USB & ETHERNET

Mesh Network Emulator ZTMN-0695D-T

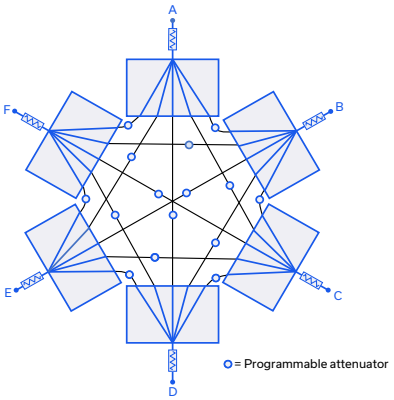
50Ω 10 to 800 MHz 6-Port 0-95 dB Rack-Mount TNC Female

THE BIG DEAL

- 6 fully interconnected test ports (15 internal paths)
- 95 dB programmable attenuation
- High input power, 5W per port
- Configure automated sweep / hop / fading sequences
- Ethernet & USB control

Generic photo used for illustration purposes only

FUNCTIONAL BLOCK DIAGRAM



APPLICATIONS

- Production, R&D, qualification testing
- Military VHF radio
- PMR (private mobile radio)
- Test & measurement systems

PRODUCT OVERVIEW

Mini-Circuits' ZTMN series mesh network emulators are multi-port test systems with independently variable attenuation on each internal path. This concept allows simulation of a "real-world" mesh communication network within the confined space of a test environment. Path loss can be varied independently between any pair of devices on the network without affecting any other combination of devices, allowing simulation of a complex range of test cases.

ZTMN-0695D-T is a 6-port mesh covering the 10 to 800 MHz band, with 5W input power rating per port and 0 to 95 dB attenuation range on each of the 15 internal paths. The model is housed in a compact, 2U height, 19-inch rack chassis with all RF connectors on the front panel. The ZTMN series also supports larger mesh network combinations, custom attenuation and frequency ranges available on request.

The system can be controlled via USB or Ethernet (supporting SSH, HTTP & Telnet protocols), allowing local 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.

KEY FEATURES

Feature	Advantages
Wide attenuation range	Independently controllable 0-95 dB attenuators on each path allow simulation of a wide range of test scenarios including receiver sensitivity, device / base-station handovers, device failures, and interference effects.
High input power	5W input power rating on each port supports direct connection to high power radio transmissions.
Rack-mount chassis	Compact 2U height, 19" rack-mountable chassis suits integration in automated production test environments.
Ethernet & USB control	USB HID and Ethernet (SSH / HTTP / Telnet) interfaces ensure compatibility with most software environments and connection requirements.

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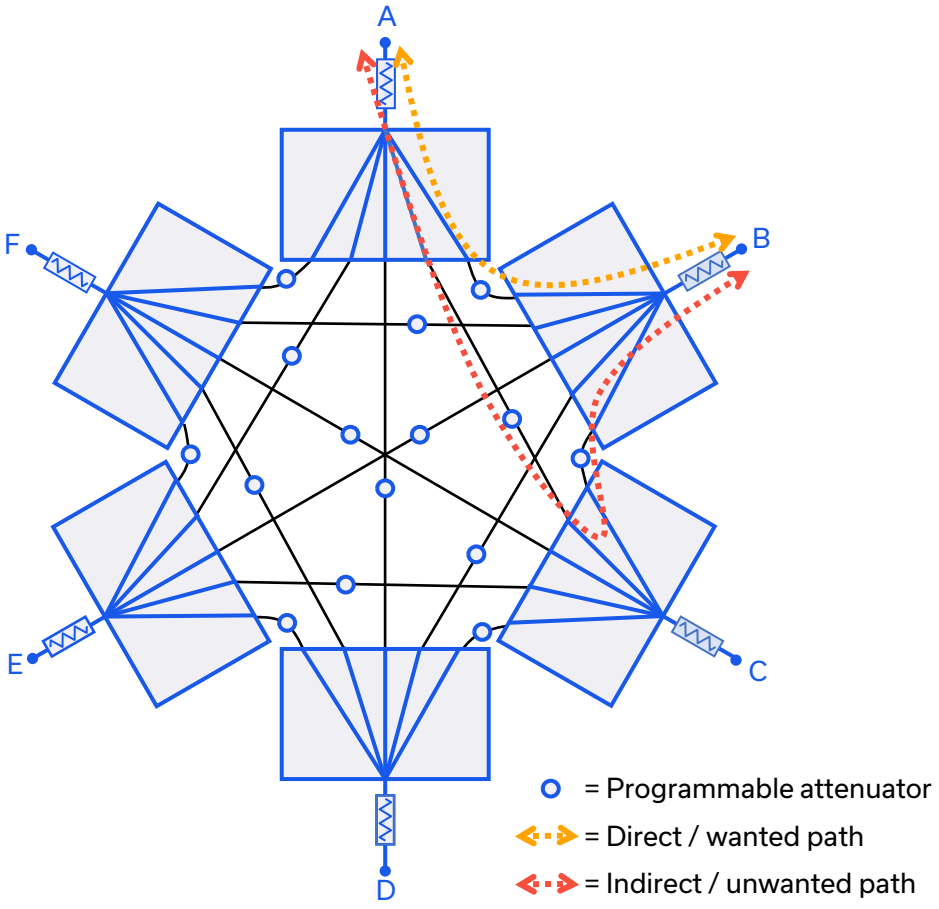
ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range	-	10	-	800	MHz
Insertion Loss	10 - 500 MHz 500 – 800 MHz		38 40	41 43	dB
Isolation	Indirect path[2,4] Direct path[3]	60 95	70 110	- -	dB
Return Loss	-		25	-	dB
Attenuation Range	0.25 dB steps 0.5 dB steps	0 90	90 95	- -	dB
Attenuation Steps	Nominal		0.25	-	dB
Input Power	-		-	5	W

1. Path loss on the direct path between 2 ports when the attenuator in path is at 0 dB.
2. Path loss on the indirect / unwanted path between 2 ports with the 2 attenuators in path at 0 dB and all others at 95 dB (limited by the isolation characteristic of the internal splitter combiner component).
3. Path loss on the direct path between 2 ports with all attenuators at 95 dB.
4. It is recommended to set all attenuators to max attenuation initially due to the isolation effects described in note 2, then reduce the attenuation on specific paths as required by the test configuration.

FUNCTIONAL BLOCK DIAGRAM



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[5]	400 µs typ

5. 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 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
:[address]:[channels]:SETATT:[value]	Set attenuation • [address] = Address of the attenuator module (refer to the Attenuator Path Map table) • [channels] = Channel number (1 to 4) within the 4-channel attenuator module. Multiple channels can be listed in a string, separated by colon (":"). • [value] = Attenuation value to set (from 0 to 95 dB) • Example 01:CHAN:1:2:3:SETATT:10.25
:[address]:[channels]:ATT?	Return a single attenuator value: • [address] = Address of the 4-channel attenuator module (refer to the Attenuator Path Map table) • [channels] = Channel number (1 to 4) within the 4-channel attenuator module • Example 01:CHAN:1:ATT?

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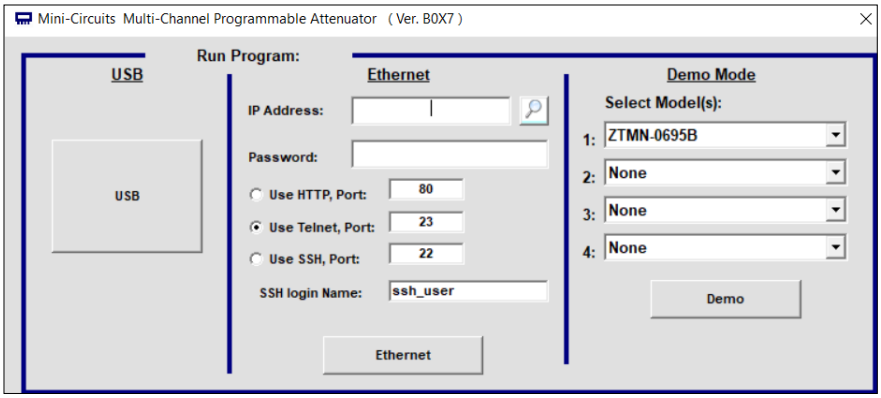
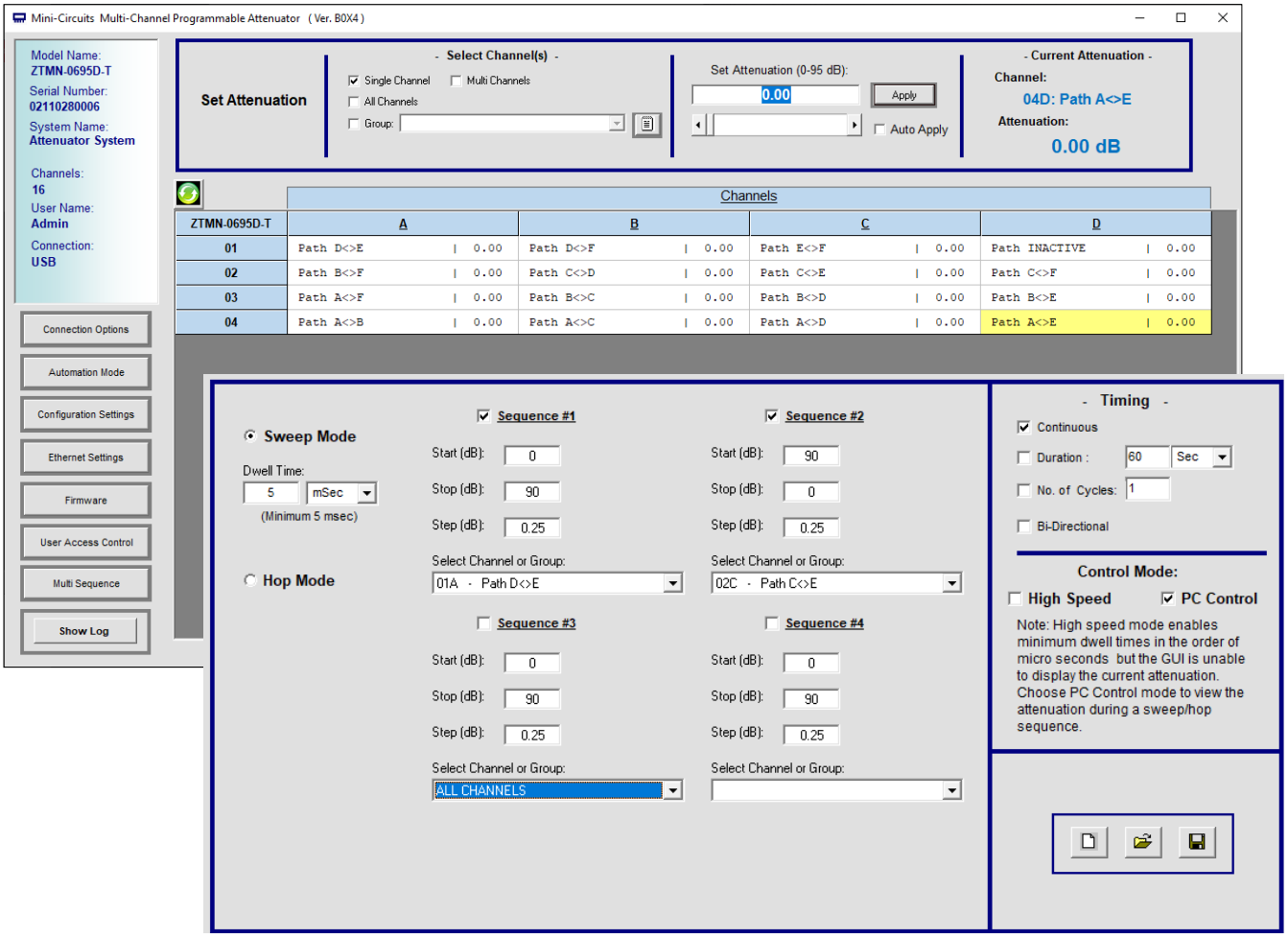
GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS

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



- View and set all attenuator values, independently or in groups
- Configure automated sweep / hop / fading sequences
- Apply custom port / path names
- Configure system and Ethernet settings



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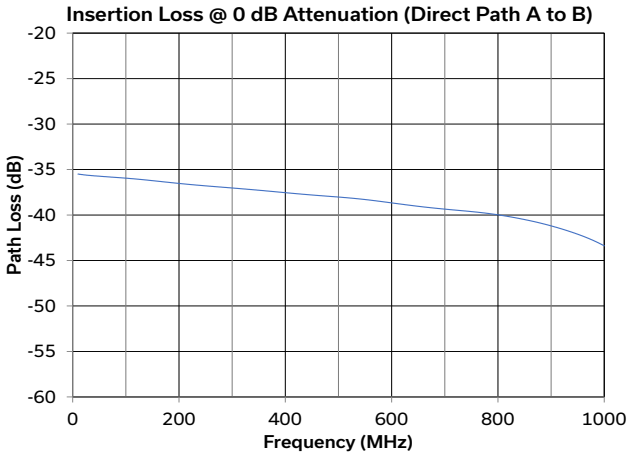
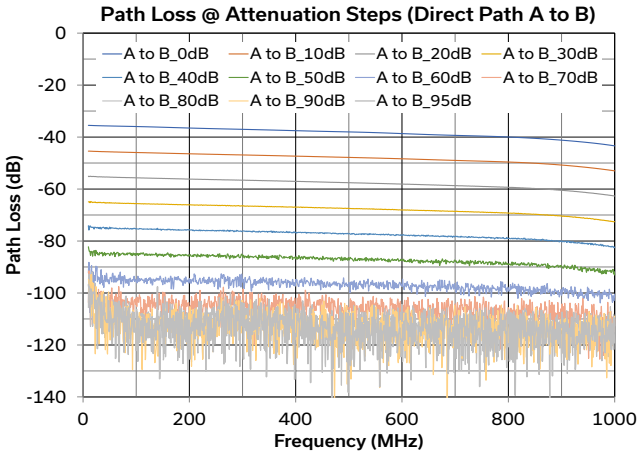
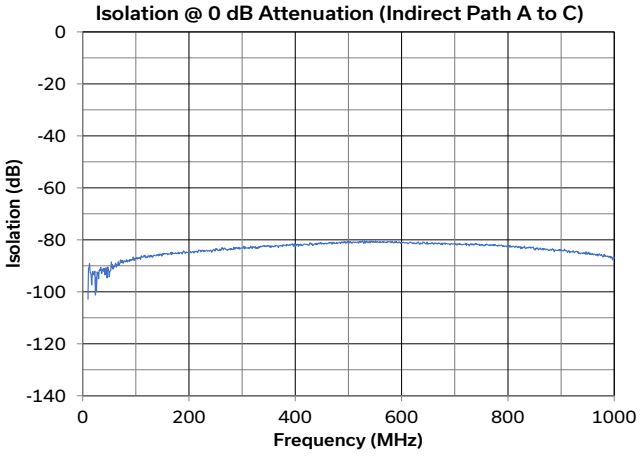
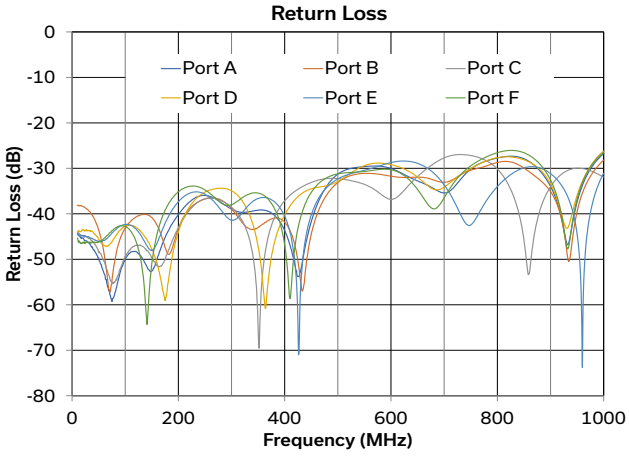
TYPICAL PERFORMANCE GRAPHS









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ABSOLUTE MAXIMUM RATINGS

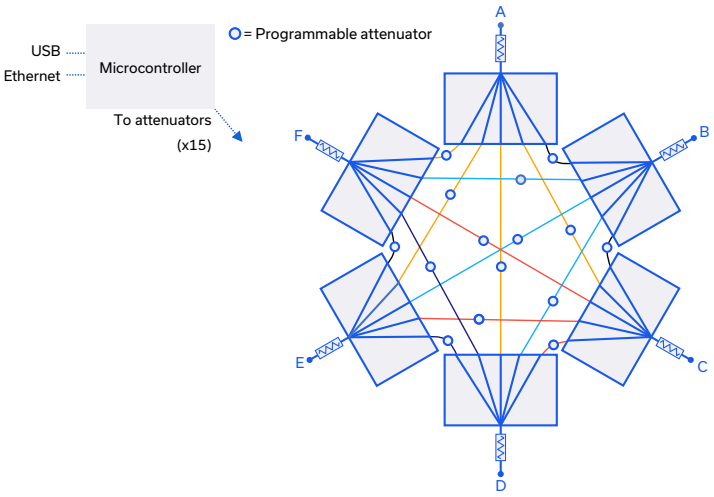
Parameter	Conditions	Limits	Units
Temperature	Operating	0 to +50	°C
	Storage	-20 to +60	
Input Power (No Damage)	Per port	5	W

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	85W maximum

FUNCTIONAL BLOCK DIAGRAM



CONNECTIONS

Port	Connector
A to F	TNC female
USB	USB type B
Ethernet / LAN	RJ45
AC Input	IEC C14 inlet

ATTENUATOR / PATH MAP

- The mesh is constructed using 4-channel programmable attenuator blocks, addressed 01 to 04
- Each of the 4 channels within a block controls the path loss between a specific pair of ports, as shown below

	Channel 1(A)	Channel 2(B)	Channel 3(C)	Channel 4(D)
Att 01	D <-> E	D <-> F	E <-> F	Not used
Att 02	B <-> F	C <-> D	C <-> E	C <-> F
Att 03	A <-> F	B <-> C	B <-> D	B <-> E
Att 04	A <-> B	A <-> C	A <-> D	A <-> E

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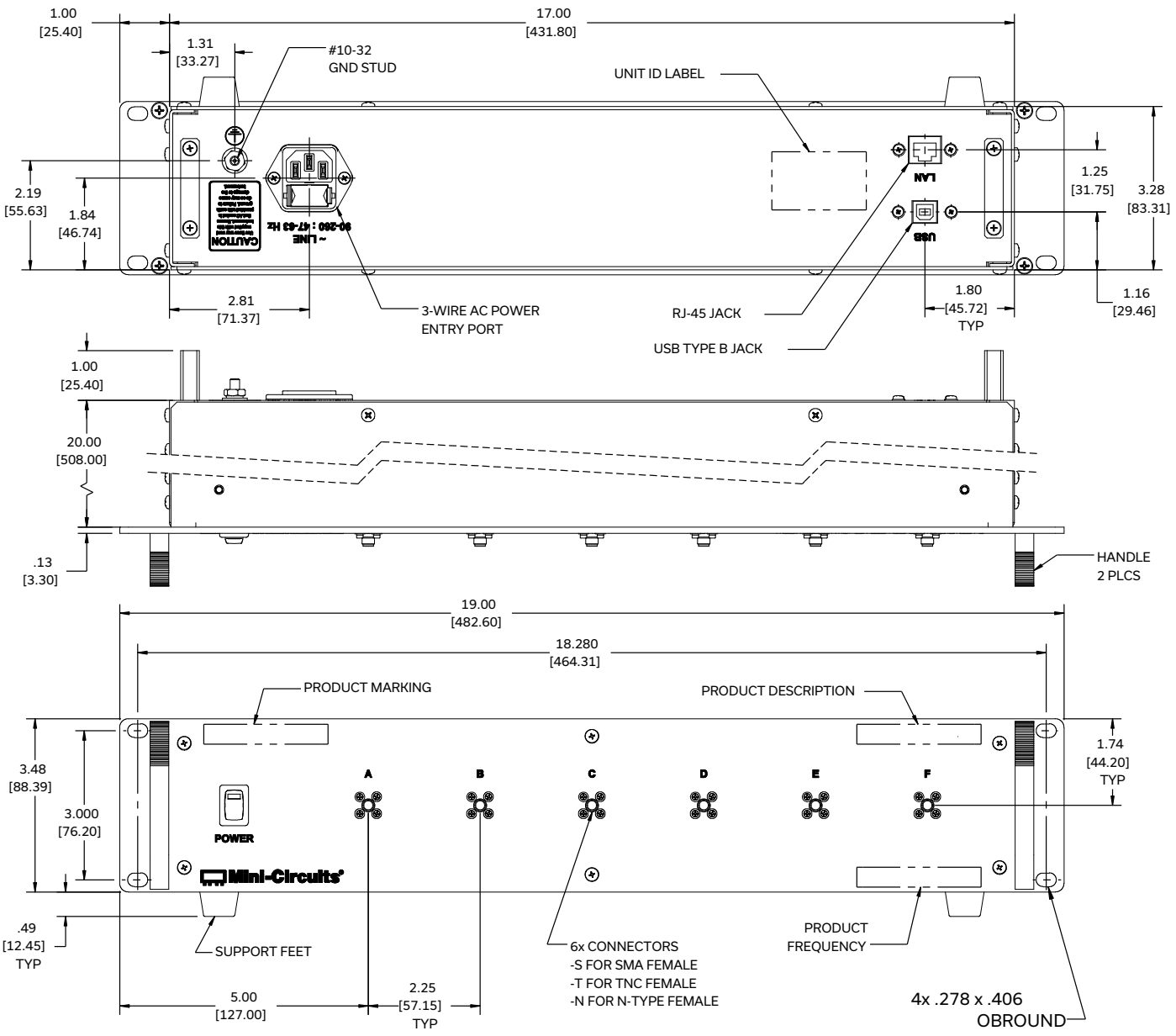
OUTLINE DRAWING



Weight: 8560 grams.

Dimensions are in inches [mm]. Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.

PRODUCT MARKING*

Product Marking: ZTMN-0695D-T
Product Description: 6-Port Mesh Network Test Drawer
Product Frequency: 10 - 800 MHz
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	YT2646
Software, User Guide & Programming Manual	www.minicircuits.com/softwaredownload/multiatt.html
Environmental Rating	ENV55
Regulatory Compliance	Refer to our website for compliance methodologies and qualifications CE FC 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)

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

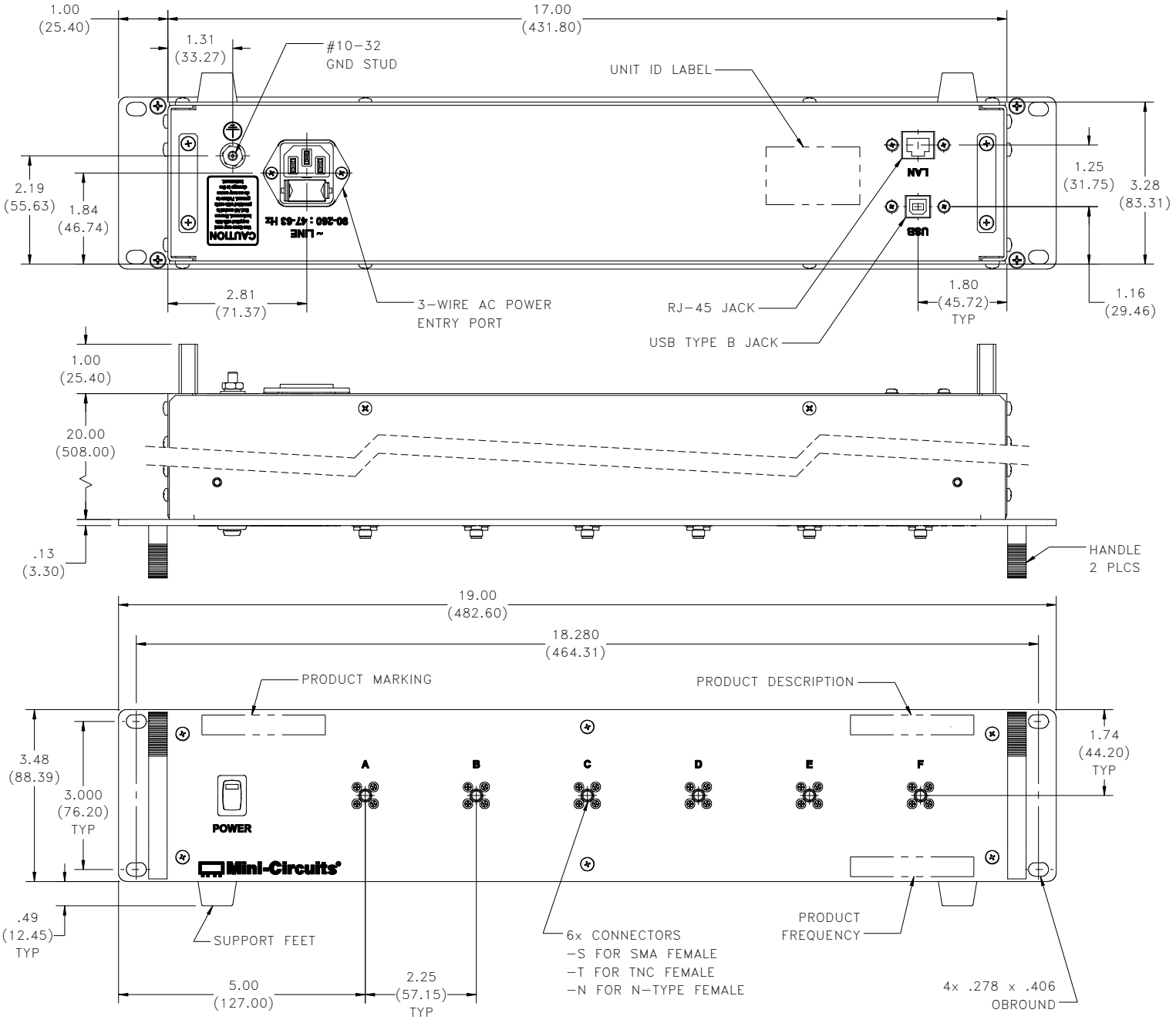
NOTES

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/terms/viewterm.html

Case Style YT

Outline Dimensions

YT2646



Notes:

1. Case material: Aluminum (with protective coating to prevent corrosion).
2. Dimensions are in inches (mm). Tolerances: 2 Pl. ±.03 inch; 3 Pl. ±.015 inch.
3. Weight: 8560 grams.
4. Marking may contain features or characters for internal lot control.

Mini-Circuits

Environmental Specifications **ENV55**

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 50° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-20° to 60° 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