ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Tektronix / Microwave Logic GB700R gigaBERT-700* at our website: *Click HERE*

LIST OF FIGURES

Figure 2-1 Example BERT Application 2-2
Figure 2-2 Nominal Generator NRZ Data and Clock Output Waveforms 2-3
Figure 2-3 Generator Front and Rear Panels 2-5
Figure 2-4 Analyzer Front and Rear Panels 2-6
Figure 2-5 Generator Display in Its Normal (Non-menu) Mode 2-7
Figure 2-6 Analyzer Display in Its Normal (Non-menu) Mode 2-8
Figure 4-1 Nominal Generator Clock and Data Waveforms Showing Amplitude, Baseline Offset, and V_{top} 4-6
Figure 4-2 Generator Clock and Data Output Equivalent Circuits 4-6
Figure 5-1 Analyzer Clock and Data Input Equivalent Circuits 5-7
Figure 5-2 The TOTALIZE Measurement Process 5-15
Figure 5-3 The WINDOW Measurement Process 5-16
Figure 5-4 The TEST Measurement Process 5-17
Figure 5-5 Example Analyzer Setup Report 5-23
Figure 5-6 Example End-of-Test Report 5-24
Figure 5-7 Example End-of-Window Reports 5-25
Figure 5-8 Example On-Error Reports 5-26
Figure 7-1 Standard Event Status Register (SESR) 7-15
Figure 7-2 Test Status Register (TSR) 7-16
Figure 7-3 Status Byte Register (SBR) 7-17

LIST OF TABLES

Table 2-1 Generator Inputs and Outputs 2-14
Table 2-2 Analyzer Inputs and Outputs 2-15
Table 2-3 Using F2 and F3 to Select Which Input to Set Up 2-20
Table 3-1 AC Power Fuse Types 3-2
Table 3-2 PRBS (2^n-1) Test Patterns 3-7
Table 3-3 Mark Density Patterns 3-8
Table 4-1 External Clock Input Specifications vs. Termination 4-3
Table 4-2 Output Setup Rules vs. Termination Impedance 4-7
Table 4-3 Data Inhibit Logic 4-13
Table 5-1 Actions Taken by Analyzer when Synchronization is Lost 5-3
Table 5-2 Synchronization Threshold 5-6
Table 5-3 How F2 and F3 Determine Which Input Can be Set Up 5-8
Table 5-4 Input Terminations for CLOCK, DATA, and REF DATA 5-9
Table 5-5 Input Threshold Range as a Function of Termination 5-11
Table 5-6 How to Tell Which Display Mode is Active 5-18
Table 6-1 Menu Descriptions 6-6
Table 6-2 Analyzer Menu System Overview 6-7
Table 6-3 Generator Menu System Overview 6-8
Table 7-1 RS-232C (Serial Port) Parameters 7-4
Table 7-2 RS-232C Connector Pin-out 7-5
Table 7-3 RS-232C Port Error Messages 7-7

CHAPTER 1
Getting Started

This chapter defines the scope of the *gigaBERT700* User Guide. It also contains important safety information, an instrument check-out procedure, and information on how to contact Tektronix Customer Service.

Auxiliary Monitor Outputs (Data, Clock, and PSYNC) A-6
Auto_Search and Pattern Synchronization A-6
Synchronization Thresholds A-6
Measurements A-7
RS-232C and GPIB Interfaces A-8
Printer (Parallel) Interface A-8
AC Power Requirements A-8
Mechanical A-9
Pattern Specifications (Generator and Analyzer) A-10
Data Patterns A-10
PRBS Pattern Phase Tap Information A-10

Default Settings ***B-1***
How to Recall Factory Default Settings B-2
Using Front Panel Controls B-2
Via Remote Control B-2
Functions Shared by Generator and Analyzer B-3
Data Pattern (Standard) B-3
Data Pattern (128K Option) B-3
Remote Interfaces B-3
View Angle and Panel Lock B-4
Generator Factory Default Settings B-5
Clock Source and Frequency B-5
Clock and Data Outputs B-5
Analyzer Factory Default Settings B-6
Clock, Data, and Reference Data Inputs B-6
Auto_Search/Pattern Synchronization B-6
Error Beeper B-6
Time and Date B-6
Printer B-7
Window Measurement Process B-7
Test Measurement Process B-7

Options ***C-1***

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Initial Self-Check Procedure

You may perform the following procedure as an initial self-check of your new *gigaBERT700* Generator and Analyzer. It is also a useful introduction to the basic features and operation of the *gigaBERT700*.

Procedure:

1. Make sure both the Generator and Analyzer are equipped with the proper fuse (See Section 3.1).
2. Make sure that the Generator and Analyzer rear-panel power switches are ON, and that their front-panel power switches are in the STBY position.
3. Plug both instruments into grounded (three-conductor) AC power outlets.
4. Connect a 50 ohm SMA cable from the Generator CLOCK output to the Analyzer CLOCK input.
5. Connect a 50 ohm SMA cable from the Generator DATA output to the Analyzer DATA input.
6. Power the Generator while pressing and holding its VIEW ANGLE, MSB 1 and (PATTERN) CLEAR keys simultaneously. Release the key after the message **Default Settings** appears in the display. Repeat this procedure with the Analyzer. This will force both the Generator and Analyzer to power up using factory default settings.
7. Set up the Generator clock and data outputs using controls in the OUTPUT box as follows:

Set this parameter	to this value	using this procedure.
DATA amplitude.	2 volts	Press the DATA key. Press AMPLITUDE up/down keys until data amplitude is set to 2.00V.
DATA baseline offset	-1 volt	Press BASELINE OFFSET up/down keys until data baseline offset is set to -1.00V.
CLOCK amplitude	2 volts	Press CLOCK. Press AMPLITUDE up/down keys until clock amplitude is set to 2.00V.
CLOCK baseline offset	-1 volt	Press BASELINE OFFSET up/down keys until clock baseline OFFSET is set to -1.00V.

8. Set Generator pattern to a 2^{23}-1 bit PRBS using controls in the PATTERN box as follows:
   a. Press PRBS.
   b. Press the pattern up/down keys until PATTERN is set to PN 23.

CHAPTER 2

BERT Basics and Feature Overview

Safety

Safety Terms Used in This User's Guide

CAUTION! Indicates an operation or practice that could harm the instrument.

WARNING! Indicates an operation or practice that could result in personal injury or loss of life.

Safety Labels Found on the Instrument

DANGER High Voltage	Protective ground (earth) terminal	ATTENTION Refer to manual

AC Power

The instrument is designed to operate from a power source that provides no more than 250 volts RMS between the two supply conductors or between either supply conductor and ground.

Ground the Instrument

The *gigaBERT700* is grounded through its AC power cord. Plug this power cord only into a properly grounded, three-conductor outlet. If you operate the instrument without a proper ground then all metal surfaces on the instrument become potential shock hazards.

Warranty and Service

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of delivery. Tektronix will repair or replace products which prove defective during the warranty period.

NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTABILITY, OR OTHERWISE IS GIVEN.

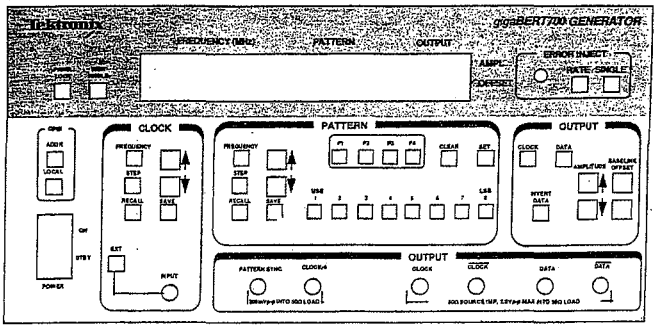
How to Reach Tektronix Customer Service

If you have any questions regarding the operation, maintenance, or application of your gigaBERT700, please contact our Customer Service Department as follows:

Address:	Tektronix, Inc. 285 Mill Road Chelmsford, MA 01824 USA	Attn. Customer Service
Phone:	508-256-6800	Press "0" and ask for Customer Service 9:00 AM to 5:00 PM, Eastern Time
FAX:	508-256-2038	Attn. Customer Service

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 2-3 Generator Front and Rear Panels



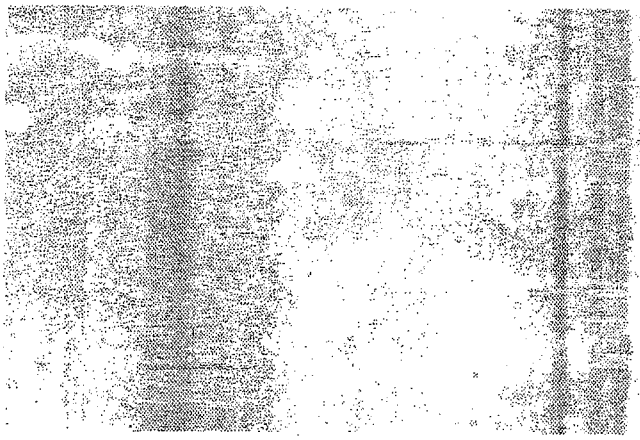
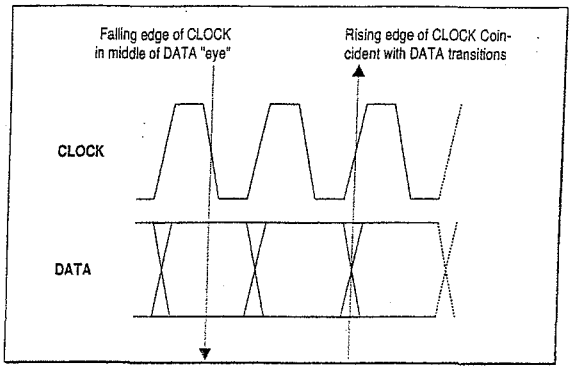


Figure 2-2 Nominal Generator NRZ Data and Clock Output Waveforms



The nominal Generator clock/data phase relationship is fixed so that the falling edges of the clock signal occur in the middle of bit time slots of the data signal. The amplitude and baseline offset of the Generator's clock and data outputs are adjustable to insure compatibility with a wide variety of input circuit designs and

- The *bottom left* section of the Analyzer display can show the following setup parameters: delay in nanoseconds for the DATA or REF DATA input; the selected input termination (GND, -2V, +3V, or FLT) for the CLOCK, DATA, or REFERENCE DATA input, or the selected word memory (WORD 0 ... WORD 7), Note that DATA input delay may be set manually by the user, or automatically by the AUTO SEARCH feature.
- The *bottom middle* section of the display shows the currently selected Analyzer pattern, for example PN23 indicates a 2^{23}-1 PRBS. This section will also indicate when input pattern inversion is enabled by displaying INV after the pattern name.
- The *bottom right* section of the Analyzer display shows the current value of the input threshold in volts for the CLOCK, DATA, or REF DATA inputs. Note that the CLOCK and DATA input thresholds may be set manually by the user, or automatically by the AUTO SEARCH feature.

Display Formats

The normal display format for the Generator and Analyzer are explained below. Note that the "normal" format is simply the format of the display when not in the menu mode. The display format used in the menu mode is explained in Chapter 6.

Generator Display

The Generator has a two-line by 24-character high-contrast liquid crystal display (LCD). The Generator display in its normal (non-menu) mode is illustrated in Figure 2-5.

Figure 2-5 Generator Display in Its Normal (Non-menu) Mode

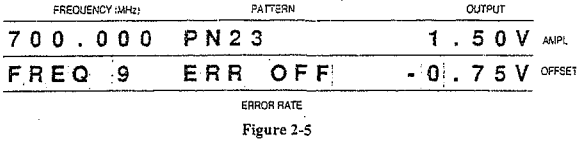
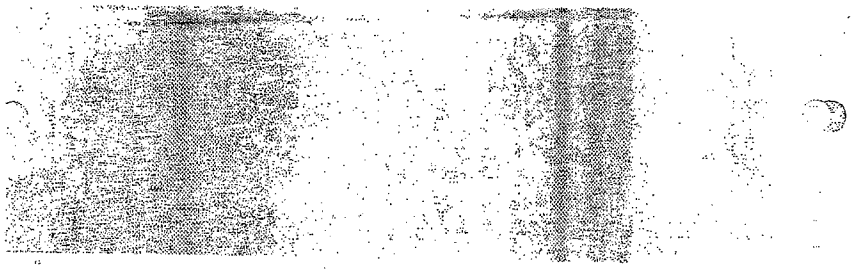


Figure 2-5

The function of each field in the normal Generator display format—that is the format used when the Generator is not in the menu mode—is described below:

- The *top left* section of the Generator display is used to show the current frequency of the internal clock in MHz. For example a display of 622.050 indicates a frequency of 622.050 MHz.
- The *top middle* section normally shows the current test pattern. For example PN23 INV indicates that the current pattern is an inverted 2^{23}-1 PRBS.
- The *top right* section of the display shows the amplitude of the CLOCK or DATA output, depending on which output control (CLOCK or DATA) is selected.
- The *bottom left* section of the Generator display may show either the presently selected word memory (WORD 0 ... WORD 7) or the selected frequency memory (FREQ 0 ... FREQ 9).
- The *bottom middle* section of the display shows the present error inject mode. If an internal error inject mode has been selected, then the generated error rate will be indicated.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



- **RS-232-C [input/output]:** A two-way serial port that may be connected to an external controller (e.g. a PC or workstation) or to a serial printer.
- **GPIB [input/output]:** A two-way, IEEE-488 compatible I/O port that may be connected to an external controller via a GPIB cable.

Generator CLOCK Section

The CLOCK section of the Generator front panel contains the external clock input described below. For more information on using an external clock source and configuring the external clock input, see Chapter 4.

- **INPUT [input]:** This is external clock input. When the external clock mode is enabled (EXT on), the signal applied to this input will be used in place of the Generator's internal clock. Otherwise, when the internal clock mode is enabled (EXT off), any signal applied to this input will be ignored.

Generator Rear Panel

The rear-panel of the Generator contains the auxiliary signal, remote control, and AC-power inputs shown below. See Chapter 7 for instruction on how to set up the RS-232 and GPIB ports, and general information on using external controllers with the Generator.

- **AUX:** This connector is not used.
- **DATA INHIBIT INPUT:** A signal applied to this input may be used to asynchronously gate the data outputs of the Generator.
- **ERROR INJECT INPUT:** A signal applied to this input may be used to control error injection when the Generator is in the external (EXT ERR) injection mode. One error will occur for each rising edge of this signal.
- **RS-232C [input/output]:** A two-way serial port that may be connected to an external controller or serial printer.
- **GPIB [input/output]:** An IEEE-488 standard I/O port that may be connected to a GPIB compatible controller. This port is not compatible with stand-alone GPIB printers.
- **AC LINE [power input]:** This is the AC power input connector for the Generator.

Analyzer INPUT Section

The IN JT section of the Analyzer front panel contains the test signal NRZ data and clock inputs shown below. For more detailed descriptions and related setup information, see Chapter 4.

- **CLOCK and DATA [inputs]:** These two inputs comprise the main test signal input to the Analyzer. DATA is the main NRZ data input to the Analyzer pattern detector and CLOCK is its corresponding clock signal. Both inputs have adjustable input decision thresholds and selectable terminations. In addition, a variable amount of delay may be added to the DATA input to properly phase-align the clock and data signals. CLOCK and DATA may be used to terminate singled-ended clock and data outputs, respectively.

Pattern Controls and Function Keys

The PATTERN section of both the Analyzer and Generator front panels contains two basic types or groups of controls: "pattern" and "function". The four function or "soft" keys—F1, F2, F3, and F4—have different functions depending on the current mode of the instrument. A primary function of these controls is to access and navigate the menu system. Pattern controls, which includes all other controls in the PATTERN section, are used to select edit, save, and recall test patterns.

Pattern Controls

- **PRBS:** Press this key, and then the pattern up/down keys to select a PRBS pattern.
- **WORD:** Press this key either to select a word or ROM pattern or to edit the current word pattern.
- **SAVE and RECALL:** Use these keys to save and recall **user-created word patterns** to and from non-volatile memory. The standard *gigaBERT700* can store up to eight 16-bit or short word patterns. When equipped with the 128K Option, the *gigaBERT700* Generator and Analyzer can store up to eight long word patterns, each containing up to 128 kbits. You may also use the RECALL key to recall patterns from ROM, including the **mark-density patterns** which are provided as part of the 128K Option.
- **WORD LENGTH:** Press this key and then the up/down keys, to adjust the length of the current word pattern.
- (↑,↓): These are the pattern up/down keys. Their effect depends on which of the above pattern keys has been selected.
- **MSB 1 to LSB 8:** Use these keys to edit the displayed byte in the current word pattern. Each key will toggle one bit in the displayed byte.
- **CLEAR:** Pressing this key forces all bits in the displayed byte to 0.
- **SET:** Pressing this key forces all bits in the displayed byte to 1.

Function (Soft) Keys (F1, F2, F3, and F4)

Menu Functions: The primary use of the function keys in the Generator and Analyzer is to access and navigate each instrument's menu system. F1 may be thought of as the main menu key. Pressing F1 will display the instrument's first level menu. Once inside the menu system, you may use the F1, F2, F3, and F4 keys to select different menus, or to make choices within a selected menu. Note that pressing the F1 key enough times will always get you out of the system. See Chapter 5. for an explanation of each Generator and Analyzer menu.

Analyzer INPUT Selection Function: When the Analyzer is not in the menu mode, you may press their F2 or F3 keys to determine which input is impacted by the INPUT section DELAY, TERMINATION and THRESHOLD keys. There are three choices. Leave both keys off to set up the DATA input, turn F2 on to

Table 2-2 Analyzer Inputs and Outputs

Connector Label	Signal Type	Section	Connector Type	Impedance, threshold, and delay
DATA/DATA BAR	input	INPUT	SMA, female	50 ohm, variable threshold and delay. Selectable termination: GND, -2 V, +3V. AC
CLOCK/CLOCK BAR	input	INPUT	SMA, female	50 ohm, variable threshold. Selectable termination: GND, -2 V, +3V. AC
REF DATA	input	INPUT	SMA, female	50 ohm, ECL, variable delay, selectable termination GND, -2V, +3V. AC
PATTERN SYNC	output	MONITOR	SMA, female	50 ohm. 200mV into 50Ω
CLOCK	output	MONITOR	SMA, female	50 ohm, 200mV into 50Ω
DATA	output	MONITOR	SMA, female	50 ohm, 200mV into 50Ω
ERROR INHIBIT INPUT	input	rear panel	BNC, female	50 ohm, ECL
RZ ERROR OUTPUT	output	rear panel	BNC, female	50 ohm, 200mV into 50Ω
PRINTER	output	rear panel	25-pin, D male	Compatible with PC parallel printers
RS-232C	I/O	rear panel	25-pin, D male	RS-232 levels and impedance
GPIB	I/O	rear panel	GPIB	IEEE-488 standard levels and impedance

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Generator ERROR INJECT Section

Controls in the ERROR INJECT section are used to set up the Generator's error injection function. See Chapter 4 for more information on how to set up the Generator's internal error injection function, and how to use an external signal source to control error injection.

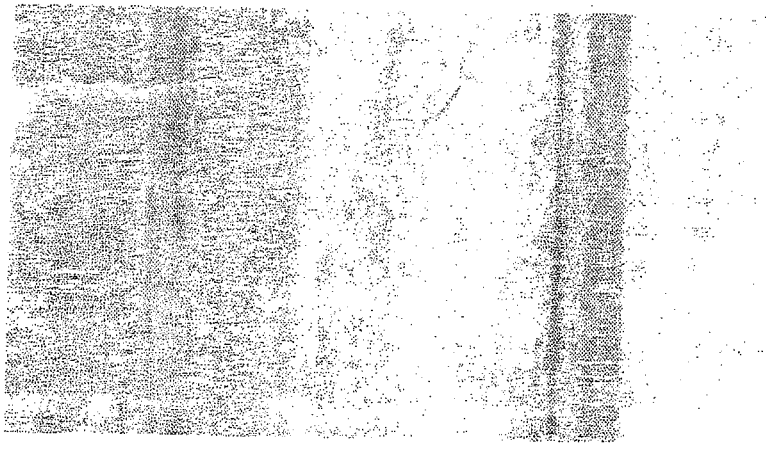
- **RATE**: Press this control one or more times to select an internal error inject rate, or the external error inject mode.
- **SINGLE**: When the error inject function is set to single (ERR OFF), press this key to inject single errors. Or, when the error inject function is set to an internal rate, or to external, use this key to turn error injection off. Note that you could then press the RATE key to turn error injection back on at the same rate as before.
- **Error Inject (LED)**: The LED in the ERROR INJECT section will flash once for each injected error.

Analyzer INPUT Section

The controls shown below are used to set up the Analyzer clock and data inputs. See Chapter 4 for Analyzer input setup procedures.

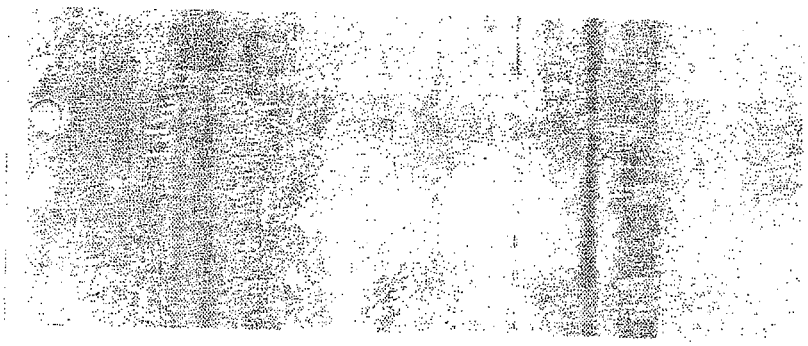
- **DELAY***: Press this key to add delay to the DATA or REF DATA inputs to adjust the clock/data phase relationship. Note that the Auto_Search function will automatically set data delay to a value which provides the maximum noise immunity, that is so that the active (falling) edge of the clock falls in the middle of data bit time slots.
- **THRESH***: Press this key to set the input decision threshold for the DATA, CLOCK, and REF DATA inputs. Note that threshold does not apply when differential operation is selected.
- **TERM***: Press this key to select the input terminations for the DATA, CLOCK, or REF DATA inputs. Available selections are: (GND, -2 V, +3 V, or AC),
- **DIFF***: Press this key to toggle the data or clock input between single-ended (LED off) or differential operation (LED on).
- **INVERT**: Press this key to select either the data non-inverted (LED off) or data inverted (LED on) mode.
- **EXT**: This is an input for an external data reference signal.

* **NOTE**: Use the F2 and F3 function keys to determine which input will be affected by the DELAY, THRESH, TERM and DIFF controls as follows:



- **DISABLE**: Use this key to enable or disable automatic pattern re-synchronization. If DISABLE is off, then the Analyzer will automatically try to resynchronize its pattern detector (by looking for a new pattern alignment) when BER goes above the current synchronization threshold. If DISABLE is on, the Analyzer will not attempt to resynchronize regardless of the BER. This allows for very high BER measurements.
- **LOCK** (indicator): This indicator turns ON when BER is less than the current synchronization threshold, and OFF when BER is greater than or equal to this threshold.

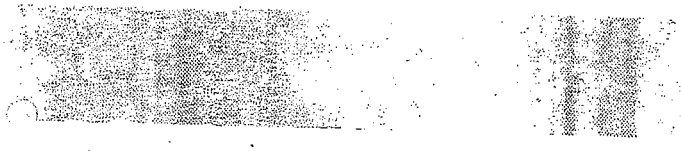
See Chapter 5 for a more detailed explanation of the AUTO SEARCH and DISABLE controls.



Recalling the Default Setup

The default setup of the Generator and Analyzer are shown in Appendix B. To return the Generator or Analyzer to this setup, use the following procedure:

1. Turn instrument power off.
2. While holding down the VIEW ANGLE, MSB 1, and (PATTERN) CLEAR keys simultaneously, turn instrument power back on.
3. *After* you see the message **Default Settings** appear in the display, release the three keys. In a few seconds the normal display format will appear and the instrument will be in its default setup.

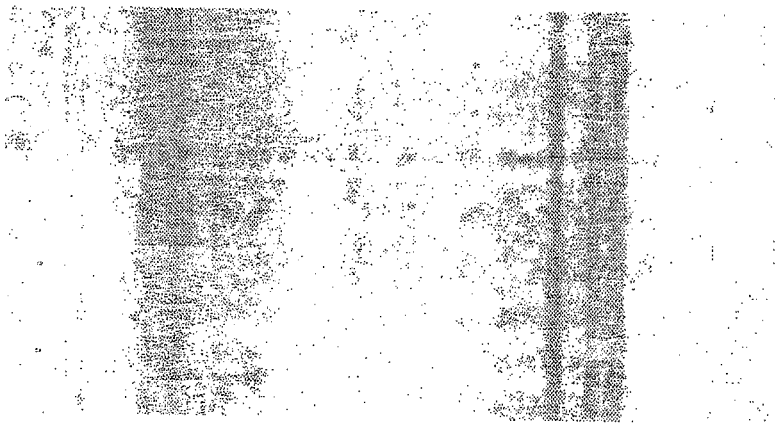


CHAPTER 3

Functions Common to the Generator and Analyzer

This chapter introduces *gigaBERT700* inputs, outputs, controls, and indicators. In addition it discusses setup and operation procedures that are common to the Analyzer and Generator.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Selecting the Active Pattern

In this User's Guide, the pattern currently being generated by the Generator or analyzed by the Analyzer is called the *active* pattern. Procedures to make a selected PRBS, word, or mark density the current active pattern are provided below.

Selecting PRBS Patterns

To select a PRBS pattern:

1. Press the PRBS key. The instrument will now be in the PRBS pattern mode.
2. Press the pattern up/down keys until the name of the desired PRBS pattern is displayed. Available PRBS patterns are:
   - ❑ PN 7
   - ❑ PN 15
   - ❑ PN 17
   - ❑ PN 20
   - ❑ PN 23

The displayed PRBS pattern becomes the active pattern immediately.

Selecting the Current Word Pattern

- ❑ To make the current word pattern the active pattern, simply press the WORD key.

Selecting a Pattern

The following section defines the patterns that can be generated and analyzed by the *gigaBERT700* and how to set up the Generator and Analyzer to use a particular pattern. Note that the Generator and Analyzer are compatible with the same suite of test patterns and use the same setup procedures. Refer to Chapter 2 for a quick overview of each control in the PATTERN section.

Pattern Definitions

The *gigaBERT700* can generate and analyze three types of test patterns: Pseudo-random bit sequence (PRBS), mark density, and word. Each type has its own set of advantages and uses.

PRBS Patterns

Pseudo-random bit sequence (PRBS) patterns are designed to simulate "live traffic" and have been standardized by the telecommunications and computer industries. As a result they are often used to characterize or qualify new devices or systems. Two key characteristics of a PRBS are its overall length in bits and maximum number of contiguous 0s. The length of a PRBS pattern has the form 2^n-1. For example a 2^{23}-1 PRBS contains 8,388,607 bits. The maximum number of contiguous 0s in a PRBS pattern is n-1, for example 22 in a 2^{23}-1 PRBS. The PRBS patterns generated and analyzed by the *gigaBERT700* are listed in Table 3-2.

Table 3-2 PRBS (2^n-1) Test Patterns

N	Label Used in Generator and Analyzer Displays	Length (2^n-1 bits)	Maximum Number of Contiguous 0s
7	PN 7	127	6
15	PN 15	32767	14
17	PN 17	131,071	16
20	PN 20	1048575	19
23	PN 23	8388607	22

3. If you need to change word length, press the WORD LENGTH key and then the pattern up/down keys. Pattern lengths of 2048 bytes or less will be displayed in terms of M bytes plus N bits. Pattern lengths above 2048 bytes will be displayed in terms of bytes only. When the desired word length is displayed, press the WORD key to return to the word editing mode.
4. To select a byte within the current pattern, use the pattern up/down keys to increment or decrement the displayed byte address.
5. To edit the selected byte, press the 1 (MSB) through 8 (LSB) bit keys to toggle individual bits. Note that the LED in each bit key indicates whether the associated bit equals 0 (LED off) or 1 (LED on).

Repeat steps 4. and 5. until the word has been edited as required.

You have now created a new word pattern and may use it to perform tests. The current pattern is automatically stored in battery-backed memory. However if the new pattern is important, be sure to save it before creating or RECALLing another pattern.

Creating Word Patterns Using Menus

The menu functions used to create or edit word patterns are:

- ❑ LENGTH
- ❑ FILL
- ❑ EDIT and
- ❑ ORDER.

These functions are located in the WORD menu. Note that ORDER is a standard function while the LENGTH, FILL, and EDIT functions are added to the WORD menu as part of the 128K Option. Therefore in standard units, all word editing procedures, except for bit order, are performed using front panel controls. However in instruments equipped with the 128K Option, word editing may be performed using either front panel controls or the menu system, depending on which approach is more convenient in a given situation.

Note that the WORD menu also includes the PSYNC and SYNC functions. If you are trying to observe the Data output of the Generator, or the Monitor Data output of the Analyzer, you may want to use the PSYNC menu to select the byte location of the pattern synchronization pulse generated by the rear-panel PSYNC output. The SYNC menu, which appears on the same page of the Analyzer menu system, is not directly involved in creating or editing word patterns. Rather, it is used to set the Analyzer pattern synchronization threshold in terms of BER.

A detailed explanation for each function in the WORD menu may be found in Chapter 6. In addition, the general procedure for creating word patterns in a Generator or Analyzer equipped with the 128K Option is given below:

1. Use the current pattern or recall a previously saved pattern as the basis for the new pattern. (See Recalling Word Patterns).

Word Patterns

This section explains how to create, edit, save, and recall word patterns using front panel controls or the menu system.

Basics

You may create and save up to eight word patterns in battery-backed memory locations WORD 0 through WORD 7. In addition, the current word pattern is stored in battery-backed memory. In standard units, each of the saved words and the current word can contain up to 16 bits. In Generators and Analyzers equipped with the 128K Option, which provides additional battery-backed memory, each of the saved words and the current word can contain up to 128 kbits.

There are three ways to create *gigaBERT700* word patterns:

1. **Using front panel controls.** This is usually the quickest way to create and edit short patterns. It also can be a practical way to edit a few bytes in long patterns if these bytes are located near to each other.
2. **Using the menu system.** Because it provides direct byte addressing, this is often the best method for editing a few widely scattered bytes in long word patterns. The menu system also provides the FILL function, used to load a user-specified 8-bit pattern into all bytes, and the ORDER function, used to set the bit-order in each byte to MSB or LSB first. Thus you can use the menu system to create long words with simple bit patterns using its byte fill, order, and editing capabilities.
3. **Downloading:** This is the best way to create long words with complex patterns. Long word patterns may be created on an external controller, using a text editor or specialized software, and downloaded via the instrument's GPIB or RS-232 ports. Downloading is the only practical way to create simulations of SONET, SDH, FDDI or other framed signals.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 4

Generator Functions

This section defines key functions of the *gigaBERT700 Generator* and how to set up these functions using front panel controls.

Amplitude and Baseline Offset

The rules governing the setup of clock and data amplitude and baseline offset are as follows:

- **RULE 1:** When terminated by 50 ohms to ground, the amplitude adjustment range of clock and data outputs is **0 to 2 V peak-to-peak.** However, the absolute voltage of the **pulse top cannot exceed +2.8 VDC,** that is:

$$V_{amplitude\ p\text{-}p} + V_{offset} \leq 2.8\ VDC$$

- **RULE 2:** When left unterminated (termination impedance > 2 kΩ) the amplitude adjustment range of clock and data outputs is **0 to 4 V peak-to-peak** with a pulse top limit of +5.6 VDC, that is:

$$V_{amplitude\ p\text{-}p} + V_{offset} \leq 5.6\ VDC$$

- **RULE 3:** Displayed amplitude and baseline offset are calibrated for a termination of 50 ohms to ground. Any variation of termination impedance or voltage will cause actual amplitude and offset to differ from the values shown in the Generator display.

These rules are summarized in Table 4-2.

Table 4-2 Output Setup Rules vs. Termination Impedance

Termination	Amplitude Limit (V pp)	Pulse Top Limit (VDC)	Actual Amplitude	Actual Baseline Offset (VDC)
50 Ω to ground	0 - 2	+2.8	as displayed	as displayed
50 Ω to +3 VDC	0 - 2	+2.8	as displayed	displayed value + 1.5 V
50 Ω to -2 VDC	0 - 2	+2.8	as displayed	displayed value - 1.0 V
AC (50 Ω to AC)	0 - 2	+2.8	as displayed	unspecified
Open Circuit	0 - 4	+5.6	2 x displayed	as displayed

The following controls are used to set clock and data output amplitude and baseline offset:

- CLOCK:
- DATA:
- AMPLITUDE (↑, ↓):
- BASELINE OFFSET (↑, ↓):

Note that when the CLOCK key is pressed, its LED turns on and the display shows clock output amplitude and offset. Similarly, when the DATA key is pressed, its LED will turn on and the display shows data output amplitude and

1. All long-word editing procedures must start with an EDIT_BEGIN command, which may have an argument from -1 to +7. An argument of -1 tells the instrument to copy the current word pattern into "scratchpad" memory, while arguments of 0 through 7 tell the instrument to copy the indicated saved word pattern into scratchpad memory.
2. The core of a long-word editing procedure is constructed from byte commands such as BYTE_BLOCK, BYTE_FILL, BYTE_INSERT, BYTE_EDIT, and BYTE_DELETE. These commands may be used to download a new pattern into scratchpad memory, or to modify a pattern previously copied or downloaded into scratchpad memory.
3. All long-word (byte) editing procedures must end with an EDIT_END command. This command may have an argument from -2 to +7. An argument of -2 tells the instrument to discard the pattern in scratchpad memory and not to update the front panel. An argument of -1 tells the instrument to copy the pattern in scratchpad memory to the current word memory location and to update the front panel. Arguments 0 to +7 tell the instrument to copy the pattern in scratchpad memory to the indicated (save) memory location without updating the front panel.

Note that a word or byte editing session in a *gigaBERT700* Generator or Analyzer can be started locally from the front panel or remotely via the instrument's RS-232 or GPIB remote ports. However the instrument will allow only one editing session to be in-progress at any given time.

Saving Word Patterns

You can save the current word pattern to one of eight word memory locations (WORD 0 to WORD 7) using the following procedure:

1. Press the SAVE key. The LED in the SAVE key should flash to indicate that you are in the save mode.
2. Press the pattern up/down keys to select a word memory location. Note that the word previously stored in this location will be overwritten.
3. Press the SAVE key again to save the current word into the selected location. At this point the SAVE LED will turn off.

Recalling Word Patterns

To recall a previously saved word pattern, use the following procedure:

1. Press RECALL to enter the recall mode. Note that the LED in the RECALL key turns on.

☑ **NOTE:** If the current word is important and has not been previously saved, you must save it before pressing RECALL. The recalled pattern will overwrite the current pattern.

Table 4-1 External Clock Input Specifications vs. Termination

Termination	Switching Threshold	Amplitude Range*
50 Ω to ground	Ground ± 50 mV	500 mV to 2 V peak-to-peak, centered on ground.
50 Ω to -2 V	-1.3 V ± 50 mV	500 mV to 1.4 V peak-to-peak, centered on -1.3 V.

* These pk-pk amplitude limits are based on the requirement that signals applied to the external clock input must cross the decision threshold by at least 200 mV, but at the same time not exceed overall limits of -2 V to +2 VDC.

Clock Source

Generator clock source may be set to internal or external using the EXT key in the CLOCK section. When the LED in the EXT key is off, then clock source is internal. If the LED is on, the clock source is external and an external source must be connected to the external clock input (INPUT).

Procedure:

- Press the EXT key to toggle clock source between internal and external.

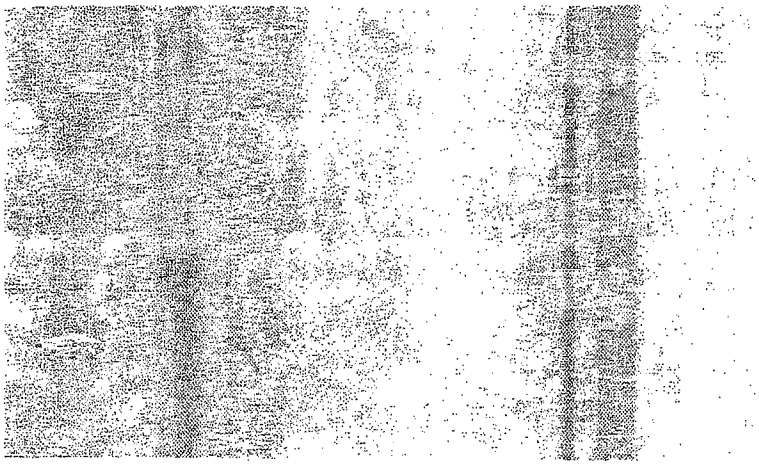
Step Size and Frequency

The frequency of the Generator internal clock may be set using the FREQUENCY, STEP, and CLOCK section up/down keys. First select a step size. Then adjust current frequency using this step size. The complete setup procedure follows:

Procedure:

1. Select a step size. Do this by pressing the STEP key one or more times until the underscore in the frequency field is under the desired digit. Note that the underscore moves right one digit for each key press. The selected digit indicates step size. For example if the current frequency is 622.950 MHz, and the underscore is under the "5", then current step size is 10 kHz. Or, if the underscore is under the "9" then the current step size is 100 kHz, etc.
2. Press the FREQUENCY key. Verify that the FREQUENCY key LED turns on.
3. Press the clock section up/down keys to increment or decrement the current frequency using the previously selected step size. Note that the underscore position indicates a step size, not which digit will be edited. For example if displayed frequency is 622.950, and the cursor is under the "9", then step size is 100 kHz and pressing the up (↑) key one time will change frequency to 623.050 MHz.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

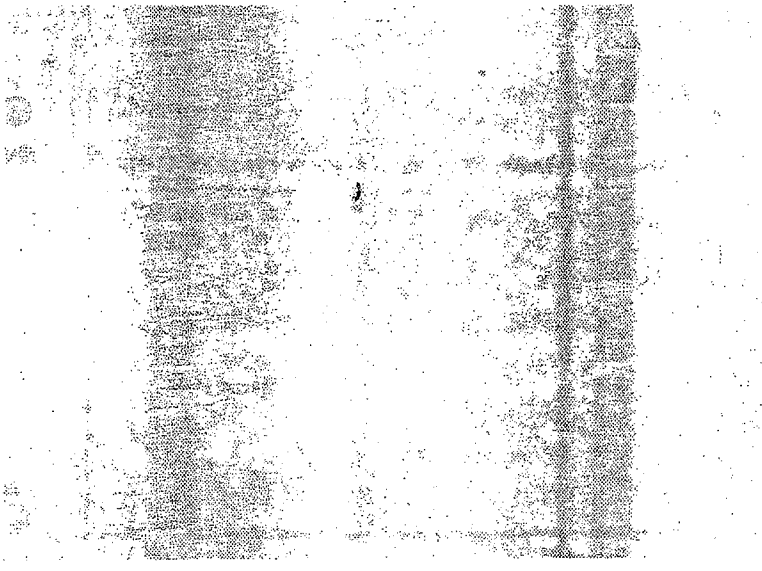


Data Inhibit

The DATA INHIBIT input is located on the rear-panel of the Analyzer. A signal applied to this input may be used to gate off and on the Generator DATA output signal. The logic of the DATA INHIBIT function is shown in Table 4-3. The DATA INHIBIT function is not bit or frame synchronized with the DATA output signal. Therefore, the gating action caused by the DATA INHIBIT input may occur anywhere within a DATA output bit time slot and anywhere within a pattern frame. DATA INHIBIT is a standard 50 ohm ECL input and does not require any threshold or delay setup.

Table 4-3 Data Inhibit Logic

Logic Level Applied to DATA INHIBIT INPUT	Action
OPEN or LOW	DATA output operates normally.
HIGH	DATA output is disabled, that is forced LOW.



Procedure for Differential Operation:

1. Connect CLOCK and CLOCK-BAR outputs of the Generator to the true and complimentary clock inputs on the DUT.
2. Connect DATA and DATA-BAR outputs of the Generator to the true and complimentary data inputs on the DUT.

pattern. At this point the SYNC LOCK LED should turn on again indicating that the Analyzer has regained synchronization. You may now start a new test interval by clearing previous results (PRESS ERROR DETECTION CLEAR key) and history indicators (PRESS HISTORY CLEAR key).

How to DISABLE Automatic Pattern Resynchronization

The pattern resynchronization disable feature is turned on or off as follows:

Procedure:

- ☐ Press the DISABLE key to toggle automatic pattern resynchronization on or off. When the DISABLE LED is on, pattern resynchronization is *disabled*. When the DISABLE LED is off, pattern resynchronization is *enabled*.

Relationship between AUTO SEARCH and DISABLE.

Turning AUTO SEARCH on automatically turns DISABLE off. Similarly, turning DISABLE on automatically turns AUTO SEARCH off. That is, AUTO SEARCH and DISABLE cannot be on at the same time. However you may turn both functions off. There are, therefore, three possible levels of Analyzer synchronization:

1. AUTO SEARCH on: This is the most automated mode.
2. AUTO SEARCH off and DISABLE off: This is a partially automated mode with AUTO SEARCH functions disabled but auto-pattern resynchronization still enabled.
3. DISABLE on: This is the "fully manual" mode in which all AUTO SEARCH functions and the auto-pattern resynchronization function, are disabled.

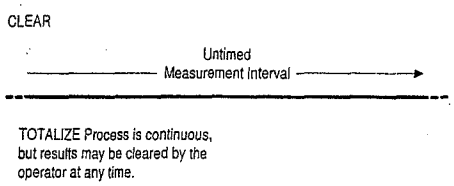
CHAPTER 5

Analyzer Functions

This chapter explains how to enable or disable Analyzer automatic synchronization functions. It further shows how to manually set Analyzer input parameters and error detection functions, and how to start tests, view results, and print results. The chapter also defines all results calculated by the Analyzer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 5-2 The TOTALIZE Measurement Process



How WINDOW Results Are Measured

Window Mode results are calculated over an sliding window whose length is defined by the user. Window results can be cleared at any time by pressing the CLEAR key when Window Mode results are displayed. But as in the case of Totalize results, the Window measurement process cannot be suspended by the user.

Window results may be thought of as a series of snapshots of the received signal performance. Each snapshot indicates BER and total bit errors over the most recent interval T, where T is the value of the Window length set by the user. The amount of "slide" between snapshots is effectively determined by the display update rate which is about five times per second. Therefore the Window slide between display updates is about 200 ms. Note that End-of-Window reports are generated once per second so the effective window slide in printed results is one second. The Window measurement process is illustrated in Figure 5-3.

Table 5-5 Input Threshold Range as a Function of Termination

Selected Termination	Threshold Setup Range
GND	- 2.00 to + 4.00 VDC, 50 mV steps
- 2 V	- 3.00 to + 3.00 VDC, 50 mV steps
+ 3 V	- 1.50 to + 4.50 VDC, 50 mV steps
AC	- 2.00 to + 2.00 VDC, 50 mV steps

The displayed threshold takes effect immediately. In other words, threshold is incremented or decremented each time you press the up or down key. Note that threshold is an AUTO SEARCH parameter. So be sure turn off AUTO SEARCH if you want to fix delay at a specific value.

Logically Inverting Input Data

The INPUT section INVERT key may be used to logically invert the input data pattern, that is change all 1s to 0s and 0s to 1s. If the INVERT key is off, then the input data pattern is not inverted. However if the INVERT key is on, the input data pattern is logically inverted. You can toggle input data inversion on or off by pressing the INVERT DATA key. Note that logically inverting the input pattern is equivalent to swapping the connections to the DATA and DATA-BAR inputs.

Procedure:

- ❑ To toggle input data inversion on or off, press the INVERT key.

Singled-ended or Differential Operation

Analyzer clock and data inputs can be operated in a singled-ended or differential mode (See Figure 5-1). Differential operation provides greater immunity to ground noise and EMI. Note that threshold setup applies to the clock and data inputs only when they are operated in the singled-ended mode. When the clock or data input is operated in the differential mode, its input threshold effectively becomes the average of the positive peak and negative peak voltage of the received true and complement signals.

Procedure to Configure CLOCK or DATA Inputs for Differential Operation:

1. Select either the DATA or CLOCK input using the F2 and F3 keys.
2. Press the DIFF key to toggle the selected input between differential (LED on) and singled-ended (LED off) operation.

Window Process Set Up

The Window measurement process may be configured using the four parameters in the WINDOW menu:

- ❑ MODE: Defines window length in terms of "bits" or "seconds".
- ❑ BITS: Window length in bits.
- ❑ SECOND: Window length in terms of hours, minutes, and seconds.
- ❑ REPORT: Turns end-of-window reports on or off.

If you want to measure Window results, you must set the MODE parameter, and depending on your MODE selection, either the BITS or SECOND parameter. In addition, if you want to generate end-of-window reports you must also set the REPORT parameter to on.

Procedure:

1. Press F1 to enter the menu system.
2. Select the WINDOW menu (F3).
3. Within the WINDOW menu, set up:
   a. MODE (F2) and
   b. either BITS (F3) or SECOND (F4).
4. Press MORE (F1) to see the next page of the WINDOW menu.
5. If you are using a printer, set the REPORT parameter (F2) to on or off as required.
6. When WINDOW menu setup is complete, press F1 multiple times to exit the menu system.

See Chapter 5 for more information on setting up the WINDOW menu.

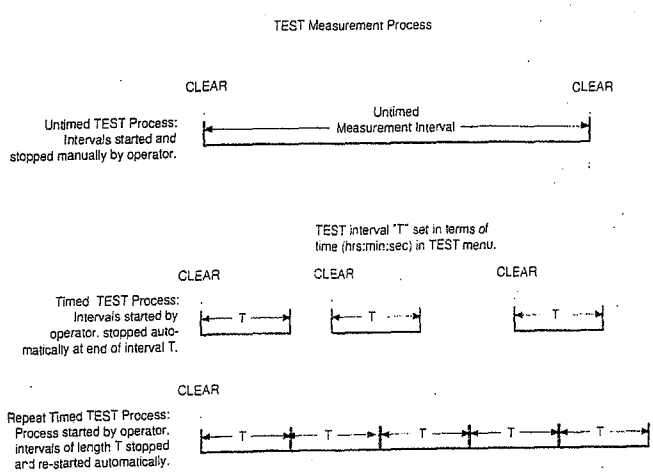
Test Process Set Up

The TEST menu contains the following six selections:

- ❑ LENGTH: Test length: hours, minutes, seconds.
- ❑ MODE: Test timing mode: Timed, Untimed, or Repeat.
- ❑ REPORT: Test reporting mode: None, Print On Error, or Both.
- ❑ THRESH: Threshold for the TES (threshold errored second) result.
- ❑ SQUEL: On Error report squelch after 10 consecutive seconds: yes or no.
- ❑ PRINT: Use this function to print current Test results immediately.

If you want to collect TEST results, you must set LENGTH and MODE before you begin a test. And if you are using a printer you should set the REPORT parameter as desired. Note that On Error reports can generate a lot of paper, so select On Error or Both with caution. Setup of the other parameters in the TEST menu are optional.

Figure 5-4 The TEST Measurement Process



Timed Tests. When the *Timed* mode is selected, the Analyzer will automatically stop accumulating Test results after the test interval (specified by the user) has elapsed. All Test results will be frozen until the CLEAR key is pressed to begin a new test.

Repeat (Timed) Tests. When the *Repeat* mode is selected, the Analyzer will automatically stop and then restart a test after a user specified test length has elapsed. This process will continue until the user presses the CLEAR key to manually stop Test result accumulation.

Untimed Tests. When the *Untimed* mode is selected, the Analyzer will continue to collect Test results until the CLEAR key is pressed. At this point Test results will remain frozen until the CLEAR key is pressed again to start a new test.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 5-5 Example Analyzer Setup Report

```
**** Tektronix, Inc. GB-700 Jun 14 92 02:14:29
AUTO_SET AUTO
DATA_DELAY 1.800E-9
DATA_THRES 0.05
RDATA_DELAY 0.000E-9
RDATA_THRES -1.50
DATA_TERM GND
CLOCK_TERM GND
RDATA_TERM GND
TEST_LENGTH "00:00:30"
TEST_MODE TIMED
TEST_PREV PRE
TEST_REP ON_ERR
TEST_STATE STOP
TEST_SQUELCH OFF
TEST_THRES OFF
WIN_MODE SEC
WIN_PREV CUR
WIN_REP OFF
WIN_BIT_LEN 09
WIN_SEC_LEN "00:00:01"
PRINT_ENABLE ON
PRINT_PORT PARALLEL
AUDIO_VOL 0
AUDIO_RATE 3
PRBS_LENGTH 23
WORD_BITS 16, #HAA, #H55
DATA_PATTERN WORD
DATA_INVERT ON
WORD_MEMORY 0, 16, #HAA, #H55
WORD_MEMORY 1, 16, #HAA, #H55
WORD_MEMORY 2, 16, #HAA, #H55
WORD_MEMORY 3, 16, #HAA, #H55
WORD_MEMORY 4, 16, #HAA, #H55
```


Viewing Results

BER and bit error results are shown in the normal display mode. However to view the complete list of Test results, you must use the TEST menu VIEW-CUR or VIEW-PRE functions.

BER and Bit Errors

The Analyzer calculates BER and bit errors using all three measurement methods (Totalize, Window, and Test). The current display mode determines which BER/bit error result pair is shown in the display. Note that BER is shown in the top, middle field while the bit error result is shown in the top, right field.

Procedure to View Desired BER and Bit Error Results:

- Press the DISPLAY SELECT key to select the appropriate display mode.

  As noted earlier, the character in front of the BER result will indicate the current display mode. The infinity symbol (∞) indicates Totalize; a blank character indicates Window; and the T, U, or R characters indicate Test results which have been measured using the timed, untimed, or repeat timing modes respectively.

All Other Results (Test Process only)

To view the complete set of Test results, select the VIEW-CUR or VIEW-PRE functions from the TEST menu. VIEW-CUR will show partial results if a timed test is in progress, or results from the last completed test. VIEW-PRE will show results saved in the "previous" test registers. These results are over-written with the contents of the current registers each time a test is completed.

Procedure:

1. Press F1 to enter the menu system.
2. Select the TEST menu (F2).
3. Press MORE (F1) twice to view the third page of the TEST menu.
4. Select either VIEW-CUR or VIEW-PRE to view all current or previous Test results respectively. Once inside either the VIEW-CUR or VIEW-PRE function, use the pattern up/down keys to scroll through the results list.
5. When done, press F1 multiple times to exit the menu system.

See Chapter 5 for more information on the TEST menu. Also see **Measurement Definitions**, later in this chapter.

Procedure to Generate an On-Demand Test Summary Report:

1. Make sure the Basic Report Setup Procedure has been completed.
2. Press F1 to enter the menu system.
3. Select the TEST menu (F2).
4. Press F1 to see the second page of the TEST menu.
5. Select the PRINT parameter to generate an immediate Test report
6. Press F1 multiple times to exit the menu system.

You can set up the Analyzer to generate End-of-Test Reports as follows:

Procedure to Enable or Disable End-of-Test Reports:

1. Complete the basic report setup procedure.
2. Press F1 to enter the menu system.
3. Select the TEST menu (F2).
4. Select the REPORT parameter (F4).
5. You may now either **enable** End-of-Test reports by selecting END OF TEST or EOT/ERROR; or **disable** End-of-Test reports, by selecting NONE.
6. Press F4 to lock in you selection.
7. Press F1 multiple times until you have exited the menu system.

End-of-Window Reports

When enabled, an End-of-Window report will occur once every second. The results of an End-of-Window report are based on a sliding interval T, where T is set in terms of bits or time (hours:minutes:seconds). Use the REPORT parameter in the WINDOW menu to enable or disable End-of-Window reports. Use the MODE, BITS, and SECOND parameters in the WINDOW menu to set window length T. An example End-of-Window report is shown in Figure 5-7.

Figure 5-7 Example End-of-Window Reports

Date:	Jun/14/92	Time:	02:42:34.46	
Bits=	5.00E+08	Errs= 5000	Err rate= 1.0E-04	Freq= 100.00 MHz
Pattern=	AA55	Data los= 0	Sync Los= 0	Phase Err= 0

Procedure to Enable or Disable End-of-Window Reports:

1. Complete the Basic Report Setup Procedure.
2. Press F1 to enter the menu system.
3. Select the WINDOW menu (F3).
4. Press F1 to see the second page of the WINDOW menu.
5. Select the REPORT parameter (F2).
6. Set the REPORT parameter to ON. Press F4 to lock in this choice.
7. Exit the menu system by pressing F1 multiple times until the normal display format appears.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 6
Menus

This chapter explains how to use the *gigaBERT700* menu system. It includes basic rules, an overview of the Generator and Analyzer menu structures, and a description of each menu function.

f. Press F1 a sixth time to exit the menu system and see the normal Analyzer display format.

At this point you could perform a 30 minute timed test by:

1. Selecting the TEST display mode (press DISPLAY SELECT until a "T" appears in front of the BER field) and
2. Pressing the ERROR DETECTION CLEAR key to start a timed test interval.

General Rules for Using the Menu System

Operation of the *gigaBERT700* Analyzer and Generator menu systems can be summed up by the following rules:

1. From the normal display mode, press F1 to enter the menu system.
2. Navigate to a particular menu function by pressing the appropriate "F" keys to select lower level menus and finally the desired function.
3. In multi-field functions, use the F2 (move left) or F3 (move right) keys to select a field. Note that the selected field is indicated by its flashing mode: flashing = selected, not flashing = not selected.
4. Once a field is selected, use the pattern up/down keys to increment or decrement the value of the selected field.
5. To exit any setup function, press F4 to lock in all setup changes or F1 to "escape" without making any setup changes.
6. From any menu, you can always exit the menu system by pressing F1 key one or more times until the normal display format appears.

Error History Indicators

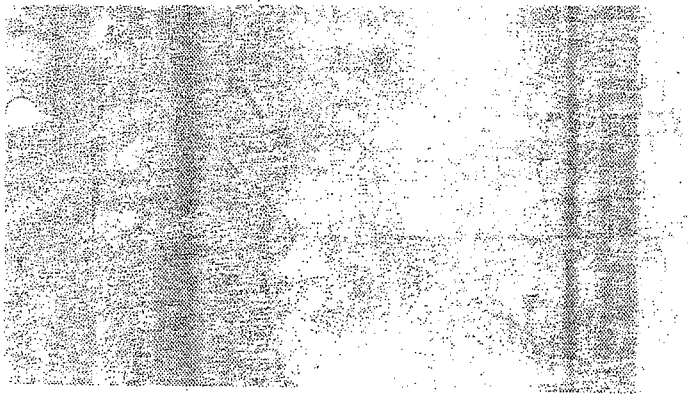
The Analyzer (performance) history indicators are located in the ERROR HISTORY section of the front panel. These indicators will latch on when the indicated event occurs, and can be cleared by the user.

Indicator Definitions

- **SYNC LOSS:** This indicator will turn on if the LOCK LED turns off; that is if the BER rises above the current synchronization threshold (See Synchronization (LOCK) Threshold in Chapter 4)
- **BIT:** Will turn on if a bit error is detected.
- **PHASE:** Will turn on if a phase error is detected. The Analyzer will report a phase error when the active clock edge moves too close to the data waveform transition point thus violating the input circuit setup or hold time.
- **POWER:** Will turn on after a power loss has occurred.

CLEAR Control

Pressing the CLEAR key will reset all active history indicators. Note that when you start a test, you must clear test results and history indicators by pressing the ERROR DETECTION CLEAR and ERROR HISTORY CLEAR keys respectively.



Analyzer Error Messages

When abnormal input conditions are detected, the Analyzer will display various error messages to indicate an unusual condition. These are explained below.

- **NO CLOCK:** This message will appear in the frequency field (top, left) if no activity is detected at the CLOCK input for 20 ms.
- **NO DATA:** This message will appear in the BER field (top, middle) if no activity is detected at the data (or clock) input for 20 ms.
- **LOW AMP:** May appear when no signal or a low-signal is applied to the CLOCK or DATA input and AUTO_SEARCH is enabled

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 6-2 Analyzer Menu System Overview

Menu	Page	F1	F2	F3	F4
"Main"	1	MORE	TEST	WINDOW	WORD
	2	MORE	RS232	GPIB	PRINT
	3	EXIT (to Normal mode)	DATE	TIME	UTIL
TEST	1	MORE	LENGTH	MODE	REPORT
	2	MORE	TIRES	SQUEL	PRINT
	3	ESC (to MAIN Menu)	VIEW-CUR	--	VIEW-PRE
WINDOW	1	MORE	MODE	BITS	SECOND
	2	ESC (to MAIN Menu)	REPORT	--	--
WORD	1	MORE*	EDIT*	LENGTH*	FILL*
	2	ESC (to MAIN Menu)	SYNC*	ORDER[3]	PSYNC*
RS232	1	MORE	BAUD	PARITY	SIZE
	2	ESC (to MAIN Menu)	EOL	XON:XOFF	ECHO
PRINT	1	ESC (to MAIN Menu)	PORT	ON:OFF	--
UTIL	1	ESC (to MAIN Menu)	OPTION	VER	--

NOTES:

1. Menu names appear in bold typeface.
2. Functions included only in instruments equipped with the 128K Option are marked with an asterisk (*).
3. The ORDER function appears under the F2 key in units **not** equipped with the 128K Option.

2. Press F2 to enter the TEST menu. You will now see the second page of the main menu:

```
 F1      F2      F3      F4
MORE  LENGTH  MODE REPORT
```

3. Press F2 and you will see the LENGTH function:

```
F1:ESC F2<-  ->F3 F4:SET
TEST LENGTH = 01:00:00
```

NOTE: Your display may show a different value.

4. The TEST LENGTH function allows you to set the length of timed tests in terms of hours, minutes, and seconds. Notice that either the hours, minutes, or seconds field will be flashing. To change the value of the flashing field, press the pattern up/down keys. To change the value of another field, use the F2 or F3 key to select this field and then use the pattern up/down keys to change its value.

   In this example, we will change TEST LENGTH from 1 hour (as shown above) to 30 minutes, as shown below:

```
F1:ESC F2<-  ->F3 F4:SET
TEST LENGTH = 00:30:00
```

5. Note that there are two ways to exit a function like TEST LENGTH. The normal way is to press F4 to lock in your changes and exit the function. However you can also exit most functions without making any setup change by pressing F1 to "escape". In this example we'll press F4 and see the following:

```
 F1      F2      F3      F4
MORE  LENGTH  MODE REPORT
```

6. Notice that we've returned to the TEST menu. Next press F3 to enter the MODE function and see the following:

```
F1:ESC              F4:SET
TEST MODE = UNTIMED
```


Word Length (LENGTH)

Format:

```
F1:ESC F2<-  ->F3 F4:SET
LEN:mmmmm BYTES + n BITS
```

Menu: WORD

Function Name: LENGTH

Instruments: Analyzer and Generator

Options: Requires the 128K Option.

Application: Use this function to set the length of the current word pattern.

Parameters:

Bytes (mmmmm): Set this parameter to the number of whole bytes in the pattern length. That is, if length is M bytes + N bits, set this parameter to M.

Range: 0 to 16,384

Bits(n): Set this parameter to the number of extra bits in the pattern length. That is, if length is M bytes + N bits, set this parameter to N.

Range: 0 to 7.

Menu Function Definitions

This section describes each menu function included in the *gigaBERT700* menu system. For each function you will find the following information:

1. Its basic display format.
2. The menu in which it is located.
3. The function name used in the menu system.
4. Whether it is found in the Analyzer, Generator, or both.
5. Which option(s) must be installed for this function to be available.
6. What this function is used for.
7. Parameters set using this function and their ranges.
8. Notes.

Note that most of the following function descriptions are identified by a menu name and a function name, for example Test Length. This is to clarify the application of the described function, and to differentiate functions that have the same name, for example Word Mode and Window Mode. Also note that function descriptions are grouped by menu.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Test Mode (MODE)

Format:
```
F1:ESC                F4:SET
TEST MODE = ccccccc
```

Menu: TEST

Function Name: MODE

Instruments: Analyzer only

Options: None required. This is a standard feature.

Application: Use this function to select a test timing mode.

Parameters: Test Timing Mode (ccccccc): May be set to TIMED. REPEAT. or UNTIMED

Notes: This function applies only to the TEST measurement process and has no impact on either the TOTALIZE or WINDOW measurement processes.

Test Threshold (THRES)

Format:
```
F1:ESC                F4:SET
ERROR THRESHOLD = eeeee
```

Menu: TEST

Function Name: THRES

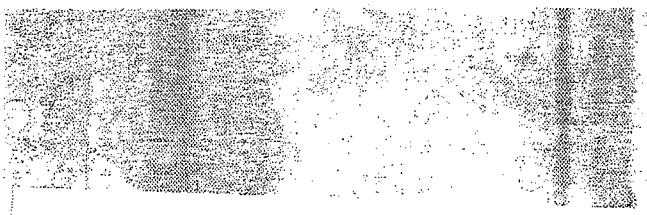
Instruments: Analyzer only

Options: None required. This is a standard feature.

Application: Use this function to set the value of the test threshold.

Parameters: Test Threshold (eeeee): Set from 1E-03 to 1E-16.

Notes: The test threshold affects On-Error reports and the TES (threshold errored second) result.



Word Order (ORDER)

Format:
```
F1:ESC                F4:SET
WORD ORDER = ccc FIRST
```

Menu: WORD

Function Name: ORDER

Instruments: Analyzer and Generator

Options: Requires the 128K Option.

Application: Use this function to change the transmit or analysis bit order (MSB first or LSB first) of the current word pattern.

Parameters: Word Order (ccc): May be set to LSB or MSB.

Note: Word order also applies to the fractional end-byte in patterns that do not contain an exact multiple of eight bits.

Word Synchronization Threshold (SYNC)

Format:
```
F1:ESC                F4:SET
WORD SYNC THRES LEVEL= d
```

Menu: WORD

Function Name: SYNC

Instruments: Analyzer only

Options: Requires the 128K Option.

Application: This function is used to set the BER synchronization threshold used by the Analyzer for long word patterns. This function does not affect the sync. thresholds for PRBS or short word patterns. which are fixed.

Parameters: Long Word Synchronization Threshold Level (d): Set this parameter to a level from 1 to 9.

Notes: The long word synchronization threshold is always set to 256 errors in a rolling window of variable length. The length of this window is automatically set by the Analyzer, based on the selected threshold level. so that the nine threshold levels effectively correspond to the following bit error rates:

Level	BER
1	3.1 E-02
2	7.8 E-03
3	1.9 E-04
4	9.7E-04
5	4.8 E-04
6	2.4 E-04
7	1.2 E-04
8	6.1 E-05
9	3.0 E-05

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Test View Current (VIEW-CUR)

Format:
```
F1:ESC                    F4:SET
(result name) (count)  (%)
```

Menu: TEST

Function Name: VIEW-CUR

Instruments: Analyzer only

Options: None required. This is a standard feature.

Application: Use this function to view current test results. In effect this function takes a snap shot of the latest results from a test in progress.

Parameters: None. This is an immediate function. Use pattern up/down keys to scroll through results. Available results are the same as for VIEW-PRE except that STOP time is replaced by the message TEST IN PROGRESS

Notes: If the TEST process is currently stopped, this function will display the error message: NO TEST IN PROGRESS.

Test Print (PRINT)

Format:
```
F1:ESC                    F4:SET
F4 TO PRINT TEST RESULTS
```

Menu: TEST

Function Name: PRINT

Instruments: Analyzer only

Options: None required. This is a standard feature.

Application: Use this function to print a test summary report based on current test results (if a test is in progress) or previous test results (if a test is not in progress).

Parameters: None. This is an immediate function. Simply press F4 to generate a report or F1 to escape the function without generating a report.

Notes: Make sure the ON/OFF function in the PRINT menu is ON if you want to generate a test summary report.

Window Reports (REPORT)

Format:
```
F1:ESC                    F4:SET
END OF WINDOW PRINT = ccc
```

Menu: WINDOW

Function Name: REPORT

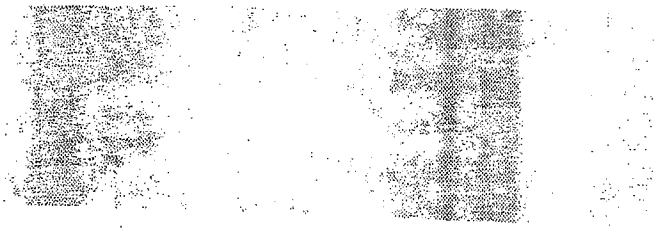
Instruments: Analyzer only

Options: None required. This is a standard feature.

Application: Use this function to enable or disable End-of-Window reports.

Parameters: End-of-Window Print (ccc): May be set to ON or OFF.

Notes: To print End-of-Window reports, be sure ON/OFF parameter in PRINT menu is set to ON.



Window Interval in Bits (BITS)

Format:
```
F1:ESC                    F4:SET
WINDOW LEN = 1.0eEE BITS
```

Menu: WINDOW

Function Name: BITS

Instruments: Analyzer only

Options: None required. This is a standard feature.

Application: When WINDOW MODE is set to BITS, use this function to set window duration in terms of bits.

Parameters: Window Length (EE): May be set from 1.0e08 to 1.0e16

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

RS-232 End-of-Line Char. (EOL)

Format:

```
F1:ESC                F4:SET
EOL = ccccc
```

Menu: RS232

Function Name: EOL

Instruments: Analyzer and Generator

Options: None required. This is a standard feature.

Application: Use this function to select an end-of-line terminator. This character or pair of characters will be added to the end of every line in reports sent to the RS-232 port.

Parameters: End-of-Line Terminator (ccccc): May be set to CR/LF, LF/CR, CR, or LF.

RS-232 Parity (PARITY)

Format:

```
F1:ESC                F4:SET
PARITY = cccc
```

Menu: RS-232

Function Name: PARITY

Instruments: Analyzer and Generator

Options: None required. This is a standard feature.

Application: Use this function to set parity for the serial port.

Parameters: Parity (cccc): May be set to ODD, EVEN, or NONE

External Clock Term. (CLOCK)

Format:

```
F1:ESC                F4:SET
EXT CLOCK TERM: ccc
```

Menu: Selected from the Generator main menu.

Function Name: CLOCK

Instruments: Generator only

Options: None required. This is a standard feature.

Application: Use this function to select a termination for the Generator external clock (INPUT) input.

Parameters: External Clock Termination (ccc): May be set to GND or -2V

RS-232 Echo (ECHO)

Format:

```
F1:ESC                F4:SET
RS232 ECHO ENABLE = ccc
```

Menu: RS232

Function Name: ECHO

Instruments: Analyzer and Generator

Options: None required. This is a standard feature.

Application: Use this function to enable or disable character echo on the RS-232 port. When enabled, the instrument will "echo" (that is, transmit back to the controller) each character that it receives on the RS-232 port.

Parameters: RS-232 Echo Enable (ccc): May be set to ON or OFF.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Time (TIME)

Format:	`F1:ESC F2<- ->F3 F4:SET` `TIME = hh:mm:ss`
Menu:	Selected from main menu.
Function Name:	TIME
Instruments:	Analyzer only
Options:	None required. This is a standard feature.
Application:	Use this function to set the instrument's 24-hour internal clock.
Parameters:	Hours (hh): Set in range 00 - 23 Minutes (mm): Set in range 00 - 59 Seconds (ss): Set in range 00 - 59
Notes:	The Analyzer clock uses a 24-hour format.

Utility Version (VER)

Format:	`F1:ESC` **(software version listed here)**
Menu:	UTIL
Function Name:	VER
Instruments:	Analyzer and Generator
Options:	None required. This is a standard feature.
Application:	Use this function to see the software version installed in your unit.
Parameters:	None. This is an immediate function.

Printer Basics

Analyzer. The Analyzer can print reports directly on a printer connected to its PRINTER or RS-232C ports. Note that these two ports are commonly referred to as the parallel and serial ports respectively. The Analyzer can also print reports indirectly by sending them to an external GPIB controller. The Analyzer cannot, however, print reports directly to a GPIB printer.

Generator. The Generator has no explicit printing functions. But you can program an external controller to read the Generator's setup and print a setup report on one of the controller's printers.

CHAPTER 7

Using Printers and External Controllers

This chapter explains how to use a printer with the *gigaBERT700* Analyzer, and how to remotely control the Generator and Analyzer via their RS-232C or GPIB ports. This chapter also includes setup procedures for the RS-232C and GPIB ports.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 7-3 RS-232C Port Error Messages

ERROR MESSAGE	MEANING
"*** Input Lost"	The RS-232C interface hardware has detected one or more lost or corrupted characters.
"*** Input Buffer Overflow"	More than 80 characters are received without a line terminator.
"*** Command Mnemonic Not Found"	Unknown command mnemonic received.
"*** Invalid Command For Interface"	Command mnemonic found, but it is not valid for the RS-232C interface.
"*** Invalid Command Type"	Command mnemonic found, but it has a missing or added "?" at the end.
"*** Too Few Parameters"	One or more expected parameters are missing.
"*** Too Many Parameters"	Too may parameters were received, or unknown characters were found trailing the command.
"*** Invalid Parameter"	Parameter is not valid for the command.
"*** Parameter Out of Range"	Parameter value is not in the range specified for the command.
"*** Parameter Not In Set"	Parameter value is not in the set of allowed values for the command.
"*** Invalid String Length"	Parameter character string is too long for the command.
"*** Parameter Separator"	An expected semicolon (;) between two parameters is missing or a command line is terminated immediately after a semicolon.
"*** Invalid Non-decimal Parameter"	Parameter is not in a valid non-decimal format, or the value of the parameter is out of the range 0 to 255 decimal.
"*** Command Execution Error"	The instrument did not execute the command properly.
"*** Out of Memory	Processor is out of memory.

Table 7-2. Note that the *gigaBERT700* RS-232C port is set up as a DCE (data communications equipment) device—that is, it receives on pin 2 and transmits on pin 3.

Table 7-2 RS-232C Connector Pin-out

PIN	NAME	FUNCTION
1.	GND	Protective Ground
2.	RxD	Received Data Input: Data is received by the *gigaBERT700* on this pin.
3.	TxD	Transmitted Data Output: Data is transmitted by *gigaBERT700* on this pin.
4.	CTS	Clear To Send. A high level or open applied to this pin indicates to the *gigaBERT700* that the controller or terminal is ready to receive data. A low level indicates that the controller or terminal is not ready. The *gigaBERT700* pulls this pin high internally with 27 kohms to +12V.
5.	RTS	Request to Send. The *gigaBERT700* always sets this pin high.
6.	DTR	Data Terminal Ready. The *gigaBERT700* always sets this pin high.
7.	GND	Signal Ground.
20.	DSR	Data Set Ready. This input is ignored.
all other pins		not used.

Cables

Use a straight-through (normal) cable when connecting the *gigaBERT700* to a DTE (data terminal equipment) device, or a null-modem cable when connecting to another DCE device.

Quick Test of the RS-232C Port

You can perform a quick test of the Analyzer or Generator RS-232C port using a terminal (or a PC running terminal emulation software) as follows:

1. De-power the instrument.
2. Attach the appropriate 25-pin cable from the instrument's RS-232C port to the appropriate RS-232C port on the terminal. Note that most terminals (and controllers) are set up as DTE and therefore use straight-through cables.

4. The selected GPIB terminator will be in effect when you press F4 to exit the GPIB function.
5. Press F1 until you have exited the menu system.

You cannot change the GPIB terminator via the GPIB port. However you can change the GPIB terminator remotely via the RS-232C port.

Returning the Instrument to Local Mode

Most GPIB controllers can put instruments on their bus into a "remote" mode in which all front panel setup controls *except the GPIB LOCAL key* are disabled. The LED in the GPIB LOCAL key on the Generator or Analyzer front panel indicates whether the instrument is in the local mode (LED off) or remote mode (LED on). If the LED is on, you can press the LOCAL key to return the instrument to the local mode.

Procedure to Return the Instrument to the Local Mode:

- ❑ If the LED in the LOCAL key is on, you can return the instrument to the local mode by pressing the LOCAL key. At this point the LED will turn off, indicating that all front panel controls are again active.

Note that there is no way for you to put the instrument into the GPIB remote mode from the front panel or using menus. However, you can lock and unlock the front panel using the PANEL LOCK key, which offers the same functionality.

ANSI/IEEE-488.2 Programming Manual Requirements

This section explains how the *gigaBERT700* implements certain standard GPIB functions, as required by ANSI/IEEE Std. 488.2-1987.

Power-On Settings

When powered-on, the *gigaBERT700* will automatically restore all device settings to their "last powered settings"—in other words to their value when the instrument was last powered-off. No remote commands will affect this power-on rule. However if the instrument detects a problem in non-volatile (battery backed) RAM at power up, then factory default settings (Appendix B) will be restored rather than the last powered settings. A RAM problem at power up will be indicated in the LCD display by the message:
RAM Corruption.

Message Exchange

The *gigaBERT700* implements GPIB message exchange as follows:

1. The input buffer is command line oriented. A new buffer is provided for each new command line.
2. Each command line may contain a maximum of 80 characters.
3. The only *gigaBERT700* commands that can return more than one message unit are listed in Table 7-5 below.

Table 7-5 Commands That Generate Multi-Unit Responses

Analyzer	Generator
*lrn?	*lrn?
all_mem?	all_mem?
histry_stat?	amplitude?
word_mem_ord?	clock_memory?
word_mem?	offset?
	word_mem_ord?
	word_memory?

4. Command responses are generated immediately after they are parsed. In other words, the *gigaBERT700* will not wait for a read command before generating a response to a query command.
5. No commands are coupled.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

☑ NOTE: Use the *CLS command to clear (reset) the SESR and return the instrument to the Operation Complete Command Idle State and the Operation Complete Query Idle State. In this state the instrument has no data in its input or output buffers and is not executing a command.

☑ NOTE: The *ESR? and TSR? query commands also clear (reset) the SESR and TSR status registers respectively.

Standard Event Status Register

The Standard Event Status Register (SESR) is a status register that indicates errors in command syntax and related occurrences. The name of each bit in the SESR is shown in Figure 7-1. The function of each bit in the SESR is defined in Table 7-7.

Figure 7-1 Standard Event Status Register (SESR)

7	6	5	4	3	2	1	0
PON	URQ	CME	EXE	DDE	QYE	RQC	OPC

Table 7-7 SESR Bit Definitions

Bit	Definition
7 (MSB)	**PON** (Power On): Set to one when the instrument is first powered on.
6	**URQ** (User Request): Not used.
5	**CME** (Command Error): Set to one when a command header (mnemonic) has been received that is not recognized or is invalid.
4	**EXE** (Execution Error): Set to one when an error has occurred while the instrument was responding to a set command or query. May indicate: a parameter is out of range; a command uses too many or too few parameters; or a command cannot be properly executed due to the instrument's current state.
3	**DDE** (Device Dependent Error): Set to one if input data has been lost at the interface (corrupted characters) or the input buffer has overflowed because a command exceeded the 80 character limit without a terminator.
2	**QYE** (Query Error): Set to one if: a) an attempt has been made to query the output queue when there are no messages available or pending, b) a command is received but the output queue is not empty, or c) an attempt has been made to query the output queue when an unterminated command is in the input queue.

GPIB Status and Event Reporting System

This section explains the GPIB status and event reporting functions provided by the *gigaBERT700*. These functions are specified in, and compatible with ANSI/IEEE Std. 488.2-1987. For detailed information on GPIB status reporting functions, refer to this document.

The purpose of the *gigaBERT700* status and event reporting system is to alert the GPIB controller when either an important change-of-status or event occurs. The instrument accomplishes this by maintaining several "status registers" and asserting the SRQ (service request) line on the GPIB bus when one or more bits in these registers are set to one. The controller can then find out which instrument or instruments initiated the SRQ using a serial poll procedure. The user can enable or disable specific status bits—and therefore control which status changes or events result in an SRQ—by setting up various "enable" registers in the instrument.

Note that *gigaBERT700* status and enable registers are also available when using RS-232C control. Specifically, you can read status registers and set enable registers via the RS-232C interface. However the SRQ alerting function is available only on the GPIB bus.

Overview of Status and Enable Registers

The *gigaBERT700* Generator and Analyzer have two *general purpose* status registers called:

- the **Standard Event Status Register (SESR)**, and
- the **Status Byte Register (SBR)**.

These two status registers, which indicate the overall status of the instrument, are defined in ANSI/IEEE Std. 488.2-1987. The Analyzer also contains a third status register which indicates the current state of various measurement processes. This register deals with functions specific to the *gigaBERT700* Analyzer and is not defined in ANSI/IEEE Std. 488.2-1987. The name of this status register is:

- the **Test Status Register (TSR)**.

The Generator and Analyzer have one enable register associated with each of their status registers. The names of the three *gigaBERT700* enable registers are:

- The **Event Status Enable Register (ESER)**,
- The **Test Status Enable Register (TSER)**, and
- The **Service Request Enable Register (SRER)**.

Note that the TSER enable register, like the associated TSR status register, is found only in the Analyzer.

Test Status Enable Register

The Test Status Enable Register (TSER) is the enable register associated with the TSR status register. Each enable bit in the TSER occupies the same bit position as the corresponding status bit in the TSR. Note that the TSER enable register, like the associated TSR status register, is found only in the Analyzer.

Status Byte Register

The Status Byte Register (SBR) indicates the overall status of the instrument and is used to control the SRQ line on the GPIB bus. The name of each defined bit in the SBR is shown in Figure 7-3. The function of each defined bit in the SBR is described in Table 7-9.

Figure 7-3 Status Byte Register (SBR)

7	6	5	4	3	2	1	0
--	MSS	ESB	MAV	TSB	--	--	--

Table 7-9 Status Byte Register Bit Definitions

Bit	Definition
7 (MSB)	Not defined.
6	**MSS** *(Master Status Summary): This bit summarizes the state of the three other bits in the SBR. It is set to 0 if all other bits are 0. It will be set to 1 when any other bit in the SBR equals 1 and its corresponding bit in the SRER is set to one. The status of the MSS bit is reevaluated each time a bit in the SBR or the Service Request Enable Register (SRER) changes.
5	**ESB** (Event Status Bit): This bit summarizes the Standard Event Status Register (SESR). It is set to 0 if all bits in the SESR are 0. It is set to 1 if any enabled bit in the SESR equals 1. If the ESB is enabled and set to 1, then the RQS and MSS bits will be set to 1. The status of the ESB bit is reevaluated each time one of the bits in the SESR or the Event Status Enable Register (ESER) changes.
4	**MAV** (Message Available): This bit is set to 1 when there is an output available for the controller.
3	**TSB** **(Test Status Bit): This bit summarizes the Test Status Register (TSR). It is set to 0 if all bits in the TSR are 0. It is set to 1 if any enabled bit in the TSR equals 1. If the TSB is enabled and set to 1, then the MSS and RQS bits will be set to 1. The status of the TSB bit is reevaluated each time one of the bits in the TSR or Test Status Enable Register (TSER) changes. *NOTE: Used only in the Analyzer.*
0 - 2	Not defined.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Command Types: Set and Query

There two basic types of *gigaBERT700* commands: set commands and query commands. Set commands are used to make setup changes or to cause a status change, for example to start or stop a test. Query commands ask the instrument to respond with the contents of a status register or the value of a given setup parameter.

gigaBERT700 commands may have only a query form or only a set form, however most commands have both. When a command has both a set and query form, the name or "mnemonic" used for the query form will be identical to its corresponding set command form, except for an added "?". For example the following are the mnemonics for the set and query form of the data threshold command:

- DATA_THRES (set command)
- DATA_THRES? (query command)

Note that in this User's Guide, query commands may be referred to as simply "queries", while set commands may be referred to as simply "commands".

Command Line Format

Command Names (Headers)

Every *gigaBERT700* command starts with a command header. Headers are character strings that contain either an entire command name, or a legal abbreviation of a command name. Legal command name abbreviations must include the leading significant characters in the command name. For example, in the save_word command only the first two letters are significant. Therefore the save_word command header may contain any of the following character strings:

save_word
sav_wor
save_wo
save_w
save_
save
sav
sa

The minimum abbreviation for each command name is identified in the Command Descriptions section later in this chapter. The use of command abbreviations is often useful when you are operating a *gigaBERT700* Generator or Analyzer manually from a terminal. However when including command names in control programs it is recommended that the full command names always be used as command headers. This improves readability and reduces the

time [s] 8-84
time? 8-85
total_bits? 8-52
total_error? 8-53
total_rate? 8-53
total_time? 8-53
tse [v] (Analyzer Only) 8-17
tse? (Analyzer Only) 8-17
tsr? (Analyzer Only) 8-18
ttl20_reset and ttl20_error? 8-67
view_angle [v] 8-32
view_angle? 8-32
win_bit_len [v] 8-75
win_bit_len? 8-75
win_bits? 8-75
win_error? 8-75
win_mode [bits | sec] 8-76
win_mode? 8-76
win_prev [current | previous] 8-76
win_prev? 8-76
win_rate? 8-77
win_report [on | off] 8-77
win_report? 8-77
win_sec_len [s] 8-77
win_sec_len? 8-78
win_time? 8-78
word_bits [le], [b1 | b2] 8-21
word_bits? 8-22
word_length [le] 8-22
word_mem_len [m], [le] 8-22
word_mem_ord [m], [msb | lsb] 8-23
word_mem_ord? 8-23
word_mem_ord? [m] 8-23
word_memory [m], [le], [b1], [b2] 8-24
word_memory? [m] 8-24
word_order [msb | lsb] 8-24
word_order? 8-25

CHAPTER 8

Remote Commands

This chapter explains the syntax used by the *gigaBERT700* remote command language, and defines all set and query commands. In addition, commands are listed and briefly described in both alphabetical and functional order.

Setting Arguments Outside of Legal Ranges

If you issue a set command with an argument value that is outside the allowed range for that argument, then the instrument will reject the command.

Numeric Responses

If the response to a query command is a number, then it will be specified as one of the following types:

Table 8-2 Numeric Response Types

Type	Description
<NR1>	decimal integer (e.g., 8)
<NR2>	decimal real number without exponent (e.g., 2.00)
<NR3>	decimal real number with exponent (e.g., 700.0E+6)
<Non-decimal numeric>	non-decimal number with leading "#H" (hexadecimal), "#Q" (octal), or "#B" (binary).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

*rst

Reset. This command causes the instrument to return to its factory default settings and to enter a known operation state. Specifically *rst does the following:

- puts the instrument into the Operation Complete Command Idle State.
- puts the instrument into the Operation Complete Query Idle State.
- returns most setup parameters to their factory default settings (Appendix B).

However *rst does not impact any of the following:

- the setup of the RS-232 or GPIB ports.
- GPIB address.
- calibration data.
- the Standard Event Status Register (SESR).
- the Event Status Enable Register (ESER).
- the power-on status clear flag setting.
- stored frequencies or words.

Min. Abbr. *rst

Example *rst

*sre [n]

Service Request Enable. This command sets the Service Request Enable (SRER) to the bit sequence corresponding to n, where n is a decimal number in the range 0 to 255.

Min. Abbr. *sre

Argument n: 0 to 255 decimal

Example *sre 48
(sets SRER to 00110000 binary)

*ese?

Event Status Enable (Query). Returns a decimal number in the range 0 to 255 corresponding to the contents of the Event Status Enable Register (ESER).

Min. Abbr. *ese?

Returns <NR1>
where <NR1> is a decimal number from 0 to 255.

Example *ese? (command)
255 (response)

*esr?

Event Status Register (Query). Returns a decimal number in the range 0 to 255 corresponding to the contents of the Standard Event Status Register (SESR).

Min. Abbr. *esr?

Returns <NR1>
where <NR1> is a decimal number in the range 0 to 255.

Example *esr? (command)
213 (response)

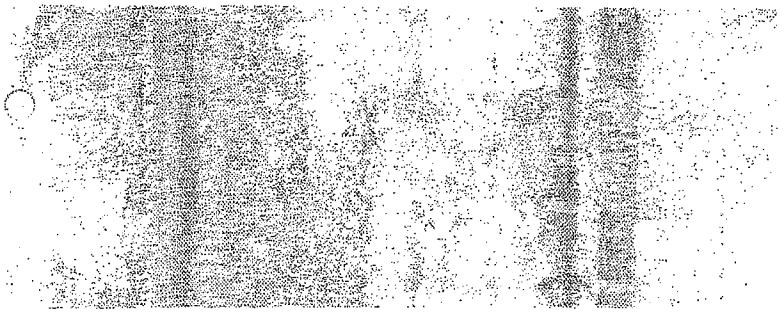
*idn?

Identify (Query). Returns the *gigaBERT700* Generator or Analyzer identification, including company name, BERT model number, Generator or Analyzer identifier, and software version number.

Min. Abbr. *idn?

Returns TEKTRONIX, BERT-700 [RX | TX], 0, Vs.ss
where:
RX indicates Analyzer
TX indicates Generator
Vs.ss = software version number (e.g. V3.00).

Example *idn?
(command)
TEKTRONIX, BERT-700 RX, 0, V3.00 (response)



*tst?

Self Test. Causes the instrument to perform a self test and return the result. A result of 0 means the self test was successful. A return of any other value means the self test was not successful. The *gigaBERT700* self test is limited in scope.

Min. Abbr. *tst?

Returns 0 (if successful)

Example *tst? (command)
0 (indicates successful self test)

*wai

Wait. This command forces the instrument to stop processing any additional commands until all pending operations are completed.

Min. Abbr. *wai

tse [v] (Analyzer Only)

Test Status Enable. This command sets the Test Status Enable Register to the bit sequence corresponding to v, where v is a decimal number in the range 0 to 255.

Min. Abbr. tse

Argument n: <NR1>, in the range 0 to 255.

Example tse 255
(sets the TSR to 11111111 binary)

Commands Shared by the Generator and Analyzer

Except where noted, the following commands are found in both the Generator and Analyzer command sets.

Pattern and Word Commands

Use these commands to select a pattern, enable or disable pattern inversion, create and save word patterns, and perform related pattern functions.

data_invert [on | off]

Data Inversion. This command enables or disables logical inversion of the Generator data *output* bit sequence or the Analyzer *input* bit sequence.

Min. Abbr. data_inv

Arguments on: enables data inversion
off: disables data inversion

Example data_invert off

data_invert?

Data Inversion Query. Returns a character string indicating whether Generator output data inversion or Analyzer input data inversion is enabled (on) or disabled (off).

Min. Abbr. data_inv?

Returns [on | off]

Example data_invert? (command)
DATA_INVERT OFF

data_pattern [prbs | word | rdata]

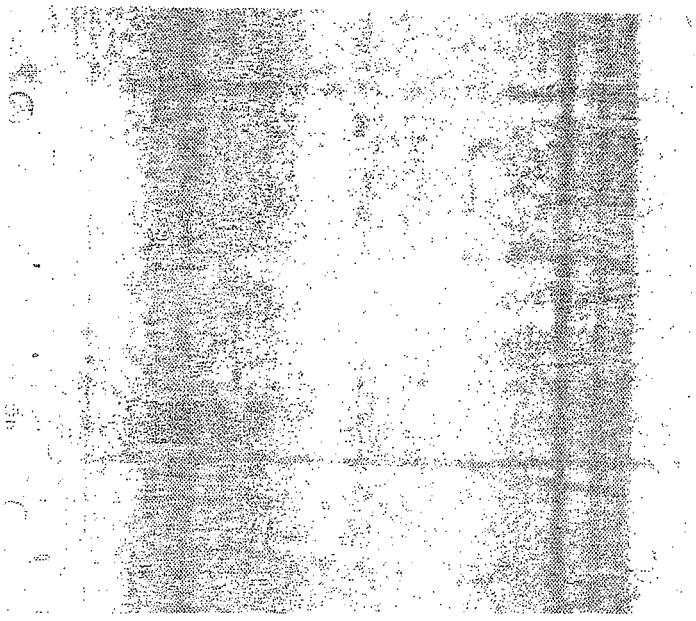
Data Pattern. Sets the Generator pattern mode to PRBS or word, or the Analyzer pattern mode to PRBS, word, or reference data.

Min. Abbr. data_p

Arguments **prbs:** selects the PRBS pattern mode.
word: selects the word pattern mode.
rdata: selects the reference data mode (**Analyzer only**).

Example data_pattern prbs

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



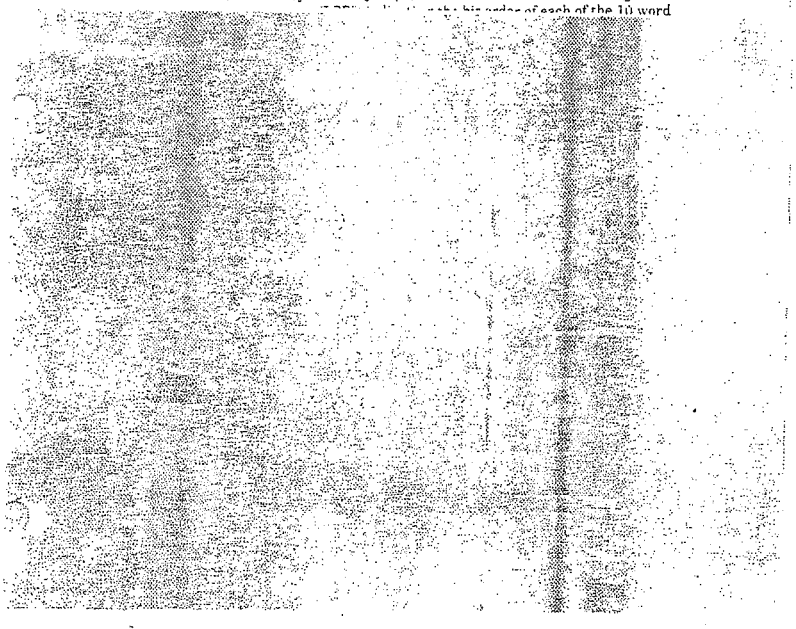
word_mem_ord [m], [msb | lsb]

Word Memory Order. Sets the bit order of the word saved at location m to either "msb" (most significant bit first) or "lsb" (least significant bit first).

Min. Abbr.	word_mem_o
Arguments	m: 0, 1, ..., 9 (0, ..., 7 for 128k option) msb: most significant bit first lsb: least significant bit first
Example	word_mem_ord 9, msb (selects the most significant bit first order for word memory location 9)

word_mem_ord?

Word Memory Order Query (All). Returns a command string ("MSB" or



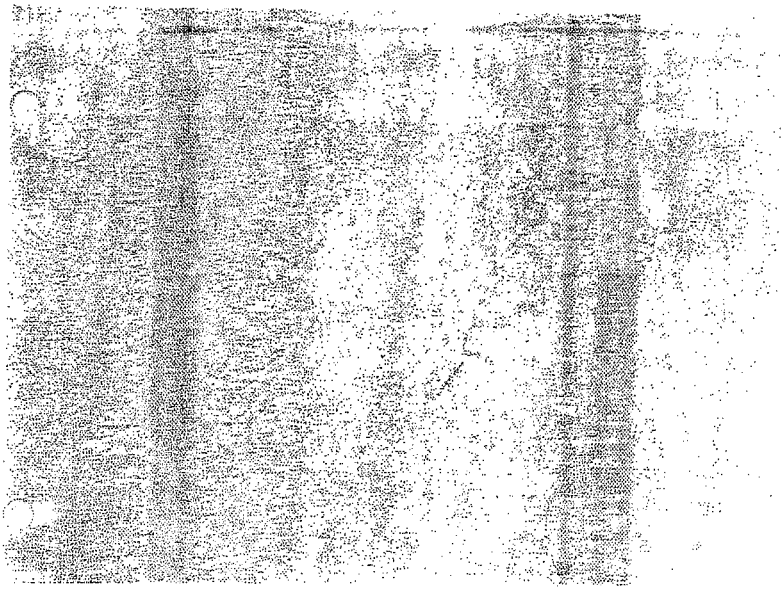
recall_word [m]

Recall Word. Causes the instrument to recall the word pattern saved at location "m" and make this pattern the current word pattern and the active pattern.

Min. Abbr.	recall_w
Arguments	m: 0, 1, ..., 9 (0, ..., 7 for 128k option)
Example	recall_word 5

save_word [m]

Save Word. Causes the instrument to save the current word pattern to word memory location "m".



gpib_bus?

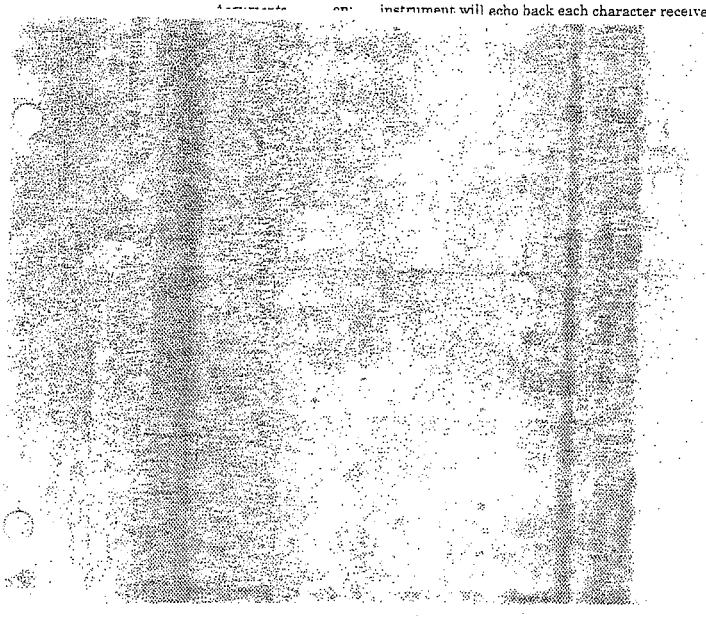
GPIB Bus Mode Query. Returns a character string indicating the current GPIB bus mode. May be used only over the RS-232 port.

Min. Abbr.	gpib_b?	
Returns	{off_bus | talk_listen}	
Example	gpib_bus?	(command)
	GPIB_BUS TALK_LISTEN	(response)

rs_echo [on | off]

RS-232C Echo. Enables or disables character echo on the RS-232C (serial) port.

Min. Abbr.	rs_e
	on: instrument will echo back each character received.



word_order?

Word Order Query. Returns a character string (MSB or LSB) indicating the bit order of the *current* word.

Min. Abbr.	word_o?	
Response	"MSB" or "LSB"	
Example	word_order?	(command)
	WORD_ORDER LSB	(response)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

header [on | off]

Header. Tells the instrument whether or not to include headers (command names) in responses.

Min. Abbr.	he	
Arguments	on:	include headers
	off:	do not include headers
Example	header on	

header?

Header Query. Returns a character string indicating the instrument's header status.

Min. Abbr.	he?	
Returns	[on off]	
Example	header? HEADER ON	(command) (response)

logo?

Logo Query. Returns a character string showing the Generator or Analyzer "logo" including company name, BERT model number, Generator or Analyzer identifier, and software version number. This command may be used only on the RS-232C port. Use the *idn? query to get this same information over the GPIB port.

rs_xon_xoff?

RS-232C Xon/Xoff Query. This command returns a character string indicating whether RS-232C port Xon/Xoff flow control is enabled or disabled.

Min. Abbr.	rs_x?	
Returns	[on | off]	
Example	rs_xon_xoff? RS_XON_XOFF ON	(command) (response)

clock_step?

Clock Step Query. Returns the current clock frequency step size.

Min. Abbr.	clock_ste?	
Returns	<NR3>	
Example	clock_step? CLOCK_STEP 1.000E+6	(command) (response)

clock_stp_up and clock_stp_dn

Clock Step Up, Clock Step Down. This command pair is used to increment or decrement the current Generator frequency using the step size previously defined with the clock_step command.

Min. Abbr.	clock_stp_u clock_stp_d	
Arguments	none	
Example	clock_step_up clock_step_dn	

Generator Commands

The following commands are found only in the Generator command set.

Clock Source and Frequency Setup Commands

clock_freq [v]

Clock Frequency. Sets the clock frequency to a value [v], specified in Hz, over the range of 150 kHz to 705 MHz, in steps of 1 kHz.

Min. Abbr.	clock_f	
Arguments	v	<NR3>, in the range 0.150E+6 to 705.000E+6 in steps of 0.001E+6.
Example	clock_freq 622.000E+6.	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

clock_off_up [v] and clock_off_dn [v]

Clock Offset Up, Clock Offset Down. This command pair is used to increment or decrement the current output clock signal baseline offset by a specified amount [v] volts.

Min. Abbr. clock_off_u
clock_off_d

Arguments v: <NR2>, in the range 0.05 to 3.80.

Example clock_off_up 0.10
clock_off_dn 0.10

clock_offset [v]

Clock Offset. Sets the baseline offset of the output clock signal to [v] volts.

Min. Abbr. clock_offs

Arguments v: <NR2>, in the range -2.00 to 1.80 in steps of 0.05.

Example clock_offset -0.75

clock_offset?

Clock Offset Query. Returns the current value of the output clock signal baseline offset.

Min. Abbr. clock_offs?

Returns <NR2>

Example clock_offset? (command)
CLOCK_OFFSET -0.75 (response)

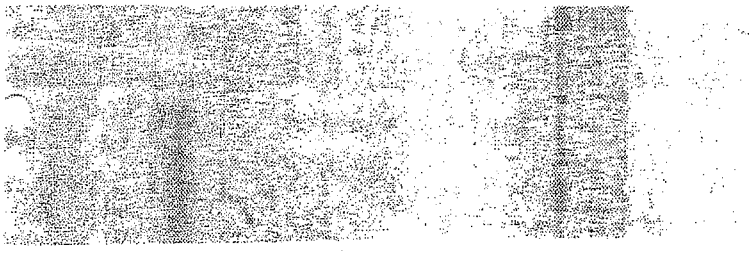
data_amp_up and data_amp_dn

Data Amplitude Up/Down (Default). This command pair is used to increment or decrement the current amplitude of the Generator data output by a default amount of 0.05 volts.

Min. Abbr. data_amp_u
data_amp_d

Arguments none

Example data_amp_dn



Output (Clock and Data) Setup Commands

amplitude [v]

Amplitude. This command sets both Data and Clock amplitudes to the same voltage [v].

Min. Abbr. am

Arguments v: <NR2>, in the range 0.50 to 2.00 in steps of 0.05.

Example amplitude 1.50

amplitude?

Amplitude Query. Returns two message units, the first indicating the clock amplitude setting and the second indicating the data amplitude setting.

Min. Abbr. am?

Returns <NR2>, <NR2>

Example amplitude? (command)
CLOCK_AMPL 1.450; DATA_AMPL 1.450 (response)

clock_amp_up and clock_amp_dn

Clock Amplitude Up/Down (Default). This command pair is used to increment or decrement the current clock amplitude setting by the default increment of 0.05 volts.

Min. Abbr. clock_amp_u
clock_amp_d

Arguments none

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

data_off_up [v] and data_off_dn [v]

Data Offset Up, Data Offset Down. This command pair is used to increment or decrement the current baseline offset of the Generator data output by a specified step size of [v] volts.

Min. Abbr. data_off_u
data_off_d

Arguments v: <NR2>, in the range 0.05 to 3.80, in steps of 0.05.

Example data_off_up 0.20

data_offset [v]

Data Offset. Sets the baseline offset of the Generator data output to a specified value of [v] volts.

Min. Abbr. data_offs

Arguments v: <NR2>, in the range -2.00 to 1.80 in steps of 0.05.

Example data_offset -0.50

data_offset?

Data Offset Query. Returns the current baseline offset of the Generator data output in terms of volts.

Min. Abbr. data_offs?

Returns <NR2>

Example data_offset? (command)
DATA_OFFSET -0.50 (response)

offset [v]

Offset. This command sets the Generator clock and data baseline offset to the same specified value of [v] volts.

Min. Abbr. off

Arguments v: <NR2>, in the range -2.00 to 1.80 in steps of 0.05.

Example offset 1.50

Error Injection Commands

error_rate [off|ext|rate_3|rate_4|rate_5|rate_6|rate_7]

Error Rate. Sets the Generator output bit error injection rate to "off", "external", or one of the following specified values: 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, or 10^{-7}.

Min. Abbr. error_r

Arguments

off:	turns error injection off.
ext:	selects the external error injection mode.
rate_3	sets bit error injection rate to 10^{-3}.
rate_4	sets bit error injection rate to 10^{-4}.
rate_5	sets bit error injection rate to 10^{-5}.
rate_6	sets bit error injection rate to 10^{-6}.
rate_7	sets bit error injection rate to 10^{-7}.

Example error_rate rate_6

error_rate?

Error Rate Query. Returns a character string indicating the current Generator output error injection mode and rate.

Min. Abbr. error_r?

Returns [off|ext|rate_3|rate_4|rate_5|rate_6|rate_7]

Example error_rate? (command)
ERROR_RATE RATE_6 (response)

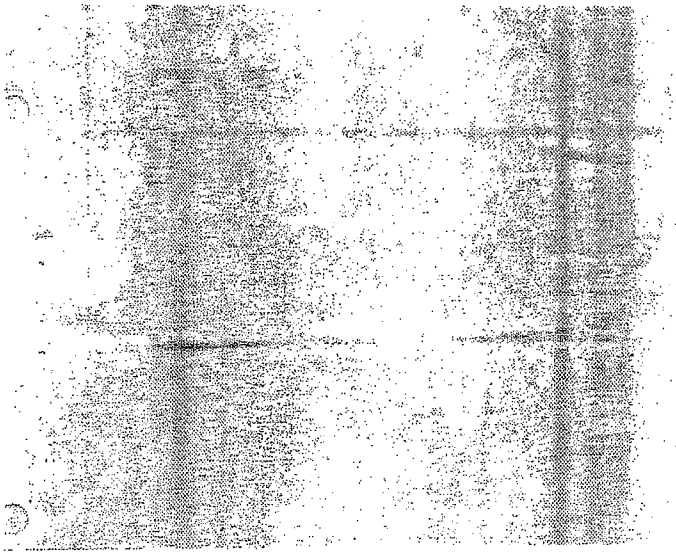
error_single

Error Single. This command injects a single bit error into the Generator output signal.

Min. Abbr. error_s

Arguments none

Example error_single



res_efs_per?

Results Error-Free Seconds. This command returns the percentage of error free seconds calculated, either in the current test interval so far or in the previous test interval, depending on the setup of TEST PREV and the current test state. (See ☑ **NOTE:** *Returning Current or Previous Test Results* on page 8-44).

Min. Abbr.	res_efs_?	
Returns	<NR2>	
Example	res_efs_per?	(command)
	RES_EFS_PER 100.00	(response)

res_elapsed?

Results Elapsed (Time). This command returns a quoted string indicating the time elapsed, either in the current interval so far or the previous interval, depending on the setup of TEST PREV and the current test state. (See ☑

clock_freq?

Clock Frequency. Returns the CLOCK input frequency in Hz that is measured by the Analyzer.

Min. Abbr.	clock_f	
Returns	<NR3>, in format ddd.ddE+6	
Example	clock_freq?	(command)
	CLOCK_FREQ 700.00E+6	(response)

res_bits?

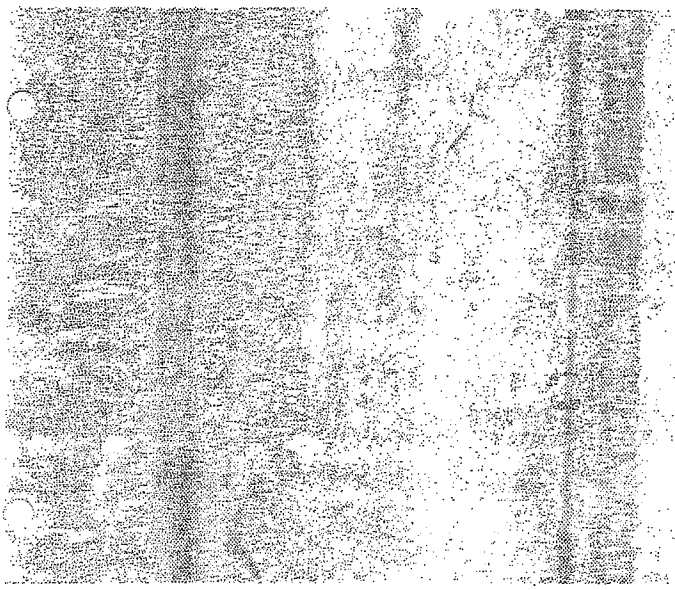
Results Bits Query. This command returns the number of bits counted, either in the current interval so far or the previous test interval, depending on the setup of TEST PREV and the current test state. (See ☑ **NOTE:** *Returning Current or Previous Test Results* on page 8-44).

Min. Abbr.	res_b?	
Returns	<NR1>	
Example	res_bits	(command)
	RES BITS 4230452921	(response)

res_cur_rate?

Results Current Rate Query. This command returns the BER measured, either in the most recent second of the current test interval or the last second of the previous test interval, depending on the setup of TEST PREV and the current test state. (See ☑ **NOTE:** *Returning Current or Previous Test Results* on page 8-44).

Min. Abbr.	res_c?	
Returns	<NR3>	
Example	res_cur_rate?	(command)
	RES_CUR_RATE 1.00E-6	(response)



res_tes?

Results Threshold Errored Seconds. This command returns the number of threshold errored seconds counted, either in the current test interval so far or in the previous test interval, depending on the setup of TEST PREV and the current test state. (See ☑. **NOTE:** *Returning Current or Previous Test Results* on page 8-44).

Min. Abbr.	res_tes?	
Returns	<NR1>	
Example	res_tes?	(command)
	RES_TES 9823	(response)

res_tes_per?

Results Threshold Errored Seconds Percentage. This command returns the percentage of threshold errored seconds, either in the current test interval so far or in the previous test interval, depending on the setup of TEST PREV and



res_pha_es?

Results Phase Errored Seconds. This command returns the number of phase errored seconds counted, either in the current test interval so far or in the previous test interval, depending on the setup of TEST PREV and the current test state. (See ☑ **NOTE:** *Returning Current or Previous Test Results* on page 8-44).

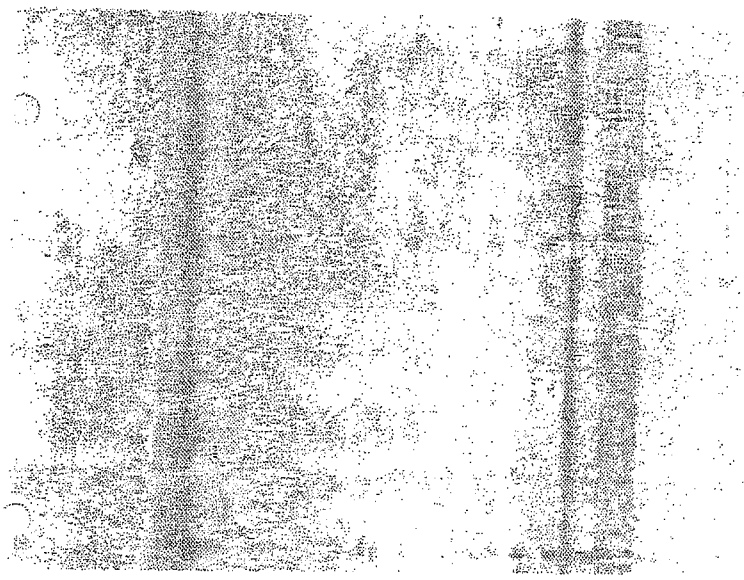
Min. Abbr.	res_p?	
Returns	<NR1>	
Example	res_pha_es?	(command)
	RES_PHA_ES 591	(response)

res_ses?

Results Severely Errored Seconds. This command returns the number of severely errored seconds counted, either in the current test interval so far or in the previous test interval, depending on the setup of TEST PREV and the current test state. (See ☑ **NOTE:** *Returning Current or Previous Test Results* on page 8-44).

Min. Abbr. res_ses?

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



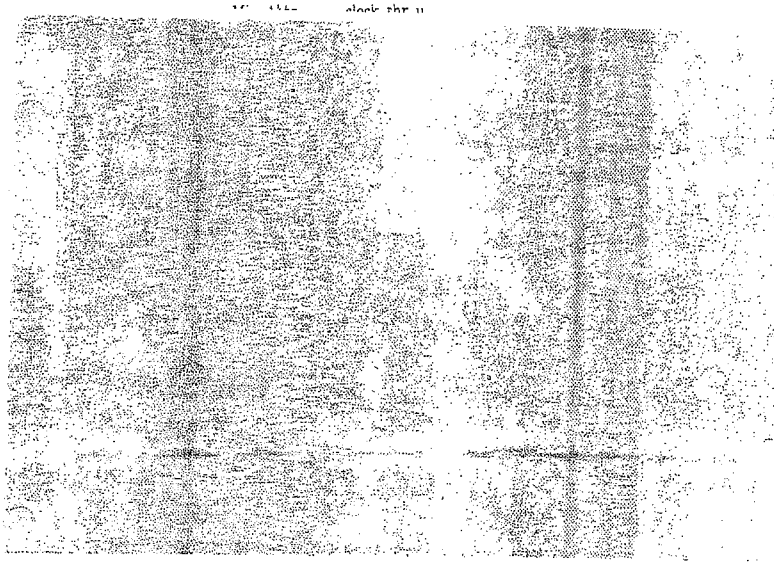
clock_term?

Clock Termination Query. Returns a character string indicating the current Analyzer clock input termination setup.

Min. Abbr.	clock_ter?	
Returns	{neg_2v | gnd | ac | pos_3v}	
Example	clock_term? CLOCK_TERM GND	(command) (response)

clock_thr_up and clock_thr_dn

Clock Threshold Up/Down (Default). This command pair is used to increment (clock_thr_up) or decrement (clock_thr_dn) the current Analyzer CLOCK input threshold voltage by the default increment of 0.05 volts.



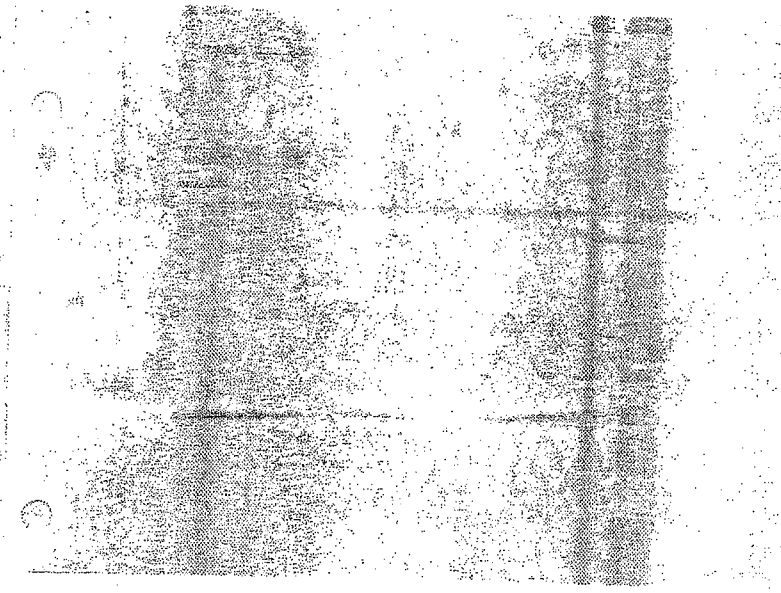
total_error?

Totalize Error Query. Returns the number of bit errors counted so far in the current Totalize measurement interval. The Totalize error count is zeroed at the start of each new Totalize measurement interval, that is at power-up and after a error reset.

Min. Abbr.	total_e?	
Returns	<NR1>	
Example	total_error? TOTAL_ERROR 20984	(command) (response)

total_rate?

Totalize (Bit Error) Rate Query. Returns the bit error rate (BER) calculated so far in the current Totalize measurement interval. Totalize BER equals the Totalize bit error count divided by the Totalize bit count.



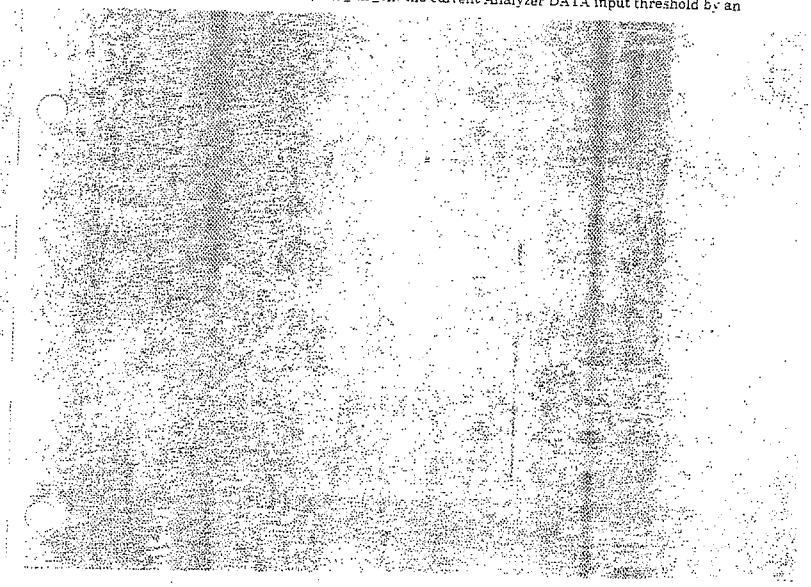
data_thr_up and data_thr_dn

Data Threshold Up/Down (Default). This pair of commands increments (data_thr_up) or decrements (data_thr_dn) the current Analyzer DATA input threshold by the default increment of 0.05 volts.

Min. Abbr.	data_thr_u data_thr_d	
Arguments	none	
Examples	data_thr_up data_thr_dn	(increments threshold by 0.05 volts) (decrements threshold by 0.05 volts)

data_thr_up [v] and data_thr_dn [v]

Data Threshold Up/Down. This pair of commands increments (data_thr_up) or decrements (data_thr_dn) the current Analyzer DATA input threshold by an



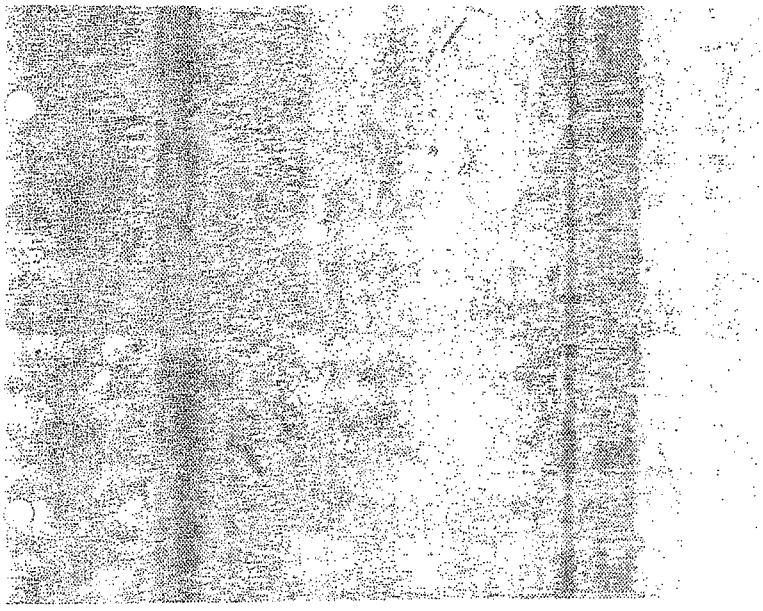
data_del_up [v] and data_del_dn [v]

Data Delay Up/Down. This command pair is used to increment (data_del_up) or decrement (data_del_dn) the current DATA input delay by v seconds. Note that v is expressed as a real number with an exponent and is in the range of 20 ps to 4.00 ns.

Min. Abbr.	data_del_u data_del_d	
Argument	v	<NR3>, 0.02E-9 to 4.00E-9, steps of 0.02E-9 (20 ps)
Example	data_del_up 0.02E-9 data_del_dn 0.10E-9	

data_delay [v]

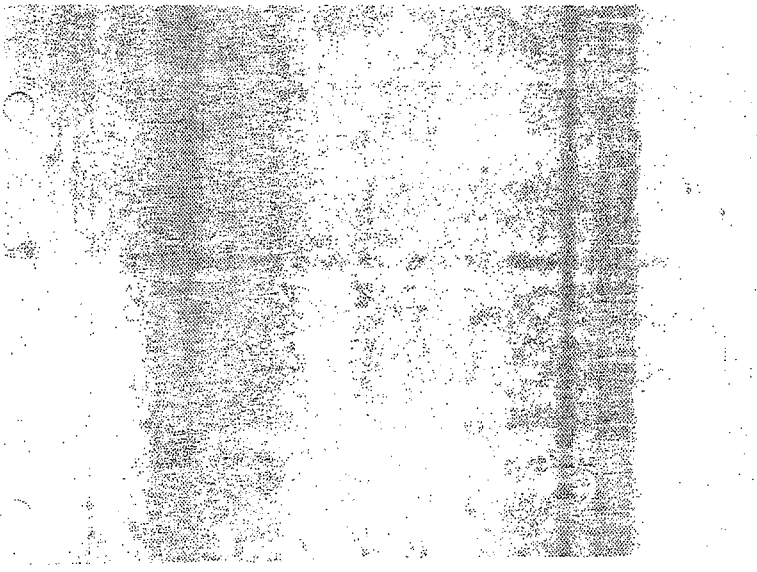
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



rdata_thres?

Reference Data Threshold Query. Returns the current threshold voltage for the Analyzer REF DATA input.

Min. Abbr.	rdata_thre	
Returns	<NR2>	
Example	rdata_thres? RDATA_THRES 1.00	(command) (response)



rdata_delay [v]

Reference Data Delay. Sets the Analyzer REF DATA input delay to v, where v may be set in the range 0.00 ns to 4.00 ns, in 0.02 ns (20 ps) steps. v is expressed as a real number with an exponent of -9.

Min. Abbr.	rdata_dela	
Argument	v:	0.00E-9 to 4.00E-9, in steps of 0.02E-9
Example	rdata_delay 1.10E-9	

rdata_delay?

Reference Data Delay Query. Returns the current Analyzer REF DATA input delay.

Min. Abbr.	rdata_dela?
Returns	<NR3>

histry_sync?

History Sync Indicator Query. Returns a character string indicating the state of the SYNC Loss history indicator.

Min. Abbr.	histry_sy?	
Returns	[on | off]	
Example	histry_sync? HISTRY_SYNC OFF	(command) (response)

sync?

Synchronization Query. Returns a character string indicating whether the Analyzer synchronization LOCK LED is on or off. If it is on, then the Analyzer is in pattern synchronization. If it is off, then the Analyzer is out of pattern synchronization.

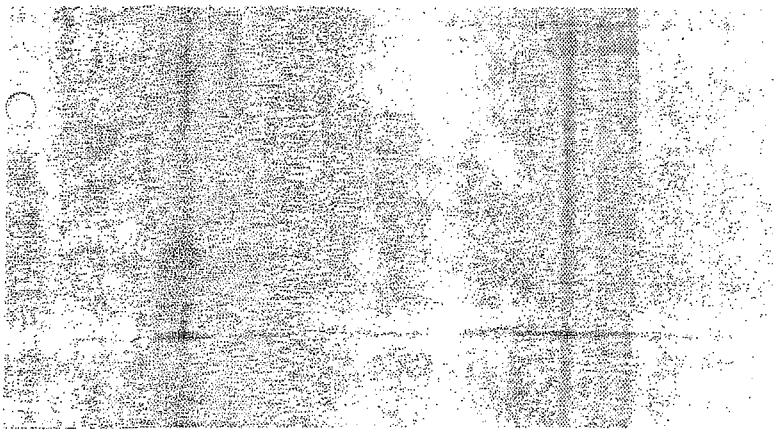
Min. Abbr.	sy?	
Returns	[on | off]	
Example	sync? SYNC ON	(command) (response)

ttl20_reset and ttl20_error?

Totalize 20 ms Reset / Totalize 20 ms Error. These two commands are similar in function to the **error_reset** and **total_error?** commands respectively. However the two ttl20 commands are better suited to make measurements over very short measurement intervals, that is intervals less than one second.

The minimum time allowed between an error_reset and a total_error? command is 500 ms. This limit does not apply to the ttl20_reset and ttl20_error? commands which will be processed as soon as they are received. Moreover, in addition to the error count, the response to a ttl20_error? query will include the number of 20 ms intervals since receipt of the ttl20_reset command.

Min. Abbr.	ttl20_r ttl20_e
ttl20_reset arguments	*none*
ttl20_error? returns	[i], [e], where:



disp_select?

Display Select Query. Returns a character string that indicates the current display mode of the Analyzer.

Min. Abbr.	dis?	
Returns	[total | window | test]	
Example	disp_select? DISP_SELECT TEST	(command) (response)

error_reset

Error Reset. This command resets the Totalize and Window measurement processes. This does not affect Test results.

Min. Abbr.	er
Arguments	none
Example	error_reset

histry_bits?

History Bits Query. Returns a character string indicating the state of the BIT error history indicator.

Min. Abbr.	histry_b

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

test_state [run | stop]

Test State. This command is used to start or stop the test measurement process.

Min. Abbr. test_st

Arguments
- **run:** starts the test measurement process. Will initiate an untimed, timed, or repeat test depending on the setup of test mode.
- **stop:** Stops the test measurement process. Will terminate untimed or repeat tests. Will also prematurely end timed tests before "test length" has elapsed.

Example test_state run

test_state?

Test State Query. Returns a character string indicating the current state of the test process. A response of RUN indicates that a test is in progress. A response of STOP indicates that no test is in progress.

Min. Abbr. test_st

Returns [run | stop]

Example

test_state?	(command)
TEST_STATE RUN	(response)

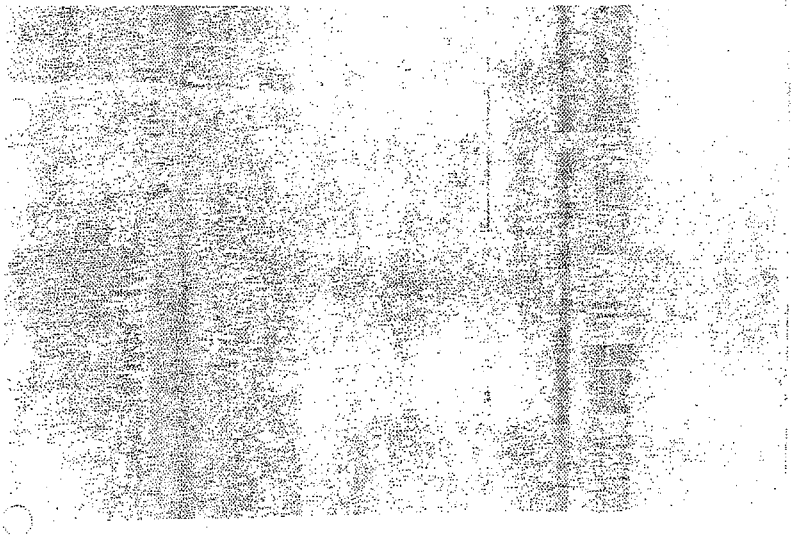
test_thres [v]

Test Threshold. Used to set the test error rate threshold to the value: 1×10^{-v}. This threshold determines which seconds are counted as Threshold Errored Seconds (TES). It also determines when On-Error reports are generated.

Min. Abbr. test_t

Arguments
- v <NR1>, in the range 2, 3, ..., 16. That is the test error rate threshold may be set in the range 10^{-2} to 10^{-16}.

Example test_thres 12



test_prev?

Test Previous Query. Returns the current state of the test_prev command.

Min. Abbr. test_pre?

Returns [current | previous]

Example

test_prev?	(command)
TEST_PREV CURRENT	(response)

test_print

Test Print. This command causes the Analyzer to print a Test Summary report. This report has the same basic format and contents as an End-of-Test report. If a test is in progress, the report will be based on current interval results. If no test is in progress, then the report will be based on results from the previous interval.

Min. Abbr. test_pri

Arguments none

PRINT Setup Commands

print_enable [on|off]

Print Enable. This command turns the "master" Analyzer Print Enable parameter on or off. When Print Enable is off, then no reports will be printed. When Print Enable is on, then all enabled reports will be printed. Remember that individual reports will not print unless they are enabled individually and Print Enable has been set to "on".

Min. Abbr. print_e

Arguments
- on enabled reports will print.
- off no reports will print

Example print_enable on

print_enable?

Print Enable Query. Returns the current state of the Print Enable parameter.

Min. Abbr. print_e?

Returns [on|off]

Example

print_enable?	(command)
PRINT_ENABLE ON	(response)

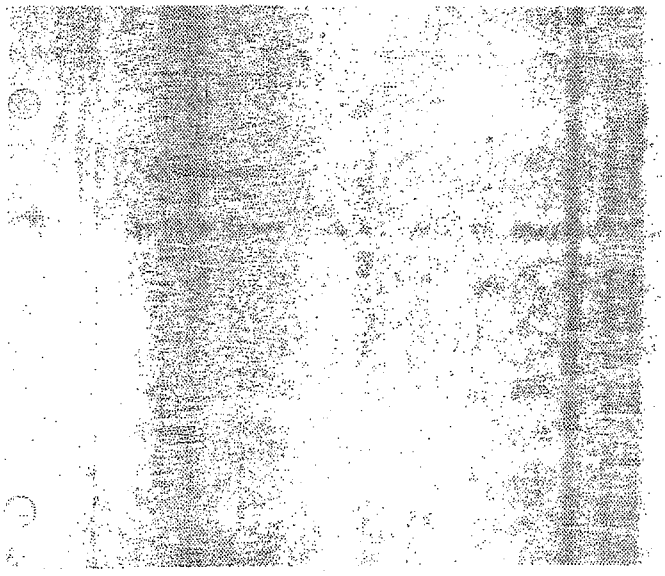
print_port [parallel | gpib | serial]

Print Port. This command selects the port on which all Analyzer reports will be printed.

Min. Abbr. print_p

Arguments
- parallel selects the rear-panel "PRINTER" port
- gpib selects the rear-panel "GPIB" port.
- serial selects the rear-panel "RS-232C" port.

Example print_port parallel



win_rate?

Window Rate Query. Returns the BER measured in either the current window interval so far, or the previous window interval, depending on the setup of WIN_PREV.

Min. Abbr. win_ra?

Returns <NR3>

Example

win_report [on | off]

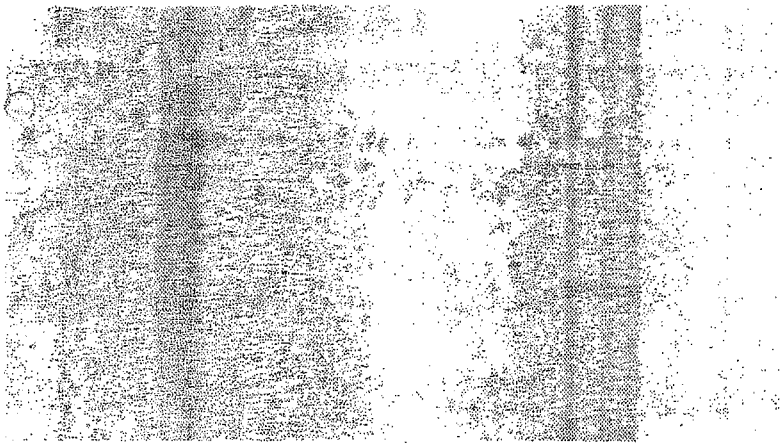
Windows Report. This command enables or disables End-of-Window reports.

Min. Abbr. win_re

Arguments
- on enables End-of-Window reports.
- off disables End-of-Window reports.

Example win_report on

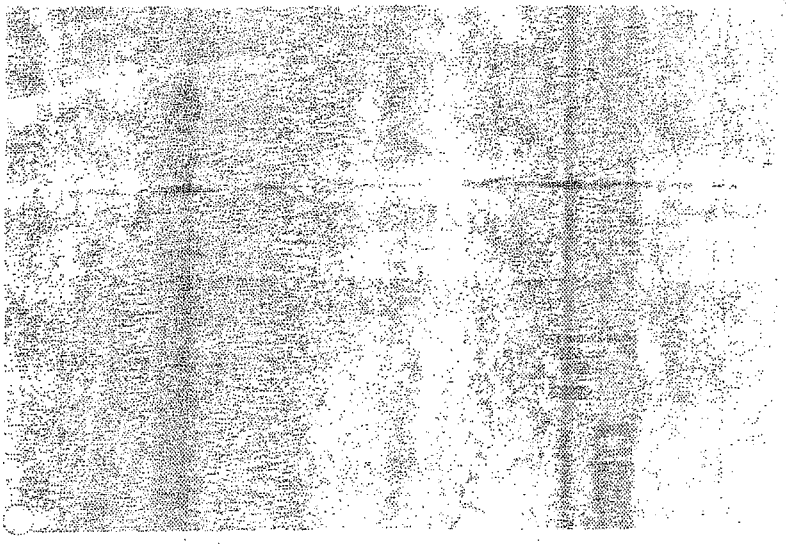
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



time?

Time Query. Returns a quoted string indicating the current setting of the instrument's time of day clock.

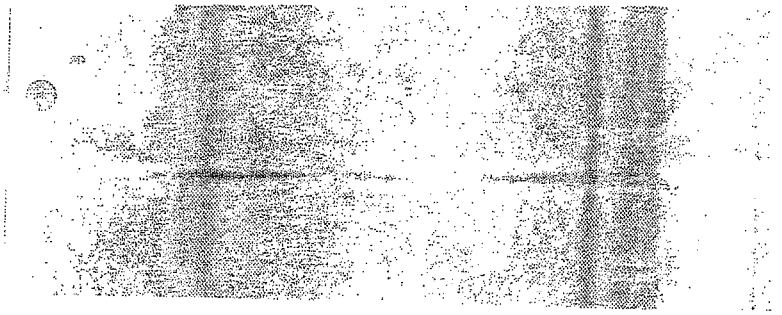
Min. Abbr.	ti?	
Returns	<qstring>	
Example	time?	(command)
	TIME "16:30:11.45"	(response)



audio_vol_up [v] and audio_vol_dn [v]

Audio Volume Up/Down. This command pair is used to increment (audio_vol_up) or decrement (audio_vol_dn) the current error beeper volume by "v" levels.

Min. Abbr.	audio_vol_u	
	audio_vol_d	
Argument	v	<NR1>, 1, 2, 3, or 4
Example	audio_vol_up 2	
	audio_vol_dn 2	



byte_fill [i], [b1], [b2], ..., [bn]

Byte Fill. This command fills the entire edit pattern with a repeating i-bit pattern. b1, b2, b3, ..., bn.

Min. Abbr.	byte_f	
Arguments	i	<NR1>, in the range 8 to 80, in steps of 8, indicates the number of bits in the fill pattern.
	b1, ..., bn	<non-decimal numeric(s)> indicating the contents of the fill pattern. Each byte may be in the range: #H00 to #HFF (hex), #Q000 to #Q377 (octal), or #B00000000 to #B11111111 (binary).
Example	byte_fill 16, #HAA, #HFF	

byte_insert [a], [i], [b1], ..., [bn]

Byte Insert. This command inserts a pattern of length i, bits, starting at address a in the edit pattern. The insert pattern is indicated by bytes b1, ..., bn.

Min. Abbr.	byte_i	
Arguments	a	<NR1>, in the range 0 to 16,383, the insert pattern will be inserted at this address.
	i	<NR1>, in the range 8 to 80, in steps of 8, the number of bits to insert.
	b1, ..., bn	<non-decimal numeric(s)> Indicating the bytes that make up the insert pattern. Each byte may be in the range #H00 to #HFF (hex), #Q000 to #Q377 (octal), or #B00000000 to #B11111111 (binary).
Example	byte_insert 1600, 32, #HFF, #HFF, #H00, #H00	
	(inserts the sequence FFFF0000 hex into the edit	
	... address 1600, and increments	

- byte_delete

2. If a command includes a bit address argument [a], then [a] must be less than the length, which can be specified by the byte_length command.

byte_block [a], [i], [b1], ..., [bn]

Byte Block. This command overwrites a block of i bits in the edit pattern, beginning at address a, with the overwrite pattern indicated by bytes b1 through bn.

Min. Abbr.	byte_b	
Arguments	a	<NR1>, in the range 0 to 16,383, the starting address of the overwrite block.
	i	<NR1>, in the range 1 to 80, the number of bits to overwrite.
	b1, ..., bn	<non-decimal numeric(s)> Indicating the bytes that make up the overwrite pattern. Each byte may be in the range #H00 to #HFF (hex), #Q000 to #Q377 (octal), or #B00000000 to #B11111111 (binary).
Example	byte_block 4096, 24, #HBB, #H10, #HFF	

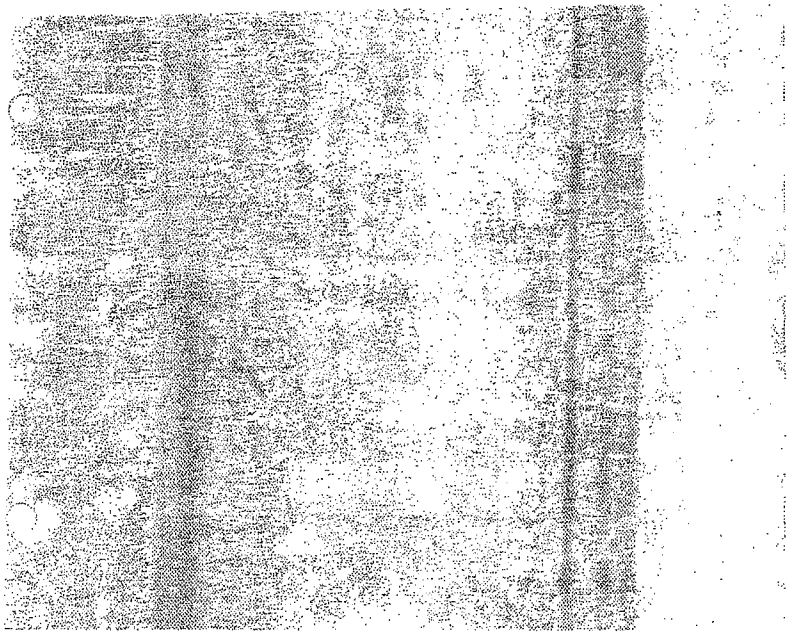
byte_block? [a]

Byte Block Query. Returns the hex., octal, or binary representation of the 80 bit section of the edit pattern beginning with the bit at address a. Note that if there is no editing session in progress, this command will return the indicated 80 bit section from the current word pattern.

Min. Abbr.	byte_b?	
Response	[a], [i], [b1], ..., [b2]	
	in format: <NR1>, <NR1>, <non-dec. numeric(s)>	
Example	byte_block? 500	
	BYTE_BLOCK 500, 16, #H12, #HF1	

☑ **NOTE:** If address [a] is within 10 bytes of the end of the pattern, then less than 10 bytes will be returned. Also, if the last byte of the pattern is included in the requested block, and this byte contains one or more unused bits, then these bits will be returned with a value of 0.

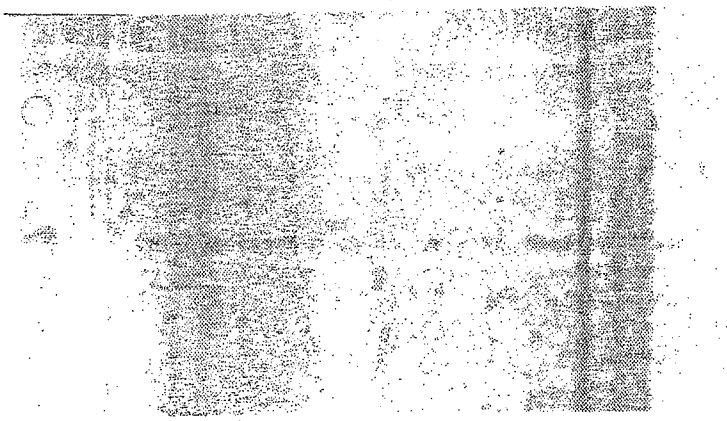
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



recall_mark [m1_8|m1_4|m1_2|m3_4|m7_8]

Recall Mark Density Pattern. This command recalls a selected mark (pulse) density pattern from PROM and makes it the current word and the active pattern.

Min. Abbr.	recall_mark	
Arguments	M1_8	1/8 (12.5%) mark density pattern
	M1_4	1/4 (25%) mark density pattern
	M1_2	1/2 (50%) mark density pattern
	M3_4	3/4 (75%) mark density pattern
	M7_8	7/8 (87.5%) mark density pattern
Example	recall_mark m7_8	



☑ **NOTE:** This command is found in the Analyzer command set only.

byte_sync? (Analyzer only)

Byte Synchronization Query. Returns a single decimal digit which represents the current long-word synchronization threshold, as explained in Table 5-2.

Min. Abbr.	byte_s?
Returns	<NR1>
Example	byte_sync? BYTE_SYNC 4

edit_begin [n]

Edit Begin. You must issue this command to the instrument before starting an editing session. In effect this command loads the contents of a word memory location specified by n into a scratch pad memory location. Once in the scratch pad memory it can be edited, uploaded to the controller, or saved to the same or a different memory location. You also must issue the edit_begin command before downloading a word pattern to the instrument.

Min. Abbr.	edit_b	
Arguments	n	<NR1>, a decimal number in the range -1 to + 7, where -1 indicates the current word pattern and 0

Agilent Technologies - Quality Instruments ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Data Inhibit	rear-panel SMA, ECL (50 ohms to -2 V term.)
Data inhibit rate	asynchronous, 1 bit + 500 ps minimum width
Data invert	front panel select

Clock Outputs

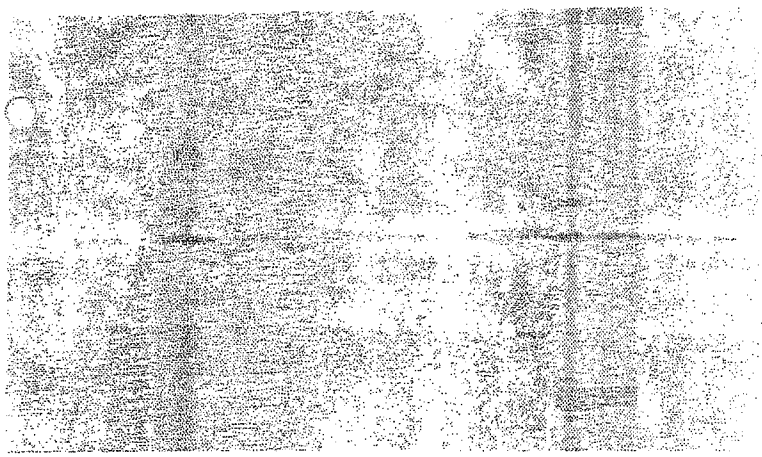
Format	true and compliment
Amplitude	variable, 500 mV to 2.0 V, in 50 mV steps
Baseline offset	variable, -2.0 V to +1.0 V, in 50 mV steps
Pulse top limit	+2 V into 50 ohms, +4 V into an open load
Rise/fall times (20 to 80%)	200 ps (typical) when amplitude equals 1 V.
Jitter	100 ps p-p max., referenced to EXT CLK
Source impedance	50 ohms
Connectors	SMA

Error Injection

Internal rates	single or 1E-n, n = 4, 5, 6, or 7
External error input	ECL, 50 ohms to -2V, 1 error per rising edge
External injection rate	50 ns minimum pulse width
External error connector	SMA

Auxiliary Outputs (Clock/4, Pattern Sync)

Level	200 mV p-p into 50 ohms, 400 mV into high impedance
Impedance	50 ohms



APPENDIX A
Specifications

This appendix lists *gigaBERT700* Generator and Analyzer specifications.



Word patterns (8/16 bit).....3 (1 of 128 errors 4096 bits)

Word patterns (128K option installed).....programmable (See Table A-1)

Table A-1 Synchronization Thresholds With 128K Option Installed

Sync. Level	BER	Errors/bits
1	3.1E-2	256:8192
2	7.8E-3	256:32768
3	1.9E-3	256:131072
4	9.7E-4	256:262144
5	4.8E-4	256:524288
6	2.4E-4	256:1048576
7	1.2E-4	256:2097152
8	6.1E-5	256:4194304
9	3.0E-5	256:8388608

Measurements

BER.....three simultaneous: Totalize, Window, and Test, displayed as 9.9E-01 to <1.0E-16

Total bit errors.....three simultaneous: Totalize, Window, and Test, displayed as 0 to 99999999

Totalize mode.....BER/bit errors since last

Analyzer Specifications

Clock Inputs

Format.....Differential or single-ended

Frequency range.....150 kHz to 705 MHz

Input level.....500 mV to 6.0 V p-p

Input threshold.....variable, -3.00 V to +4.50 V, in 50 mV steps

Impedance.....50 ohms

Termination voltage.....selectable, GND, -2 V, +3 V, or AC

Data Inputs

Format.....NRZ-L, true or inverted, differential or single-ended

Input threshold.....variable, -3.0 V to + 4.5 V in 50 mV steps

Input amplitude.....500 mV to 6.0 V p-p

Termination voltage.....selectable, GND, -2 V, +3 V, or AC

Impedance.....50 ohms

Delay relative to clock.....variable: 0 to 4.00 ns in 20 ps steps

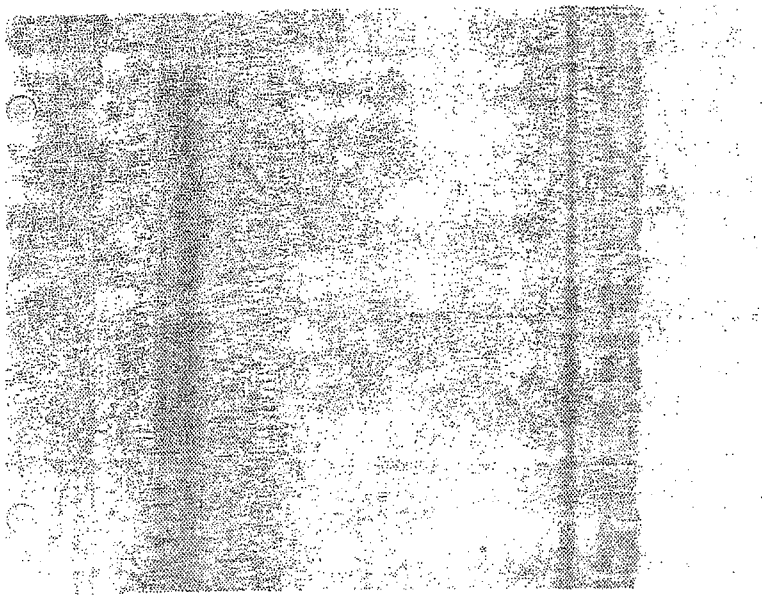
Connectors.....SMA

Reference Data Input

Format.....NRZ-L true

Input threshold.....variable: -2.0 V to +1.0 V in 50 mV steps

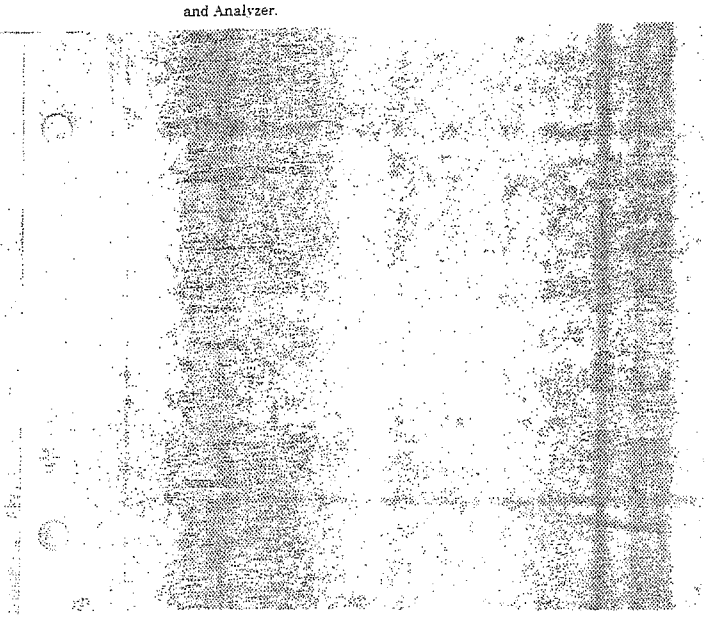
Input amplitude.....500 mV to 6.0 V p-p



APPENDIX B

Default Settings

This appendix lists factory default settings for the *gigaBERT700* Generator and Analyzer.



Operating temperature range.....to 50 degrees C

Mechanical

Weight.....10 Kg (22 lb.)

Size.....152H x 366W x 340D mm (6" x 14.4" x 13.4")

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Generator Factory Default Settings

Clock Source and Frequency

External Clock mode ..... INT, GND termination
Frequency (current) ..... 705.000 MHz
Frequency memories (0 through 9) ..... 705.000 MHz
Frequency step size ..... 100.000 MHz

Clock and Data Outputs

Output clock amplitude ..... 1.50 volts
Clock baseline offset ..... -0.75 volts
Output data amplitude ..... 1.50 volts
Data baseline offset ..... -0.75 volts
Error injection rate ..... off

Functions Shared by Generator and Analyzer

Data Pattern (Standard)

Current PRBS pattern ..... PN 7 (2^7-1)
Current word length ..... 16 bits
Current word pattern ..... AA 55
Word memories (0 through 7) ..... same as current word
Active pattern ..... PRBS
Data Invert ..... off
Word Order ..... LSB first

Data Pattern (128K Option)

Current word length ..... 8 bytes
Current word pattern AA55A55AAA55A55A
Word memories (0 through 7) ..... same as current word
Pattern Sync. pulse 0

APPENDIX C
Options

This appendix explains the options available with your *gigaBERT700* Generator and Analyzer.

OPTIONS 1R, 1T—Rack Mount.

This option adds the rack mount assembly to the analyzer and generator.

OPTIONS 2A, 2R, 2T—75 ohm Impedance.

This option changes the nominal impedance of the following *gigaBERT700* inputs and outputs from the standard 50 ohms to 75 ohms:

Analyzer: DATA, DATA-BAR, CLOCK, CLOCK-BAR.

Generator: DATA, DATA-BAR, CLOCK, CLOCK-BAR.

The nominal impedance of all other signal inputs and outputs remains 50 ohms.

OPTION 4S

Printer

Port ..... parallel
Print enable ..... on

Window Measurement Process

Mode ..... bits
Bits ..... 1.0E+9
Seconds 1
End-of-Window reports ..... off

Test Measurement Process

Test mode ..... timed
Timed test interval 00:00:30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Functional Test

To functionally test the gigaBERT700, connect the Generator to the Analyzer and confirm their correct operation as described below.

Note

In these procedures, the Generator and Analyzer are returned to their default settings. The word memories will be reset. If you have entered word patterns that you do not want to lose, use a GPIB or RS-232C controller to save them before beginning these procedures.

❑ **Step 1:** Make connections appropriate to the options installed as follows:

Connections for Functional Test

Option	From	To	Comment
Standard Instrument	TX Clock	RX Clock	50 ohm, SMA coax
	TX Not Clock	RX Not Clock	50 ohm, SMA coax
	TX Data	RX Data	50 ohm, SMA coax
	TX Not Data	RX Not Data	50 ohm, SMA coax
75 ohm Option	TX Clock	RX Clock	75 ohm, SMA coax[1]
	TX Not Clock	RX Not Clock	75 ohm, SMA coax[1]
	TX Data	RX Data	75 ohm, SMA coax[1]
	TX Not Data	RX Not Data	75 ohm, SMA coax[1]

[1]This may be accomplished by using SMA to BNC adapters and 75 ohm BNC coaxial cables.

See Figure 1 for Setup of Functional Test.

❑ **Step 2:** Reset both the Generator and Analyzer to their factory default settings. Press the 'CLEAR' key in the PATTERN section, the 'MSB(1)' key and the 'VIEW ANGLE' key, and hold down all three keys while cycling the power.

The message DEFAULT SETTINGS should appear briefly on the display of each unit, followed by the gigaBERT700 logo, before the functional display appears.

❑ **Step 3:** At the Generator, verify that error injection is off (you should see ERR OFF on the display). If error injection is on, press the 'SINGLE' key in the ERROR INJECT section to turn it off.

Confirmation of Buttons and Indicators

❑ **Step 46:** Reset both the Generator and Analyzer by cycling the power.

❑ **Step 47:** Verify the following Generator LEDs.

Section	ON	OFF
CLOCK	FREQUENCY	RECALL SAVE EXT
PATTERN	PRBS	WORD RECALL SAVE WORD LENGTH F1 - F4 Bits 1 - 8
OUTPUT	DATA	CLOCK INVERT DATA
ERROR INJECT		RATE
Left Side		PANEL LOCK GPIB ADDR LOCAL

❑ **Step 48:** Verify the Generator LEDs and buttons operate by toggling the following buttons and observing the LEDs turn ON and OFF.

Section	LED/Button	Indicator
Left Side	PANEL LOCK	ON - OFF
	GPIB ADDR	ON - OFF

❑ **Step 49:** Verify the Analyzer LEDs and buttons operate by toggling the following buttons and observing the LEDs turn ON and OFF.

Section	LED/Button	Indicator
Left Side	PANEL LOCK	ON - OFF
	ADDR	ON - OFF

Tektronix

Customer Acceptance Test
For
gigaBERT700 Generator & Analyzer

NOTICE TO ALL PERSONS RECEIVING THIS DOCUMENT

THIS DOCUMENT IS ONLY CONDITIONALLY ISSUED, AND NEITHER RECEIPT NOR POSSESSION THEREOF CONFERS OR TRANSFERS ANY RIGHT IN, OR LICENSE TO USE, THE SUBJECT MATTER OF THE DOCUMENT OR ANY DESIGN OR TECHNICAL INFORMATION SHOWN THEREON, NOR ANY RIGHT TO REPRODUCE THIS DOCUMENT OR ANY PART THEREOF, EXCEPT FOR MANUFACTURE BY VENDORS FOR TEKTRONIX AND FOR MANUFACTURE UNDER THE CORPORATION'S WRITTEN LICENSE, NO RIGHT TO REPRODUCE THE DOCUMENT IS GRANTED UNLESS BY WRITTEN AGREEMENT WITH OR WRITTEN PERMISSION FROM THE CORPORATION.

Revision History

Date	Description	Pages Affected
9/29/94	Initial Release	Whole Document
9/3/96	Change Name to Tektronx	Whole Document

Confirmation of Error Injection Rates

❑ **Step 28:** In the Analyzer ERROR DETECTION section, press the 'DISPLAY SELECT' key until there is an ∞ (infinity) symbol on the display preceding the error rate.

❑ **Step 29:** At the Analyzer, press the 'CLEAR' key in the ERROR HISTORY section, and press the 'CLEAR' key in the ERROR DETECTION section to clear the history LEDs and error rate display.

❑ **Step 30:** In the Generator ERROR INJECTION section, press the 'SINGLE' key and confirm on the Analyzer the BIT LED (in the ERROR HISTORY section) lights and that the displayed error total increases by one each time you press the 'SINGLE' key. Press this key at least 20 times.

Note

Press the 'SINGLE' key briefly. If you hold it down, the Generator injects errors repeatedly into the data stream.

❑ **Step 31:** In the ERROR HISTORY section, press the 'CLEAR' key to clear the history LEDs.

❑ **Step 32:** In Generator ERROR INJECTION section, press the 'RATE' key. ERR 1E-7 will appear on the display. The ERROR INJECTION LED should be on steadily.

❑ **Step 33:** In the Generator ERROR DETECTION section, press the 'CLEAR' key to clear the totalize error display.

❑ **Step 34:** Wait 15 seconds, then confirm that the error rate displayed on the Analyzer matches the Generator injected error rate and that the Analyzer BIT LED in the ERROR HISTORY section is lighted.

❑ **Step 35:** In the Generator ERROR INJECTION section, press the 'RATE' key once to select the next error rate.

❑ **Step 36:** Repeat steps 33 through 35 until all Generator error rates have been verified and EXT appears on the Generator display. Press the Generator 'ERROR RATE' key once more to turn off error injection.

❑ **Step 37:** Look straight at the Generator LCD panel. Depress the VIEW ANGLE button until you see the darkest digits. Change the vertical angle from which you view the display and adjust the clarity by depressing the VIEW ANGLE adjust button. This is to verify that the contrast of the display can be optimized for the user's viewing angle.

❑ **Step 38:** Repeat Step 37 for the Analyzer.

❑ **Step 39:** Set the Generator and the Analyzer to Factory Default settings. Verify that the Analyzer SYNC LOCK light illuminates. Push the CLEAR key in the ERROR HISTORY section. Record the delay value shown on the display (lower left display area) for later use. De-select AUTOSEARCH on the Analyzer. Press the 'DELAY' key in the input section of the Analyzer. Vary the delay using the 'UP' and 'DOWN' arrow keys in the input section of the Analyzer until the PHASE light in the ERROR HISTORY section illuminates. Manually return the Analyzer delay setting to that recorded above. Verify that the PHASE light can be extinguished by the 'CLEAR' key.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP