USB & Ethernet Controlled

Mechanical Switch System

ZT-166

50Ω DC to 18 GHz

Typical Applications

- 5G node / device testing
- Automated test equipment
- Fail-safe / redundancy switching
- Modular switch matrices

Product Overview

ZT-166 is a flexible switch rack, configured with 10 independent mechanical SP4T switches and a single mechanical SPDT switch 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 RF connectors on the front panel.

The front panel switch arrangement makes ZT-166 especially convenient in applications requiring switching between high numbers of ports, up to SP32T (single pole thirty two throws). With the use of Mini-Circuits' low cost Hand-Flex™ interconnect cables, multiple matrix configurations can be easily created by the user.

The switches are controlled via USB or Ethernet, allowing control directly from a PC, or remotely over a network. 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).

Key Features

Feature	Advantages
Flexible mechanical switch options	Mechanical absorptive switches provide high reliability, repeatable high performance and internal terminations of input signals on the disconnected paths
Fast turnaround time	Rapid applications support allows test configurations to be quickly developed without causing production delays.
Rack-mount chassis	4U height 19" rack-chassis suits integration in automated production test environments
USB & Ethernet control	USB HID and Ethernet (HTTP / Telnet) interfaces provide easy compatibility with a wide range of software setups and programming environments

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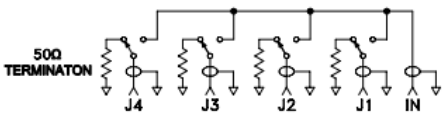
Electrical Specifications @ 25ºC (per SP4T Switch)

Parameter	Conditions	Min	Typ	Max	Units
Frequency Range		DC		18	GHz
Insertion Loss	DC – 8 GHz		0.15	0.30	dB
	8 – 12 GHz		0.20	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 (Cold Switching)[1]	DC – 18 GHz			20	W
Switch Lifetime (per Switch)	100 mW hot switching [2]	10			million cycles
	1W hot switching		1		

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

Switch Configuration:
- Normally open (all ports disconnected)
- Absorptive (internal terminations on ports J1-J4)

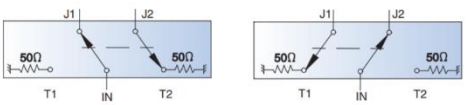


Electrical Specifications @ 25ºC (per SPDT Switch)

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 (Cold Switching)[1]	DC – 18 GHz			20	W
Switch Lifetime (per Switch)	100 mW hot switching [2]	10			million cycles
	1W hot switching		3		

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

Switch Configuration:
- Fail-safe
- Absorptive



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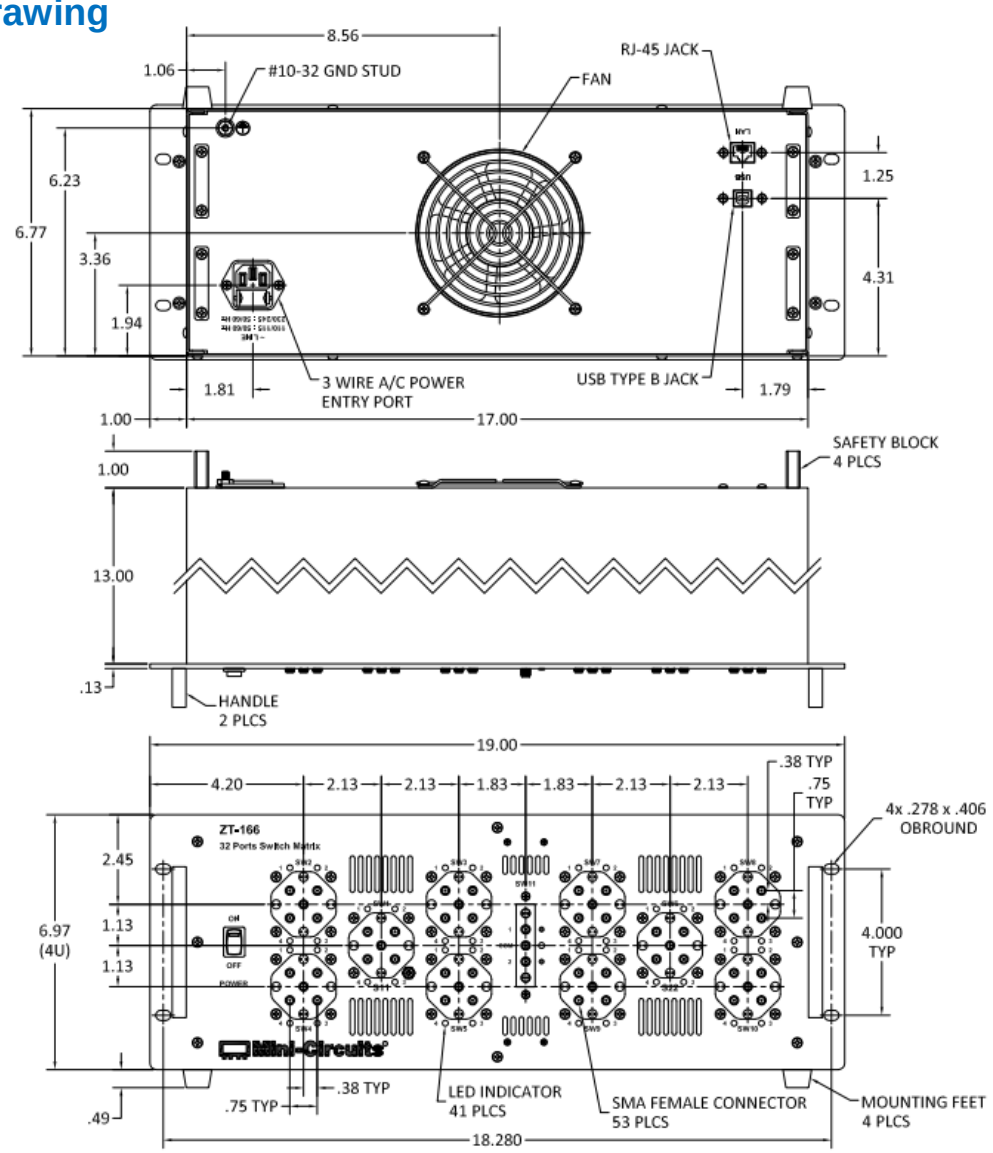
Mechanical / Environmental Specifications

Dimensions	19” (w) x 4U (h) x 13” (d); mounting feet add 0.5” height
Case Material	Aluminum (with protective coatings to prevent corrosion)
Case Drawing	99-01-2023
RF Connectors	SMA female
Front Panel	a) Power ON/OFF switch with indicator light b) All RF ports c) LED switch position indicators
Rear Panel	a) AC mains power input (IEC C14 inlet) b) USB & RJ45 control connections c) Cooling fan vents
Control Interface	USB and Ethernet TCP/IP supporting HTTP and TELNET protocols
Power Supply	AC mains power input (90-260 V, 47-63 Hz) with 2A, 250V fuse rating
Operating Temperature	0° to +50° C

Case Drawing



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Software Specifications

Software & Documentation Download:

- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples can be downloaded free of charge
- Please contact testsolutions@minicircuits.com for support

Minimum System Requirements:

Parameter	Requirements	
Interface	USB HID & Ethernet (HTTP & Telnet)	
System Requirements	GUI	Windows 98 or later
	USB API DLL	Windows 98 or later and programming environment with ActiveX or .NET support
	USB Direct Programming	Linux; Windows 98 or later
	Ethernet	Windows, Linux or Mac computer with a network port and Ethernet TCP / IP support
Hardware	Pentium II or later with 256 MB RAM	

Application Programming Interface (API)

Ethernet Support:
- Simple ASCII / SCPI command set for switch & attenuator control
- Communication via HTTP or Telnet
- Supported by most common programming environments

USB Support (Windows):
- ActiveX COM DLL file for creation of 32-bit programs
- .NET library DLL file for creation of 32 / 64-bit programs
- Supported by most common programming environments (refer to application note AN-49-001 for summary of supported environments)

USB Support (Linux):
- Direct USB programming using a series of USB interrupt codes

Full programming instructions and examples available for a wide range of programming environments / languages.

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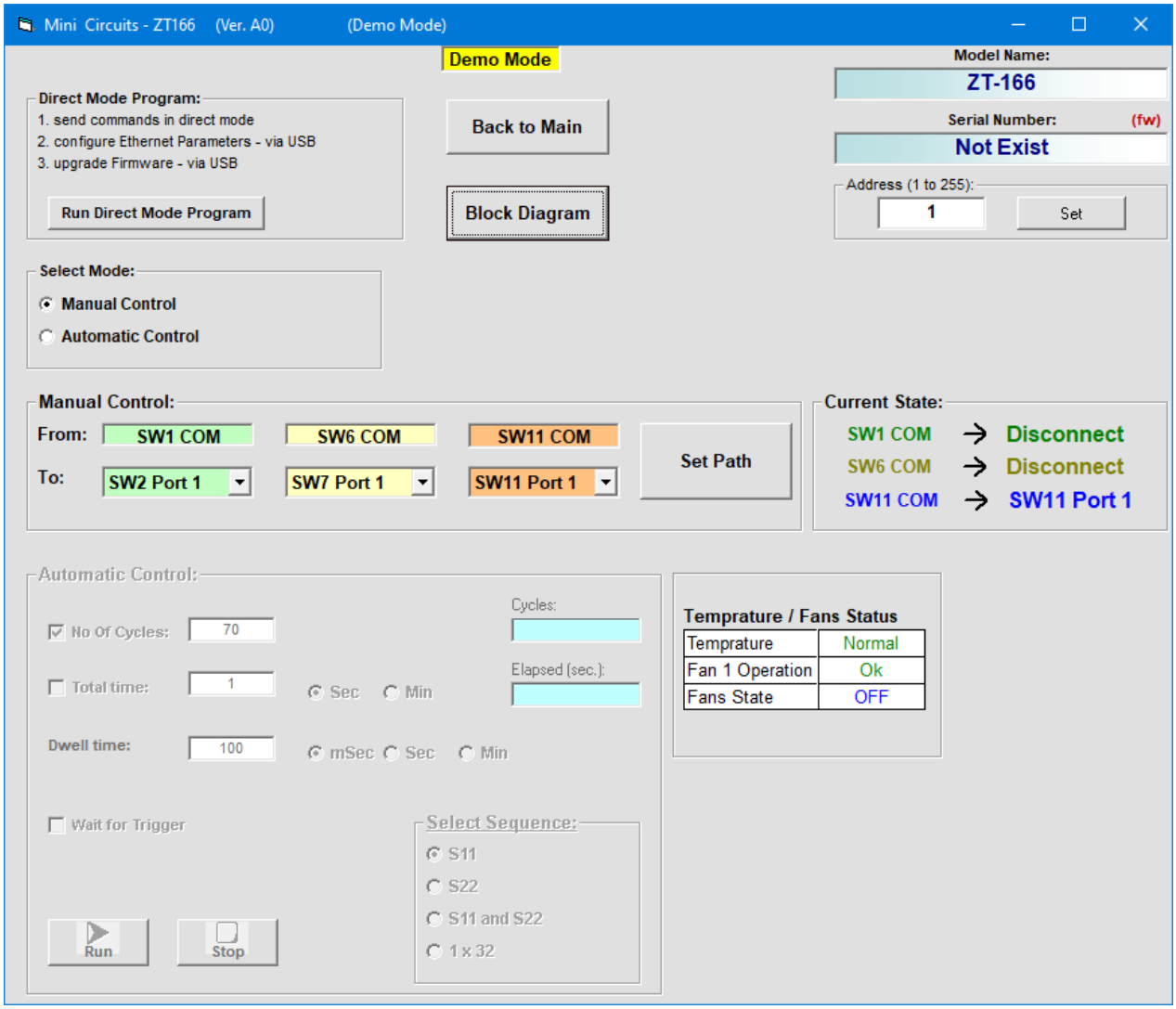
Graphical User Interface (GUI) for Windows - Key Features

- Connect via USB or Ethernet
- Run GUI in demo mode to preview functionality without hardware
- View and set all switch states at the click of a button
- View system status
- Configure user profiles to label switches and control access
- Send programmatic commands
- Configure Ethernet IP settings



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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)
B13-67-11+	2	Rear safety block
B18-DD-125+	4	Pan-head screw

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

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

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