming commands
- Configure Ethernet settings
- Update firmware



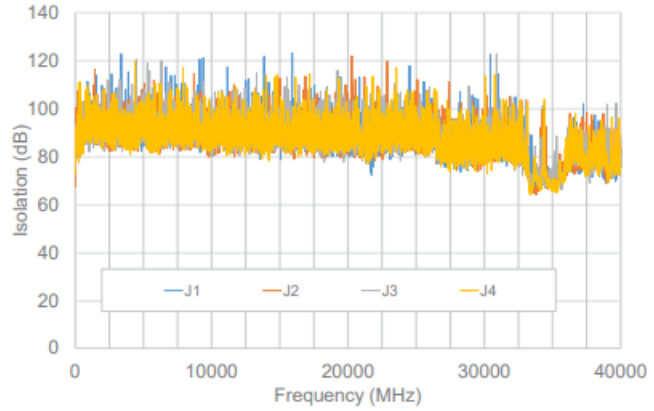


TYPICAL PERFORMANCE CURVES (EACH SWITCH)

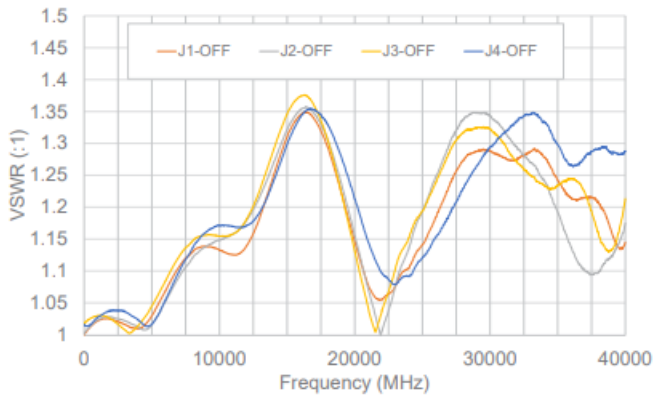
INSERTION LOSS



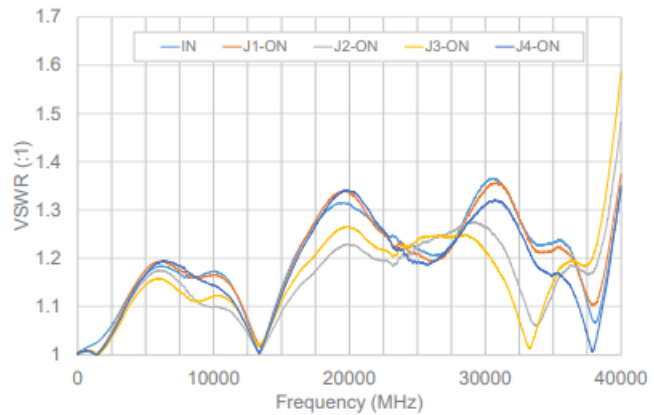
ISOLATION



VSWR - In-Active Path, Into Internal Terminations



VSWR - Active Through Path



**ABSOLUTE MAX RATINGS**

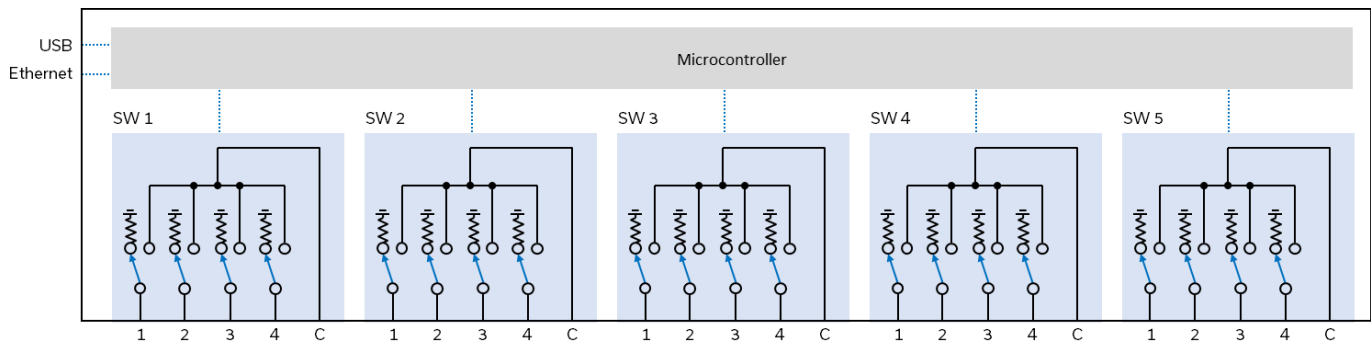
Parameter	Conditions	Limits	Units
Temperature	Operating	0 to +50	°C
	Storage	-15 to +85	
Input Power (No Damage)	Cold switching:		W
	DC-12 GHz	20	
	12-26 GHz	10	
	26-40 GHz	5	
	Hot switching	1	
Into terminations	1		

Permanent damage may occur if any of these limits are exceeded. Operating in the range between operating power limits and absolute maximum ratings for extended periods of time may result in reduced life and reliability.

POWER SUPPLY

Power Supply	AC mains input: 100-240 V, 50 / 60 Hz
Fuse	2A, 250V rating
Power Consumption	85W maximum

Using included AC/DC-24-3W1 power supply adapter (110 / 240V AC input)

FUNCTIONAL BLOCK DIAGRAM**CONNECTIONS**

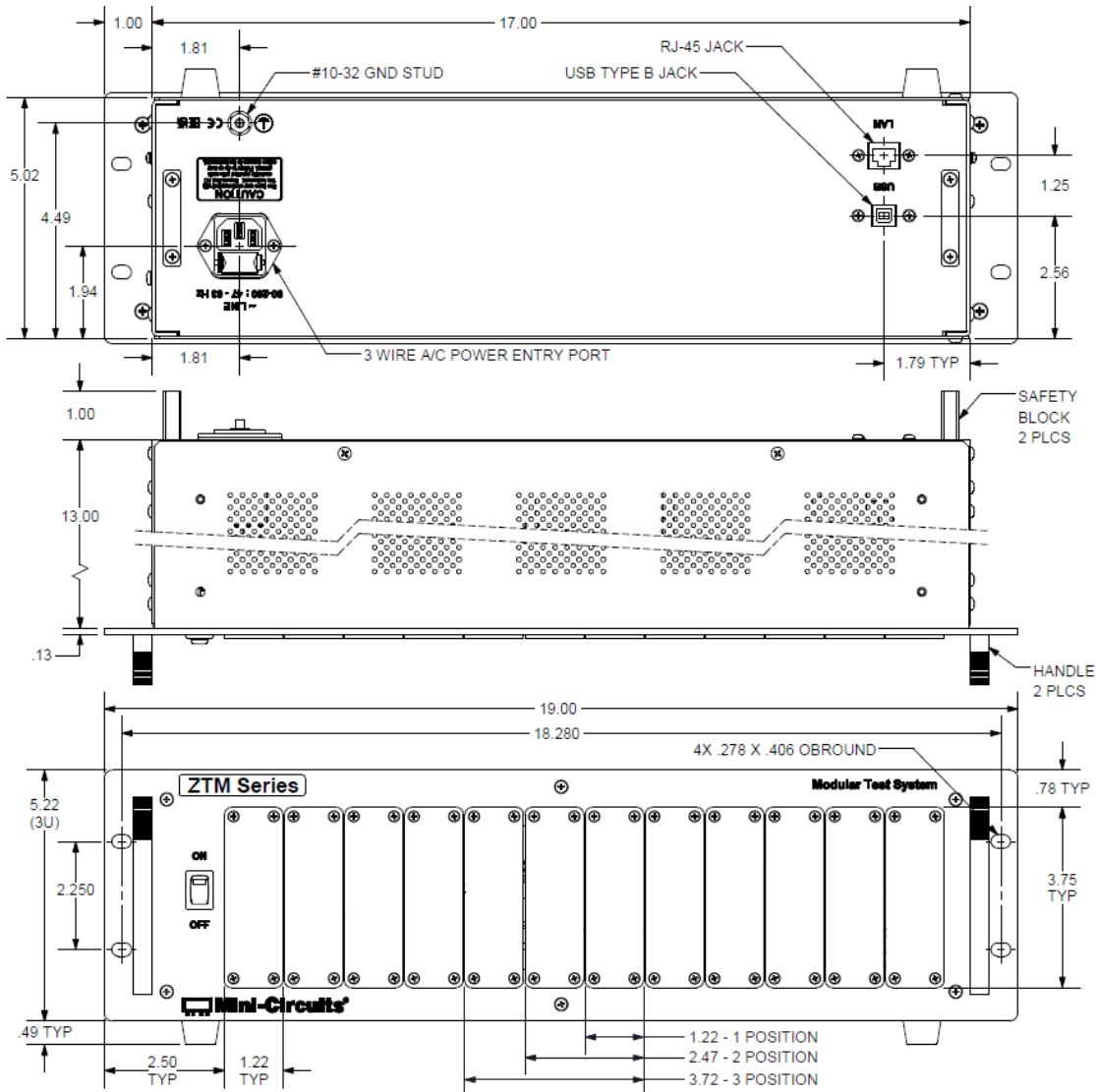
Name	Connector Type
SW 1-5, ports C & 1-4 each	2.92 mm female
USB	USB type-B
Ethernet / LAN	RJ45
AC Input	IEC C14 inlet

SWITCH CONTROL LOGIC (EACH SWITCH)

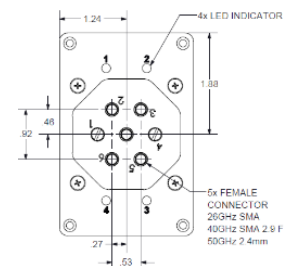
Switch Command	Switch State
:SP4T:x:STATE:0	All ports disconnected
:SP4T:x:STATE:1	C to 1
:SP4T:x:STATE:2	C to 2
:SP4T:x:STATE:3	C to 3
:SP4T:x:STATE:4	C to 4



CASE STYLE DRAWING



5 x SP4T switch window:



Notes:

1. Case material: Aluminum (with protective coating to prevent corrosion)
2. Dimensions are in inches (mm) – Tolerances: 2 pl. ±0.03 inch; 3 pl. ±0.15 inch
3. Weight: 4.5 kg
4. Marking may contain other features or characters for internal lot control



PRODUCT MARKING


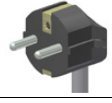



ZTM-5SP4T-40
 Modular Test System
 Serial Number



DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE

Ordering Information	Model Name: ZTM-5SP4T-40 Contact Us: testsolutions@minicircuits.com	
Case Style	YD2681	
Software, User Guide & Programming Manual	https://www.minicircuits.com/softwaredownload/ztm_rcm.html	
Environmental Rating	ENV55	
Regulatory Compliance	Refer to our website for compliance methodologies and qualifications 	www.minicircuits.com/quality/environmental_introduction.html

Included Accessories	Part Number	Description
	CBL-3W-xx	AC power cord (IEC C13 connector to local plug) Select one option from the list below. Please contact testsolutions@minicircuits.com if your region is not listed.
	USB-CBL-AB-7+	USB cable (6.8ft) type A to type B
	CBL-RJ45-MM-5+	Ethernet cable (5 ft)

AC Power Cord Options	Part Number	Description
	CBL-3W-US	USA NEMA 5-15 plug (type B) to IEC C13 connector
	CBL-3W-EU	Europe CEE 7/7 plug (type E/F) to IEC C13 connector
	CBL-3W-UK	UK BS-1363 plug (type G) to IEC C13 connector
	CBL-3W-AU	Australia & China AS/NZS 3112 plug (type I) to IEC C13 connector
	CBL-3W-IL	Israel SI-32 plug (type H) to IEC C13 connector



USB & Ethernet

5 x SP4T Mechanical Switch Assembly **ZTM-5SP4T-40**

50 Ω DC to 40 GHz Rack-Mount 2.92 mm Female

 Mini-Circuits

NOTES

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

