

# Programmer Manual



**DG2040**  
**Data Generator**

**071-0258-50**

This document applies to firmware version 1.00  
and above.

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# Preface

The DG2040 Data Generator Programmer Manual provides information on operating the instrument over a General Purpose Interface Bus (GPIB) interface or an RS-232-C interface.

This manual provides the following information:

- The *Getting Started* section describes how to connect and set up for remote operation.
- The *Syntax and Commands* section defines the command syntax and processing conventions and describes each command in the data generator command set.
- The *Status and Events* section explains the status information and event messages reported by the data generator.
- The *Appendices* section contains various topics of use to the programmer.
- *Glossary and Index* contains a glossary of common terms and an index to this manual.

## Related Manuals

Other documentation for DG2040 Data Generator includes:

- The *DG2040 User Manual* (Tektronix part number 071-0257-XX) describes the operation of the instrument.
- The *DG2040 Service Manual* (Tektronix part number 071-0259-XX) provides information for maintaining and servicing the Data Generator.

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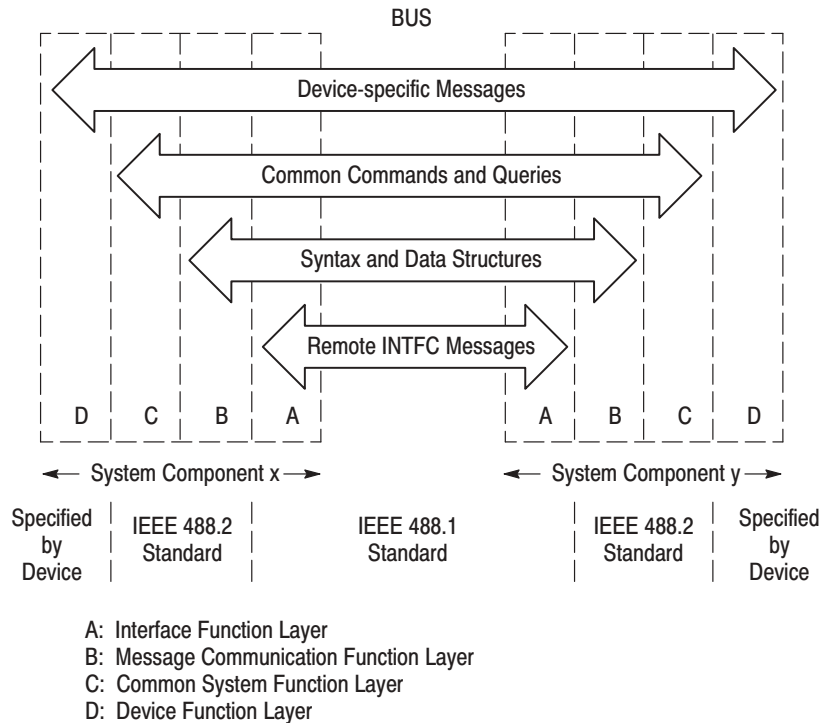
- \* **This phone number is toll free in North America. After office hours, please leave a voice mail message. Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices.**



# Getting Started

The DG2040 Data Generator has two interfaces for remote operation: the GPIB interface and the RS-232-C interface. All menu-controlled and front-panel controlled functions, except the ON/STBY function, the edit function, and the GPIB and RS-232-C parameter setup functions, can be performed through the GPIB or the RS-232-C interface using the programming command set (described in *Syntax and Command* Section).

The GPIB interface conforms to ANSI/IEEE Std 488.1-1987, which specifies the hardware interface, its basic functional protocol, and a set of interface messages (codes) that control the interface functions. This instrument also conforms to ANSI/IEEE Std 488.2-1987 which specifies Codes, Formats, Protocols, and Common Commands to support the system application. The functional layers of the GPIB system are shown in Figure 1-1.



**Figure 1-1: Functional layers in GPIB system**

The RS-232-C interface, which was established by the Electronic Industries Association (EIA), provides a common basis of serial communication between devices that exchange data. This interface has long been used on terminals, modems, printers, and other devices. The RS-232-C interface that the data generator provides also uses most of the same codes, formats, protocols, and common commands as are used with the GPIB interface (ANSI/IEEE Std 488.2-1987).

## Choosing an Interface

Your system hardware may let you choose which interface to use with your system; Be sure to consider the advantages and disadvantages of each interface. For example, the GPIB interface is an eight-bit parallel bus and therefore it offers high-speed data transfers and multiple instrument control. In contrast, the RS-232-C interface is a slower serial data bus for single instrument control, but it is easy to connect to and can be used with a low-cost controller. Table 1-1 compares the GPIB and RS-232-C interface.

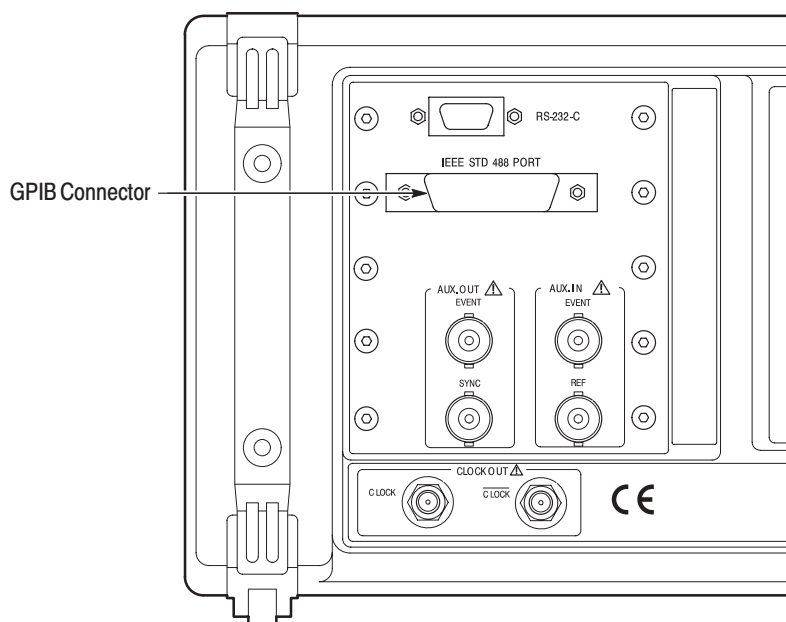
**Table 1-1: GPIB and RS-232-C comparison**

Operating attribute	GPIB	RS-232-C
Cable	ANSI/IEEE Std 488	9-wire (DCE)
Data flow control	Hardware, 3-wire handshake	Flagging: soft (XON/XOFF), hard (DTR/CTS)
Data format	8-bit parallel	8-bit serial
Interface control	Operator low-level control message	None
Interface messages	Most ANSI/IEEE Std 488	Device clear via ASCII break signal
Interrupts reported	Service requests status and event code	Status and event code (no service requests)
Message termination (Receive)	Hardware EOI, software LF, or both	Software CR, LF, or CR and LF
Message termination (Transmit)	Hardware EOI, and software LF	Software LF
Timing	Asynchronous	Asynchronous
Transmission path length	≤2 meters between devices; ≤20 meters total cabling for GPIB system	≤15 meters
Speed	200 Kbytes/sec	19,200 bits/sec
System environment	Multiple devices (≤15)	Single terminal (point to point connection)

## Installing for GPIB Communication

**NOTE.** Power off the instrument before connecting a GPIB cable.

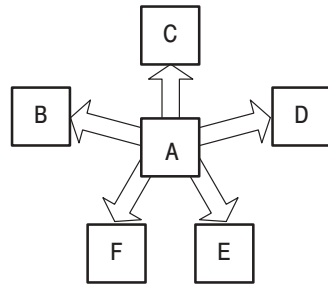
With the power off, connect a GPIB cable from the GPIB controller to the ANSI/IEEE Std 488 port (GPIB) connector on the rear panel of the data generator (Refer Figure 1-2). For example, when using an MS-DOS compatible controller, connect the GPIB cable between the National Instrument PC2A GPIB board and the data generator GPIB connector.



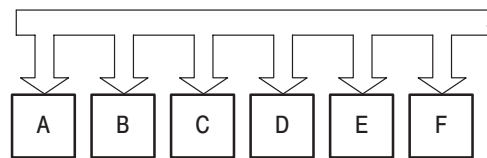
**Figure 1-2: GPIB connector**

Instruments can be connected to the GPIB in linear or star configurations or in a combination of both configurations. A linear hookup is one where a GPIB cable is used to string one device to a second, and then another GPIB cable is used to string from a second to a third, and so on until all devices in the system are connected. A star setup is one where one end of all the GPIB cables in the system are attached to one device. Refer to Figure 1-3 for these GPIB system configurations.

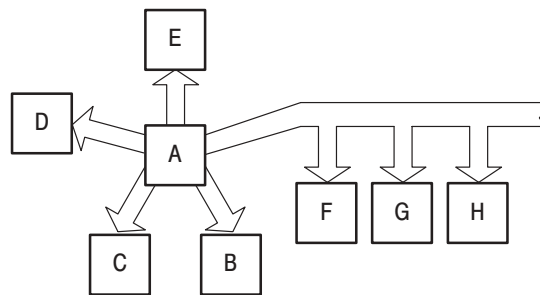
**Star Configuration**



**Linear Configuration**



**Combination of Star and Linear Configurations**



**Figure 1-3: GPIB system configurations**

**Restrictions**

Consider the following restrictions when distributing instruments on the GPIB bus:

- No more than 15 total devices (including the controller) can be included on a signal bus.
- In order to maintain the electrical characteristics of the bus, one device load must be connected for every two meters of cable (most often, each device represents one device load to the bus).
- The total cable length (cumulative) must not exceed 66 feet (20 meters).
- At least two-thirds of the device loads must be powered on.

## Setting the GPIB Parameters

Follow the step below to set the GPIB parameters:

1. Press the UTILITY button in the MENU column to the right of the screen. The UTILITY menu appears above the bottom menu buttons.
2. Press the System bottom menu button to display the System menu (See Figure 1-4).
3. Select the Configure item from the GPIB menu using the up and down arrow buttons. Set the GPIB operating mode using the left and right arrow buttons.
  - Talk/Listen. Sets the communications mode to talk/listen.
  - Talk Only. Sets the communications mode to talk only, which is used for hardcopy output.
  - Off Bus. Logically disconnect the data generator from GPIB system.

---

**NOTE.** The data generator accepts as a terminator either the software LF (Line Feed), sent as the last data byte, or the hardware EOI, with the EOI line asserted concurrently with the last data byte sent.

---

4. Select the Address item from the GPIB menu using the up and down arrow buttons. Then use the rotary knob to set the primary address to a value in the range 0 to 30.
5. Select the Remote Port item using the up and down arrow buttons. Highlight GPIB using the left and right arrow buttons. This selects the GPIB as the remote interface.

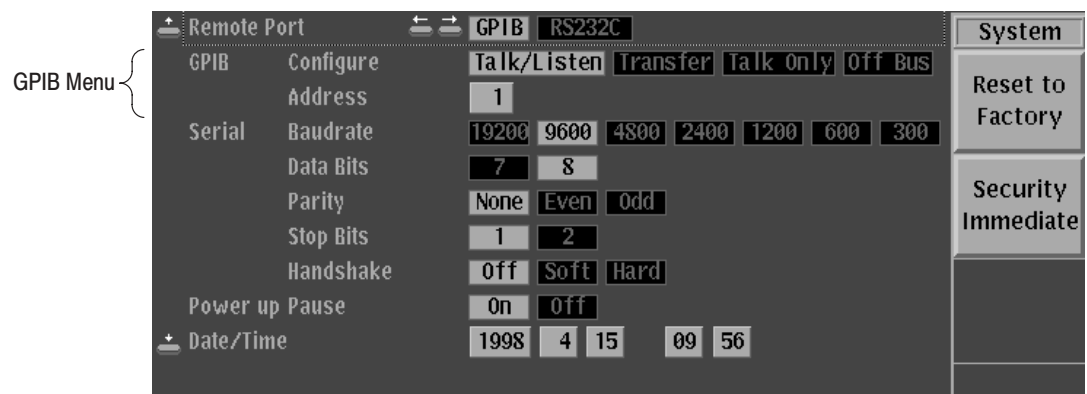


Figure 1-4: GPIB parameter settings

## Installing for RS-232-C Communication

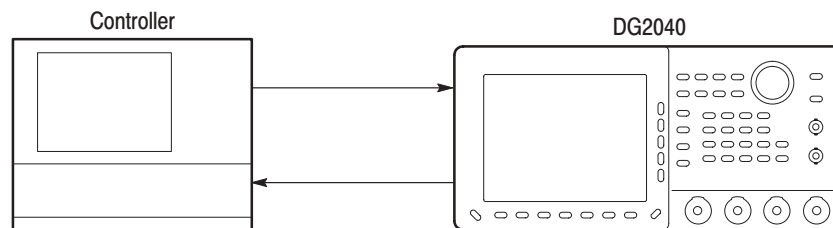
---

**NOTE.** Power off the instrument before connecting an RS-232-C cable.

---

Connect an RS-232-C cable from the computer terminal to the RS-232-C connector on the rear panel of the data generator. Use a configuration based on the settings for the data flow control (flagging).

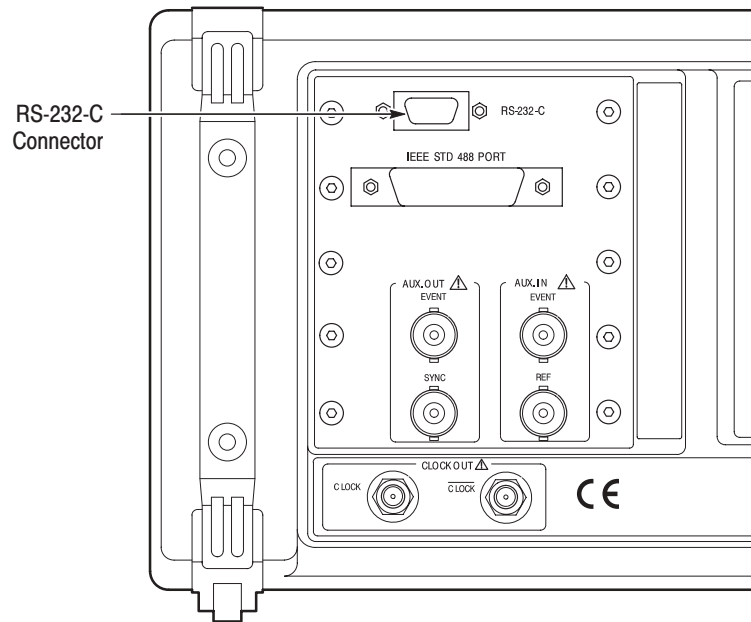
The RS-232-C provides a point-to-point connected communication interface between two devices (see Figure 1-5). The data generator can transmit and receive the same message serially over the RS-232-C interface as it can in parallel over the GPIB interface.



**Figure 1-5: RS-232-C point-to-point connection**

Several connectors are used with the RS-232-C interface: a DTE device uses a standard 25-pin male D-type shell connector; a DCE device uses a standard 25-pin female D-type shell connector. Some recent computers implement the RS-232-C interface using 9-pin D-type connector.

This data generator uses a standard 9-pin D-type shell connector, provided on the rear panel (see Figure 1-6), along with a 9-pin male to 25-pin male conversion cable. Figure 1-7 on page 1-8 shows both 9-pin and 25 pin connectors with their pin number assignments.



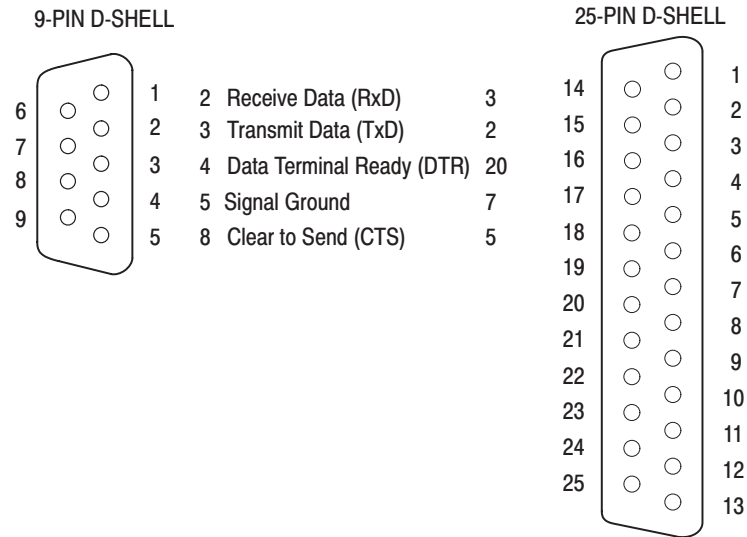
**Figure 1-6: RS-232-C port**

This data generator is designed as DCE device. You may connect it up to 15 meters (50 feet) from a DTE device using a straight-through male-to-female cable. However, if the other device is configured as a DCE device, you will need a special adapter or null-modem cable for local DCE-to-DCE communications. Refer to the wiring examples in the Figure 1-8 for the proper signal connections between devices.

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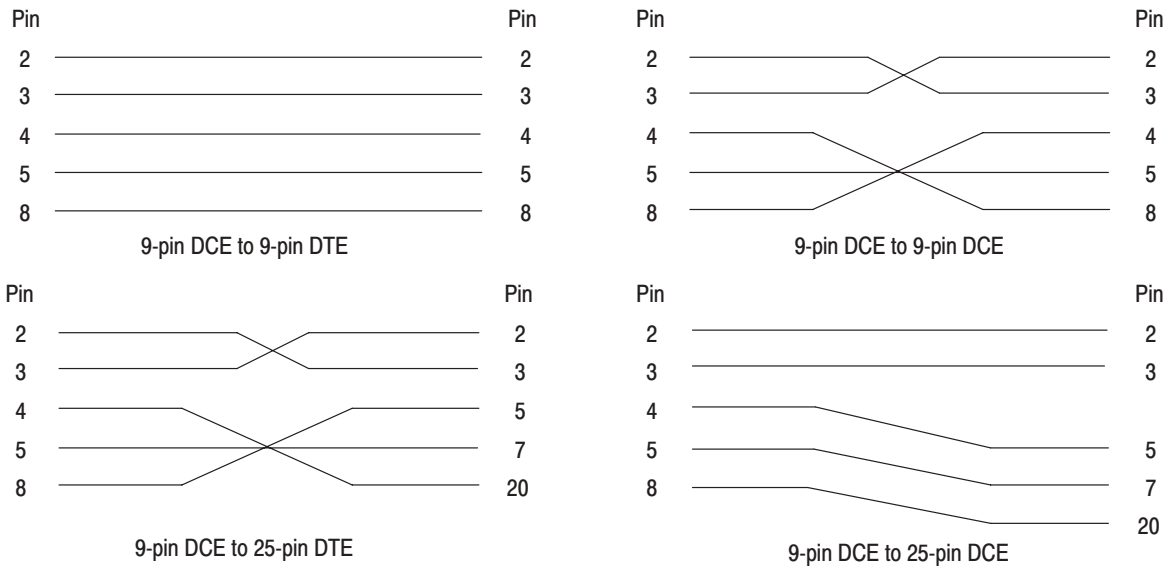
**NOTE.** *In this data generator, only TxD, RxD, DTR, CTS pins and Signal Ground are available.*

---



**NOTE:** TxD, RxD, DTR, CTS and Ground lines are only available in the data generator.

**Figure 1-7: Pin assignments of 9-pin and 25-pin D-type shell connector**



**NOTE:** When using software flow control, the CTS-DTR lines do not need to be connected.

**Figure 1-8: Typical RS-232-C cable wiring requirements**



## Setting the RS-232 Parameters

To set the RS-232-C parameters, perform the following steps:

1. Press the **UTILITY** button in the MENU column to the right of the screen. The UTILITY menu appears above the bottom menu buttons.
2. Press the System bottom menu button to display the System menu (See Figure 1-9).
3. Select the Baud rate item from the Serial menu using the up and down arrow buttons. Here select the data transfer rate using the left and right arrow buttons. The rate can be set to 300, 600, 1200, 2400, 4800, 9600, or 19200 baud.
4. Select the Data Bits item from the Serial menu using the up and down arrow buttons. Then use the left and right arrow buttons to select the data bit length for each character. The bit length can be set to either 7 or 8 bits.
5. Select the Parity item from the Serial menu using the up and down arrow buttons. Then use the left and right arrow buttons to set the error check bit for each character. The error bit can be set to None, Even, or Odd parity.
6. Select the Stop Bits item from the Serial menu using the up and down arrow buttons. Then use the left and right arrow buttons to select the number of stop bits sent after each character. The number of stop bits can be set to either 1 or 2.
7. Select the Handshake item from the Serial menu using the up and down arrow buttons. Then use the left and right arrow buttons to select the method of controlling the flow of data between devices. The data flow method can be set to Hard (DTR/CTS), Soft (XON/XOFF), and Off (no flow control).
8. Select the Remote Port item using the up and down arrow buttons, and additionally, highlight "RS232C" using the left and right arrow buttons. This selects the RS-232-C interface as the remote interface.

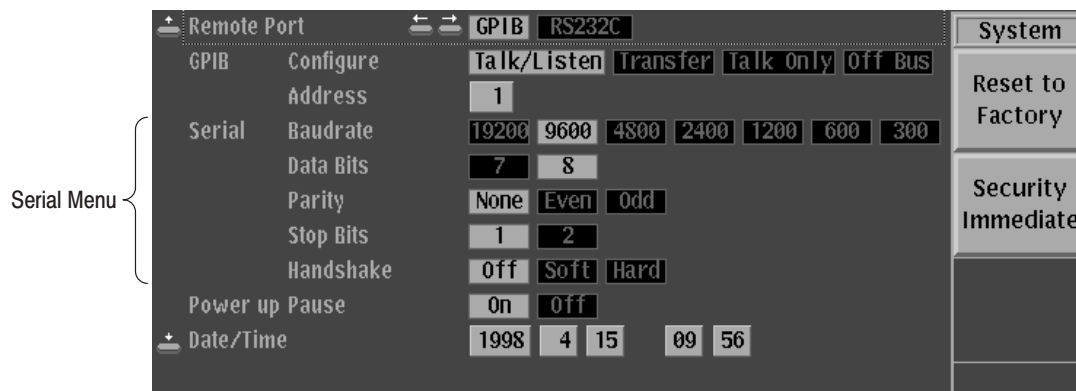


Figure 1-9: RS-232-C parameter settings



# Syntax

The DG2040 Data Generator provides a large set of commands to control the operations and functions from an external controller. This section describes the syntax and communication rules for using these commands to operate the data generator.

## Command Notation

The command syntax is in extended BNF (Backus-Naur Form) notation. The extended BNF symbols used in the command set are shown in the following table.

**Table 2-1: BNF symbols and meanings**

Symbol	Meaning
< >	Indicates a defined element
	Delimits Exclusive OR elements
{ }	Delimits a group of elements one of which the programmer must select
[ ]	Delimits an optional element that the programmer may omit
[ ]...	Delimits an optional element that the programmer may omit or may repeat one or more times
::=	Indicates that the left member is defined as shown by the the right member

## Program and Response Messages

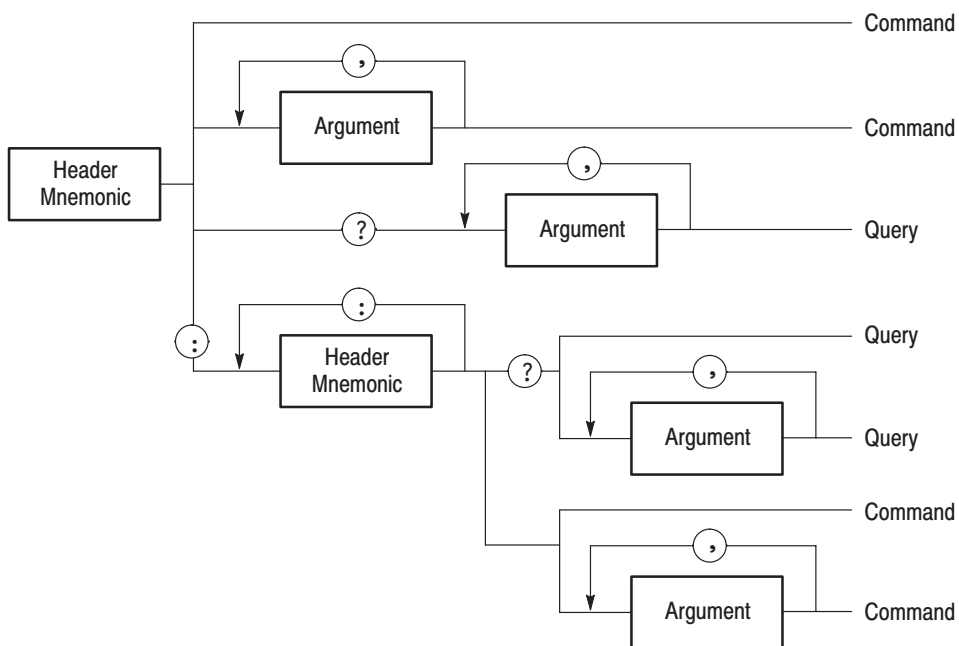
Programs created or placed in an external controller are transferred to the data generator as a program message. A program message is a sequence of zero or more program message units delimited by the program message unit delimiter, the semicolon (;).

A program message unit is a set command or query command. The data generator performs a function or changes a setting or mode when it receives a set command; when it receives a query command, it returns measurement data, settings, status codes and/or status messages. The data generator transfers these response messages to the external controller.

## Command and Query Structure

Commands are either set commands or query commands (usually just called commands and queries in this manual). Most commands have both a set form and query form. The query form of a command is the same as the set form, except that the query form ends with a question mark.

Figure 2-1 shows a flowchart of the structure of the commands and queries. The structure of the header is described in detail in *Header* on page 2-6.



**Figure 2-1: Command and query structure flowchart**

## Character Encoding

The program can be described using the American Standard Code for Information Interchange (ASCII) character encoding.

This seven-bit ASCII code is used for the majority of syntactic elements and semantic definitions. In special cases, an eight-bit ASCII Code is allowed in the arbitrary block arguments described on page 2-6. The ASCII code character set table is found in Appendix A.

## Syntactic Delimiters

Syntactic elements in a program message unit are delimited (differentiated) with colons, white space, commas, or semicolons.

**Colon (:).** Typically delimits the compound command header.

```
MMEMORY:DELETE:ALL, SOURCE:OSCILLATOR:REFERENCE
```

**White Space.** Typically delimits command/query headers from the argument.

```
DIAGNOSTIC:SELECT ALL  
SYSTEM:DATE 1998,4,16
```

DIAGNOSTIC:SELECT and SYSTEM:DATE are the command headers, and ALL and 1998,4,16 are the arguments.

**Comma (,).** Typically delimits between multiple arguments. In the above example, a comma delimits the multiple arguments 1998, 4 and 16.

**Semicolon (;).** Typically delimits between multiple commands (or multiple program message units). For more information about using the semicolon, refer to *Concatenating Commands* on page 2-8.

## White Space

White space, which is used to delimit certain syntactic elements in a command, is defined in the data generator as a single ASCII-encoded byte in the range ASCII 0-32 (decimal). This range consists of the standard ASCII characters exclusively except for ASCII 10, which is the Line Feed (LF) or New Line (NL) character.

## Special Characters

The Line Feed (LF) character or the New Line (NL) character (ASCII 10) and all characters in the range of ASCII 127-255 are defined as special characters. These characters are used in arbitrary block arguments only; using these characters in other parts of any command yields unpredictable results.

## Arguments

In a command or query, one or more arguments follow the command header. The argument, sometimes called program data, is a quantity, quality, restriction, or limit associated with the command or query header. Depending on the command or query header given, the argument is one of the following types:

- Decimal Numeric
- String
- Arbitrary Block

### Decimal Numeric

The data generator defines a decimal numeric argument as one expressed in one of three numeric representations: NR1, NR2, or NR3. This definition complies with that found in ANSI/IEEE Std 488.2-1987. Any commands that use arguments in any of the the first three notations can use a fourth notation NRf (for Numerical Representation flexible). The four formats are shown in Table 2-2.

**Table 2-2: Decimal Numeric Notation**

Type	Format	Examples
NR1	implicit-point (integer)	1, +3, -2, +10, -20
NR2	explicit-point unscaled (fixed point)	1, 2, +23.5, -0.15
NR3	explicit-point scaled (floating point)	1E+2, +3.36E-2, -1.02E+3
NRf	numeric representation-flexible; any of NR1, NR2, and NR3 may be used	1, +23.5, -1.02E+3

As just implied, you can use NRf notation for arguments in your programs for any commands that this manual lists as using any of NR1, NR2, or NR3 notation in its arguments. Be aware, however, that query response will still be in the format specified in the command. For example, if the command description is :DESE <NR1>, you can substitute NR2 or NR3 when using the command in a program. However, if you use the query :DESE?, the data generator will respond in the format <NR1> to match the command description in this manual.

### Unit and SI Prefix

If the decimal numeric argument refers to a voltage or frequency, you can express it using SI units instead of in the scaled explicit point input value format <NR3>. (SI units are units that conform to the Systeme International d'Unites standard.) For example, you can use the input format 200 mV or 1.0 MHz instead of 200.0E-3 or 1.0E+6, respectively, to specify voltage or frequency.

You can omit the unit, but you must include the SI unit prefix. You can use either upper or lowercase units.

V or v for voltage

Hz, HZ, or hz for frequency

The SI prefixes, which must be included, are shown below. Note that either lower or upper case prefixes can be used.

SI Prefix <sup>1</sup>	m/M	k/K	m/M
Corresponding Power	$10^{-3}$	$10^3$	$10^6$

<sup>1</sup> **Note that the prefix m/M indicates  $10^{-3}$  when the decimal numeric argument denotes voltage, but  $10^6$  when it denotes frequency.**

## String

String, sometimes referred to as a string literal, a literal, or just a string, is defined as a series of characters enclosed by double quotation marks (") as in:

"This is a string constant" or "0 .. 127"

To include a double quoted character in the string, insert an additional double quote character ahead of the double quote character in the string. For example, the string:

serial number "B010000"

would be defined as:

"serial number ""B010000"""

Single quotation marks (') can also be used instead of double quotation marks. For instance:

'serial number 'B010000''

String constants may be of any length up to the memory limits of the instrument in which the message is parsed.

**Arbitrary Block**

An arbitrary block argument is defined as:

```
#<byte count digit><byte count>[<contiguous eight-bit data byte>]...
```

or:

```
#<contiguous eight-bit data byte>... <terminator>
```

where:

<byte count digit>::= a nonzero digit in the range ASCII 1-9 that defines the number of digits (bytes) in the <byte count> field.

<byte count>::= any number of digits in the range ASCII 0-9 that define how many bytes are in the <contiguous 8-bit data byte> field.

<contiguous 8-bit data byte>::= a <byte count> number of 8-bit bytes in the range ASCII 0-255 that define the message. Each byte defines one character.

<terminator>::= a software LF followed by a hardware EOI. For example,

```
#16AB4ZLT<LF><&EOI>
```

## Header

**Header Mnemonic**

The header mnemonic represents a header node or a header subfunction. The command or query header comprises one or more header mnemonics that are delimited with the colon (:).

**Channel Representation**

The channel can be specified by using the OUTPut:CH<n> header mnemonic in commands and query commands. The term <n> is a number between 0 and 1 that expresses the specified channel.

**Header Structure**

Commands and queries can be structured into six basic forms.

- Simple command header
- Simple query header
- Compound command header
- Compound query header
- Common command header
- Common query header



Figure 2-1 on page 2-2 shows the syntax for all possible structures, and each of the six basic forms are explained below.

**Simple Command Header.** A command that contains only one header mnemonic. It may also contain one or more arguments. Its message format is:

```
[:]<Header Mnemonic> [<Argument>[,<Argument>]...]
```

such as:

```
START
or
STOP
```

**Simple Query Header.** A command that contains only one header mnemonic followed by a question mark (?). Its message format is:

```
[:]<Header Mnemonic>? [<Argument>[,<Argument>]...]
```

such as:

```
HCOPY?
or
TRIGGER?
```

**Compound Command Header.** A command that contains multiple header mnemonics plus argument(s). Its message format is:

```
[:]<Header Mnemonic>[:<Header Mnemonic>]...
[<Argument>[,<Argument>]...]
```

such as:

```
MMEMORY:INITIALIZE HD1
or
SYSTEM:SECURITY:STATE ON
```

**Compound Query Header.** A command that contains multiple header mnemonics followed by a question mark (?). Its message format is:

```
[:]<Header Mnemonic>[:<Header Mnemonic>]...?
[<Argument>[,<Argument>]...]
```

such as:

```
DIAGNOSTIC:RESULT?
or
DATA:BLOCK:SIZE? "BLOCK1"
```

**Common Command Header.** A command that precedes its header mnemonic with an asterisk (\*). Its message format is:

```
<Header Mnemonic> [<Argument>[,<Argument>]...]
```

such as:

```
*RST
```

The common commands are defined by IEEE Std 488.2 and are common to all devices which support IEEE Std 488.2 on the GPIB bus.

**Common Query Header.** A command that precedes its header mnemonic with an asterisk (\*) and follows it with a question mark (?). Its message format is:

```
<Header Mnemonic>? [<Argument>[,<Argument>]...]
```

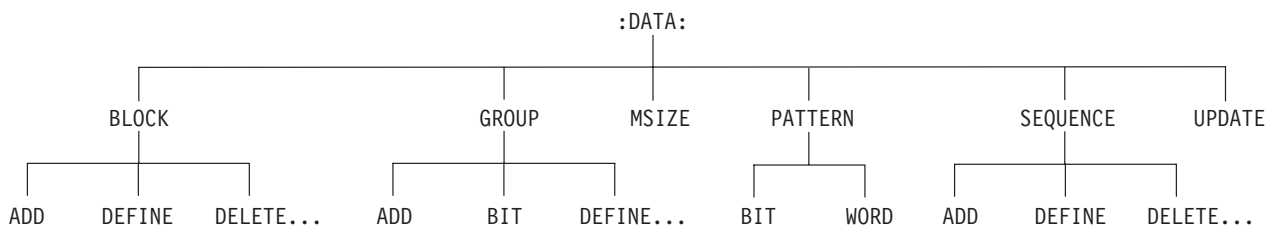
such as:

```
*IDN?
```

The common commands are defined by IEEE Std 488.2 and are common to all devices which support the IEEE Std 488.2 on the GPIB bus.

## Concatenating Commands

Most of the compound command headers are in a tree structure. The tree structure of an example command is diagrammed below. Note that the top of the structure always begins with a colon (:).



The following example of a compound command combines three headers delimited by semicolons:

```
:DATA:BLOCK:ADD 512,"BLOCK3"; :DATA:BLOCK:DELETE "BLOCK2";
:DATA:BLOCK:SIZE "BLOCK1",512
```

You must include the complete path in each header when there is no common complete path to the start of the tree structure (the colon). However, note that part of each header in the above example has a common path :DATA:BLOCK. You may shorten compound command structures with such headers. For example, the command above may be rewritten as follows.

```
:DATA:BLOCK:ADD 512,"BLOCK3"; DELETE "BLOCK2"; SIZE
"BLOCK1",512
```

Note that the mnemonics :DATA and :BLOCK are assumed from the first header by the headers that follow. The following command descriptions are valid examples of commands shortened using the principle just described. (Note that the insertion of common command (\*SRE) between headers does not prevent the headers that follow from assuming the earlier header mnemonics.)

```
:DATA:BLOCK:ADD 512,"BLOCK3"; DELETE "BLOCK2";
:DATA:GROUP:DELETE "GROUP4"

:DATA:MSIZE 16384; BLOCK:ADD 512,"BLOCK3"; DELETE "BLOCK2"

:DATA:BLOCK:ADD 512,"BLOCK3"; *SRE?; DELETE "BLOCK2"; SIZE
"BLOCK1",512
```

The following examples have been shortened incorrectly and cause errors.

```
:DATA:BLOCK:DELETE "BLOCK2"; DATA:GROUP:DELETE "GROUP4"

:DATA:BLOCK:ADD 512,"BLOCK3"; GROUP:DELETE "GROUP4"

:DATA:BLOCK:DELETE "BLOCK2"; MSIZE 16384
```

## Query Responses

The query causes the data generator to return information about its status or settings. A few queries also initiate an operation action before returning information; for instance, the \*TST? query performs the self test.

If the programmer has enabled headers to be returned with query responses, the data generator formats a query response like the equivalent set-command header followed by its argument(s). When headers are turned off for query responses, only the values are returned. Table 2-3 shows the difference in query responses.

**Table 2-3: Header in query responses**

Query	Header On	Header Off
DATA:MSIZE?	:DATA:MSIZE 16384	16384
DIAGNOSTIC:SELECT?	:DIAGNOSTIC:SELECT PMEMORY	PMEMORY

Use the command `HEADER ON` when you want the header returned along with the information. You can save such a response and send it back as a set-command later. Use `HEADER OFF` when you want only the information back.

## Other General Command Conventions

**Upper and Lower Case** The instrument accepts upper, lower, or mixed case alphabetic messages. The following three commands are recognized as identical.

```
HEADER ON
or
header on
or
header On
```

**Abbreviation** Any header, argument, or reserved word that is sent to the data generator can be abbreviated. The minimum required spelling is shown in upper case throughout the subsection *Command Groups* beginning on page 2-11. The command `TRIGGER:SLOPE POSITIVE` can be rewritten in either of the following forms.

```
TRIGGER:SLOPE POSITIVE
or
TRIG:SLOP POS
```

# Functional Command Groups

This subsection describes the organization of the DG2040 Data Generator command as a number of functional groups. (See subsection *Command Descriptions* on page 2-19 for a complete description of each command in alphabetical order.)

Throughout this section, the parenthesized question symbol (?) follows the command header to indicate that both a command and query form of the command can be used.

## Command Summaries

Tables 2-4 through 2-16 list the command that are part of the 12 functional groups.

### DATA Commands

Use these commands to define blocks, groups, and sequences, to set up pattern data, and to set which sequence controls become valid when the run mode is set to Enhanced.

**Table 2-4: DATA commands**

Header	Description
DATA?	Query the settings related to pattern data
DATA:BLOCK:ADD	Add a block definition
DATA:BLOCK:DEFine(?)	Set or query the block definitions
DATA:BLOCK:DELeTe	Delete a block definition
DATA:BLOCK:DELeTe:ALL	Delete all block definitions
DATA:BLOCK:REName	Change a block name
DATA:BLOCK:SIze(?)	Change or query the size of a block
DATA:GROUp:ADD	Add a group definition
DATA:GROUp:BIT(?)	Change or query a groups bit structure
DATA:GROUp:DEFine(?)	Set or query the group definitions
DATA:GROUp:DELeTe	Delete a group definition
DATA:GROUp:DELeTe:ALL	Delete all group definitions
DATA:GROUp:NAME?	Query the name of a group
DATA:GROUp:REName	Change a group name
DATA:MSIze(?)	Set or query the pattern data memory size

**Table 2-4: DATA commands (Cont.)**

Header	Description
DATA:PATtern:BIT(?)	Set or query individual pattern data bits
DATA:PATtern[:WORD](?)	Set or query pattern data in word units
DATA:SEquence:ADD	Add a sequence step
DATA:SEquence:DEFine(?)	Set or query the sequence definitions
DATA:SEquence:DELeTe	Delete a sequence step
DATA:SEquence:DELeTe:ALL	Delete all sequence definitions
DATA:SEquence:EVJ(?)	Set or query the event jump on/off state
DATA:SEquence:EVJT0(?)	Set or query the event jump destination
DATA:SEquence:LOOP(?)	Set or query the infinite loop on/off state
DATA:SEquence:REPeat(?)	Set or query the repeat count of a sequence step
DATA:SEquence:TWAIT(?)	Set or query the trigger wait on/off state
DATA:SUBSequence:ADD	Add a sub sequence step
DATA:SEBSequence:CLEAr	Delete all sub sequence definitions
DATA:SUBSequence:DEFine(?)	Set or query the sub sequence definitions
DATA:SUBSequence:DELeTe	Delete a sub sequence step
DATA:SUBSequence:DELeTe:ALL	Delete a sub sequence definition
DATA:SUBSequence:REPeat(?)	Set or query the repeat count of a sub sequence step
DATA:UPDate	Forcibly update the pattern and other data

**DEBUG Commands**

Use these commands to set all settings for debugging.

**Table 2-5: DEBUG Commands**

Header	Description
DEBug?	Query all settings for debugging
DEBug:SNOop?	Query all settings for debugging
DEBug:SNOop:DELAy?	Query delay time for debugging
DEBug:SNOop:DELAy:TIME(?)	Set or query delay time for debugging
DEBug:SNOop:STATe(?)	Turn on or off for debugging

**DIAGNOSTIC Commands**

Use these commands to select and execute the self-test routines, which are classified by function.

**Table 2-6: DIAGNOSTIC commands**

Header	Description
DIAGnostic?	Query all current settings related to self test
DIAGnostic:RESUlt?	Query self-test result
DIAGnostic:SElect(?)	Set or query self-test routine
DIAGnostic:STate	Perform self-test

**DISPLAY Commands**

Use these commands to execute functions associated with front panel keys, buttons, and knobs, adjust the screen brightness, and perform other display related functions.

**Table 2-7: DISPLAY commands**

Header	Description
DISPlay?	Query settings made with display group commands
DISPlay:BRIGhtness(?)	Set brightness of screen
DISPlay:CLock(?)	Set or query the date and time display state
DISPlay:DIMmer(?)	Set or query the state of the display dimmer function
DISPlay:ENABle(?)	Set or query the display on/off state
DISPlay:MENU?	Query all menu display related information
DISPlay:MENU[:NAME]	Set the menu selection state
DISPlay:MENU:NAME?	Query the menu selection state
DISPlay:MENU:STate(?)	Set or query the menu display on/off state
DISPlay[:WINDow]:TEXT:CLEar	Erase the message display area
DISPlay[:WINDow]:TEXT[:DATA](?)	Set or query the contents of the message display area

**EDGE Commands** Use these commands to select and execute the edge control functions.

**Table 2-8: EDGE commands**

Header	Description
EDGE?	Query all current settings related to edge control
EDGE:STATe(?)	Set or query edge control on/off state
EDGE:POSITIOn(?)	Set or query edge position offset

**HARDCOPY Commands** Use these commands to start and stop for hardcopy operation, and select port and its outputting format.

**Table 2-9: HARDCOPY commands**

Header	Description
HCOPY?	Query all hardcopy related information
HCOPY:ABORt	Stop the current hardcopy operation
HCOPY:DATA?	Create and send hardcopy data
HCOPY:FORMAt(?)	Set or query output format of hardcopy
HCOPY:PORT(?)	Set or query output port of hardcopy
HCOPY:STARt	Start a hardcopy operation

**MEMORY Commands (Mass Memory—Floppy Disk)** Use these commands to control all floppy disk and file operations.

**Table 2-10: MEMORY commands**

Header	Description
MMEMory:CATaLog[:ALL]?	Query disk file and directory information
MMEMory:CATaLog:ORDer(?)	Set or query the display order for disk file and directory information
MMEMory:CDIRectory(?)	Set or query the current working directory
MMEMory:COpy	Copy a disk file
MMEMory:DELeTe:ALL	Delete all files and directories on the disk
MMEMory:DELeTe[:NAME]	Delete the specified file or directory on the disk
MMEMory:FRee?	Query disk memory usage
MMEMory:INITialize	Format a disk
MMEMory:LOAD	Read data from a disk file



**Table 2-10: MEMORY commands (Cont.)**

Header	Description
MMEMory:LOCK(?)	Set or query the disk file lock state
MMEMory:MDIRectory	Make a new directory on the disk
MMEMory:REName	Change the name of a disk file or directory
MMEMory:SAVE	Write data to a disk file

**MODE Commands** Use these commands to set the run and update modes.

**Table 2-11: MODE commands**

Header	Description
MODE?	Query the states related to pattern generation
MODE:STATe(?)	Set or query the run mode for pattern generation
MODE:UPDate(?)	Set or query the data update mode

**OUTPUT Commands** Use these commands to set all the settings related to the output channels and clock. The <n> terms in the header mnemonic are used to specify the channel in these commands.

**Table 2-12: OUTPUT commands**

Header	Description
OUTPut?	Query the settings related to the output channels and clock
OUTPut:CH<n>:ASSIGn(?)	Set or query channel data bit assignments
OUTPut:CH<n>:DELAy(?)	Set or query channel delay times
OUTPut:CH<n>:HIGH(?)	Set or query channel high-level output voltage
OUTPut:CH<n>:LOW(?)	Set or query channel low-level output voltage
OUTPut:CH<n>:RELEase	Clear channel data bit assignments
OUTPut:CHCLK:HIGH(?)	Set or query clock output high-level output voltage
OUTPut:CHCLK:LOW(?)	Set or query clock output low-level output voltage
OUTPut:DEFine(?)	Set or query channel data bit assignments
OUTPut:ELEVEl(?)	Set or query the event input level

**SOURCE Commands**

Use these commands to select the clock signal source, set the clock frequency, and enable or disable the event input.

**Table 2-13: SOURCE commands**

Header	Description
SOURce:EVENT:ENABle(?)	Query, enable, or disable the event input
SOURce[:OSCillator]?	Query all clock signal settings
SOURce:OSCillator:EXTernal:FREQuency(?)	Set or query the external clock frequency
SOURce:OSCillator[:INTernal]:FREQuency(?)	Set or query the internal clock frequency
SOURce:OSCillator:REFerence(?)	Set or query the clock signal internal/external selection

**SYSTEM Commands**

Use these commands to set the system parameters such as system data and time or security setting.

**Table 2-14: SYSTEM commands**

Header	Description
SYSTem:DATE(?)	Set or query system data <year,month,day>
SYSTem:PPAUse(?)	Set or query the setting for system operation when a self-diagnostics detects an error
SYSTem:SECurity:IMMediate	Delete all settings and data
SYSTem:SECurity:STATe(?)	Set or query the security on/off state
SYSTem:TIME(?)	Set or query system time <hour,minute,second>

**TRIGGER Commands**

Use these commands to set the trigger conditions for the internal and external trigger source.

**Table 2-15: TRIGGER commands**

Header	Description
TRIGger?	Query all current trigger-related settings
TRIGger:IMPedance(?)	Set or query the impedance presented to the the external trigger signal
TRIGger:INTERVal?	Query the internal trigger settings
TRIGger:INTERVal:STATe(?)	Set or query the internal trigger state

**Table 2-15: TRIGGER commands (Cont.)**

Header	Description
TRIGger:INTERVal:TIME(?)	Set or query the internal trigger interval time
TRIGger:LEVel(?)	Set or query the level of the external trigger signal that generates the triggering event
TRIGger:SLOPe(?)	Set or query the slope of the external signal that generates a triggering event
TRIGger:SOURce(?)	Set or query trigger source

**Other Commands**

This group is a collection of commands that cannot be classified in any other group.

**Table 2-16: Other commands**

Header	Description
ABSTouch	Perform the function corresponding to the front-panel control selected
ALLEv?	Dequeue all events from Event Queue
*CLS	Clear SESR, SBR and Event Queue
DESE(?)	Set and query DESER
*ESE(?)	Set and query ESER
*ESR?	Query SESR
EVENT?	Dequeue event from Event Queue
EVMsg?	Dequeue event from Event Queue
EVQty?	Query number of event on Event Queue
FACTory	Reset all settings to defaults
HEADer(?)	Allow or suppress the return of the control header in response messages
ID?	Query ID information about the data generator
*IDN?	Query ID information about the data generator
LOCK(?)	Query, lock, or unlock local control using the front-panel controls
*OPC(?)	Generate or return the operation complete message
*PSC(?)	Set or query power-on status clear flag
*RST	Reset this data generator
RUNNing?	Query whether the instrument is currently outputting a pattern or sequence

**Table 2-16: Other commands (Cont.)**

<b>Header</b>	<b>Description</b>
*SRE(?)	Set or query SRER
START	Start pattern or sequence output
*STB?	Query SBR
STOP	Stop pattern or sequence output
*TRG	Generate the triggering event
*TST?	Perform self-test
UNLock	Unlock (allow) local control using the front-panel controls
UPTime?	Query the elapsed time since power on
VERBose(?)	Set or query short or long response headers
*WAI	Hold off all commands until all pending operations complete

# Command

This subsection lists each command and query in the DG2040 Data Generator command set alphabetically. Each command entry includes its command description and command group, its related commands (if any), its syntax, and its arguments. Each entry also includes one or more usage examples.

This subsection fully spells out headers, mnemonics, and arguments with the minimal spelling shown in upper case. For example, to use the abbreviated version of the DISPLAY:BRIGhtness command, just type DISP:BRIG.

The symbol (?) follows the command header of those commands that can be used as either a command or a query. The symbol ? follows those commands that can only be a query. If neither symbol follows the command, it can only be used as a command.

## ABSTouch

The ABSTouch command performs the same action that actuating the corresponding front-panel key, button, or knob does.

**Group** DISPLAY

**Related Commands** None

**Syntax** ABSTouch {BOTTOM1 | BOTTOM2 | BOTTOM3 | BOTTOM4 | BOTTOM5 | BOTTOM6 | BOTTOM7 | SIDE1 | SIDE2 | SIDE3 | SIDE4 | SIDE5 | CLEARMenu | SETUp | EDIT | APPLication | UTILity | CURSor | EXECute | UParrow | DOWNarrow | LEFTarrow | RIGHTarrow | KNOBLeft | KNOBRight | RUN | STEp | ZERo | ONE | TWO | THREe | FOUR | FIVE | SIX | SEVen | EIGHt | NINe | POINT | A | MINUs | B | HZ | S | V | C | KHZ | MS | MV | D | MHZ | US | E | GHZ | NS | F | DElete | ENTer | HARDcopy | MANual}

**Arguments** Sending any of the arguments that are shown in Figure 2-2 is the equivalent of operating a front panel control. Which argument corresponds to which control is shown in Figure 2-2. Sending an argument corresponding to a front-panel button is the same as pressing that button once; if the argument sent corresponds to a knob, it is the same as rotating the knob clockwise or counterclockwise by  $\frac{1}{25}$  of a turn.

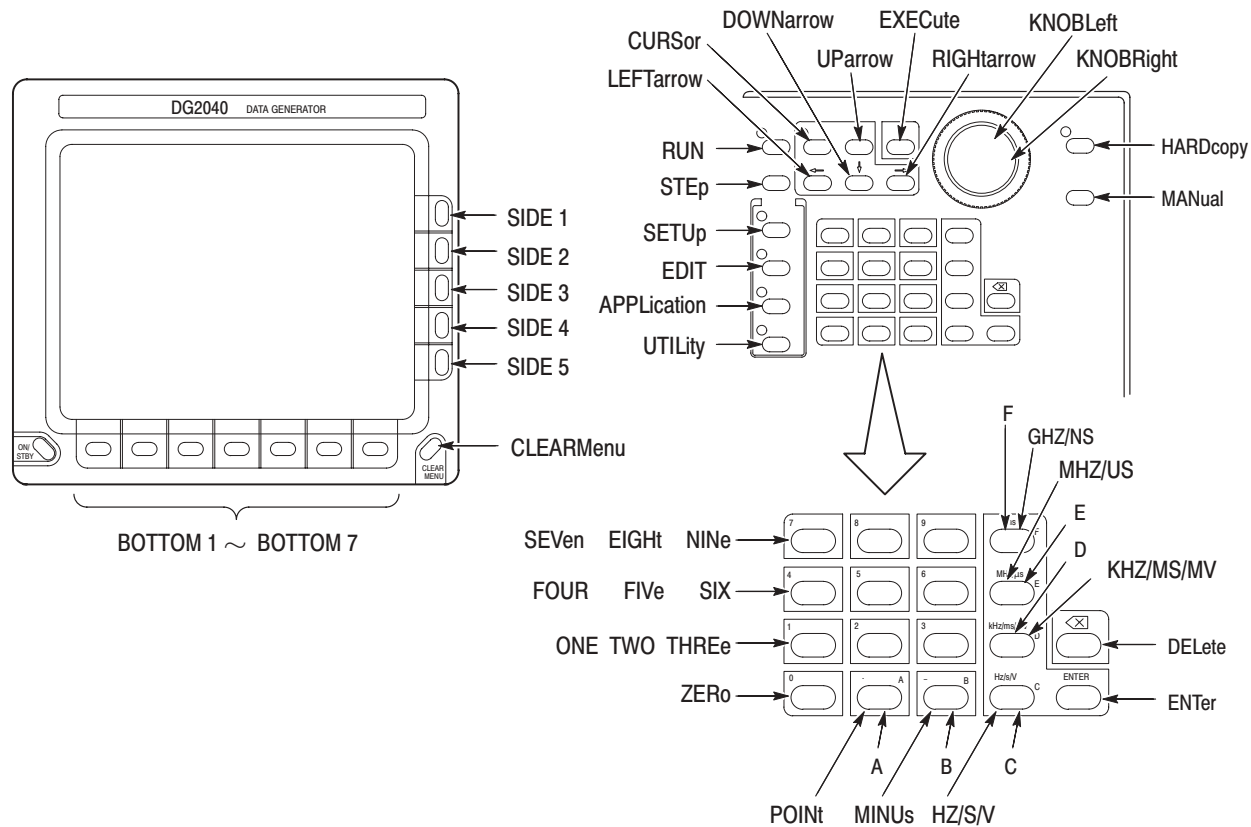


Figure 2-2: ABSTouch arguments and associated controls

**Examples**    `ABSTOUCH SETUP`  
 displays the same setup menu that is displayed by pressing the front-panel button `SETUP` in the `MENU` column on the front panel.

## ALLEv?

The `ALLEv?` query dequeues all event codes and their corresponding event messages. Use the `*ESR?` query to make events available for dequeuing using `ALLEv?` query.

**Group**    Other

**Related Commands**    `*CLS`, `DESE`, `*ESE`, `*ESR?`, `EVENT?`, `EVMsg?`, `EVQt?`, `*SRE`, `*STB?`

**Syntax**    `ALLEv?`

<b>Arguments</b>	None
<b>Responses</b>	[ :ALLEV ] <event code>, "<event message;second message>" [ ;<event code>, "<event message:second message>" ] ...
<b>Examples</b>	ALLEV? might return the string :ALLEV 113, "Undefined header; unrecognized command - OUT:ELEV"; 420, "Query UNTERMINATED".

## \*CLS

The \*CLS common command clears SESR (Standard Event Status Register), the SBR (Status Byte Register) and the Event Queue, which are used in the data generator status and event reporting system. For more details, refer to Section 3 *Status and Events*.

<b>Group</b>	Other
<b>Related Commands</b>	DESE, *ESE, *ESR?, *EVENT?, EVMsg?, EVQty?, *SRE, *STB?
<b>Syntax</b>	*CLS
<b>Examples</b>	*CLS clears the SESR, the SBR, and the Event Queue.

## DATA?

The DATA? query returns the setting states related to the pattern data.

<b>Group</b>	DATA
<b>Related Commands</b>	OUTPut?
<b>Syntax</b>	DATA?
<b>Examples</b>	DATA? might return :DATA:MSIZE 1000;BLOCK:DEFINE #190,UNNAMED; :DATA:SUBSEQUENCE:DEFINE #213SUB,UNNAMED,1; :DATA:SEQUENCE:DEFINE #217UNNAMED,1,0,0,0,0; :DATA:GROUP:DEFINE #219DATA1,1,1 DATA0,0,0

## DATA:BLOCK:ADD

The DATA:BLOCK:ADD command adds a block. This results in one new block being defined in the block definition section.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:BLOCK:DEFine, DATA:BLOCK:DELeTe, DATA:BLOCK:DELeTe:ALL, DATA:BLOCK:REName, DATA:BLOCK:SIZE
<b>Syntax</b>	DATA:BLOCK:ADD <Position>,<Name>
<b>Arguments</b>	<Position>::=<NR1> where <NR1> is the start position of the added block.  <Name>::=<string> where <string> is the name of the added block.
<b>Examples</b>	:DATA:BLOCK:ADD 512,"BLOCK1" adds a block starting at 512 point named BLOCK1.



## DATA:BLOCK:DEFine (?)

The DATA:BLOCK:DEFine command sets up the information for the whole block definition section in ASCII. The DATA:BLOCK:DEFine? query returns the whole block definition section.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:BLOCK:ADD, DATA:BLOCK:DELeTe, DATA:BLOCK:DELeTe:ALL, DATA:BLOCK:REName, DATA:BLOCK:SIZE
<b>Syntax</b>	DATA:BLOCK:DEFine <Blockinfo> DATA:BLOCK:DEFine?
<b>Arguments</b>	<p>&lt;Blockinfo&gt;::=&lt;blockheader&gt;&lt;Blkdef&gt;[&lt;LF&gt;&lt;Blkdef&gt;][&lt;LF&gt;&lt;Blkdef&gt;] ... Arbitrary block data for the block definition</p> <p>where,</p> <p>&lt;blockheader&gt;::=&lt;byte count digit&gt;&lt;byte count&gt;</p> <p>&lt;Blkdef&gt;::=&lt;Aposition&gt;,&lt;AName&gt;</p> <p>&lt;Aposition&gt; is the block starting position specified in ASCII (Note that the starting position of the first block must be zero), and &lt;AName&gt; is the block name specified in ASCII.</p> <p>&lt;LF&gt;::=&lt;ASCII line feed code (dec 10)&gt;</p>
<b>Responses</b>	[:DATA:BLOCK:DEFINE] <Blockinfo> where <Blockinfo> is a data block in the same format as the argument.
<b>Examples</b>	:DATA:BLOCK:DEFine #2320,BLOCK0<LF>512,BLOCK1<LF>1024,BLOCK2 defines three blocks: BLOCK0, BLOCK1, and BLOCK2.

## DATA:BLOCK:DELeTe

The DATA:BLOCK:DELeTe command deletes the specified block. Note that the first block cannot be deleted.

**Group** DATA

**Related Commands** DATA:BLOCK:ADD, DATA:BLOCK:DEFine, DATA:BLOCK:DELeTe:ALL, DATA:BLOCK:REName, DATA:BLOCK:SIZE

**Syntax** DATA:BLOCK:DELeTe <Name>

**Arguments** <Name>::=<string>  
where <string> is the name of the block to be deleted.

**Examples** :DATA:BLOCK:DELETE "BLOCK2"  
deletes the block with the name BLOCK2.

## DATA:BLOCK:DELeTe:ALL

The DATA:BLOCK:DELeTe:ALL command deletes all blocks. After this command is executed, the whole memory area consists of one block with the name "NO NAME".

**Group** DATA

**Related Commands** DATA:BLOCK:ADD, DATA:BLOCK:DEFine, DATA:BLOCK:DELeTe, DATA:BLOCK:REName, DATA:BLOCK:SIZE

**Syntax** DATA:BLOCK:DELeTe:ALL

**Arguments** None

## DATA:BLOCK:REName

The DATA:BLOCK:REName command changes the name of a data block.

**Group** DATA

**Related Commands** DATA:BLOCK:ADD, DATA:BLOCK:DEFine, DATA:BLOCK:DELeTe, DATA:BLOCK:DELeTe:ALL, DATA:BLOCK:SIZE

**Syntax** DATA:BLOCK:REName <From-blockname>,<To-blockname>

**Arguments** <From-blockname>::=<string>  
where <string> is the name of the block before it is renamed.  
  
<To-blockname>::=<string>  
where <string> is the name of the block after it is renamed.

**Examples** :DATA:BLOCK:RENAME "BLOCK3", "BLOCK4"  
changes the name of BLOCK3 to BLOCK4.

## DATA:BLOCK:SIZE (?)

The DATA:BLOCK:SIZE command changes the size of a data block. The DATA:BLOCK:SIZE? query returns the size of the specified block.

The minimum data block size is 360 points, and it must be in multiple of 4.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:BLOCK:ADD, DATA:BLOCK:DEFine, DATA:BLOCK:DELeTe, DATA:BLOCK:DELeTe:ALL, DATA:BLOCK:REName
<b>Syntax</b>	DATA:BLOCK:SIZE <Name>,<Size> DATA:BLOCK:SIZE? <Name>
<b>Arguments</b>	<Name>::=<string> where <string> is a block name.  <Size>::=<NR1> where <NR1> is a new block size.
<b>Responses</b>	[ :DATA:BLOCK:SIZE] <Name>,<Size>
<b>Examples</b>	:DATA:BLOCK:SIZE "BLOCK1",512 changes the block size of the block BLOCK1 to 512.

## DATA:GROUP:ADD

The DATA:GROUP:ADD command adds a group.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:GROUP:BIT, DATA:GROUP:DEFine, DATA:GROUP:DELeTe, DATA:GROUP:DELeTe:ALL, DATA:GROUP:NAME?, DATA:GROUP:REName
<b>Syntax</b>	DATA:GROUP:ADD <Name>,<MSB>,<LSB>

**Arguments** <Name>::=<string>  
where <string> is the name of the group to be added.

<MSB>::=<NR1>  
where MSB is the Most Significant Bit  
where <NR1>is the high order bit for the group.

<LSB>::=<NR1>  
where LSB is the Least Significant bit  
where <NR1>is the low order bit for the group.

**Examples** :DATA:GROUP:ADD "GROUP01",1,0  
adds a group that consists of 2 bits, DATA0 to DATA1, and has the name GROUP01.

## DATA:GROUP:BIT (?)

The DATA:GROUP:BIT command changes the bit configuration of a group. The DATA:GROUP:BIT? query returns the set bit configuration.

**Group** DATA

**Related Commands** DATA:GROUP:ADD, DATA:GROUP:DEFine, DATA:GROUP:DELeTe, DATA:GROUP:DELeTe:ALL, DATA:GROUP:NAME?, DATA:GROUP:REName

**Syntax** DATA:GROUP:BIT <Name>,<MSB>,<LSB>  
DATA:GROUP:BIT? <Name>

**Arguments** <Name>::=<string>  
where the name of the group to be changed or queried.

<MSB>::=<NR1>  
where <NR1>is the high order bit for the group.

<LSB>::=<NR1>  
where <NR1>is the low order bit for the group.

**Responses** [:DATA:GROUP:BIT] <Name>,<MSB>,<LSB>

**Examples** :DATA:GROUP:BIT "GROUP02",1,0  
changes the bit configuration for the group named GROUP02 to be DATA0 to DATA1.

## DATA:GROUP:DEFine (?)

The DATA:GROUP:DEFine command sets up the information for the whole group definition section in ASCII. The DATA:GROUP:DEFine? query returns the information for the whole group definition section.

**Group** DATA

**Related Commands** DATA:GROUP:ADD, DATA:GROUP:BIT, DATA:GROUP:DELeTe, DATA:GROUP:DELeTe:ALL, DATA:GROUP:NAME?, DATA:GROUP:REName

**Syntax** DATA:GROUP:DEFine <Groupblock>  
DATA:GROUP:DEFine?

**Arguments** <Groupblock>::=<blockheader><Group>[<LF><Group>][<LF><Group>]...  
Arbitrary block data for the group definition

where,

<blockheader>::=<byte count digit><byte count>

<Group>::=<AName>,<AMSB>,<ALSB>

The <AName>, <AMSB>, and <ALSB> fields are ASCII character strings that specify the following information.

<AName>	group name
<AMSB>	group's high order bit
<ALSB>	group's low order bit

<LF>::=<ASCII line feed code (10)>

**Responses** [:DATA:GROUP:DEFINE] <Groupblock>  
where <Groupblock> is a data block with the same format as the argument.

**Examples** :DATA:GROUP:DEFine #211GROUP01,1,0  
defines the GROUP01.

## DATA:GROUP:DELeTe

The DATA:GROUP:DELeTe command deletes the specified group.

**Group** DATA

**Related Commands** DATA:GROUP:ADD, DATA:GROUP:BIT, DATA:GROUP:DEFine,  
DATA:GROUP:DELeTe:ALL, DATA:GROUP:NAME?, DATA:GROUP:REName

**Syntax** DATA:GROUP:DELeTe <Name>

**Arguments** <Name>::=<string>  
where <string> is the name of the group to delete.

**Examples** :DATA:GROUP:DELETE "GROUP02"  
deletes the group with the name GROUP02.

## DATA:GROUP:DELeTe:ALL

The DATA:GROUP:DELeTe:ALL command deletes all group definitions.

**Group** DATA

**Related Commands** DATA:GROUP:ADD, DATA:GROUP:BIT, DATA:GROUP:DEFine, DATA:GROUP:DE-  
LeTe, DATA:GROUP:NAME?, DATA:GROUP:REName

**Syntax** DATA:GROUP:DELeTe:ALL

**Arguments** None

## DATA:GROUP:NAME?

The DATA:GROUP:NAME? query returns the name of the group that includes the specified bit.

**Group** DATA



<b>Related Commands</b>	DATA:GROUP:ADD, DATA:GROUP:BIT, DATA:GROUP:DEFine, DATA:GROUP:DE- lete, DATA:GROUP:DElete:ALL, DATA:GROUP:REName
<b>Syntax</b>	DATA:GROUP:NAME? <Bit>
<b>Arguments</b>	<Bit>::=<NR1> where <NR1> is the number of the bit to be queried (0 to 1).
<b>Responses</b>	[ :DATA:GROUP:NAME] <Bit>,<Name> where  <Bit>::=<NR1>                      a bit number (0 to 1) <Name>::=<string>                  the group name
<b>Examples</b>	DATA:GROUP:NAME? <1> might return :DATA:GROUP:NAME 1,"GROUP02", which indicates that the name of the group that includes the DATA1 bit is GROUP02.

## DATA:GROUP:REName

The DATA:GROUP:REName command changes the name of a group.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:GROUP:ADD, DATA:GROUP:BIT, DATA:GROUP:DEFine, DATA:GROUP:DE- lete, DATA:GROUP:DElete:ALL, DATA:GROUP:NAME?
<b>Syntax</b>	DATA:GROUP:REName <From-groupname>,<To-groupname>
<b>Arguments</b>	<From-groupname>::=<string> where <string> is the name of the group before it is renamed.  <To-groupname>::=<string> where <string> is the name of the group after it is renamed.
<b>Examples</b>	:DATA:GROUP:RENAME "GROUP01","GROUP02" changes the name of the group GROUP01 to be GROUP02.

## DATA:MSIZe (?)

The DATA:MSIZE command sets the bit pattern section memory area size. The DATA:MSIZE? query returns the bit pattern section memory area setting.

The minimum memory size is 360 words, and it must be in multiples of 4.

<b>Group</b>	DATA
<b>Related Commands</b>	None
<b>Syntax</b>	DATA:MSIZe <Memory Size> DATA:MSIZe?
<b>Arguments</b>	<Memory Size>::=<NR1> where <NR1> is the number that expresses the memory size (in words).
<b>Responses</b>	[ :DATA:MSIZE ] <Memory Size>

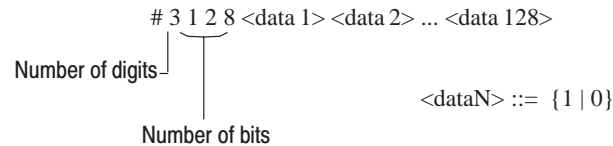
## DATA:PATtern:BIT (?)

The DATA:PATTERN:BIT command sets the data memory bit pattern section. Data is given in bit units. The DATA:PATTERN:BIT? query returns the contents of the data memory bit pattern section.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:PATtern[:WORD]
<b>Syntax</b>	DATA:PATtern:BIT <Bit Position>,<Address>,<Length>,<Data> DATA:PATtern:BIT? <Bit Position>,<Address>,<Length>

<b>Arguments</b>	<Bit Position>::=<NR1>	bit position (0 to 1)
	<Address>::=<NR1>	start address (0 to 262143)
	<Length>::=<NR1>	data length (1 to 262144)
	<Data>::=<block>	arbitrary block data for the bit pattern section

Example where the data length is 128:



The value of the data bit at the specified address is specified with the ASCII character for 0 or 1. Data bits for the specified data length are stored in address order, with all bits expressed similarly in ASCII. The number of bytes in the block header will be equal to the length of the specified data.

**Responses** [ :DATA:PATTERN:BIT ] <Bit Position>,<Address>,<Length>,<Data>

## DATA:PATtern[:WORD] (?)

The DATA:PATtern[:WORD] command sets the data memory bit pattern section. The data is given in word units. The DATA:PATtern:WORD? query returns the contents of the data memory bit pattern section.

**Group** DATA

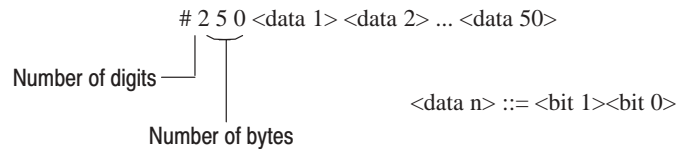
**Related Commands** DATA:PATtern:BIT

**Syntax** DATA:PATtern[:WORD] <Address>,<Length>,<Data>  
DATA:PATtern:[WORD]? <Address>,<Length>

**Arguments** <Address>::=<NR1>  
where <NR1> is a start address (0 to 262143)

<Length>::=<NR1> data length (1 to 262144)  
<Data>::=<block> arbitrary block data for the bit pattern section

Example where the data length is 50:



Each word (2 bits) of the bit pattern data is expressed as each byte . The least significant bit (LSB) of each byte is correspond to bit 0. The data block is formed by iterating this method for each word in order starting with the start address.

**Responses** [:DATA:PATTERN:WORD] <Address>,<Length>,<Data>

## DATA:SEquence:ADD

The DATA:SEquence:ADD command adds a sequence step.

**Group** DATA

**Related Commands** DATA:SEquence:DEFine, DATA:SEquence:DELete, DATA:SEquence:DE-  
Lete:ALL

**Syntax** DATA:SEquence:ADD <LineN>,<Name>,<Repeat>,<To>,<WaitE>,  
<JumpE>,<LoopE>

**Arguments**

<LineN>::=<NR1>  
where <NR1> is a sequence step number.

<Name>::=<string>  
where <string> is a block name (surrounded in double (") or single (') quotes).

<Repeat>::=<NR1>  
where <NR1> is a repeat count (1 to 65536).

<To>::=<NR1>  
where <NR1> is a event jump destination line number.

<WaitE>::={ON | OFF | 1 | 0}                    trigger wait on/off state

<JumpE>::={ON | OFF | 1 | 0}                    event jump on/off state

<LoopE>::={ON | OFF | 1 | 0}                    infinite loop on/off

**Examples** :DATA:SEQUENCE:ADD 4,"BLOCK3",16,0,0,1,1  
adds a sequence step that consists of the block named BLOCK3 at the sequence  
line number 4 position.

When this sequence is executed in enhanced mode, BLOCK3 will be executed repeatedly since the infinite loop setting is set on. However, since event jump is also set on, the instrument will jump to sequence line number 0 if an external event occurs. In run modes other than enhanced mode, BLOCK3 will be executed 16 times and then control will switch to the next line number.

## DATA:SEquence:DEFine (?)

The DATA:SEquence:DEFine command sets up all of the sequence definition section information in ASCII. The DATA:SEquence:DEFine? query returns all of the sequence definition section information.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:SEquence:ADD, DATA:SEquence:DELeTe, DATA:SEquence:DELeTe:ALL
<b>Syntax</b>	DATA:SEquence:DEFine <Sequence Block> DATA:SEquence:DEFine?
<b>Arguments</b>	<Sequence Block>::=<blockheader><Step>[<LF><Step>][<LF><Step>]... Arbitrary block data for the sequence definition  where,  <blockheader>::=<byte count digit><byte count>  <Step>::=<AName>,<AREpeat>,<ATo>,<AWaitE>,<AJumpE>,<ALoopE>  The items in <Step> are ASCII character strings that express the following information. <AName> the block name (with no quotation marks) <AREpeat> repeat count (1 to 65536) <ATo> event jump destination line number <AWaitE> trigger wait on/off state ({ON   1}:ON, {OFF   0}:OFF) <AJumpE> event jump on/off state ({ON   1}:ON, {OFF   0}:OFF) <ALoopE> infinite loop on/off ({ON   1}:ON, {OFF   0}:OFF)  <LF>::=<ASCII line feed code (10)>
<b>Responses</b>	[ :DATA:SEQUENCE:DEFINE ] <Sequence Block> where <Sequence Block> is a data block with the same format as the argument. However, note that rather than the ON and OFF keywords, only 0 and 1 are used for the <AWaitE>, <AJumpE>, and <ALoopE> items.
<b>Examples</b>	:DATA:SEquence:DEFine #235BLOCK1,16,0,1,0,0<LF>BLOCK2,32,0,0,1,1 defines a two step sequence that consists of the two blocks BLOCK1 and BLOCK2.

## DATA:SEquence:DElete

The DATA:SEquence:DElete command deletes the specified sequence step.

**Group** DATA

**Related Commands** DATA:SEquence:ADD, DATA:SEquence:DEFine, DATA:SEquence:DElete:ALL

**Syntax** DATA:SEquence:DElete <Line Number>

**Arguments** <Line Number>::=<NR1>  
where <NR1> is the line number of the sequence step to be deleted.

**Examples** :DATA:SEQUENCE:DELETE 3  
deletes the line 3 sequence step.

## DATA:SEquence:DElete:ALL

The DATA:SEquence:DElete:ALL command deletes all sequence definitions.

**Group** DATA

**Related Commands** DATA:SEquence:ADD, DATA:SEquence:DEFine, DATA:SEquence:DElete

**Syntax** DATA:SEquence:DElete:ALL

**Arguments** None

## DATA:SEQUENCE:EVJ (?)

The DATA:SEQUENCE:EVJ command sets the sequence step event jump to on or off. The DATA:SEQUENCE:EVJ? query returns the sequence step event jump on/off state.

**Group** DATA

**Related Commands** DATA:SEQUENCE:EVJTO, DATA:SEQUENCE:LOOP, DATA:SEQUENCE:REPEAT, DATA:SEQUENCE:TWAIT

**Syntax** DATA:SEQUENCE:EVJ <Line Number>,{ON | OFF | 1 | 0}  
DATA:SEQUENCE:EVJ? <Line Number>

**Arguments** <Line Number>::=<NR1>  
where <NR1> is the line number of the sequence step to be set.

ON or 1  
sets the event jump to on.

OFF or 0  
sets the event jump to off.

**Responses** [:DATA:SEQUENCE:EVJ] <Line Number>,{1 | 0}

**Examples** :DATA:SEQUENCE:EVJ 8,ON  
sets the event jump state for the line 8 sequence step to on.



## DATA:SEquence:EVJTO (?)

The DATA:SEquence:EVJTO command sets the sequence step event jump destination. The DATA:SEquence:EVJTO? query returns the event jump destination set for the sequence step.

**Group** DATA

**Related Commands** DATA:SEquence:EVJ, DATA:SEquence:LOOP, DATA:SEquence:REPeat, DATA:SEquence:TWAIT

**Syntax** DATA:SEquence:EVJTO <Line Number>,<Target>  
DATA:SEquence:EVJTO? <Line Number>

**Arguments** <Line Number>::=<NR1>  
where <NR1> is the line number of the sequence step to be set.  
  
<Target>::=<NR1>  
where <NR1> is the line number of the jump destination sequence step.

**Responses** [:DATA:SEQUENCE:EVJTO] <Line Number>,<Target>

**Examples** :DATA:SEQUENCE:EVJTO 5,0  
sets the line 5 sequence step event jump destination to line 0.

## DATA:SEquence:LOOP (?)

The DATA:SEquence:LOOP command sets the sequence step infinite loop state to on or off. The DATA:SEquence:LOOP? query returns the sequence step infinite loop on/off state.

**Group** DATA

**Related Commands** DATA:SEquence:EVJ, DATA:SEquence:EVJTO, DATA:SEquence:REPeat, DATA:SEquence:TWAIT

**Syntax** DATA:SEquence:LOOP <Line Number>,{ON | OFF | 1 | 0}  
DATA:SEquence:LOOP? <Line Number>

**Arguments** <Line Number>::=<NR1>  
where <NR1> is the line number of the sequence step to be set.

ON or 1  
sets the infinite loop state to on.

OFF or 0  
sets the infinite loop state to off.

**Responses** [:DATA:SEQUENCE:LOOP] <Line Number>,{1 | 0}

**Examples** :DATA:SEQUENCE:LOOP 9,OFF  
sets the infinite loop state for the line 9 sequence step to off.

## DATA:SEquence:REPeat (?)

The DATA:SEquence:REPeat command sets the sequence step repeat count. The DATA:SEquence:REPeat? query returns the repeat count set for the sequence step.

**Group** DATA

**Related Commands** DATA:SEquence:EVJ, DATA:SEquence:EVJTO, DATA:SEquence:LOOP, DATA:SEquence:TWAIT

<b>Syntax</b>	DATA:SEquence:REPeat <Line Number>,<Times> DATA:SEquence:REPeat? <Line Number>
<b>Arguments</b>	<Line Number>::=<NR1> where <NR1> is the line number of the sequence step to be set.  <Times>::=<NR1> where <NR1> is a repeat count (1 to 65536).
<b>Responses</b>	[ :DATA:SEQUENCE:REPEAT ] <Line Number>,<Times>
<b>Examples</b>	:DATA:SEQUENCE:REPEAT 5,8 sets the line 5 sequence step repeat count to 8.

## DATA:SEquence:TWAIT (?)

The DATA:SEquence:TWAIT command sets the sequence step trigger wait state to on or off. The DATA:SEquence:TWAIT? query returns the sequence step trigger wait on/off state.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:SEquence:EVJ, DATA:SEquence:EVJT0, DATA:SEquence:LOOP, DATA:SEquence:REPeat
<b>Syntax</b>	DATA:SEquence:TWAIT <Line Number>,{ON   OFF   1   0} DATA:SEquence:TWAIT? <Line Number>
<b>Arguments</b>	<Line Number>::=<NR1> where <NR1> is the line number of the sequence step to be set.  ON or 1 sets the trigger wait state to on.  OFF or 0 sets the trigger wait state to off.
<b>Responses</b>	[ :DATA:SEQUENCE:TWAIT ] <Line Number>,{1   0}
<b>Examples</b>	:DATA:SEQUENCE:TWAIT 5,ON sets the line 5 sequence step trigger wait state to on.

## DATA:SUBSequence:ADD

The DATA:SUBSequence:ADD command adds a subsequence step.

**Group** DATA

**Related Commands** DATA:SUBSequence:DEFine, DATA:SUBSequence:DELeTe, DATA:SUBSequence:DELeTe:ALL

**Syntax** DATA:SUBSequence:ADD <Sname>, <LineN>, <Name>, <Repeat>

**Arguments**

<Sname>::=<String>  
where <string> is a subsequence name (surrounded in double (") or single (') quotes).

<LineN>::=<NR1>  
where <NR1> is a subsequence step number.

<Name>::=<String>  
where <string> is a block name (surrounded in double (") or single (') quotes).

<Repeat>::=<NR1>  
where <NR1> is a repeat count (1 to 65536).

**Examples** :DATA:SUBSEQUENCE:ADD "SUB1",2"BLOCK3",10  
adds a subsequence step that consists of the block named BLOCK3 at the subsequence line number 2 position in the subsequence named SUB1.

## DATA:SUBSequence:CLEAR

The DATA:SUBSequence:CLEAR command clears all subsequence definitions.

**Group** DATA

**Related Commands** DATA:SUBSequence:ADD, DATA:SUBSequence:DEFine, DATA:SUBSequence:DELeTe, DATA:SUBSequence:DELeTe:ALL

**Syntax** DATA:SUBSequence:CLEAR

**Arguments** None

## DATA:SUBSequence:DEFine (?)

The DATA:SUBSequence:DEFine command sets up all of the subsequence definition section information in ASCII. The DATA:SUBSequence:DEFine? query returns all of the subsequence definition section information.

<b>Group</b>	DATA
<b>Related Commands</b>	DATA:SUBSequence:ADD, DATA:SUBSequence:CLEAR, DATA:SUBSequence:DELETE, DATA:SUBSequence:DELETE:ALL
<b>Syntax</b>	DATA:SUBSequence:DEFine <Subseq Block> DATA:SUBSequence:DEFine?
<b>Arguments</b>	<p>&lt;Subseq Block&gt; ::= &lt;blockheader&gt;&lt;SName&gt;,&lt;Step&gt;[,&lt;Step&gt;...]          [&lt;LF&gt;&lt;SName&gt;,&lt;Step&gt;] [,&lt;Step&gt;...] ...]          Arbitrary block data for the sequence definition</p> <p>where,</p> <p>&lt;Step&gt; ::= &lt;AName&gt;,&lt;ARepeat&gt;</p> <p>The items in &lt;Step&gt; are ASCII character strings that express the following information.</p> <p>&lt;SName&gt;        the subsequence name (with no quotation marks)          &lt;AName&gt;        the block name (with no quotation marks)          &lt;ARepeat&gt;      repeat count (1 to 65536)</p> <p>&lt;LF&gt; ::= &lt;ASCII line feed code (10)&gt;</p>
<b>Responses</b>	[:DATA:SUBSEQUENCE:DEFINE] <Subseq Block> where <Subseq Block> is a data block with the same format as the argument.
<b>Examples</b>	:DATA:SUBSEQUENCE:DEFINE #233SUB1,B1,16,B2,32<LF>SUB2,B3,2,B4,3 defines a two step subsequence that consists of the two subsequences SUB1 and SUB2.

## DATA:SUBSequence:DElete

The DATA:SUBSequence:DElete command deletes the specified subsequence step.

**Group** DATA

**Related Commands** DATA:SUBSequence:ADD, DATA:SUBSequence:CLEAR,  
DATA:SUBSequence:DEFine, DATA:SUBSequence:DElete:ALL

**Syntax** DATA:SUBSequence:DElete <SName>,<Line Number>

**Arguments** <SName>::=<String>  
where <String> is a subsequence name (surrounded in double (") or single (') quotes).  
  
<Line Number>::=<NR1>  
where <NR1> is the line number of the sequence step to be deleted.

**Examples** :DATA:SUBSEQUENCE:DELETE "SUB2", 7  
deletes the line 7 subsequence step named SUB2.

## DATA:SUBSequence:DElete:ALL

The DATA:SUBSequence:DElete:ALL command deletes the specified subsequence definitions.

**Group** DATA

**Related Commands** DATA:SUBSequence:ADD, DATA:SUBSequence:CLEAR,  
DATA:SUBSequence:DEFine, DATA:SUBSequence:DElete

**Syntax** DATA:SUBSequence:DElete:ALL <SName>

**Arguments** <SName>::=<String>  
where <String> is a subsequence name (surrounded in double (") or single (') quotes).

**Examples**     :DATA:SUBSEQUENCE:DELETE:ALL "SUB1"  
deletes the subsequence definition named SUB1.

## DATA:SUBSequence:REPeat (?)

The DATA:SUBSequence:REPeat command sets the subsequence step repeat count. The DATA:SUBSequence:REPeat? query returns the repeat count set for the subsequence step.

**Group**        DATA

**Related Commands**   None

**Syntax**        DATA:SUBSequence:REPeat <SName>,<Line Number>,<Times>  
DATA:SUBSequence:REPeat? <SName>,<Line Number>

**Arguments**     <SName>::=<String>  
where <String> is a subsequence name (surrounded in double (") or single (') quotes).

                  <Line Number>::=<NR1>  
where <NR1> is the line number of the sequence step to be set.

                  <Times>::=<NR1>  
where <NR1> is a repeat count (1 to 65536).

**Responses**     [:DATA:SUBSEQUENCE:REPEAT] <SName>,<Line Number>,<Times>

**Examples**     :DATA:SUBSEQUENCE:REPEAT "SUB1",5,8  
sets the line 5 sequence step repeat count in the subsequence named SUB1 to 8.

## DATA:UPDate

The DATA:UPDate command transfers the contents of data memory to pattern generation memory so that the output reflects the most recent data. This command is only valid when the mode is set to manual mode. The processing performed by this command is executed automatically if any data changes when the instrument is in automatic mode.

<b>Group</b>	DATA
<b>Related Commands</b>	None
<b>Syntax</b>	DATA:UPDate
<b>Arguments</b>	None

## DEBug?

The DEBug? query returns all current settings for the remote command debugging function.

This query is equivalent to the DEBug:SNOp? query.

<b>Group</b>	DEBUG
<b>Related Commands</b>	DEBug:SNOp?, DEBug:SNOp:DELAy:TIME, DEBug:SNOp:STATE
<b>Syntax</b>	DEBug?
<b>Arguments</b>	None
<b>Responses</b>	See Examples
<b>Examples</b>	DEBUG? might return :DEBUG:SNOOP:STATE 0; DELAY:TIME 0.2



## DEBug:SNOop?

The DEBug:SNOop? query returns all current settings for the remote command debugging function.

This query is equivalent to the DEBug? query.

**Group** DEBUG

**Related Commands** DEBug?, DEBug:SNOop:DELAy:TIME, DEBug:SNOop:STATe

**Syntax** DEBug:SNOop?

**Arguments** None

**Responses** See Examples

**Examples** DEBUG:SNOOP?  
might return :DEBUG:SNOOP:STATE 0; DELAY:TIME 0.2

## DEBug:SNOop:DELAy?

The DEBug:SNOop:DELAy? query returns the display time for commands in a sequence of commands connected by semicolons.

This query is equivalent to the DEBug:SNOop:DELAy:TIME? query.

**Group** DEBUG

**Related Commands** DEBug?, DEBug:SNOop?, DEBug:SNOop:DELAy:TIME?, DEBug:SNOop:STATE

**Syntax** DEBug:SNOop:DELAy?

**Arguments** None

**Responses** [:DEBUG:SNOOP:DELAY]<Delay Time>  
where <Delay Time>::=<NR2>

**Examples** DEBUG:SNOOP:DELAy?  
might return :DEBUG:SNOOP:DELAy:TIME 0.2

## DEBUg:SNOOp:DELAy:TIME (?)

The DEBUg:SNOOp:DELAy:TIME command sets the display time for commands in a sequence of commands that are connected by semicolons.

The DEBUg:SNOOp:DELAy:TIME? query returns the display time for commands in a sequence of commands connected by semicolons.

**Group** DEBUG

**Related Commands** DEBUg?, DEBUg:SNOOp?, DEBUg:SNOOp:DELAy?, DEBUg:SNOOp:STATe

**Syntax** DEBUg:SNOOp:DELAy:TIME <Time>  
DEBUg:SNOOp:DELAy:TIME?

**Arguments** <Time> ::= <NR2> [<unit>]  
where <NR2> combined with [<unit>] specifies a time in the range 0.0 s to 10.0 s in steps of 0.1 s, and [<unit>] ::= {s |ms | $\mu$ s}, for seconds, milliseconds, or microseconds.

**Examples** :DEBUg:SNOOp:DELAy:TIME 0.5  
sets the command display time to 0.5 seconds.

## DEBUg:SNOp:STATe (?)

The DEBUg:SNOp:STATe command sets and clears the remote command debugging function.

The DEBUg:SNOp:STATe? query returns the currently specified state of the remote command debugging function.

The debugging function displays messages input from the remote interface in the CRT screen message area. If commands are connected by semicolons, each message is displayed for the time specified with the DEBUg:SNOp:DELAy:TIME command.

The display format is as follows:

Control codes — "<code decimal display>", e.g. LF is displayed as "<10>".

Alphanumerics and symbols — "<code ASCII display>", e.g., "A" is displayed as "A".

Message termination — "<PMT>"

Interface messages — "<DCL>" and "<GET>". Others are displayed as "<code decimal display>".

Block data — "#0"

Any data other than one of the above — "<code decimal display>", e.g. a code value of 80 (hexadecimal) would be displayed as <128>.

**Group** DEBUG

**Related Commands** DEBUg?, DEBUg:SNOp?, DEBUg:SNOp:DELAy?, DEBUg:SNOp:TIME

**Syntax** DEBUg:SNOp:STATe {ON | OFF | <NR1>}  
DEBUg:SNOp:STATe?

**Arguments** ON or nonzero value  
enables the debugging function.

OFF or zero value  
clears the debugging function.

**Responses**

1	the debugging function is currently set.
0	the debugging function is currently cleared.

**Examples**

```
:DEBUG:SNOOP:STATE ON
```

enables the debugging function.

## DESE (?)

The DESE command sets the bits of the DESER (Device Event Status Enable Register) used in the status and event reporting system of the data generator. The DESE? query returns the contents of the DESER. Refer to Section 3 *Status and Events* for more information about DESE.

The power-on default for the DESER is to set all bits to 1 if the power-on status flag is TRUE. If this flag is set to FALSE, the DESER maintains its current value through a power cycle.

**Group** Other

**Related Commands** \*CLS, \*ESE, \*ESR?, EVENT?, EVMsg?, EVQty?, \*SRE, \*STB?

**Syntax**

```
DESE <Bit Value>
DESE?
```

**Arguments** <Bit Value>::=<NR1>  
where <NR1> is a decimal integer, which must range from 0 to 255, that sets the DESER bits to its binary equivalent.

**Examples**

```
:DESE 177
```

sets the DESER to 177 (binary 10110001), which sets the PON, CME, EXE and OPC bits.

```
:DESE?
```

might return :DESE 176, which indicates that the DESER contains the binary number 10110000.

## DIAGnostic?

The `DIAGnostic?` query returns the selected self-test routine(s), runs the routine, and returns the results.

**Group** DIAGNOSTIC

**Related Commands** `DIAGnostic:SElect`, `DIAGnostic:STATe`, `DIAGnostic:RESUlT?`

**Syntax** `DIAGnostic?`

**Arguments** None

**Responses** `[[:DIAGNOSTIC:SELECT] <Self-test Routine>; [RESULT],<Result>[,<Result>]...<Self-test Routine>::= <label>`  
where <label> is one of following routines:

ALL	all routines
CPU	CPU unit check routine
DISPlay	display unit check routine
FPANel	front panel control unit check routine
CLOCK	clock unit check routine
TRIGger	trigger unit test routine
PMEMemory	pattern memory check routine
SMEMemory	sequence memory check routine

and where `<Result>::=<NR1>` is one of following responses:

0	terminated without error
100	detected an error in the CPU unit
200	detected an error in the display unit
300	detected an error in the front panel unit
400	detected an error in the clock unit
500	detected an error in the trigger unit
600	detected an error in the sequence memory
700	detected an error in the pattern memory

---

**NOTE.** *The DG2040 Data Generator does not respond to any commands or queries issued during Self Test.*

---

**Examples**     DIAGNOSTIC?  
                  might return :DIAGNOSTIC:SELECT ALL;RESULT 0.

## DIAGnostic:RESULT?

The DIAGnostic:RESULT? query returns the results of self-test execution.

**Group**        DIAGNOSTIC

**Related Commands**   DIAGnostic:SElect, DIAGnostic:STATE

**Syntax**       DIAGnostic:RESULT?

**Arguments**   None

**Responses**    :DIAGNOSTIC:RESULT<Result>[,<Result>]...  
                  <Result>::=<NR1>  
                  where <NR1> is one of following values:

0	terminated without error
100	detected an error in the CPU unit
200	detected an error in the display unit
300	detected an error in the front panel unit
400	detected an error in the clock unit
500	detected an error in the trigger unit
600	detected an error in the sequence memory
700	detected an error in the pattern memory

**Examples**     DIAGNOSTIC:RESULT?  
                  might return :DIAGNOSTIC:RESULT 200

## DIAGnostic:SElect (?)

The `DIAGnostic:SElect` command selects the self test routine. The `DIAGnostic:SElect?` query returns the currently selected routine. The `DIAGnostic:STATE` command executes the routine.

**Group** DIAGNOSTIC

**Related Commands** `DIAGnostic:STATE`, `DIAGnostic:RESULT?`

**Syntax** `DIAGnostic:SElect { ALL | CPU | DISPlay | FPANe1 | CLOCK | TRIGger | SMEMory | PMEMory }`

`DIAGnostic:SElect?`

**Arguments**

ALL	checks all routines that follow
CPU	checks the CPU unit
DISPlay	checks the display unit
FPANe1	checks the front panel control unit
CLOCK	checks the clock unit
TRIGger	checks the trigger unit
SMEMory	checks the sequence memory
PMEMory	checks the pattern memory

**Examples** `:DIAGNOSTIC:SELECT CPU ; STATE EXECUTE`  
executes the CPU self-test routine.

## DIAGnostic:STATE

The `DIAGnostic:STATE` command executes the self-test routine(s) selected with the `DIAGnostic:SElect` command. If an error is detected during execution, the routine that detected the error terminates. If all of the self-test routines are selected using the `DIAGnostic:SElect` command, self-testing continues with execution of the next self-test routine.

**Group** DIAGNOSTIC

**Related Commands** `DIAGnostic:SElect`, `DIAGnostic:RESULT?`

**Syntax** `DIAGnostic:STATE EXECute`



<b>Arguments</b>	EXECute Performs the self-test using the selected routine.
<b>Examples</b>	:DIAGNOSTIC:SELECT ALL ; STATE EXECUTE ; RESULT? executes all of the self-test routines. After all self-test routines finish, the results of the self tests are returned.

## DISPlay?

The DISPlay? query returns all the settings set using the display commands.

<b>Group</b>	DISPLAY
<b>Related Commands</b>	None
<b>Syntax</b>	DISPlay?
<b>Arguments</b>	None
<b>Responses</b>	Returns the settings as a sequence of commands, suitable for sending as set commands later to restore a setup. See <i>Examples</i> section on page 4-1.
<b>Examples</b>	DISPLAY? might return :DISPLAY:BRIGHTNESS 0.7;CLOCK 0;DIMMER 1;ENABLE 1;MENU:NAME SETUP;STATE 1;:DISPLAY:WINDOW:TEXT:DATA " "

## DISPlay:BRIGhtness (?)

The DISPlay:BRIGhtness command adjusts the brightness of the screen; the DISPlay:BRIGhtness? query returns the current brightness setting.

<b>Group</b>	DISPLAY
<b>Related Commands</b>	DISPlay?
<b>Syntax</b>	DISPlay:BRIGhtness <Value> DISPlay:BRIGhtness?
<b>Arguments</b>	<Value>::=<NRf> where <NRf> is a real number ranging from 0 to 1.
<b>Examples</b>	:DISPLAY:BRIGHTNESS 0.7 sets screen brightness to 70% of maximum intensity.

## DISPlay:CLOCK (?)

The DISPlay:CLOCK command sets whether or not the date and time are displayed.

The DISPlay:CLOCK? query returns whether or not the date and time are displayed.

<b>Group</b>	DISPLAY
<b>Related Commands</b>	DISPlay?
<b>Syntax</b>	DISPlay:CLOCK {ON   OFF   1   0} DISPlay:CLOCK?
<b>Arguments</b>	ON or 1 sets the data generator to display the date and time.  OFF or 0 sets the data generator to not display the date and time.

**Responses**

1	Date and time is currently displayed.
0	Date and time is currently not displayed.

**Examples**     :DISPLAY:CLOCK ON  
sets the data generator to display the date and time.

## DISPly:DIMmer (?)

The DISPly:DIMmer command sets whether or not the screen dimmer function operates. The DISPly:DIMmer? query returns the on/off state of the screen dimmer function. When the dimmer function is on, if no front panel controls are used for about 10 minutes, the screen brightness is lowered automatically.

**Group**        DISPLAY

**Related Commands**   DISPly?

**Syntax**        DISPly:DIMmer {ON | OFF | 1 | 0}  
DISPly:DIMmer?

**Arguments**

ON or 1	enables the dimmer function.
OFF or 0	clears the dimmer function.

**Responses**     [:DISPLAY:DIMMER] {1 | 0}

**Examples**     :DISPLAY:DIMMER ON  
turns the dimmer function on.

## DISPlay:ENABLE (?)

The DISPlay:ENABLE command turns the display on or off. When security is turned on, once the display is set to off, it cannot be turned on again. The DISPlay:ENABLE? query returns the on/off state of the display.

<b>Group</b>	DISPLAY
<b>Related Commands</b>	DISPlay?, DISPlay:MENU:STATe
<b>Syntax</b>	DISPlay:ENABLE {ON   OFF   1   0} DISPlay:ENABLE?
<b>Arguments</b>	ON or 1 turns the display on.  OFF or 0 turns the display off.
<b>Responses</b>	[:DISPLAY:ENABLE] {1   0}
<b>Examples</b>	:DISPLAY:ENABLE OFF turns the display off.

## DISPlay:MENU?

The DISPlay:MENU? query returns the type and display state of the selected menu.

<b>Group</b>	DISPLAY
<b>Related Commands</b>	DISPlay?, DISPlay:MENU[:NAME], DISPlay:MENU:NAME?
<b>Syntax</b>	DISPlay:MENU?
<b>Arguments</b>	None
<b>Responses</b>	[:DISPLAY:MENU:NAME] {SETUP   EDIT   APPLICATION   UTILITY};[STATE] {1   0}

**Examples**     :DISPlay:MENU?  
                  might return :DISPLAY:MENU:NAME SETUP;STATE 1

## DISPlay:MENU[:NAME]

The DISPlay:MENU[:NAME] command selects the menu to be displayed on the screen.

**Group**        DISPLAY

**Related Commands**   DISPlay?, DISPlay:MENU?, DISPlay:MENU:NAME?

**Syntax**       DISPlay:MENU[:NAME] {SETUp | EDIT | APPLication | UTILity}

**Arguments**

SETUp	displays the setup menu
EDIT	displays the edit menu
APPLication	displays the application menu
UTILity	displays the utility menu

**Examples**     :DISPLAY:MENU:NAME UTILITY  
                  selects the UTILITY menu.

## DISP`lay`:MENU:NAME?

The DISP`lay`:MENU:NAME? query returns the type of the selected menu.

<b>Group</b>	DISPLAY
<b>Related Commands</b>	DISP <code>lay</code> ?, DISP <code>lay</code> :MENU?, DISP <code>lay</code> :MENU:[ <code>:NAME</code> ]
<b>Syntax</b>	DISP <code>lay</code> :MENU:NAME?
<b>Arguments</b>	None
<b>Responses</b>	[ <code>:DISPLAY:MENU:NAME</code> ] {SETUP   EDIT   APPLICATION   UTILITY}
<b>Examples</b>	DISP <code>lay</code> :MENU:NAME? might return <code>:DISPLAY:MENU:NAME EDIT</code>

## DISP`lay`:MENU:STATe (?)

The DISP`lay`:MENU:STATe command sets whether or not menus are displayed on the screen. The DISP`lay`:MENU:STATe? query returns whether or not menus are displayed on the screen. This command is equivalent to the DISP`lay`:ENABLE command.

<b>Group</b>	DISPLAY
<b>Related Commands</b>	DISP <code>lay</code> ?, DISP <code>lay</code> :ENABLE, DISP <code>lay</code> :MENU?, DISP <code>lay</code> :MENU:[ <code>:NAME</code> ]
<b>Syntax</b>	DISP <code>lay</code> :MENU:STATe {ON   OFF   1   0} DISP <code>lay</code> :MENU:STATe?
<b>Arguments</b>	ON or 1      Menus are displayed. OFF or 0     Menus are not displayed.
<b>Responses</b>	[ <code>:DISPLAY:MENU:STATE</code> ] {1   0}
<b>Examples</b>	DISPLAY:MENU:STATE ON sets the instrument to display menus on the screen.

## DISPlay[:WINDow]:TEXT:CLEAr

The DISPlay[:WINDow]:TEXT:CLEAr command clears the message display area on the screen.

**Group** DISPLAY

**Related Commands** DISPlay?, DISPlay[:WINDow]:TEXT[:DATA]

**Syntax** DISPlay[:WINDow]:TEXT:CLEAr

**Arguments** None

**Examples** :DISPLAY:WINDOW:TEXT:CLEAR  
clears the message display area.

## DISPlay[:WINDow]:TEXT[:DATA] (?)

The DISPlay[:WINDow]:TEXT[:DATA] command sends a message to be displayed in the screen message display area. The sent message is displayed immediately. The DISPlay[:WINDow]:TEXT[:DATA]? query returns the contents of the input screen message.

---

**NOTE.** *The contents of the message display area scrolls automatically. To fully update the display contents, first clear the message display area using the DISPlay[:WINDow]:TEXT:CLEAr command.*

---

<b>Group</b>	DISPLAY
<b>Related Commands</b>	DISPlay?, DISPlay[:WINDow]:TEXT:CLEAr
<b>Syntax</b>	DISPlay[:WINDow]:TEXT[:DATA] <Message> DISPlay[:WINDow]:TEXT[:DATA]?
<b>Arguments</b>	<Message>::=<string> where <string> is a message character string.
<b>Responses</b>	[:DISPLAY:WINDOW:TEXT:DATA] <Message>
<b>Examples</b>	:DISPLAY:WINDOW:TEXT:DATA "ABCD" sends the text "ABCD" to be displayed in the message display area.

## EDGE?

The EDGE? query returns all the settings related to the edge control.

<b>Group</b>	EDGE
<b>Related Commands</b>	None
<b>Syntax</b>	EDGE?
<b>Arguments</b>	None



**Responses** [:EDGE:STATE] {ON | OFF}; [POSITION] <NR2>

**Examples** EDGE?  
might return :EDGE:STATE ON;POSITION 5.0e-12

## EDGE:STATe (?)

The EDGE:STATe command turns the edge control on or off. The EDGE:STATe? query returns status that indicates whether or not the edge control is being set.

**Group** EDGE

**Related Commands** None

**Syntax** EDGE:STATe {ON | OFF | 1 | 0}  
EDGE:STATe?

**Arguments** ON or 1  
turn the edge control on.  
  
OFF or 0  
turn the edge control off.

**Responses** [:EDGE:STATe] {1 | 0}

**Examples** :EDGE:STATE ON  
turns the edge control on.

## EDGE:POSITIOn (?)

The EDGE:POSITIOn command set an edge offset position by time to shift the edge position. The EDGE:POSITIOn? query returns the edge offset position currently set.

**Related Commands** None

**Syntax** EDGE:POSITIOn <Time>  
EDGE:POSITIOn?

**Arguments** <Time>::=<NR2>[<unit>]  
where <unit>::={s|ms| $\mu$ s|ns|ps} with a range of -100 ps to 100 ps, in 5 ps steps.

**Examples** :EDGE:POSITION 5ps  
sets the offset position to 5 picoseconds.

## \*ESE (?)

The \*ESE common command sets the bits of the ESER (Event Status Enable Register) used in the status and events reporting system of the data generator. The \*ESE? query returns the contents of the ESER. Refer to Section 3 *Status and Events* for more information about the ESER.

If the power on status flag is TRUE, the power-on default for the ESER is to reset all bits to zero. If this flag is set to FALSE, the ESER bits do not change value during the power-on cycle.

**Group** Other

**Related Commands** \*CLS, DESE, \*ESR?, EVENT?, EVMsg?, EVQty?, \*SRE, \*STB?

**Syntax** \*ESE <Bit Value>  
\*ESE?

**Arguments** <Bit Value>::=<NR1>  
where <NR1> is a decimal integer that ranges from 0 to 255. The ESER bits will be set to the binary equivalent of the decimal integer sent.

**Examples** \*ESE 177  
sets the ESER to 177 (binary 10110001), which sets the PON, CME, EXE and OPC bits.

\*ESE?  
might return 176, which indicates that the ESER contains the binary number 11010000.

## \*ESR?

The \*ESR? common query returns the contents of SESR (Standard Event Status Register) used in the status and events reporting system. Refer to the *Status and Events* section for more information about \*ESR? or SESR.

**Group** Other

**Related Commands** \*CLS, DESE, \*ESE?, EVENT?, EVMsg?, EVQty?, \*SRE, \*STB?

**Syntax** \*ESR?

**Arguments** None

**Examples** \*ESR?  
might return 181, which indicates that the SESR contains the binary number 10110101.

## EVENT?

The EVENT? query dequeues the event code of the event that has been in the Event Queue the longest out of all available events. Use the \*ESR? query to make the events available for dequeuing using EVENT?. Refer to the *Status and Events section*.

**Group** Other

**Related Commands** \*CLS, DESE, \*ESE, \*ESR?, EVMsg?, EVQty?, \*SRE, \*STB?

**Syntax** EVENT?

**Arguments** None

**Examples** EVENT?  
might return :EVENT 113

## EVMsg?

The EVMsg? query dequeues the event code and event message of the event that has been in the Event Queue the longest out of all available events. Use the \*ESR? query to make the events available for dequeuing using EVMsg? For more details, refer to the *Status and Events section*.

**Group** Other

**Related Commands** \*CLS, DESE, \*ESE, \*ESR?, EVENT?, EVQty?, \*SRE, \*STB?

**Syntax** EVMsg?

**Arguments** None

**Examples** :EVMSG?  
might return :EVMSG 420,"Query UNTERMINATED".

## EVQty?

The EVQty? query returns the number of events currently in the Event Queue. If no event is being queued, 0 is returned.

**Group** Other

**Related Commands** \*CLS, DESE, \*ESE, \*ESR, EVMsg?, EVENT?, \*SRE, \*STB?

**Syntax** EVQty?

**Arguments** None

**Examples** :EVQty?  
might return :EVQTY 5.

## FACTory

The FACTory command resets the data generator to its factory default settings and purges all stored settings. Refer to Appendix D, page D-1, for a list of the factory settings.

**Group** Other

**Related Commands** \*RST, SECURE

**Syntax** FACTory

**Arguments** None

**Examples** :FACTORY  
resets the data generator to its factory default settings.

## HCOPY?

The HCOpy? query returns the set image data format and the output port for hardcopy output.

**Group** HARDCOPY

**Related Commands** HCOpy:FORMat, HCOpy:PORT

**Syntax** HCOpy?

**Arguments** None

**Responses** [:HCOpy:FORMat] {BMP | EPSON | EPSMONO | THINKJET | TIFF};[:PORT]  
{DISK | GPIB | RS232C}  
where

BMP  
the Windows monochrome file format.

EPSON  
the format used by 9-pin and 24-pin dot matrix printers in ESC/P graphics mode.

EPSMono  
the encapsulated Postscript format monochrome image file format.

THINKjet  
the format used by HP inkjet printers.

TIFF  
the TIFF format.

**Examples** HCOpy?  
might return :HCOpy:FORMat TIFF ; PORT DISK

In this case the instrument outputs hardcopy data to file on the floppy disk in the TIFF format.

## HCOPY:ABORT

The HCOpy:ABORT command aborts hardcopy output.

**Group** HARDCOPY

**Related Commands** HCOpy:START

**Syntax** HCOpy:ABORT

**Arguments** None

**Examples** :HCOpy:ABORT  
 aborts hardcopy output.

## HCOPY:DATA?

The HCOpy:DATA? query outputs the hard copy data to the output queue. However, note that this command has no effect on (and is not affected by) the hard copy output port setting.

**Group** HARDCOPY

**Related Commands** HCOpy:PORT

**Syntax** HCOpy:DATA?

**Arguments** None

**Responses** [:HCOpy:DATA] <Image>  
 where  
 <Image> ::= <block>                    the hardcopy image data block

**Examples** :HCOpy:DATA?  
 outputs hard copy data to the output queue.

## HCOPY:FORMAt (?)

The HCOpy:FORMAt command sets the hard copy output format.

The HCOpy:FORMAt? query returns the currently specified hard copy output format.

**Group** HARDCOPY

**Related Commands** HCOpy?

**Syntax** HCOpy:FORMAT {BMP | EPSOn | EPSMono | THINKjet | TIFF}  
HCOpy:FORMAT?

**Arguments**

BMP  
the Windows monochrome file format.

EPSOn  
the format used by 9-pin and 24-pin dot matrix printers in ESC/P graphics mode.

EPSMono  
the encapsulated Postscript format monochrome image file format.

THINKjet  
the format used by HP inkjet printers.

TIFF  
the TIFF format.

**Responses** [:HCOpy:FORMAT] {BMP | EPSON | EPSMONO | THINKJET | TIFF}

**Examples** :HCOpy:FORMAT TIFF  
sets the data generator to output hard copy in the TIFF format.



## HCOPY:PORT (?)

The HCOpy:PORT command sets the hard copy output port.

The HCOpy:PORT? query returns the currently specified hard copy output port.

**Group** HARDCOPY

**Related Commands** HCOpy?

**Syntax** HCOpy:PORT {DISK | GPIB | RS232c}  
HCOpy:PORT?

**Arguments** DISK  
outputs to a file on the floppy disk.

GPIB  
outputs to the GPIB port.

RS232c  
outputs to the RS-232C port.

**Responses** [HCOpy:PORT] {DISK | GPIB | RS232c}

**Examples** :HCOpy:PORT DISK  
sets the hard copy output destination to a file on the floppy disk.

## HCOPY:START

The HCOpy:START command starts hardcopy output.

<b>Group</b>	HARDCOPY
<b>Related Commands</b>	HCOpy:ABORT
<b>Syntax</b>	HCOpy:START
<b>Arguments</b>	None
<b>Examples</b>	:HCOpy:START starts hardcopy output.

## HEADer (?)

The HEADer command enables or disables the command header responses to all queries except IEEE Std 488.2 common commands. The HEADer? query returns the status indicating whether the command header responses are enabled or not.

<b>Group</b>	Other
<b>Related Commands</b>	VERBose
<b>Syntax</b>	HEADer {ON   OFF   <NR1>} HEADer?
<b>Arguments</b>	ON or nonzero value enables the command header responses.  OFF or zero value disables the command header responses.
<b>Responses</b>	1      command header responses are currently enabled. 0      command header responses are currently disabled.

**Examples**     :HEADER OFF  
disables the command header responses.

                  :HEADER?  
might return 1 which indicates command headers are currently enabled for  
return in query responses.

## ID?

The ID? query returns the ID information of the data generator.

**Group**        Other

**Related Commands**   \*IDN?

**Syntax**        ID?

**Arguments**     None

**Responses**     ID <Manufacturer>/<Model>, <Firmware Level>  
where  
<Manufacturer>::=SONY\_TEK,  
<Model>::=DG2040  
<Firmware Level>::=CF:<Code and Format Version>, and  
FV:<Firmware Version>.

**Examples**     :ID?  
returns SONY\_TEK/DG2040,CF:91.1CN,FV:1.00

**\*IDN?**

The \*IDN? common query returns the ID information of the data generator.

<b>Group</b>	Other
<b>Related Commands</b>	ID?
<b>Syntax</b>	*IDN?
<b>Arguments</b>	None
<b>Responses</b>	<Manufacturer>, <Model>, <Serial Number>, <Firmware Level> where <Manufacturer>::=SONY/TEK, <Model>::=DG2040, <Serial Number>::=0, <Firmware Level>::=CF:<Code and Format Version>, <sp>FV:<Firmware Version>, and <sp>::= Space.
<b>Examples</b>	*IDN? might return SONY/TEK,DG2040,0,CF:91.1CN FV:1.00

**LOCK (?)**

The LOCK command enables or disables the knob and all front panel buttons except the ON/STBY button.

The LOCK? query returns a status indicating whether the knob and the buttons are locked or not.

These data generators do not switch between remote control and local control modes, but rather allow simultaneous setting from an external controller and from the front panel. Use this command to lock the functions of the front panel buttons and knobs to disable front panel operations during operation from an external controller or during external controller software execution.

---

**NOTE.** When the front panel control operations are locked out by the *LOCK* command, the instrument displays the character string “FP: LOCKED” at the upper right of the screen.

---

<b>Group</b>	Other
<b>Related Commands</b>	UNLock
<b>Syntax</b>	LOCK {ALL   NONE} LOCK?
<b>Arguments</b>	ALL disables the front panel buttons and the knob except the ON/STBY button.  NONE enables the front panel buttons and the knob.
<b>Examples</b>	:LOCK ALL disables the front panel buttons and the knob.

## MMEMemory:CATalog[:ALL]?

The MMEMemory:CATalog[:ALL]? query returns a list of all files and directories in the current directory on the floppy disk.

<b>Group</b>	MEMORY
<b>Related Commands</b>	MMEMemory:CATalog:ORDer
<b>Syntax</b>	MMEMemory:CATalog[:ALL]?
<b>Arguments</b>	None
<b>Responses</b>	<pre>[:MMEMemory:CATALOG:ALL] &lt;File Entry&gt;[,&lt;File Entry&gt;]... where &lt;File Entry&gt;::=&lt;File Name&gt;,&lt;File Size&gt;,&lt;Time Stamp&gt;, &lt;File Name&gt;::=&lt;string&gt;, &lt;File Size&gt;::=&lt;NR1&gt;, and &lt;Time Stamp&gt;::=&lt;string&gt;.</pre>

---

**NOTE.** A file size of 0 is returned for subdirectories.

---

## MMEMemory:CATalog:ORDer (?)

The MMEMemory:CATalog:ORDer command sets the display order for file information in disk directory listings. The MMEMemory:CATalog:ORDer? query returns the display order for file information in disk directory listings.

<b>Group</b>	MEMORY
<b>Related Commands</b>	MMEMemory:CATalog[:ALL]?
<b>Syntax</b>	<pre>MMEMemory:CATalog:ORDer {NAME1   NAME2   TIME1   TIME2} MMEMemory:CATalog:ORDer?</pre>

<b>Arguments</b>	<p>NAME1 orders the display according to the ASCII collating sequence of the file names.</p> <p>NAME2 orders the display in the reverse order of the NAME1 order.</p> <p>TIME1 orders the display with older (Date and Time) files first.</p> <p>TIME2 orders the display with more recent (Date and Time) files first.</p>
<b>Responses</b>	[:MMEMORY:CATALOG:ORDER] {NAME1   NAME2   TIME1   TIME2}
<b>Examples</b>	<p>:MMEMORY:CATALOG:ORDER NAME1 sets the order of file information recorded in disk directory listings to alphabetical order by file name.</p>

## MMEMory:CDIRectory (?)

The MMEMory:CDIRectory command changes the current working directory. The MMEMory:CDIRectory? query returns the current working directory path.

<b>Group</b>	MEMORY
<b>Related Commands</b>	MMEMory:MDIRectory
<b>Syntax</b>	<p>MMEMory:CDIRectory &lt;Directory Path&gt; MMEMory:CDIRectory?</p>
<b>Arguments</b>	<p>&lt;Directory Path&gt;::=&lt;string&gt; where &lt;string&gt; is the name of the new current working directory.</p>
<b>Responses</b>	[:MMEMORY:CDIRECTORY] <Directory Path>
<b>Examples</b>	<p>:MMEMORY:CDIRECTORY "\DG\WORK3" changes the current working directory to \DG\WORK3.</p>

## MMEemory:COPY

The MMEemory:COPY command copies a file on the disk and creates a new file. If the copy destination file already exists, an error is issued and the existing file is not overwritten.

**Group** MEMORY

**Related Commands** MMEemory:DElete:ALL, MMEemory:DElete[:NAME]

**Syntax** MMEemory:COPY <From-path>,<To-path>

**Arguments** <From-path>::=<string>  
where <string> is the path name of the source file.

<To-path>::=<string>  
where <string> is the path name of the destination file.

**Examples** :MMEMORY:COPY "MYDATA.PDA", "MYWORK.PDA"  
copies the file MYDATA.PDA in the current directory and creates a new file, MYWORK.PDA, in the current directory.

## MMEemory:DElete:ALL

The MMEemory:DElete:ALL command deletes all files and subdirectories in the current directory. However, nonempty subdirectories are not deleted.

**Group** MEMORY

**Related Commands** MMEemory:DElete[:NAME]

**Syntax** MMEemory:DElete:ALL

**Arguments** None

**Examples** :MMEMORY:DELETE:ALL  
deletes all files and empty subdirectories in the current directory.



**MMEMemory:DELEte[:NAME]**

The MMEMemory:DELEte[:NAME] command deletes the file or subdirectory with the specified path name. However, nonempty subdirectories are not deleted.

**Group** MEMORY

**Related Commands** MMEMemory:DELEte:ALL

**Syntax** MMEMemory:DELEte[:NAME] <Path Name>

**Arguments** <Path Name>::=<string>  
where <string> is the path name of the file or subdirectory to be deleted.

**Examples** :MMEMORY:DELETE "NOMORE.PDA"  
deletes the file NOMORE.PDA in the current directory.

**MMEMemory:FREE?**

The MMEMemory:FREE? query returns used size and unused size of the mass memory. This query is equivalent to the MMEMemory:FREE:ALL? query.

**Group** MEMORY

**Related Commands** None

**Syntax** MMEMemory:FREE?

**Arguments** None

**Responses** :MMEMORY:FREE <Used Size>, <Unused Size>  
where  
<Used Size>::=<NR1> and  
<Unused Size>::=<NR1>.

**Examples** :MMEMORY:FREE?  
might return :MMEMORY:FREE 104584,1352704

## MMEemory:INITialize

The MMEemory:INITialize command formats a floppy disk. The format type is specified by the argument.

**Group** MEMORY

**Related Commands** None

**Syntax** MMEemory:INITialize {DD1 | DD2 | HD1 | HD2 | HD3}

**Arguments** You can select from the following formats:

Argument	Description
DD1	2DD, 720 KB, 80 tracks, 9 sectors/track, 512 bytes/sector. Format for IBM PC 2DD and Toshiba J3100 2DD.
DD2	2DD, 640 KB, 80 tracks, 8 sectors/track, 512 bytes/sector. Format for NEC PC-9800 2DD.
HD1	2HD, 1.232 MB, 77 tracks, 15 sectors/track, 1,024 bytes/sector. Format for NEC PC-9800 2HD.
HD2	2HD, 1.200 MB, 80 tracks, 15 sectors/track, 512 bytes/sector. Format for Toshiba J3100 2HD.
HD3	2HD, 1.440 MB, 80 tracks, 18 sectors/track, 512 bytes/sector. Format for IBM PC 2HD.

**Examples** :MMEemory:INITIALIZE HD3  
formats a floppy disk for IBM PC 2HD.

## MMEemory:LOAD

The MMEemory:LOAD command loads in pattern data and block, group, sequence, and setup information in DG2040 Data Generator format into the instruments internal memory from a disk file.

**Group** MEMORY

**Related Commands** MMEemory:SAVE

**Syntax** MMEemory:LOAD <File Name>

**Arguments** <File Name>::=<string>  
where <string> is the name of the file to be loaded.

**Examples** :MMEMORY:LOAD "MYDATA.PDA"  
loads all information from the file MYDATA.PDA in the current directory into the instrument's internal memory.

## MMEemory:LOCK (?)

The MMEemory:LOCK command sets and clears file locks. When a file is locked, it cannot be deleted or written to. The MMEemory:LOCK? query returns whether or not the file is locked.

**Group** MEMORY

**Related Commands** None

**Syntax** MMEemory:LOCK <Path Name>,{ON | OFF | 1 | 0}  
MMEemory:LOCK? <Path Name>

**Arguments** <Path Name>::=<string>  
where <string> is the name of the file to be locked or unlocked.

ON or 1  
locks the file.

OFF or 0  
unlocks the file.

**Responses** 0 the file is not locked.  
1 the file is locked.

**Examples** :MMEMORY:LOCK "COUNT1.PDA",ON  
locks the file COUNT1.PDA in the current directory.

## MMEemory:MDIRectory

The MMEemory:MDIRectory command creates a new subdirectory. The command is invalid if a directory with the specified name already exists.

**Group** MEMORY

**Related Commands** MMEemory:CDIRectory, MMEemory:RDIRectory

**Syntax** MMEemory:MDIRectory <Directory Path>

**Arguments** <Directory Path>::=<string>  
where <string> is the name or path of the new directory.

**Examples** :MMEMORY:MDIRECTORY "WORK4"  
creates the new directory WORK4 in the current working directory.

## MMEemory:REName

The MMEemory:REName command changes the name of the specified file. A file that is locked using the MMEemory:LOCK command cannot be renamed.

**Group** MEMORY

**Related Commands** MMEemory:COPY

**Syntax** MMEemory:REName <From-filename>, <To-filename>

**Arguments** <From-filename>::=<string>  
where <string> is the name of the file to be changed.  
  
<To-filename>::=<string>  
where <string> is the name of the file after it is changed.

**Examples** :MMEMORY:RENAME "COUNT1.PDA", "COUNT2.PDA"  
changes the name of the file COUNT1.PDA in the current working directory to COUNT2.PDA.

## MMEemory:SAVE

The MMEemory:SAVE command saves the pattern data and block, group, sequence, and setup information stored in the internal memory into a disk file in DG2040 Data Generator format.

**Group** MEMORY

**Related Commands** MMEemory:LOAD

**Syntax** MMEemory:SAVE <Path Name>

**Arguments** <Path Name>::=<string>  
where <string> is the path name of the file.

**Examples** :MMEemory:SAVE "NEWDATA.PDA"  
saves all the information in internal memory to the file NEWDATA.PDA in the current working directory.

## MODE?

The MODE? query returns all the setting states related to the pattern generation mode.

<b>Group</b>	MODE
<b>Related Commands</b>	MODE:STATe, MODE:UPDate
<b>Syntax</b>	MODE?
<b>Arguments</b>	None
<b>Responses</b>	[ :MODE:STATE ] { REPEAT   SINGLE   STEP   ENHANCED }; [ UPDATE ] { AUTO   MANUAL }
<b>Examples</b>	<p>MODE?</p> <p>might return :MODE:STATE REPEAT;UPDATE AUTO</p> <p>Here, the run mode is set to repeat and the output pattern update method is set to automatic. (See the items on the MODE:STATe and MODE:UPDate commands.)</p>

## MODE:STATe (?)

The MODE:STATe command sets the run mode for pattern generation. The MODE:STATe? query returns the pattern generation run mode setting.

<b>Group</b>	MODE								
<b>Related Commands</b>	MODE?								
<b>Syntax</b>	MODE:STATe { REPeat   SINGle   STEp   ENHanced } MODE:STATe?								
<b>Arguments</b>	<table><tr><td>REPeat</td><td>Pattern data output is repeated.</td></tr><tr><td>SINGle</td><td>Pattern data output is performed exactly once.</td></tr><tr><td>STEp</td><td>Pattern data is output not according to the internal clock, but rather by a clock signal created by the STEP key.</td></tr><tr><td>ENHanced</td><td>Pattern data is output according to the defined sequence.</td></tr></table>	REPeat	Pattern data output is repeated.	SINGle	Pattern data output is performed exactly once.	STEp	Pattern data is output not according to the internal clock, but rather by a clock signal created by the STEP key.	ENHanced	Pattern data is output according to the defined sequence.
REPeat	Pattern data output is repeated.								
SINGle	Pattern data output is performed exactly once.								
STEp	Pattern data is output not according to the internal clock, but rather by a clock signal created by the STEP key.								
ENHanced	Pattern data is output according to the defined sequence.								

**Responses** [:MODE:STATE] {REPEAT | SINGLE | STEP | ENHANCED}

**Examples** :MODE:STATE SINGLE  
sets the run mode to single.

## MODE:UPDate (?)

The MODE:UPDate command sets the output pattern update method used when data related to pattern generation is changed. The MODE:UPDate? query returns the output pattern update method used when data related to pattern generation is changed.

**Group** MODE

**Related Commands** MODE?

**Syntax** MODE:UPDate {AUTO | MANua1}  
MODE:UPDate?

**Arguments** AUTO           Pattern output reflects changes each time the data is changed in any way.  
MANua1           Pattern output is not changed when data is changed until an update forcing command is received.

**Responses** [:MODE:UPDATE] {AUTO | MANUAL}

**Examples** :MODE:UPDATE AUTO  
sets the output pattern update method to AUTO.

## \*OPC (?)

The \*OPC common command causes bit 0 in the SESR (Standard Event Status Register) to be set, and the operation complete message to be issued, when all pending operations are finished.

The \*OPC? query waits until all pending operations are finished and returns a “1” ASCII character.

<b>Group</b>	Other
<b>Related Commands</b>	*WAI
<b>Syntax</b>	*OPC *OPC?
<b>Arguments</b>	None
<b>Examples</b>	HCOPY:PORT DISK;HCOPY START;*OPC causes the SESR bit 0 to be set and the operation complete message to be issued on the completion of hardcopy.

## OUTPut?

The OUTPUT? query returns all the settings related to the channel and clock output.

<b>Group</b>	OUTPUT
<b>Related Commands</b>	DATA?
<b>Syntax</b>	OUTPut?
<b>Arguments</b>	None



**Examples**    OUTPUT?  
 might return  
 :OUTPUT:ELEVEL 1.4;CHO:HIGH 2.500;LOW 0.000;DELAY -1.00E-0.9;  
 ASSIGN 0;:OUTPUT:CH1:HIGH 2.500;LOW 0.000;DELAY -0.50E-09;  
 ASSIGN 1;:OUTPUT:CHCLK:HIGH 1.500;LOW 0.000;  
 :OUTPUT:DEFINE #2110,0,0<LF>1,1,0

## OUTPut:CH<n>:ASSIGN (?)

The OUTPut:CH<n>:ASSIGN command assigns a data bit to the specified channel. The OUTPut:CH<n>:ASSIGN? query returns the data bit assigned to the specified channel. A bit number of -1 is returned if no data bit is assigned to the channel.

**Group**    OUTPUT

**Related Commands**    OUTPut:CH<n>:RELEase, OUTPut:DEFine

**Syntax**    OUTPut:CH<n>:ASSIGN <Bit>  
 OUTPut:CH<n>:ASSIGN?  
 (<n>::={0|1})

**Arguments**    <Bit>::=<NR1>  
 where <NR1> is a data bit number (0 | 1).

**Responses**    [:OUTPUT:CH<n>:ASSIGN] <Bit>

**Examples**    :OUTPUT:CHO:ASSIGN 0  
 assigns data bit D0 to channel 0.

## OUTPut:CH<n>:DELAy (?)

The OUTPut:CH<n>:DELAy command sets the delay time for the specified channel. The OUTPut:CH<n>:DELAy? query returns the delay time setting for the specified channel.

<b>Group</b>	OUTPUT
<b>Related Commands</b>	None
<b>Syntax</b>	OUTPut:CH<n>:DELAy <Time> OUTPut:CH<n>:DELAy? (<n>::={0 1})
<b>Arguments</b>	<Time>::=<NR2>[<unit>] where <NR2> combined with [<unit>] specifies a time, and [<unit>]::={s ms us ns}, for seconds, milliseconds, microseconds, or nanoseconds.
<b>Responses</b>	[ :OUTPUT:CH<n>:DELAy ] <NR3>
<b>Examples</b>	:OUTPUT:CH0:DELAy 1ns sets the delay time for channel 0 to 1ns.

## OUTPut:CH<n>:HIGH (?)

The OUTPut:CH<n>:HIGH command sets the high-level output voltage for the specified channel. The OUTPut:CH<n>:HIGH? query returns the high-level output voltage setting for the specified channel.

<b>Group</b>	OUTPUT
<b>Related Commands</b>	OUTPut:CH<n>:LOW
<b>Syntax</b>	OUTPut:CH<n>:HIGH <VolT> OUTPut:CH<n>:HIGH? (<n>::={0 1})

<b>Arguments</b>	<code>&lt;Volt&gt;::=&lt;NR2&gt;[&lt;Unit&gt;]</code> where <code>&lt;NR2&gt;</code> combined with <code>[&lt;Unit&gt;]</code> specifies a high-level voltage; and <code>&lt;Unit&gt;::={V   mV}</code> , for volt or millivolt.
<b>Responses</b>	<code>[ :OUTPUT:CH&lt;n&gt;:HIGH ] &lt;NR2&gt;</code>
<b>Examples</b>	<code>:OUTPUT:CH1:HIGH 1V</code> sets the channel 1 high-level output voltage to 1 V.

## OUTPut:CH<n>:LOW (?)

The `OUTPut:CH<n>:LOW` command sets the low-level output voltage for the specified channel. The `OUTPut:CH<n>:LOW?` query returns the low-level output voltage setting for the specified channel.

<b>Group</b>	OUTPUT
<b>Related Commands</b>	OUTPut:CH<n>:HIGH
<b>Syntax</b>	<code>OUTPut:CH&lt;n&gt;:LOW &lt;Volt&gt;</code> <code>OUTPut:CH&lt;n&gt;:LOW?</code> ( <code>&lt;n&gt;::={0 to 1}</code> )
<b>Arguments</b>	<code>&lt;Volt&gt;::=&lt;NR2&gt;[&lt;Unit&gt;]</code> where <code>&lt;NR2&gt;</code> combined with <code>[&lt;Unit&gt;]</code> specifies a low-level voltage; and <code>&lt;Unit&gt;::={V   mV}</code> , for volt or millivolt.
<b>Responses</b>	<code>[ :OUTPUT:CH&lt;n&gt;:LOW ] &lt;NR2&gt;</code>
<b>Examples</b>	<code>:OUTPUT:CH0:LOW -1V</code> sets channel 0 low-level output voltage to -1 V.

## OUTPut:CH<n>:RELEase

The OUTPut:CH<n>:RELEase command clears the data bit assignment for the specified channel.

**Group** OUTPUT

**Related Commands** OUTPut:CH<n>:ASSIGN, OUTPut:DEFine

**Syntax** OUTPut:CH<n>:RELEase  
(<n>::={0 to 1})

**Arguments** None

**Examples** :OUTPUT:CH1:RELEASE  
clears data bit assignment for channel 1.

## OUTPut:CHCLK:HIGH (?)

The OUTPut:CHCLK:HIGH command sets the high-level output voltage for the clock output. The OUTPut:CHCLK:HIGH? query returns the high-level output voltage setting for the clock output.

**Group** OUTPUT

**Related Commands** OUTPut:CHCLK:LOW

**Syntax** OUTPut:CHCLK:HIGH <Volt>  
OUTPut:CHCLK:HIGH?

**Arguments** <Volt>::=<NR2>[<Unit>]  
where <NR2> combined with [<Unit>] specifies a high-level voltage; and  
<Unit>::={V | mV}, for volt or millivolt.

**Responses** [:OUTPUT:CHCLK:HIGH] <NR2>

**Examples** :OUTPUT:CHCLK:HIGH 1V  
sets the high-level output voltage for the clock output to 1 V.

## OUTPut:CHCLK:LOW (?)

The OUTPut:CHCLK:LOW command sets the low-level output voltage for the clock output. The OUTPut:CHCLK:LOW? query returns the low-level output voltage setting for the clock output.

**Group** OUTPUT

**Related Commands** OUTPut:CHCLK:HIGH

**Syntax** OUTPut:CHCLK:LOW <Volt>  
OUTPut:CHCLK:LOW?

**Arguments** <Volt>::=<NR2>[<Unit>]  
where <NR2> combined with [<Unit>] specifies a low-level voltage; and  
<Unit>::={V | mV}, for volt or millivolt.

**Responses** [:OUTPUT:CHCLK:LOW] <NR2>

**Examples** :OUTPUT:CHCLK:LOW -1V  
sets the low-level output voltage for the clock output to -1 V.

## OUTPut:DEFine (?)

The OUTPut:DEFine command assigns data bits to all the channels specified in the header. The data bit assignment is cleared for any data bit not specified in the argument. The OUTPut:DEFine? query returns the data bits assigned to the channels specified in the header.

<b>Group</b>	OUTPUT
<b>Related Commands</b>	OUTPut:CH<n>:ASSIGN, OUTPut:CH<n>:RELEase
<b>Syntax</b>	OUTPut:DEFine <Assigninfo> OUTPut:DEFine?
<b>Arguments</b>	<p>&lt;Assigninfo&gt; ::= &lt;blockheader&gt;&lt;Assign&gt; [&lt;LF&gt;&lt;Assign&gt;]  [&lt;LF&gt;&lt;Assign&gt;] ...                    arbitrary block data that defines the  channel assignments</p> <p>where,</p> <p>&lt;blockheader&gt; ::= &lt;byte count digit&gt;&lt;byte count&gt;</p> <p>&lt;Assign&gt; ::= &lt;AChannel&gt;, &lt;ABit&gt;</p> <p>The &lt;AChannel&gt; and &lt;ABit&gt; items are ASCII character strings that express the following information.</p> <p>&lt;AChannel&gt;    channel number (0 or 1) &lt;ABit&gt;        data bit number (0 or 1)</p> <p>&lt;LF&gt; ::= &lt;ASCII line feed code (10)&gt;</p>
<b>Responses</b>	[ :OUTPUT:DEFINE ] <Assigninfo> where <Assigninfo> is an arbitrary data block with the same format as the argument.
<b>Examples</b>	OUTPut:DEFine #170,1<LF>1,0 assigns the channels as follows when executed.
	Channel 0: Bit 1 Channel 1: Bit 0

## OUTPut:ELEVEl (?)

The OUTPut:ELEVEl command sets the event input threshold level. The OUTPut:ELEVEl? query returns the event input threshold level setting.

**Group** OUTPUT

**Related Commands** None

**Syntax** OUTPut:ELEVEl <Volt>  
OUTPut:ELEVEl?

**Arguments** <Volt>::=<NR2>[<Unit>]  
where <Unit>::={V | mV} with a range of -5.0 V to 5.0 V in 0.1 V steps.

**Responses** [OUTPUT:ELEVEL] <NR2>

**Examples** :OUTPUT:ELEVEL 500mV  
sets the event input threshold level to 500 mV.

**\*PSC (?)**

The \*PSC common command controls the automatic power-on clearing of the ESER (Event Status Enable Register), the SRER (Service Request Enable Register), and DESER (Device Event Status Enable Register). These registers are used in the status and event reporting system.

The \*PSC? common query returns status of the power-on status clear flag.

**Group** Other

**Related Commands** DESE, \*ESE, FACTory, \*SRE

**Syntax** \*PSC <Power-On Status Clear>  
\*PSC?

**Arguments** <Power-On Status Clear>::=<NR1>  
where <NR1> is a decimal integer that must range from -32767 to 32767, the value of which determines whether power on clearing occurs as follows:

Zero value sets the power-on status clear flag to FALSE. When this flag is set FALSE, the values of the DESER, the SESR, and the ESER are restored at power on. With these values restored, the instrument can assert SRQ after powering on.

Nonzero value sets the power-on status clear flag to TRUE. When this flag is set TRUE, all the bits in the DESER are set and are reset in the SESR and ESER. This action prevents the instrument from asserting any SRQs after powering on.

**Responses** 1 the power-on status clear flag is currently set to TRUE.  
0 the power-on status clear flag is currently set to FALSE.

**Examples** \*PSC 1  
sets the power-on status flag to TRUE.  
  
\*PSC?  
might return :0 to indicate that the power-on status clear flag is currently set to FALSE.



**\*RST**

The \*RST common command resets this data generator to the default state (default values are listed in Appendix D).

<b>Group</b>	Other
<b>Related Commands</b>	FACTory, SECURE
<b>Syntax</b>	*RST
<b>Arguments</b>	None
<b>Examples</b>	*RST resets the instrument.

**RUNNING?**

The RUNNING? query returns status that indicates whether or not pattern data (or a sequence) is being output.

<b>Group</b>	Other
<b>Related Commands</b>	START, STOP
<b>Syntax</b>	RUNNING?
<b>Arguments</b>	None
<b>Responses</b>	1     pattern data or a sequence is being output. 0     nothing is being output.
<b>Examples</b>	:RUNNING? might return :RUNNING 1.

## SOURce:EVENT:ENABLE (?)

The SOURce:EVENT:ENABLE command enables or disables the EVENT input  
The SOURce:EVENT:ENABLE? query returns whether or not the EVENT input is enabled.

<b>Group</b>	SOURCE
<b>Related Commands</b>	None
<b>Syntax</b>	SOURce:EVENT:ENABLE {ON   OFF   1   0} SOURce:EVENT:ENABLE?
<b>Arguments</b>	ON or 1 enables the EVENT input.  OFF or 0 disables the EVENT input.
<b>Responses</b>	[ :SOURCE:EVENT:ENABLE ] {1   0}
<b>Examples</b>	:SOURCE:EVENT:ENABLE ON enables the EVENT input.

## SOURce[:OSCillator]?

The SOURce[:OSCillator]? query returns all the settings states related to clock signals.

<b>Group</b>	SOURCE
<b>Related Commands</b>	SOURce:OSCillator:EXternal:FREQuency, SOURce:OSCillator[:INTernal]:FREQuency, SOURce:OSCillator:REFerence
<b>Syntax</b>	SOURce[:OSCillator]?
<b>Arguments</b>	None

<b>Responses</b>	<code>[ :SOURCE:OSCILLATOR:REFERENCE ] { INTERNAL   EXTERNAL }; [ EXTERNAL:FREQUENCY ] &lt;NR3&gt;HZ; [ :SOURCE:OSCILLATOR:INTERNAL:FREQUENCY ] &lt;NR3&gt;HZ;</code>
<b>Examples</b>	<code>:SOURCE:OSCillator? might return :SOURCE:OSCILLATOR:REFERENCE INTERNAL; EXTERNAL:FREQUENCY 1.000E+8HZ;:SOURCE:OSCILLATOR:INTERNAL :FREQUENCY 2.000E+8HZ</code>

## SOURCE:OSCillator:EXternal:FREQUENCY (?)

The `SOURCE:OSCillator:EXternal:FREQUENCY` command enters the frequency of the externally supplied clock signal. The `SOURCE:OSCillator:EXternal:FREQUENCY?` query returns the externally supplied clock signal frequency setting.

**Group** SOURCE

**Related Commands** `SOURCE[:OSCillator]?`, `SOURCE:OSCillator[:INTERNAL]:FREQUENCY`, `SOURCE:OSCillator:REFERENCE`

**Syntax** `SOURCE:OSCillator:EXternal:FREQUENCY <Frequency>  
SOURCE:OSCillator:EXternal:FREQUENCY?`

**Arguments** `<Frequency> ::= <NR3> [<Unit>]`  
where `<NR3>` is a decimal number that combines with `[<Unit>]` to have a range of 0.1 ~ 1.1 E+9 Hz, and `[<Unit>] ::= { Hz | kHz | MHz | GHz }`, for hertz, kilohertz, megahertz, or gigahertz.

**Responses** `[ :SOURCE:OSCILLATOR:EXTERNAL:FREQUENCY ] <NRf>HZ`

**Examples** `:SOURCE:OSCILLATOR:EXTERNAL:FREQUENCY 10.0MHZ`  
sets the external clock signal frequency input setting to 10 MHz.

## SOURce:OSCillator[:INTernal]:FREQUENCY (?)

The SOURce:OSCillator[:INTernal]:FREQUENCY command sets the frequency of the internal clock oscillator. The SOURce:OSCillator[:INTernal]:FREQUENCY? query returns the internal clock oscillator frequency setting.

<b>Group</b>	SOURCE
<b>Related Commands</b>	SOURce[:OSCillator]?, SOURce:OSCillator:EXTernal:FREQUENCY, SOURce:OSCillator:REFerence
<b>Syntax</b>	SOURce:OSCillator[:INTernal]:FREQUENCY <Frequency> SOURce:OSCillator[:INTernal]:FREQUENCY?
<b>Arguments</b>	<Frequency> ::= <NR3> [<Unit>] where <NR3> is a decimal number that combines with [<Unit>] to have a range of 1.0~1.1 E+9 Hz, and [<Unit>] ::= {Hz   kHz   MHz   GHz}, for hertz, kilohertz, megahertz, or gigahertz.
<b>Responses</b>	[ :SOURCE:OSCILLATOR:INTERNAL:FREQUENCY ] <Nrf>HZ
<b>Examples</b>	:SOURCE:OSCILLATOR:INTERNAL:FREQUENCY 1GHZ sets the internal clock oscillator frequency to 1 GHz.

## SOURce:OSCillator:REFerence (?)

The SOURce:OSCillator:REFerence command sets whether the internal clock oscillator or an external clock input signal is used as the clock signal source. The SOURce:OSCillator:REFerence? query returns whether the internal clock oscillator or an external clock input signal is used as the clock signal source.

<b>Group</b>	SOURCE
<b>Related Commands</b>	SOURce[:OSCillator]?, SOURce:OSCillator:EXTernal:FREQUENCY, SOURce:OSCillator[:INTernal]:FREQUENCY
<b>Syntax</b>	SOURce:OSCillator:REFerence {INTernal   EXTernal} SOURce:OSCillator:REFerence?

<b>Arguments</b>	<p>INTerna1 use the internal clock source.</p> <p>EXTerna1 use an external clock source connected to the external clock input.</p>
<b>Responses</b>	[ :SOURCE:OSCILLATOR:REFERENCE ] { INTERNAL   EXTERNAL }
<b>Examples</b>	<p>:SOURCE:OSCILLATOR:REFRENCE INTERNAL sets the internal clock oscillator to be used as the clock signal source.</p>

## \*SRE (?)

The \*SRE common command sets the bits of the SRER (Service Request Enable Register). The \*SRE? common query returns the contents of SRER.

The power-on default for the SRER is all bits reset if the power-on status flag is TRUE. If this flag is set to FALSE, the SRER maintains its value through a power cycle.

<b>Group</b>	Other
<b>Related Commands</b>	*CLS, DESE, *ESE, *ESR?, EVENT?, EVMsg?, EVQty?, *STB?
<b>Syntax</b>	<p>*SRE &lt;Bit Value&gt;</p> <p>*SRE?</p>
<b>Arguments</b>	<p>&lt;Bit Value&gt;::=&lt;NR1&gt;</p> <p>where the argument must be decimal number from 0 to 255. The SRER bits are set in binary bit according to the decimal number.</p>
<b>Examples</b>	<p>*SRE 48 sets the SRER to 48 (binary 00110000), which sets the ESB and MAV bits.</p> <p>*SRE? might return 32 which indicates that the SRER contains the binary number 00100000.</p>

## START

The START command sets the instrument to the start state. If the run mode is set to repeat or step, pattern data or sequence output starts. If the run mode is set to single, then the instrument goes to the trigger wait state.

<b>Group</b>	Other
<b>Related Commands</b>	RUNning?, STOP, *TRG
<b>Syntax</b>	START
<b>Arguments</b>	None
<b>Examples</b>	:START sets the instrument to the start state.

## \*STB?

The \*STB? common query returns the value of the SBR (Status Byte Register). Bit 6 of the SBR is read as a MSS (Master Status Summary) bit. Refer to the *Status and Events section*, for more details on the SBR.

<b>Group</b>	Other
<b>Related Commands</b>	*CLS, DESE, *ESE, *ESR, EVENT?, EVMsg?, EVQty?, *SRE
<b>Syntax</b>	*STB?
<b>Arguments</b>	None
<b>Responses</b>	<NR1> which is a decimal number.
<b>Examples</b>	*STB? might return 96, which indicates that the SBR contains the binary number 01100000.

## STOP

The STOP command stops pattern data or sequence output. If the run mode is set to single, the trigger wait state is cancelled.

<b>Group</b>	Other
<b>Related Commands</b>	RUNNing?, START, *TRG
<b>Syntax</b>	STOP
<b>Arguments</b>	None
<b>Examples</b>	:STOP stops pattern data or sequence output.

## SYSTem:DATE (?)

The SYSTem:DATE command sets the internal clock date. The SYSTem:DATE? query returns the internal clock date.

<b>Group</b>	SYSTEM
<b>Related Commands</b>	SYSTem:TIME
<b>Syntax</b>	SYSTem:DATE <Year>,<Month>,<Day> SYSTem:DATE?
<b>Arguments</b>	<Year>::=<NR1>                   the year (YYYY) <Month>::=<NR1>                   the month (MM) <Day>::=<NR1>                   the day (DD)
<b>Responses</b>	[ :SYSTEM:DATE] <Year>,<Month>,<Day>
<b>Examples</b>	:SYSTEM:DATE 1998,12,16 sets the date.

## SYSTem:PPAUse (?)

The SYSTem:PPAUse command sets whether or not the instrument goes to the operator key input wait state (power-up pause) when an error is detected by the power-up diagnostics or no output pod is connected. The SYSTem:PPAUse? query returns the power-up pause setting (on or off).

<b>Group</b>	SYSTEM
<b>Related Commands</b>	None
<b>Syntax</b>	SYSTem:PPAUse {ON   OFF   1   0} SYSTem:PPAUse?
<b>Arguments</b>	ON or 1 enables the power-up pause.  OFF or 0 disables the power-up pause.
<b>Responses</b>	[ :SYSTEM:PPAUSe? ] {1   0}
<b>Examples</b>	:SYSTEM:PPAUSe ON turns power-up pause on.

## SYSTem:SECurity:IMMediate

The SYSTem:SECurity:IMMediate command sets all internal settings to the factory setting state (the same state that results when the FACTory command is executed) and completely erases all data. Bit patterns, groups, blocks, and sequences are included in the erased data. The GPIB and RS-232-C settings, and the data and time settings are not reset.

<b>Group</b>	SYSTEM
<b>Related Commands</b>	FACTory, *RST
<b>Syntax</b>	SYSTem:SECurity:IMMediate



---

**Arguments** None

## **SYSTem:SECurity:STATe (?)**

The SYSTem:SECurity:STATe command sets security to on or off. The SYSTem:SECurity:STATe? query returns whether the security setting is on or off. When the security setting is changed from on to off, the contents of internal memory are completely erased. The security on/off setting is not changed by executing the FACTory command.

**Group** SYSTEM

**Related Commands** SYSTem:SECurity:IMMediate

**Syntax** SYSTem:SECurity:STATe {ON | OFF | 1 | 0}  
SYSTem:SECurity:STATe?

**Arguments** ON or 1  
sets the security state to on.  
  
OFF or 0  
sets the security state to off.

**Responses** [:SYSTEM:SECURITY:STATE] {1 | 0}

**Examples** :SYSTEM:SECURITY:STATE ON  
sets the security state to on.

## SYSTem:TIME (?)

The SYSTem:TIME command sets the internal clock time. The SYSTem:TIME? query returns the internal clock time.

<b>Group</b>	SYSTEM
<b>Related Commands</b>	SYSTem:DATE
<b>Syntax</b>	SYSTem:TIME <Hour>,<Minute>,<Second> SYSTem:TIME?
<b>Arguments</b>	<Hour>           the hours <Minute>         the minutes <Second>         the seconds
<b>Responses</b>	[ :SYSTem:TIME ] <Hour>,<Minute>,<Second>
<b>Examples</b>	:SYSTem:TIME 10, 10, 35 sets the time.

## \*TRG

The \*TRG common command generates trigger event.

<b>Group</b>	Other
<b>Related Commands</b>	RUNNing?, START, STOP
<b>Syntax</b>	*TRG
<b>Arguments</b>	None
<b>Examples</b>	*TRG generates trigger event.

## TRIGger?

The TRIGger? query returns all of the currently specified settings related to the trigger function.

**Group** TRIGGER

**Related Commands** TRIGger:IMPedance, TRIGger:LEVEl, TRIGger:SLOPe

**Syntax** TRIGger?

**Arguments** None

**Responses** [:TRIGGER:IMPEDANCE]{HIGH | LOW};[LEVEL]<NR2>  
[SLOPE]{POSITIVE | NEGATIVE};  
[SOURCE]{EXTERNAL | INTERNAL};  
[INTERVAL:TIME]<Time>;  
[STATE]{1 | 0}

**Examples** :TRIGGER?  
might return :TRIGGER:IMPEDANCE LOW;LEVEL 1.400;  
SLOPE POSITIVE;SOURCE INTERNAL;INTERVAL:TIME 1.0us;STATE 1

## TRIGger:IMPedance (?)

The TRIGger:IMPedance command selects high impedance (1 k $\Omega$ ) or low impedance (50  $\Omega$ ) for the external trigger input connector. The TRIGger:IMPedance? query returns currently selected impedance.

<b>Group</b>	TRIGGER
<b>Related Commands</b>	TRIGger:LEVel, TRIGger:SLOPe, TRIGger:SOURce
<b>Syntax</b>	TRIGger:IMPedance {HIGH   LOW} TRIGger:IMPedance?
<b>Arguments</b>	HIGH            selects high impedance: 1 k $\Omega$ LOW             selects low impedance: 50 $\Omega$
<b>Examples</b>	:TRIGGER:IMPEDANCE LOW selects low impedance.

## TRIGger:INTERVal?

The TRIGger:INTERVal? query returns the interval time and the state of the internal trigger

<b>Group</b>	TRIGGER
<b>Related Commands</b>	TRIGger:INTERVal:STATe, TRIGger:INTERVal:TIME
<b>Syntax</b>	TRIGger:INTERVal?
<b>Arguments</b>	None
<b>Responses</b>	[ :TRIGGER:INTERVAL:TIME ] <Time>; {STATE} {1   0}
<b>Examples</b>	:TRIGGER:INTERVAL? might returns :TRIGGER:INTERVAL:TIME 1.0MS;STATE 1

## TRIGger:INTERVal:STATe (?)

The TRIGger:INTERVal:STATe command sets the internal trigger to on or off.  
The TRIGger:INTERVal:STATe? query returns whether the internal trigger is on or off.

**Group** TRIGGER

**Related Commands** TRIGger:INTERVal?, TRIGger:INTERVal:TIME

**Syntax** TRIGger:INTERVal:STATe{ON | OFF | 0 | 1}  
TRIGger:INTERVal:STATe?

**Arguments** ON or 1 sets the internal trigger to on.  
OFF or 0 sets the internal trigger to off.

**Responses** [:TRIGGER:INTERVAL:STATE]{1 | 0}

**Examples** :TRIGGER:INTERVAL:STATE ON  
sets the internal trigger to on.

## TRIGger:INTERVal:TIME (?)

The TRIGger:INTERVal:TIME command sets the interval time for the internal trigger. The TRIGger:INTERVal:TIME? query returns the interval time for the internal trigger. This setting is available even if the trigger source setting is external.

<b>Group</b>	TRIGGER
<b>Related Commands</b>	TRIGger:INTERVal?, TRIGger:INTERVal:STATE
<b>Syntax</b>	TRIGger:INTERVal:TIME <Time> TRIGger:INTERVal:TIME?
<b>Arguments</b>	<Time>::=<NR2>[<Unit>] where <Unit>::={s ms us ns} with a range of 1.0 $\mu$ s to 10.0 s.
<b>Responses</b>	[:TRIGGER:INTERVAL:time] <NR3>
<b>Examples</b>	:TRIGGER:INTERVAL:TIME 1US sets the interval time to 1 $\mu$ s.

## TRIGger:LEVel (?)

The TRIGger:LEVel command sets the level on the external trigger at which the trigger event is generated. The TRIGger:LEVel? query returns the level currently set.

<b>Group</b>	TRIGGER
<b>Related Commands</b>	TRIGger:IMPedance, TRIGger:SLOPe, TRIGger:SOURce
<b>Syntax</b>	TRIGger:LEVel <Level> TRIGger:LEVel?
<b>Arguments</b>	<Level>::=<NR2>[<unit>] where <unit>::={V   mV} with a range of -5.0 V to 5.0 V, in 0.1 V steps.

**Examples**     :TRIGGER:LEVEL 200mV  
sets the level to 200 mV.

## TRIGger:SLOpe (?)

The TRIGger:SLOpe command selects the rising or falling edge of the external signal which generates the trigger event. The TRIGger:SLOpe? query returns status indicating which slope is currently selected.

**Group**        TRIGGER

**Related Commands**   TRIGger:IMPedance, TRIGger:LEVel, TRIGger:SOURce

**Syntax**        TRIGger:SLOpe {POSitive | NEGative}  
TRIGger:SLOpe?

**Arguments**     POSitive  
selects rising edge.  
  
NEGative  
selects falling edge.

**Examples**     :TRIGGER:SLOPE POSITIVE  
selects rising edge for trigger.

## TRIGger:SOURce(?)

The TRIGger:SOURce command selects internal or external for the trigger signal source. The TRIGger:SOURce? query returns currently selected trigger signal source.

**Group** TRIGGER

**Related Commands** TRIGger:IMPedance, TRIGger:LEVel, TRIGger:SLOPe

**Syntax** TRIGger:SOURce {EXternal | INTERNAL}  
TRIGger:SOURce?

**Arguments** EXternal  
selects external trigger.

INTERNAL  
selects internal trigger.

**Examples** :TRIGGER:SOURCE EXTERNAL  
selects external trigger.

## \*TST?

The \*TST? common query performs the self test and returns the results. If an error is detected during self test, execute stop immediately. This command takes up to 90 seconds to run the self test, and the data generator will not respond to any commands and queries while it runs.

**Group** Other

**Related Commands** DIAGnostic:RESUlt?, DIAGnostic:SElect, DIAGnostic:STATe

**Syntax** \*TST?

**Arguments** None



**Responses** <Result>  
 where <Result>::=<NR1> and <NR1> is one of following arguments.

0	Terminated without error.
100	Detected an error in the CPU unit.
200	Detected an error in the display unit.
300	Detected an error in the front panel unit.
400	Detected an error in the clock unit.
500	Detected an error in the trigger unit.
600	Detected an error in the sequence memory.
700	Detected an error in the pattern memory.

**Examples** \*TST?  
 might return 200 to indicate that errors were detected in the display unit.

---

**NOTE.** *Approximately 90 seconds are required to complete the self test. The DG2040 Data Generator will not respond to commands sent while the self test is running.*

---

## UNLock

The UNLock command enables all the front panel buttons and the knob. This command is equivalent to the command LOCK NONE.

**Group** Other

**Related Commands** LOCK

**Syntax** UNLOCK ALL

**Arguments** ALL  
 enables the front panel buttons and the knob.

**Examples** :UNLOCK ALL  
 enables the front panel buttons and the knob.

## UPTime?

The UPTime? query returns the time elapsed since the data generator was powered on.

<b>Group</b>	Other
<b>Related Commands</b>	None
<b>Syntax</b>	UPTime?
<b>Arguments</b>	None
<b>Examples</b>	:UPTIME 7.016 indicates the instrument has been powered on for 7.016 hours.

## VERBose (?)

The VERBose command selects the long headers or the short headers to be returned with response messages. Longer response headers enhance readability for other programmers; shorter response headers provide faster bus transfer speed.

<b>Group</b>	Other
<b>Related Commands</b>	HEADer
<b>Syntax</b>	VERBose {ON   OFF   <NR1>} VERBose?
<b>Arguments</b>	ON or nonzero value selects long response header.  OFF or zero value selects short response header.
<b>Responses</b>	Responses are decimal numbers (<NR1>) and are defined as follows.  1 Long header is currently selected. 0 Short header is currently selected.

**Examples**     :VERBOSE ON  
                  sets long header for query responses.

                  :VERBOSE?  
                  might return :VERBOSE 1, which indicates that the long response header is  
                  currently selected.

## **\*WAI**

The \*WAI common command prevents the data generator from executing any further commands or queries until all pending operations are completed.

**Group**        Other

**Related Commands**   \*OPC

**Syntax**        \*WAI

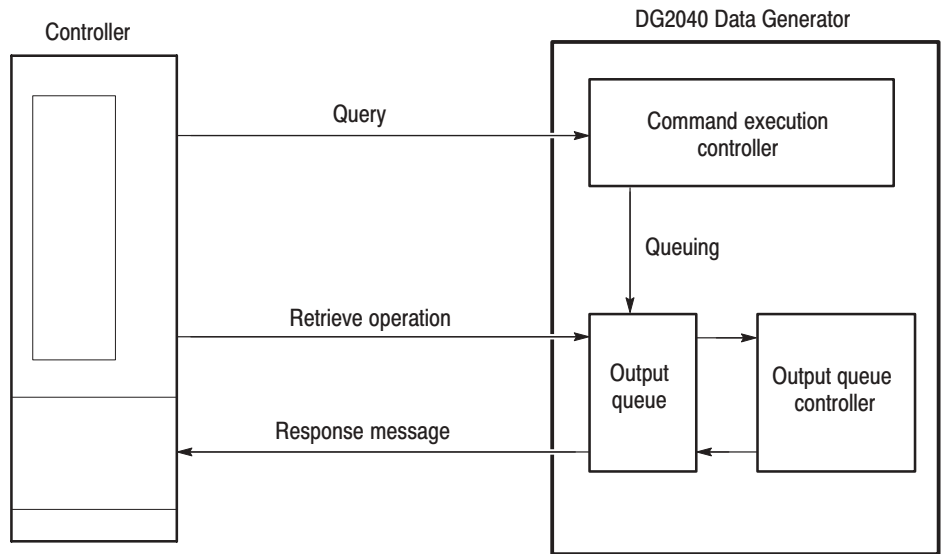
**Arguments**     None

**Examples**     \*WAI  
                  prevents the execution of any commands or queries until all pending operations  
                  complete.

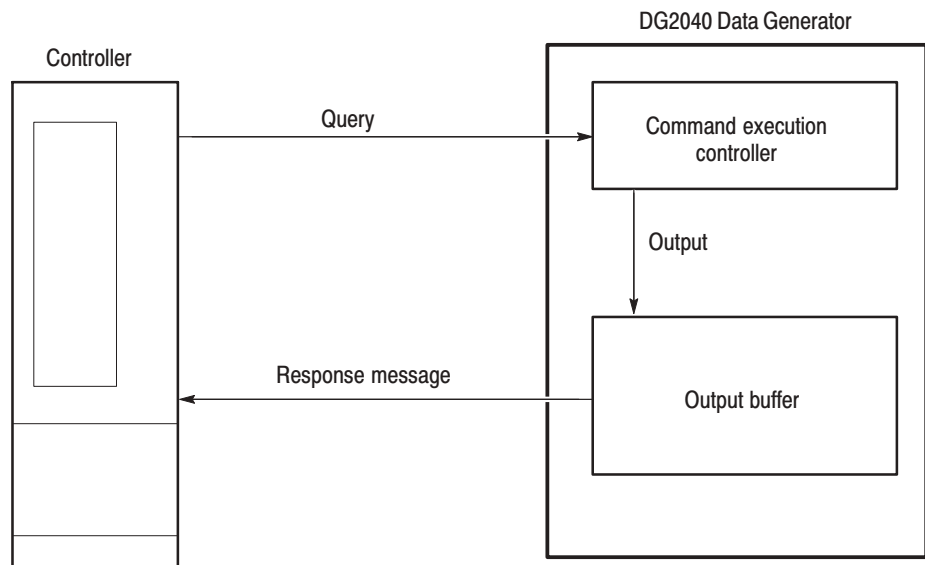


# Retrieving Response Messages

The method used for retrieving response messages differs depending on whether a GPIB interface or an RS-232-C interface is used. Figures 2-3 and 2-4 give an overview of these methods.



**Figure 2-3: GPIB: Retrieving Response Messages**



**Figure 2-4: RS-232-C: Retrieving Response Messages**

Figure 2-3 shows the response message retrieval operation when a GPIB interface is used. When a query command is sent from the external controller the data generator puts the response message for the query on the output queue. This response message cannot be retrieved unless the user performs a retrieval operation through the external controller.

If there is a response message queued in the output queue and another query command is sent from the external controller before a retrieval operation for the earlier message is performed, the data generator will delete the queued response message and put the response message for the more recently sent query command in the output queue.

The SBR (status byte register) MAV bit can be used to check the response message queuing state. See Section 3 *Status and Events*, for more information on the output queue, SBR, and control methods.

Figure 2-4 shows the response message retrieval operation when an RS-232-C interface is used. When a query command is sent from the external controller, the data generator immediately sends the response message to the external controller through an output buffer. As a result, when either a dumb terminal or a terminal emulator program running on a PC is used as the external controller, the response message will be displayed on the CRT immediately after the query command is typed in.

Unlike the GPIB interface, if an RS-232-C interface is used, response messages will never be deleted even if query commands are sent one after another.

# Status and Events

This section describes how the DG2040 Data Generator reports its status and internal events for both the GPIB and RS-232-C interfaces. It describes the elements that comprise the status and events reporting system and explains how status and events are handled.

The status and event reporting system reports certain significant events that occur within the data generator. It is made up of five registers plus two queues. Four of the registers and one of the queues are compatible with IEEE Std 488.2-1987; the other register and queue are specific to Tektronix.

## Registers

The registers fall into two functional groups:

- The status registers store information about the status of the DG2040 Data Generator. The status registers include the Standard Event Status Register (SESR) and the Status Byte Register (SBR).
- The enable registers determine whether certain events are reported to the Status Registers and the Event Queue. They include the Device Event Status Enable Register (DESER), the Event Status Enable Register (ESER), and the Service Request Enable Register (SRER).

### Status Registers

The Standard Event Status Register (SESR) and the Status Byte Register (SBR) record certain types of events that may occur while the data generator is in use. IEEE Std 488.2-1987 defines these registers.

Each bit in a Status Register records a particular type of event, such as an execution error or service request. When an event of a given type occurs, the data generator sets the bit that represents that type of event to a value of one. (You can disable bits so that they ignore events and remain at zero. See the *Enable Registers* section on page 3-4.) Reading the status registers tells you what types of events have occurred.

**The Standard Event Status Register (SESR).** The SESR, shown in Figure 3-1, records eight types of events that can occur within the data generator. Use the \*ESR? query to read the SESR register. Reading the register clears the bits of the register, so that the register can accumulate information about new events.

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

**Figure 3-1: The Standard Event Status (SESR)**

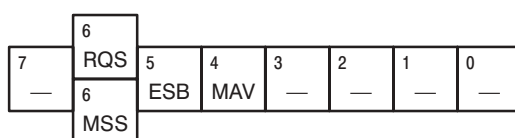
**Table 3-1: SESR bit functions**

Bit	Function
7 (MSB)	<b>PON</b> (Power On). Indicates that the data generator was powered on.
6	<b>URQ</b> (User Request). Indicates an event occurred and because of that event the data generator needs attention from the operator.
5	<b>CME</b> (Command Error). Indicates that an error occurred while the data generator was parsing a command or query. Command error messages are listed in Table 3-5 on page 3-10.
4	<p><b>EXE</b> (Execution Error). Indicates that an error occurred while the data generator was executing a command or query. An execution error occurs for either of the following reasons:</p> <ul style="list-style-type: none"> <li>■ A value designated for the argument is out of the range allowed by the data generator, is not valid for the command, or is incorrect in some other sense.</li> <li>■ Execution took place improperly under conditions different from those which should have been requested.</li> </ul> <p>Execution error messages are listed in Table 3-6 on page 3-12.</p>
3	<b>DDE</b> (Device Dependent Error). Indicates that a device-specific error occurred. Device error messages are listed in Table 3-7 on page 3-14.
2	<p><b>QYE</b> (Query Error). Indicates that an error occurred upon attempting to read the output queue. Such an error occurs for one of the following two reasons.</p> <ul style="list-style-type: none"> <li>■ An attempt was made to retrieve a message from the output queue even through it is empty or pending.</li> <li>■ Output queue message was cleared while it was being retrieved from the output queue.</li> </ul>
1	<b>RQC</b> (Request Control).The data generator does not use this bit. Request Control (RQC) is used to show that an instrument has requested to transfer bus control back to the controller. (This is the usage prescribed by the IEEE Std. 488.1.)
0 (LSB)	<b>OPC</b> (Operation Complete). Indicates that the operation is complete. This bit is set when all pending operations complete following a *OPC command.



**The Status Byte Register (SBR).** Shown in Figure 3-2, this register records whether output is available in the Output Queue, whether the data generator requests service, and whether the SESR has recorded any events.

Use a Serial Poll or the \*STB? query to read the contents of the SBR. The bits in the SBR are set and cleared depending on the contents of the SESR, the Event Status Enable Register (ESER), and the Output Queue. When you use a Serial Poll to obtain the SBR, bit 6 is the RQS bit. When you use the \*STB? query to obtain the SBR, bit 6 is the MSS bit. Reading the SBR does not clear the bits, including the MSS bit.



**Figure 3-2: The Status Byte Register (SBR)**

**Table 3-2: SBR bit functions**

Bit	Function
7 (MSB)	Not used. (Must be set to zero for data generator operation.)
6	The <b>RQS</b> (Request Service) bit, when obtained from a serial poll. Shows that the data generator requests service from the GPIB controller (that is, the SRQ line is asserted on the GPIB). This bit is cleared when the serial poll completes.
6	The <b>MSS</b> (Master Status Summary) bit, when obtained from *STB? query. Summarizes the ESB and MAV bits in the SBR. (In other words, that status is present and enabled in the SESR or a message is available at the Output Queue or both.)
5	The <b>ESB</b> (Event Status Bit). Shows that status is enabled and present in the SESR. <sup>1</sup>
4	The <b>MAV</b> (Message Available) bit . Shows that output is available in the Output Queue.
3 – 0	Not used. (Must be set to zero for data generator operation.)

<sup>1</sup> **When operating over the RS-232-C interface, you can read the contents of the SBR using the \*STB? query. However, this bit (ESB) is the only SBR bit of any significance to RS-232-C operation.**

### Enable Registers

You use the DESER (Device Event Status Enable Register), the ESER (Event Status Enable Register), and the SRER (Service Request Enable Register) to select which events are reported to the Status Registers and the Event Queue. Each of these Enable Registers acts as a filter to a Status Register (the DESER also acts as a filter to the Event Queue) and can allow or prevent information from being recorded in the register or queue.

Each bit in an Enable Register corresponds to a bit in the Status Register it controls. In order for an event to be reported to its bit in the Status Register, the corresponding bit in the Enable Register must be set to one. If the bit in the Enable Register is set to zero, the event is not recorded.

Various commands set the bits in the Enable Registers. The Enable Registers and the commands used to set them are described below.

**The Device Event Status Enable Register (DESER).** Shown in Figure 3-3. This register controls which events of those shown are reported to the SESR and the Event Queue. The bits in the DESER correspond to those in the SESR, as was described earlier.

Use the DESE command to enable and disable the bits in the DESER. Use the DESE? query to read the DESER.

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

**Figure 3-3: The Device Event Status Enable Register (DESER)**

**The Event Status Enable Register (ESER).** Shown in Figure 3-4, this controls which events of those shown are allowed to be summarized by the Event Status Bit (ESB) in the SBR.

Use the \*ESE command to set the bits in the ESER. And use the \*ESE? query to read.

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

**Figure 3-4: The Event Status Enable Register (ESER)**

**The Service Request Enable Register (SRER).** controls which bits in the SBR generate a Service Request and are summarized by the Master Status Summary (MSS) bit. See Figure 3-5.

Use the \*SRE command to set the SRER. Use the \*SRE? query to read it. The RQS bit remains set to one until either the Status Byte Register is read with a Serial Poll or the MSS bit changes back to a zero.

7	6	5	4	3	2	1	0
—	—	ESB	MAV	—	—	—	—

**Figure 3-5: The Service Request Enable Register (SRER)**

## Queues

The status and event reporting system contains two queues, the Event Queue and the Output Queue. The Event Queue which is used when operating with either the GPIB and RS-232-C interface, while the Output Queue is used only when operating over the GPIB interface. (Instead of using an output queue, an output buffer buffers query-response messages for immediate transfer to the data transmission line for RS-232-C operation.)

### Output Queue

The Output Queue is a FIFO (First In First Out) queue that hold response messages until they are requested. When a message is put in the queue, the MAV bit of the Status Byte Register (SBR) is set.

The Output Queue empties each time the data generator receives a new command or query. Therefore the controller must read the output queue before it sends the next command or query command or it will lose responses to earlier queries. If a command or query command is given without taking it out, an error results and the Output Queue is emptied.

### Event Queue

The Event Queue is a FIFO queue which can hold up to 20 data generator-generated events. When the number of events exceeds 20, the 20th event is replaced by the event code 350, “Queue overflow”.

To read out from the Event Queue, do the following steps:

1. Send \*ESR? To read out the contents of SESR. When the contents of SESR are read out, SESR is cleared allowing you to take out events from the Event Queue.

2. Send one of the following queries:
  - ALLEv? To read out and returns all events made available by \*ESR?. Returns both the event code and message text.
  - EVENT? To read out and return the oldest event of those made available by \*ESR?. Returns only the event code.
  - EVMsg? To read out and return the oldest event of those made available by \*ESR?. Returns both the event code and message text.

Reading the SESR erases any events that were made available by previous \*ESR? reads, but that were not read from the Event Queue. Events that occur after an \*ESR? read are put in the Event Queue but are not available until \*ESR? is used again.

## Processing Sequence

Figure 3-6 shows the status and event processing flow.

To process a sequence, do the following steps:

1. An event occurs, which causes the DESR to be checked. Based on the state of the DESR, the following actions occur:
  - If the control bit for that event is set in the DESER, the SESR bit that corresponds to this event becomes set to 1.
  - The set control bit lets the event be placed into the Event Queue. Placing the event in the Event Queue sets the MAV bit in the SBR to one.
  - If the control bit for that event is also set in the ESER, the ESB bit of SBR becomes set also.
2. When either bit of SBR has been set to 1 and the corresponding control bit of SRER is also set, the MSS bit of SBR becomes set and a service request is generated for use with GPIB interface operation.

As noted earlier, the RS-232-C interface does not use the output queue; therefore, the MAV bit would not become set in the sequence just described. Rather, response messages are sent to the output buffer for immediate transfer to the external controller on the output line. Message transfer is automatic and it is not necessary to use commands to retrieve these messages.

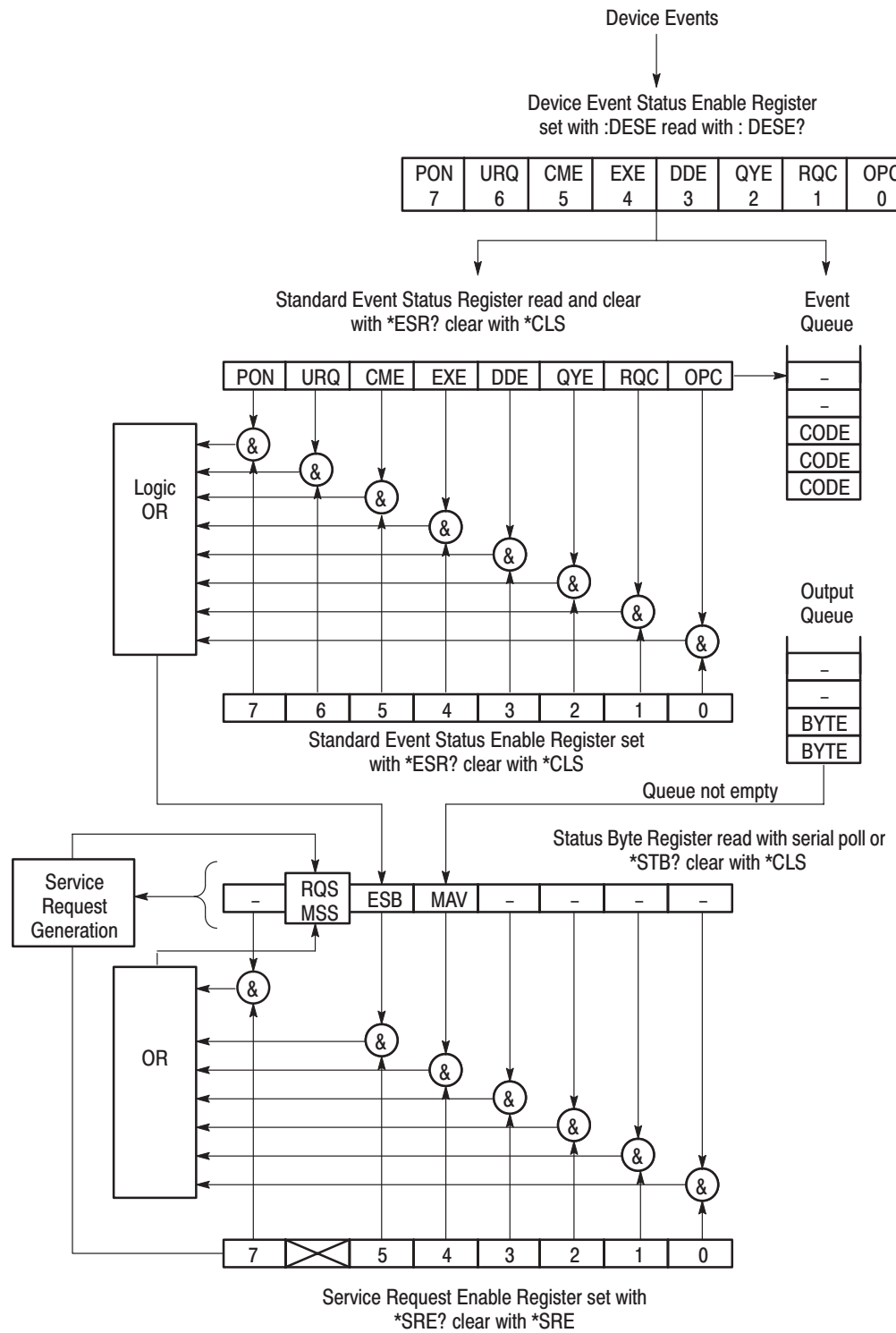


Figure 3-6: Status and event handling process overview



# Messages

Tables 3-3 through 3-11 list the status and event messages used in the GPIB/RS-232-C status and event reporting system. You use the \*ESR? query to make the messages available for dequeuing; you use the :EVENT?, EVMsg?, and ALLEv? queries to dequeue and return the messages. The messages return as follows:

- The :EVENT? query command returns the event code only. When using these query commands, use the \*ESR? query to make the events available for return.
- The EVMsg?, and ALLEv? queries return both the event code and event message in the following format:

<event code>, “<event message ; secondary message>”

Most messages returned have both an event message, followed by a semicolon (;), and a second message which contains more detailed information. Although these secondary messages are not listed in this manual, you can use the EVMsg? and ALLEv? queries to display them.

Table 3-3 lists the definition of event codes.

**Table 3-3: Definition of event codes**

Event class	Event code ranges	Descriptions
No Events	0-1	No event nor status
Reserved	2-99	(unused)
Command Errors	100-199	Command errors
Execution Errors	200-299	Command execution errors
Device-Specific Errors	300-399	Internal device errors (Hardware errors)
Query Errors	400-499	System event and query errors
Execution Warnings	500-599	Execution warnings
Reserved	600-1999	(unused)
Extended Execution Errors	2000-2999	Device dependent command execution errors
Extended Device-Specific Errors	3000-3999	Device dependent device errors
Reserved	4000-	(unused)

Table 3-4 lists the message when the system has no events nor status to report. These have no associated SESR bits.

**Table 3-4: Normal condition**

Code	Description
0	No events to report — queue empty
1	No events to report — new events pending *ESR?

Table 3-5 lists the error messages generated due to improper command syntax. Check that the command is properly formed and that it follows the syntax.

**Table 3-5: Command errors (CME Bit:5)**

Code	Description
100	Command error
101	Invalid character
102	Syntax error
103	Invalid separator
104	Data type error
105	GET not allowed
106	Invalid program data separator
108	Parameter not allowed
109	Missing parameter
110	Command header error
111	Header separator error
112	Program mnemonic too long
113	Undefined header
114	Header suffix out of range
118	Query not allowed
120	Numeric data error
121	Invalid character in number
123	Exponent too large
124	Too many digits
128	Numeric data not allowed
130	Suffix error
131	Invalid suffix



**Table 3-5: Command errors (CME Bit:5) (Cont.)**

<b>Code</b>	<b>Description</b>
134	Suffix too long
138	Suffix not allowed
140	Character data error
141	Invalid character data
144	Character data too long
148	Character data not allowed
150	String data error
151	Invalid string data
152	String data too long
158	String data not allowed
160	Block data error
161	Invalid block data
168	Block data not allowed
170	Expression error
171	Invalid expression
178	Expression data not allowed
180	Macro error
181	Invalid outside macro definition
183	Invalid inside macro definition
184	Macro parameter error

Table 3-6 lists the execution errors that are detected during execution of a command.

**Table 3-6: Execution errors (EXE Bit:4)**

<b>Code</b>	<b>Description</b>
200	Execution error
201	Invalid while in local
202	Settings lost due to RTL
203	Command protected
210	Trigger error
211	Trigger ignored
212	Armed ignored
213	Init ignored
214	Trigger deadlock
215	ARM deadlock
220	Parameter error
221	Settings conflict
222	Data out of range
223	Too much data
224	Illegal parameter value
225	Parameter under range
226	Parameter over range
227	Parameter rounded
230	Data corrupt or stale
231	Data questionable
240	Hardware error
241	Hardware missing
250	Mass storage error
251	Missing mass storage
252	Missing media
253	Corrupt media
254	Media full
255	Directory full
256	File name not found
257	File name error

**Table 3-6: Execution errors (EXE Bit:4) (Cont.)**

<b>Code</b>	<b>Description</b>
258	Media protected
260	Expression error
261	Math error in expression
262	Expression syntax error
263	Expression execution error
270	Macro error
271	Macro syntax
272	Macro execution error
273	Illegal macro label
274	Macro parameter error
275	Macro definition too long
276	Macro recursion error
277	Macro redefinition not allowed
278	Macro header not found
280	Program error
281	Cannot create program
282	Illegal program name
283	Illegal variable name
284	Program currently running
285	Program syntax error
286	Program run time error

Table 3-7 lists the internal errors that can occur during operation of the data generator. These errors may indicate that the data generator needs repair.

**Table 3-7: Internal device errors (DDE Bit:3)**

Code	Description
300	Device-specific error
310	System error
311	Memory error
312	PUD memory lost
313	Calibration memory lost
314	Save/recall memory lost
315	Configuration memory lost
330	Self-test failed
350	Queue overflow (does not affect the DDE bit)

Table 3-8 lists the system event messages. These messages are generated whenever certain system conditions occur.

**Table 3-8: System event and query errors**

Code	Description
401	Power on
402	Operation complete
403	User request
404	Power fail
405	Request control
410	Query INTERRUPTED
420	Query UNTERMINATED
430	Query DEADLOCKED
440	Query UNTERMINATED after indefinite response

Table 3-9 lists warning messages that do not interrupt the flow of command execution. These messages warn you that you may get unexpected results.

**Table 3-9: Warnings (EXE Bit:4)**

Code	Description
500	Execution warning

Table 3-10 lists status messages that are specific to the data generator. These messages appear when a operation starts, ends, or is in process. These messages have no associated SESR bit.

**Table 3-10: Device-dependent command execution errors**

Code	Description
2000	File error
2001	Directory not empty
2002	Too many files
2003	File locked
2004	File already exists
2005	File already opened
2006	Invalid file type
2007	File type mismatch
2008	Internal memory full
2009	Invalid file format
2010	Comment error
2012	Invalid data in comment string
2020	Pattern data error
2021	To much pattern data
2022	Pattern data byte count error
2023	Pattern data load error
2024	Internal pattern memory full
2025	Invalid pattern size
2026	Invalid pattern data
2030	Sequence error
2032	Too much sequence data
2033	Invalid sequence repeat count

**Table 3-10: Device-dependent command execution errors (Cont.)**

<b>Code</b>	<b>Description</b>
2034	Invalid sequence syntax
2035	Sequence load error
2036	Internal sequence memory full
2037	No sequence
2038	Invalid sequence number
2039	Sequence incomplete
2040	Data error
2041	Invalid data syntax
2042	Invalid data value
2050	Time error
2051	Invalid time syntax
2052	Invalid time value
2060	Invalid group name
2061	Group name is empty
2062	Same name already exists
2063	Too much group
2064	Group name not found
2065	Group number is not found
2066	Invalid group data
2067	Invalid group syntax
2070	Invalid block position
2071	To much block
2072	Block already exists
2073	Block is not found
2074	Illegal block name
2075	Illegal block size
2076	Block name already exists
2077	Block is not defined
2078	Too much block data
2079	Invalid block syntax
2080	Import error
2081	Code table syntax error
2082	Too much table data

**Table 3-10: Device-dependent command execution errors (Cont.)**

<b>Code</b>	<b>Description</b>
2100	Hardcopy error
2101	Hardcopy busy
2102	Hardcopy timeout error
2103	Subsequence error
2132	Too much subsequence data
2133	Invalid subsequence repeat count
2134	Invalid subsequence syntax
2135	Subsequence load error
2136	Internal subsequence memory full
2137	No subsequence
2138	Subsequence line is not found
2139	Subsequence incomplete
2140	Too many subsequence
2141	Subsequence name error
2200	Message error

Table 3-11 lists device error messages that are specific to the device.

**Table 3-11: Extended device specific errors**

<b>Code</b>	<b>Description</b>
3001	RS-232-C input buffer overflow
3002	Internal divider error
3003	Internal EEPROM init error
3004	Internal EEPROM write error
3005	Internal EEPROM read error
3006	Internal FPGA configuration error



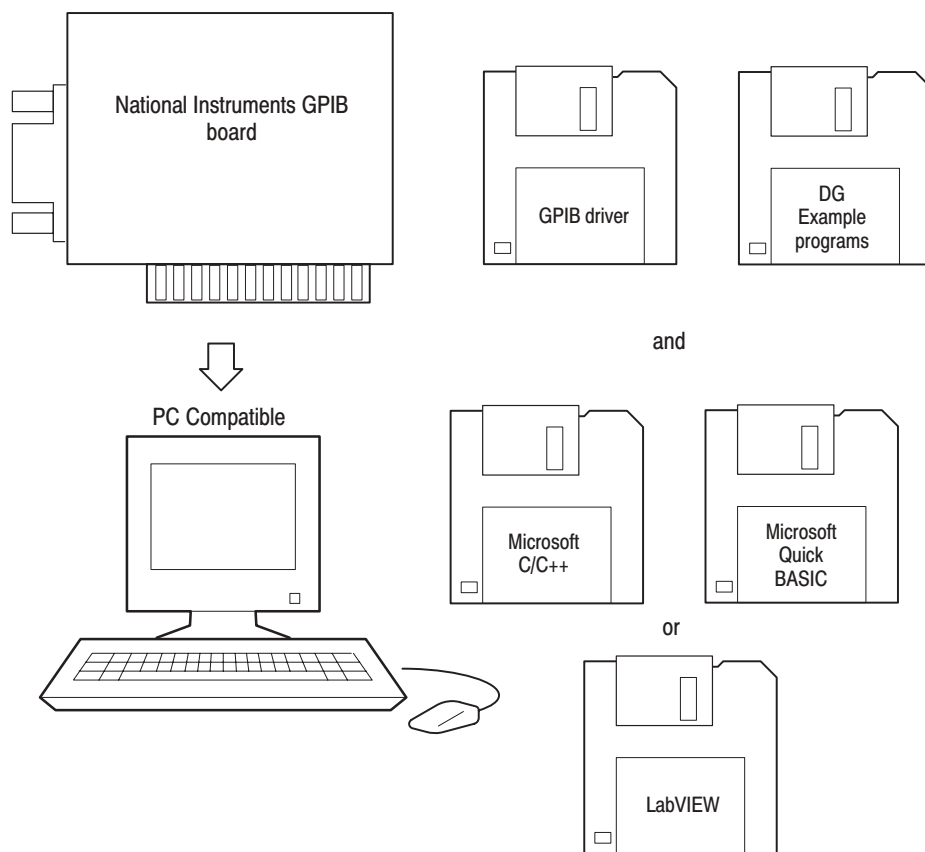


# Programming Examples

The example programs illustrate methods you can use to control the data generator from the GPIB interface. The floppy disk supplied with the data generator contains a listing for these programs written in Microsoft C/C++ and Quick BASIC. The programs will also work with National Instruments LabVIEW.

The diskette also contains the file *README.TXT*. Refer to the file for details about how to run the programs.

The programs run on a PC-compatible system equipped with a National Instruments GPIB board and associated drivers.



**Figure 4-1: Equipment needed to run the example programs**



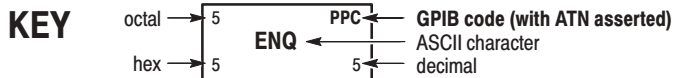
# Appendix A: Character Charts

Table A-1: The DG2040 Character Set

	0	1	2	3	4	5	6	7
<b>0</b>	<b>NUL</b> 0		<b>space</b> 32	<b>0</b> 48	<b>@</b> 64	<b>P</b> 80	<b>'</b> 96	<b>p</b> 112
<b>1</b>		<b>Ω</b> 17	<b>!</b> 33	<b>1</b> 49	<b>A</b> 65	<b>Q</b> 81	<b>a</b> 97	<b>q</b> 113
<b>2</b>		<b>Δ</b> 18	<b>”</b> 34	<b>2</b> 50	<b>B</b> 66	<b>R</b> 82	<b>b</b> 98	<b>r</b> 114
<b>3</b>			<b>#</b> 35	<b>3</b> 51	<b>C</b> 67	<b>S</b> 83	<b>c</b> 99	<b>s</b> 115
<b>4</b>			<b>\$</b> 36	<b>4</b> 52	<b>D</b> 68	<b>T</b> 84	<b>d</b> 100	<b>t</b> 116
<b>5</b>			<b>%</b> 37	<b>5</b> 53	<b>E</b> 69	<b>U</b> 85	<b>e</b> 101	<b>u</b> 117
<b>6</b>		<b>μ</b> 22	<b>&amp;</b> 38	<b>6</b> 54	<b>F</b> 70	<b>V</b> 86	<b>f</b> 102	<b>v</b> 118
<b>7</b>	<b>'</b> 7		<b>,</b> 39	<b>7</b> 55	<b>G</b> 71	<b>W</b> 87	<b>g</b> 103	<b>w</b> 119
<b>8</b>		<b>—</b> 24	<b>(</b> 40	<b>8</b> 56	<b>H</b> 72	<b>X</b> 88	<b>h</b> 104	<b>x</b> 120
<b>9</b>	<b>HT</b> 9	<b>—</b> 25	<b>)</b> 41	<b>9</b> 57	<b>I</b> 73	<b>Y</b> 89	<b>i</b> 105	<b>y</b> 121
<b>A</b>	<b>LF</b> 10	<b>∞</b> 26	<b>*</b> 42	<b>:</b> 58	<b>J</b> 74	<b>Z</b> 90	<b>j</b> 106	<b>z</b> 122
<b>B</b>		<b>ESC</b> 27	<b>+</b> 43	<b>;</b> 59	<b>K</b> 75	<b>[</b> 91	<b>k</b> 107	<b>{</b> 123
<b>C</b>	<b>±</b> 12		<b>,</b> 44	<b>&lt;</b> 60	<b>L</b> 76	<b>\</b> 92	<b>l</b> 108	<b> </b> 124
<b>D</b>	<b>CR</b> 13	<b>≠</b> 29	<b>—</b> 45	<b>=</b> 61	<b>M</b> 77	<b>]</b> 93	<b>m</b> 109	<b>}</b> 125
<b>E</b>		<b>~</b> 30	<b>.</b> 46	<b>&gt;</b> 62	<b>N</b> 78	<b>^</b> 94	<b>n</b> 110	<b>~</b> 126
<b>F</b>	<b>•</b> 15		<b>/</b> 47	<b>?</b> 63	<b>O</b> 79	<b>-</b> 95	<b>o</b> 111	<b>rubout</b> 127

**Table A-2: ASCII & GPIB Code Chart**

B7 B6 BITS B4 B3 B2 B1	0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
	CONTROL				NUMBERS SYMBOLS				UPPER CASE				LOWER CASE			
0 0 0 0	0 0	NUL	20 10	DLE	40 20	SP	60 30	LA16 0	100 40	TA0 @	120 50	TA16 P	140 60	SA0 ,	160 70	SA16 p
0 0 0 1	1 1	GTL SOH	21 11	LL0 DC1	41 21	LA1 !	61 31	LA17 1	101 41	TA1 A	121 51	TA17 Q	141 61	SA1 a	161 71	SA17 q
0 0 1 0	2 2	STX	22 12	DC2	42 22	LA2 "	62 32	LA18 2	102 42	TA2 B	122 52	TA18 R	142 62	SA2 b	162 72	SA18 r
0 0 1 1	3 3	ETX	23 13	DC3	43 23	LA3 #	63 33	LA19 3	103 43	TA3 C	123 53	TA19 S	143 63	SA3 c	163 73	SA19 s
0 1 0 0	4 4	SDC EOT	24 14	DCL DC4	44 24	LA4 \$	64 34	LA20 4	104 44	TA4 D	124 54	TA20 T	144 64	SA4 d	164 74	SA20 t
0 1 0 1	5 5	PPC ENQ	25 15	PPU NAK	45 25	LA5 %	65 35	LA21 5	105 45	TA5 E	125 55	TA21 U	145 65	SA5 e	165 75	SA21 u
0 1 1 0	6 6	ACK	26 16	SYN	46 26	LA6 &	66 36	LA22 6	106 46	TA6 F	126 56	TA22 V	146 66	SA6 f	166 76	SA22 v
0 1 1 1	7 7	BEL	27 17	ETB	47 27	LA7 '	67 37	LA23 7	107 47	TA7 G	127 57	TA23 W	147 67	SA7 g	167 77	SA23 w
1 0 0 0	10 8	GET BS	30 18	SPE CAN	50 28	LA8 (	70 38	LA24 8	110 48	TA8 H	130 58	TA24 X	150 68	SA8 h	170 78	SA24 x
1 0 0 1	11 9	TCT HT	31 19	SPD EM	51 29	LA9 )	71 39	LA25 9	111 49	TA9 I	131 59	TA25 Y	151 69	SA9 i	171 79	SA25 y
1 0 1 0	12 A	LF	32 1A	SUB	52 2A	LA10 *	72 3A	LA26 :	112 4A	TA10 J	132 5A	TA26 Z	152 6A	SA10 j	172 7A	SA26 z
1 0 1 1	13 B	VT	33 1B	ESC	53 2B	LA11 +	73 3B	LA27 ;	113 4B	TA11 K	133 5B	TA27 [	153 6B	SA11 k	173 7B	SA27 {
1 1 0 0	14 C	FF	34 1C	FS	54 2C	LA12 ,	74 3C	LA28 <	114 4C	TA12 L	134 5C	TA28 \	154 6C	SA12 l	174 7C	SA28 
1 1 0 1	15 D	CR	35 1D	GS	55 2D	LA13 -	75 3D	LA29 =	115 4D	TA13 M	135 5D	TA29 ]	155 6D	SA13 m	175 7D	SA29 }
1 1 1 0	16 E	SO	36 1E	RS	56 2E	LA14 .	76 3E	LA30 >	116 4E	TA14 N	136 5E	TA30 ^	156 6E	SA14 n	176 7E	SA30 ~
1 1 1 1	17 F	SI	37 1F	US	57 2F	LA15 /	77 3F	UNL ?	117 4F	TA15 O	137 5F	UNT -	157 6F	SA15 o	177 7F	RUBOUT (DEL)
		ADDRESSED COMMANDS		UNIVERSAL COMMANDS		LISTEN ADDRESSES				TALK ADDRESSES				SECONDARY ADDRESSES OR COMMANDS		



**Tektronix**  
 REF: ANSI STD X3.4-1977  
 IEEE STD 488.1-1987  
 ISO STD 646-2973

## Appendix B: Reserved Words

The words in the following list are reserved words for use with the DG2040 Data Generator.

*CLS	DATE	ID	REPeat
*ESE	POSITIOn	IMMediate	RESUlt
*ESR	DEBUg	IMPedance	RUNNING
*IDN	DEFine	INITialize	SAVE
*OPC	DELAy	INTernal	SECurity
*PSC	DELeTe	INTERVal	SElect
*RST	DESE	LEVel	SEquence
*SRE	DIAG	LOAD	SIZE
*STB	DIMmer	LOCK	SLOpe
*TRG	DISPlay	LOOP	SNOop
*TST	EDGE	LOW	SOURce
*WAI	ELEVel	MDIRectory	STARt
ABORt	ENABle	MENU	STATe
ABSTouch	EVENT	MMEMemory	STOP
ADD	EVJ	MODE	SUBSequence
ALL	EVJTO	MSIZE	SYSTEM
ALLEv	EVMsg	NAME	TEXT
ASSIGN	EVQty	ORDER	TIME
BIT	EXTernal	OSCillator	TRIGger
BLOCK	FACTory	OUTPut	TWAIT
BRIGHTness	FORMat	PATtern	UNLock
CATalog	FREE	PORT	UPDate
CDIRectory	FREQuency	PPAUse	UPTime
CH<n>	GROUp	RANge	VALid
CLEAR	HCOPY	REFerence	VERBose
CLOCK	HEADer	RELEase	WINDow
COPY	HIGH	REName	WORD



# Appendix C: Interface Specification

This appendix lists and describes the GPIB functions and messages that the DG2040 Data Generator implements.

## Interface Functions

Table C–1 shows which GPIB interface functions are implemented in this instrument. Following the table is a brief description of each function.

**Table C–1: GPIB interface function implementation**

Interface function	Implemented subset	Capability
Acceptor Handshake (AH)	AH1	Complete
Source Handshake (SH)	SH1	Complete
Listener (L)	L4	Basic Listener Unaddress if my talk address (MTA) No talk only mode
Talker (T)	T5	Basic Talker, Serial Poll Unaddress if my-listen-address (MLA)
Device Clear (DC)	DC1	Complete
Remote/Local (RL)	RL1	Complete
Service Request (SR)	SR1	Complete
Parallel Poll (PP)	PP0	None
Device Trigger (DT)	DT1	Complete
Controller (C)	C0	None
Electrical Interface	E2	Three-state driver

- Acceptor Handshake (AH). Allows a listening device to help coordinate the the proper reception of data. The AH function holds off initiation or termination of a data transfer until the listening device is ready to receive the next data byte.
- Source Handshake (SH). Allows a talking device to help coordinate the proper transfer of data. The SH function controls the initiation and termination of the transfer of data bytes.

- Listener (L). Allows a device to receive device-dependent data over the interface. This capability exists only when the device is addressed to listen. This function uses a one-byte address.
- Talker (T). Allows a device to send device-dependent data over the interface. This capability exists only when the device is addressed to talk. The function uses a one-byte address.
- Device Clear (DC). Allows a device to be cleared or initialized, either individually or as part of a group of devices.
- Remote/Local (RL). Allows a device to select between two sources for operating control. This function determines whether input information from the front panel controls (local) or GPIB commands (remote) control the data generator.
- Service Request (SR). Allows a device to request service from the controller.
- Controller (C). Allows a device with the capability to send the device address, universal commands, and addressed commands to other device over the interface to do so.
- Electrical Interface (E) Identifies the type of the electrical interface. The notation E1 indicates the electrical interface uses open collector drivers, while E2 indicates the electrical interface uses three-state drivers.

## Interface Messages

Table C-2 lists the GPIB Universal and Addressed commands that the DG2040 Data Generator implements. A brief description of each function follows the table.

**Table C-2: GPIB interface messages**

Interface message	Implemented
Device Clear (DC)	Yes
Local Lockout (LLO)	Yes
Serial Poll Disable (SPD)	Yes
Serial Poll Enable (SPE)	Yes
Parallel Poll Unconfigure (PPU)	No
Go To Local (GTL)	Yes
Selected Device Clear (SDC)	Yes
Group Execute Trigger (GET)	Yes



**Table C-2: GPIB interface messages (Cont.)**

<b>Interface message</b>	<b>Implemented</b>
Take Control (TCT)	No
Parallel Poll Configure (PPC)	No

- Device Clear (DCL). Clears (initializes) all devices on the bus that have a device clear function, whether the controller has addressed them or not.
- Local Lockout (LLO). Disables the return to local function.
- Serial Poll Enable (SPE). Puts all devices on the bus, that have a service request function, into the serial poll enabled state. In this state, each device sends the controller its status byte, instead of the its normal output, after the device receives its talk address on the data lines. This function may be used to determine which device sent a service request.
- Serial Poll Disable (SPD). Changes all devices on the bus from the serial poll state to the normal operating state.
- Go To Local (GTL). Causes the listen-addressed device to switch from remote to local (front-panel) control.
- Select Device Clear (SDC). Clears or initializes all listen-addressed devices.
- Group Execute Trigger (GET). Triggers all applicable devices and causes them to initiate their programmed actions.
- Take Control (TCT). Allows controller in charge to pass control of the bus to another controller on the bus.
- Parallel Poll Configure (PPC). Causes the listen-addressed device to respond to the secondary commands Parallel Poll Enable (PPE) and Parallel Poll Disable (PPD), which are placed on the bus following the PPC command. PPE enables a device with parallel poll capability to respond on a particular data line. PPD disables the device from responding to the parallel poll.



# Appendix D: Factory Initialization Settings

The following table lists the commands affected by a factory initialization and their factory initialization settings.

**Table D-1: Factory initialized settings**

Header	Default settings
<b>DATA commands</b>	
DATA:MSIZE	1000
<b>DEBUG commands</b>	
DEBUg:SNOOp:DELAy:TIME	0.2
DEBUg:SNOOp:STATe	0
<b>DIAGNOSTIC commands</b>	
DIAG:SElect	ALL
<b>DISPLAY commands</b>	
DISPlay:BRIGHtness	0.7
DISPlay:CLOCK	0
DISPlay:DIMmer	0
DISPlay:ENABle	1
DISPlay:MENU[:NAME]	EDIT
DISPlay:MENU:STATe	1
<b>EDGE commands</b>	
EDGE:STATe	0
EDGE:POSITIOn	0.00 [ps]
<b>HARDCOPY commands</b>	
HCOPY:FORMat	BMP
HCOPY:PORT	DISK
<b>MEMORY commands</b>	
MMEMory:CATalog:ORDer	NAME1
<b>MODE commands</b>	
MODE:STATe	REPEAT
MODE:UPDate	AUTO

**Table D-1: Factory initialized settings (Cont.)**

<b>Header</b>	<b>Default settings</b>
<b>OUTPUT commands</b>	
OUTPut:ELEVel	1.4 [V]
OUTPut:CH<n>:DELAy	0.0 [ns]
OUTPut:CH<n>:HIGH	1.5 [V]
OUTPut:CH<n>:LOW	0.0 [V]
OUTPut:CHCLK:HIGH	1.5 [V]
OUTPut:CHCLK:LOW	0.0 [V]
<b>SOURCE commands</b>	
SOURce:OSCillator:EXTernal:FREQuency	1.0E+8 [Hz]
SOURce:OSCillator[:INTernal]:FRE- Quency	1.0E+8 [Hz]
SOURce:OSCillator:REFerence	INTERNAL
<b>SYSTEM commands</b>	
SYSTem:PPAUSe	1
SYSTem:SECurity:STATe	0
<b>TRIGGER commands</b>	
TRIGger:IMPedance	HIGH
TRIGger:INTERVal:STATe	OFF
TRIGger:INTERVal:TIME	10.0 [s]
TRIGger:LEVel	1.4 [V]
TRIGger:SLOPe	POSITIVE
TRIGger:SOURce	EXTERNAL
<b>Other commands</b>	
DESE	256
*ESE	0
HEADer	1
LOCK	NONE
*PSC	1
*SRE	0
VERBoSe	1

# Glossary

## **ASCII**

Acronym for the American Standard Code for Information Interchange. Controllers transmit commands to the instrument using ASCII character encoding.

## **Address**

A 7-bit code that identifies an instrument on the communication bus. The instrument must have a unique address for the controller to recognize and transmit commands to it.

## **BNF (Backus-Naur Form)**

A standard notation system for command syntax diagrams. The syntax diagrams in this manual use BNF notation.

## **Controller**

A computer or other device that sends commands to and accepts responses from the digitizing oscilloscope.

## **EOI**

A mnemonic referring to the control line “End or Identify” on the GPIB interface bus. One of the two possible end-of-message terminators.

## **EOM**

A generic acronym referring to the end-of-message terminator. The end-of-message terminator can be either an EOI or the ASCII code for line feed (LF).

## **GPIB**

Acronym for General Purpose Interface Bus, the common name for the communications interface system defined in IEEE Std 488.

## **IEEE**

Acronym for the Institute for Electrical and Electronic Engineers.

## **QuickC**

A computer language (distributed by Microsoft) that is based on C.



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