Blocking Switch Matrix

ZT-12X12B

Mini-Circuits®

50 Ω   600 to 6000 MHz   12 x 12   Rack-Mount   SMA Female

THE BIG DEAL

• Bi-directional, 12 x 12 blocking switch matrix
• One-to-one switch paths
• Low insertion loss between connected ports
• High isolation between disconnected ports
• SSH secure Ethernet communication
• Daisy-chain control of multiple switch racks
• Convenient rack-mountable chassis

APPLICATIONS

• High throughput production testing
• RF test automation & signal routing
• 5G FR1, Bluetooth & WiFi device testing
• MIMO antenna testing

Front View

Back View

Generic photo used for illustration purposes only

PRODUCT OVERVIEW

Mini-Circuits' ZT-12X12B is a high-performance, 12 by 12 blocking switch matrix, operating over a wide bandwidth from 600 MHz to 6 GHz. The system is integrated into a compact, 4U height, 19-inch rack-mountable chassis with 12 RF ports (A1 to A12) on the front panel and 12 RF ports (B1 to B12) on the rear, all SMA female.

The blocking configuration supports 12 active switch paths at any time, with each of the 12 "A" ports able to connect to any of the 12 "B" ports in a one-to-one arrangement. The matrix is bi-directional so the "A" and "B" ports can be used interchangeably as both inputs and outputs.

The switch matrix can be controlled via USB or Ethernet (supporting SSH, 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.

The daisy-chain control interface further simplifies control integration by allowing multiple switch racks to be interconnected via their respective serial in and out connections. The complete set of daisy-chained matrices can then be independently controlled through a single USB / Ethernet connection.

KEY FEATURES

Feature	Advantages
High port count	Bi-directional operation between 12 input and 12 output ports facilitates a wide range of switching applications with integration of a large number of test systems and devices.
Blocking matrix	One-to-one switch paths with low loss when connected and high isolation when disconnected; minimizing the impact of the matrix itself on sensitive RF test results.
Daisy-chain control	Control multiple switch racks through a single USB or Ethernet connection, simplifying control systems and switch automation.
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.
Rack-mount chassis	Compact 4U height, 19" rack-mountable chassis suits integration in automated production test environments.

Mini-Circuits®

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Blocking Switch Matrix   **ZT-12X12B**

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ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		600		6000	MHz
Insertion Loss	600 – 3000 MHz		9	12	dB
	3000 – 6000 MHz		12	15	
Isolation (Inactive Paths)[1]	600 – 3000 MHz	65	80		dB
	3000 – 6000 MHz	55	70		
Isolation (Adjacent Ports)[2]	600 – 3000 MHz	65	80		dB
	3000 – 6000 MHz	55	70		
Return Loss[3]	600 – 6000 MHz		12		dB
RF Input Power	Cold switching			+27	dBm
	Hot switching			+17	
	Into internal terminations			+17	

1. Isolation from input to output on a disconnected switch path. Example: A1 to B1 isolation is the leakage measured at B1 when A1 is connected to B2.
2. Isolation between any pair of A or B ports. Example: Isolation measured from B1 to B2.
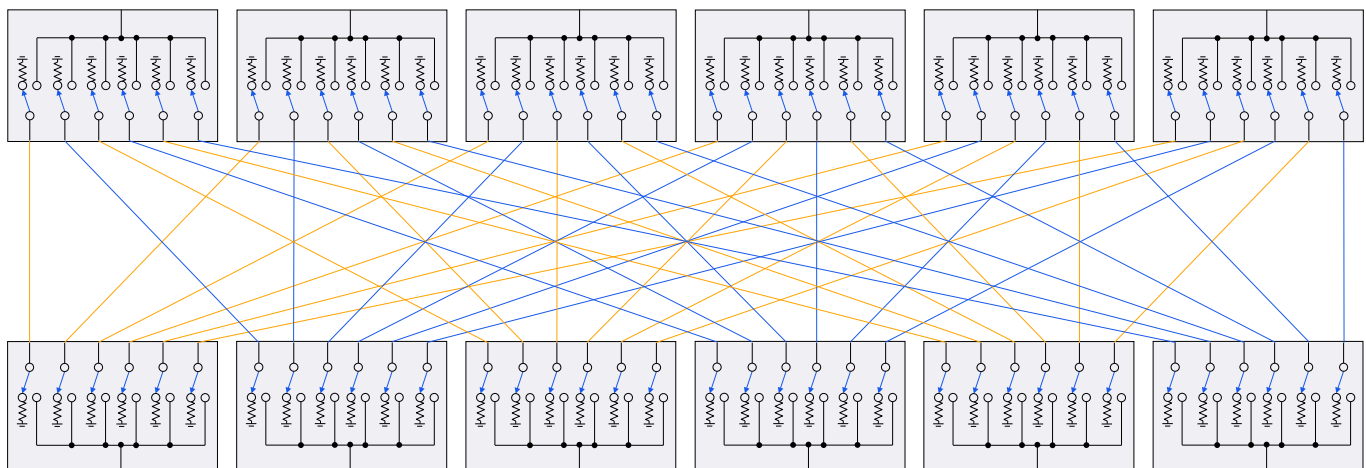3. Return loss into all ports in all states

FUNCTIONAL BLOCK DIAGRAM
Complete System

6x6 Module

Blocking Switch Matrix ZT-12X12B
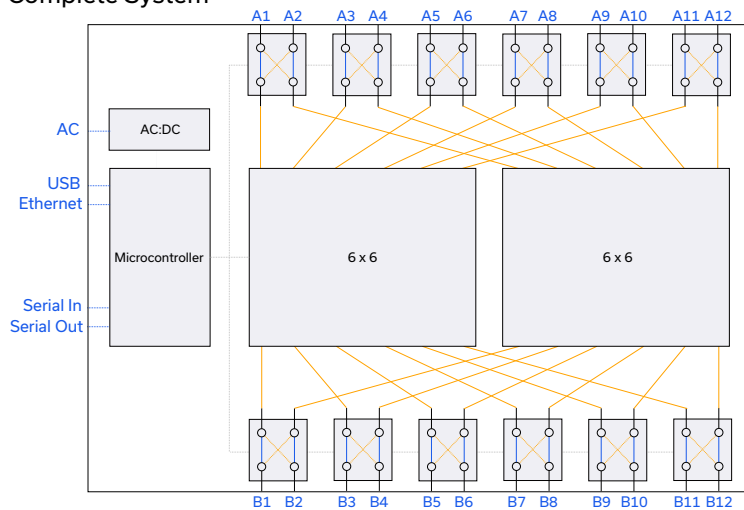
50 Ω   600 to 6000 MHz   12 x 12   Rack-Mount   SMA Female

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[1]	400 μs typ
Daisy-Chain	Supported Protocols	Mini-Circuits proprietary
	Requirements	Additional ZT-12X12B switch racks with one unit to be controlled using USB or Ethernet

1. Based on the polling interval of the USB HID protocol 125 μs 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 that 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 that 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):

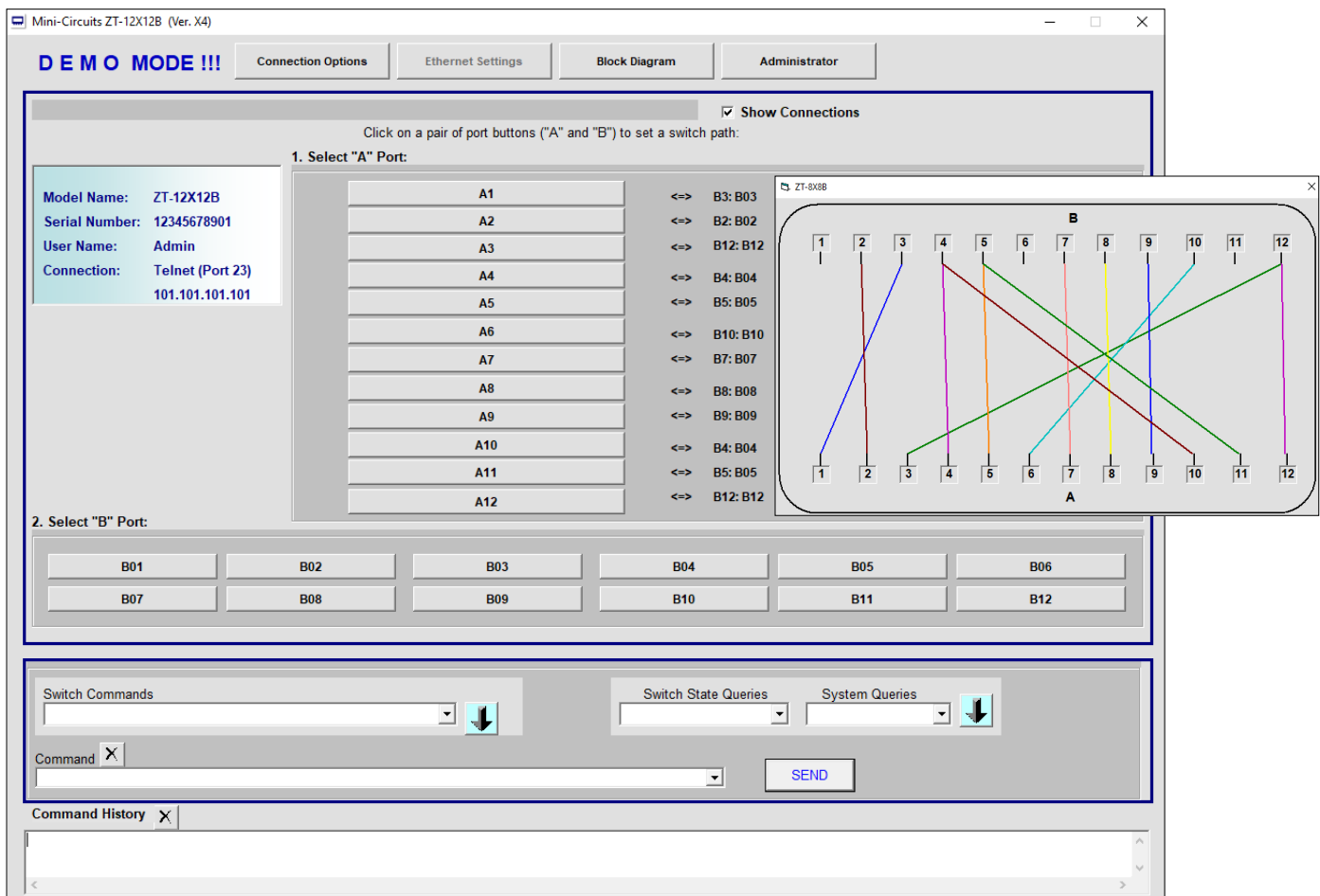| Command / Query	Description
:MN?	Read model name
:SN?	Read serial number
:FIRMWARE?	Read firmware version
:[address]:PATH:[A_port]:[B_port]	Set a single switch state: • [address] = Address of the ZT-12X12B units when multiple units are daisy-chained (00 to nn) – Can be omitted for a single unit • [A_port] = The "A" port name to connect (A1 to A12) • [B_port] = The "B" port name to connect (B1 to B12) • Example :PATH:A1:B12
:[address]:PATH:[input_port]?	Get the "output" port connected to the specified "input port": • [address] = Address of the ZT-12X12B units when multiple units are daisy-chained (00 to nn) – Can be omitted for a single unit • [input_port] = The "A" or "B" port name to check (A1 to A12 or B1 to B12) • Example :PATH:B12:?

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GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS

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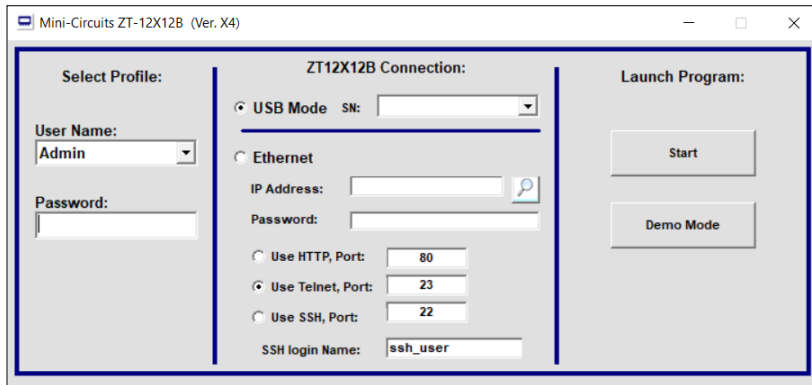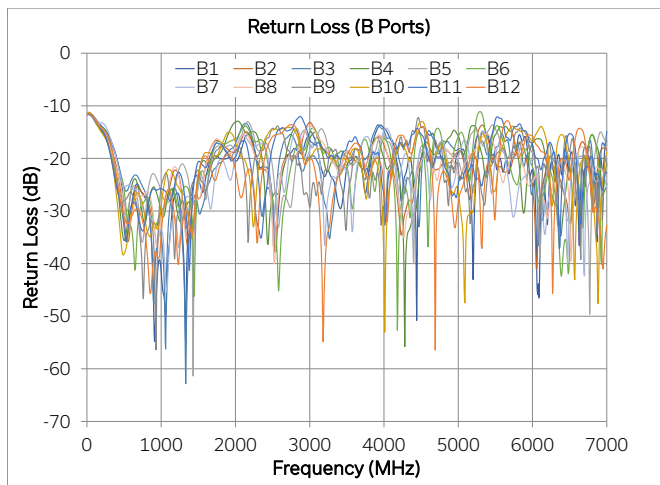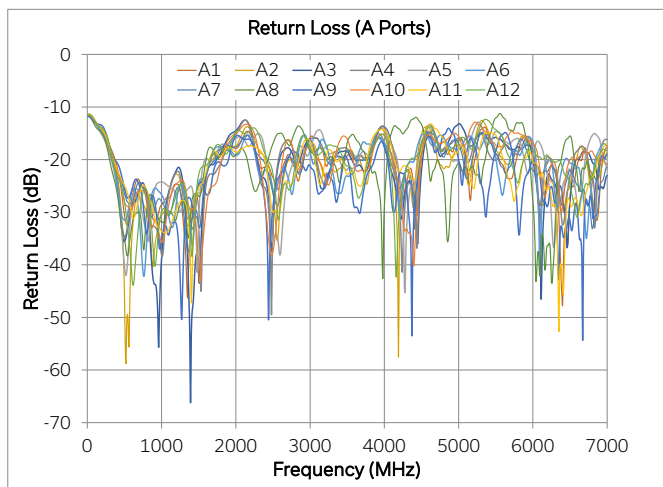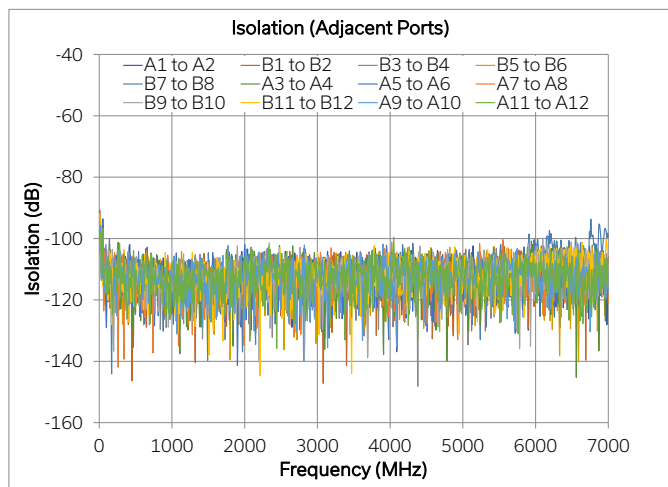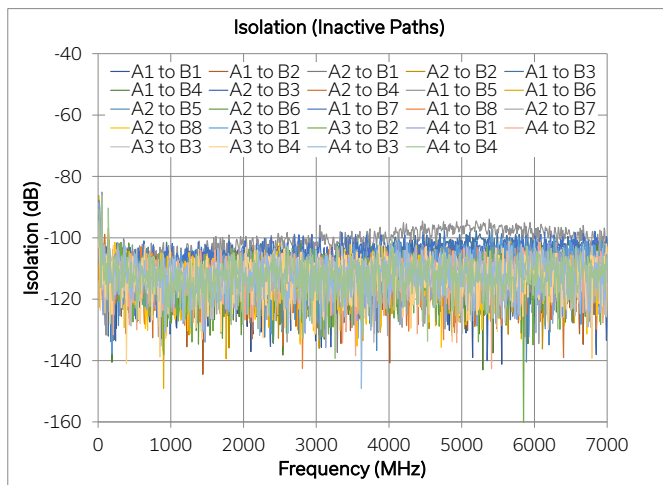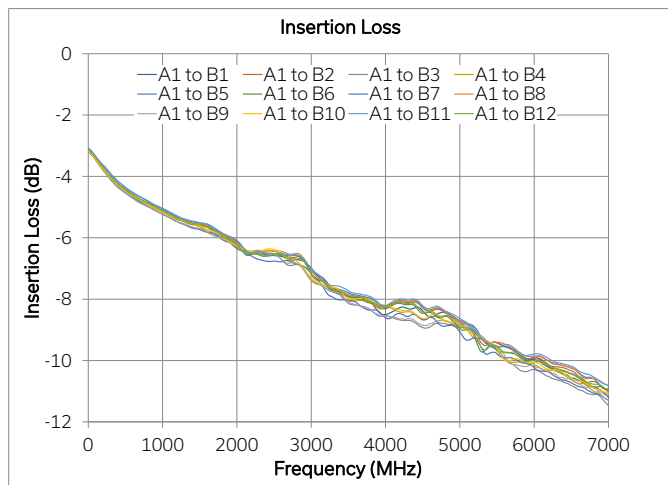

- View and set all switch paths at the click of a button
- Configure automated switching sequences
- Define custom switch and port labels
- Configure Ethernet settings
- Update firmware

TYPICAL PERFORMANCE GRAPHS

Insertion Loss

Isolation (Inactive Paths)

Isolation (Adjacent Ports)

Return Loss (A Ports)

Return Loss (B Ports)

ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Limits	Units
Temperature	Operating	0 to +50	°C
	Storage	-20 to +60	
Input Power (No Damage)	Cold switching	+27	dBm
	Hot switching	+17	
	Into internal termination	+17	

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

CONNECTIONS

Port	Connector
A1-A12 & B1-B12	SMA female
USB	USB type B
Ethernet / LAN	RJ45
Serial In & Serial Out	D-sub 9-pin
AC Input	IEC C14 inlet

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CASE STYLE DRAWING
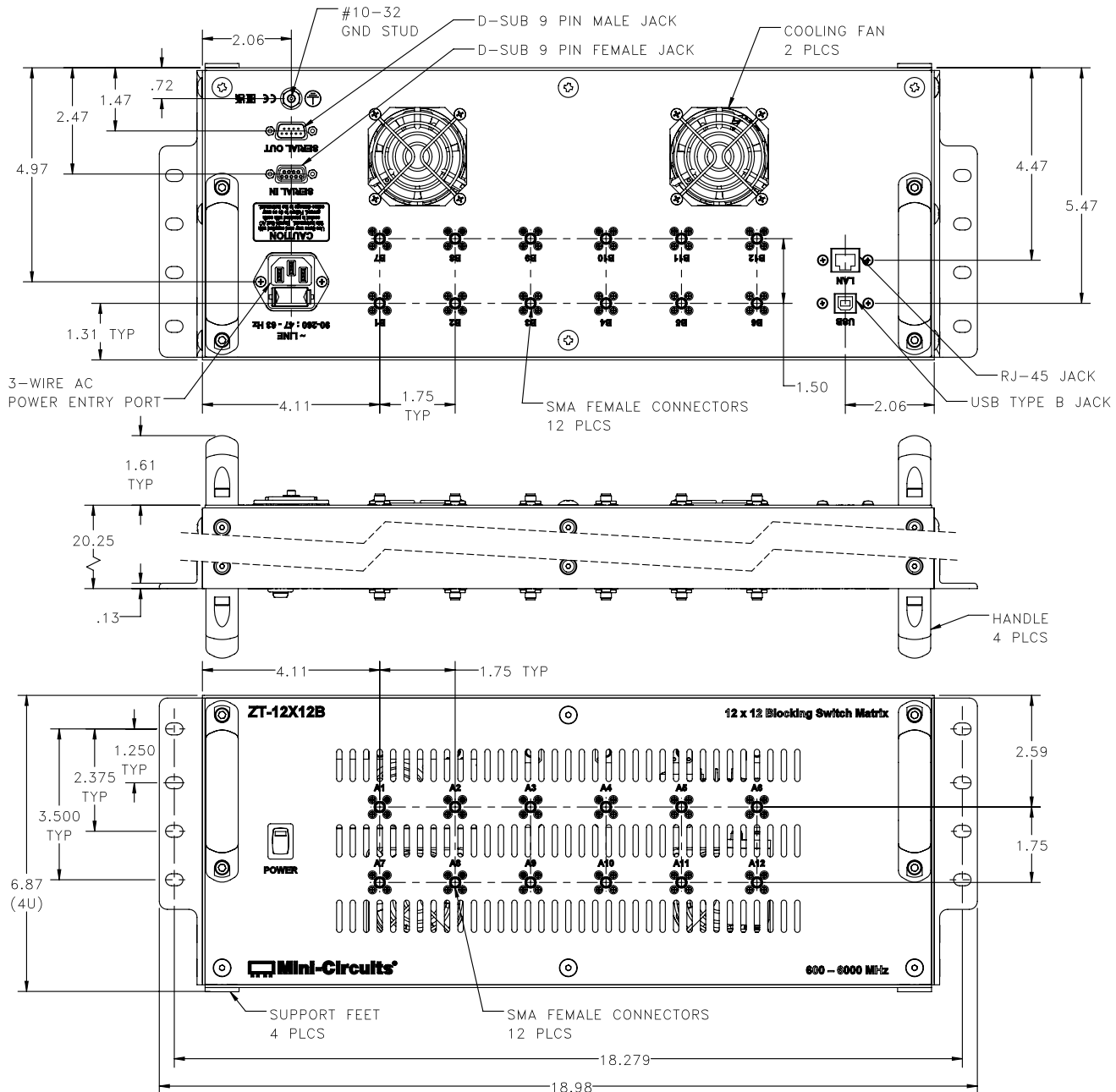
PRODUCT MARKING*

Product Marking: ZT-12X12B
Product Description: 12 x 12 Blocking Switch Matrix
Product Frequency: 600 – 6000 MHz
Unit ID Label: Serial number and other identification marks
*Marking may contain other features or characters for internal lot control

DETAILED MODEL INFORMATION IS AVAILABLE ON OUR WEBSITE **CLICK HERE**

Case Style	99-01-3310
Software, User Guide & Programming Manual	www.minicircuits.com/softwaredownload/zt/MCL_ZT12X12B_Setup_X4.zip
Environmental Rating	ENV55
Regulatory Compliance	Refer to our website for compliance methodologies and qualifications $\quad$ CE $\quad$ UK CA $\quad\quad$ www.minicircuits.com/quality/environmental_introduction.html

Contact Us: testsolutions@minicircuits.com

Included Accessories	Part Number	Description
	USB-CBL-AB-7+	USB cable (6.8ft) type A to type B
	CBL-RJ45-MM-5+	Ethernet cable (5 ft)
	D-SUB9-MF-6+	Serial daisy-chain control cable (6") with D-sub 9-pin connectors
	HT-4-SMA	SMA connector wrench (4" length)
	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.

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

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-0° to 40° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-15° to 85° C Ambient Environment	Individual Model Data Sheet
Operating and Storage Humidity	5% to 85% RH (non-condensing)	Ambient
Bench Handling Test	Bench Top Tip 45° & Drop	MIL-PRF-28800F
Transit Drop Test	Free Fall Drop, 20 cm (7.9 inches)	MIL-PRF-28800F Class 3