Mechanical Switch System

**ZT-169**

50Ω   DC to 18 GHz

Product Overview

ZT-169 is a flexible switch rack, configured with 10 independent SP4T and 4 independent SPDT mechanical switches on the front panel. Each switch is of a high reliability, fail-safe design, operating from DC to 18 GHz with low loss and high isolation. The model is housed in a compact 4U height, 19-inch rack chassis with SMA female RF connectors 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 (both 32-bit and 64-bit systems).

SP8T / SP32T Switch Applications

With the use of Mini-Circuits' low cost Hand-Flex™ interconnect cables, multiple matrix configurations can be easily created by the user. The front panel switch arrangement supports configuration as a set of 4 x SP8T switches, which can be further connected into a single SP32T switch.

Mini-Circuits
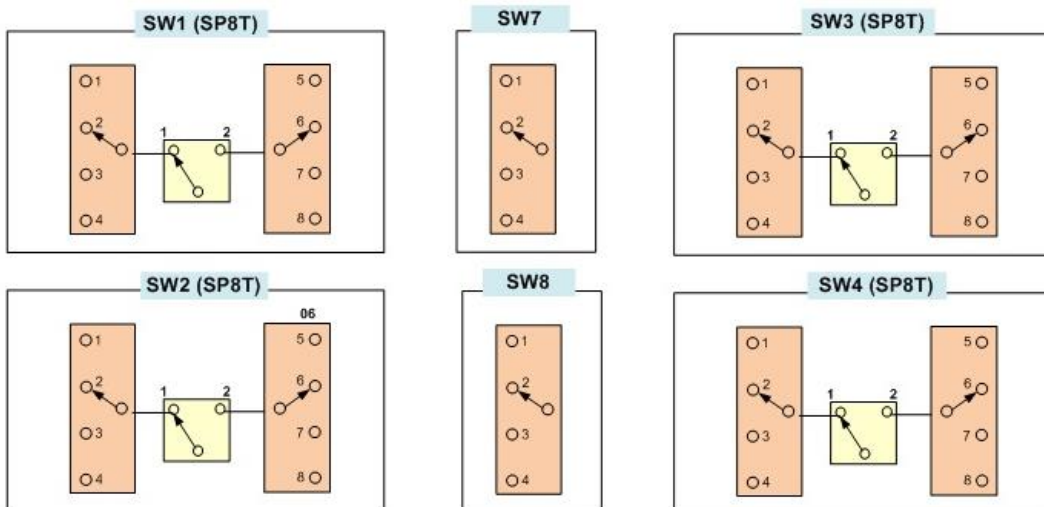
Electrical Specifications @ 25⁰C (per SP4T switch)

Parameter	Conditions	Min	Typ	Max	Units
Frequency Range		DC		18	GHz
Insertion Loss	DC – 8 GHz		0.15	0.30	dB
	8 – 12 GHz		0.25	0.40	
	12 – 18 GHz		0.50	0.80	
Isolation	DC – 8 GHz	80	100		dB
	8 – 12 GHz	75	95		
	12 – 18 GHz	60	80		
VSWR	DC – 8 GHz		1.20		:1
	8 – 12 GHz		1.20		
	12 – 18 GHz		1.30		
Switching Time			25		ms
RF Input Power[1]	Cold switching			20	W
Switch Lifetime	100 mW hot switching[2]	10			million cycles
	1W hot switching		1		

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

Electrical Specifications @ 25⁰C (per SPDT switch)

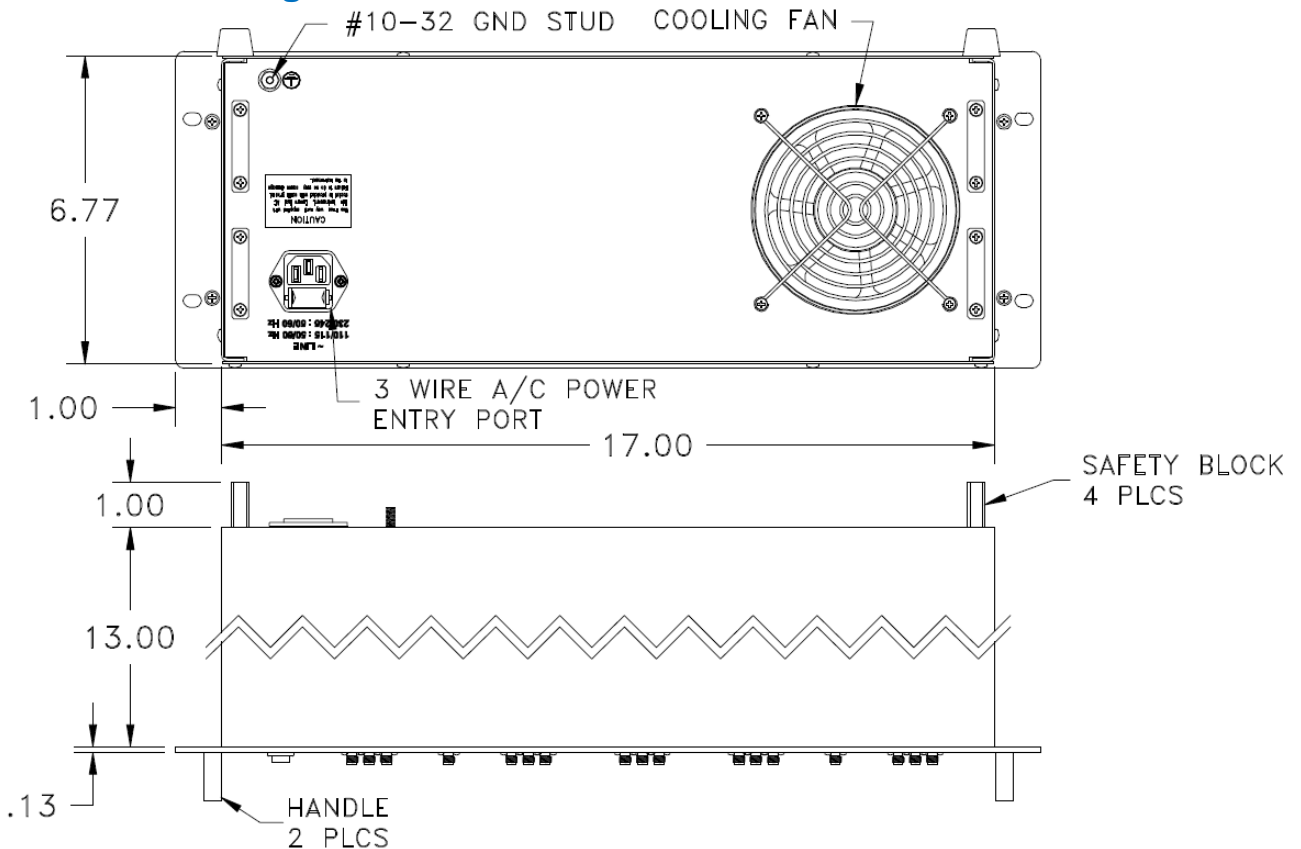| Parameter	Conditions	Min	Typ	Max	Units
Frequency Range		DC		18	GHz
Insertion Loss	DC – 8 GHz		0.15	0.30	dB
	8 – 12 GHz		0.25	0.40	
	12 – 18 GHz		0.30	0.50	
Isolation	DC – 8 GHz	75	90		dB
	8 – 12 GHz	70	80		
	12 – 18 GHz	60	66		
VSWR	DC – 8 GHz		1.20		:1
	8 – 12 GHz		1.20		
	12 – 18 GHz		1.15		
Switching Time			25		ms
RF Input Power[1]	Cold switching			20	W
Switch Lifetime	100 mW hot switching[2]		10		million cycles
	1W hot switching		3		

[1] Maximum power for any connected through path as stated; maximum power into any internal termination is 1W
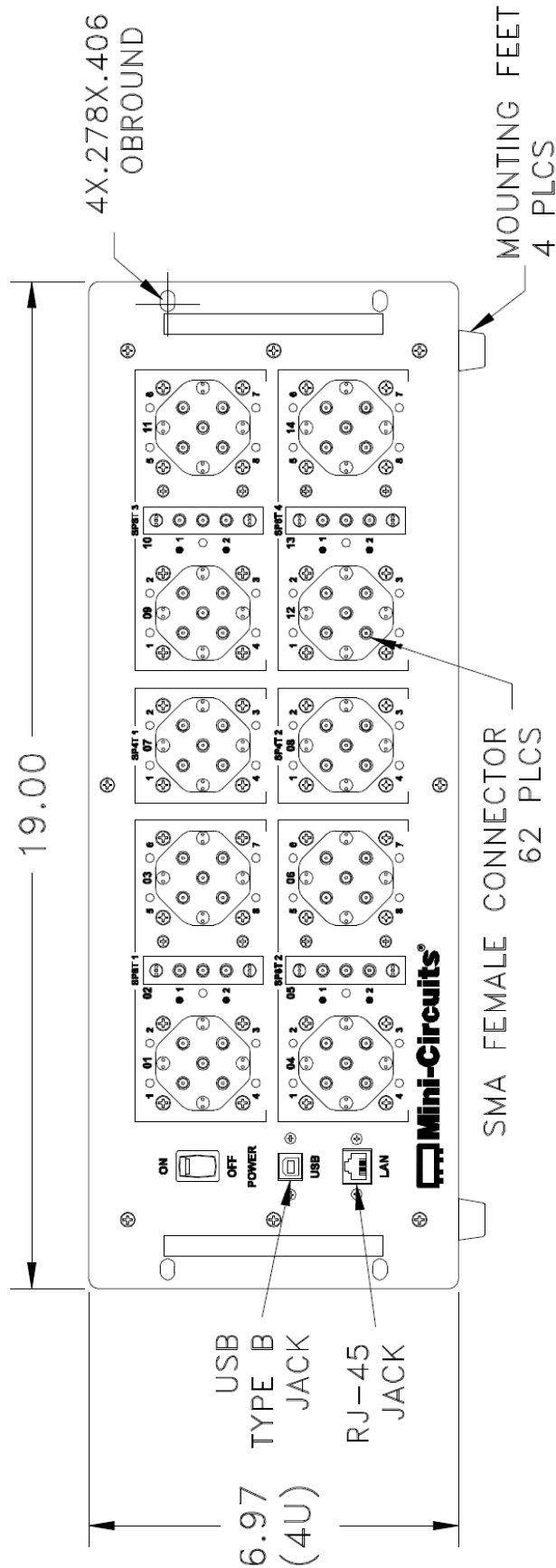[2] Hot switching power above this level will degrade the switch lifetime

Mechanical / Environmental Specifications

Dimensions	19" (W) x 4U (H) x 13" (D)	0.5" additional for removable feet		
Case Drawing	99-01-2021			
Case Material	Aluminum (with protective coating to prevent corrosion)			
RF Connectors	**Panel**	**Connector**	**Quantity**	**Port Labels**
	Front	SMA female	62	Individual switch numbers 01-14; SP8T1-4 with ports 1-8 per group; SP4T1-2 with 1-4 per switch
Panel Items	**Front Panel**		**Rear Panel**	
Panel Marking	• ZT-169 • UE RF Switch Matrix		• CE • EAC • Serial number / date code / model name	
Other Connectors	• USB type B socket • RJ45 (LAN) socket		• AC mains power input (IEC C14 inlet)	
Other	• Power on / off switch with LED • Carry handles • LED switch position indicators		• Fan vent	
Power Supply	AC mains power input (90-260 V, 47-63 Hz)			
Fuse	2A, 250V rating			
Temperature	Operating: 0 to +50 ºC			

Outline Drawing

Mechanical Switch System

ZT-169

Outline Drawing

Mini-Circuits®

Software Specifications

• Please contact testsolutions@minicircuits.com for support

| Ethernet Control	Supported Protocols	TCP / IP, HTTP, Telnet, DHCP, UDP
	Max Data Rate	10 Mbps (10Base-T Half Duplex)
USB Control	Supported Protocols	HID - Full Speed
	Min Communication Time	3 ms typ
Software Support	• Mini-Circuits' Universal GUI for USB & LAN control (Windows only) • ASCII / SCPI command syntax for LAN programming (all OS) • ActiveX / .Net DLL APIs for USB programming (Windows only) • Interrupt codes for direct USB programming (all OS) • Full programming instructions and examples for a wide range of languages	
Downloads	Software & Documentation	Contact testsolutions@minicircuits.com

Programming Commands

• The key ASCII / SCPI commands for control of the system are summarized below
• These can be sent via the USB or Ethernet API
• Please refer to the programming manual for full details

Command / Query	Description
:MN?	Read model name
:SN?	Read serial number
:FIRMWARE?	Read firmware version
:Ssw_number=port	Set an individual switch state: • sw_number = 01 to 14 • port = the switch state to set (1 to 2 for SPDT or 0 to 4 for SP4T) Example: • S01=4 Set SP4T 01 to state 4 • S02=2 Set SPDT 02 to state 2
:Csw_number=port	Set switch states based on the SP4T and SP8T groups indicated on the front panel (external cable connections required to create the SP8T switches): • sw_number = 1 to 4 or 7 or 8 • port = the switch state to set • For Switches 1 to 4 (SP8T) - port = 0 to 8 • For Switches 7 to 8 (SP4T) - port = 0 to 4 Example: • C1=8 Set SP8T1 to state 8 (SPDT 02 to state 2 & SP4T 03 to state 4) • C7=4 Set SP4T 07 to state 4

Graphical User Interface (GUI) for Windows - Key Features

- Connect via USB or Ethernet
- Run GUI in "demo mode" to evaluate software without a hardware connection
- View and set all switch states
- Configure Ethernet settings
- Upgrade firmware
- Send SCPI commands
- View temperature & fan status
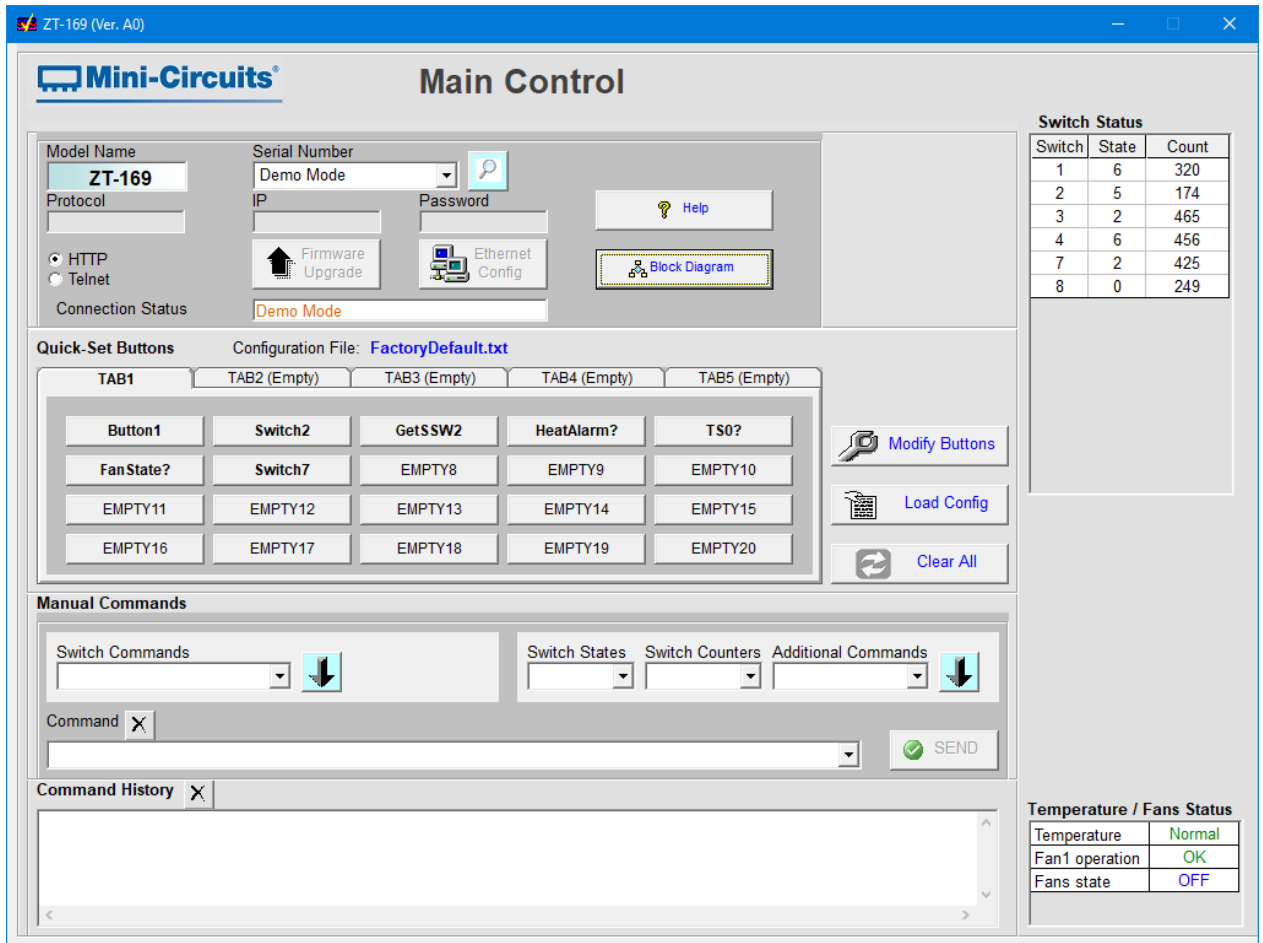
Ordering Information

Please contact Mini-Circuits' Test Solutions department for price and availability:
testsolutions@minicircuits.com

Included Accessories

Model Name	Quantity	Description
CBL-3W-xx*	1	AC power cord (IEC C13 connector to local plug)
USB-CBL-AB-7+	1	USB cable (6.8 ft)
CBL-RJ45-MM-5+	1	Ethernet cable (5 ft)
HT-4-SMA	1	SMA Cable Wrench (4 in)

*Please specify one option on the purchase order, at no charge

Cable Model	Region
CBL-3W-US	USA
CBL-3W-EU	Europe
CBL-3W-IL	Israel
CBL-3W-UK	UK
CBL-3W-AU	Australia / China

Additional 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

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