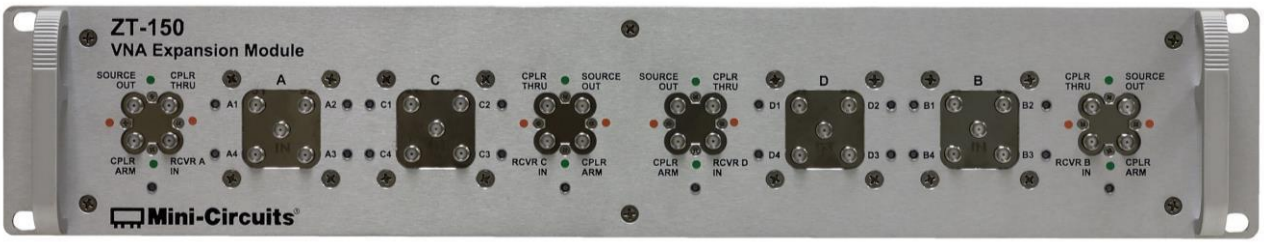
Rack-Mounted | USB & Ethernet Control

# High Dynamic Range VNA Extender ZT-150

50Ω DC to 18 GHz




## Product Overview

Mini-Circuits' ZT-150 is a flexible switch rack configured with 4 mechanical transfer (DPDT) switches and 4 mechanical SP4T switches, all of which can be independently controlled.

The front panel connector configuration has been arranged to allow use of ZT-150 as a convenient expansion module for 4-port VNAs, such as Keysight's PNA-X series. The SP4T switches allow each of the 4 VNA test ports to be switched between 4 connections, while the transfer switches allow switching between the PNA-X series' standard and high dynamic range modes.

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

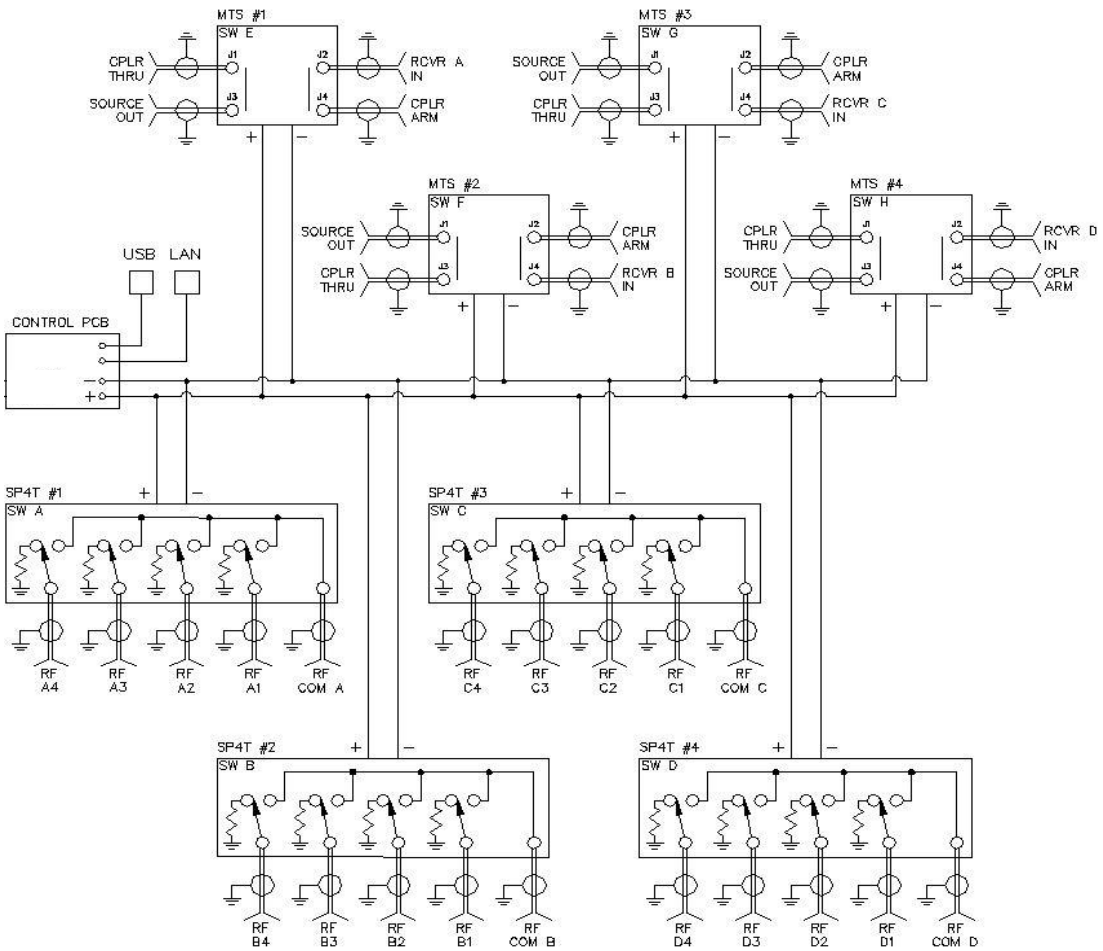
| Feature | Advantages |
|---|---|
| High reliability mechanical switches | Mechanical absorptive switches provide high reliability, repeatable high performance and internal terminations of input signals on the disconnected paths |
| Compact package | The 2U height chassis with reinforced top panel is can be located within a test rack or on a bench, supporting a VNA above |
| Ethernet-TCP/IP (HTTP & Telnet) | Remote control from any Windows®, Mac®, or Linux® computer, or even a mobile device with a network connection and Ethernet-TCP/IP (HTTP or Telnet protocols) support. Using a VPN would allow remote control from anywhere in the world. |
| USB HID (Human Interface Device) | Local control via USB connection. Plug-and-Play, no driver required. Compatible with Windows® or Linux® operating systems using 32 and 64 bit architectures. |
| Full software support | The user friendly Windows GUI (graphical user interface automation) allows manual control straight out of the box. A full API (application programming interface), programming examples and manuals are provided to allow automation in most programming environments. |

# High Dynamic Range VNA Extender ZT-150

## Mechanical Specifications

| | |
|---|---|
| **Dimensions** | 19” (W) x 2U (H) x 20” (D) |
| **Case Material** | Aluminum (with protective coatings to prevent corrosion) |
| **Case Drawing** | 99-01-1926 |
| **RF Connectors** | SMA female |
| **Front panel** | a) 4 x RF transfer switches (16 x SMA female connectors)<br>b) 4 x SP4T switches (20 x SMA female connectors)<br>c) LED switch position indicators<br>d) Carry handles |
| **Rear panel** | a) ON/OFF switch with indicator light<br>b) AC mains power supply input<br>c) USB & RJ45 control connections<br>d) Label with date code/serial number/MCL part# for traceability |
| **Control Interface** | a) USB and Ethernet TCP/IP supporting HTTP and TELNET protocols |
| **Power supply** | a) AC mains power supply (90-260 V, 47-63 Hz)<br>b) 2A, 250V fuse rating |
| **Operating temp** | 0° to +50° C |

## Functional Block Diagram



# High Dynamic Range VNA Extender ZT-150

## Electrical Specifications at 25°C (per Transfer Switch)

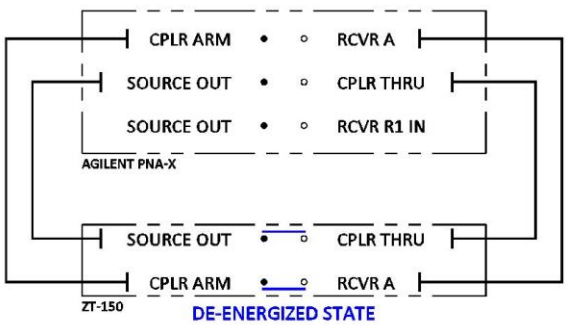
| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | DC | | 18 | GHz |
| Insertion Loss | DC - 1 GHz | — | 0.10 | 0.15 | dB |
| | 1 - 8 GHz | — | 0.10 | 0.25 | |
| | 8 - 12 GHz | — | 0.20 | 0.36 | |
| | 12 - 18 GHz | — | 0.25 | 0.45 | |
| Isolation | DC - 1 GHz | 85 | 100 | — | dB |
| | 1 - 8 GHz | 75 | 90 | — | |
| | 8 - 12 GHz | 70 | 86 | — | |
| | 12 - 18 GHz | 60 | 76 | — | |
| VSWR | DC - 1 GHz | — | 1.05 | 1.10 | :1 |
| | 1 - 8 GHz | — | 1.15 | 1.20 | |
| | 8 - 12 GHz | — | 1.15 | 1.30 | |
| | 12 - 18 GHz | — | 1.15 | 1.30 | |
| Switching Time | — | — | 25 | — | ms |
| RF Input Power[1] | Cold switching | — | — | 10 | W |
| Switch Lifetime (per Switch) | <0.1W hot switching[2] | 10 | — | — | million cycles |
| | 0.1 - 1W hot switching | — | 3 | — | |

[1] Maximum power for cold switching is 10W per path, 20W total, with all ports terminated into 50Ω
[2] Hot switching power above this level will degrade the switch lifetime.

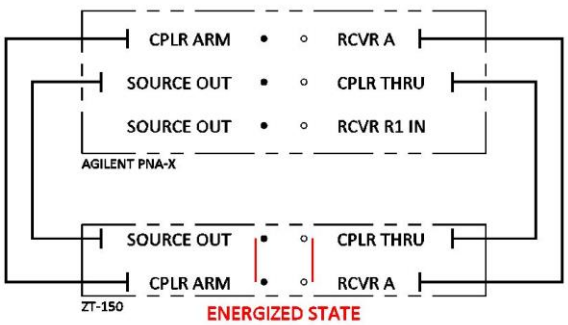
### Transfer Switch States


### Keysight PNA-X Operating Modes

- Interconnections between Mini-Circuits' ZT-150 and Keysight's PNA-X series to allow switching between the VNA's normal and high dynamic range modes.




NORMAL DYNAMIC RANGE MODE




HIGH DYNAMIC RANGE MODE

# High Dynamic Range VNA Extender ZT-150

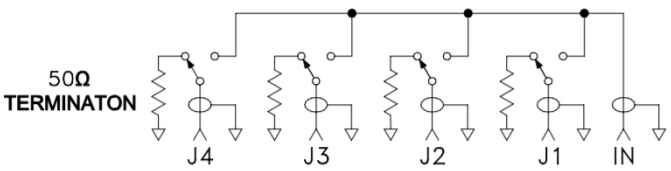
## Electrical Specifications at 25°C (per SP4T Switch)

| Parameter | Port | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Frequency | All RF Ports | — | DC | | 18 | GHz |
| RF Insertion Loss (per switch) | | DC to 1 GHz<br>1 GHz to 8 GHz<br>8 GHz to 12 GHz<br>12 GHz to 18 GHz | –<br>–<br>–<br>– | 0.10<br>0.15<br>0.25<br>0.50 | 0.20<br>0.30<br>0.40<br>0.80 | dB |
| RF VSWR [1] | | DC to 1 GHz<br>1 GHz to 8 GHz<br>8 GHz to 12 GHz<br>12 GHz to 18 GHz | –<br>–<br>–<br>– | 1.05<br>1.20<br>1.20<br>1.30 | 1.10<br>1.40<br>1.40<br>1.60 | :1 |
| RF Isolation (per switch) | | DC to 1 GHz<br>1 GHz to 8 GHz<br>8 GHz to 12 GHz<br>12 GHz to 18 GHz | 85<br>80<br>75<br>60 | 105<br>100<br>95<br>80 | –<br>–<br>–<br>– | dB |
| Switching Time | | – | – | 25 | – | ms |
| RF Power (cold switching) [2,3] | | | – | – | 20 | W |
| Life (per switch) | | @ 100 mW (hot switching) [4]<br>@ 1 W (hot switching) [4] | 10<br>– | –<br>1 | –<br>– | million switching cycles |

[1] For COM port only when connected to port 1,2,3, or 4 . For ports 1,2,3 and 4 only when connected to COM port.
[2] Power handling is specified with RF applied to the COM port and external load connected to 1,2,3, or 4 ports.
[3] Cold switching describes switch operation where there is no significant user signal present at the moment the switch contacts open or close.
[4] Exceeding these limits will result in reduced life.

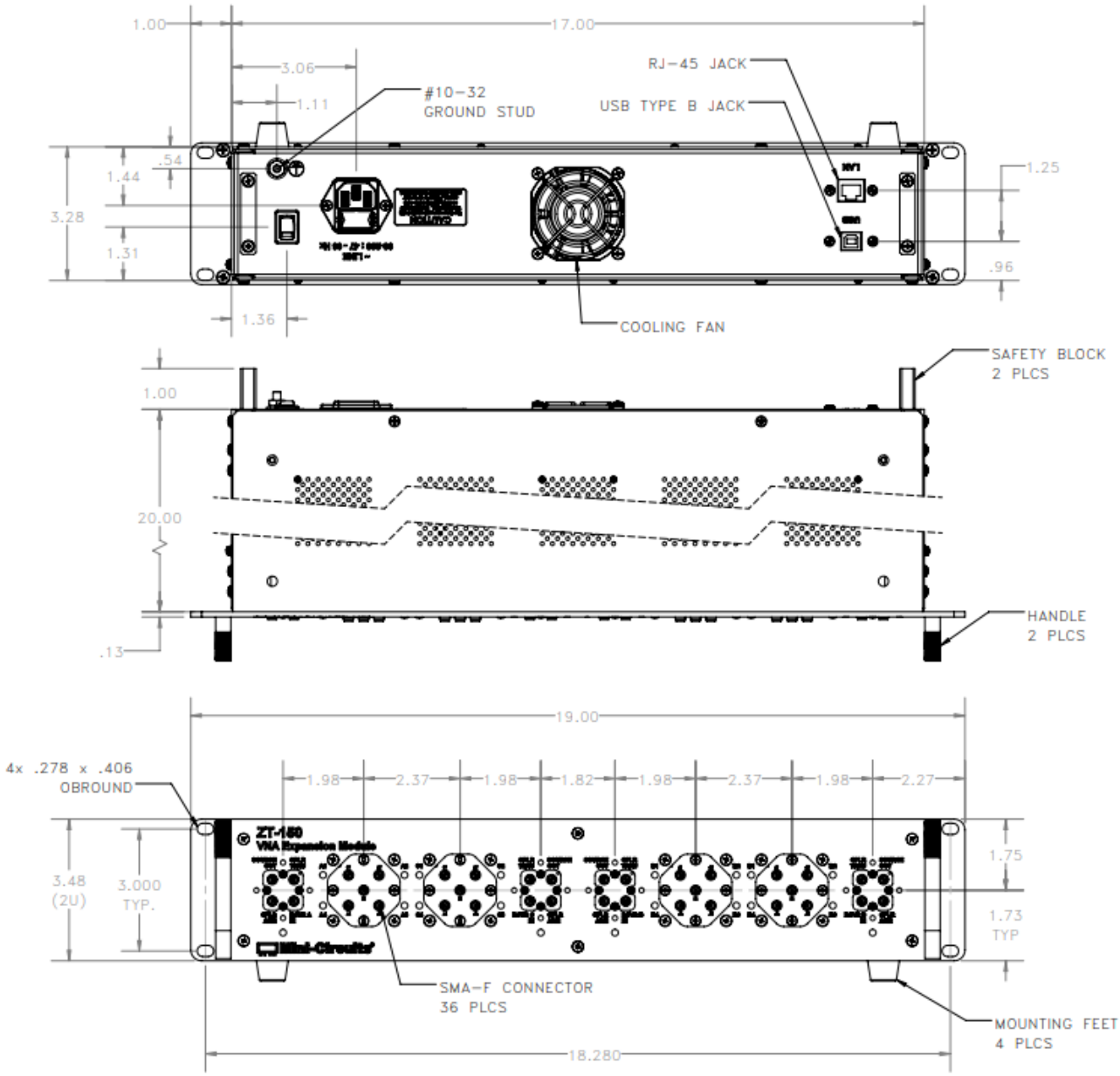
| | |
|---|---|
| RF power (through path) | 20W |
| RF power (into internal termination) | 1W |

### SP4T Switch Configuration



# High Dynamic Range VNA Extender ZT-150

## Outline Drawing



## Software Specifications

**Software & Documentation Download:**

- Mini-Circuits' full software and support package including user guide, Windows GUI, DLL files, programming manual and examples are available on request
- Please contact testsolutions@minicircuits.com for support

**Minimum System Requirements:**

| Parameter | Requirements | |
|---|---|---|
| Interface | USB HID & Ethernet (HTTP & Telnet) | |
| System Requirements | GUI | Windows 98 or later |
| | USB API DLL | Windows 98 or later and programming environment with ActiveX or .NET support |
| | USB Direct Programming | Linux; Windows 98 or later |
| | Ethernet | Windows, Linux or Mac computer with a network port and Ethernet TCP / IP support |
| Hardware | Pentium II or later with 256 MB RAM | |

**Application Programming Interface (API)**

**Ethernet Support:**

- Simple ASCII / SCPI command set for attenuator control
- Communication via HTTP or Telnet
- Supported by most common programming environments

**USB Support (Windows):**

- ActiveX COM DLL file for creation of 32-bit programs
- .NET library DLL file for creation of 32 / 64-bit programs
- Supported by most common programming environments (refer to application note AN-49-001 for summary of supported environments)

**USB Support (Linux):**

- Direct USB programming using a series of USB interrupt codes

Full programming instructions and examples available for a wide range of programming environments / languages.

# High Dynamic Range VNA Extender ZT-150

## Graphical User Interface (GUI) for Windows - Key Features

- Connect via USB or Ethernet
- View and set all switch states
- Configure Ethernet settings
- Upgrade firmware
- Send SCPI commands
- View temperature & fan status