



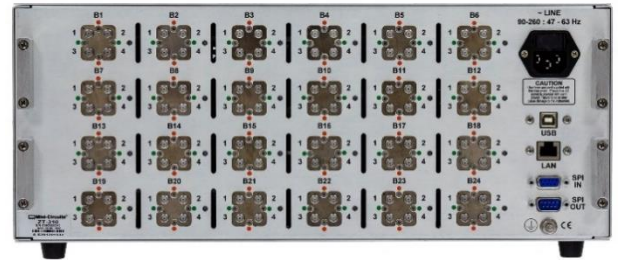
## THE BIG DEAL

- 32 x DPDT / transfer switches
- High reliability mechanical switch construction
- Low loss & high isolation
- GUI & API for automation



## APPLICATIONS

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



## PRODUCT OVERVIEW

ZT-310 is part of Mini-Circuits' flexible series of rack-mounted mechanical switch systems, offering high performance and fast turnaround for automated test setups. This design consists of a 19" rack chassis (4U height) with 32 x high reliability mechanical DPDT / transfer switches, mounted across the front and rear panels.

With the use of Mini-Circuits' low-cost Hand-Flex™ interconnect cables, multiple matrix configurations can be created easily by the user.

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).

## KEY FEATURES

Feature	Advantages
Flexible mechanical switch configurations	Transfer switches provide a simple DPDT switch application (2 input to 2 output switch matrix) and are a useful building block in much larger switch matrices.
Rack-mount chassis	4U height, 19" rack-mountable chassis with RF connections on the front and rear panels, suits integration in automated production test environments.
Fail-safe design	The switches revert to a known default state when the power supply is removed, allowing their use in systems which must continue to operate safely in the event of power failure.
Ethernet & USB control	USB HID and Ethernet (HTTP & Telnet) interfaces ensure compatibility with most software environments and connection requirements.



## MECHANICAL SPECIFICATIONS

<b>Dimensions</b>	19" (W) x 4U (H) x 20" (D)			
<b>Case Drawing</b>	99-01-2927			
<b>Weight</b>	22.2 lbs (10.1 kg)			
<b>Case Material</b>	Aluminum (with protective coating to prevent corrosion)			
<b>RF Connectors</b>	<b>Panel</b>	<b>Connector</b>	<b>Quantity</b>	<b>Port Labels</b>
	Front	SMA female	32	1-4 per switch (A1-A8)
	Rear	SMA female	96	1-4 per switch (B1-B24)
	<b>Front Panel</b>		<b>Rear Panel</b>	
<b>Panel Marking</b>	<ul style="list-style-type: none"> <li>ZT-310</li> <li>32 x Transfer Switch Matrix</li> <li>DC-18 GHz</li> </ul>		<ul style="list-style-type: none"> <li>CE / EAC / UKCA</li> <li>Serial number / date code / model name</li> </ul>	
<b>Panel Items</b>	<ul style="list-style-type: none"> <li>Power on / off switch with LED</li> <li>Carry handles</li> <li>8 x transfer switch with LED position indicators</li> </ul>		<ul style="list-style-type: none"> <li>24 x transfer switch with LED position indicators</li> <li>AC mains power input (IEC C14 inlet)</li> <li>USB type B socket</li> <li>RJ45 (LAN) socket</li> <li>2 x D-sub (9-pin) connectors (SPI In &amp; Out)</li> </ul>	
<b>Power Supply</b>	AC mains power input (90-260 V, 47-63 Hz)			
<b>Fuse</b>	2A, 250V rating			
<b>Power Consumption</b>	180W max			
<b>Temperature</b>	Operating: 0 to +50 °C			

## ELECTRICAL SPECIFICATIONS @ 25°C

Parameter	Conditions	Min	Typ	Max	Units
<b>Frequency Range</b>		DC		18	GHz
<b>Insertion Loss</b>	DC - 1 GHz	-	0.10	0.15	dB
	1 - 8 GHz	-	0.10	0.25	
	8 - 12 GHz	-	0.20	0.36	
	12 - 18 GHz	-	0.25	0.45	
<b>Isolation</b>	DC - 1 GHz	85	100	-	dB
	1 - 8 GHz	75	90	-	
	8 - 12 GHz	70	86	-	
	12 - 18 GHz	60	76	-	
<b>VSWR</b>	DC - 1 GHz	-	1.05	-	:1
	1 - 8 GHz	-	1.15	-	
	8 - 12 GHz	-	1.15	-	
	12 - 18 GHz	-	1.15	-	
<b>Switching Time</b>		-	25	-	ms
<b>RF Input Power<sup>1</sup></b>	Cold switching	-	-	10	W
<b>Switch Lifetime</b>	<0.1W hot switching <sup>2</sup>	10	-	-	million cycles
	0.1 - 1W hot switching	-	3	-	

1. Maximum power for cold switching is 10W per path, 20W total, with all ports terminate into 50Ω

2. Hot switching power above this level will degrade the switch lifetime



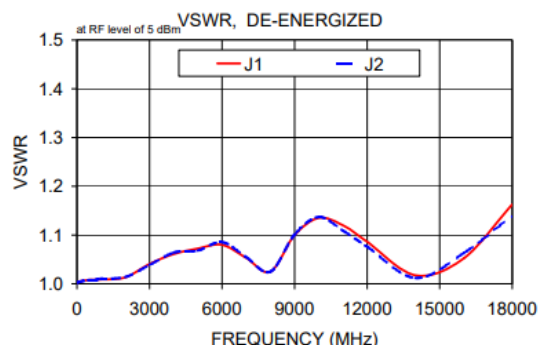
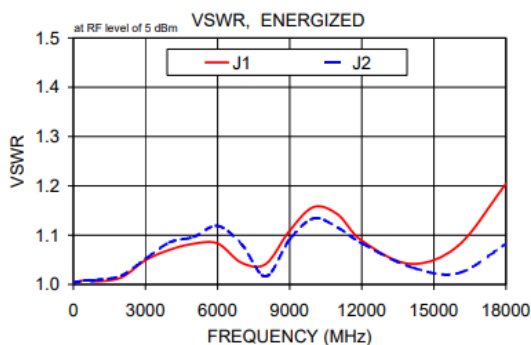
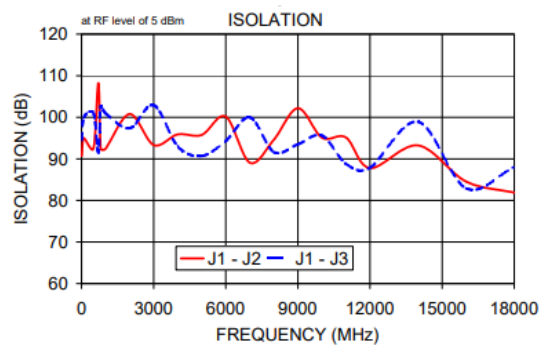
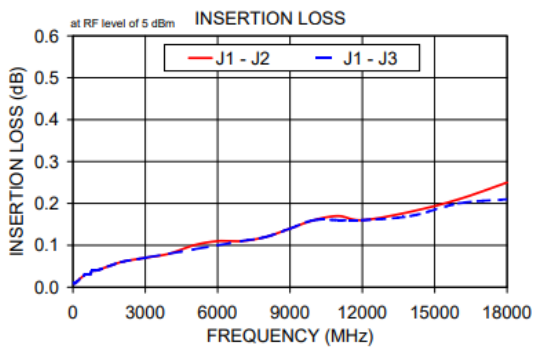
## SWITCHING CONFIGURATION (PER SWITCH)

- Fail-safe
- DPDT / transfer



## TYPICAL PERFORMANCE DATA

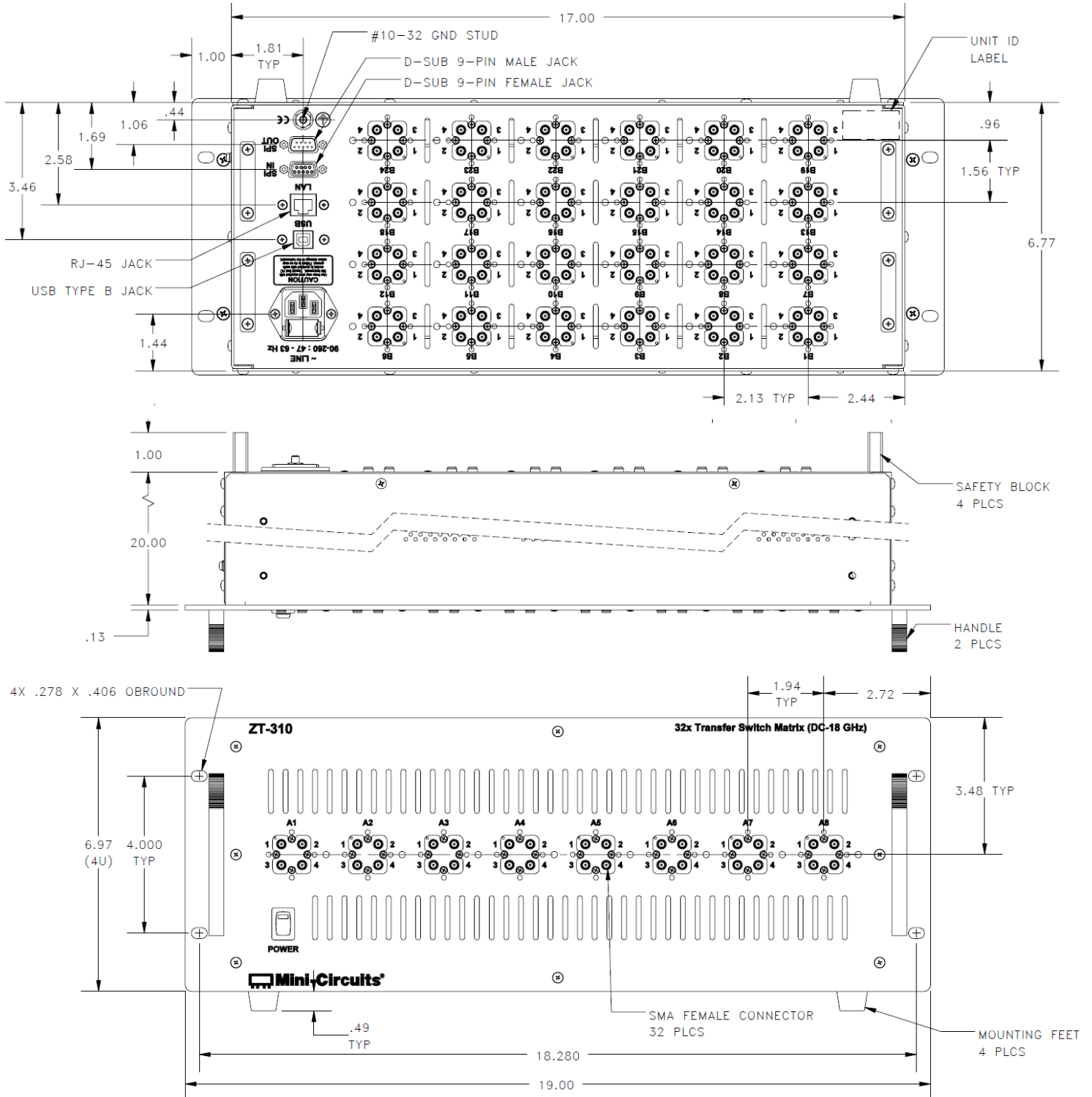
FREQ. (MHz)	ON INSERTION LOSS (dB)		OFF ISOLATION (dB)		VSWR (:1)			
	J1-J2	J1-J3	J1-J2	J1-J3	State 2		State 1	
					J1	J2	J1	J2
10.00	0.01	0.01	90.66	94.50	1.00	1.00	1.00	1.00
100.00	0.01	0.01	94.93	100.05	1.00	1.00	1.00	1.00
500.00	0.03	0.03	92.59	100.93	1.01	1.01	1.01	1.01
700.00	0.03	0.03	108.21	91.48	1.01	1.01	1.01	1.01
800.00	0.04	0.04	92.52	102.45	1.01	1.01	1.01	1.01
1000.00	0.04	0.04	92.45	100.96	1.01	1.01	1.01	1.01
2000.00	0.06	0.06	100.79	97.34	1.01	1.02	1.01	1.01
3000.00	0.07	0.07	93.32	102.92	1.05	1.05	1.04	1.04
4000.00	0.08	0.08	95.89	93.03	1.07	1.09	1.06	1.06
5000.00	0.10	0.09	95.75	90.70	1.08	1.10	1.07	1.07
6000.00	0.11	0.10	100.15	94.32	1.08	1.12	1.08	1.09
7000.00	0.11	0.11	89.08	99.96	1.04	1.08	1.05	1.05
8000.00	0.12	0.12	94.59	91.64	1.04	1.02	1.02	1.02
9000.00	0.14	0.14	102.19	93.50	1.11	1.09	1.10	1.10
10000.00	0.16	0.16	95.10	95.63	1.16	1.13	1.14	1.14
11000.00	0.17	0.16	95.14	88.79	1.14	1.12	1.12	1.11
12000.00	0.16	0.16	87.77	87.85	1.09	1.08	1.09	1.08
14000.00	0.18	0.17	93.24	98.95	1.04	1.04	1.02	1.01
16000.00	0.21	0.20	84.54	82.94	1.08	1.02	1.05	1.06
18000.00	0.25	0.21	81.87	88.03	1.20	1.08	1.16	1.14





# Mechanical Switch System

## OUTLINE DRAWING





## SOFTWARE SPECIFICATIONS

Please contact [testsolutions@minicircuits.com](mailto:testsolutions@minicircuits.com) for support

<b>Ethernet Control</b>	<b>Supported Protocols</b>	TCP / IP, HTTP, Telnet, DHCP, UDP
	<b>Max Data Rate</b>	10 Mbps (10Base-T Half Duplex)
<b>USB Control</b>	<b>Supported Protocols</b>	HID - Full Speed
	<b>Min Communication Time</b>	3 ms typ
<b>Software Support</b>	<ul style="list-style-type: none"> <li>• Mini-Circuits' Universal GUI for USB &amp; LAN control (Windows only)</li> <li>• ASCII / SCPI command syntax for LAN programming (all OS)</li> <li>• ActiveX / .Net DLL APIs for USB programming (Windows only)</li> <li>• Interrupt codes for direct USB programming (all OS)</li> <li>• Full programming instructions and examples for a wide range of languages</li> </ul>	

## 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
:MTS:sw_number:STATE:port	Set a single switch state: <ul style="list-style-type: none"> <li>• sw_number = 1 to 32</li> <li>• port = the switch state to set</li> <li>• Example: :MTS:1:STATE:2</li> </ul>
:Csw_number=port	Short-hand to set a single switch state: <ul style="list-style-type: none"> <li>• sw_number = 1 to n</li> <li>• port = the switch state to set</li> <li>• Example: C1=2</li> </ul>
:MTS:sw_number:STATE?	Get the state of a single switch: <ul style="list-style-type: none"> <li>• sw_number = 1 to n</li> <li>• Example: :MTS:1:STATE?</li> </ul>



## 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
- Configure Ethernet settings
- Upgrade firmware
- Send SCPI commands

The screenshot displays the Mini-Circuits ZT-310 GUI. The interface is titled "Main Control" and includes several functional areas:

- Set Path:** Includes fields for Model Name (ZT-310) and Serial Number (01903200010 - USB), along with Protocol (USB), IP, and Password fields. It also features buttons for "Show Command", "Save to Quick Set Button", and "SEND".
- Quick-Set Buttons:** A grid of 20 buttons labeled EMPTY1 through EMPTY20, organized into five tabs (TAB1 to TAB5). Includes "Modify Buttons", "Load Config", and "Clear All" options.
- Manual Commands:** A section for entering commands, with dropdowns for "Switch Commands", "Switch States", "Switch Counters", and "Additional Commands". It includes a "Command" input field and a "SEND" button.
- Command History:** A scrollable area to view previously sent commands.
- Switch Status Table:** A table on the right side of the window showing the status of 28 switches.

Switch	State	Count
1	2	26
2	2	23
3	1	15
4	2	16
5	2	18
6	2	16
7	2	14
8	2	13
9	1	4
10	2	12
11	1	10
12	1	13
13	1	9
14	1	6
15	2	12
16	1	6
17	1	5
18	1	6
19	1	9
20	2	17
21	1	2
22	1	3
23	1	3
24	1	3
25	1	3
26	1	2
27	1	2
28	1	2



## ORDERING INFORMATION

Please contact Mini-Circuits' Test Solutions department for price and availability:

[testsolutions@minicircuits.com](mailto: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

Revision	Updates	Date	Creator	Reviewer
1	Initial web release	11-Aug-20	LW	WT
2	Updated panel image and datasheet format	18-Jul-22	LW	WT

### 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](http://www.minicircuits.com/MCLStore/terms.jsp)