



THE BIG DEAL

- Completely flexible 24 x 8 matrix
- Fully non-blocking / full fan-out
- Combine any combination of input & output ports
- Independently programmable loss on each path
- GUI & API for automation

APPLICATIONS

- eNodeB
- Mesh radio
- Massive MIMO
- Cellular handover



PRODUCT OVERVIEW

ZT-24RFX8 is a “full fan-out” or “fully non-blocking” matrix. These systems use a combination of programmable attenuators and splitter / combiners to provide a completely flexible set of paths between the input and output ports. The configuration is analogous to a switch matrix except any individual path can be “on” (0 dB attenuation), or “off” (max attenuation), or any specific path loss in-between. In addition, all inputs can connect simultaneously to all outputs, and all paths are bi-directional.

This completely flexible set of path characteristics is ideal for cellular transceiver and handover test requirements, particularly complex LTE eNodeB applications. Multiple signal sources and interferers can be combined into any combination of DUT at precisely tailored signal levels.

The matrix is housed in a 5U height, 19-inch rack chassis with SMA RF connectors on the front and rear panels. The system can be controlled via USB or Ethernet (supporting SSH, HTTP & 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.

KEY FEATURES

Feature	Advantages
Splitter / attenuator matrix	Connect any combination of inputs to any combination of outputs with precise signal levels on each path
Rack-mount chassis	Rack-mountable chassis with RF connections on the front and rear panels, suits integration in automated production test environments.
Ethernet & USB control	USB HID and Ethernet (HTTP / Telnet / SSH) interfaces ensure compatibility with most software environments and connection requirements.



MECHANICAL SPECIFICATIONS

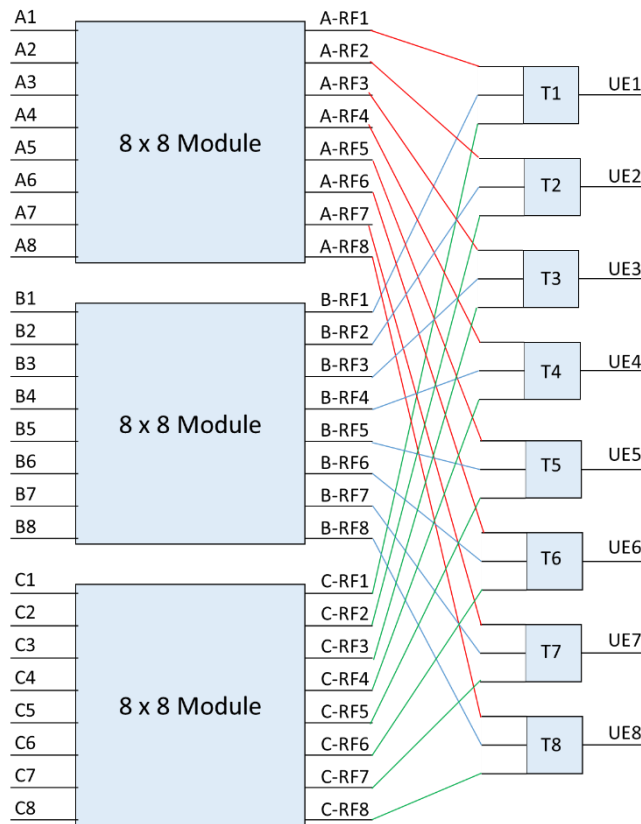
Dimensions	19" (W) x 5U (H) x 30" (D)			
Case Drawing	99-01-3038			
Weight	38.1 kg			
Case Material	Aluminum (with protective coating to prevent corrosion)			
RF Connectors	Panel	Connector	Quantity	Port Labels
	Front	SMA female	24	A-RF1 to 8; B-RF1 to 8; C-RF1 to 8
			8	UE1 to UE8
			24	Interconnect ports
Rear	SMA female	24	A1 to A8; B1 to B8; C1 to C8	
	Front Panel		Rear Panel	
Panel Marking	<ul style="list-style-type: none"> ZT-24RFX8 24 x 8 RF Port System 500-6000 MHz 		<ul style="list-style-type: none"> CE / EAC / UKCA Serial number / date code / model name 	
Panel Items	<ul style="list-style-type: none"> Power on / off switch with LED Removable carry handles 		<ul style="list-style-type: none"> Removable carry handles AC mains power input (IEC C14 inlet) USB type B socket RJ45 (LAN) socket 	
Power Supply	AC mains power input (90-260 V, 47-63 Hz)			
Fuse	2A, 250V rating			
Power Consumption	70W max			
Temperature	Operating: 0 to +50 °C			

ELECTRICAL SPECIFICATIONS @ 25°C

Parameter	Conditions	Min	Typ	Max	Units
Frequency		500		6000	MHz
Total Path Loss Including External Cables	500 - 3000 MHz		30.0		dB
	3000 - 6000 MHz		35.8		
Isolation (Between A1-A8, B1-B8, C1-C8 ports @ 0 dB)	500 - 3000 MHz	45	52		dB
	3000 - 6000 MHz	48	57		
Path Loss 8RFX8 Block	500 - 3000 MHz		23	28	dB
	3000 - 6000 MHz		28	32	
Return Loss 8RFX8 Block	500 - 3000 MHz		18		dB
	3000 - 6000 MHz		13		
Path Loss 3-Way Splitter	500 - 3000 MHz		6.5	7.2	dB
	3000 - 6000 MHz		7.3	8.0	
Return Loss UE Ports	500 - 3000 MHz		23		dB
	3000 - 6000 MHz		20		
Return Loss 3-Way Outputs	500 - 3000 MHz		24		dB
	3000 - 6000 MHz		27		
Isolation Between 3-Way Outputs	500 - 3000 MHz	17	25		dB
	3000 - 6000 MHz	20	25		
Attenuation Range	Per path, 0.25 dB steps	0		63	dB
Input Power				+30	dBm



SIMPLIFIED FUNCTIONAL BLOCK DIAGRAM



8 x 8 Modules

- Each module has 8 inputs and 8 outputs, interconnected via splitters and combiners
- All paths are bi-directional
- Each internal path has an independent programmable attenuator (64 per module)
- Each input can connect to each output in any combination and with precisely controlled path loss

3-Way Splitter / Combiners

- T1 to T8 are 4-way splitter / combiners, each with the 4th port terminated
- UE1-UE8 ports are routed into all 3 of the 8 x 8 Modules

External Cables

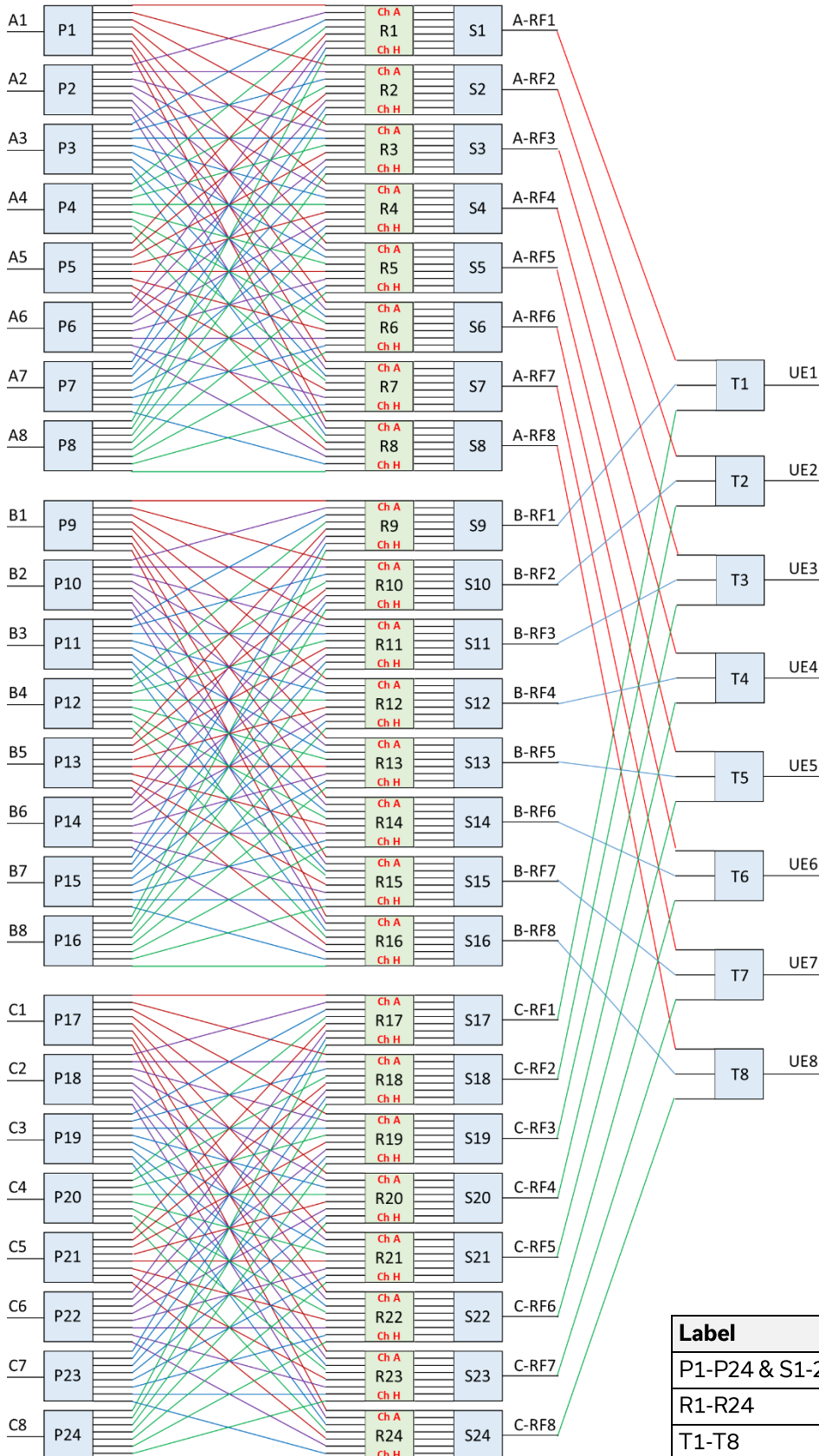
- Connections between the 8 x 8 Modules and the 3-way splitter / combiners are made using external cables (24 total)

System Function

- The complete system has 24 inputs and 8 outputs
- All paths are bi-directional
- Each internal path has an independent programmable attenuator (192 total)
- Each input can connect to each output in any combination and with precisely controlled path loss



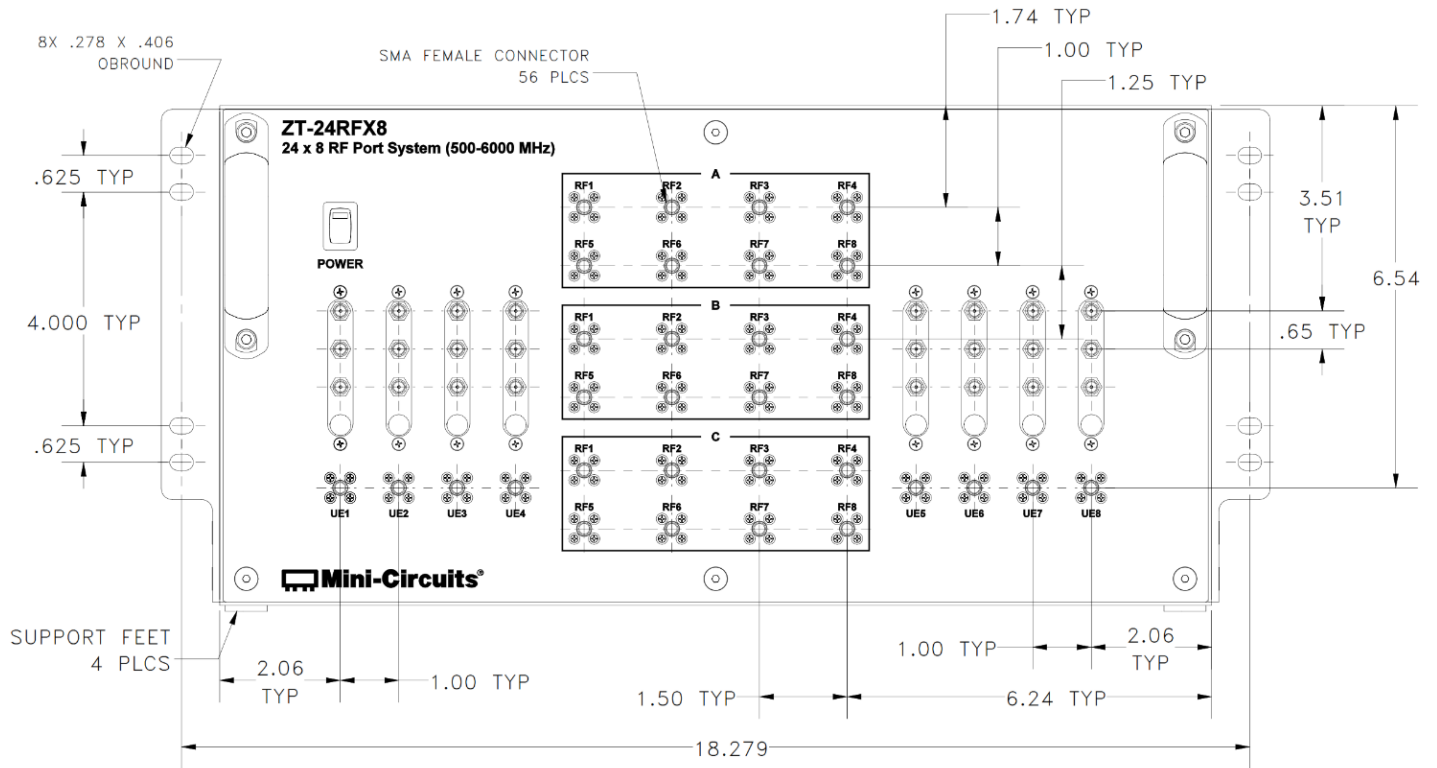
FULL SYSTEM BLOCK DIAGRAM



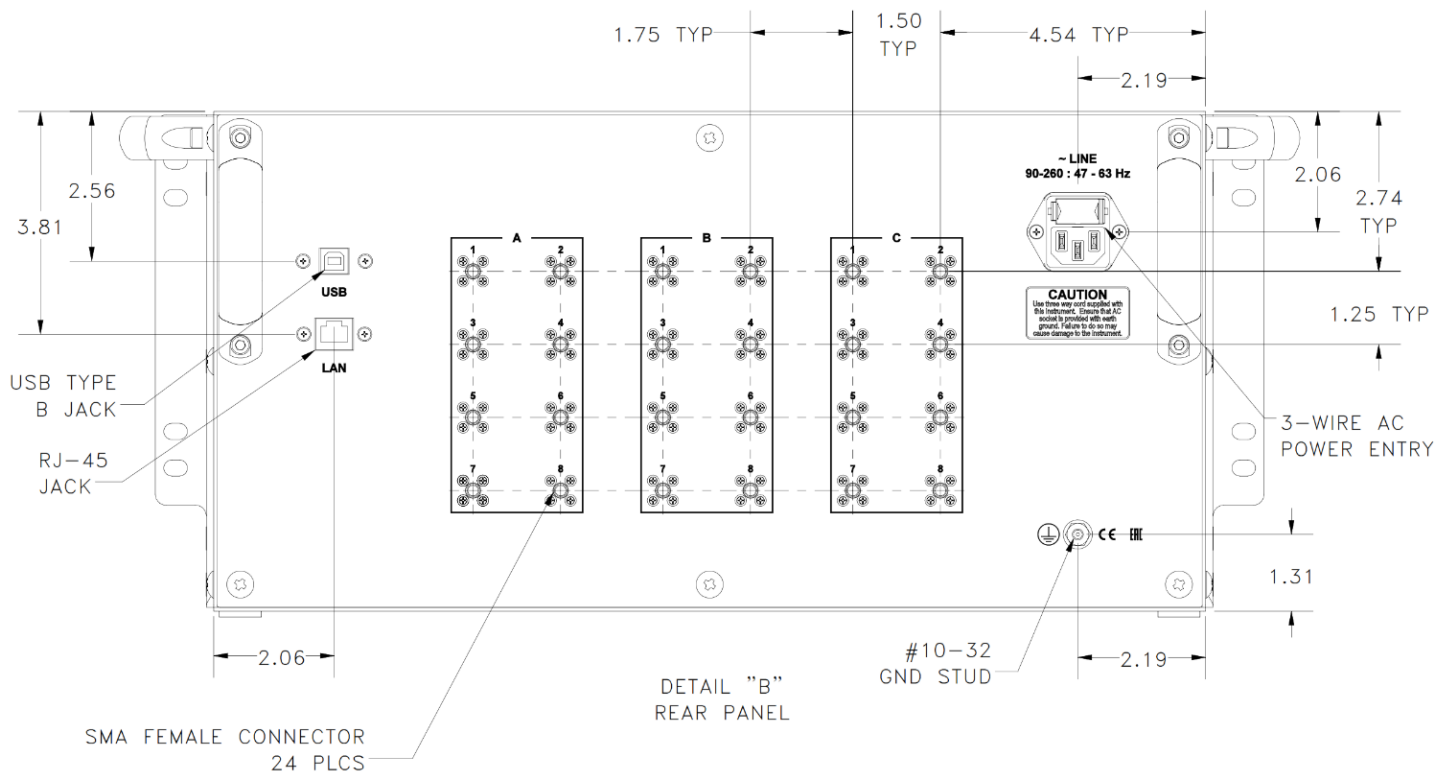
Label	Description
P1-P24 & S1-24	8-way splitter / combiner
R1-R24	8-channel programmable attenuator
T1-T8	3-way splitter / combiner



OUTLINE DRAWING



DETAIL "A"
FRONT PANEL

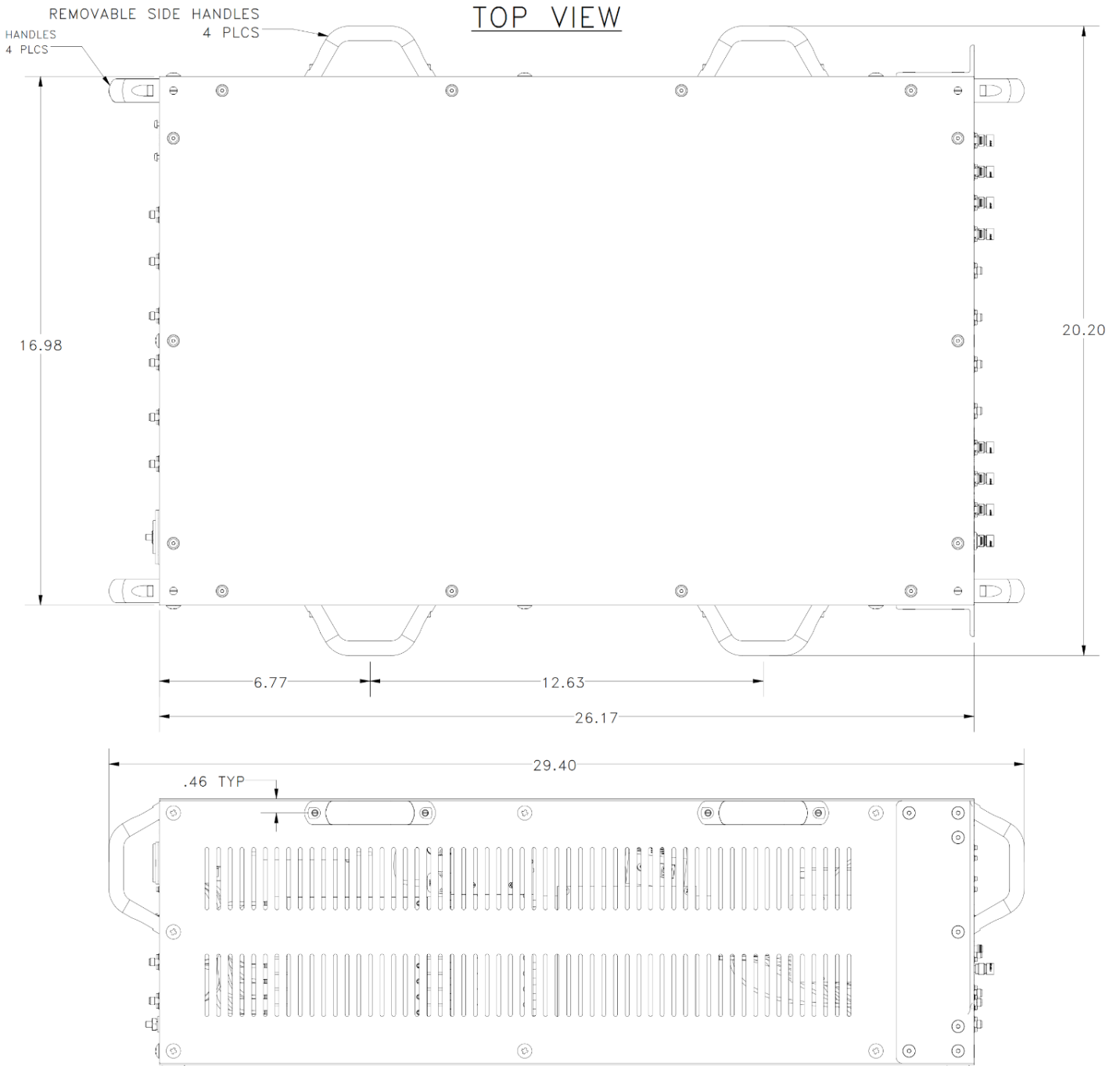


DETAIL "B"
REAR PANEL



OUTLINE DRAWING

TOP VIEW

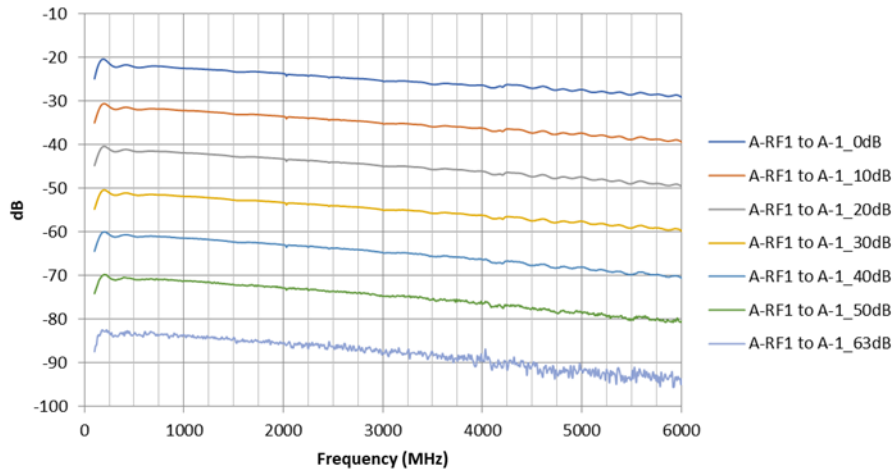




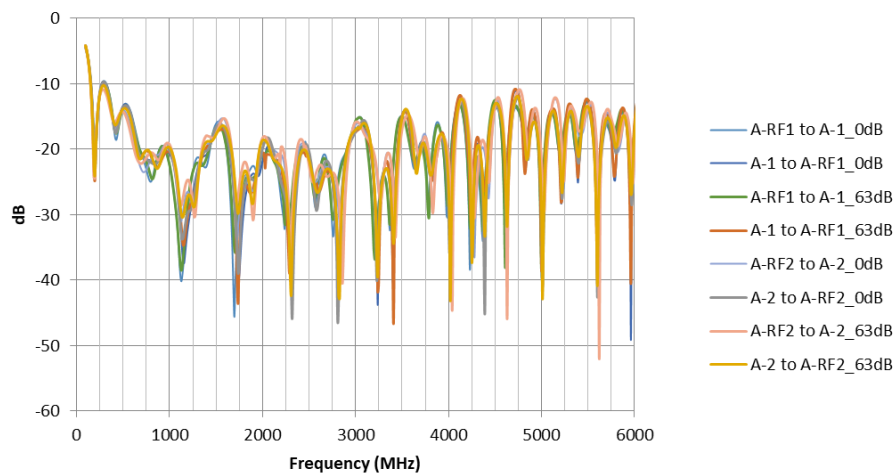
TYPICAL PERFORMANCE DATA

Per 8 x 8 Module

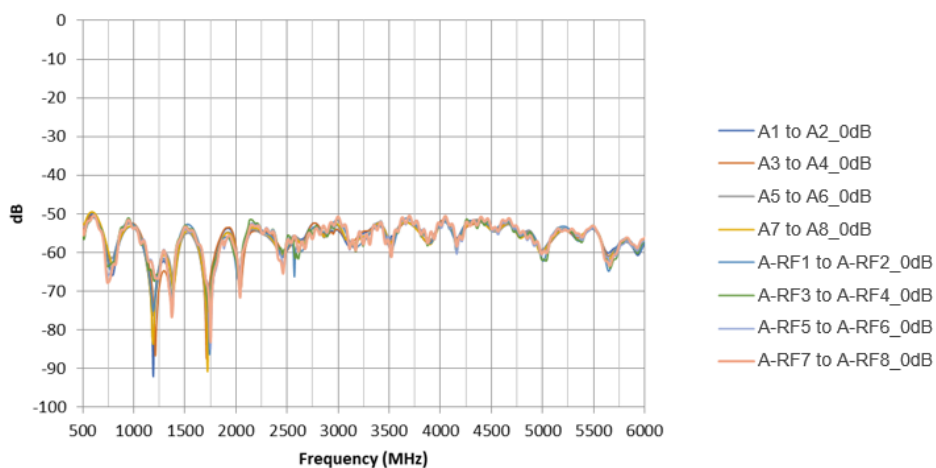
Path Loss (8 x 8 Module)



Return Loss (8 x 8 Module)



Isolation (8 x 8 Module) – Between A1-A8 or B1-B8 @ 0 dB

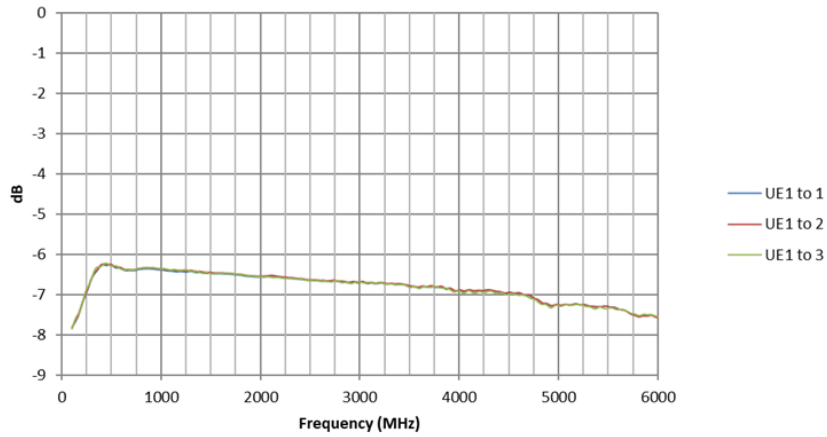




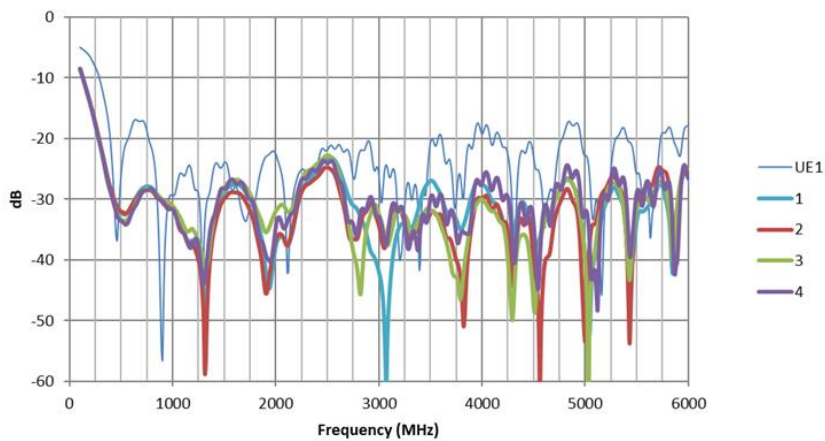
TYPICAL PERFORMANCE DATA

Per 8 x 8 Module

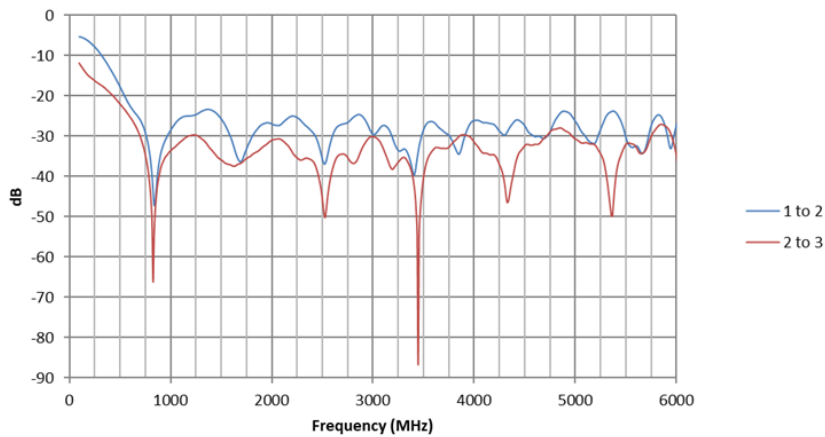
Path Loss (3-Way Splitter)



Return Loss (3-Way Splitter)



Isolation (3-Way Splitter)





ATTENUATOR LOGIC TABLE

- Signal routing and level control within the matrix is accomplished using programmable attenuators
- The 192 attenuator channels are organized over 24 separate 8-channel attenuator modules
- The logic table below maps out the specific attenuator channel which applies to each independent input / output path

	Channel 1 (A)	Channel 2 (B)	Channel 3 (C)	Channel 4 (D)	Channel 5 (E)	Channel 6 (F)	Channel 7 (G)	Channel 8 (H)
Att 01	A1 <> UE1	A2 <> UE1	A3 <> UE1	A4 <> UE1	A5 <> UE1	A6 <> UE1	A7 <> UE1	A8 <> UE1
Att 02	A1 <> UE2	A2 <> UE2	A3 <> UE2	A4 <> UE2	A5 <> UE2	A6 <> UE2	A7 <> UE2	A8 <> UE2
Att 03	A1 <> UE3	A2 <> UE3	A3 <> UE3	A4 <> UE3	A5 <> UE3	A6 <> UE3	A7 <> UE3	A8 <> UE3
Att 04	A1 <> UE4	A2 <> UE4	A3 <> UE4	A4 <> UE4	A5 <> UE4	A6 <> UE4	A7 <> UE4	A8 <> UE4
Att 05	A1 <> UE5	A2 <> UE5	A3 <> UE5	A4 <> UE5	A5 <> UE5	A6 <> UE5	A7 <> UE5	A8 <> UE5
Att 06	A1 <> UE6	A2 <> UE6	A3 <> UE6	A4 <> UE6	A5 <> UE6	A6 <> UE6	A7 <> UE6	A8 <> UE6
Att 07	A1 <> UE7	A2 <> UE7	A3 <> UE7	A4 <> UE7	A5 <> UE7	A6 <> UE7	A7 <> UE7	A8 <> UE7
Att 08	A1 <> UE8	A2 <> UE8	A3 <> UE8	A4 <> UE8	A5 <> UE8	A6 <> UE8	A7 <> UE8	A8 <> UE8
Att 09	B1 <> UE1	B2 <> UE1	B3 <> UE1	B4 <> UE1	B5 <> UE1	B6 <> UE1	B7 <> UE1	B8 <> UE1
Att 10	B1 <> UE2	B2 <> UE2	B3 <> UE2	B4 <> UE2	B5 <> UE2	B6 <> UE2	B7 <> UE2	B8 <> UE2
Att 11	B1 <> UE3	B2 <> UE3	B3 <> UE3	B4 <> UE3	B5 <> UE3	B6 <> UE3	B7 <> UE3	B8 <> UE3
Att 12	B1 <> UE4	B2 <> UE4	B3 <> UE4	B4 <> UE4	B5 <> UE4	B6 <> UE4	B7 <> UE4	B8 <> UE4
Att 13	B1 <> UE5	B2 <> UE5	B3 <> UE5	B4 <> UE5	B5 <> UE5	B6 <> UE5	B7 <> UE5	B8 <> UE5
Att 14	B1 <> UE6	B2 <> UE6	B3 <> UE6	B4 <> UE6	B5 <> UE6	B6 <> UE6	B7 <> UE6	B8 <> UE6
Att 15	B1 <> UE7	B2 <> UE7	B3 <> UE7	B4 <> UE7	B5 <> UE7	B6 <> UE7	B7 <> UE7	B8 <> UE7
Att 16	B1 <> UE8	B2 <> UE8	B3 <> UE8	B4 <> UE8	B5 <> UE8	B6 <> UE8	B7 <> UE8	B8 <> UE8
Att 17	C1 <> UE1	C2 <> UE1	C3 <> UE1	C4 <> UE1	C5 <> UE1	C6 <> UE1	C7 <> UE1	C8 <> UE1
Att 18	C1 <> UE2	C2 <> UE2	C3 <> UE2	C4 <> UE2	C5 <> UE2	C6 <> UE2	C7 <> UE2	C8 <> UE2
Att 19	C1 <> UE3	C2 <> UE3	C3 <> UE3	C4 <> UE3	C5 <> UE3	C6 <> UE3	C7 <> UE3	C8 <> UE3
Att 20	C1 <> UE4	C2 <> UE4	C3 <> UE4	C4 <> UE4	C5 <> UE4	C6 <> UE4	C7 <> UE4	C8 <> UE4
Att 21	C1 <> UE5	C2 <> UE5	C3 <> UE5	C4 <> UE5	C5 <> UE5	C6 <> UE5	C7 <> UE5	C8 <> UE5
Att 22	C1 <> UE6	C2 <> UE6	C3 <> UE6	C4 <> UE6	C5 <> UE6	C6 <> UE6	C7 <> UE6	C8 <> UE6
Att 23	C1 <> UE7	C2 <> UE7	C3 <> UE7	C4 <> UE7	C5 <> UE7	C6 <> UE7	C7 <> UE7	C8 <> UE7
Att 24	C1 <> UE8	C2 <> UE8	C3 <> UE8	C4 <> UE8	C5 <> UE8	C6 <> UE8	C7 <> UE8	C8 <> UE8



SOFTWARE SPECIFICATIONS

Please contact testsolutions@minicircuits.com for support

Ethernet Control	Supported Protocols	TCP / IP, SSH, HTTP, Telnet, DHCP, UDP
	Max Data Rate	100 Mbps (100Base-T Full Duplex)
USB Control	Supported Protocols	HID - High Speed
	Min Communication Time	400 μ s typ
Software Support	<ul style="list-style-type: none"> • Mini-Circuits' Universal GUI for USB & LAN control (Windows only) • ASCII / SCPI command syntax for LAN programming (all OS) • ActiveX / .Net DLL APIs for USB programming (Windows only) • Interrupt codes for direct USB programming (all OS) • Full programming instructions and examples for a wide range of languages 	
Downloads	Software & Documentation	https://www.minicircuits.com/softwaredownload/multiatt.html

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
: [address] :CHAN: [channels] :SETATT: [Att]	Set attenuation: [address] <ul style="list-style-type: none"> • Address of the 8-channel attenuator module • SL can be used to refer to all 8-channel modules [channels] <ul style="list-style-type: none"> • Channel number (1 to 8) within the 8-channel module • Multiple channels can be listed, separated by "." [Att] <ul style="list-style-type: none"> • Attenuation value (0-63) Examples: :01:CHAN:1:SETATT:10.25 <ul style="list-style-type: none"> • Sets channel 1 of RS8DAT 01 to 10.25dB) :01:CHAN:1:2:3:SETATT:10.25 <ul style="list-style-type: none"> • Sets channels 1, 2, & 3 of RS8DAT 01 to 10.25dB) :SL:CHAN:1:2:3:4:SETATT:10.25 <ul style="list-style-type: none"> • Sets channels 1, 2, 3, & 4 of all RS8DATs to 0.25dB
: [address] :CHAN: [channels] :ATT?	Returns the attenuation of a single channel <ul style="list-style-type: none"> • [address] : Address of the RS8DAT (01, 02, ..., SL) • [channels] : Channel of the RS8DAT (1, 2, ..., 8) Examples: :01:CHAN:1:ATT? <ul style="list-style-type: none"> • Returns the attenuation of channel 1 of RS8DAT 1



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 states
- Configure Ethernet settings
- Upgrade firmware

ZT-16RFX8	A/E		B/E		C/G		D/H	
01	Path UE1<>A-1	67.00	Path UE1<>A-2	50.75	Path UE1<>A-3	55.00	Path UE1<>A-4	27.50
01	Path UE1<>A-5	28.75	Path UE1<>A-6	73.50	Path UE1<>A-7	1.25	Path UE1<>A-8	72.25
02	Path UE2<>A-1	77.50	Path UE2<>A-2	67.25	Path UE2<>A-3	4.25	Path UE2<>A-4	39.25
02	Path UE2<>A-5	82.00	Path UE2<>A-6	75.00	Path UE2<>A-7	35.50	Path UE2<>A-8	91.50
03	Path UE3<>A-1	82.75	Path UE3<>A-2	5.25	Path UE3<>A-3	90.25	Path UE3<>A-4	34.50
03	Path UE3<>A-5	49.75	Path UE3<>A-6	73.00	Path UE3<>A-7	5.00	Path UE3<>A-8	56.25
04	Path UE4<>A-1	44.50	Path UE4<>A-2	28.25	Path UE4<>A-3	59.25	Path UE4<>A-4	61.50
04	Path UE4<>A-5	25.00	Path UE4<>A-6	26.50	Path UE4<>A-7	78.75	Path UE4<>A-8	78.25
05	Path UE5<>A-1	56.00	Path UE5<>A-2	93.75	Path UE5<>A-3	86.50	Path UE5<>A-4	21.50
05	Path UE5<>A-5	66.00	Path UE5<>A-6	93.00	Path UE5<>A-7	23.25	Path UE5<>A-8	50.75
06	Path UE6<>A-1	10.00	Path UE6<>A-2	95.00	Path UE6<>A-3	64.25	Path UE6<>A-4	1.50
06	Path UE6<>A-5	54.75	Path UE6<>A-6	9.50	Path UE6<>A-7	9.75	Path UE6<>A-8	76.00
07	Path UE7<>A-1	27.00	Path UE7<>A-2	4.25	Path UE7<>A-3	28.00	Path UE7<>A-4	36.25
07	Path UE7<>A-5	28.50	Path UE7<>A-6	90.00	Path UE7<>A-7	93.00	Path UE7<>A-8	38.25
08	Path UE8<>A-1	26.50	Path UE8<>A-2	15.25	Path UE8<>A-3	15.50	Path UE8<>A-4	61.50
08	Path UE8<>A-5	39.00	Path UE8<>A-6	39.25	Path UE8<>A-7	67.75	Path UE8<>A-8	31.00
09	Path UE1<>B-1	60.25	Path UE1<>B-2	19.75	Path UE1<>B-3	17.75	Path UE1<>B-4	55.50
09	Path UE1<>B-5	7.75	Path UE1<>B-6	43.50	Path UE1<>B-7	86.00	Path UE1<>B-8	24.75
10	Path UE2<>B-1	74.50	Path UE2<>B-2	36.00	Path UE2<>B-3	27.50	Path UE2<>B-4	87.25
10	Path UE2<>B-5	60.00	Path UE2<>B-6	59.75	Path UE2<>B-7	40.75	Path UE2<>B-8	9.25
11	Path UE3<>B-1	53.25	Path UE3<>B-2	66.00	Path UE3<>B-3	86.75	Path UE3<>B-4	79.25



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)

*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
5	Updated format; increased power rating (+30 dBm)	4-Aug-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