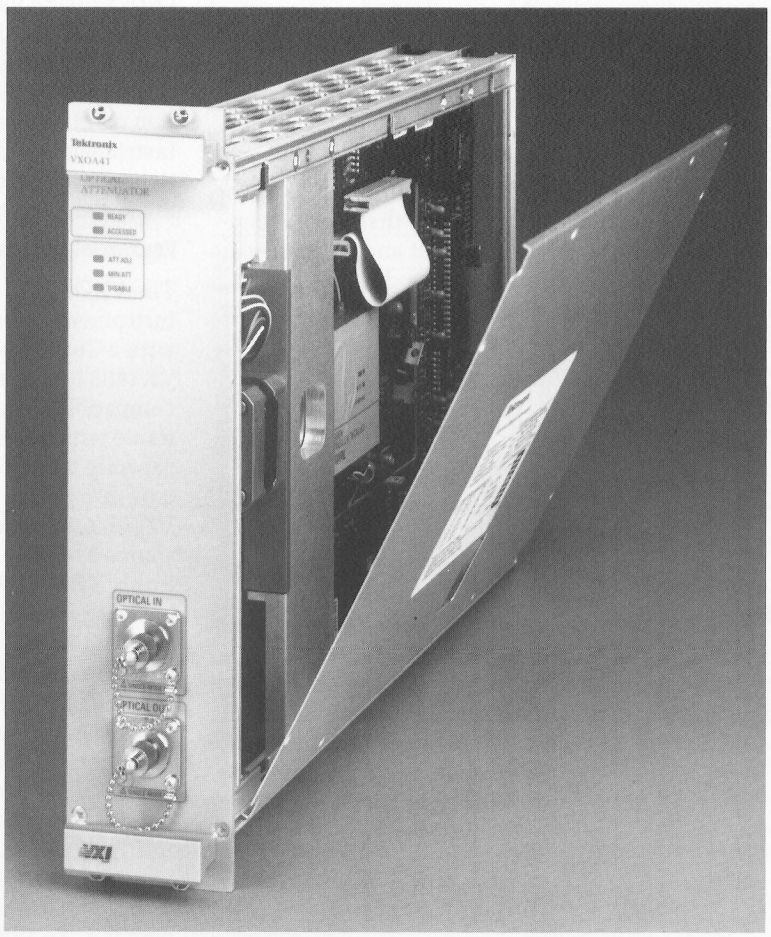
Tektronix

VXOA41 VXI Programmable Optical Attenuator



The VXOA41 is a computer controlled optical attenuation plug-in module for use in VXI-based automated test systems.

Features:	Applications:
Message-based control	Bit error testing
C-sized card configuration	Receiver performance evaluation
VXI Rev. 1.3 compatible	Fiber optic link and system R&D
Singlemode and multimode input/ outputs	OTDR fiber attenuation calibration
Compact physical size	Calibration of optical power meter linearity
Four user changeable optical fiber connector types	General control of fiber based optical power

Figure 1. VXOA41 Optical Attenuator plug-in module.

Product Description

The Tektronix VXOA41 Optical Attenuator is a high-performance instrument used to control the level of optical power propagating through an optical fiber. This product is a plug-in C-sized instrument module for use in a VXIbus System (Specification Rev.1.3). The VXOA41 occupies two slots in a VXIbus card-modular instrument mainframe. It provides computer controlled optical attenuation from 0 to 60 dB in 0.01 dB steps.

VXOA41 attenuators accept and deliver optical input and output signals on connectorized optical fiber cables. The standard version VXOA41 provides for singlemode fiber input & output. Options 01, 02, and 03 provide for the input & output of the three most commonly used multimode fiber sizes (50 μm, 62.5 μm, and 100 μm fiber core diameters).

Technical specifications for the VXOA41 are essentially the same as the Tektronix OA5000 Series Programmable Optical Attenuators with only minor exceptions.

Key Applications

The VXOA41 products are intended for use in production testing of high-speed fiber optic transmission equipment during its manufacture. Optical receiver sensitivity testing (bit error rate measured as a function of optical signal level) is an important application for this attenuator.

VXOA41 attenuators are equivalent in function and performance to the Tektronix OA5000 Series of programmable optical attenuators, which are GPIB compatible but not VXIbus compatible.

VXOA41 products provide one basic functional building block in an all-VXI Tektronix manufacturing test system for SDH/SONET

physical layer compliance testing applications. The VXOA41 can also be used as a retrofit module in existing VXI test systems supplied by other manufacturers as well as those supplied by Tektronix.

Typical Configurations

The VXOA41 is a double-wide VXIbus module. The instrument may therefore be configured with numerous other modules in a VXIbus mainframe thereby taking advantage of the backplane trigger and local bus resources available. The VXOA41 is often used in conjunction with an optical power meter module and/or a stable optical source. The VXOA41 also may be used in a VXI-based SDH/SONET test system for qualifying SONET transmitters and receivers over their specified dynamic operating range (optical power range). Control of the instrument is accomplished over the VXIbus through the Word Serial Protocol and an IEEE 488.2 compliant command set.

Front Panel Indicators

The VXOA41 has five LED indicators on the front panel. Two of these are the standard Tektronix VXIbus indicators: READY and ACCESSED. The other three indicators are specific to the VXOA41: ATT ADJ, MIN ATT, and DISABLE. The user adjusts the various states and settings of the instrument through the command set.

Front Panel Optical Connectors

The VXOA41 is provided with FC fiber optic connectors installed on the front panel. Users wishing to convert these bulkhead connectors to another type (ST, SC, or DIN-47256) will need to order one Universal Fiber Optic Connector Adapter Kit (020-1885-00) per bulkhead connector that is to be changed. Users that wish to convert both input and output connectors will need to order two Universal Fiber Optic Connector Adapter Kits.

Maintenance

The only routine maintenance required of the user is the cleaning of the optical input and output optical connectors. There is no rigid schedule for the frequency of this maintenance. It depends largely on the cleanliness and frequency of fiber connections and disconnections made to the instrument. It is suggested that any noticeable increase in insertion loss to the instrument is indicative of possible fiber optic connectors which require cleaning

Bite

Built-In-Test Equipment (BITE) is provided by several self tests that are automatically performed on power-up and may also be invoked on command. Circuitry tested includes the CPU and all memory. The VXOA41 supports the IEEE 488.2 defined *TST? and *CAL? commands. Front panel LEDs provide visual BITE for instrument readiness, system controller access, attenuation adjustment, minimum attenuation condition, and shutter status. Instrument parameters and conditions may be read at any time by the system controller.

Equipment Required

The VXOA41 is not a stand-alone instrument and must be used with a Tektronix VX1400 or VX1405 Mainframe or other VXI compatible C-size or D-size mainframe with a minimum cooling capacity of 1.5 liters/sec (at 0.04 mm H_2O). Also required is a VXI slot-0 controller and/or Resource Manager such as a Tektronix VX4521 Resource Manager, or Tektronix EPC-2, or EPC-7 System Controller. Additionally a software utility is needed that is capable of sending and receiving VXI message-based commands and queries to and from a VXI device. If using an EPC-2 controller, this may be the BusProbe utility; if using the VX4521, this may be any GPIB talker-listener utility on a controller with a GPIB card (i.e., an IBIC DOS or Windows utility).

VXOA41 Optical Attenuator Characteristics

Optical

Characteristic	Performance
Wavelength Range	600 nm - 1700 nm (usable wavelengths are >1100 nm for singlemode)
Input/Output Fiber Type	Singlemode (standard) 50/125 μm diameter (Option 01) 62.5/125 μm diameter (Option 02) 100/140 μm diameter (Option 03)
Insertion Loss	2 dB from 1100 - 1600 nm: SM & MM 4 dB from 700 - 1100 nm: MM only
Attenuation Range	60 dB from 700 nm - 1350 nm, 50 dB from 1350 nm - 1600 nm >100 dB with shutter closed (for standard, Option 01, and Option 02 versions), >90dB with shutter closed (for Option 03)
Accuracy	±0.15 dB (±0.05 dB typ.) at 850 ±20 nm, 1300 ±20 nm, and 1550 ±20 nm for all MM units ±0.15 dB at 1300 ±20 nm, 1550±20 nm, for SM unit ±0.25 dB at other wavelengths for SM unit
Linearity	MM units: ±0.05 dB, 600 nm - 1700 nm SM units: ±0.05 dB, 1100 nm - 1700 nm
Repeatability	±0.05 dB
Mode Dependent Loss	Relative attenuation: ±0.05 dB Insertion loss: 0.25 dB (Option 01), 0.35 dB (Option 02 and 03)
Temperature Dependence	±0.005 dB / °C / db ATT setting ±0.02 dB / °C (insertion loss) (0 - 50°C relative to 25°C)
Input Return Loss	<–45 dB (SM), < –25 dB (MM)
Polarization Dependence	<±0.2 dB diff. in throughput attenuation
Maximum Optical Input	100 mW (+20 dBm) continuous

Environmental

Temperature	Operating: 0°C - 50°C Non-operating: –55°C - 60°C
Altitude	Operating: 4.6 km (15,000 ft) Non-operating: 15 km (50,000 ft)
Humidity	Operating: 90% RH, 0°C - 50°C Non-operating: 90% RH, 60°C
Shock	60 g's (Ω sine) 11ms duration, 3 shocks in each direction along 3 major axes, 18 total shocks
Bench Handling	12 drops from 45° and/or 4"
Transportation Handling	Non-operating: Drops of 36 inches on all edges, faces, corners
Emissions, EMI (conducted & radiated)	FCC Rules and Regulations, Part 15, Subpart J, Class A; VFG 243; CISPR 22
Susceptibility, EMI	Radiated: IEC 801-3 (3 V/m) Conducted: MIL-461B, 1980 (CS01, CS02, and CS06)
Susceptibility, ESD	6 kV maximum ESD discharge applied to operating instrument

Physical and Electrical

Net Weight	2.4 kg (5.25 lbs)
Dimensions, overall	Width: 60.66 mm (2.388 in) Height: 366.70 mm (14.437 in) Depth: 345.03 mm (13.584 in)
Power Dissipation, total	$P_{total\ max} \leq 22$ W in instrument $P_{typical} = 13.25$ W in instrument

Ordering Information

VXOA41
VXI Programmable
Optical Attenuator

Includes:

VXI optical attenuation C-sized plug-in module with female FC (installed) input and output optical bulkhead connectors; User manual (070-8777-00).

Optional Accessories

☐ **Universal Fiber Optic Connector Adapter Kit –** Universal Fiber Optic Connector Adapter Kits (020-1885-00) provide the field installable parts necessary to convert VXOA41 front panel optical bulkhead (female) connectors to ST™, SC, and DIN-47256 input and output optical connectors (FC connectors come installed on instrument). One kit is needed for each of two front panel connectors.

☐ **Fiber Optic Cables –** The following Tektronix fiber optic cable assemblies are intended to provide high quality interconnections between fiber optic test equipment having the same or different optical connector types. Each cable assembly consists of a single jacketed fiber connectorized on both ends with male connectors. Cables with different type connectors on each end are for interconnecting two instruments having dissimilar female connectors. The type of connector installed on each end of the fibers are indicated below.

Single Mode:

☐ **Fiber Optic Cables –** 2 meter length, 8/125 μm core/cladding diameter, includes in-line connector adapter.

- ☐ FC/PC to Diamond 3.5 connectors (174-1385-00)
- ☐ FC/PC to ST connectors (174-1386-00)
- ☐ FC/PC to FC/PC connectors (174-1387-00)
- ☐ FC/PC to Biconic connectors (174-1388-00)
- ☐ FC/PC to Diamond 2.5 connectors (174-1497-00)

Multimode:

☐ **Fiber Optic Cables –** 2 meter length, 62.5/125 μm core/cladding diameter.

- ☐ FC/PC to FC/PC connectors (174-2322-00)
- ☐ FC/PC to Biconic connectors (174-2323-00)
- ☐ FC/PC to SMA connectors (174-2324-00)

☐ **Fiber Optic Cables –** 2 meter length, 100/140 μm core/cladding diameter.

- ☐ SMA to ST connectors (174-0876-00)
- ☐ SMA to Diamond 3.5 connectors (174-0877-00)
- ☐ SMA to FC connectors (174-0878-00)
- ☐ SMA to SMA connectors (174-0879-00)
- ☐ SMA to Biconic connectors (174-0880-00)
- ☐ SMA to Diamond 2.5 connectors (174-1303-00)

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