

# GBIC TEST SYSTEMS FOR FIBRE CHANNEL AND GIGABIT ETHERNET

GTS1063 • GTS1250



## FEATURES AND BENEFITS

- Compact Platforms for Testing and Characterizing Industry-standard GBIC Modules
- Built-in Generator for Standard Jitter Test Patterns
- Electrical Input for External Transmit Patterns
- Differential Unbuffered Output for Serial Receive Data Stream
- Serial Clock and Data Recovery (Option)

## APPLICATIONS

- Test and Evaluation of GBIC Modules
- Verifying Compliance to Fibre Channel and Gigabit Ethernet Standards
- Bit Error Rate Testing of Fiber Optic Links
- Supports Diagnostic Waveform Analysis of GBIC Receive Signal
- GTS1063 Supports Fibre Channel
- GTS1250 Supports Gigabit Ethernet

### GBIC TEST PLATFORM

Gigabit Ethernet and Fibre Channel are developing into leading communication standards for the backbones of local area networks and enterprise storage systems. In support of these technologies, Gigabit Interface Converters (GBICs) have become an industry standard for interfacing network hubs, processors and storage devices via optical fiber links. The GTS1063 and GTS1250 are instruments for testing and evaluating GBICs. They accept GBICs via a receptacle on the front-panel, and provide access to their electrical Transmit and Receive interface, and all other monitoring pins.

### PROGRAMMED OR EXTERNAL TEST PATTERNS

For the transmitter side of the GBIC, the instruments can generate test patterns based on Fibre Channel and Gigabit Ethernet standards, and accept externally generated patterns. The built-in patterns are selected on the instrument front-panel or remotely through TTL levels. In addition, the instruments provide inputs for jitter modulation of the transmit data.

### RECEIVE SIGNALS WITH CLOCK RECOVERY (OPTION 01)

On the receiver side of the GBIC, the instrument makes available the recovered and retimed data, and the recovered clock for Bit Error Rate Testers and eye pattern triggering. For diagnostic waveform analysis, the complementary unbuffered data signal from the GBIC is also made available.

## CHARACTERISTICS

### GBIC PORT

Industry standard GBIC receptacle on front-panel.

### ELECTRICAL INPUTS AND OUTPUTS

SMA connectors, unless stated otherwise.

### INTERNAL TRANSMIT PATTERN GENERATOR

**Clock Source** – Internal or external.

**Data Format** – NRZ.

All built-in patterns except PRBS7 as defined in the T11.2 MJS Fibre Channel Standard and IEEE Standard 802.3 Annex 36A, 1998 (Gigabit Ethernet).

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**Programmed Transmit Data Patterns –**

**D28.5:** High frequency test pattern for testing random jitter and duty cycle. Continuously repeating 10101010 output (equivalent to square wave of 1/2 clock rate).

**K28.7:** Low frequency test pattern for testing rise and fall times. Continuously repeating 111100000 output (equivalent to square wave of 1/10 clock rate).

**K28.5:** Mixed frequency test pattern for testing deterministic jitter. Continuously repeating sequence of 001111010 followed by logical inverse 110000101.

**CRPAT:** Compliant Random Pattern (GTS1063 only).

**CJTPAT:** Compliant Jitter Tolerance Pattern (GTS1063 only).

**LONG:** Long continuous random test pattern for measuring wideband system jitter (GTS1250 only).

**SHORT:** Short continuous random test pattern for measuring wideband system jitter (GTS1250 only).

**PRBS7:** Pseudo Random Bit Sequence (equivalent to 2<sup>7</sup>-1) for common BER and PRBS testing. Selected pattern is sent directly to  $\pm$ Tx-Data pins of GBIC receptacle.

**EXTERNAL TRANSMIT DATA INPUT**

**Amplitude** –  $>300\text{ mV}_{p-p}$  and  $<1.5\text{ V}_{p-p}$ .

**Data Rate** – 100 Mb/s to 1.4 Gb/s.

Data Input is digitally compared and sent directly to  $\pm$ Tx-Data pins of GBIC receptacle; no significant timing jitter is added or subtracted.

**EXTERNAL CLOCK INPUT**

**Amplitude** –  $>300\text{ mV}_{p-p}$ ,  $<1.5\text{ V}_{p-p}$ .

**Clock Rate** –

GTS1063: 1.0625 GHz  $\pm$  1%.

GTS1250: 1.25 GHz  $\pm$  1%.

**TRANSMIT DATA OUTPUTS**

**Transmit Data** – Data pattern sent to GBIC transmitter.

**Transmit Data'** – Complement of Transmit Data.

**Average Duty Cycle** – 50%  $\pm$  1%.

**Clock Out** – 1.0625 GHz clock signal (GTS1063), 1.25 GHz clock signal (GTS1250), synchronous to outgoing transmit pattern.

**Common for Transmit Data and Clock Out** – Output Data Rate: 1.0625 Gb/s  $\pm$  75 ppm (GTS1063), 1.25 Gb/s  $\pm$  75 ppm (GTS1250). Rise/Fall time (10 to 90%):  $<300\text{ ps}$ .

**Sync Pulse** –

Pulse synchronous to outgoing transmit pattern. Repetition rate depending on selected pattern.

**Random Jitter** –  $<4\text{ ps rms}$  (typical 2 ps rms).

**Deterministic Jitter** –  $<40\text{ ps peak-to-peak}$  (typical  $<20\text{ ps}$ ).

**Common for Transmit Data, Clock, and Sync Pulse Outputs –**

Output amplitude:  $>300\text{ mV}_{p-p}$ ,  $<600\text{ mV}_{p-p}$ .  
Output impedance:  $50\ \Omega$ , AC coupled.

**TRANSMIT DATA JITTER MODULATION**

Varies pulse width of transmit data stream via externally supplied voltage.

**Amplitude** – max.  $2.5\text{ V}_{p-p}$ .

**Frequency** – DC to 4.75 MHz (typical).

**Jitter Variation** –  $\pm 1\text{ V}$  changes logic pulse widths by  $\pm 110\text{ ps}$ .

**RECEIVE DATA OUTPUT**

**+ Receive Data, – Receive Data** – Direct pick-off from  $\pm$ Rx-Data pins of GBIC receptacle via  $75\text{ to }50\ \Omega$  min-loss conversion circuitry.

**Output Amplitude** – 1 V measured in  $50\ \Omega$  environment represents 2.36 V in  $75\ \Omega$  environment.

**Output Impedance** –  $50\ \Omega$ , DC coupled.

**RECOVERED CLOCK AND RECEIVE DATA (OPT. 01)**

Derived from Rx-Data of GBIC.

Receive Data retimed by recovered clock.

**Lock Range** –

GTS1063: 1.0625 Gb/s  $\pm$  10,000 ppm.

GTS1250: 1.25 Gb/s  $\pm$  10,000 ppm.

**Phase Lock Loop Bandwidth** –

GTS1063: 637 kHz  $\pm$  100 kHz.

GTS1250: 750 kHz  $\pm$  100 kHz.

**Jitter Tolerance** –

$f_{MOD} < 30\text{ kHz}$ : 1.5 UI (120 ps).

$30\text{ kHz} < f_{MOD} < 3\text{ MHz}$ : 0.15 UI (120 ps).

( $f_{MOD}$  = Frequency of horizontal timing jitter of incoming optical signal)

**Clock-to-Recovered Data Jitter** –  $<8\text{ ps rms}$  (typ.  $<4\text{ ps rms}$ ).

**Output Amplitude** –  $>300\text{ mV}_{p-p}$ ,  $<600\text{ mV}_{p-p}$ .

**Output Impedance** –  $50\ \Omega$ , AC coupled.

**Rise/Fall Time (10 to 90%)** –  $<300\text{ ps}$ .

**INDICATORS**

**Front-panel Indicators for GBIC** –

Receive Loss of Signal (Rx LOS).

GBIC Transmitter Fault (Tx Fault).

GBIC I and V overload.

**GBIC RECEPTACLE SUPPLY**

**Supply Voltage** – 4.85 to 5.15 V (typ. 5 V), variable by  $\pm 500\text{ mV}$  via auxiliary input.

**Supply Current** – max. 400 mA steady state.

**Output Ripple** –  $<50\text{ mV}_{p-p}$  relative to receptacle GND.

Overload protected with reset function.

**AUXILIARY INPUTS**

Available on rear-panel 25-pin male D connector.

**Remote Control of Transmit Pattern** – 3-Bit TTL input.

**Lock Out Front Panel Pattern Select** – TTL input.

**External Clock Enable** – TTL input.

**GBIC Tx Disable** – TTL input.

**GBIC Overload Reset** – TTL input.

**GBIC Supply Shutdown** – TTL input.

**GBIC V Offset** –  $\pm 500\text{ mV}$  from GBIC 5 V supply.

**AUXILIARY OUTPUTS**

Available on rear-panel 25-pin male D connector.

**GBIC Tx Fault and Rx Los** – TTL output flags.

**GBIC serial-ID communication lines.**

**GBIC I and V Overload** – TTL output flags.

**GBIC V Monitor** – 1 to  $\pm 3\%$  GBIC supply voltage via  $1\text{ k}\Omega$  resistor.

**GBIC I Monitor** – 1 mV per 1 mA  $\pm 3\%$  of GBIC supply current.

**ENVIRONMENTAL, EMC, SAFETY**

**Operating Temperature (Class VI)** –

$+10^\circ\text{ C}$  to  $+40^\circ\text{ C}$ .

**Nonoperating Temperature (Class VI)** –

$-55^\circ\text{ C}$  to  $+75^\circ\text{ C}$ .

**Humidity** –

Operating: At or below  $+33^\circ\text{ C}$ : 20% to 80%.

Upper limit derates to 25% at  $+40^\circ\text{ C}$ .

Nonoperating: At or below  $+31^\circ\text{ C}$ : 5% to 90%.

Upper limit derates to 20% at  $+60^\circ\text{ C}$ .

**Random Vibration** –

Operating: 0.31 g rms, from 5 to 500 Hz.

Nonoperating: 2.46 g rms, from 5 to 500 Hz.

10 minutes each axis.

**EMC Compliance** –

Meets intent of Directive 89/336/EEC for electromagnetic compatibility.

Australian AN/NZS 2064.1/2 and AS/NZS 3548.

**Safety** –

UL3111-1; CAN/CSA C22.2 No. 1010.1; EN 61010-1: 1995/A2.

**Power** –

Line Voltage: 100 to 240 VAC + 10% (autorange).

Line Frequency: 47 to 63 Hz.

## CHARACTERISTICS CONTINUED

### PHYSICAL CHARACTERISTICS

Dimensions	mm	in.
Height	45	1.75
Width	204	8
Depth	331	13
Weight	kg	lbs.
Net	1.8	3.9
Shipping	5.2	11.5

### SPECIFICATIONS FOR IBM GBIC MODULES:

	IBM 850 nm Multi-mode	IBM 1310 nm Single-mode
	Order 119-6112-00	Order 119-6113-00
Optical data rate*	1.0625 or 1.25 Gb/s	1.0625 or 1.25 Gb/s
Optical wavelength	770 to 860 nm	1270 to 1350 nm
Launch power	-9.5 to -5.0 dBm	-9.5 to -3.0 dBm
Optical connections	Female SC for Transmit and Receive Signal	

## ORDERING INFORMATION

### GTS1063

Test System for Fibre Channel Gigabit Ethernet Interface Converters.

### GTS1250

Test System for Ethernet Gigabit Interface Converters.

**Includes:** Instruction Manual, Certificate of Calibration, US Power Cord.

### OPTIONS

**Opt. 01** – Clock Recovery.

### INTERNATIONAL POWER CORD OPTIONS

**Opt. A1** – Universal Euro 240 V, 50 Hz.

**Opt. A2** – United Kingdom 240 V, 50 Hz.

**Opt. A3** – Australia 240 V, 50 Hz.

**Opt. A5** – Switzerland 220 V, 50 Hz.

**Opt. AC** – China 240 V, 50 Hz.

**Opt. A99** – No power cord.

### MEASUREMENT SERVICE OPTIONS

**Opt. D1** – Calibration Data Report.

**Opt. C3** – Three years of Calibration Services.

**Opt. D3** – Three years of Calibration Data (requires Opt. C3).

**Opt. R3** – Three years of Extended Warranty.

### RECOMMENDED ACCESSORIES

**IBM 850 nm Multi-mode 1.25 Gb/s GBIC** - Order 119-6112-00.

**IBM 1310 nm Single-mode 1.25 Gb/s GBIC** - Order 119-6113-00.

**TVGF13** – Dual rack mount kit.

**For further information, contact Tektronix:**



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