USB & ETHERNET

Mechanical Switch Assembly ZT-2SP16T-18

50Ω DC to 18 GHz 2 x SP16T Rack-Mount SMA Female

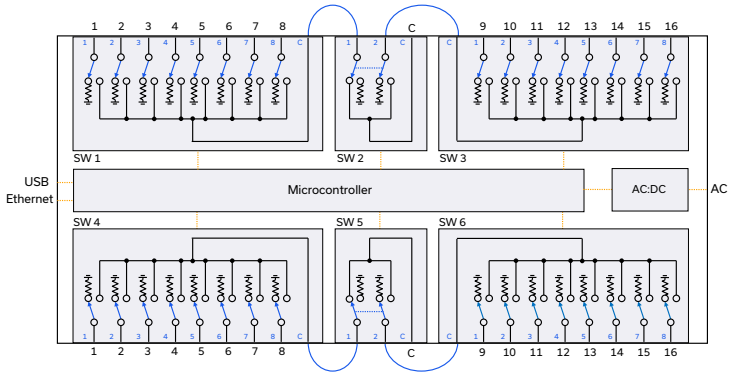
THE BIG DEAL

- Mechanical absorptive switches
- 2 x SPDT + 4 x SP8T or configure into 2 x SP16T
- Ethernet & USB control
- Fail-safe / redundancy switching
- LED switch state indicators
- SSH secure Ethernet communication



Generic photo used for illustration purposes only

FUNCTIONAL BLOCK DIAGRAM



APPLICATIONS

- Benchtop and rack-mounted automated test systems
- 5G FR1, WiFi 6E, UWB, Bluetooth
- Military radio, radar & electronic warfare
- Switch matrices

PRODUCT OVERVIEW

Mini-Circuits' ZT-2SP16T-18 houses 2 x SPDT and 4 x SP8T absorptive electro-mechanical switches. Each switch operates over an extremely wide bandwidth, from DC to 18 GHz with high isolation and low insertion loss. The switches can be conveniently interconnected on the front panel, using Mini-Circuits' 141-3SMR+ conformable cables, to form a pair of SP16T switches.

The switches are housed in a compact, 2U height, 19-inch rack chassis with all SMA (female) RF connectors on the front. LED switch state indicators on the front panel enable visual display of all switch states. The switch assembly can be controlled via USB or Ethernet (supporting SSH, HTTP & Telnet 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.

KEY FEATURES

Feature	Advantages
Mechanical switches	Mechanical absorptive switches provide low loss, high isolation, 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 2U height, 19" rack-mountable chassis suits integration in automated production test environments.
Secure Ethernet communication	Support for SSH (Secure Shell protocol) provides a means for secure communication over Ethernet networks with strict security policies. HTTP & Telnet communication via Ethernet are also supported.

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50Ω DC to 18 GHz 2 x SP16T Rack-Mount SMA Female

ELECTRICAL SPECIFICATIONS AT +25°C (EACH SP16T SWITCH)

Interconnected using 141-3SMR+ cables

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		DC		18	GHz
Insertion Loss	DC – 8 GHz 8 – 12 GHz 12 – 18 GHz		0.45 0.65 0.90		dB
Isolation	DC – 8 GHz 8 – 12 GHz 12 – 18 GHz		90 85 80		dB
Return Loss	DC – 8 GHz 8 – 12 GHz 12 – 18 GHz		20 20 15		dB

ELECTRICAL SPECIFICATIONS AT +25°C (EACH SPDT SWITCH)

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	DC – 8 GHz 8 – 12 GHz 12 – 18 GHz		0.15 0.25 0.30	0.30 0.40 0.50	dB
Isolation	DC – 8 GHz 8 – 12 GHz 12 – 18 GHz	75 70 60	90 80 66		dB
Return Loss	DC – 8 GHz 8 – 12 GHz 12 – 18 GHz		20 20 19		dB
Switching Time	-		25		ms
RF Input Power (Cold switching)	DC-18 GHz Into internal termination [1]			20 1	W
Switch Lifetime	100 mW hot switching [2] 1W hot switching		5 1		million cycles

ELECTRICAL SPECIFICATIONS AT +25°C (EACH SP8T SWITCH)

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	DC – 8 GHz 8 – 18 GHz		0.15 0.35	0.30 0.60	dB
Isolation	DC – 8 GHz 8 – 18 GHz	70 60	80 75		dB
Return Loss	DC – 8 GHz 8 – 18 GHz		20 16		dB
Switching Time	-		25		ms
RF Input Power (Cold switching)	DC – 8 GHz 8 – 18 GHz Into internal termination [1]			20 10 1	W
Switch Lifetime	100 mW hot switching [2] 1W hot switching	2	 1		million cycles

1 Maximum power into any internal termination is 1W per port, 3W total per switch
2 Hot switching power above this level will degrade the switch lifetime

CONTROL INTERFACES

Ethernet Control	Supported Protocols	TCP / IP, SSH, HTTP, Telnet, DHCP, UDP (limited)
	Max Data Rate	100 Mbps (100 Base-T Full Duplex)
USB Control	Supported Protocols	HID – High Speed
	Min Communication Time[3]	400 µs typ

3. Based on the polling interval of the USB HID protocol ((125 us with 1024 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

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):

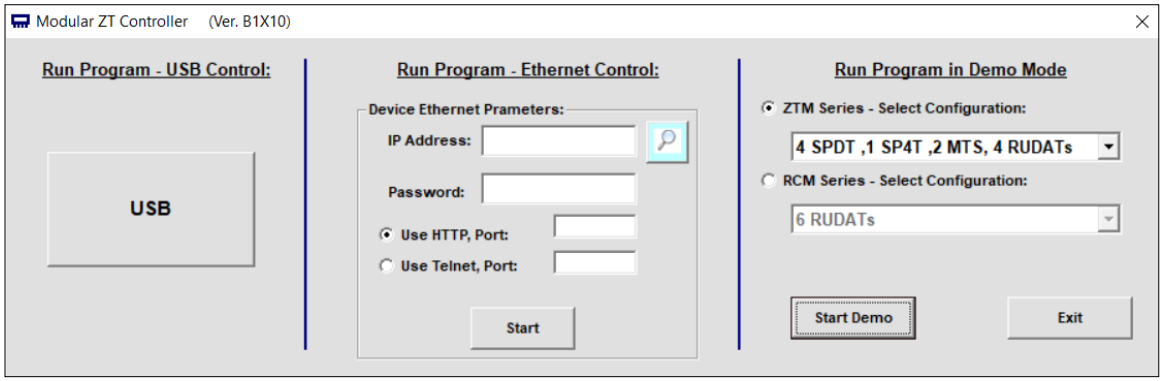
Command / Query	Description
:MN?	Read model name
:SN?	Read serial number
:FIRMWARE?	Read firmware version
:[sw_type]:[sw_label]:STATE:[port]	Set a single switch state: [sw_type] = SPDT or SP8T [sw_label] = 1 to 6 [port] = For SPDT switches: 1 (Com to 1) or 2 (Com to 2) = For SP8T switches: 0 (all ports disconnected) to 8 (Com to 8) Example :SP8T:3:STATE:8 (set switch SP8T switch 3 to state 8)
:[sw_type]:[sw_label]:STATE?	Get a single switch state: [sw_type] = SPDT or SP8T [sw_label] = 1 to 6 Example :SP8T:3:STATE:8 (set switch SP8T switch 3 to state 8)

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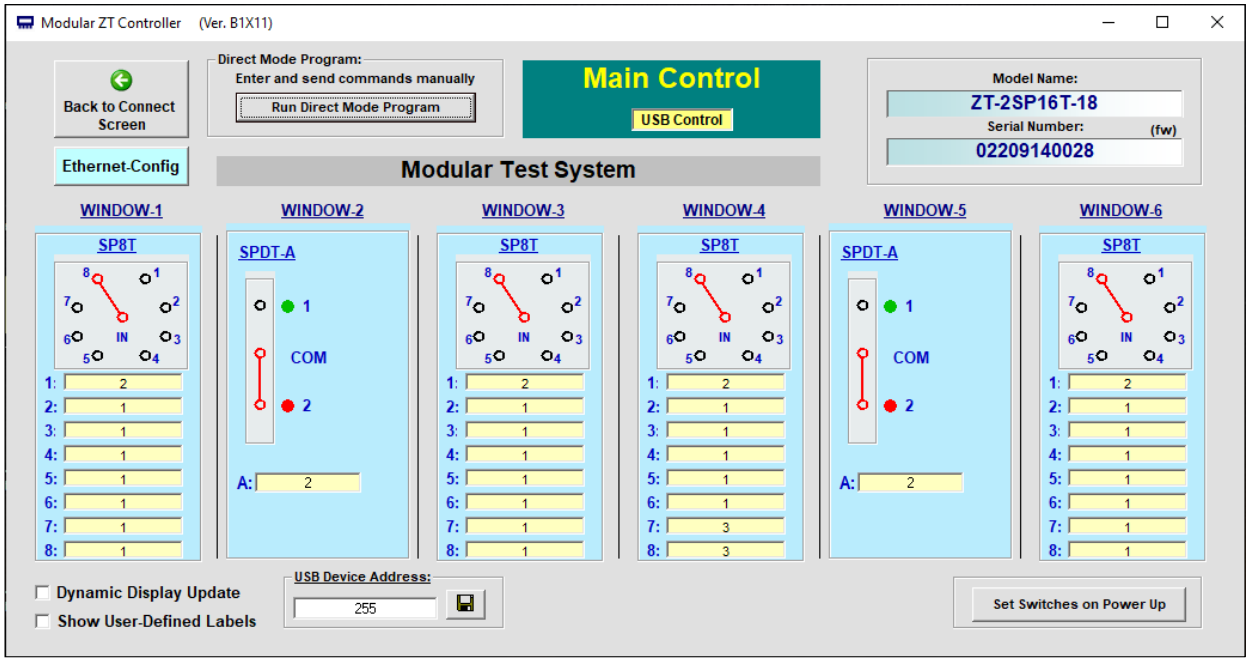
50Ω DC to 18 GHz 2 x SP16T Rack-Mount SMA Female

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
- Set switch power-up states
- Configure Ethernet settings
- Update firmware

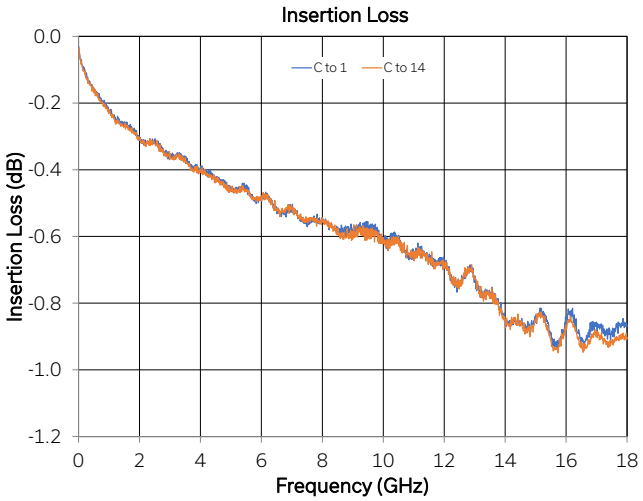


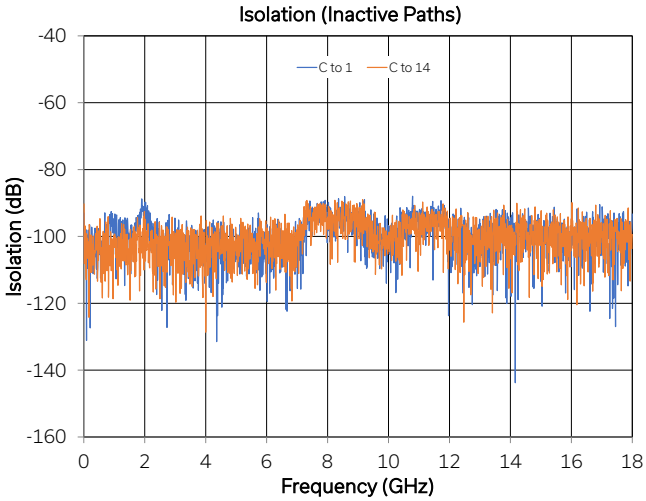
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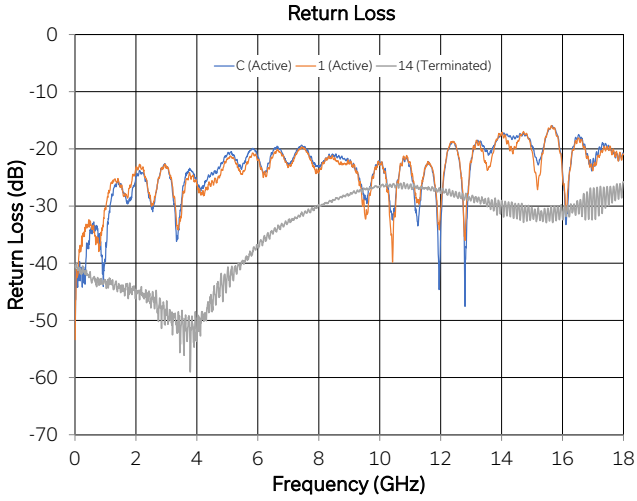
50Ω DC to 18 GHz 2 x SP16T Rack-Mount SMA Female

TYPICAL PERFORMANCE CURVES EACH SP16T SWITCH

Isolation measured between Com and any disconnected port.
Example: "C to 1" is the leakage measured at port 1 when the active switch path is C to 2.







Mechanical Switch Assembly ZT-2SP16T-18

50Ω DC to 18 GHz 2 x SP16T Rack-Mount SMA Female

ABSOLUTE MAXIMUM RATINGS

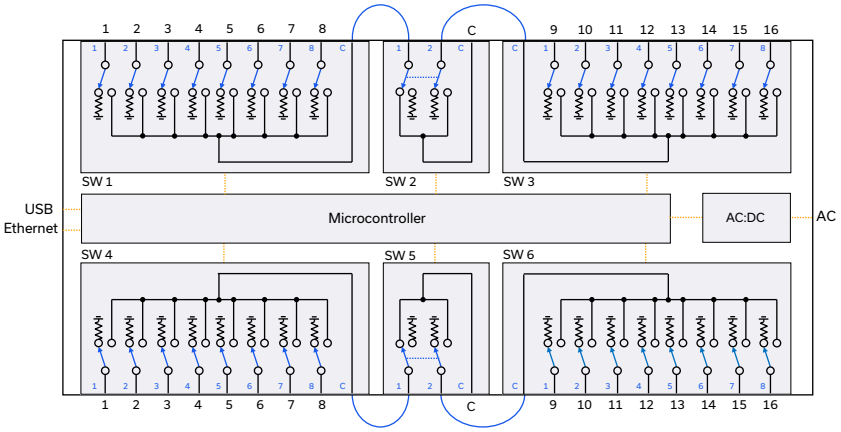
Parameter	Conditions	Limits	Units
Temperature	Operating	0 to +50	°C
	Storage	-20 to +60	
Input Power (No Damage)	Cold switching		W
	Each SPDT (DC-18 GHz)	20	
	Each SP8T (DC-8 GHz)	20	
	Each SP8T (8-18 GHz)	10	
	Hot switching	1	
	Into internal termination	1	

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	150W maximum

FUNCTIONAL BLOCK DIAGRAM



Shown with 4 external cable connections to create 2 x SP16T configuration

CONNECTIONS

Port	Connector
C & 1-2 (each SPDT)	SMA female
C & 1-8 (each SP8T)	SMA female
USB	USB type B
Ethernet / LAN	RJ45
AC Input	IEC C14 inlet

C = Com port
1-8 = input / output ports

SWITCH STATE TABLES

Each SP8T Switch:

Switch Command	Switch State	Switch x LED State							
		LED1	LED2	LED3	LED4	LED5	LED6	LED7	LED8
:SP8T:[x]:STATE:0	All ports disconnected (C open; ports 1-8 terminated)	Off	Off	Off	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:1	C to 1	On	Off	Off	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:2	C to 2	Off	On	Off	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:3	C to 3	Off	Off	On	Off	Off	Off	Off	Off
:SP8T:[x]:STATE:4	C to 4	Off	Off	Off	On	Off	Off	Off	Off
:SP8T:[x]:STATE:5	C to 5	Off	Off	Off	Off	On	Off	Off	Off
:SP8T:[x]:STATE:6	C to 6	Off	Off	Off	Off	Off	On	Off	Off
:SP8T:[x]:STATE:7	C to 7	Off	Off	Off	Off	Off	Off	On	Off
:SP8T:[x]:STATE:8	C to 8	Off	Off	Off	Off	Off	Off	Off	On

Each SPDT switch:

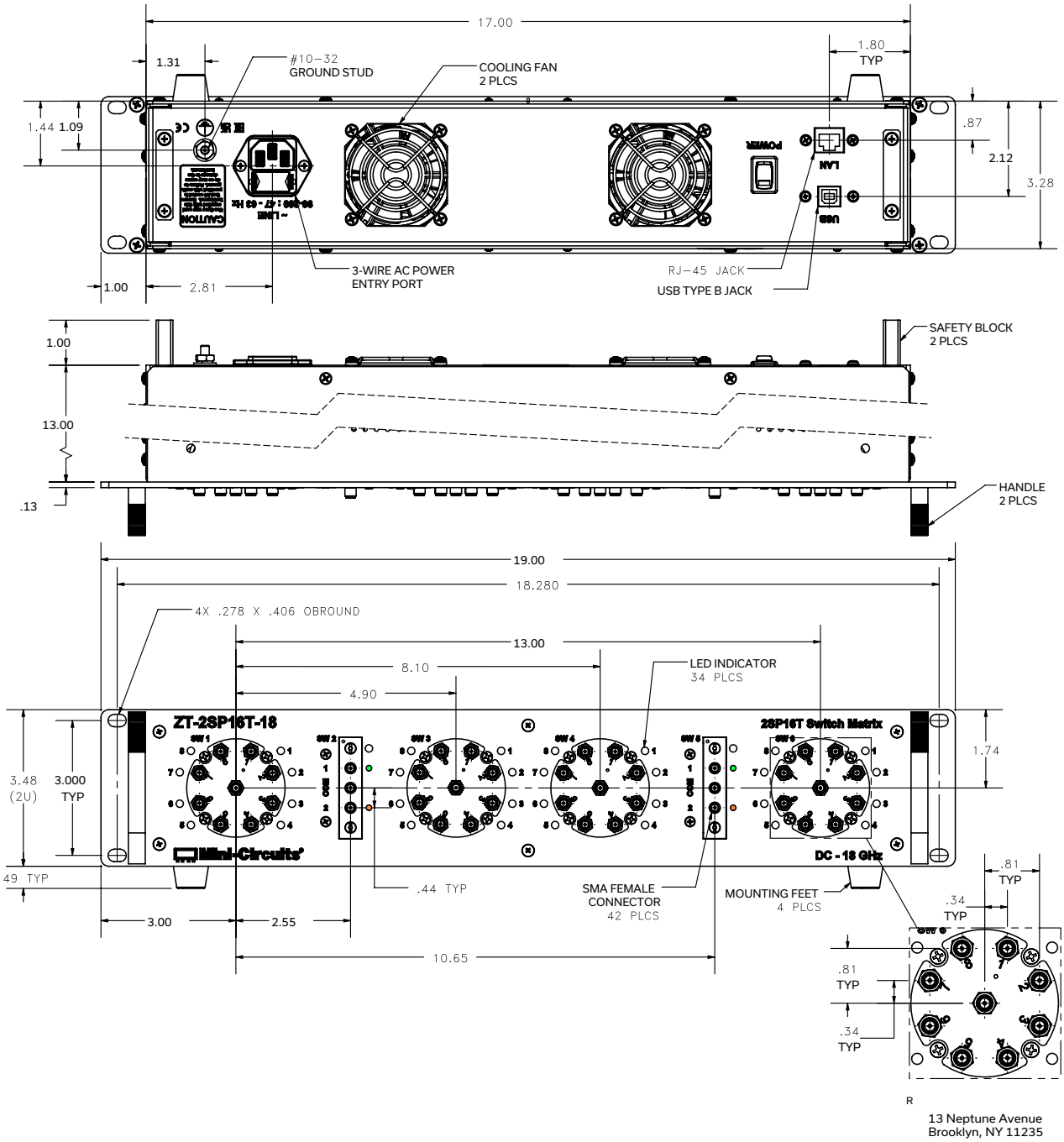
Switch Command	Switch x State	Switch x LED State
:SPDT:[x]:STATE:1	C to 1	Green
:SPDT:[x]:STATE:2	C to 2	Orange

x = switch number

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50Ω DC to 18 GHz 2 x SP16T Rack-Mount SMA Female

CASE STYLE DRAWING



PRODUCT MARKING*

Product Marking: ZT-2SP16T-18
Product Description: 2SP16T Switch Matrix
Product Frequency: DC-18 GHz
Unit ID Label: Serial number and other identification marks
*Marking may contain other features or characters for internal lot control

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DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE CLICK HERE

Case Style	99-01-3313
Software, User Guide & Programming Manual	https://www.minicircuits.com/softwaredownload/ztm_ztm2.html
Environmental Rating	ENV56
Regulatory Compliance	Refer to our website for compliance methodologies and qualifications CE UKCA www.minicircuits.com/quality/environmental_introduction.html

Contact Us: testsolutions@minicircuits.com

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)
	HT-4-SMA	SMA connector wrench (4" length)
	141-3SMR+ (x4)	Hand-flex conformable interconnect cable (3" length, SMA male right-angle connectors)

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

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