

FIBER OPTIC TRIGGERS

2002 Product Brief

Third Millennium Engineering offers a semi-custom product line of fiber optic sampling oscilloscope trigger test instruments. These products are useful to customers involved with research, product development, manufacturing, deployment, operation, and maintenance of fiber optic telecom products. Clock recovery technology is used to extract an electrical trigger signal from a fiber optic signal sent to an optical sampling oscilloscope, such as those made by Agilent, Tektronix, and others. Models are offered for 850 nM multimode, 1310 nM multimode, 1310 nM single mode, or 1550 nM single mode operating wavelengths. Various ~10 Gb/s models are offered with 1 to 6 separate fixed value trigger rates at any rate between 9.3 Gb/s and 12.9 Gb/s. Lower trigger rate models are offered with programmable trigger rates between 10 Mb/s and 2.7 Gb/s operation. Other model variations add an analog electrical data output for input to an electrical channel of a sampling oscilloscope or a digital output for operating an error detector. Several amplification options are offered to improve the optical input sensitivity.

An example instrument structure is shown in the block diagram below. A single-mode fiber optic signal is passed through a tap optical coupler to the optical input of a fiber optic sampling oscilloscope. The tapped optical input is delivered to an optical receiver via an optional optical boost amplifier and variable attenuator. The receiver output is amplified and distributed via a selector switch to one or more clock (or clock-data) recovery circuits. The clock (or clock-data) outputs are routed via selector switches to clock (or clock and data) output connectors. The clock output is connected to the sampling oscilloscope trigger input. The data output can be connected to a BERT tester.

Each instrument is normally packaged in a GPIB, RS-232, or USB programmable, worldwide powerable, rack-mountable, mainframe chassis. Simple low cost manual desktop versions are also offered. Customers can specify the exact model needed from many possibilities. TME can often modify or retrofit any instrument at a later date, as customer needs change. Special all-optical clock recovery models can be provided upon request for trigger rates over 39 Gb/s.

Variety of Models Offered

- 850 nM multimode, 1310 nM multimode, 1310 nM single mode, or 1550 nM single mode operating wavelengths
- 1 to 6 independent ~10 Gb/s trigger channels in one chassis, any rate from 9.3 Gb/s to 12.9 Gb/s
- Programmable trigger rates for models between 10 Mb/s and 2.7 Gb/s

Variety of Options Offered

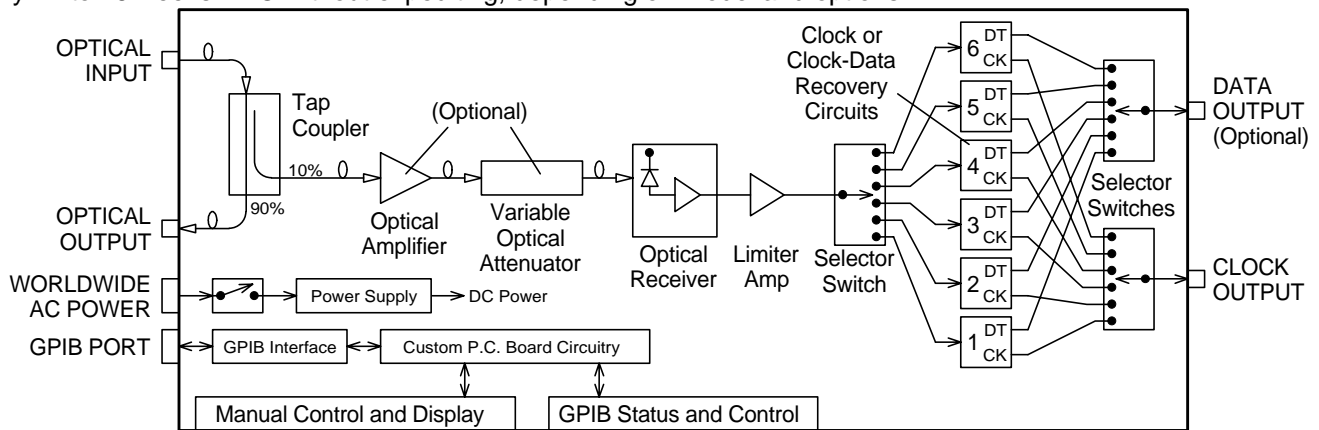
- Optical amplifier and leveling attenuator to extend minimum input range
- Electrical clock splitter, programmable clock phase shifter, APD receiver or larger coupler tap for more sensitivity, polarized optical I/O, use of different clock recovery technologies, multi-port optical tap coupler, no optical tap coupler, other wavelength ranges, special customer specified optical connectors or other components

Instrument Basic Features

- Worldwide AC powerable, 19" rack mount or bench top mainframe chassis
- GPIB-HPIB-IEE488.2, RS-232, or USB controlled, manual control via front panel user interface
- Front panel mounted optical and microwave I/O connectors

Price and Delivery

Call TME or a representative to discuss and refine your special trigger needs and request a quote. Terms are typically 50% due at order placement, 50% due after instrument acceptance, and financing can be arranged if needed. Delivery is typically 12 to 16 weeks ARO without expediting, depending on model and options.



Example Block Diagram for 6 Ch. Fiber Optic Trigger Test Instrument

Third Millennium Engineering

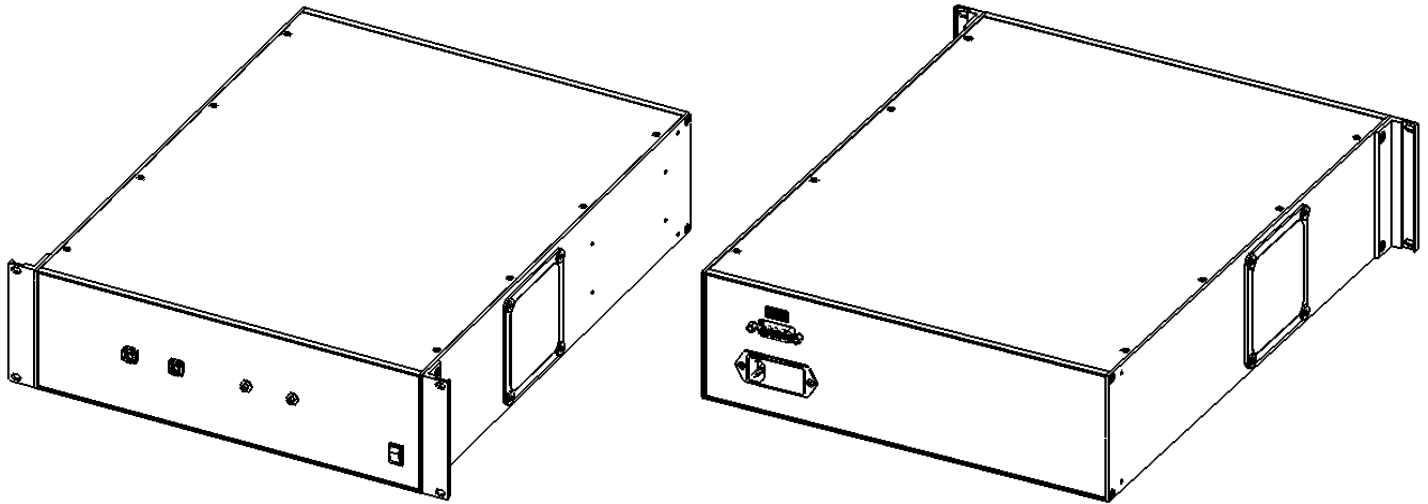
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Example ~10 Gb/s Multi-Rate Fiber Optic Trigger Test Instrument

Example ~10 Gb/s Fiber Optic Trigger Models

Model Code	Item	Electrical Outputs	Maximum Expansion	Price 1 Ch.	Price 2 Ch.	Price 3 Ch.	Price 4 Ch.	Price 5 Ch.	Price 6 Ch.
TKA9031-36*	1	Clock only	6 trigger channels	\$62,675	\$72,550	\$82,425	\$92,300	\$102,175	\$112,050
TKA9041-46*	2	Clock and Data	6 trigger channels	\$71,450	\$83,325	\$95,200	\$107,075	\$118,950	\$130,825
TKA9021, 22*	3	Clock only	2 trigger channels	\$53,425	\$63,300				
TKA9023, 24*	4	Clock and Data	2 trigger channels	\$57,950	\$69,825				
TKA9011*	5	Clock only	1 trigger channel	\$48,425					
TKA9012*	6	Clock and Data	1 trigger channel	\$50,650					

Options (others available)

Model Code	Model Options	Added Price
Option A	Any model with added optical amplifier and variable attenuator, extends optical power range to -20 dBm minimum	\$13,950
TKA9001*	Retrofit 1 additional Clock only trigger channel up to maximum expansion, at TME factory, shipping not included	\$10,875
TKA9002*	Retrofit 1 additional Clock and Data trigger channel up to maximum expansion, at TME factory, shipping not included	\$12,875

Brief Specifications: Rack mount GPIB instrument. Trigger rate can be any fixed rate between 9.3 Gb/s and 12.9 Gb/s. Optical input power range is -5 dBm minimum to +10 dBm maximum using 10% tap coupler. Pass-thru optical insertion loss is 1 dB typical. Wavelength range is 1275-1310 nm and 1500-1580 nm. Jitter is 7% rms max on clock output. Clock outputs are 1.5 Vpp minimum sine wave. Data output levels are dependent upon optical input power level and are an analog of the O-to-E converted and limited data. Optical connectors are single mode FC/UPC bulkhead feedthrus, electrical connectors are K-female. * = options.

Note: All listed prices (USD) and specifications may change without notice, made firm upon quote.

OTHER TME PRODUCTS

All TME semi-custom functional test instruments are normally GPIB, RS-232, or USB programmable, worldwide powerable, and ESD compliant. Simple low cost manual desktop versions are also offered in some cases.

- **FIBER OPTIC TRANSLATORS:** Digital and/or analog fiber optic transmitter, receiver, transceiver, and wavelength converter test instruments. 1 to over 16 channels, NRZ or RZ or CRZ or other modulation, 50 Mb/s to 43 Gb/s, almost any clock recovery rate, single mode and multimode, fixed or tunable, 850 nm or 1310 nm or 1550 nm bands on ITU grid, CWDM and WWDM and DWDM, single-ended or differential electrical I/O, AC or DC coupling, polarity reversal. Options such as SBS suppression, channel ID, variable optical attenuators, optical power monitor, low pass filters, etc.
- **FEC TRANSLATORS:** Electronic transmitter, receiver, and transceiver test instruments used for Forward Error Correction (FEC) of 2.5, 10, and 40 Gb/s telecom signals. 1 to 4 channels models offered for ~10 Gb/s SONET/SDH or Ethernet to G.975, G.709, or SuperFEC data rates.
- **ELECTRONIC TRANSLATORS:** convert, split, or select one or more signals between common single-ended and differential 50, 75, and 100 ohm analog coax test equipment I/O and/or digital CMOS, TTL, ECL, and other logic levels and DS1, DS3, and other telecom formats.
- **FIBER OPTIC SPANS:** Programmable chromatic dispersion using one or more single mode fiber types, dispersion compensating fiber, dispersion compensators, optical switches, optical amplifiers, optical filters, etc. Programmable "telecom superhighway in a box"!
- **TELECOM SWITCH MATRICES:** Multi-channel, telecom specific RF, microwave, and optical switch matrices. Routes fiber optic, microwave, RF, DS3, DS1 signals between product and test equipment. Channel loop-back, daisy chain, daisy bypass, float, terminate, short, test access modes.
- **"MR. HORIZON" FUNCTIONAL TEST FIXTURES:** Flexible, economical, recyclable functional test fixturing system, standardizes ~75%. Fixture quick-connects to a base with multiple DC power supplies, digital/analog I/O, fiber optics/RF/microwave I/O, pneumatics, and temperature control.
- **FULL CUSTOM PRODUCTS:** Technical and business consulting, multi-disciplinary engineering and design, low volume manufacturing and construction, system integration. Product Design, Prototype, and Pre-Production - hybrids, MCMs, sub-assemblies, modules, equipment, systems. Expertise with fiber optic, electronic, RF, microwave, sensors, analog, digital, interface, power, transmission lines, thermal, EMI/RFI, mechanical design, packaging, pcb assemblies, advanced packaging and technologies, etc. Functional Test Systems - consoles, fixtures (single or multiple head, precision, multi-technology, etc.), custom and commodity equipment, console-fixture interfaces, software, cabling, etc. for research, product development, or manufacturing.

Visit Third Millennium Engineering at <http://www.tmeplano.com> for the latest information on TME products and services.