AT1700 Series

Broadband Switches / Multiplexers

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1 GENERAL INFORMATION

1.1 Overview

The AT1700 series multiplexer switch offers a high performance, cost effective solution for broadband RF switching in headend environments. These switches are ideal for test measurement systems, such as the realWORX monitoring system, where multiple CATV signals need to be tested through the same spectrum analyzer. The 1700 series is compatible with the AT2500HM series analyzers as well as with previous AT2000HM series spectrum analyzers.

Switch control is provided via serial port or manual control.

1.2 Disclaimer

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2 GETTING STARTED

2.1 Product Overview

The VeEX Inc. AT1700 Series comprises the AT1701 (16x1) and AT1702 (16x2) Multiplexers.

The AT1701 Multiplexer has 16 RF input ports and 1 output port. The output port can select any one of the inputs or can be set to a NO SELECT (i.e. all-off) state.

The AT1702 Multiplexer has 16 RF input ports and 2 independently controlled output ports. Essentially it is two 16-to-1 multiplexers sharing the 16 inputs. Each of the output ports can select one of the inputs or can be set in a NO SELECT (i.e. all-off) state.

All ports have a bandwidth of 1 GHz, a nominal 10 dB gain and >50 dB isolation.

Multiplexers can either be cascaded or outputs combined for flexible selection of one signal source from a multiplicity of sources.

The AT1700 series is housed in a 1 RU, 12" deep chassis. Each unit has its own external power source.

The output ports can be controlled independently via the front panel buttons or remotely through an RS-232 connection. Communication IN and OUT connectors are provided for connecting to the controller and for "Daisy Chaining" communications from one unit to the next.

The AT1700 switches may be used in combination with previous model AT1600 switches. Be sure that the communications configuration matches both models.

2.2 Front Panel

Status Indicator

An LED is located behind the VeEX Logo in the center of the AT1700 front panel and is powered on when the unit is connected to the main power source.

2.3 Rear Panel
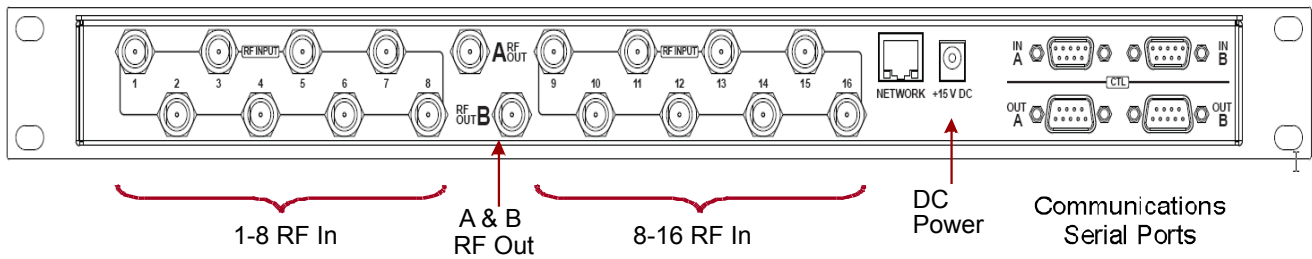
2.4 Close-Up of Controls & Display
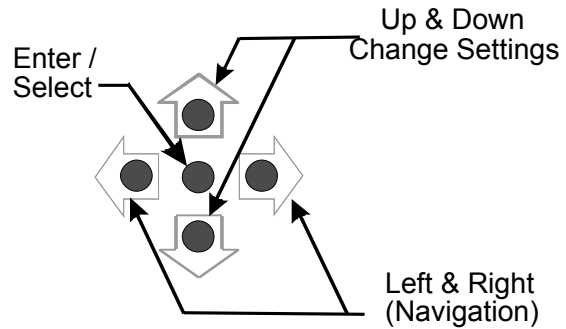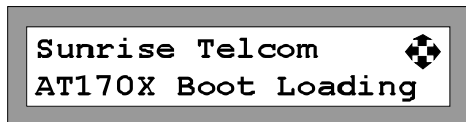
Left & Right Arrows are for navigation and sequence from screen to screen. Up and Down arrows increment or decrement the current selected setting. The Center button selects the highlighted item and is used to terminate changes (Enter).

3 INSTALLATION

3.1 Receiving Instructions

Inspect the shipping container and contents for damage. Notify VeEX Inc. immediately of any shipping damage.

Verify the contents of the package.

Each container should include the following:

	AT1701	AT1702
AT1701 or AT1702 Multiplexer	1	1
Power Adapter	1	1
DB9F-to-DB9M cable 6'	1	2

3.2 Physical Location

The AT1700 series is intended for rack-mount installation, and for indoor use only.

See Operating Specifications for environmental requirements. As is general practice, the RF cables should be kept to a minimum length to minimize their impact on measurement results.

3.3 Electrical Connections

The unit is powered from an external power supply whose input is connected to the AC mains and whose output is connected to the unit. The power supply is auto-ranging from 100VAC to 240VAC, 47 to 63 Hz.

The AT1700 has no ON-OFF switch. It is powered on or off by connecting or disconnecting the power source, either at the AC mains or at the DC power connection to the unit.

WARNING! Always use a three-pronged AC power cord (supplied with the product) and insert only into a properly grounded three-pronged receptacle. Failure to ensure proper grounding may expose users to a shock hazard may damage the product and shall void the warranty.

> ***Note: Any attached equipment (customer supplied) must be grounded to the same protective ground as the Multiplexer.***

3.4 Signal Connections

All signal connections made to both input and output ports ("F" connectors) must:

1. Maintain proper ground continuity.
2. Be stripped of any AC or DC component, common in "cable powering" techniques.

> ***Note: At no time should "cable powering" (24 to 90 VAC or VDC) be applied to any of the signal ports. Doing so may cause irreparable damage to the unit and will void the warranty.***

3.5 RS-232 Controller Requirements

There are no specific requirements of the controller other than it must be equipped with an RS-232 communica-

tions port and connected with appropriate cabling.

Controller requirements will be dictated by the software application used to control the multiplexer.

> ***Note: Any controller equipment (customer supplied) shall be grounded to the same protective ground as the Multiplexer.***
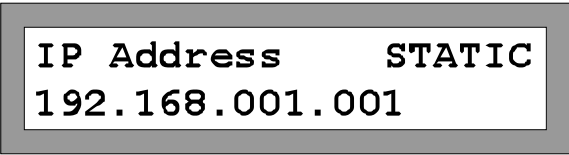
3.6 Ethernet

Before the Ethernet can be used, the IP address needs to be setup for your network. The default IP address, as shipped for the factory, is 192.168.1.1. The Ethernet port may be configured from the front panel.

Press the Left or Right arrow keys until the IP address screen is displayed.

Use the Up & Down arrow keys to select STATIC or DHCP.

When STATIC is selected use the Left or Right arrow key to select the 2nd line IP address and use the Up and Down arrows to sequence each digit in the IP address until the desired IP is displayed.
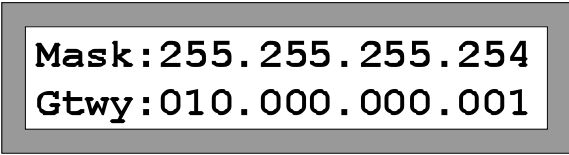
```
IP Address     STATIC
192.168.001.001
```

Press ENTER.

In addition, the Subnet Mask and Gateway must be setup.
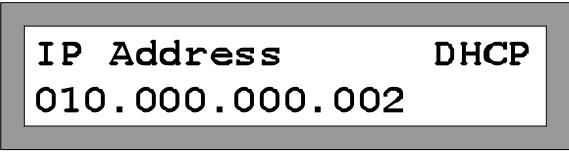
From the IP Address screen, press the Left or Right arrow key to display the Mask & Gateway setup screen. Press Enter and then use the Left and Right arrow keys to navigate to the desired digit to edit and use the Up and Down arrow keys to select the desired digit. Repeat this process for each digit until the desired Subnet Mask is displayed.

```
Mask:255.255.255.254
Gtwy:010.000.000.001
```

Press ENTER and use the Left and Right arrow keys to select the Gateway IP address and edit it as needed.

If DHCP is selected, the AT1700 will obtain an IP address, Subnet Mask and Gateway from your DHCP server.

```
IP Address      DHCP
010.000.000.002
```

> ***Note that setup may now be completed via a simple web browser connection. See the Web Browser Interface section 4.7.***

4 FEATURES AND FUNCTIONS

4.1 Buttons
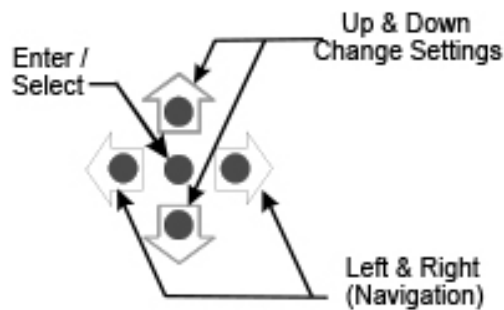
The AT1700 has a group of five buttons for manual control and to control the configuration of the AT1700 multi-plexer.

Left & Right Arrows are for navigation and sequence from screen to screen. Up and Down arrows increment or decrement the current selected setting. The Center button selects the highlighted item and is used to terminate changes (Enter).

4.2 Reset

The AT1700 may be returned to the original factory default setting by using the Left or Right arrows to scroll the display to the "Set Factory Defaults" screen and pressing the center Enter button. This resets all parameters to the Factory Default setting. Complete configuration is required following this step.

```
Set Factory Defaults
```
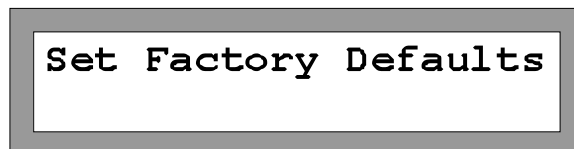
4.3 Test Points

A -20 dB Test Point (female "F" connector) is provided for each Output Port and is located on the front panel for easy access.

4.4 RF Inputs and Outputs

Sixteen 1 GHz bandwidth RF inputs are provided. The AT1702 has 2 RF outputs, one for each of the internal 16-to-1 multiplexers. As a result each output can be independently connected to any one of the shared RF inputs, passing that signal through to the output at unity gain.

> *Note: At no time should "cable powering" (24 to 90 VAC or VDC) be applied to any of the signal ports. Doing so may cause irreparable damage to the unit and will void the warranty.*

4.5 Power In

Power In is provided for powering the unit from the AC adapter provided. No other power source should be utilized unless it is provided by VeEX. An Optional 48 V DC power adapter is available.

4.6 RS-232 Communication Ports

Independent communication ports are provided for the A and B Ports of the AT1702.

A single communications port is provided on the AT1701.

The communication inputs for Channel A and Channel B (AT1702 only) connect to a controller using a standard DB9F-to-DB9M connector "straight through" serial cable.

> *Note: Connection to an AT2500 uses the same DB9F to DB9M cable.*

> *Note: Connection to a CaLan 3010 requires a DB9M to DB9M "straight through" cable as supplied with the 3010. Also referred to as the "cloning" cable.*

The communication Output ports allow chaining the communication link from one unit to the next using a standard DB9F-to-DB9M connector, such that all of the multiplexers are on the same communications link.

Since AT1700 series switches may be physically separated by some distance, cable up to 100 feet or 30 meters may be used. Depending on the environment, cable may need to be shielded for proper operation. If AT1600 series switches are combined with AT1700 series switches, an RS-232 terminator may be required for proper operation on long cable installations. Please consult the Product Support group for these special installations.

4.7 Web Browser Interface

Once the Ethernet port is configured, the AT1700 may be connected to the network. Simply enter the IP address in the URL address bar of your browser. The user may also make all setup and configuration changes via the web browser interface by entering the default IP address 192.168.1.1 in the URL address bar of your browser.

The current Software version, hardware version, MAC address and serial number of the AT1700 is displayed at the top of the webpage.

VeEX ATSwitch
The Verification Experts

ATSwitch Setup & Configuration

Software Version: 1.16   Hardware Version: AT1702   Mac Address: 00:d0:dd:00:01:22   Serial Number: 132010025

Switch Port Status & Configuration

Output Port A

Switch Address	001
Mode:	Remote
Input Port:	001
Protocol:	2 - Long
Baud Rate:	4 - 115.2K

Output Port B

Switch Address	001
Mode:	Remote
Input Port:	001
Protocol:	1 - Short
Baud Rate:	4 - 115.2K

Update Port Configuration

IP Configuration

Ip Mode ◉ DHCP ○ Static
IP Address 010.000.000.035   IP Mask 255.255.254.000   IP Gateway 010.000.000.007
Update IP Config

Upgrade Firmware

Please specify a file, or a set of files..
Choose File No file chosen
Upgrade Firmware

External Links

- VeEX

Once the Web page is displayed, simply edit the switch configuration for port A and port B. See section 5 for configuration settings.

Additionally the Ethernet IP setup may be modified directly on the Webpage. Select DHCP or STATIC mode. If STATIC is selected, enter the desired IP address, Subnet Mask and Gateway and then click on UPDATE IP CONFIG.

> *Note: If the IP address is changed, you will need to re-connect your browser to the new IP address.*

When a Firmware Upgrade is required, it may be installed via the webpage interface. Click on the BROWSE button under Upgrade Firmware and navigate to the new firmware file. When it is displayed in the window, click on the UPGRADE FIRMWARE button. Be sure not to power off the AT1700 during this process. When upgrade is complete, a popup message will appear indicating the upgrade was successful.

5 OPERATING MODES

5.1 Initial Operation

When the unit is powered on the firmware is loaded prior to any switch capability.
After power-up, the unit will display the current state of each multiplexer.

```
Sunrise Telcom        ✦
AT170X Boot Loading
```

The AT1701 will display only Port A information (no port B). AT1702 will display both Port A and B. The mode, Remote or Manual, is displayed along with the current input port number selected.

This condition persists until a front panel key is pressed or until a valid remote command is received on either

```
Port A: NO Remote
Port B: NO Remote
```

channel. Although displaying no selected input port the unit is in the REMOTE mode and is ready for normal operation.

5.2 Manual Mode

When the Multiplexer is in the Manual mode, the user may scroll to the desired input Port 1 to 16 using the UP and DOWN buttons.

The unit can be placed in manual or REMOTE mode by pressing the center ENTER button, using the left or right arrow to navigate to the desired Port selection and pressing the Up or Down arrow to change the desired setting. .
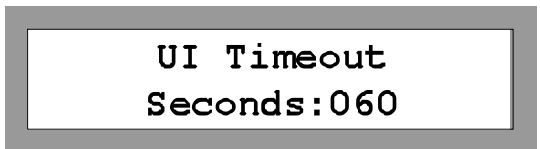
If the AT1700 is in Manual mode the UI Timeout will begin. If a button is not pressed for the duration of the UI timeout, the Port will automatically go back to the Remote mode following the specified delay, after the last key

```
Port A: NO Remote
Port B: NO Remote
```

press. This prevents a user from accidentally leaving the AT1700 in the manual mode and preventing a monitoring system from normal operation.

The user may set the UI Timeout delay. From the main menu, press the left or right arrow key until "UI Timeout" is displayed. Press the center Enter key to select UI Time out. Us the left and right arrow keys to highlight the digital to be changed. Press the Up or Down arrows to increment or decrement the desired digit. Press the center Enter key when the desired delay is shown.
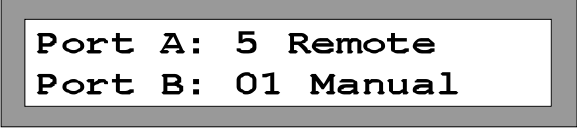
```
    UI Timeout
   Seconds:060
```

Note: The AT1700 has independent RF Input port controls for Manual and REMOTE modes to allow switching between modes without affecting the channel selected in the other port.

5.3 Remote Mode

When the Multiplexer is in REMOTE mode all unit functionality is controlled through the communications port. All front panel controls are limited to displaying the current settings, except for the LOCAL/REMOTE function which may be used to manually change to the Manual mode of operation.

The RF Input Indicators continue to show the selected RF input, as in LOCAL mode (1 to 16).

```
Port A: 5 Remote
Port B: 01 Manual
```

Port A in the screen above is in Remote mode and currently selecting the input port 5. Port B is in the Manual mode and current set to input port 1.

6 CONFIGURATION MODE

Configuration may be performed manually from the front panel or via the Web Browser interface. See section 4.7 for Web Browser operation.

During boot-up (during power-up or after selecting Factory Defaults) the unit goes through a short process when the buttons are not accessible.

Since multiple switches may be used in an installation, each output port must have a Switch Address for the controller to know which switch to control.

```
Switch Address
Port A:01 Port B:02
```

Use the Left or Right arrow keys to select the Switch Address screen for Port A and Port B. Press ENTER and use the Left and Right arrow keys to navigate from Port A to B and vice versa. Use the Up and Down arrow keys to increment or decrement the port numbers for each output port.

Note: If a switch is used as a combiner for other switches it should be configured as port 1.

In addition, each port must be configured to match its controller. Use the Left or Right arrow keys to select Setup mode for Port A or Port B.
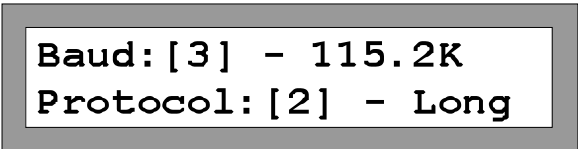
```
Configure Port: A
```

Or

```
Configure Port: B
```

Press the Enter button to select one of the above and to display the current setting for that Port. Once Configuration Mode has been selected, the AT1700 displays the communicate information for that port. Each Port's configuration is independent,

```
Baud:[3] - 115.2K
Protocol:[2] - Long
```

Use the Left and Right arrow keys to navigate to the desired parameter to change and use the Up and Down arrows to change the setting.

Note: The Baud rate must match the controller device. Typically the highest Baud rate setting is the most preferred.

There are two Protocol modes, Long and Short. Similarly, select the appropriate Protocol for the controller. Typically Long Protocol for PC and AT2500s as controllers and Short for CaLan 3010 applications.

The following chart is from the AT1600 manual as a reference.

Sequence	AT1700 Display	Parameter	Settings	Comments
1	01 01	Switch Address	Switch address can be set from 1 to 64.	Use the Up/Down buttons for the corresponding channel (A or B) to increment or decrement it's address. Press either Mode button (Channel-A or Channel-B) to accept the address
2	P2	Protocol - Port A	1 = Short protocol 2 = Long protocol	Press Channel-A Mode button to accept.
3	P2	Protocol - Port B	1 = Short protocol 2 = Long protocol	Press Channel-B Mbutton to accept. (Aonly)
4	b4	Baud Rate - Port A	1 = 19.2 KBaud, 2 = 38.4 KBaud, 3 = 57.6 KBaud, 4 = 115.2 KBaud	Press Channel-A Mbutton to accept.
5	b4	Baud Rate - Port B	1 = 19.2 KBaud, 2 = 38.4 KBaud, 3 = 57.6 KBaud, 4 = 115.2 KBaud	Press Channel-B Mbutton to accept. (Aonly)

Advance to the next parameter in the sequence by pressing the appropriate button. Following the last parameter, the unit will function as configured, entering REMOTE mode, and the display and buttons return to normal operation (see 6.1).

Typical settings:

- **AT2500**
  - o Protocol Long (2)
  - o Baud Rate 115.2 KBaud (4)
- **CaLan 3010**
  - o Protocol Long (2)
  - o Baud Rate 38.4 KBaud (2)

6.1 UI Timeout Operation

The UI (user interface) Timeout Delay controls whether or not the unit returns to REMOTE mode automatically, after having been put into LOCAL mode by the user.

```
        UI Timeout
      Seconds:060
```
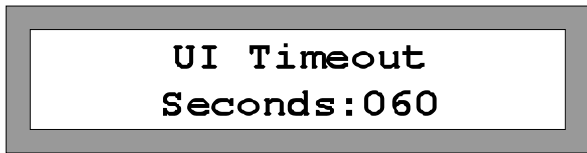
With the delay set to 999 seconds, the unit will remain in LOCAL mode indefinitely. With any other delay value (1-998), the unit will automatically return to REMOTE mode, once no keyboard activity has been detected for the set time delay.

The Auto-remote delay has no bearing on initial boot-up. When the switch boots-up, it is always in remote mode, ready to receive commands. The auto-remote delay applies only when the switch has been manually put into the LOCAL mode via the front panel buttons.

If the multiplexer is set into LOCAL mode by a remote controller, it will stay in LOCAL until a front panel key is pressed or the remote controller resets it to REMOTE mode, initiating the Auto-Remote timer for that output port.

6.2 Trigger Mode

The Trigger Mode allows for more rapid stepping by first loading an Input Sequence Table and then stepping through the table by simply toggling the Trigger Line (DTR signal).

There are two update methods available in Trig mode: Leading Update and Trailing Update on RF Hardware rev 1 and later:
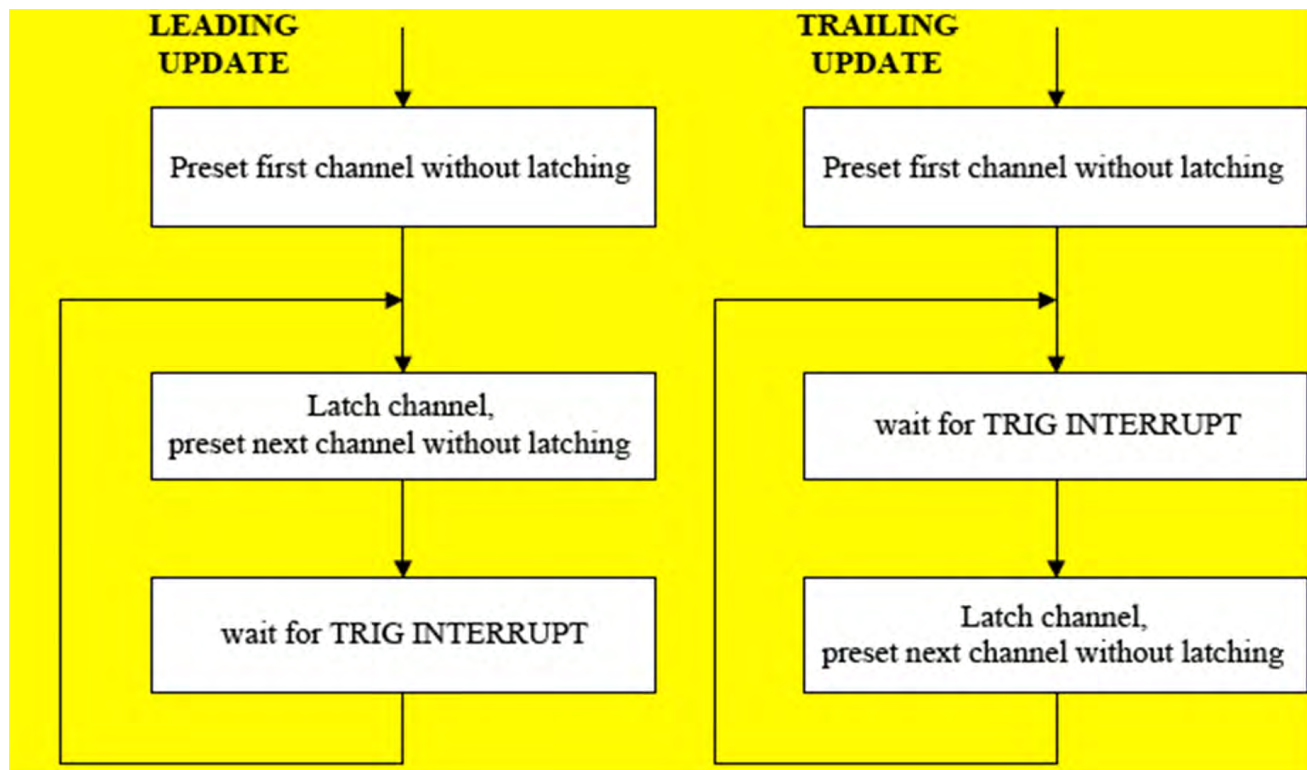
Trigger mode may only be initiated by a remote controller. In order for a controller to initiate the Trigger Mode, the following steps must be followed:

1. The multiplexer output port (A or B) must be in REMOTE mode.

2. The host controller must download a valid Input Sequence Table containing a list of 2 to 255 Inputs

3. The controller must send an "Enable Sequence" command to the multiplexer. Following successful receipt of this command the RF Input Indicators will either show the first input in the sequence table (Leading Update mode) or will stay on the current channel (Trailing Update mode). (See AT1700 Protocol Specifications for more details)

4. Sequenced operation is now ready. Each time the controller toggles the trigger line, the multiplexer will advance to the next item in the table. Upon reaching the end of the table, the pointer will wrap around to the first item.

The decimal point of the leftmost digit is illuminated to indicate that the unit is in TRIGGER mode.

7 SERVICE AND SUPPORT

VeEX Inc. is committed to providing excellent service worldwide. Our goal is to provide you with professional assistance in the use of our software and services, wherever you are located. Technical Support and Customer Service solutions vary by country. If you have questions about the services, please refer to the Technical Support section below.

At VeEX Inc. we get everyone involved and trained to handle Customer service and support requirements. This assures our customers that there is always someone that can be reached at a moment's notice. VeEX Inc. also provides product training to regional representatives allowing them to provide some of the product support locally and in a prompt and personalized manner.

7.1 Technical Support

Repairs and/or calibration are typically completed in 5 to 10 working days. The factory pays shipping costs only when returning equipment to a customer following warranty repair. It is the responsibility the customer to notify the factory technical support persons prior to shipping products for servicing, since many times problems may be solved over the telephone, saving the user more precious time and shipping costs.

A number and e-mail address for technical and sales support are provided below.
Tel: +1 510 651 0500
Fax: +1 510 651 0505
E-mail: customercare@veexinc.com
Web Site: http://www.veexinc.com

7.2 Warranty Information

This VeEX Inc. product is warranted against defects in materials and workmanship during its warranty period.

The warranty period for this product is contained in the warranty page on http://www.veexinc.com.

VeEX Inc. agrees to repair or replace any assembly or component found to be defective under normal use during this period. The obligation under this warranty is limited solely to repairing or replacing the product that proves to be defective within the scope of the warranty when returned to the factory. This warranty does not apply under certain conditions, as set forth on the warranty page on http://www.veexinc.com. Please refer to the website for specific details.

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8 PRODUCT SPECIFICATIONS

8.1 GENERAL SPECIFICATIONS

Model	AT1701	AT1702	
RF Inputs	16	16	Common to both channels
RF Outputs	1	2	Independent outputs and controls for each channel
Test Points	1	2	One for each channel, located on front panel
Comm. Ports	3	5	2 Input ports (1 for each channel) and 2 Output ports(1 for each channel) and 1 Ethernet Port
Comm. Port Type	RS-232 & Ethernet	RS-232 & Ethernet	

8.2 ELECTRICAL SPECIFICATIONS

Parameter	Value	Tolerance	Comments
Pass band (All inputs)	5 – 1 000 MHz	NA	
Gain AT1701	10 dB	± 1 dB	Across the band
Pass band Flatness	+0.75		Across the band
Return Loss all inputs	10 dB min	12 dB typical	Across the band
Return Loss outputs	13 dB min	15 dB typical	Across the band
Maximum Signal level	10 dBmV		Per Channel for 100 channels or +30 dBmV total power
CTB	-60 dBc min	-65 dBc typical	100 channels @ 10 dBmV *
CSO	-60 dbc	-65 dBc typical	100 channels @ 10 dBmV *
Input Crosstalk	-50 db min	-60 dB typical	Across the band
Isolation 16 inputs	-50 dB min	-60 dB typical	Across the band
Switching differential **	± 0.5 dB max		Across the band
Noise Figure	< 3.0 dB		Across the band
Operate time, Short Protocol ***	2.1 msec to 7 msec max	115.2 kBaud	Message +actuation + ACK With traffic on other com port
Operate time, Long Protocol ***	3.9 msec typ 10 msec max	115.2 kBaud	Message +actuation + ACK With traffic on other com port
Switching time ****	40 µsec 0.8 msec typ 2.9 msec max		Switch actuation Ready for next trigger With traffic on other com port
Test Point Loss	-20 dB	+/- 2 dB	

** Variation on one output due to switching of the other output to the same input.

*** Time required for Message reception, processing, switch actuation and ACK transmission.

**** Time required for switch actuation, in Trigger Mode, after the rising edge of hardware trigger (DTR).

8.3 MECHANICAL & ENVIRONMENTAL SPECIFICATIONS

Parameter	Value	Tolerance	Remark
Size	1 RU x 19" x 12"		
Mass	6.6 lb		
Temperature, operating	5 to +40 C		
Temperature, storage	-40 to +70 C		
Pollution Degree	II		
Installation Category	II		
Altitude	Up to 2000m		
Humidity	80% up to 31°C		Decreasing linearly to 50% at 40°C
Shock and vibration	3 g maximum		
Powering	15 VDC	± 10%	
Electrical Supply Class	II		Certified plug-in power supply rated at 3A minimum.
Main Supply Voltage Tolerance	± 10%		Main S upply Voltage indicated on plug-in power supply.
Current consumption	1750 mA max		1750 mA typical @ 15VDC