

# SCPI Command Reference Volume 1

## Agilent Technologies E4428C/38C ESG Signal Generators

This guide applies to the following signal generator models:

**E4428C ESG Analog Signal Generator**

**E4438C ESG Vector Signal Generator**

Due to our continuing efforts to improve our products through firmware and hardware revisions, signal generator design and operation may vary from descriptions in this guide. We recommend that you use the latest revision of this guide to ensure you have up-to-date product information. Compare the print date of this guide (see bottom of page) with the latest revision, which can be downloaded from the following website:

*<http://www.agilent.com/find/esg>*



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---

# 1 SCPI Basics

This chapter describes how SCPI information is organized and presented in this guide. An overview of the SCPI language is also provided. This Chapter contains the following major sections:

- [“Command Reference Information” on page 2](#)
- [“SCPI Basics” on page 3](#)

---

## Command Reference Information

### SCPI Command Listings

The Table of Contents lists the Standard Commands for Programmable Instruments (SCPI) without the parameters. The SCPI subsystem name will generally have the first part of the command in parenthesis that is repeated in all commands within the subsystem. The title(s) beneath the subsystem name is the remaining command syntax. The following example demonstrates this listing:

```
Communication Subsystem (:SYSTem:COMMunicate)
:PMETer:CHANnel
:SERial:ECHO
```

The following examples show the complete commands from the above Table of Contents listing:

```
:SYSTem:COMMunicate:PMETer:CHANnel
:SYSTem:COMMunicate:SERial:ECHO
```

### Key and Data Field Cross Reference

The index is set up so applicable key and data field names can be cross-referenced to the appropriate SCPI command. There are two headings in the index where the key and data field names can be found:

- individual softkey, hardkey, or data field name
- subsystem name

### Supported Field

Within each command section, the Supported heading describes which signal generator configurations are supported by the SCPI command. When “All Models” is shown next to this heading, all signal generator configurations are supported by the SCPI command. When “All with Option xxx” is shown next to this heading, only the stated option(s) is supported.

---

## SCPI Basics

This section describes the general use of the SCPI language for the ESG. It is not intended to teach you everything about the SCPI language; the SCPI Consortium or IEEE can provide that level of detailed information. For a list of the specific commands available for the signal generator, refer to the table of contents.

For additional information, refer to the following publications:

- IEEE Standard 488.1-1987, IEEE Standard Digital Interface for Programmable Instrumentation. New York, NY, 1998.
- IEEE Standard 488.2-1992, IEEE Standard Codes, Formats, Protocols and Command Commands for Use with ANSI/IEEE Standard 488.1-1987. New York, NY, 1998.

### Common Terms

The following terms are used throughout the remainder of this section:

Command	A command is an instruction in SCPI consisting of mnemonics (keywords), parameters (arguments), and punctuation. You combine commands to form messages that control instruments.
Controller	A controller is any device used to control the signal generator, for example a computer or another instrument.
Event Command	Some commands are events and cannot be queried. An event has no corresponding setting; it initiates an action at a particular time.
Program Message	A program message is a combination of one or more properly formatted commands. Program messages are sent by the controller to the signal generator.
Query	A query is a special type of command used to instruct the signal generator to make response data available to the controller. A query ends with a question mark. Generally you can query any command value that you set.
Response Message	A response message is a collection of data in specific SCPI formats sent from the signal generator to the controller. Response messages tell the controller about the internal state of the signal generator.

## Command Syntax

A typical command is made up of keywords prefixed with colons (:). The keywords are followed by parameters. The following is an example syntax statement:

```
[ :SOURCE ] :POWER [ :LEVEL ] MAXimum|MINimum
```

In the example above, the [ :LEVEL ] portion of the command immediately follows the :POWER portion with no separating space. The portion following the [ :LEVEL ], MINimum|MAXimum, are the parameters (argument for the command statement). There is a separating space (white space) between the command and its parameter.

Additional conventions in syntax statements are shown in [Table 1-1](#) and [Table 1-2](#).

**Table 1-1 Special Characters in Command Syntax**

Characters	Meaning	Example
	A vertical stroke between keywords or parameters indicates alternative choices. For parameters, the effect of the command varies depending on the choice.	[ :SOURCE ] :AM: MOD DEEP NORMAl DEEP or NORMAl are the choices.
[ ]	Square brackets indicate that the enclosed keywords or parameters are optional when composing the command. These implied keywords or parameters will be executed even if they are omitted.	[ :SOURCE ] :FREQUENCY [ :CW ] ? SOURCE and CW are optional items.
< >	Angle brackets around a word (or words) indicate they are not to be used literally in the command. They represent the needed item.	[ :SOURCE ] :FREQUENCY: START <val><unit>  In this command, the words <val> and <unit> should be replaced by the actual frequency and unit.  :FREQUENCY:START 2.5GHZ
{ }	Braces indicate that parameters can optionally be used in the command once, several times, or not at all.	[ :SOURCE ] :LIST: POWER <val>{ , <val> }  a single power listing: LIST:POWER 5 a series of power listings: LIST:POWER 5,10,15,20

**Table 1-2 Command Syntax**

Characters, Keywords, and Syntax	Example
Upper-case lettering indicates the minimum set of characters required to execute the command.	[:SOURCE] :FREQuency [:CW] ?, FREQ is the minimum requirement.
Lower-case lettering indicates the portion of the command that is optional; it can either be included with the upper-case portion of the command or omitted. This is the flexible format principle called forgiving listening. Refer to <a href="#">“Command Parameters and Responses” on page 7</a> for more information.	:FREQuency Either :FREQ, :FREQuency, or :FREQUENCY is correct.
When a colon is placed between two command mnemonics, it moves the current path down one level in the command tree. Refer to <a href="#">“Command Tree” on page 6</a> more information on command paths.	:TRIGger:OUTPut:POLarity? TRIGger is the root level keyword for this command.
If a command requires more than one parameter, you must separate adjacent parameters using a comma. Parameters are not part of the command path, so commas do not affect the path level.	[:SOURCE] :LIST: DWELl <val>{,<val>}
A semicolon separates two commands in the same program message without changing the current path.	:FREQ 2.5GHZ;:POW 10DBM
White space characters, such as <tab> and <space>, are generally ignored as long as they do not occur within or between keywords.  However, you must use white space to separate the command from the parameter, but this does not affect the current path.	:FREQ uency or :POWER :LEVel are not allowed.  A <space> between :LEVel and 6.2 is mandatory.  :POWER:LEVel 6.2

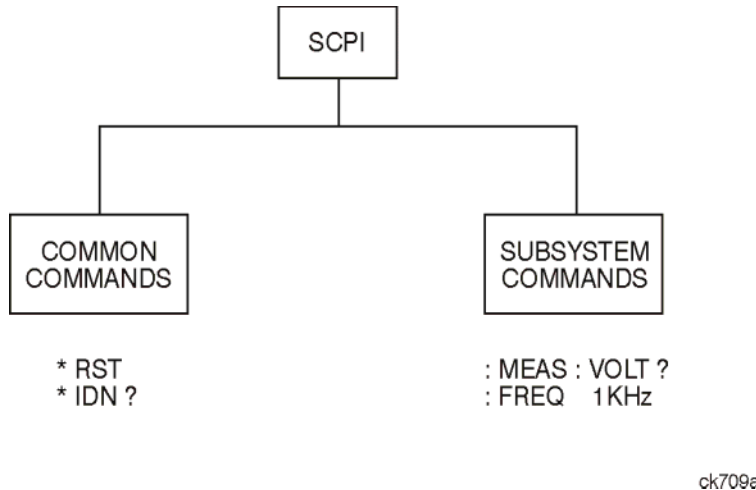
## Command Types

Commands can be separated into two groups: common commands and subsystem commands. [Figure 1-1](#), shows the separation of the two command groups.

Common commands are used to manage macros, status registers, synchronization, and data storage and are defined by IEEE 488.2. They are easy to recognize because they all begin with an asterisk. For example \*IDN?, \*OPC, and \*RST are common commands. Common commands are not part of any subsystem and the signal generator interprets them in the same way, regardless of the current path setting.

Subsystem commands are distinguished by the colon (:). The colon is used at the beginning of a command statement and between keywords, as in :FREQuency [:CW?]. Each command subsystem is a set of commands that roughly correspond to a functional block inside the signal generator. For example, the power subsystem (:POWeR) contains commands for power generation, while the status subsystem (:STATus) contains commands for controlling status registers.

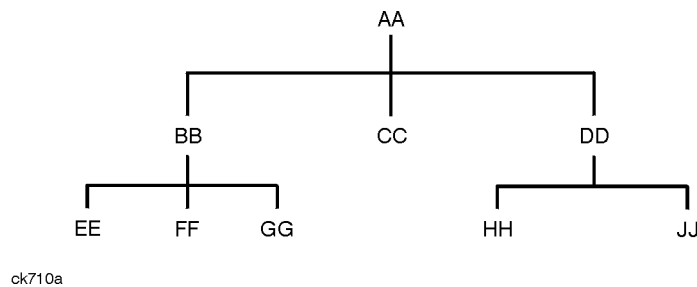
Figure 1-1 Command Types



## Command Tree

Most programming tasks involve subsystem commands. SCPI uses a structure for subsystem commands similar to the file systems on most computers. In SCPI, this command structure is called a command tree and is shown in Figure 1-2.

Figure 1-2 Simplified Command Tree



The command closest to the top is the root command, or simply “the root.” Notice that you must follow a particular path to reach lower level commands. In the following example, :POWeR represents AA, :ALC

represents BB, :SOURCE represents GG. The complete command path is :POWER:ALC:SOURCE? (:AA:BB:GG).

### Paths Through the Command Tree

To access commands from different paths in the command tree, you must understand how the signal generator interprets commands. The parser, a part of the signal generator firmware, decodes each message sent to the signal generator. The parser breaks up the message into component commands using a set of rules to determine the command tree path used. The parser keeps track of the current path (the level in the command tree) and where it expects to find the next command statement. This is important because the same keyword may appear in different paths. The particular path is determined by the keyword(s) in the command statement.

A message terminator, such as a <new line> character, sets the current path to the root. Many programming languages have output statements that automatically send message terminators.

---

**NOTE** The current path is set to the root after the line-power is cycled or when \*RST is sent.

---

### Command Parameters and Responses

SCPI defines different data formats for use in program and response messages. It does this to accommodate the principle of forgiving listening and precise talking. For more information on program data types refer to IEEE 488.2.

Forgiving listening means the command and parameter formats are flexible.

For example, with the :FREQUENCY:REFERENCE:STATE ON|OFF|1|0 command, the signal generator accepts :FREQUENCY:REFERENCE:STATE ON, :FREQUENCY:REFERENCE:STATE 1, :FREQ:REF:STAT ON, :FREQ:REF:STAT 1 to turn on the frequency reference mode.

Each parameter type has one or more corresponding response data types. A setting that you program using a numeric parameter returns either real or integer response data when queried. Response data (data returned to the controller) is more concise and restricted, and is called precise talking.

Precise talking means that the response format for a particular query is always the same.

For example, if you query the power state (:POWER:ALC:STATE?) when it is on, the response is always 1, regardless of whether you previously sent :POWER:ALC:STATE 1 or :POWER:ALC:STATE ON. [Table 1-3](#) shows the response for a given parameter type.

**Table 1-3                      Parameter and Response Types**

<b>Parameter Types</b>	<b>Response Data Types</b>
Numeric	Real, Integer
Extended Numeric	Real, Integer
Discrete	Discrete
Boolean	Numeric Boolean
String	String

**Numeric Parameters**

Numeric parameters are used in both common and subsystem commands. They accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation.

If a signal generator setting is programmed with a numeric parameter which can only assume a finite value, it automatically rounds any entered parameter which is greater or less than the finite value. For example, if a signal generator has a programmable output impedance of 50 or 75 ohms, and you specified 76.1 for the output impedance, the value is rounded to 75. The following are examples of numeric parameters:

- 100                                      no decimal point required
- 100.                                      fractional digits optional
- 1.23                                      leading signs allowed
- 4.56E<space>3                              space allowed after the E in exponential
- 7.89E-001                              use either E or e in exponential
- +256                                      leading + allowed
- .5    digits left of decimal point optional

**Extended Numeric Parameters**

Most subsystems use extended numeric parameters to specify physical quantities. Extended numeric parameters accept all numeric parameter values and other special values as well.

The following are examples of extended numeric parameters:



100	any simple numeric value
1.2GHZ	GHZ can be used for exponential (E009)
200MHZ	MHZ can be used for exponential (E006)
-100mV	negative 100 millivolts
10DEG	10 degrees

Extended numeric parameters also include the following special parameters:

DEfault	resets the parameter to its default value
UP	increments the parameter
DOWN	decrements the parameter
MINimum	sets the parameter to the smallest possible value
MAXimum	sets the parameter to the largest possible value

### Discrete Parameters

Discrete parameters use mnemonics to represent each valid setting. They have a long and a short form, just like command mnemonics. You can mix upper and lower case letters for discrete parameters.

The following examples of discrete parameters are used with the command  
:TRIGger[:SEQUence]:SOURce BUS|IMMediate|EXTernal.

BUS	GPIB, LAN, or RS-232 triggering
IMMediate	immediate trigger (free run)
EXTernal	external triggering

Although discrete parameters look like command keywords, do not confuse the two. In particular, be sure to use colons and spaces properly. Use a colon to separate command mnemonics from each other and a space to separate parameters from command mnemonics.

The following are examples of discrete parameters in commands:

```
TRIGger:SOURce BUS
TRIGger:SOURce IMMediate
TRIGger:SOURce EXTernal
```

### Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. The two-state boolean parameter has four arguments. The following list shows the arguments for the two-state boolean parameter:

ON	boolean true, upper/lower case allowed
OFF	boolean false, upper/lower case allowed
1	boolean true
0	boolean false

### String Parameters

String parameters allow ASCII strings to be sent as parameters. Single or double quotes are used as delimiters.

The following are examples of string parameters:

```
'This is valid'  
"This is also valid"  
'SO IS THIS'
```

### Real Response Data

Real response data represent decimal numbers in either fixed decimal or scientific notation. Most high-level programming languages that support signal generator input/output (I/O) handle either decimal or scientific notation transparently.

The following are examples of real response data:

```
+4.000000E+010, -9.990000E+002  
-9.990000E+002  
+4.000000000000000E+010  
+1  
0
```

### Integer Response Data

Integer response data are decimal representations of integer values including optional signs. Most status register related queries return integer response data.

The following are examples of integer response data:

0	signs are optional
+100	leading + allowed
-100	leading – allowed
256	never any decimal point

### Discrete Response Data

Discrete response data are similar to discrete parameters. The main difference is that discrete response data only returns the short form of a particular mnemonic, in all upper case letters.

The following are examples of discrete response data:

```

IMM
EXT
INT
NEG
  
```

### Numeric Boolean Response Data

Boolean response data returns a binary numeric value of one or zero.

### String Response Data

String response data are similar to string parameters. The main difference is that string response data returns double quotes, rather than single quotes. Embedded double quotes may be present in string response data. Embedded quotes appear as two adjacent double quotes with no characters between them.

The following are examples of string response data:

```

"This is a string"
"one double quote inside brackets: [""]"
>Hello!"
  
```

## Program Messages

The following commands will be used to demonstrate the creation of program messages:

```
[ :SOURce ] :FREQuency:START      [ :SOURce ] :FREQuency:STOP  
[ :SOURce ] :FREQuency[:CW]      [ :SOURce ] :POWer [ :LEVeL ] :OFFSet
```

### Example 1

```
:FREQuency:START 500MHZ;STOP 1000MHZ
```

This program message is correct and will not cause errors; `START` and `STOP` are at the same path level. It is equivalent to sending the following message:

```
FREQuency:START 500MHZ;FREQuency:STOP 1000MHZ
```

### Example 2

```
:POWer 10DBM;:OFFSet 5DB
```

This program message will result in an error. The message makes use of the default `POWER[:LEVeL]` node (root command). When using a default node, there is no change to the current path position. Since there is no command `OFFSet` at the root level, an error results.

The following example shows the correct syntax for this program message:

```
:POWer 10DBM;:POWer:OFFSet 5DB
```

### Example 3

```
:POWer:OFFSet 5DB;POWer 10DBM
```

This program message results in a command error. The path is dropped one level at each colon. The first half of the message drops the command path to the lower level command `OFFSet`; `POWer` does not exist at this level.

The `POWER 10DBM` command is missing the leading colon and when sent, it causes confusion because the signal generator cannot find `POWER` at the `POWER:OFFSet` level. By adding the leading colon, the current path is reset to the root. The following shows the correct program message:

```
:POWer:OFFSet 5DB;:POWer 10DBM
```

### Example 4

```
FREQ 500MHZ;POW 4DBM
```

In this example, the keyword short form is used. The program message is correct because it utilizes the default nodes of `:FREQ[:CW]` and `:POW[:LEVeL]`. Since default nodes do not affect the current path, it is not necessary to use a leading colon before `FREQ` or `POW`.

## File Name Variables

File name variables designate a data file and file path. File name variables are used in the SCPI command syntax whenever files are accessed. The name of the file is always required, but the file path can sometimes be optional or be designated using different formats. The following table shows these different file path formats:

Format	File Name Variable	Example
Format 1	"<file name>"	"Test_Data"
Format 2	"<file name@msus>"	"Test_Data@SEQ"
Format 3	"<msus:file name>"	"SEQ:Test_Data"
Format 4	"</user/directory/file name>"	"/USER/SEQ/Test_Data"

Formats 2–4 offer programming flexibility and are equivalent. Format 1 can only be used with SCPI commands that imply the path name as part of the command syntax. Typically, SCPI load commands that access user-data files do not need to have a file path designated.

See [Table 1-4 on page 14](#) for information on file types and directories.

---

**NOTE** The maximum length for a file name is 23 characters, excluding the file path.

---

### Example Using Format 1

```
:CORR:FLAT:LOAD "FLAT_DATA"
```

The preceding example loads user-flatness data from a file called `FLAT_DATA` located in the `USERFLAT` directory. No file path is needed as the command syntax implies the directory where the file is located.

### Example Using Format 2

```
:MEM:COPY "IQ_DATA@NVWFM", "Test_DATA@WFM1"
```

The preceding example copies a file named `IQ_DATA` located in the `WAVEFORM` directory to a file named `Test_DATA` in volatile waveform memory (`WFM1`).

### Example Using Format 3

```
:MEM:COPY "NVWFM:IQ_DATA", "WFM1:Test_DATA"
```

The preceding example copies a file named `IQ_DATA` located in the `WAVEFORM` directory to a file named `Test_DATA` in volatile waveform memory (`WFM1`).

### Example Using Format 4

```
:MEM:COPY "/USER/WAVEFORM/IQ_DATA", "/USER/BBG1/WAVEFORM/IQ_DATA"
```

The preceding example copies a file named IQ\_DATA located in the WAVEFORM directory to a file named IQ\_DATA in volatile waveform memory (WFM1).

The following examples show commands, with different formats, that can be used to download a waveform file named Test\_Data into the signal generator's volatile waveform memory (WFM1):

#### Command Syntax Format 3

```
:MEMory:DATA "WFM1:Test_Data", #ABC
```

#### Command Syntax Format 4

```
:MEMory:DATA "/USER/BBG1/WAVEFORM/Test_Data", #ABC
```

These commands are equivalent. The data block, #ABC, is described as follows:

- # This character indicates the beginning of the data block
- A Number of digits in the byte count B
- B Byte count in C
- C Waveform data

Refer to “:DATA” on page 105 and the *E4428C/38C ESG Signal Generators Programming Guide* for more information on data blocks and downloading waveform data.

## File Types and Directory Structure

The signal generator uses a computer directory model structure for file storage. The top level directory is called the USER directory. All other directories are subdirectories located under the USER directory. Each subdirectory is dedicated to the type of data stored. For example, the FIR directory is used to store finite impulse filter (FIR) coefficient data whereas the MARKERS directory is used to store marker data.

The following table lists signal generator the subdirectories and file paths where file types are stored.

**Table 1-4 File Types and Directory Structures**

File System	File Type	File Path	MSUS Path
BINARY <sup>a</sup>	BIN	/USER/BIN	BINARY. <sup>b</sup>
BIT <sup>a</sup>	BIT	/USER/BIT	BIT:

**Table 1-4 File Types and Directory Structures**

File System	File Type	File Path	MSUS Path
CDMA <sup>ab</sup>	CDMA	/USER/CDMA	CDMA:
DMOD - ARB digital modulation file <sup>a</sup>	DMOD	/USER/DMOD	DMOD:
DWCDMA - ARB downlink W-CDMA file <sup>a</sup>	DWCD	/USER/DWCDMA	DWCDMA:
FCDMA - ARB forward link cdma2000 file <sup>a</sup>	FCDM	/USER/FCDMA	FCDMA:
FIR - finite impulse response filter file	FIR	/USER/FIR	FIR:
FSK - frequency shift keying modulation file <sup>a</sup>	FSK	/USER/FSK	FSK:
HDR1 - volatile arbitrary waveform header file <sup>a</sup>	HDR1	/USER/BBG1/HEADER	HDR1:
I/Q - modulation file <sup>a</sup>	IQ	/USER/IQ	IQ:
LIST - sweep list file	LIST	/USER/LIST	LIST:
MCDMA - ARB multicarrier CDMA file <sup>a</sup>	MCMD	/USER/MCDMA	MCDMA:
MDMOD - ARB multicarrier digital modulation file <sup>a</sup>	MDM	/USER/MDMOD	MDMOD:
MDWCDMA - ARB multicarrier downlink W-CDMA file <sup>a</sup>	MDWC	/USER/MDWCDMA	MDWCDMA:
MFCDMA - ARB multicarrier forward link cdma2000 file <sup>a</sup>	MFCD	/USER/MFCDMA	MFCDMA:
MKR1 - volatile arbitrary waveform marker file <sup>a</sup>	MKR1	/USER/BBG1/MARKERS	MKR1:
MTONE - ARB multitone file <sup>a</sup>	MTON	/USER/MTONE	MTONE:
NVHDR - non-volatile arbitrary waveform header file <sup>a</sup>	NVHDR	/USER/HEADER	NVHDR:
NVMKR - non-volatile arbitrary waveform marker file <sup>a</sup>	NVMKR	/USER/MARKERS	NVMKR:

**Table 1-4 File Types and Directory Structures**

File System	File Type	File Path	MSUS Path
NVWFM - non-volatile arbitrary waveform file <sup>a</sup>	NVWFM	/USER/WAVEFORM	NVWFM:
RCDMA - ARB reverse link cdma2000 file <sup>a</sup>	RCDM	/USER/RCDM	RCDM:
SEQ - ARB sequence file <sup>a</sup>	SEQ	/USER/SEQ	SEQ:
SHAPE - burst shape file <sup>a</sup>	SHAP	/USER/SHAPE	SHAPE:
STATE	STAT	/USER/STATE	STATE:
USERFLAT - user-flatness file	UFLT	/USER/USERFLAT	USERFLAT:
UWCDMA - ARB uplink W-CDMA file <sup>a</sup>	UWCD	/USER/UWCDMA	UWCDMA:
WFM1 - waveform file <sup>a</sup>	WFM1	/USER/BBG1/WAVEFORM	WFM1:

- a. This feature does not apply to the E4428C.
- b. This msus designator is optional.

## MSUS (Mass Storage Unit Specifier) Variable

The variable "<msus>" enables a command to be file type specific when working with user files. Some commands use it as the only command parameter, while others can use it in conjunction with a file name when a command is not file type specific. When used with a file name, it is similar to Format 2 in the “[File Name Variables](#)” section on [page 13](#). The difference is the file type specifier (msus) occupies its own variable and is not part of the file name syntax.

The following examples illustrate the usage of the variable "<msus>" when it is the only command parameter:

*Command Syntax with the msus variable*

```
:MMEMory:CATalog? "<msus>"
```

*Command Syntax with the file system*

```
:MMEMory:CATalog? "LIST:"
```

The variable "<msus>" is replaced with "LIST:". When the command is executed, the output displays only the files from the List file system.



The following examples illustrate the usage of the variable "<file name>" with the variable "<msus>":

*Command Syntax with the file name and msus variables*

```
:MMEMory:DELEte[:NAME] "<file name>", ["<msus>"]
```

*Command Syntax with the file name and file system*

```
:MMEMory:DELEte:NAME "LIST_1", "LIST:"
```

The command from the above example cannot discern which file system LIST\_1 belongs to without a file system specifier and will not work without it. When the command is properly executed, LIST\_1 is deleted from the List file system.

The following example shows the same command, but using Format 2 from the “File Name Variables” section on [page 13](#):

```
:MMEMory:DELEte:NAME "LIST_1@LIST"
```

When a file name is a parameter for a command that is not file system specific, either format ("<file name>","<msus>" or "<file name@msus>") will work.

Refer to [Table 1-4 on page 14](#) for a listing of the file systems and types.

## Quote Usage with SCPI Commands

As a general rule, programming languages require that SCPI commands be enclosed in double quotes as shown in the following example:

```
":FM:EXTernal:IMPedance 600"
```

However when a string is the parameter for a SCPI command, additional quotes or other delimiters may be required to identify the string. Your programming language may use two sets of double quotes, one set of single quotes, or back slashes with quotes to signify the string parameter. The following examples illustrate these different formats:

```
"MEMory:LOAD:LIST ""myfile"" used in BASIC programming languages
```

```
"MEMory:LOAD:LIST \"myfile\" used in C, C++, Java, and PERL
```

```
"MEMory:LOAD:LIST 'myfile' accepted by most programming languages
```

Consult your programming language reference manual to determine the correct format.

## Binary, Decimal, Hexadecimal, and Octal Formats

Command values may be entered using a binary, decimal, hexadecimal, or octal format. When the binary, hexadecimal, or octal format is used, their values must be preceded with the proper identifier. The decimal format (default format) requires no identifier and the signal generator assumes this format when a numeric value is entered without one. The following list shows the identifiers for the formats that require them:

- #B identifies the number as a binary numeric value (base-2).
- #H identifies the number as a hexadecimal alphanumeric value (base-16).
- #Q identifies the number as a octal alphanumeric value (base-8).

The following are examples of SCPI command values and identifiers for the decimal value 45:

#B101101	binary equivalent
#H2D	hexadecimal equivalent
#Q55	octal equivalent

The following example sets the RF output power to 10 dBm (or the equivalent value for the currently selected power unit, such as DBUV or DBUVEMF) using the hexadecimal value 000A:

```
:POW #H000A
```

A unit of measure, such as DBM or mV, will not work with the values when using a format other than decimal.

The following example sets the bluetooth board address to FFBF7 (hexadecimal):

```
:RADio:BLUEtooth:ARB:BDADdr #HFFBF7
```

---

## 2 Basic Function Commands

This chapter provides SCPI descriptions for subsystems dedicated to signal generator operations common to most ESG Signal Generators. This chapter contains the following major sections:

- “Correction Subsystem ([:SOURce]:CORRection)” on page 20
- “Digital Modulation Subsystem—E4438C ([:SOURce])” on page 22
- “Frequency Subsystem ([:SOURce])” on page 38
- “List/Sweep Subsystem ([:SOURce])” on page 49
- “Power Subsystem ([:SOURce]:POWer)” on page 58

---

## Correction Subsystem ([:SOURCE]:CORREction)

### :FLATness:LOAD

**Supported** All Models

```
[:SOURCE]:CORREction:FLATness:LOAD "<file name>"
```

This command loads a user-flatness correction file. The "<file name>" variable is the name of the file located in the Catalog of USERFLAT Files. The directory path is implied in the command and need not be specified in the variable name. For more information on file name syntax, refer to [“File Name Variables” on page 13](#).

**Key Entry** Load From Selected File

### :FLATness:PAIR

**Supported** All Models

```
[:SOURCE]:CORREction:FLATness:PAIR <freq> [<unit>], <corr> [<unit>]
```

This command sets a frequency and amplitude correction pair.

<corr.> This variable is the power correction.

Range	Frequency	Standard	Option UNB
	Option 501: 100kHz–1GHZ	–136 to 20DB	–136 to 25DB
	Option 502: 100kHz–2GHZ	–136 to 20DB	–136 to 25DB
	Option 503: 100kHz–3GHZ	–136 to 20DB	–136 to 25DB
	Option 504: 100kHz–4GHZ	–136 to 20DB	–136 to 25DB
	Option 506: 100kHz–6GHZ	–136 to 25DB	N/A

**Key Entry** Configure Cal Array

**Remarks** The maximum number of points that can be entered is 1601. Options 501, 502, and 504 are specific to the E4438C.

### :FLATness:POINts

**Supported** All Models

```
[:SOURCE]:CORREction:FLATness:POINts?
```

This query returns the number of points in the user-flatness correction file.

## :FLATness:PRESet

**Supported** All Models

---

**CAUTION** The current correction data will be overwritten once this command is executed. Save the current data if needed. Refer to “:FLATness:STORE” on page 21 for storing user-flatness files.

---

[:SOURCE]:CORREction:FLATness:PRESet

This command presets the user-flatness correction to a factory-defined setting that consists of one point.

**Key Entry** Preset List

## :FLATness:STORE

**Supported** All Models

[:SOURCE]:CORREction:FLATness:STORE "<file name>"

This command stores the current user-flatness correction data to a file named by the :CORREction:FLATness:STORE. The directory path is implied in the command and need not be specified in the "<file name>" variable.

**Key Entry** Store To File

**Remarks** For information on file name syntax, refer to “File Name Variables” on page 13.

## [:STATe]

**Supported** All Models

[:SOURCE]:CORREction[:STATe] ON|OFF|1|0

[:SOURCE]:CORREction[:STATe] ?

This command enables or disables the user-flatness corrections.

**\*RST** 0

**Key Entry** Flatness Off On

---

## Digital Modulation Subsystem—E4438C ([:SOURce])

### :BURSt:SOURce

**Supported** E4438C

[ :SOURce ] :BURSt :SOURce EXT [1] | INT [1]

[ :SOURce ] :BURSt :SOURce?

This command selects either an internally generated or an externally supplied burst source.

**\*RST** EXT

**Key Entry** **Burst Envelope Int Ext Off**

**Remarks** The external burst source is applied to the EXT 1 INPUT connector.  
The INT[1] choice will not work unless an internal burst source is active.

### :BURSt:STATe

**Supported** E4438C

[ :SOURce ] :BURSt :STATe ON | OFF | 1 | 0

[ :SOURce ] :BURSt :STATe?

This command enables or disables the burst envelope function.

**\*RST** 0

**Key Entry** **Burst Envelope Int Ext Off**

### :DM:EXTernal:ALC:BANDwidth | BWIDth

**Supported** All Models

---

**NOTE** Refer to the *Programming Compatibility Guide* for information on this command. This command was replaced by the “:ALC:BANDwidth|BWIDth” command shown on [page 58](#) and the “:ALC:BANDwidth” command on [page 59](#).

---

## **:DM:EXTernal:HCRest[:STATe]**

**Supported** E4438C

```
[ :SOURce ] :DM:EXTernal:HCRest [ :STATe ] ON|OFF|1|0  
[ :SOURce ] :DM:EXTernal:HCRest [ :STATe ] ?
```

This command changes the operating condition to accommodate I/Q inputs with a high crest factor.

ON(1) This choice turns high crest mode on for externally applied signals with high crest factors. High crest mode allows the signal generator to process these signals with less distortion. For crest factors higher than 4 dB, I/Q drive levels should be reduced by 1 dB for each dB above that level. In high crest mode, the maximum output level is reduced and power level accuracy is degraded.

OFF(0) This choice disables the high crest mode.

**\*RST** 0

**Key Entry** High Crest Mode Off On

## **:DM:EXTernal:FILTer**

**Supported** E4438C

```
[ :SOURce ] :DM:EXTernal:FILTer 40e6|THROUGH  
[ :SOURce ] :DM:EXTernal:FILTer ?
```

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter using this command will automatically set “:DM:EXTernal:FILTer:AUTO” on [page 23](#) to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THROUGH This choice bypasses filtering.

**\*RST** THR

**Key Entry** 40.000 MHz Through

## **:DM:EXTernal:FILTer:AUTO**

**Supported** E4438C

```
[ :SOURce ] :DM:EXTernal:FILTer:AUTO ON|OFF|1|0  
[ :SOURce ] :DM:EXTernal:FILTer:AUTO ?
```

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel outputs.

**Digital Modulation Subsystem—E4438C (:SOURce)**

ON(1)	This choice will automatically select a digital modulation filter optimized for the current signal generator settings.
OFF(0)	This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:DM:EXTernal:FILTer” on page 23 for selecting a filter or through path.
*RST	1
<b>Key Entry</b>	<b>I/Q Output Filter Manual Auto</b>

**:DM:EXTernal:POLarity**

<b>Supported</b>	E4438C
[:SOURce]:DM:EXTernal:POLarity NORMAL INVERT	
[:SOURce]:DM:EXTernal:POLarity?	
This command sets the phase polarity for the I/Q signal.	
*RST	NORM
<b>Key Entry</b>	<b>Int Phase Polarity Normal Invert</b>
<b>Remarks</b>	This command is for backward compatibility with the appropriate ESG E44xxB.

**:DM:EXTernal:SOURce**

<b>Supported</b>	E4438C
[:SOURce]:DM:EXTernal:SOURce EXTernal INTERNAL BBG1 EXT600 OFF SUM	
[:SOURce]:DM:EXTernal:SOURce?	
This command selects the I/Q signal source that is routed to the rear panel I and Q output connectors.	
EXTernal	This choice routes a portion of the externally applied signals at the 50 ohm I and Q input connectors to the rear panel I and Q output connectors.
INTERNAL	This choice is for backward compatibility with the appropriate ESG E44xxB and performs the same function as the BBG1 selection.
BBG1	This choice routes a portion of the baseband generator I/Q signals to the rear panel I and Q connectors and requires Option 001/601or 002/602.
EXT600	This choice routes a portion of the externally applied signals at the 600 ohm I and Q input connectors to the rear panel I and Q output connectors.
OFF	This choice disables the output to the rear panel I and Q output connectors.



<b>SUM</b>	This choice routes a portion of the summed I/Q signals from source one and two, to the rear panel I and Q output connectors. See “:DM:SRATio” on page 36 for setting the summing ratio of the I/Q signals between source one and two.
<b>*RST</b>	EXT
<b>Key Entry</b>	<b>Ext 50 Ohm    BBG1    Ext 600 Ohm    Off    Sum</b>
<b>Remarks</b>	The output is the analog component of the I and Q signals. For selecting the I/Q source, refer to “:DM:SOURce” on page 35.

**:DM:IQADjustment:BBG:QSKew**

Supported            E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :DM:IQADjustment:BBG:QSKew <val><unit>
[ :SOURce ] :DM:IQADjustment:BBG:QSKew?
```

This command affects both the rear-panel I and Q signals, and the RF output path by adjusting the phase angle (quadrature skew) of the Q vector.

Positive skew increases the angle from 90 degrees while negative skew decreases the angle from 90 degrees. When the quadrature skew is zero, the phase angle between the I and Q vectors is 90 degrees.

The <val> variable has a minimum resolution of 0.1. The command works with or without the unit variable.

**Example**

```
:DM:IQAD:BBG:QSK 4.5DEG
```

The preceding example increases the phase angle by 4.5 degrees.

**\*RST**                    +0.00000000E+000

**Range**                    -30 to 30DEG

**Key Entry**                **Quadrature Angle Adjustment**

**Remarks**                This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

To change the quadrature skew on only the RF output path, see “:DM:IQADjustment:QSKew” on page 30.

**:DM:IQADjustment:EXTernal:COFFset****Supported** E4438C

[:SOURce]:DM:IQADjustment:EXTernal:COFFset &lt;val&gt;

[:SOURce]:DM:IQADjustment:EXTernal:COFFset?

This command sets the common mode offset voltage for both the in-phase (I) and quadrature-phase (Q) signals going to the rear panel I and Q output connectors.

The variable <val> is expressed in units of volts (mV–V).

**\*RST** +0.00000000E+000**Range** –3 to 3**Key Entry** **Common Mode I/Q Offset**

**Remarks** This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

**:DM:IQADjustment:EXTernal:DIOffset****Supported** E4438C

[:SOURce]:DM:IQADjustment:EXTernal:DIOffset &lt;val&gt;

[:SOURce]:DM:IQADjustment:EXTernal:DIOffset?

This command sets the differential offset voltage for an in-phase (I) signal routed to the I output connectors.

The variable <val> is expressed in units of volts (mV–V).

**\*RST** +0.00000000E+000**Range** –3 to 3**Key Entry** **Diff. Mode I Offset**

**Remarks** This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

### :DM:IQADjustment:EXTernal:DQOFFset

**Supported** E4438C

```
[ :SOURce ] :DM:IQADjustment:EXTernal:DQOFFset <val>  
[ :SOURce ] :DM:IQADjustment:EXTernal:DQOFFset?
```

This command sets the differential offset voltage for a quadrature-phase (Q) signal routed to the Q output connectors.

**\*RST** +0.00000000E+000

**Range** -4 to 4

**Key Entry** **Diff. Mode Q Offset**

**Remarks** This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

### :DM:IQADjustment:EXTernal:GAIN

**Supported** E4438C

```
[ :SOURce ] :DM:IQADjustment:EXTernal:GAIN <val>  
[ :SOURce ] :DM:IQADjustment:EXTernal:GAIN?
```

This command sets the I/Q gain ratio for signals routed to the rear panel I and Q output connectors.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +0.00000000E+000

**Range** -4 to 4

**Key Entry** **I/Q Out Gain Balance**

**Remarks** This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

### :DM:IQADjustment:EXTernal:IOFFset

**Supported** E4438C

```
[ :SOURce ] :DM:IQADjustment:EXTernal:IOFFset <val>  
[ :SOURce ] :DM:IQADjustment:EXTernal:IOFFset?
```

**Digital Modulation Subsystem—E4438C (:SOURce)**

This command sets the offset voltage for a signal applied to the 600 ohm I input connector.

The variable <val> is expressed in units of volts (mV–V).

**\*RST** +0.00000000E+000

**Key Entry** Ext In 600 Ohm I Offset

**Range** –5 to 5

**Remarks** This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

**:DM:IQADjustment:EXTernal:IQATten**

**Supported** E4438C

[ :SOURce ] :DM:IQADjustment:EXTernal:IQATten <val>

[ :SOURce ] :DM:IQADjustment:EXTernal:IQATten?

This command sets the I/Q output attenuation level.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +6.00000000E+000

**Range** 0–40

**Key Entry** I/Q Output Atten

**Remarks** The value set by this command is active even if the I/Q adjustment function is off.

**:DM:IQADjustment:EXTernal:QOFFset**

**Supported** E4438C

[ :SOURce ] :DM:IQADjustment:EXTernal:QOFFset <val>

[ :SOURce ] :DM:IQADjustment:EXTernal:QOFFset?

This command sets the offset voltage for a signal applied to the 600 ohm Q input connector.

The variable <val> is expressed in units of volts (mV–V).

**\*RST** +0.00000000E+000

**Range** –5 to 5

**Key Entry** Ext In 600 Ohm Q Offset

**Remarks** This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

## **:DM:IQADjustment:GAIN**

**Supported** E4438C

[ :SOURce ] :DM:IQADjustment:GAIN <val>

[ :SOURce ] :DM:IQADjustment:GAIN?

This command sets the gain for the I signal relative to the Q signal.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +0.00000000E+000

**Range** -4 to 4

**Key Entry** **I/Q Gain Balance Source 1**

**Remarks** This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

## **:DM:IQADjustment:IOFFset**

**Supported** E4438C

[ :SOURce ] :DM:IQADjustment:IOFFset <val>

[ :SOURce ] :DM:IQADjustment:IOFFset?

This command adjusts the I channel offset value.

The variable <val> is expressed in units of percent with a minimum resolution of 0.025.

**\*RST** +0.00000000E+000

**Range** -50.000 to 50.000

**Key Entry** **I Offset**

**Remarks** When using this command to minimize the LO feedthrough signal, optimum performance is achieved when the command is sent after all other I/Q path commands are executed, such as those that change the internal phase polarity or adjust the modulator attenuator. If other adjustments are made after minimizing is performed, the LO feedthrough signal may increase.

This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

**:DM:IQADjustment:QOFFset****Supported** E4438C[:SOURce]:DM:IQADjustment:QOFFset  
[:SOURce]:DM:IQADjustment:QOFFset?

This command adjusts the Q channel offset value.

The variable <val> is expressed in units of percent with a minimum resolution of 0.025.

**\*RST** +0.00000000E+000**Range** -50.000 to 50.000**Key Entry** **Q Offset**

**Remarks** When using this command to minimize the LO feedthrough signal, optimum performance is achieved when the command is sent after all other I/Q path commands are executed, such as those that change the internal phase polarity or adjust the modulator attenuator. If other adjustments are made after minimizing is performed, the LO feedthrough signal may increase.

This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.

**:DM:IQADjustment:QSKew****Supported** E4438C[:SOURce]:DM:IQADjustment:QSKew <val>  
[:SOURce]:DM:IQADjustment:QSKew?

This command adjusts the phase angle (quadrature skew) between the I and Q vectors by increasing or decreasing the Q phase angle. It affects only the RF output path.

If the signal generator is operating at frequencies greater than 3.3 GHz, quadrature skew settings greater than  $\pm 5$  degrees will not be within specifications.

Positive skew increases the angle from 90 degrees while negative skew decreases the angle from 90 degrees. When the quadrature skew is zero, the phase angle between the I and Q vectors is 90 degrees.

The <val> variable is expressed in degrees with a minimum resolution of 0.1.

**Example**

:DM:IQAD:QSK 4.5

The preceding example increases the phase angle by 4.5 degrees.

<b>*RST</b>	+0.00000000E+000
<b>Range</b>	-1E1 to +1E1
<b>Key Entry</b>	<b>Quadrature Angle Adjustment</b>
<b>Remarks</b>	This command is effective only if the state of the I/Q adjustment function is set to ON. Refer to “:DM:IQADjustment[:STATe]” on page 32.  To change the quadrature skew for both the rear-panel I and Q signals, and RF output path, see “:DM:IQADjustment:BBG:QSKew” on page 25 (requires Option 001/601 or 002/602).

### **:DM:IQADjustment:SKEW**

**Supported** E4438C

```
[ :SOURce] :DM:IQADjustment:SKEW[:DELay] <val>
[:SOURce] :DM:IQADjustment:SKEW?
```

This command changes the input skew which is a time delay difference between the I and Q signals. Equal and opposite skew is applied to both I and Q and affects the RF Output and I/Q output paths simultaneously. A positive value delays the I signal relative to the Q signal, and a negative value delays the Q signal relative to the I signal.

If the internal I/Q correction path is set to RF or BB the I/Q signals are already optimized and adjusting I/Q skew would add an impairment to the signals. If the internal I/Q correction path is set to Off, then adjusting the I/Q skew could improve the I/Q signals. The I/Q skew adjustment cannot be performed on the MSK, FSK, and C4FM constant envelope modulations.

I/Q skew adjustments are preserved when the instrument state is saved. I/Q skew adjustments are also preserved when instrument settings are changed. If the signal generator is calibrated, the skew adjustments are added to the calibration value used for the given signal generator state. If the signal generator is uncalibrated, the skew adjustments are re-applied directly.

Using I/Q skew while playing a user FIR file greater than 32 symbols will generate an error.

The variable <val> is expressed in seconds. Range limits are determined by the modulation configuration but is limited to a maximum of  $\pm 2$  seconds.

**Example**

```
:DM:IQAD:SKEW .5
```

The preceding example sets the time delay difference between the I and Q signals to 500 milliseconds.

**\*RST** +0.00000000E+000

**Key Entry** I/Q Timing Skew

**:DM:IQADjustment:SKEW:Path****Supported** E4438C

[:SOURce]:DM:IQADjustment:SKEW:PATH RF BB

[:SOURce]:DM:IQADjustment:SKEW?

This command selects either the RF or BB (baseband) path as the path to which skew timing corrections will be applied. If there are no factory I/Q timing skew corrections data, then adjusting the I/Q timing skew for the selected path may improve the error vector magnitude (EVM) of the signal. Refer to the “[:DM:IQADjustment:SKEW](#)” on page 31 for more information.

If internal I/Q corrections are available for the RF or external I/Q output (BB) path then the I/Q signals are already optimized and adjusting I/Q skew for either path would add an impairment to the signal.

**Example**

:DM:IQAD:SKEW:PATH RF

The preceding example selects the RF path as the path to which skew timing adjustments will be made.

**\*RST** +0.00000000E+000**Key Entry** I/Q Timing Skew Path**:DM:IQADjustment[:STATe]****Supported** E4438C

[:SOURce]:DM:IQADjustment[:STATe] ON|OFF|1|0

[:SOURce]:DM:IQADjustment[:STATe]?

This command enables or disables the I/Q adjustments.

**Example**

:DM:IQAD 1

The preceding example enables I/Q adjustments.

**\*RST** 0**Key Entry** I/Q Adjustments Off On**:DM:MODulation:FILTer****Supported** E4438C

[:SOURce]:DM:MODulation:FILTer 2.1e6|40e6|THROUGH

[:SOURce]:DM:MODulation:FILTer?



This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter with this command automatically sets “:DM:MODulation:FILTer:AUTO” to OFF(0).

2.1E6                      This choice applies a 2.1 MHz baseband filter to the I/Q signals.

40E6                        This choice applies a 40 MHz baseband filter to the I/Q signals.

THRough                  This choice bypasses filtering.

\*RST                        THR

**Key Entry                  2.100 MHz      40.000 MHz      Through**

### **:DM:MODulation:FILTer:AUTO**

**Supported                  E4438C**

```
[ :SOURCE ] :DM:MODulation:FILTer:AUTO ON|OFF|1|0
[ :SOURCE ] :DM:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1)                      This choice will automatically select a digital modulation filter.

OFF(0)                     This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:DM:MODulation:FILTer” on page 32 for selecting a filter or through path.

\*RST                        1

**Key Entry                  I/Q Mod Filter Manual Auto**

### **:DM:MODulation:ATTen**

**Supported                  E4438C**

```
[ :SOURCE ] :DM:MODulation:ATTen <val>
[ :SOURCE ] :DM:MODulation:ATTen?
```

This command attenuates the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

\*RST                        +2.00000000E+000

**Range                        0–40**

**Key Entry                  Modulator Atten Manual Auto**

**:DM:MODulation:ATTen:AUTO****Supported** E4438C

[:SOURce]:DM:MODulation:ATTen:AUTO ON|OFF|1|0

[:SOURce]:DM:MODulation:ATTen:AUTO?

This command enables or disables the I/Q attenuation auto mode.

ON (1) This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “:DM:MODulation:ATTen” on page 33 for setting the attenuation value.

**\*RST** 1**Key Entry** Modulator Atten Manual Auto**:DM:POLarity[:ALL]****Supported** E4438C

[:SOURce]:DM:POLarity[:ALL] NORMal|INVert

[:SOURce]:DM:POLarity?

This command sets the digital modulation phase polarity.

NORMal This choice selects normal phase polarity for the I and Q signals.

INVert This choice flips the I and Q signals by routing the I signal to the Q input of the I/Q modulator and the Q signal to the I input.

**\*RST** NORM**Key Entry** Int Phase Polarity Normal Invert

## **:DM:SKEW:PATH**

**Supported** E4438C

[ :SOURce ] :DM:SKEW:PATH RF | BB

[ :SOURce ] :DM:SKEW:PATH?

This command selects the skew path.

**RF** When RF is selected, the skew is optimized for the I/Q signal applied to the RF Output. The BB output will be functional, but the I/Q timing skew applied will be optimized for the RF path. When using this choice, seven symbols of latency are added to the Arb based waveform. While in real-time mode, the maximum number of user symbols for the FIR is limited to 32.

**BB** When BB is selected, the skew is optimized for the I/Q signal outputs on the rear panel. The RF Output will be functional, but the I/Q timing skew applied will be optimized for the BB path. When using this choice, seven symbols of latency are added to the Arb based waveform. While in real-time mode, the maximum number of user symbols for the FIR is limited to 32.

**\*RST** INT

**Key Entry** **Int I/Q Skew Corrections RF BB Off**

## **:DM:SKEW[:STATe]**

**Supported** E4438C

[ :SOURce ] :DM:SKEW[:STATe] ON | OFF | 1 | 0

[ :SOURce ] :DM:SKEW[:STATe] ?

This command enables or disables the I/Q timing skew correction function.

**\*RST** 1

**Key Entry** **Int I/Q Skew Corrections RF BB Off**

## **:DM:SOURce**

**Supported** E4438C

[ :SOURce ] :DM:SOURce [1] | 2 EXTernal | INTernal | BBG1 | EXT600 | OFF

[ :SOURce ] :DM:SOURce?

This command selects the I/Q modulator source.

**EXTernal** This choice selects a 50 ohm impedance for the I and Q input connectors and routes the applied signals to the I/Q modulator.

## Basic Function Commands

### Digital Modulation Subsystem—E4438C ([:SOURce])

INTernal	This choice is for backward compatibility with the appropriate ESG E44xxB and performs the same function as the BBG1 selection.
BBG1	This choice selects the baseband generator as the source for the I/Q modulator and requires Option 001/601 or 002/602.
EXT600	This choice selects a 600 ohm impedance for the I and Q input connectors and routes the applied signals to the I/Q modulator.
OFF	This choice disables the digital modulation source.
*RST	EXT
<b>Key Entry</b>	<b>Ext 50 Ohm      BBG1      Ext 600 Ohm      Off</b>

### :DM:SRATio

**Supported**      E4438C

`[:SOURce]:DM:SRATio <val><unit>`

`[:SOURce]:DM:SRATio?`

This command sets the power level difference (ratio) between the source one and source two signals when the two signals are summed together. A positive ratio value reduces the amplitude for source two, while a negative ratio value reduces the amplitude for source one.

The range for the summing ratio is dependent on the modulator attenuator (mod atten) setting for the signal generator that is summing the signals together. The minimum range is achieved when the modulator attenuator setting is zero and the maximum range is reached when the maximum attenuator value is used. The range can be calculated using the following formula:

$$\pm \text{Range} = 50 \text{ dB} + \text{Mod Atten}$$

\*RST      +0.00000000E+000

**Range**      *Min:*  $\pm 50$  dB      *Max:*  $\pm 90$  dB

**Key Entry**      **Summing Ratio (SRC1/SRC2) x.xx dB**

**Remarks**      For real-time modulation format modulator attenuator settings, see [“:DM:MODulation:ATTen” on page 33](#) and [“:DM:MODulation:ATTen:AUTO” on page 34](#). For an Arb modulation format modulator attenuator setting, refer to the SCPI command subsystem for the Arb format being used and find the commands that contain the command mnemonics IQ:MODulation:ATTen.

## :DM:STATe

**Supported** E4438C

[ :SOURce ] :DM:STATe ON | OFF | 1 | 0

[ :SOURce ] :DM:STATe?

This command enables or disables the I/Q modulator.

ON (1) This choice enables the internal I/Q modulator.

OFF (0) This choice disables the internal I/Q modulator. You can turn off the I/Q modulation with this choice even though a digital modulation format is enabled. With this configuration, the RF output signal will not be modulated, but the I/Q signals may be present at the rear panel I and Q outputs depending on the rear panel output selection.

**\*RST** 0

**Key Entry** I/Q Off On

**Remarks** The I/Q modulator is enabled whenever a digital format is turned on.  
The I/Q annunciator will be shown on the signal generator display whenever the I/Q modulator is on.

---

## Frequency Subsystem ([:SOURCE])

### :FREQUENCY:CHANNELS:BAND

**Supported**      All Models

```
[:SOURCE]:FREQUENCY:CHANNELS:BAND NBASe|NMOBILE|BPGSm|MPGSm|BEGSm|MEGSm|  
BRGSm|MRGSm|BDCS|MDCS|BPCS|MPCS|B450|GM450|B480|M480|B850|M850|B8|M8|B15  
|M15|B390|B420|B460|B915|M380|M410|M450|M870|PHS|DECT  
[:SOURCE]:FREQUENCY:CHANNELS:BAND?
```

This command sets the frequency of the signal generator by specifying a frequency channel band.

NBASe	This choice selects Standard Base as the frequency band for NADC.
NMOBILE	This choice selects Standard Mobile as the frequency band for NADC.
BPGSm	This choice selects P-Gsm 900 Base as the frequency band for GSM.
MPGSm	This choice selects P-Gsm 900 Mobile as the frequency band for GSM.
BEGSm	This choice selects E-Gsm 900 Base as the frequency band for GSM.
MEGSm	This choice selects E-Gsm 900 Mobile as the frequency band for GSM.
BRGSm	This choice selects R-Gsm 900 Base as the frequency band for GSM.
MRGSm	This choice selects R-Gsm 900 Mobile as the frequency band for GSM.
BDCS	This choice selects DCS 1800 Base as the frequency band for GSM.
MDCS	This choice selects DCS 1800 Mobile as the frequency band for GSM.
BPCS	This choice selects PCS 1900 Base as the frequency band for GSM.
MPCS	This choice selects PCS 1900 Mobile as the frequency band for GSM.
B450	This choice selects Gsm 450 Base as the frequency band for GSM.
GM450	This choice selects Gsm 450 Mobile as the frequency band for GSM.
B480	This choice selects Gsm 480 Base as the frequency band for GSM.
M480	This choice selects Gsm 480 Mobile as the frequency band for GSM.
B850	This choice selects Gsm 850 Base as the frequency band for GSM.
M850	This choice selects Gsm 850 Mobile as the frequency band for GSM.
B8	This choice selects 800MHz Base as the frequency band for PDC.

M8 This choice selects 800MHz Mobile as the frequency band for PDC.  
 B15 This choice selects 1500MHz Base as the frequency band for PDC.  
 M15 This choice selects 1500MHz Mobile as the frequency band for PDC.  
 B390 This choice selects Base 390-400 as the frequency band for TETRA.  
 B420 This choice selects Base 420-430 as the frequency band for TETRA.  
 B460 This choice selects Base 460-470 as the frequency band for TETRA.  
 B915 This choice selects Base 915-921 as the frequency band for TETRA.  
 M380 This choice selects Mobile 380-390 as the frequency band for TETRA.  
 M410 This choice selects Mobile 410-420 as the frequency band for TETRA.  
 M450 This choice selects Mobile 450-460 as the frequency band for TETRA.  
 M870 This choice selects Mobile 870-876 as the frequency band for TETRA.  
 PHS This choice selects Standard PHS as the frequency band.  
 DECT This choice selects Standard DECT as the frequency band.

**\*RST**

BPGS

**Key Entry**

<b>P-GSM Base</b>	<b>E-GSM Base</b>	<b>R-GSM Base</b>	<b>DCS Base</b>
<b>PCS Base</b>	<b>GSM 450 Base</b>	<b>GSM 480 Base</b>	<b>GSM 850 Base</b>
<b>NADC Base</b>	<b>800MHZ Base</b>	<b>1500MHZ Base</b>	
<b>Tetra Base 390/400</b>	<b>Tetra Base 420/430</b>	<b>Tetra Base 460/470</b>	
<b>Tetra Base 915/921</b>	<b>PHS Standard</b>	<b>DECT Standard</b>	
<b>P-GSM Mobile</b>	<b>E-GSM Mobile</b>	<b>R-GSM Mobile</b>	<b>DCS Mobile</b>
<b>PCS Mobile</b>	<b>GSM 450 Mobile</b>	<b>GSM 480 Mobile</b>	<b>GSM 850 Mobile</b>
<b>NADC Mobile</b>	<b>800MHZ Mobile</b>	<b>1500MHZ Mobile</b>	
<b>Tetra Mobile 380/390</b>	<b>Tetra Mobile 410/420</b>	<b>Tetra Mobile 450/460</b>	
<b>Tetra Mobile 870/876</b>			

**Remarks**

The frequency channel state must be enabled for this command to work. Refer to “:FREQuency:CHANnels[:STATe]” on page 41.

**:FREQuency:CHANnels:NUMBer**

**Supported** All Models

[ :SOURce] :FREQuency:CHANnels:NUMBer <number>

[ :SOURce] :FREQuency:CHANnels:NUMBer?

This command sets the frequency of the signal generator by specifying a channel number of a given frequency band.

**\*RST** +1

<b>Range</b>	P-GSM Base/Mobile:	1–24
	E-GSM and R-GSM Base/Mobile:	1–1023
	DCS Base/Mobile:	512–885
	PCS Base/Mobile:	512–900
	GSM-450 Base/Mobile:	259–293
	GSM-480 Base/Mobile:	306–340
	GSM-850 Base/Mobile:	128–251
	NADC Base/Mobile:	1–1023
	800MHZ Base/Mobile:	0–640
	1500MHZ Base/Mobile:	0–960
	TETRA 380/390 Mobile:	3600–4000
	TETRA 390/4000 Base:	3600–4000
	TETRA 410/420 Mobile:	800–1200
	TETRA 420/430 Base:	800–1200
	TETRA 460/470: 2400 through 2800	2400–2800
	TETRA 870/876 Mobile:	600–640
	TETRA 915/921 Base:	600–940
	PHS Standard:	1–255
	DECT Standard:	0–9

**Key Entry** Channel Number

**Remarks** The frequency channel state must be enabled for this command to work. Refer to “:FREQuency:CHANnels[:STATe]” on page 41.



### **:FREQuency:CHANnels[:STATe]**

**Supported**            All Models

```
[ :SOURce ] :FREQuency:CHANnels [:STATe] ON|OFF|1|0
[ :SOURce ] :FREQuency:CHANnels [:STATe] ?
```

This command enables or disables the frequency channel and band selection to set the output frequency.

**\*RST**                    0

**Key Entry**            **Freq Channels Off On**

**Remarks**            To set frequency channels band refer to “:FREQuency:CHANnels:BAND” on [page 38](#).

### **:FREQuency:FIXed**

**Supported**            All Models

```
[ :SOURce ] :FREQuency:FIXed <val><unit>|UP|DOWN
[ :SOURce ] :FREQuency:FIXed?
```

This command sets the signal generator output frequency, or increments or decrements the current RF frequency setting.

<val>                    A frequency value.

UP                        Increases the current frequency setting by the value set with the “:FREQuency[:CW]:STEP[:INCRement]” command found on [page 47](#). The front-panel up-arrow key performs the same function.

DOWN                    Decreases the current frequency setting by the value set with the “:FREQuency[:CW]:STEP[:INCRement]” command found on [page 47](#). The front-panel down-arrow key performs the same function.

**\*RST**                    Option 501: +10000000000000E+09  
                           Option 502: +20000000000000E+09  
                           Option 503: +30000000000000E+09  
                           Option 504: +40000000000000E+09  
                           Option 506: +60000000000000E+09

**Range**                    E4438C Option 501: 100kHz–1GHZ  
                           E4438C Option 502: 100kHz–2GHZ  
                           Option 503: 100kHz–3GHZ  
                           E4438C Option 504: 100kHz–4GHZ

**Frequency Subsystem ([:SOURce])**

Option 506: 100kHz–6GHz

**Remarks** To set the frequency mode to FIXed, refer to “:FREQuency:MODE” on page 42.  
 A frequency change may affect the current output power. Refer to “[:LEVel][:IMMediate][:AMPLitude]” on page 69 for the correct specified frequency and amplitude settings.

**:FREQuency:MODE**

**Supported** All Models

```
[ :SOURce ] :FREQuency:MODE CW | FIXed | LIST
[ :SOURce ] :FREQuency:MODE?
```

This command sets the frequency mode of the signal generator to CW or swept.

**CW and FIXed** These choices are synonymous with one another and stops a frequency sweep, allowing the ESG to operate at a set frequency. Refer to “:FREQuency[:CW]” on page 46 for setting the frequency in the CW mode and to “:FREQuency:FIXed” on page 41 for setting the frequency in the FIXed mode.

**LIST** This choice selects the swept frequency mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or STEP frequency sweep.

---

**NOTE** To perform a frequency and amplitude sweep, you must also select LIST as the power mode. See “:MODE” on page 66 for selecting the list mode for an amplitude sweep.

---

**\*RST** CW

**Key Entry** **Frequency Freq Off**

**:FREQuency:MULTiplier**

**Supported** All Models

```
[ :SOURce ] :FREQuency:MULTiplier <val>
[ :SOURce ] :FREQuency:MULTiplier?
```

This command sets the multiplier for the signal generator carrier frequency.

**\*RST** +1.00000000E+000

**Range** Negative Values: -100 to -.001      Positive Values: .001–1000

**Key Entry** **Freq Multiplier**

**Remarks** For any multiplier other than one, the MULT indicator is shown in the frequency area of the display.

### **:FREQuency:OFFSet**

**Supported** All Models

```
[ :SOURce ] :FREQuency:OFFSet <val><unit>  
[ :SOURce ] :FREQuency:OFFSet?
```

This command sets the frequency offset.

The query of this command returns a value equal to the original output frequency times the multiplier value, plus the frequency offset value.

**\*RST** +0.00000000000000E+00

**Range** -200GHZ to 200GHZ

**Key Entry** **Freq Offset**

**Remarks** When an offset has been entered, the OFFS indicator is turned on in the frequency area of the display.

The frequency offset state is turned on when any non-zero value is entered; entering zero will turn it off. Refer to “[:FREQuency:OFFSet:STATe](#)” for setting the offset state independent of entering offset values.

### **:FREQuency:OFFSet:STATe**

**Supported** All Models

```
[ :SOURce ] :FREQuency:OFFSet:STATe ON|OFF|1|0  
[ :SOURce ] :FREQuency:OFFSet:STATe?
```

This command enables or disables the offset frequency.

**\*RST** 0

**Key Entry** **Freq Offset**

**Remarks** Entering OFF (0) will set the frequency offset to 0 Hz.

### **:FREQuency:REFerence**

**Supported** All Models

```
[ :SOURce ] :FREQuency:REFerence <val><unit>  
[ :SOURce ] :FREQuency:REFerence?
```

This command sets the output reference frequency.

## Basic Function Commands

### Frequency Subsystem ([:SOURce])

<b>*RST</b>	+0.00000000000000E+00
<b>Range</b>	Option 501: 0HZ–1GHZ Option 502: 0HZ–2GHZ Option 503: 0HZ–3GHZ Option 504: 0HZ–4GHZ Option 506: 0HZ–6GHZ
<b>Key Entry</b>	<b>Freq Ref Set</b>
<b>Remarks</b>	Options 501, 502, and 504 are specific to the E4438C.

### :FREQuency:REFeRence:STATe

**Supported** All Models

```
[ :SOURce ] :FREQuency:REFeRence:STATe ON|OFF|1|0  
[ :SOURce ] :FREQuency:REFeRence:STATe?
```

This command enables or disables the frequency reference mode.

**\*RST** 0

**Key Entry** **Freq Ref Off On**

**Remarks** When the frequency reference mode is on, subsequent frequency parameters are set relative to the reference value.

### :FREQuency:STARt

**Supported** All Models

```
[ :SOURce ] :FREQuency:STARt <val><unit>  
[ :SOURce ] :FREQuency:STARt?
```

This command sets the first frequency point in a step sweep.

**\*RST** Option 501: +10000000000000E+09  
Option 502: +20000000000000E+09  
Option 503: +30000000000000E+09  
Option 504: +40000000000000E+09  
Option 506: +60000000000000E+09

**Range** Option 501: 100kHz–1GHZ  
Option 502: 100kHz–2GHZ  
Option 503: 100kHz–3GHZ

	Option 504: 100kHz–4GHz
	Option 506: 100kHz–6GHz
<b>Key Entry</b>	<b>Freq Start</b>
<b>Remarks</b>	Options 501, 502, and 504 are specific to the E4438C.

### **:FREQuency:STOP**

<b>Supported</b>	All Models
	<code>[:SOURce]:FREQuency:STOP &lt;val&gt;&lt;unit&gt;</code>
	<code>[:SOURce]:FREQuency:STOP?</code>
	This command sets the last frequency point in a step sweep.
<b>*RST</b>	Option 501: +10000000000000E+09
	Option 502: +20000000000000E+09
	Option 503: +30000000000000E+09
	Option 504: +40000000000000E+09
	Option 506: +60000000000000E+09
<b>Range</b>	Option 501: 100kHz–1GHz
	Option 502: 100kHz–2GHz
	Option 503: 100kHz–3GHz
	Option 504: 100kHz–4GHz
	Option 506: 100kHz–6GHz
<b>Key Entry</b>	<b>Freq Stop</b>
<b>Remarks</b>	Options 501, 502, and 504 are specific to the E4438C.

### **:FREQuency:SYNThesis**

<b>Supported</b>	E4438C except with Option UNJ
	<code>[:SOURce]:FREQuency:SYNThesis 1 2</code>
	<code>[:SOURce]:FREQuency:SYNThesis?</code>
	This command sets the phase-lock loop (PLL) bandwidth to optimize phase noise for offsets above and below 10 kHz.
1	This choice will select mode 1 which optimize phase noise at offsets below 10 kHz.
2	This choice will select mode 2 which optimizes phase noise at offsets above

## Basic Function Commands

### Frequency Subsystem ([:SOURce])

10 kHz.

**\*RST** +1

**Key Entry**      **Mode 1 Optimize <10kHz Offset**      **Mode 2 Optimize >10kHz Offset**

#### **:FREQuency[:CW]**

**Supported**      All Models

[[:SOURce]:FREQuency[:CW] <val><unit>|UP|DOWN

[[:SOURce]:FREQuency[:CW]?

This command sets the signal generator output frequency for the CW frequency mode, or increments or decrements the current RF frequency setting.

<val>      A frequency value.

UP      Increases the current frequency setting by the value set with the “:FREQuency[:CW]:STEP[:INCRement]” command found on [page 47](#). The front-panel up-arrow key performs the same function.

DOWN      Decreases the current frequency setting by the value set with the “:FREQuency[:CW]:STEP[:INCRement]” command found on [page 47](#). The front-panel down-arrow key performs the same function.

**\*RST**      Option 501: +10000000000000E+09  
Option 502: +20000000000000E+09  
Option 503: +30000000000000E+09  
Option 504: +40000000000000E+09  
Option 506: +60000000000000E+09

**Range**      E4438C Option 501: 100kHz–1GHZ  
E4438C Option 502: 100kHz–2GHZ  
Option 503: 100kHz–3GHZ  
E4438C Option 504: 100kHz–4GHZ  
Option 506: 100kHz–6GHZ

**Key Entry**      **Frequency**

**Remarks**      To set the frequency mode to CW, refer to “:FREQuency:MODE” on [page 42](#).

A frequency change may affect the current output power. Refer to “[:LEVel][:IMMediate][:AMPLitude]” on [page 69](#) for the correct specified frequency and amplitude settings.

### **:FREQuency[:CW]:STEP[:INCRement]**

**Supported** All Models

```
[ :SOURce ] :FREQuency [ :CW ] :STEP [ :INCRement ] <val><unit>  
[ :SOURce ] :FREQuency [ :CW ] :STEP [ :INCRement ] ?
```

This command sets the incremental step value for the frequency parameter.

**Range** .01 Hz–99 GHz

**Key Entry** **Incr Set**

**Remarks** The value set with this command is not affected by \*RST or a power cycle.

### **:PHASe:REFerence**

**Supported** All Models

```
[ :SOURce ] :PHASe :REFerence
```

This command sets the current output phase as a zero reference.

**Key Entry** **Phase Ref Set**

**Remarks** Subsequent phase adjustments are set relative to the new reference.

### **:PHASe[:ADJust]**

**Supported** All Models

```
[ :SOURce ] :PHASe [ :ADJust ] <val><unit>  
[ :SOURce ] :PHASe [ :ADJust ] ?
```

This command adjusts the phase of the modulating signal.

The query will only return values in radians.

**\*RST** +0.00000000E+000

**Range** Radians: –3.14 to 3.14RAD      Degrees: –180 to 179DEG

**Key Entry** **Adjust Phase**

### **:ROSCillator:SOURce**

**Supported** All Models

```
[ :SOURce ] :ROSCillator :SOURce ?
```

This command queries the source of the reference oscillator. It returns either INT (internal) or EXT (external).

## **:ROSCillator:SOURce:AUTO**

**Supported** All Models except signal generators with Option UNJ

```
[ :SOURce ] :ROSCillator:SOURce:AUTO ON | OFF | 1 | 0
```

```
[ :SOURce ] :ROSCillator:SOURce:AUTO?
```

This command enables or disables the ability of the signal generator to automatically select between the internal and an external reference oscillator.

ON (1) This choice enables the signal generator to detect when a valid reference signal is present at the 10 MHz IN connector and automatically switches from internal to external frequency reference.

OFF (0) This choice selects the internal reference oscillator and disables the switching capability between the internal and an external frequency reference.

**\*RST** 1

**Key Entry** **Ref Oscillator Source Auto Off On**



## List/Sweep Subsystem ([:SOURce])

A complete sweep setup requires commands from other subsystems. [Table 2-1](#) shows the function and location of these other commands.

**Table 2-1 Location of Commands from the other Subsystems**

Sweep Type	Function	Command Location	Key Entry under Sweep/List key
List and Step	Start/stop frequency sweep	“:FREQuency:MODE” on page 42	<b>Freq Off</b>
	Start/stop amplitude sweep	“:MODE” on page 66	<b>Ampl Off</b>
	Start/stop frequency and amplitude sweep <sup>1</sup>	“:MODE” on page 66 “:FREQuency:MODE” on page 42	<b>Freq &amp; Ampl Off</b>
	Set up and control sweep triggering <sup>2</sup>	“Trigger Subsystem” on page 166	See the “Trigger Subsystem”
List	Load a list sweep file	“:LOAD:LIST” on page 123 and page 127	<b>Load From Selected File</b>
	Store list sweep data to a file	“:STORE:LIST” on page 123 and page 127	<b>Store To File</b>
Step	Start frequency sweep	“:FREQuency:START” on page 44	<b>Freq Start</b>
	Store list sweep data to a file	“:STORE:LIST” on page 123 and page 127	<b>Store To File</b>
	Start amplitude sweep	“:START” on page 67	<b>Ampl Start</b>
	Stop amplitude sweep	“:STOP” on page 68	<b>Ampl Stop</b>

1. Execute both commands to start or stop a frequency and amplitude sweep.
2. For point to point triggering, see “:LIST:TRIGger:SOURce” on page 54.

**:LIST:DIRection****Supported** All Models

[:SOURce]:LIST:DIRection UP|DOWN

[:SOURce]:LIST:DIRection?

This command sets the direction of a list or step sweep.

UP This choice enables a sweep in an ascending order:

- first to last point for a list sweep
- start to stop for a step sweep

DOWN This choice reverses the direction of the sweep.

**\*RST** UP**Key Entry** Sweep Direction Down Up**:LIST:DWELl****Supported** All Models

[:SOURce]:LIST:DWELl &lt;val&gt;{,&lt;val&gt;}

[:SOURce]:LIST:DWELl?

This command sets the dwell time for the current list sweep points.

The variable &lt;val&gt; is expressed in units of seconds with a 0.001 resolution.

---

**NOTE** The dwell time (<val>) does not begin until the signal generator has settled for the current frequency and/or amplitude change.

---

**Range** 0.001–60**Remarks** Dwell time is used when IMMEDIATE is the trigger source. Refer to [“:LIST:TRIGger:SOURce” on page 54](#) for the trigger setting.

The dwell time is the amount of time the sweep is guaranteed to pause after setting the frequency and/or power for the current point.

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## :LIST:DWEL:POINts

**Supported** All Models

[ :SOURCE ] :LIST:DWELl :POINts?

This command queries the signal generator for the number of dwell points in the current list sweep file.

## :LIST:DWEL:TYPE

**Supported** All Models

[ :SOURCE ] :LIST:DWELl :TYPE LIST | STEP

[ :SOURCE ] :LIST:DWELl :TYPE?

This command toggles the dwell time for the list sweep points between the values defined in the list sweep and the value for the step sweep.

**LIST** This choice selects the dwell times from the list sweep. Refer to [“:LIST:DWELI” on page 50](#) for setting the list dwell points.

**STEP** This choice selects the dwell time from the step sweep. Refer to [“:SWEep:DWELI” on page 56](#) for setting the step dwell.

**\*RST** LIST

**Key Entry** Dwell Type List Step

## :LIST:FREQuency

**Supported** All Models

[ :SOURCE ] :LIST:FREQuency <val>{ , <val> }

[ :SOURCE ] :LIST:FREQuency?

This command sets the frequency values for the current list sweep points.

The variable <val> is expressed in units of Hertz.

**Range** Option 501: 100E3–1E9  
Option 502: 100E3–2E9  
Option 503: 100E3–3E9  
Option 504: 100E3–4E9  
Option 506: 100E3–6E9

List/Sweep Subsystem ([:SOURce])

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST. Options 501, 502, and 504 are specific to the E4438C. The maximum number of list sweep points is 1,601.

**:LIST:FREQuency:POINts**

**Supported** All Models

[ :SOURce ] :LIST:FREQuency:POINts?

This command queries the current list sweep file for the number of frequency points.

**:LIST:MANual**

**Supported** All Models

[ :SOURce ] :LIST:MANual <val>

[ :SOURce ] :LIST:MANual?

This command sets a list or step sweep point as the current sweep point controlling the frequency and power output.

**Range** List Sweep: 1–1601 Step Sweep: 2-65535

**Key Entry** **Manual Point**

**Remarks** If list or step mode is controlling frequency or power, or both, then the indexed point in the respective list(s) will be used.

Entering a value with this command will have no effect, unless MANual is the selected mode. Refer to “:LIST:MODE” on page 53 for setting the proper mode.

If the point selected is beyond the length of the longest enabled list, then the point will be set to the maximum possible point, and an error will be generated.

## :LIST:MODE

**Supported** All Models

```
[ :SOURce ] :LIST:MODE AUTO | MANual
```

```
[ :SOURce ] :LIST:MODE?
```

This command sets the operating mode for the current list or step sweep.

**AUTO** This choice enables the selected sweep type to perform a sweep of all points.

**MANual** This choice enables you to select a single sweep point. The selected point controls the frequency and/or amplitude according to the sweep type. Refer to “:LIST:MANual” on page 52 for selecting a sweep point.

**\*RST** AUTO

**Key Entry** **Manual Mode Off On**

## :LIST:POWer

**Supported** All Models

```
[ :SOURce ] :LIST:POWer <val> { , <val> }
```

```
[ :SOURce ] :LIST:POWer?
```

This command sets the amplitude for the current list sweep points.

**Range** Refer to “[:LEVel][:IMMediate][:AMPLitude]” on page 69 for output power ranges.

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

During an amplitude sweep operation, signal generators with Option UNB or Option 506 protect the step attenuator by automatically switching to attenuator hold (OFF) mode. The attenuator is locked at its current setting and the amplitude sweep range is limited to 40 dB.

The maximum number of list sweep points is 1,601.

## :LIST:POWer:POINts

**Supported** All Models

```
[ :SOURce ] :LIST:POWer:POINts?
```

This command queries the number of power points in the current list sweep file.

### :LIST:RETRace

**Supported** All Models

[ :SOURce ] :LIST:RETRace ON | OFF | 1 | 0

[ :SOURce ] :LIST:RETRace?

This command resets the single sweep to the first sweep point, or leaves it at the last sweep point upon completion of the sweep operation.

On (1) The sweep resets to the first sweep point.

Off (0) The sweep stays at the last sweep point.

\*RST 1

**Key Entry** Sweep Retrace Off On

### :LIST:TRIGger:SOURce

**Supported** All Models

[ :SOURce ] :LIST:TRIGger:SOURce BUS | IMMEDIATE | EXTERNAL | KEY

[ :SOURce ] :LIST:TRIGger:SOURce?

This command sets the trigger source for a list or step sweep event.

To set the sweep trigger, see “:TRIGger[:SEQUENCE]:SOURce” on page 168.

BUS This choice enables GPIB triggering using the \*TRG or GET command, or LAN and RS-232 triggering using the \*TRG command.

IMMEDIATE This choice enables immediate triggering of the sweep event.

EXTERNAL This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.

KEY This choice enables triggering by pressing the front-panel **Trigger** hardkey.

#### Example

```
:LIST:TRIG:SOUR BUS
```

The preceding example sets the trigger source to the instrument BUS.

\*RST IMM

**Key Entry** Bus Free Run Ext Trigger Key

## :LIST:TYPE

**Supported** All Models

[ :SOURCE ] :LIST:TYPE LIST|STEP

[ :SOURCE ] :LIST:TYPE?

This command toggles between the two types of sweep.

**LIST** This type of sweep has arbitrary frequencies and amplitudes.

**STEP** This type of sweep has equally spaced frequencies and amplitudes.

**\*RST** STEP

**Key Entry** Sweep Type List Step

## :LIST:TYPE:LIST:INITialize:FSTep

**Supported** All Models

---

**CAUTION** The current list sweep data will be overwritten once this command is executed. If needed, save the current data. Refer to “:STORE:LIST” on page 123 for storing list sweep files.

---

[ :SOURCE ] :LIST:TYPE:LIST:INITialize:FSTep

This command replaces the loaded list sweep data with the settings from the current step sweep data points.

**Key Entry** Load List From Step Sweep

**Remarks** You can have only one sweep list at a time.

The maximum number of list sweep points is 1,601. When copying the step sweep settings over to a list sweep, ensure that the number of points in the step sweep do not exceed the maximum list sweep points.

### :LIST:TYPE:LIST:INITialize:PRESet

**Supported** All Models

---

**CAUTION** The current list sweep data will be overwritten once this command is executed. If needed, save the current data. Refer to “:STORE:LIST” on page 123 for storing list sweep files.

---

[ :SOURce ] :LIST:TYPE:LIST:INITialize:PRESet

This command replaces the current list sweep data with a factory-defined file consisting of one point at a frequency, amplitude, and dwell time.

**Key Entry** Preset List

### :SWEep:DWELl

**Supported** All Models

[ :SOURce ] :SWEep:DWELl <val>

[ :SOURce ] :SWEep:DWELl?

This command enables you to set the dwell time for a step sweep.

The variable <val> is expressed in units of seconds with a 0.001 resolution.

---

**NOTE** The dwell time (<val>) does not begin until the signal generator has settled for the current frequency and/or amplitude change.

---

**\*RST** +2.00000000E-003

**Range** 0.001-60

**Key Entry** Step Dwell

**Remarks** Dwell time is used when the trigger source is set to IMMEDIATE. Refer to “:LIST:TRIGger:SOURce” on page 54 for the trigger setting.

The dwell time is the amount of time the sweep is guaranteed to pause after setting the frequency and/or power for the current point.



## **:SWEep:POINts**

**Supported**            All Models

[ :SOURCE ] :SWEep:POINts <val>

[ :SOURCE ] :SWEep:POINts?

This command defines the number of step sweep points.

**\*RST**                    2

**Range**                   2–65535

**Key Entry**              # **Points**

---

## Power Subsystem ([:SOURce]:POWer)

### :ALC:BANDwidth | BWIDth

**Supported** All Models

```
[:SOURce]:POWer:ALC:BANDwidth|BWIDth 100HZ|1KHZ|10KHZ
[:SOURce]:POWer:ALC:BANDwidth|BWIDth?
```

This command sets the bandwidth of the automatic leveling control (ALC) loop. This is one of two commands that replace the :DM:EXTernal:ALC:BANDwidth|BWIDth NORMal|NARRow command. The NARRow parameter in the old command corresponds to the 100HZ selection. The NORMal parameter in the old command corresponds to the ON parameter in the command “:ALC:BANDwidth” on page 59.

100HZ	This choice selects a 100 Hz ALC bandwidth. This bandwidth has the longest settling time, but the least signal degradation and lowest error vector magnitude for digital signals. This is the auto selection for digital modulation.
1KHZ	This choice selects a 1 kHz ALC bandwidth. This bandwidth is the auto selection for pulse modulation and AM modulation to a carrier frequency of 500 kHz.
10KHZ	This choice selects a 10 kHz ALC bandwidth. This bandwidth has the fastest settling time, but the most signal degradation and highest error vector magnitude for digital signals. This is the auto selection for AM modulation above a 500 kHz carrier frequency and with FM/ΦM modulation.

#### Example

```
:POW:ALC:BWID 1KHZ
```

The preceding example sets the ALC bandwidth to 1 kHz.

```
*RST 10000
```

**Key Entry**      **100 Hz   1kHz   10 kHz**

**Remarks** Use this command when the ALC is set to on. Refer to “:ALC[:STATe]” on page 62 for selecting the ALC on or off state. Refer to the *E4428C/38C ESG Signal Generators User’s Guide* for information on ALC bandwidth.

## :ALC:BANDwidth

**Supported** All Models

```
[:SOURCE]:POWER:ALC:BANDwidth|BWIDth:AUTO ON|OFF|1|0
[:SOURCE]:POWER:ALC:BANDwidth|BWIDth:AUTO?
```

This command turns the bandwidth (BW) auto state on or off.

The bandwidth auto function allows the signal generator to automatically select a bandwidth for the automatic leveling control (ALC) circuit. This is one of two commands that replace the :DM:EXTernal:ALC:BANDwidth|BWIDth NORMAL|NARROW command. The ON (1) selection in this command corresponds to the NORMAL parameter in the old command. The NARROW parameter in the old command corresponds to the 100HZ parameter used with the command “:ALC:BANDwidth|BWIDth” on page 58.

ON (1) This choice allows the signal generator to automatically select an ALC BW. The selection of the ALC BW depends on the signal generator modulation type as shown in the following table.

Modulation Type	Auto ALC Bandwidth Selection
Digital Modulation	100 Hz
Pulse Modulation	1 kHz
AM Modulation	10 kHz <sup>1</sup> or 1 kHz
FM/ΦM Modulation	10 kHz

1. 10 kHz ALC bandwidth for carrier frequencies above 500 kHz

OFF (0) This choice disables automatic selection of the ALC BW, allowing you to select one of three ALC BWs: 100 Hz, 1 kHz, or 10 kHz. To select the desired ALC bandwidth, use the “:ALC:BANDwidth|BWIDth” command shown on page 58.

**\*RST** 1

**Key Entry** Auto

**Remarks** For more information on ALC bandwidth, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.

## :ALC:LEVel

**Supported** All Models

```
[ :SOURce ] :POWer:ALC:LEVel <value>dB
[ :SOURce ] :POWer:ALC:LEVel?
```

This command sets the automatic leveling control (ALC) level. Use this command after setting the attenuation auto mode to On. Refer to “:ATTenuation:AUTO” on page 65 for setting the attenuation auto mode.

The ALC is used to maintain the signal generator’s output power level by compensating for power fluctuations due to drift, band changes, or load variations. After you set the ALC level, the signal generator’s output power is monitored and corrected so that the power level setting is maintained.

### Example

```
:POW:ALC:LEV 10DB
```

The preceding example sets the ALC to 10 dB.

**\*RST** +1.00000000E+000

**Range** -20 to 20

**Key Entry** **Set ALC Level**

## :ALC:SEARCh

**Supported** All Models

```
[ :SOURce ] :POWer:ALC:SEARCh ON|OFF|1|0|ONCE
[ :SOURce ] :POWer:ALC:SEARCh?
```

This command sets the internal power search mode. A power search is recommended for pulse-modulated signals with pulse widths less than one microsecond.

ON (1) This choice executes the power search automatically with each change in RF frequency or power.

OFF (0) This choice disables the automatic power search routine.

ONCE This choice executes a single power search of the current RF output signal.

**\*RST** 0

**Key Entry** **Power Search Manual Auto** **Do Power Search**

**Remarks** Use this command when the ALC state is set to OFF (0). Refer to “:ALC[:STATE]” on page 62 for setting the ALC state.

If ON was previously selected, executing ONCE will cause OFF to be the current

selection after the power search is completed.

### **:ALC:SEARch:REFeRence**

**Supported** All Models

```
[ :SOURce ] :POWer:ALC:SEARch:REFeRence FIXed|MODulated  
[ :SOURce ] :POWer:ALC:SEARch:REFeRence?
```

This command sets either fixed or modulated modes of power search.

**FIXed** This choice uses a 0.5 volt reference.

**MODulated** This choice uses the RMS value of the current I/Q modulation.

**\*RST** MOD

**Key Entry** **Power Search Reference Fixed Mod**

### **:ALC:SEARch:SPAN:START**

**Supported** All Models

```
[ :SOURce ] :POWer:ALC:SEARch:SPAN:START  
[ :SOURce ] :POWer:ALC:SEARch:SPAN:START?
```

This command sets the start frequency for a span power search over a user specified range.

**Key Entry** **Start Frequency**

**Remarks** The start frequency has no default value. The start frequency value will be the last value set before powering off the instrument.

### **:ALC:SEARch:SPAN:STOP:SPAN:STOP**

**Supported** All Models

```
[ :SOURce ] :POWer:ALC:SEARch:SPAN:STOP  
[ :SOURce ] :POWer:ALC:SEARch:SPAN:STOP?
```

This command sets the stop frequency for a span power search over a user specified range.

**Key Entry** **Stop Frequency**

**Remarks** The stop frequency has no default value. The stop frequency value will be the last value set before powering off the instrument.

### **:ALC:SEARch:SPAN:TYPE**

**Supported**            All Models

```
[ :SOURce ] :POWer:ALC:SEARch:SPAN:TYPE FULL|USER  
[ :SOURce ] :POWer:ALC:SEARch:SPAN:TYPE?
```

This command enables you to select the frequency range for a span power search. You can specify the range (USER) or you can select the full range (FULL) of the signal generator.

**Key Entry**            **Span Type User Full**

### **:ALC:SEARch:SPAN[:STATe]**

**Supported**            All Models

```
[ :SOURce ] :POWer:ALC:SEARch:SPAN[:STATe] ON|OFF|1|0  
[ :SOURce ] :POWer:ALC:SEARch:SPAN[:STATe] ?
```

This command enables (1) or disables (0) the span mode, allowing you to perform power searches over a selected range of frequencies. The power search corrections are then stored and used whenever the signal generator is tuned within the selected range.

### **:ALC[:STATe]**

**Supported**            All Models

```
[ :SOURce ] :POWer:ALC[:STATe] ON|OFF|1|0  
[ :SOURce ] :POWer:ALC[:STATe] ?
```

This command enables or disables the automatic leveling control (ALC) circuit.

**\*RST**                    1

**Key Entry**            **ALC Off On**

**Remarks**            The purpose of the ALC circuit is to hold output power at a desired level by adjusting the signal generator's power circuits to compensate for power drift. Power drift occurs over time and changes in temperature. Refer to the *E4428C/38C ESG Signal Generators User's Guide* for more information on the ALC.

## :ALternate:AMPLitude

**Supported** All Models except signal generators with Option UNB or 506.

```
[ :SOURCE ] :POWER:ALternate:AMPLitude <val>
```

```
[ :SOURCE ] :POWER:ALternate:AMPLitude?
```

This command sets the delta value for the alternate amplitude.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +0.00000000E+000

**Range** -156 to 156

**Key Entry** **Alt Amp Delta**

**Remarks** The actual RF output amplitude is equal to the Alternate Amplitude Delta value plus the RF output amplitude; this sum cannot exceed the minimum and maximum amplitude limits of the signal generator. For example, if the Alternate Amplitude Delta is set to -156 dB and the RF output amplitude is set to 20 dB, the sum is equal to -136 dB.

## :ALternate:MANual

**Supported** All Models

```
[ :SOURCE ] :POWER:ALternate:MANual MAIN|DELTA
```

```
[ :SOURCE ] :POWER:ALternate:MANual?
```

This command toggles the alternate amplitude manual trigger source between main and alternate (delta).

**MAIN** The main power is present at the RF output.

**DELTA** The alternate power is present at the RF output.

**\*RST** MAIN

**Key Entry** **Manual Trigger Main Delta**

**Remarks** This command is effective only if MANual is the selection for the trigger source. Refer to “:ALternate:TRIGger[:SOURCE]” on page 64 for more information.

**:ALternate:STATe**

**Supported** All Models

```
[:SOURce]:POWer:ALternate:STATe ON|OFF|1|0
[:SOURce]:POWer:ALternate:STATe?
```

This command enables or disables the alternate amplitude.

**\*RST** 0

**Key Entry** **Alt Ampl Off On**

**:ALternate:TRIGger[:SOURce]**

**Supported** All Models except with Option UNB or 506

```
[:SOURce]:POWer:ALternate:TRIGger[:SOURce] INTernal|EXTernal|MANual
[:SOURce]:POWer:ALternate:TRIGger[:SOURce]?
```

This command sets the trigger source for the alternate amplitude signal.

**INTernal** This choice is available only for an E4438C with Option 001/601 or 002/602. The baseband generator triggers each timeslot to output a power level set with either the user-selected main or alternate amplitude parameter.

Each timeslot is allowed to output power with a user-selected main or alternate amplitude. This choice requires the Option 001/601 or 002/602 baseband generator option.

This choice requires a baseband generator option. Each timeslot is allowed to output power with a user-selected main or alternate amplitude.

**EXTernal** This choice requires an external trigger to the TRIG IN rear panel connector to toggle the RF output power between main and alternate amplitudes.

**MANual** This choice enables the RF output power to be toggled between main and alternate amplitudes using the front-panel **Trigger** hardkey.

**\*RST** MAN

**Key Entry** **Int Ext Manual**



## **:ATTenuation**

**Supported**            All Models

```
[:SOURCE]:POWER:ATTenuation <val><unit>
[:SOURCE]:POWER:ATTenuation?
```

This command sets the signal generator’s attenuator level. Before setting the attenuator level, set the “:ATTenuation:AUTO” function to Off which will disable ALC control.

In normal operation the attenuator level is selected by the signal generator’s automatic loop control (ALC) which maintains the output power by adjusting internal circuits to compensate for any power fluctuations due to drift, band changes, or load variations. In some applications, such as fast pulse modulation, the ALC may not respond quickly enough to compensate for the pulse rise times. In this case you can set the attenuator and override any ALC adjustments.

The output power is the ALC level minus the attenuator setting. The attenuator is set in increments of 5 dB.

### **Example**

```
:POW:ATT 10DB
```

The preceding example sets the attenuator to 10 dB.

**\*RST**                    +115  
**Range**                    0 to 115 dB  
**Key Entry**                **Set Atten**

## **:ATTenuation:AUTO**

**Supported**            All Models

```
[:SOURCE]:POWER:ATTenuation:AUTO ON|OFF|1|0
[:SOURCE]:POWER:ATTenuation:AUTO?
```

This command sets the state of the attenuator auto mode function.

**ON (1)**                    This selection allows the signal generator’s automatic loop control (ALC) to adjust the attenuator so that a specified RF power level, at the ESG’s RF output connector, is maintained.

**OFF (0)**                    This choice allows for a user-selected attenuator setting that is not affected by the signal generator’s ALC circuitry.

The OFF (0) selection can be used to eliminate power discontinuity normally associated with attenuator switching during power adjustments.

**\*RST**                    1

**Power Subsystem ([:SOURce]:POWer)**

<b>Key Entry</b>	<b>Atten Hold Off On</b>
<b>Remarks</b>	During an amplitude sweep operation, signal generators with Option UNB or 506 protect the step attenuator from fast amplitude changes by automatically switching to attenuator auto Off mode. The attenuator is locked at its current setting and the amplitude sweep range is limited to 40 dB. Refer to the “:ALC:LEVel” on page 60 for more information.

**:MODE**

<b>Supported</b>	All Models
	<code>[:SOURce]:POWer:MODE FIXed LIST</code>
	<code>[:SOURce]:POWer:MODE?</code>

This command sets the signal generator power mode to fixed or swept.

FIXed	This choice stops a power sweep, allowing the signal generator to operate at a fixed power level. Refer to “[:LEVel][:IMMediate][:AMPLitude]” on page 69 for setting the output power level.
LIST	This choice selects the swept power mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or STEP power sweep.

---

**NOTE** To perform a frequency and amplitude sweep, you must also select LIST as the frequency mode. See “:FREQuency:MODE” on page 42 for selecting the list mode for a frequency sweep.

---

<b>*RST</b>	FIX
<b>Key Entry</b>	<b>Amplitude    Ampl    Off</b>

**:REFERENCE**

<b>Supported</b>	All Models
	<code>[:SOURce]:POWer:REFErence &lt;val&gt;&lt;unit&gt;</code>
	<code>[:SOURce]:POWer:REFErence?</code>

This command sets the power level for the signal generator RF output reference.

<b>*RST</b>	+0.00000000E+000
<b>Range</b>	-400 to 300DBM
<b>Key Entry</b>	<b>Ampl Ref Set</b>

**Remarks**            The RF output power is referenced to the value entered in this command.

**:REFerence:STATe**

**Supported**            All Models

```
[ :SOURce] :POWer:REFerence:STATe ON|OFF|1|0
[:SOURce] :POWer:REFerence:STATe?
```

This command enables or disables the RF output reference.

ON(1)                    This choice will set the power reference state to ON. The unit displayed for commands, “:ANNotation:AMPLitude:UNIT” on page 85 and “:POWer” on page 170 will be expressed in DB.

OFF(0)                   This choice will set the power reference state to OFF.

**\*RST**                    0

**Key Entry**            **Ampl Ref Off On**

**Remarks**            Once the reference state is ON, all subsequent output power settings are set relative to the reference value.

Amplitude offsets can be used with the amplitude reference mode.

**:STARt**

**Supported**            All Models

```
[ :SOURce] :POWer:STARt <val><unit>
[:SOURce] :POWer:STARt?
```

This command sets the first amplitude point in a step sweep.

**\*RST**                    -1.35000000E+002

**Range**                   Refer to “[:LEVel][:IMMediate][:AMPLitude]” on page 69 for the output power ranges.

**Key Entry**            **Ampl Start**

**Remarks**            During an amplitude sweep operation, signal generators with Option UNB or 506 protect the step attenuator by automatically switching to attenuator hold (ON) mode. The attenuator is locked at its current setting and the amplitude sweep range is limited to 40 dB.

**:STOP****Supported** All Models

[:SOURce]:POWer:STOP &lt;val&gt;&lt;unit&gt;

[:SOURce]:POWer:STOP?

This command sets the last amplitude point in a step sweep.

**\*RST** -1.35000000E+002**Range** Refer to “[[:LEVel][:IMMediate][:AMPLitude]]” on page 69 for the output power ranges.**Key Entry** **Ampl Stop****Remarks** During an amplitude sweep operation, signal generators with Option UNB or 506 protect the step attenuator by automatically switching to attenuator hold (ON) mode. The attenuator is locked at its current setting and the amplitude sweep range is limited to 40 dB.**[:LEVel][:IMMediate]:OFFSet****Supported** All Models

[:SOURce]:POWer[:LEVel] [:IMMediate]:OFFSet &lt;val&gt;&lt;unit&gt;

[:SOURce]:POWer[:LEVel] [:IMMediate]:OFFSet?

This command sets the power offset value.

**\*RST** +0.00000000E+000**Range** -200DB to 200DB**Key Entry** **Ampl Offset****Remarks** This simulates a power level at a test point beyond the RF OUTPUT connector without changing the actual RF output power. The offset value only affects the displayed amplitude setting.

You can enter an amplitude offset any time in either normal operation or amplitude reference mode.

### **[[:LEVel]][:IMMediate]][:AMPLitude]**

**Supported** All Models

```
[ :SOURce ] :POWer [ :LEVel ] [ :IMMediate ] [ :AMPLitude ] <val><unit>
[ :SOURce ] :POWer [ :LEVel ] [ :IMMediate ] [ :AMPLitude ] ?
```

This command sets the RF output power.

**\*RST** -1.35000000E+002

<b>Range</b>	<i>Frequency</i>	<i>Standard</i>	<i>Option UNB</i>	<i>Option 506</i>
	250kHz–250MHz	-136 to 11dBm	-136 to 15dBm	-136 to 12dBm
	>250MHz–1GHz	-136 to 13dBm	-136 to 17dBm	-136 to 14dBm
	> 1–3GHz	-136 to 10dBm	-136 to 16dBm	-136 to 13dBm
	> 3–4GHz	-136 to 7dBm	-136 to 13dBm	-136 to 10dBm
	> 4–6GHz	N/A	N/A	-136 to 10dBm

**Key Entry** **Amplitude**

**Remarks** The ranges for this command are specified values from the data sheet.

### **[[:LEVel]][:IMMediate]][:AMPLitude]:STEP**

**Supported** All Models

```
[ :SOURce ] :POWer [ :LEVel ] [ :IMMediate ] [ :AMPLitude ] :STEP [ :INCRement ]
<val><unit> | UP | DOWN
[ :SOURce ] :POWer [ :LEVel ] [ :IMMediate ] [ :AMPLitude ] :STEP [ :INCRement ] ?
```

This command sets the incremental step value for the amplitude parameter, or increments or decrements the current RF output power level by the specified <val> value.

<val> The increment power value.

UP Increases the current output power by the amount set with <val>. The front-panel up arrow key performs the same function.

DOWN Decreases the current output power by the amount set with <val>. The front-panel down arrow key performs the same function.

**Range** .02–100dB

**Key Entry** **Incr Set**

**Remarks** The value set with this command is not affected by \*RST or a power cycle.



---

## 3 System Commands

This chapter provides SCPI descriptions for subsystems dedicated to peripheral signal generator operations common to all ESG models. This chapter contains the following major sections:

- “Calibration Subsystem (:CALibration)” on page 72
- “Communication Subsystem (:SYSTem:COMMunicate)” on page 75
- “Diagnostic Subsystem (:DIAGnostic[:CPU]:INFORmation)” on page 81
- “Display Subsystem (:DISPlay)” on page 85
- “IEEE 488.2 Common Commands” on page 88
- “Memory Subsystem (:MEMory)” on page 94
- “Mass Memory Subsystem (:MMEMory)” on page 124
- “Output Subsystem (:OUTPut)” on page 128
- “Route Subsystem (:ROUte:HARDware:DGENerator)” on page 130
- “Status Subsystem (:STATus)” on page 136
- “System Subsystem (:SYSTem)” on page 154
- “Trigger Subsystem” on page 166
- “Unit Subsystem (:UNIT)” on page 170

---

## Calibration Subsystem (:CALibration)

### :DCFM

**Supported** All

:CALibration:DCFM

This command initiates a DCFM or DC $\Phi$ M calibration depending on the currently active modulation. This calibration eliminates any dc or modulation offset of the carrier signal.

---

**NOTE** If the calibration is performed with a dc signal applied, any deviation provided by the dc signal will be removed and the new zero reference point will be at the applied dc level. The calibration will have to be performed again when the dc signal is disconnected to reset the carrier signal to the correct zero reference.

---

**Key Entry** DCFM/DCFM Cal

**Remarks** Use this calibration for externally applied signals. While the calibration can also be performed for internally generated signals, dc offset is not a normal characteristic for them.

### :IQ

**Supported** E4438C

:CALibration:IQ

This command initiates an I/Q calibration.

**Key Entry** Execute Cal

### :IQ:DC

**Supported** E4438C

:CALibration:IQ:DC

This command performs a one to two second adjustment that is not traceable to a standard. However, it will minimize errors associated with offset voltages. This adjustment minimizes errors for the current signal generator setting and at a single frequency. The DC adjustment is volatile and must be repeated with each signal generator setting change. This command can be sent while the RF On/Off is set to Off and the adjustment will still be valid when the RF is enabled.



The I/Q DC adjustment is dependent upon a number of instrument settings. If any of the instrument settings change, the adjustment will become invalid. The dependent instrument settings are:

- RF frequency
- I/Q attenuation level
- Baseband generator settings
- I/Q polarity settings
- Baseband filter settings
- Path settings (Internal I/Q Mux Path 1 or Path 2)
- I/Q calibration (the I/Q DC calibration will be invalidated if any other I/Q calibration is executed or if the **Revert to Factory Default** key is pressed)
- Temperature ( $\pm 5$  degrees)

The following instrument states will not invalidate the I/Q DC calibration:

- Power level changes
- I/Q Impairments

**Key Entry**                    **Execute Cal** (with **Calibration Type User Full** set to DC)

### **:IQ:DEfault**

**Supported**                    E4438C

:CALibration:IQ:DEfault

This command will restore the original factory calibration data for the internal I/Q modulator.

**Key Entry**                    **Revert to Default Cal Settings**

### **:IQ:FULL**

**Supported**                    E4438C

:CALibration:IQ:FULL

This command performs an adjustment to the I/Q offset, gain and quadrature for the full-frequency range (regardless of the start and stop frequency settings) and stores the results in the signal generator's firmware.

**Key Entry**                    **Execute Cal** (with **Calibration Type User Full** set to Full)

**Remarks**                    Start and stop frequencies will default to the full frequency range of the signal generator.

### :IQ:START

**Supported** E4438C

:CALibration:IQ:START <val><unit>

:CALibration:IQ:START?

This command sets the start frequency and automatically sets the calibration type to User for an I/Q calibration.

**Range** Option 501: 100kHz–1GHz  
Option 502: 100kHz–2GHz  
Option 503: 100kHz–3GHz  
Option 504: 100kHz–4GHz  
Option 506: 100kHz–6GHz

**Key Entry** **Start Frequency**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### :IQ:STOP

**Supported** E4438C

:CALibration:IQ:STOP <val><unit>

:CALibration:IQ:STOP?

This command sets the stop frequency and automatically sets the calibration type to User for an I/Q calibration.

**Range** Option 501: 100kHz–1GHz  
Option 502: 100kHz–2GHz  
Option 503: 100kHz–3GHz  
Option 504: 100kHz–4GHz  
Option 506: 100kHz–6GHz

**Key Entry** **Stop Frequency**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

---

## Communication Subsystem (:SYSTem:COMMunicate)

### :GPIB:ADDRes

**Supported** All

```
:SYSTem:COMMunicate:GPIB:ADDRes <number>  
:SYSTem:COMMunicate:GPIB:ADDRes?
```

This command sets the signal generator's GPIB address.

**Range** 0–30

**Key Entry** GPIB Address

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### :GTLocal

**Supported** All

```
:SYSTem:COMMunicate:GTLocal
```

This command sets the signal generator to local mode which enables front panel operation.

**Key Entry** Local

### :LAN:CONFig

**Supported** All Models

```
:SYSTem:COMMunicate:LAN:CONFig DHCP|MANual  
:SYSTem:COMMunicate:LAN:CONFig?
```

This command sets the signal generator's internet protocol (IP) address.

MANual The user assigns an IP address to the signal generator.

DHCP The network assigns an IP address to the signal generator.

#### Example

```
:SYST:COMM:LAN:CONF DHCP
```

The preceding example sets up the signal generator LAN configuration to use a DHCP IP address.

**Key Entry** LAN Config

### :LAN:GATEway

**Supported** All

```
:SYSTEM:COMMunicate:LAN:GATEway "<ipstring>"
```

```
:SYSTEM:COMMunicate:LAN:GATEway?
```

This command sets the gateway for local area network (LAN) access to the signal generator from outside the current sub-network.

**Key Entry**            **Default Gateway**

**Remarks**            Using an empty string restricts access to the signal generator to local hosts on the LAN.

### :LAN:HOSTname

**Supported** All

```
:SYSTEM:COMMunicate:LAN:HOSTname "<string>"
```

```
:SYSTEM:COMMunicate:LAN:HOSTname?
```

This command sets the signal generator's local area network (LAN) connection hostname.

**Key Entry**            **Hostname**

**Remarks**            The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### :LAN:IP

**Supported** All

```
:SYSTEM:COMMunicate:LAN:IP "<ipstring>"
```

```
:SYSTEM:COMMunicate:LAN:IP?
```

This command sets the signal generator's local area network (LAN) internet protocol (IP) address for your IP network connection.

**Key Entry**            **IP Address**

**Remarks**            The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## :LAN:SUBNet

**Supported** All

```
:SYSTem:COMMunicate:LAN:SUBNet "<ipstring>"  
:SYSTem:COMMunicate:LAN:SUBNet?
```

This command sets the signal generator's local area network (LAN) subnet mask address for your internet protocol (IP) network connection.

**Key Entry** Subnet Mask

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## :PMETer:ADDRess

**Supported** All

```
:SYSTem:COMMunicate:PMETer:ADDRess <val>  
:SYSTem:COMMunicate:PMETer:ADDRess?
```

This command sets the address for a power meter that is controlled by the signal generator.

**Range** 0–30

**Key Entry** Meter Address

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

The power meter is controlled only through a GPIB cable.

Ensure that the power meter address is different from the signal generator address.

## :PMETer:CHANnel

**Supported** All

```
:SYSTem:COMMunicate:PMETer:CHANnel A|B  
:SYSTem:COMMunicate:PMETer:CHANnel?
```

This command sets the measurement channel on the power meter that is controlled by the signal generator.

**Key Entry** Meter Channel A B

**Remarks** A single-channel power meter uses channel A and selecting channel B will have no effect.

**Communication Subsystem (:SYSTEM:COMMunicate)**

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

The power meter is controlled only through a GPIB cable.

**:PMETer:IDN**

**Supported** All

:SYSTEM:COMMunicate:PMETer:IDN E4418B | E4419B | E4416A | E4417A

:SYSTEM:COMMunicate:PMETer:IDN?

This command sets the model number of the power meter that is controlled by the signal generator.

**Key Entry** **Power Meter**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

The power meter is controlled only through a GPIB cable.

**:PMETer:TIMEout**

**Supported** All

:SYSTEM:COMMunicate:PMETer:TIMEout <num> [<time suffix>]

:SYSTEM:COMMunicate:PMETer:TIMEout?

This command sets the period of time which the signal generator will wait for a valid reading from the power meter.

The variable <num> has a resolution of 0.001.

**Range** 1mS–100S

**Key Entry** **Meter Timeout**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

The power meter is controlled only through a GPIB cable.

If a time-out occurs, the signal generator reports an error message.

## **:SERial:BAUD**

**Supported** All

```
:SYSTem:COMMunicate:SERial:BAUD <number>
```

```
:SYSTem:COMMunicate:SERial:BAUD?
```

This command sets the baud rate for the rear panel RS-232 interface labeled RS-232.

**Key Entry** **RS-232 Baud Rate**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## **:SERial:ECHO**

**Supported** All

```
:SYSTem:COMMunicate:SERial:ECHO ON|OFF
```

```
:SYSTem:COMMunicate:SERial:ECHO?
```

This command enables or disables the RS-232 echo.

**Key Entry** **RS-232 ECHO Off On**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## **:SERial:RESet**

**Supported** All

```
:SYSTem:COMMunicate:SERial:RESet
```

This event command resets the RS-232 buffer and will discard any unprocessed SCPI input received by the RS-232 port.

**Key Entry** **Reset RS-232**

## :SERial:TOUT

**Supported** All

:SYSTem:COMMunicate:SERial:TOUT <val>

:SYSTem:COMMunicate:SERial:TOUT?

This command sets the RS-232 serial port time-out value.

If further input is not received within the time-out period specified, while a SCPI command is being processed, the command is aborted and the input buffer is cleared.

The variable <val> is entered in units of seconds.

**Range** 1–25

**Key Entry** **RS-232 Timeout**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.



---

## Diagnostic Subsystem (:DIAGnostic[:CPU]:INFORMATION)

### :BOARDs

**Supported**      All

:DIAGnostic[:CPU]:INFORMATION:BOARDs?

This query returns a list of the installed boards in the signal generator. The information will be returned in the following format:

"<board name,part number,serial number,version number,status>"

This information format will repeat with as many iterations as the number of detected boards in the signal generator.

**Key Entry**      **Installed Board Info**

### :CCOunt:ATTenuator

**Supported**      All

:DIAGnostic[:CPU]:INFORMATION:CCOunt:ATTenuator?

This query returns the cumulative number of times that the attenuator has been switched.

**Key Entry**      **Diagnostic Info**

### :CCOunt:PON

**Supported**      All

:DIAGnostic[:CPU]:INFORMATION:CCOunt:PON?

This query returns the cumulative number of times the signal generator has been powered-on.

**Key Entry**      **Diagnostic Info**

### :CCOunt:PROTection

**Supported**      All

:DIAGnostic[:CPU]:INFORMATION:CCOunt:PROTection?

This query returns the cumulative number of times the reverse power protection has been cycled.

**Key Entry**      **Diagnostic Info**

### **:DISPlay:OTIME**

**Supported** All Models

`:DIAGnostic[:CPU]:INFORMATION:DISPlay:OTIME?`

This query returns the cumulative number of hours the display has been on.

**Key Entry** **Diagnostic Info**

### **:LICense:AUXiliary**

**Supported** E4438C with Option 001/600 or 002.602

`:DIAGnostic[:CPU]:INFORMATION:LICense:AUXiliary?`

This query returns a list of licenses for software applications associated with the signal generator that have the software license file installed on the PC, as opposed to a license key installed on the signal generator. However this query does not return demo licenses for Arb-based applications.

**Key Entry** **Auxiliary Software Options**

**Remarks** If you use the signal generator with a PC that has a copy of a software application for which a license shows with this query, the software automatically accesses and installs the license on the PC.

To access Arb-based demo software licenses, see “[:LICense:WAVEform](#)” . To view option numbers for software applications that use license keys, see “[:OPTions](#)” on page 83.

### **:LICense:WAVEform**

**Supported** E4438C with Option 001/600 or 002/602

`:DIAGnostic[:CPU]:INFORMATION:LICense:WAVEform?`

This query returns a list of Arb-based licenses (including demo) for software applications associated with the signal generator that have the software license file installed on the PC, as opposed to a license key installed on the signal generator. These waveform licenses are created by the software application in a license file on the PC. Refer to “[:WLICence\[:VALue\]](#)” on page 84 for more information.

The response format is a series of comma-separated entries enclosed in quotation marks. The first field is the waveform type number and the second is a text description of the license.

**Key Entry** **Waveform Licenses**

**Remarks** If a license appears in this list, this means that you can transfer waveform files, created with the associated Arb-based software application to another signal generator if the other signal generator has the same license. For more information,

refer to the command, “:LICense:AUXiliary” on page 82.

For a list of option numbers for software applications that use license keys, see “:OPTions”.

## :OPTions

**Supported** All Models

:DIAGnostic[:CPU]:INFORMATION:OPTions?

This query returns a list of internally installed signal generator options.

**Key Entry**            **Options Info**

## :OPTions:DETail

**Supported** All Models

:DIAGnostic[:CPU]:INFORMATION:OPTions:DETail?

This query returns the options that are installed along with the option revision and DSP version if applicable.

**Key Entry**            **Options Info**

## :OTIME

**Supported** All Models

:DIAGnostic[:CPU]:INFORMATION:OTIME?

This query returns the cumulative number of hours that the signal generator has been on.

**Key Entry**            **Diagnostic Info**

## :REVision

**Supported** All Models

:DIAGnostic[:CPU]:INFORMATION:REVision?

This query returns the CPU bootstrap read only memory (boot ROM) revision date. In addition, the query returns the revision, creation date, and creation time of the main firmware.

**Key Entry**            **Diagnostic Info**

**Diagnostic Subsystem (:DIAGnostic[:CPU]:INFORMATION)**

**:SDATe**

**Supported**            All Models

:DIAGnostic[:CPU]:INFORMATION:SDATe?

This query returns the date and time of the main firmware.

**Key Entry**            **Diagnostic Info**

**:WLICence[:VALue]**

**Supported**            E4438C with Option 001/601 or 002/602

:DIAGnostic[:CPU]:INFORMATION:WLICence[:VALue]? <type\_num>

This query returns the number of seconds remaining on the waveform license for the type of waveform designated by the <type\_num> variable number. The type variable number is obtained using the “:LICence:WAVEform” command shown on [page 82](#). Zero is returned for non-existent and expired licenses. The value 2<sup>32</sup> -1 (4,294,967,295) is returned for licenses that do not expire. Refer to the *E4428C/38C ESG Signal Generators Key and Data Field Reference* for information on the waveform licence.

---

## Display Subsystem (:DISPlay)

### :ANNotation:AMPLitude:UNIT

**Supported** All Models

```
:DISPlay:ANNotation:AMPLitude:UNIT DBM|DBUV|DBUVEFMF|V|VEMF|DB  
:DISPlay:ANNotation:AMPLitude:UNIT?
```

This command sets the displayed front panel amplitude units.

If the amplitude reference state is set to on, the query returns units expressed in DB. Setting any other unit will cause a setting conflict error stating that the amplitude reference state must be set to off. Refer to, “:REFerence:STATE” on page 67 for more information.

**\*RST** DBM

### :ANNotation:CLOCK:DATE:FORMat

**Supported** All Models

```
:DISPlay:ANNotation:CLOCK:DATE:FORMat MDY|DMY  
:DISPlay:ANNotation:CLOCK:DATE:FORMat?
```

This command enables the selection of the date format. The choices are month-day-year (MDY) or day-month-year (DMY) format.

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### :ANNotation:CLOCK[:STATe]

**Supported** All Models

```
:DISPlay:ANNotation:CLOCK[:STATe] ON|OFF|1|0  
:DISPlay:ANNotation:CLOCK[:STATe]?
```

This command enables or disables the digital clock view in the lower right side of the front panel display.

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## :BRIGhtness

**Supported** All Models

:DISPlay:BRIGhtness <val>

:DISPlay:BRIGhtness?

This command sets the display brightness (intensity). The brightness can be set to the minimum level (0.02), maximum level (1), or in between by using fractional numeric values (0.03–0.99).

**Range** 0.02–1

**Key Entry** **Brightness**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## :CAPTure

**Supported** All Models

:DISPlay:CAPTure

This event command enables the user to capture the current display and store it in the signal generator's memory.

**Remarks** The display capture is stored as DISPLAY.BMP in the Binary file system. This file is overwritten with each subsequent display capture. The file can be down-loaded in the following manner:

1. Log on to the signal generator using ftp.
2. Change (cd) to the BIN directory.
3. Retrieve the file by using the get command.

## :CONTRast

**Supported** All Models

:DISPlay:CONTRast <val>

:DISPlay:CONTRast?

This command sets the contrast of the LCD display. The contrast can be set to the maximum level (1), minimum level (0), or in between by using fractional numeric values (0.001–0.999).

**Range** 0–1

**Key Entry** Display contrast hardkeys are located below the display.

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### **:INVerse**

**Supported** All Models

:DISPlay:INVerse ON|OFF|1|0

:DISPlay:INVerse?

This command sets the display of the source to inverse video mode.

**Key Entry** **Inverse Video Off On**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### **:REMote**

**Supported** All Models

:DISPlay:REMote ON|OFF|1|0

:DISPlay:REMote?

This command enables or disables the display updating when the signal generator is remotely controlled.

ON (1) This choice updates the signal generator display so you can see the settings as the commands are executed, however, this will degrade the signal generator speed.

OFF (0) This choice turns off the display updating while further optimizing the signal generator for speed.

**Key Entry** **Update in Remote Off On**

**Remarks** The setting enabled by this command is not affected by signal generator preset or \*RST. However, cycling the signal generator power will reset it to zero.

### **[:WINDow][:STATe]**

**Supported** All Models

:DISPlay[:WINDow][:STATe] ON|OFF|1|0

:DISPlay[:WINDow][:STATe] ?

This command is used to either blank out (OFF or 0) the display screen or turn it on (ON or 1).

**Remarks** The setting enabled by this command is not affected by \*RST. However, presetting the signal generator or cycling the power will turn the display on.

---

## IEEE 488.2 Common Commands

### \*CLS

**Supported** All Models

\*CLS

The Clear Status (CLS) command clears the Status Byte Register, the Data Questionable Event Register, the Standard Event Status Register, the Standard Operation Status Register and any other registers that are summarized in the status byte.

### \*ESE

**Supported** All Models

\*ESE <data>

The Standard Event Status Enable (ESE) command sets the Standard Event Status Enable Register.

The variable <data> represents the sum of the bits that will be enabled.

**Range** 0–255

**Remarks** The setting enabled by this command is not affected by signal generator preset or \*RST. However, cycling the signal generator power will reset this register to zero.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### \*ESE?

**Supported** All Models

\*ESE?

The Standard Event Status Enable (ESE) query returns the value of the Standard Event Status Enable Register.

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.



## \*ESR?

**Supported** All Models

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

\*ESR?

The Standard Event Status Register (ESR) query returns the value of the Standard Event Status Register.

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

## \*IDN?

**Supported** All Models

\*IDN?

The Identification (IDN) query outputs an identifying string. The response will show the following information:

<company name>, <model number>, <serial number>, <firmware revision>

**Key Entry** **Diagnostic Info**

**Remarks** The identification information can be modified. Refer to “:IDN” on page 156 for more information.

## \*OPC

**Supported** All Models

\*OPC

The Operation Complete (OPC) command sets bit 0 in the Standard Event Status Register when all pending operations have finished.

**\*OPC?**

**Supported**            All Models

\*OPC?

The Operation Complete (OPC) query returns the ASCII character 1 in the Standard Event Status Register when all pending operations have finished.

**\*OPT?**

Supported            All Models

\*OPT?

The options (OPT) query returns a comma-separated list of all of the instrument options currently installed on the signal generator.

**Key Entry**            **Instrument Options**

**\*PSC**

**Supported**

\*PSC ON|OFF|1|0

The Power-On Status Clear (PSC) command controls the automatic power-on clearing of the Service Request Enable Register, the Standard Event Status Enable Register, and device-specific event enable registers.

ON (1)                This choice enables the power-on clearing of the listed registers.

OFF (0)              This choice disables the clearing of the listed registers and they retain their status when a power-on condition occurs.

**Remarks**            The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

**\*PSC?**

**Supported**            All Models

\*PSC?

The Power-On Status Clear (PSC) query returns the flag setting as enabled by the \*PSC command.

**\*RCL**

**Supported**            All Models

\*RCL <reg>, <seq>

The Recall (RCL) command recalls the state from the specified memory register <reg> of the specified sequence <seq>.

<b>Range</b>	Registers: 0–99	Sequences: 0–9
<b>Key Entry</b>	<b>RECALL Reg</b>	<b>Select Seq:</b>

## \*RST

**Supported** All Models

\*RST

The Reset (RST) command resets most signal generator functions to factory-defined conditions.

**Remarks** Each command shows the \*RST value if the setting is affected.

## \*SAV

**Supported** All Models

\*SAV <reg>, <seq>

The Save (SAV) command saves signal generator settings to the specified memory register <reg> of the specified sequence <seq>.

<b>Range</b>	Registers: 0–99	Sequences: 0–9
<b>Key Entry</b>	<b>Save Reg</b>	<b>Save Seq[n] Reg[nn]</b>

**Remarks** The save function does not save all signal generator settings. Refer to the *E4428C/38C ESG Signal Generators User's Guide* for more information on the save function. Refer to [“\\*RCL” on page 90](#) for information on recalling saved signal generator settings.

## \*SRE

**Supported** All Models

\*SRE <data>

The Service Request Enable (SRE) command sets the value of the Service Request Enable Register.

The variable <data> is the decimal sum of the bits that will be enabled. Bit 6 (value 64) is ignored and cannot be set by this command.

**Range** 0–255

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming*

*Guide* for more information.

Entering values from 64 to 127 is equivalent to entering values from 0 to 63.

The setting enabled by this command is not affected by signal generator preset or \*RST. However, cycling the signal generator power will reset it to zero.

**\*SRE?**

**Supported** All Models

\*SRE?

The Service Request Enable (SRE) query returns the value of the Service Request Enable Register.

**Range** 0–63 or 128–191

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**\*STB?**

**Supported** All Models

\*STB?

The Read Status Bye (STB) query returns the value of the status byte including the master summary status (MSS) bit.

**Range** 0–255

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**\*TRG**

**Supported** All Models

\*TRG

The Trigger (TRG) command triggers the device if BUS is the selected trigger source, otherwise, \*TRG is ignored.

**\*TST?**

**Supported** All Models

\*TST?

The Self-Test (TST) query initiates the internal self-test and returns one of the following results:

- 0 This shows that all tests passed.
- 1 This shows that one or more tests failed.

**Key Entry**      **Run Complete Self Test**

### **\*WAI**

**Supported**      All Models

\*WAI

The Wait-to-Continue (WAI) command causes the signal generator to wait until all pending commands are completed, before executing any other commands.

## Memory Subsystem (:MEMory)

### :CATalog:BINary

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:BINary?

This command outputs a list of the binary files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** Binary

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:BIT

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:BIT?

This command outputs a list of the bit files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** Bit

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:CDMa

---

**NOTE** Refer to the *E4428C/38C ESG Signal Generators Programming Compatibility Guide* for information on this command. This command is still valid for backward compatibility and was replaced by “:CATalog:CDMA”.

---

## :CATalog:CDMA

**Supported** E4438C with Option 401

:MEMory:CATalog:CDMA?

This command outputs a list of the arbitrary waveform CDMA files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** **CDMA**

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:DMOD

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:DMOD?

This command outputs a list of the arbitrary waveform digital modulation files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** **DMOD**

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:DWCDma

**Supported** E4438C with Option 400

:MEMory:CATalog:DWCDma?

This command outputs a list of the arbitrary waveform downlink W-CDMA files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** DWCDMA

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:FCDMa

**Supported** E4438C with Option 401

:MEMory:CATalog:FCDMa?

This command outputs a list of the arbitrary waveform forward link cdma2000 files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** FCDMA

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.



## :CATalog:FIR

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:FIR?

This command outputs a list of the finite impulse response filter files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** FIR

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:FSK

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:FSK?

This command outputs a list of the FSK files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** FIR

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:IQ

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:IQ?

This command outputs a list of the IQ files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** I/Q

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:LIST

**Supported** All Models

:MEMory:CATalog:LIST?

This command outputs a list of the list sweep files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** List

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:MCDMa

**Supported** E4438C with Option 401

:MEMory:CATalog:MCDMa?

This command outputs a list of the arbitrary waveform multicarrier IS-95 CDMA files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** MCDMA

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:MDMod

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:MDMod?

This command outputs a list of the arbitrary waveform multicarrier digital modulation files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** MDMOD

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:MDWCdma

**Supported** E4438C with Option 400

:MEMory:CATalog:MDWCdma?

This command outputs a list of the arbitrary waveform multicarrier downlink W-CDMA files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** MDWCdma

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:MFCdma

**Supported** E4438C with Option 401

:MEMory:CATalog:MFCdma?

This command outputs a list of the arbitrary waveform multicarrier forward link cdma2000 files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** MFCdma

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:MTONe

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:MTONe?

This command outputs a list of the arbitrary waveform multitone files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** MTONE

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:RCDMa

**Supported** E4438C with Option 401

:MEMory:CATalog:RCDMa?

This command outputs a list of the arbitrary waveform files for reverse link cdma2000. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** RCDMA

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:SEQ

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:SEQ?

This command outputs a list of the arbitrary waveform sequence files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** SEQ

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:SHAPE

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:CATalog:SHAPE?

This command outputs a list of the burst shape files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** SHAPE

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:STATe

**Supported** All Models

:MEMory:CATalog:STATe?

This command outputs a list of the state files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** **State**

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :CATalog:UFLT

**Supported** All Models

:MEMory:CATalog:UFLT?

This command outputs a list of the user-flatness correction files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** **User Flatness**

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog:UWCDma

**Supported** E4438C with Option 400

:MEMory:CATalog:UWCDma?

This command outputs a list of the arbitrary waveform uplink W-CDMA files. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** UWCDMA

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :CATalog[:ALL]

**Supported** All Models

:MEMory:CATalog[:ALL]?

This command outputs a list of all the files in the memory subsystem. However it does not include files stored on the Option 001/601 or 002/602 baseband generator. The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the memory subsystem. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

**Key Entry** All

**Remarks** Refer to the [Table on page 14](#) for a listing of the file types and [“File Name Variables” on page 13](#) for information on the "<file name>" syntax.



## :COPY[:NAME]

**Supported** All Models

```
:MEMory:COPY[:NAME] "<file name>","<file name>"
```

This command makes a duplicate of the requested file.

**Key Entry** Copy File

**Remarks** Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

When copying a waveform file from volatile to non-volatile memory, the marker file and file header, associated with the waveform file, will automatically be copied at the same time.

## :DATA

**Supported** E4438C with Option 001/601 or 002/602

```
:MEMory:DATA "<file_name>",<data_block>
```

```
:MEMory:DATA? "<file_name>"
```

This command loads waveform data into signal generator memory using the `<data_block>` parameter and saves the data to a file designated by the `"<file_name>"` variable. The query returns the file contents of the file as a datablock.

The waveform file must be located in volatile waveform memory (WFM1) before it can be played by the signal generator’s dual ARB player.

For downloads directly into volatile waveform memory use the path `"WFM1:<file_name>"`. For downloads to non-volatile waveform memory, use the path `"NVWFM:<file_name>"`.

`"<file_name>"` This variable names the destination file, including the directory path.

`<data_block>` This parameter represents the data and file length parameters. The data in the file is represented by the `<data_block>` variable.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on programming the status registers.

---

**NOTE** ARB waveform files created using the :DATA command cannot be retrieved or uploaded. Attempting to do so will cause the signal generator to display the message: `ERROR:221, Access denied`. To download ARB data to files for later retrieval, use the `“:DATA:UNPRotected”` command on [page 116](#).

---

**Memory Subsystem (:MEMory)****Example**

```
:MEM:DATA "NVWFM:IQ_Data",#210Qaz37pY9oL
```

The preceding example downloads 10 bytes of data to a file, IQ\_Data., in the signal generator's non-volatile memory. The table shown below describes the command parameters.

- |                   |  |
|-------------------|--|
| • "NVWFM:IQ_Data" | IQ_Data is the file name. The directory path is not needed. The path "/USER/WAVEFORM/" is implied. |
| • #210Qaz37pY9oL  | Data block   |
| #                 | This character indicates the beginning of the data block   |
| 2                 | Number of digits in the byte count   |
| 10                | Byte count   |
| Qaz37pY9oL        | 10 bytes of data   |

---

**NOTE** The data, Qaz37pY9oL, in the above command are not valid and are shown for example purposes only. Typically, ascii characters representing data are unprintable.

---

**Remarks** See [“File Name Variables” on page 13](#) for information on the file name syntax.

**:DATA:APPend**

**Supported** E4438C with Option 001/601 or 002/602

```
:MEMory:DATA:APPend "<file_name>",<data_block>
```

This commands appends data to an existing file stored in signal generator memory.

"<file\_name>" This variable names the destination file and directory path.

<data\_block> This parameter represents the data and file length parameters. The data in the file is represented by the <data\_block> variable. The file length parameters are used by the signal generator for allocating memory.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

**Example**

```
:MEM:DATA:APPend "NVWFM:IQ_Data",#14Y9oL
```

The preceding example downloads and appends the data, Y9oL, to an existing file named IQ\_Data stored in the signal generator’s non-volatile memory (NVWFM).

- "NVWFM:IQ\_Data"                    IQ\_Data the file name. The directory path is not needed. The path "/USER/WAVEFORM/" is implied.
- #14Y9oL                              Data block
  - #                                      This character indicates the beginning of the data block
  - 1                                      Number of digits in the byte count
  - 4                                      Byte count
  - Y9oL                                  4 bytes of data

**Remarks**                    Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

**:DATA:BIT**

**Supported**                    E4438C with Option 001/601 or 002/602

```
:MEMory:DATA:BIT "<file_name>",<bit_count>,<data_block>
:MEMory:DATA:BIT? "<file_name>"
```

This command loads bit data into signal generator memory using the <bit\_count> and <data\_block> parameters and saves the data to a file designated by the "<file\_name>" variable. The query returns the bit count, file length information, and the data.

- "<file\_name>"    This variable names the destination file and the directory path.
- <bit\_count>        This number represents the number of bits in the data block.
- <data\_block>      This parameter represents the data and file length parameters. The data in the file is represented by the <data\_block> variable. The file length parameters are used by the signal generator for allocating memory.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

**Example**

```
:MEM:DATA:BIT "Test_Data",16,#12Qz
```

The preceding example downloads bit data to the file, Test\_Data. The table below describes the command parameters.

**Memory Subsystem (:MEMory)**

- "Test\_Data"                      Test\_Data is the file name. The directory path is not needed. The path "/USER/BIT/" is implied.
- 16                                      Number of bits in the data block
- #12Qz                                Data block
  - #                                      This character indicates the beginning of the data block
  - 1                                      Number of digits in the byte count
  - 2                                      Byte count
  - Qz                                     16 bits of data (ascii representation of bit data)

**Remarks**                      Refer to “File Name Variables” on page 13 for information on the file name syntax.

**:DATA:FIR**

**Supported**                      E4438C with Option 001/601 or 002/602

```
:MEMory:DATA:FIR "<file_name>",osr,coefficient{,coefficient}
:MEMory:DATA:FIR? "<file_name>"
```

This command loads oversample ratio (OSR) and user-defined finite impulse response (FIR) coefficient data into a file in the signal generator’s non-volatile memory (NVWFM). The query returns the oversample ratio and coefficient data.

"<file\_name>"    This variable is the file name of the destination file. The directory path, /USER/FIR is not required as it is implied by the command.

osr                      The OSR is the number of filter taps per symbol.

coefficient        This variable is the FIR coefficient. The maximum number of coefficients is 1024.

{,coefficient}    This optional variable is used when you enter additional coefficients.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

**Example**

```
:MEM:DATA:FIR "FIR_1",4,0,0,0,0,0,0.000001,0.000012,0.000132,
0.001101,0.006743,0.030588,0.103676,0.265790,0.523849,0.809508,1,1,
0.809508,0.523849,0.265790,0.103676,0.030588,0.006743,0.001101,0.000132,
0.000012,0.000001,0,0,0,0,0
```

The preceding example downloads FIR coefficient and oversampling ratio data to the signal generator’s non-volatile memory in a file named FIR\_1. Notice that the signal generator directory

path, /USER/FIR, is not needed as it is implied by the command. Refer to “File Name Variables” on page 13 for information on the file name syntax.

**Range**                    *osr*: 1–32  
                               *coefficient*: –1000 to 1000

**Key Entry**              **Oversample Ratio**

**:DATA:FSK**

Supported                E4438C with Option 001/601 or 002/602

```
:MEMory:DATA:FSK "<file_name>",<num_states>,<f0>,<f1>,...<f(n)>
[,<diff_state>,<num_diff_states>,<diff1>,...<diff(n)>]
:MEMory:DATA:FSK? "<file_name>"
```

This command loads custom frequency shift keying (FSK) data into a file in the signal generator’s non-volatile memory (NVWFM).

The query returns data in the following form:

```
<num_states>,<f0>,<f1>,...<f(n)>,<diff_state>,<num_diff_states>,<diff1>,...<diff(n)>
```

"<file\_name>" This variable string identifies the name of the FSK file. The filename must be enclosed with quotation marks.

<num\_states> This variable identifies the number of frequency states.

<f0> This variable identifies the value of the first frequency state.

<f1>,...<f(n)> This variable identifies the value of the second and subsequent frequency states with a frequency resolution of 0.1Hz.

<diff\_state> This variable enables or disables differential encoding.

<num\_diff\_states> This variable identifies the number of differential states.

<diff0> This variable identifies the value of the first differential state.

<diff1>,...<diff(n)> This variable identifies the value of the second and subsequent differential states.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

**Example**

```
:MEM:DATA:FSK "4FSK",4,-2kHz,-1kHz,2kHz,1kHz,ON,2,1,0
```

The preceding example downloads a four-level FSK data to a file named 4FSK. There are four states (frequencies): -2kHz, -1kHz, 2kHz, 1kHz; differential encoding is toggled ON, and there are two differential states 1 and 0. The table shown below describes the command parameters.

- "4FSK"                                    4FSK is the FSK file name. The directory path is not needed. The path "/USER/FSK" is implied.
- 4    Number of states
- -2kHz                                    First frequency state
- -1kHz                                    Second frequency state
- 2kHz                                      Third frequency state
- 1kHz                                      Fourth frequency state
- ON                                        Differential encoding is on
- 2                                         Number of differential states
- 1                                         Value of the first differential state.
- 0                                         Value of the second differential state.

**Range**                    *num\_diff\_states:* 0–256  
                               *num\_states:* 2–16  
                               *f0–f(n):* -20MHZ to 20MHZ  
                               *diff0–diff(n):* -128 to 127

**Remarks**                Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

**:DATA:IQ**

**Supported**                E4438C with Option 001/601 or 002/602

```
:MEMory:DATA:IQ "<file_name>",<offsetQ>,<num_states>,<i0>,<q0>,<i1>,<q1>,...<i(n)>,<q(n)>[,<diff_state>,<num_diff_states>,<diff0>,<diff1>,...<diff(n)>]
```

```
:MEMory:DATA:IQ? "<file_name>"
```

This command loads custom I/Q data into a file in the signal generator’s non-volatile waveform memory (NVWFM).

The query returns data in the following form:

<offsetQ>, <num\_states>, <i0>, <q0>, <i1>, <q1>, ... <i(n)>, <q(n)>, <diff\_state>  
 , <num\_diff\_states>, <diff0>, <diff1>, ... <diff(n)>

"<file\_name>" This variable string identifies the name of the I/Q file. The filename must be enclosed with quotation marks.

<offsetQ> This variable enables (1) or disables (0) the Q output delay by 1/2 symbol from the I output.

<num\_states> This is the number of symbols.

<i0>...<i(n)> This is the I value of the first and subsequent I symbols.

<q0>...<q(n)> This is the Q value of the first and subsequent Q symbols.

<diff\_state> This variable enables and disables differential encoding.

<num\_diff\_states> This variable identifies the number of differential states.

<diff0> This variable identifies the value of the first differential state.

<diff1, ... diff(n)> This variable identifies the value of the second and subsequent differential states.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

**Example**

```
:MEM:DATA:IQ "Test_BPSK",1,2,1,0,0,0
```

The preceding example loads and stores a two-symbol I/Q file named `Test_BPSK` that has a Q offset. The table shown below describes the command parameters.

- "Test\_BPSK"                    `Test_BPSK` is the file name. The directory path is not needed. The path `"/USER/IQ"` is implied.
- 1                                Q Offset. The Q output delay is enabled.
- 2                                Number of symbols
- 1                                Value of the first I symbol
- 0                                Value of the first Q symbol.
- 0                                Value of the second I symbol
- 0                                Value of the second Q symbol

**Memory Subsystem (:MEMory)**

<b>Range</b>	<i>num_states</i> : 2–256 <i>i0–i(n)</i> : –1 to 1 <i>q0–q(n)</i> : –1 to 1 <i>num_diff_states</i> : 0–256 <i>diff0–diff(n)</i> : –128 to 127
<b>Remarks</b>	Refer to “ <a href="#">File Name Variables</a> ” on page 13 for information on the file name syntax.

**:DATA:PRAM:FILE:BLOCK**

**Supported** E4438C with Option 001/601 or 002/602

`:MEMory:DATA:PRAM:FILE:BLOCK "<file_name>", <data_block>`

This command loads block-formatted data directly into pattern RAM volatile memory (WFM1). Pattern RAM memory describes how memory (WFM1) is used and is not a distinct piece of memory. A PRAM file is specified as an array of bytes.

"<file\_name>" This variable names the destination file. No directory path name is needed.

<data\_block> This parameter represents the data and file length parameters. The data in the file is represented by the <data\_block> variable. The file length parameters are used by the signal generator for allocating memory.

Pattern Ram files are binary files downloaded directly into waveform memory as an array of bytes. Each byte specifies a data bit (LSB 0), a burst bit (BIT 2), and an Event 1 output bit (BIT 6). Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on pattern RAM downloading.

**Example**

`:MEM:DATA:PRAM:FILE:BLOC "PRAM_Data", #14Yq8L`

The preceding example downloads PRAM data to a file named PRAM\_Data into the signal generator’s volatile memory (WFM1).

- "PRAM\_Data" PRAM\_Data is the file name. PRAM files are saved to the signal generator’s volatile memory (WFM1).
- #14Yq8L Data block
  - # This character indicates the beginning of the data block
  - 1 Number of digits in the byte count
  - 4 Byte count
  - Yq8L 4 bytes of data



---

**NOTE** The data, Yq8L, in the above command is not valid and is used for example purposes only. Typically, ASCII characters representing data are unprintable.

---

**Remarks** Refer to “File Name Variables” on page 13 for information on the file name syntax.

## **:DATA:PRAM:FILE:LIST**

**Supported** E4438C with Option 001/601 or 002/602

MEMory:DATA:PRAM:FILE:LIST "<file\_name>", <uint8> [, <uint8>, <...>]

This command loads list-formatted data directly into pattern RAM volatile memory (WFM1). Pattern RAM memory describes how memory (WFM1) is used and is not a distinct piece of memory. A PRAM file is specified as an array of bytes.

---

**NOTE** This command should be preceded by a \*WAI (Wait-to-Continue) command to ensure that all pending operations are completed, before loading the list.

---

"<file\_name>" This variable names the destination file.

<uint8> This variable is any of the valid 8-bit, unsigned integer values between 0 and 255.

[, <uint8>, <...>] This variable identifies the value of the second and subsequent 8-bit unsigned integer variables.

Pattern Ram files are binary files downloaded directly into waveform memory as an array of bytes. Each byte specifies a data bit (LSB 0), a burst bit (BIT 2), and an Event 1 output bit (BIT 6). Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on pattern RAM downloading.

### **Example**

```
:MEM:DATA:PRAM:LIST "Pram_Data", 85,21,21,20,20,100
```

The preceding example downloads PRAM data, in list format, to a file named `Pram_Data` in the signal generator’s volatile memory (WFM1).

- "Pram\_Data" Pram\_Data is the file name. PRAM files are saved to the signal generator’s volatile memory (WFM1).
- 85 The first 8-bit integer value
- 21,21,20,20,100 Subsequent 8-bit integer values.

**Memory Subsystem (:MEMory)**

<b>Range</b>	0–255
<b>Remarks</b>	Refer to “File Name Variables” on page 13 for information on the file name syntax.

**:DATA:PRAM**


---

<b>NOTE</b>	Refer to the <i>E4428C/38C ESG Signal Generators Programming Compatibility Guide</i> for information on this command. This command is still valid for backward compatibility with earlier signal generator models.
-------------	--

---

**:DATA:PRAM:BLOCK**


---

<b>NOTE</b>	Refer to the <i>E4428C/38C ESG Signal Generators Programming Compatibility Guide</i> for information on this command. This command was replaced by “:DATA:PRAM:FILE:BLOCK” on page 112.
-------------	---

---

**:DATA:PRAM:LIST**


---

<b>NOTE</b>	Refer to the <i>E4428C/38C ESG Signal Generators Programming Compatibility Guide</i> for information on this command. This command has been replaced by “:DATA:PRAM:FILE:LIST” on page 113.
-------------	---

---

**:DATA:SHAPE**

**Supported** E4438C with Option 001/601 or 002/602

```
:MEMory:DATA:SHAPE "<filename>",<num_rise_points>,<rp0>,<rp1>,  
...<num_fall_points>,<fp0>,<fp1>,...<fp(n)>  
:MEMory:DATA:SHAPE? "<filename>"
```

This command creates a new burst shape file and stores it in the signal generator non-volatile memory.

"<filename>" This variable string identifies the name of the burst shape file.

num\_rise\_points This variable specifies how many rise points used in the command.

rp0,...rp(n) This variable defines each successive rise point, where 0 is no power and 1 is full power.

num\_fall\_points This variable specifies how many fall points used in the command.

fp0,...fp(n)      This variable defines each successive fall point, where 0 is no power and 1 is full power.

**Range**            num\_rise\_points: 2–256    num\_fall\_points: 2–256  
                      rp0–rp(n): 0.0–1.0      fp0–fp(n): 0.0–1.0

## **:DATA:SHAPE**

**Supported**        E4438C with Option 001/601 or 002/602

```
:MEMory:DATA:SHAPE
"<file_name>",<rise_pnts>,<rp0>,<rp1>,...<fall_points>,<fp0>,<fp1>,...<fp(n)>
:MEMory:DATA:SHAPE? "<file_name>"
```

This command loads a burst shape file into the signal generator's non-volatile memory (NVWFM).

"<file\_name>"    This variable names the destination file and directory path.

rise\_pnts        This variable indicates the number of rise points used to describe the burst shape rising slope.

rp0,...rp(n)    This variable defines each successive rise point, where 0 is no power and 1 is full power.

fall\_points     This variable indicates the number of fall points used to describe the burst shape falling slope.

fp0,...fp(n)    This variable defines each successive fall point, where 1 is full power and 0 is no power.

Refer the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

### **Example**

```
:MEM:DATA:SHAP "Shape_File",6,0,0.2,0.4,0.6,0.8,1.0,2,0.5,0
```

The preceding example loads shape data to a file named `Shape_File` in the signal generator's non-volatile memory.

- "Shape\_File"                      `Shape_File` is the shape data filename. The directory path is not needed. The path `"/USER/SHAPE/"` is implied.
- 6                                      Number of rise points describing the burst shape.
- 0,0.2,0.4,0.6,0.8,1.0              Rise point values.
- 2                                      Number of fall points describing the burst shape.
- 0.5,0                                Fall point values.

**Memory Subsystem (:MEMory)**

<b>Range</b>	<i>num_rise_points</i> : 2–256
	<i>num_fall_points</i> : 2–256
	<i>rp0–rp(n)</i> : 0.0–1.0
	<i>fp0–fp(n)</i> : 0.0–1.0

**:DATA:UNPRotected**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DATA:UNPRotected "<file\_name>", <data\_block>

This command allows you to download data and store it in a file on the signal generator with the ability to retrieve it. This command is intended for downloading waveform data; however you can use it to download other types of data.

---

**NOTE** If you do not use the *UNPRotected* command when downloading a waveform file, you will not be able to retrieve or upload the file. Attempting to do so will cause the signal generator to display the message: `ERROR:221, Access denied`.

---

"<file\_name>" This variable names the destination file and directory path. The file type determines how you must format the "<file\_name>" variable as described in the following list.

- **Binary file** The "<file\_name>" variable requires only a file name. A file name without a file path is automatically stored in the Binary memory catalog. Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.
- **Encrypted file** The "<file\_name>" variable requires a path that includes the SECUREWAVE directory. The securewave directory path is SNVWFM: for non-volatile waveform memory and SWFM1: for volatile waveform memory.
- **All other file types** The "<file\_name>" variable requires a path that includes the destination directory for the file type. Refer to the [Table on page 14](#), and [“File Name Variables” on page 13](#) for more information.

<data\_block> This parameter represents the data and file length parameters. The data in the file is represented by the <data\_block> variable.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

**Example**

```
:MEM:DATA:UNPR "NVWFM:Data_File",#18Qz37pY9o
```

The preceding example downloads waveform data to a file named Data\_File in the signal generator's non-volatile securewave directory. The table shown below describes the command parameters.

- |                     |  |
|---------------------|--|
| • "NVWFM:Data_File" | Data_File is the filename. The directory path is not needed. The path "/USER/SECUREWAVE" is implied. |
| • #18Qz37pY9o       | Data block   |
| #                   | This character indicates the beginning of the data block   |
| 1                   | Number of digits in the byte count   |
| 8                   | Byte count   |
| Qz37pY9o            | 8 bytes of data  |

---

**NOTE**      The data, Qz37pY9o, in the above command is not valid and is used for example purposes only. Typically, ascii characters representing data are unprintable.

---

**:DElete:ALL**

**Supported**      All Models

---

**CAUTION**      Using this command deletes all user files including binary, list, state, and flatness correction files, and any saved setups which use the front panel table editor. However, this does not include files stored on the Option 001/601 or 002/602 baseband generator. You cannot recover the files after executing this command.

---

```
:MEMory:DELeTe:ALL
```

This command clears the file system of all user files.

**Key Entry**      **Delete All Files**

### **:DElete:BINary**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:BINary

This command deletes all binary files.

**Key Entry** Delete All Binary Files

### **:DElete:BIT**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:BIT

This command deletes all bit files.

**Key Entry** Delete All Bit Files

### **:DElete:CDMa**

---

**NOTE** Refer to the *E4428C/38C ESG Signal Generators Programming Compatibility Guide* for information on this command. This command is still valid for backward compatibility and was replaced by “:DELeTe:CDMA”.

---

### **:DElete:CDMA**

**Supported** E4438C with Option 401

:MEMory:DELeTe:CDMA

This command deletes all arbitrary waveform IS-95 CDMA files.

**Key Entry** Delete All ARB CDMA Files

### **:DElete:DMOD**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:DMOD

This command deletes all arbitrary waveform digital modulation files.

**Key Entry** Delete All ARB DMOD Files

### **:DElete:DWCDma**

**Supported** E4438C with Option 400

:MEMory:DELeTe:DWCDma

This command deletes all arbitrary waveform downlink W-CDMA files.

**Key Entry** Delete All ARB DWCDMA Files

### **:DElete:FCDMa**

**Supported** E4438C with Option 401

:MEMory:DELeTe:FCDMa

This command deletes all arbitrary waveform forward link W-CDMA files.

**Key Entry** Delete All ARB FCDMA Files

### **:DElete:FIR**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:FIR

This command deletes all finite impulse response filter files.

**Key Entry** Delete All FIR Files

### **:DElete:FSK**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:FSK

This command deletes all FSK files.

**Key Entry** Delete All FSK Files

### **:DElete:IQ**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:IQ

This command deletes all I/Q files.

**Key Entry** Delete All I/Q Files

### **:DElete:LIST**

**Supported** All Models

:MEMory:DElete:LIST

This command deletes all List files.

**Key Entry** Delete All List Files

### **:DElete:MCDMa**

**Supported** E4438C with Option 401

:MEMory:DElete:MCDMa

This command deletes all arbitrary waveform multicarrier IS-95 CDMA files.

**Key Entry** Delete All ARB MCDMA Files

### **:DElete:MDMod**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DElete:MDMod

This command deletes all arbitrary waveform multicarrier digital modulation files.

**Key Entry** Delete All ARB MDMOD Files

### **:DElete:MDWCdma**

**Supported** E4438C with Option 400

:MEMory:DElete:MDWCdma

This command deletes all arbitrary waveform multicarrier downlink W-CDMA files.

**Key Entry** Delete All ARB MDWCdma Files

### **:DElete:MFCdma**

**Supported** E4438C with Option 401

:MEMory:DElete:MFCdma

This command deletes all arbitrary waveform multicarrier forward link cdma2000 files.

**Key Entry** Delete All ARB MFCDMA Files



### **:DElete:MTONe**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:MTONe

This command deletes all arbitrary waveform multitone files.

**Key Entry** Delete All ARB MTONE Files

### **:DElete:RCDMa**

**Supported** E4438C with Option 401

:MEMory:DELeTe:RCDMa

This command deletes all arbitrary waveform reverse link cdma2000 files.

**Key Entry** Delete All ARB RCDMA Files

### **:DElete:SEQ**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:SEQ

This command deletes all sequence files.

**Key Entry** Delete All Sequence Files

### **:DElete:SHApe**

**Supported** E4438C with Option 001/601 or 002/602

:MEMory:DELeTe:SHApe

This command deletes all burst shape files.

**Key Entry** Delete All Shape Files

### **:DElete:STATe**

**Supported** All Models

:MEMory:DELeTe:STATe

This command deletes all state files.

**Key Entry** Delete All Models State Files

### **:DElete:UFLT**

**Supported** All Models

:MEMory:DELeTe:UFLT

This command deletes all user-flatness correction files.

**Key Entry** Delete All UFLT Files

### **:DElete:UWCDma**

**Supported** E4438C with Option 400

:MEMory:DELeTe:UWCDma

This command deletes all arbitrary waveform uplink W-CDMA files.

**Key Entry** Delete All ARB UWCDMA Files

### **:DElete[:NAME]**

**Supported** All Models

:MEMory:DELeTe[:NAME] "<file name>"

This command clears the user file system of "<file name>".

**Key Entry** Delete File

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

When deleting a waveform (WFM1) file from memory, the marker file and file header, associated with the waveform file, will also be deleted.

### **:FREE[:ALL]**

**Supported** All Models

:MEMory:FREE[:ALL] ?

This command returns the number of bytes left in the user file system.

**Key Entry** All

## :LOAD:LIST

**Supported** All Models

```
:MEMory:LOAD:LIST "<file name>"
```

This command loads a list sweep file.

**Key Entry** Load From Selected File

## :MOVE

**Supported** All Models

```
:MEMory:MOVE "<src_file>","<dest_file>"
```

This command renames the requested file in the memory catalog.

**Key Entry** Rename File

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :STATe:COMMENT

**Supported** All Models

```
:MEMory:STATe:COMMENT <reg_num>,<seq_num>,"<comment>"
```

```
:MEMory:STATe:COMMENT? <reg_num>,<seq_num>
```

This command lets you to add a descriptive comment to the saved state <reg\_num>,<seq\_num>. Comments can be up to 55 characters long.

**Key Entry** Add Comment To Seq[n] Reg[nn]

## :STORe:LIST

**Supported** All Models

```
:MEMory:STORe:LIST "<file name>"
```

This command stores the current list sweep data to a file.

**Key Entry** Store To File

---

## Mass Memory Subsystem (:MMEMory)

### :CATalog

**Supported** All Models

```
:MMEMory:CATalog? "<msus>"
```

This command outputs a list of the files from the specified file system.

The variable "<msus>" (mass storage unit specifier) represents "<file system>". The file systems and types are shown in [Table 1-4 on page 14](#).

The return data will be in the following form:

```
<mem used>,<mem free>{,"<file listing>"}
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the specified file system. Each file listing will be in the following format:

```
"<file name>,<file type>,<file size>"
```

Key Entry	Binary	List	State	User Flatness	FIR	Shape	Bit	FSK
	IQ	Seq	DMOD	MTONE	MDMOD	CDMA	MCDMA	FCDMA
		MFCDMA	RCDMA	WCDMA	FWCDMA	MFWCDMA	RWCDMA	
		DWCDMA	MDWCDMA	UWCDMA	WFM1	NVMKR	NVWFM	

**Remarks** Refer to “[MSUS \(Mass Storage Unit Specifier\) Variable](#)” on page 16 for information on the use of the "<msus>" variable.

### :COPY

**Supported** All Models

```
:MMEMory:COPY "<file name>","<file name>"
```

This command makes a duplicate of the requested file.

**Key Entry** Copy File

**Remarks** Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

When copying a waveform file from volatile to non-volatile memory, the marker file and file header, associated with the waveform file, will automatically be copied at the same time.

## :DATA

**Supported** E4438C with Option 001/601 or 002/602

:MMEMory:DATA "<file name>", <datablock>

:MMEMory:DATA? "<file name>"

This command loads <datablock> into the memory location "<file name>".

The query returns the <datablock> associated with the "<file name>".

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :DElete:NVWFm

**Supported** E4438C with Option 001/601 or 002/602

:MMEMory:DElete:NVWFm

This command clears the user file system of all non-volatile arbitrary waveform files.

**Key Entry** Delete All NVWFm Files

## :DElete:WFM

**Supported** E4438C with Option 001/601 or 002/602

:MMEMory:DElete:WFM

This command clears the user file system of all arbitrary waveform files, which is the same function as performed by the command shown in [“:DElete:WFM1”](#).

**Key Entry** Delete All WFM1 Files

## :DElete:WFM1

**Supported** E4438C with Option 001/601 or 002/602

:MMEMory:DElete:WFM1

This command clears the user file system of all arbitrary waveform files, which is the same function as performed by the command shown in [“:DElete:WFM1”](#).

**Key Entry** Delete All WFM1 Files

### :DElete[:NAME]

**Supported** All

```
:MMEMory:DElete[:NAME] "<file name>", ["<msus>"]
```

This command clears the user file system of "<file name>" with the option of specifying the file system separately.

The variable "<msus>" (mass storage unit specifier) represents the file system. For a list of the file systems refer to the [Table on page 14](#).

**Key Entry** Delete File

**Remarks** If the optional variable "<msus>" is omitted, the file name needs to include the file system extension. Refer to [“File Name Variables” on page 13](#) and [“MSUS \(Mass Storage Unit Specifier\) Variable” on page 16](#) for information on the use of the file variables.

When deleting a waveform file from memory, the marker file and file header, associated with the waveform file, will also be deleted.

### :HEADer:CLEar

**Supported** E4438C with Option 001/601 or 002/602

```
:MMEMory:HEADer:CLEar "<file name>"
```

This command sets the file header field settings to unspecified for the "<file name>" variable.

**Key Entry** Clear Header

**Remarks** This command does not require a personality modulation to be on. Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

### :HEADer:DESCription

**Supported** E4438C with Option 001/601 or 002/602

```
:MMEMory:HEADer:DESCription "<file name>", "<description>"
```

```
:MMEMory:HEADer:DESCription? "<file name>"
```

This command inserts a description for the file header.

**Key Entry** Edit Description

**Remarks** The header description is limited to 32 characters. Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :LOAD:LIST

**Supported** All

```
:MMEMory:LOAD:LIST "<file name>"
```

This command loads a List sweep file.

**Key Entry** Load From Selected File

## :MOVE

**Supported** All

```
:MMEMory:MOVE "<src_file>", "<dest_file>"
```

This command renames the requested file in the memory catalog.

**Key Entry** Rename File

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## :STORe:LIST

**Supported** All

```
:MMEMory:STORe:LIST "<file name>"
```

This command stores the current list sweep data to a file.

**Key Entry** Store To File

---

## Output Subsystem (:OUTPut)

### :BLANking:AUTO

**Supported** All

:OUTPut:BLANking:AUTO ON|OFF|1|0

:OUTPut:BLANking:AUTO?

This command turns the RF output on or off during frequency band changes. Frequency band changes can cause the signal generator's RF output to fluctuate. The output blanking function, when active, turns off the RF output until the frequency settles.

ON (1) The RF output turns off when crossing a frequency band.

OFF (0) The RF output stays on when crossing a frequency band.

\*RST 1

**Key Entry** Output Blanking Off On Auto

**Remarks** Refer to the signal generator's data sheet for information on frequency switching speeds, settling times, and frequency band information.

### :BLANking:STATe

**Supported** All

:OUTPut:BLANking:STATe ON|OFF|1|0

:OUTPut:BLANking:STATe?

This command enables or disables the RF output blanking state.

ON (1) The RF output turns off during frequency changes.

OFF (0) The RF output stays on during frequency changes.

\*RST 1

**Remarks** Refer to the signal generator's data sheet for information on frequency switching speeds, settling times, and frequency band information.



## **:MODulation[:STATe]**

**Supported** All

:OUTPut:MODulation[:STATe] ON|OFF|1|0

:OUTPut:MODulation[:STATe]?

This command enables or disables the modulation of the RF output with the currently active modulation type(s).

**\*RST** 1

**Key Entry** **Mod On/Off**

**Remarks** Some modulation types can be simultaneously enabled such as pulse and AM.

An annunciator on the signal generator is always displayed to indicate whether modulation is switched on or off.

## **[:STATe]**

**Supported** All

:OUTPut[:STATe] ON|OFF|1|0

:OUTPut[:STATe]?

This command enables or disables the RF output.

**\*RST** 0

**Key Entry** **RF On/Off**

**Remarks** Although you can configure and engage various modulations, no signal is available at the RF OUTPUT connector until this command is executed.

An annunciator is always displayed on the signal generator to indicate whether the RF output is switched on or off.

---

## Route Subsystem (:ROUTE:HARDware:DGENERator)

### :INPut:BPOLarity

**Supported** E4438C with Option 001/601 or 002/602

:ROUTE:HARDware:DGENERator:INPut:BPOLarity POSitive|NEGative

:ROUTE:HARDware:DGENERator:INPut:BPOLarity?

This command configures the polarity of the TTL input signal at the BURST GATE IN connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Burst Gate In Polarity Neg Pos**

**Remarks** This command performs the same function as [“:IPOLarity:BGATE”](#) on page 131.

### :INPut:CPOLarity

**Supported** E4438C with Option 001/601 or 002/602

:ROUTE:HARDware:DGENERator:INPut:CPOLarity POSitive|NEGative

:ROUTE:HARDware:DGENERator:INPut:CPOLarity?

This command configures the polarity of the TTL input signal at the DATA CLOCK connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Data Clock Polarity Neg Pos**

**Remarks** This command performs the same function as [“:IPOLarity:CLOCK”](#) on page 132.

### :INPut:DPOLarity

**Supported** E4438C with Option 001/601 or 002/602

```
:ROUTE:HARDware:DGENerator:INPut:DPOLarity POSitive|NEGative  
:ROUTE:HARDware:DGENerator:INPut:DPOLarity?
```

This command configures the polarity of the TTL input signal at the DATA connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** Data Polarity Neg Pos

**Remarks** This command performs the same function as “:IPOLarity:DATA” on page 132.

### :INPut:SPOLarity

**Supported** E4438C with Option 001/601 or 002/602

```
:ROUTE:HARDware:DGENerator:INPut:SPOLarity POSitive|NEGative  
:ROUTE:HARDware:DGENerator:INPut:SPOLarity?
```

This command configures the polarity of the TTL input signal at the SYMBOL SYNC connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** Symbol Sync Polarity Neg Pos

**Remarks** This command performs the same function as “:IPOLarity:SSYNc” on page 132.

### :IPOLarity:BGATe

**Supported** E4438C with Option 001/601 or 002/602

```
:ROUTE:HARDware:DGENerator:IPOLarity:BGATe POSitive|NEGative  
:ROUTE:HARDware:DGENerator:IPOLarity:BGATe?
```

This command configures the polarity of the input signal at the BURST GATE IN connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** Burst Gate In Polarity Neg Pos

**Remarks** This command performs the same function as “:INPut:BPOLarity” on page 130.

**:IPOLarity:CLOCK**

**Supported** E4438C with Option 001/601 or 002/602

:ROUTE:HARDware:DGENERator:IPOLarity:CLOCK POSitive|NEGative

:ROUTE:HARDware:DGENERator:IPOLarity:CLOCK?

This command configures the polarity of the TTL input signal at the DATA CLOCK connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Data Clock Polarity Neg Pos**

**Remarks** This command performs the same function as [“:INPut:CPOLarity” on page 130](#).

**:IPOLarity:DATA**

**Supported** E4438C with Option 001/601 or 002/602

:ROUTE:HARDware:DGENERator:IPOLarity:DATA POSitive|NEGative

:ROUTE:HARDware:DGENERator:IPOLarity:DATA?

This command configures the polarity of the TTL input signal at the DATA connector. POSitive refers to normal logic, while NEGative refers the inverted logic.

**\*RST** POS

**Key Entry** **Data Polarity Neg Pos**

**Remarks** This command performs the same function as [“:INPut:DPOLarity” on page 131](#).

**:IPOLarity:SSYNc**

**Supported** E4438C with Option 001/601 or 002/602

:ROUTE:HARDware:DGENERator:IPOLarity:SSYNc POSitive|NEGative

:ROUTE:HARDware:DGENERator:IPOLarity:SSYNc?

This command configures the polarity of the TTL input signal at the SYMBOL SYNC connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Symbol Sync Polarity Neg Pos**

**Remarks** This command performs the same function as [“:INPut:SPOLarity” on page 131](#).

**:OPOLarity:CLOCK**

**Supported** E4438C with Option 001/601 or 002/602

```
:ROUTE:HARDware:DGENERator:OPOLarity:CLOCK POSitive|NEGative
```

```
:ROUTE:HARDware:DGENERator:OPOLarity:CLOCK?
```

This command configures the polarity of the TTL output Data Clock Out signal at the DATA CLK OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while the NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Data Clock Out Neg Pos**

**Remarks** This command performs the same function as [“:OUTPut:CPOLarity” on page 134](#).

**:OPOLarity:DATA**

**Supported** E4438C with Option 001/601 or 002/602

```
:ROUTE:HARDware:DGENERator:OPOLarity:DATA POSitive|NEGative
```

```
:ROUTE:HARDware:DGENERator:OPOLarity:DATA?
```

This command configures the polarity of the TTL output DATA OUT signal at the DATA OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Data Out Polarity Neg Pos**

**Remarks** This command performs the same function as [“:OUTPut:DPOLarity” on page 135](#).

### :OPOLarity:SSYNc

**Supported** E4438C with Option 001/601 or 002/602

:ROUTE:HARDware:DGENERator:OPOLarity:SSYNc POSitive|NEGative

:ROUTE:HARDware:DGENERator:OPOLarity:SSYNc?

This command configures the polarity of the TTL output SYMBOL SYNC signal at the SYM SYNC OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Symbol Sync Out Polarity Neg Pos**

**Remarks** This command performs the same function as [“:OUTPut:SPOLarity” on page 135](#).

### :OUTPut:CPOLarity

**Supported** E4438C with Option 001/601 or 002/602

:ROUTE:HARDware:DGENERator:OUTPut:CPOLarity POSitive|NEGative

:ROUTE:HARDware:DGENERator:OUTPut:CPOLarity?

This command configures the polarity of the TTL output DATA CLOCK OUT signal at the DATA CLK OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** **Data Clock Polarity Neg Pos**

**Remarks** This command performs the same function as [“:OPOLarity:CLOCK” on page 133](#).

### **:OUTPut:DCS[:STATe]**

**Supported** E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENERator:OUTPut:DCS[:STATe] ON|OFF|1|0

:ROUTe:HARDware:DGENERator:OUTPut:DCS[:STATe] ?

This command is used to enable or disable the output DATA OUT, DATA CLK OUT, and SYM SYNC OUT signals from the rear panel AUX I/O connector. Normally, these output signals should be enabled (On). However, disabling these outputs will decrease the spurs that are sometimes present when operating at high symbol rates.

**\*RST** 1

**Key Entry** DATA/CLK/SYNC Rear Outputs Off On

### **:OUTPut:DPOLarity**

**Supported** E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENERator:OUTPut:DPOLarity POSitive|NEGative

:ROUTe:HARDware:DGENERator:OUTPut:DPOLarity?

This command configures the polarity of the TTL output signal at the DATA OUT connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** Data Out Polarity Neg Pos

**Remarks** This command performs the same function as “:OPOLarity:DATA” on page 133.

### **:OUTPut:SPOLarity**

**Supported** E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENERator:OUTPut:SPOLarity POSitive|NEGative

:ROUTe:HARDware:DGENERator:OUTPut:SPOLarity?

This command configures the polarity of the TTL input signal at the SYMBOL SYNC connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

**\*RST** POS

**Key Entry** Symbol Sync Out Polarity Neg Pos

## Status Subsystem (:STATus)

### :OPERation:BASEband:CONDition

**Supported** E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASEband:CONDition?

This query returns the decimal sum of the bits in the Baseband Operation Condition Register. For example, if the baseband is busy (bit 0), the value 1 is returned.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects the current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### :OPERation:BASEband:ENABLE

**Supported** E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASEband:ENABLE <val>

:STATus:OPERation:BASEband:ENABLE?

This command determines which bits in the Baseband Operation Event Register will set the Baseband is Busy bit (bit 10) in the Standard Operation Condition Register.

The variable <num> is the sum of the decimal values of the bits you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.



### **:OPERation:BASEband:NTRansition**

**Supported** E4438C with Option 001/601 or 002/602

```
:STATUS:OPERation:BASEband:NTRansition <val>
```

```
:STATUS:OPERation:BASEband:NTRansition?
```

This command determines which bits in the Baseband Operation Condition Register will set the corresponding bit in the Baseband Operation Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:OPERation:BASEband:PTRansition**

**Supported** E4438C with Option 001/601 or 002/602

```
:STATUS:OPERation:BASEband:PTRansition <val>
```

```
:STATUS:OPERation:BASEband:PTRansition?
```

This command determines which bits in the Baseband Operation Condition Register will set the corresponding bit in the Baseband Operation Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:OPERation:BASEband[:EVENT]**

**Supported** E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASEband[:EVENT]?

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

This query returns the decimal sum of the bits in the Standard Operation Baseband Event Register.

**Range** 0–32767

**Remarks** The equivalent PTR and NTR filters must be set before the condition register can set the corresponding bit in the event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:OPERation:CONDition**

**Supported** All

:STATus:OPERation:CONDition?

This query returns the decimal sum of the bits for the registers that are set to one and are part of the Standard Operation Status Group. For example, if a sweep is in progress (bit 3), the value 8 is returned.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

## **:OPERation:ENABLE**

**Supported** All

```
:STATus:OPERation:ENABLE <val>
```

```
:STATus:OPERation:ENABLE?
```

This command determines which bits in the Standard Operation Event Register will set the Standard Operation Status Summary bit (bit 7) in the Status Byte Register.

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

## **:OPERation:NTRansition**

**Supported** All

```
:STATus:OPERation:NTRansition <val>
```

```
:STATus:OPERation:NTRansition?
```

This command determines which bits in the Standard Operation Condition Register will set the corresponding bit in the Standard Operation Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### :OPERation:PTRansition

**Supported** All

```
:STATus:OPERation:PTRansition <val>  
:STATus:OPERation:PTRansition?
```

This command determines which bits in the Standard Operation Condition Register will set the corresponding bit in the Standard Operation Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### :OPERation[:EVENT]

**Supported** All

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

```
:STATus:OPERation[:EVENT]?
```

This query returns the decimal sum of the bits in the Standard Operation Event Register.

**Range** 0–32767

**Remarks** The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### :PRESet

**Supported** All

```
:STATus:PRESet
```

This command presets all transition filters, enable registers, and error/event queue enable registers.

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:BERT:CONDition**

**Supported** E4438C with Option UN7, 300 or both

:STATus:QUESTionable:BERT:CONDition?

This query returns the decimal sum of the bits in the Data Questionable BERT Condition Register. For example, if no clock signal has been input for more than three seconds during the bit error rate measurement (bit 0), then a value of 1 is returned.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects the current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:BERT:ENABLE**

**Supported** E4438C with Option UN7, 300 or both

:STATus:QUESTionable:BERT:ENABLE <val>

:STATus:QUESTionable:BERT:ENABLE?

This command determines which bits in the Data Questionable BERT Event Register will set the Data Questionable BERT Summary bit (bit 12) in the Data Questionable Condition Register.

The variable <val> is the sum of the decimal values of the bits you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### :QUESTionable:BERT:NTRansition

**Supported** E4438C with Option UN7, 300 or both

:STATUS:QUESTionable:BERT:NTRansition <val>

:STATUS:QUESTionable:BERT:NTRansition?

This command determines which bits in the Data Questionable BERT Condition Register will set the corresponding bit in the Data Questionable BERT Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects the current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### :QUESTionable:BERT:PTRansition

**Supported** E4438C with Option UN7, 300 or both

:STATUS:QUESTionable:BERT:PTRansition <val>

:STATUS:QUESTionable:BERT:PTRansition?

This command determines which bits in the Data Questionable BERT Condition Register will set the corresponding bit in the Data Questionable BERT Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:BERT[:EVENT]**

**Supported** E4438C with Option UN7, 300 or both

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

`:STATUS:QUESTionable:BERT[:EVENT]?`

This command returns the decimal value of the sum of the bits in the Data Questionable BERT Event Register.

**Range** 0–32767

**Remarks** Note that the register requires that the equivalent PTR or NTR filters be set before a condition register bit can set a bit in the Event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:CALibration:CONDition**

**Supported** All

`:STATUS:QUESTionable:CALibration:CONDition?`

This query returns the decimal sum of the bits in the Data Questionable Calibration Condition Register. For example, if the DCFM or DCΦM zero calibration fails (bit 0), a value of 1 is returned.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects the current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:CALibration:ENABLE**

**Supported** All

`:STATUS:QUESTionable:CALibration:ENABLE <val>`

`:STATUS:QUESTionable:CALibration:ENABLE?`

This command determines which bits in the Data Questionable Calibration Event Register will set the calibration summary bit (bit 8) in the Data Questionable Condition Register.

**Status Subsystem (:STATUS)**

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTIONable:CALibration:NTRansition**

**Supported** All

```
:STATUS:QUESTIONable:CALibration:NTRansition <val>  
:STATUS:QUESTIONable:CALibration:NTRansition?
```

This command determines which bits in the Data Questionable Calibration Condition Register will set the corresponding bit in the Data Questionable Calibration Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTIONable:CALibration:PTRansition**

**Supported** All

```
:STATUS:QUESTIONable:CALibration:PTRansition <val>  
:STATUS:QUESTIONable:CALibration:PTRansition?
```

This command determines which bits in the Data Questionable Calibration Condition Register will set the corresponding bit in the Data Questionable Calibration Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.



### **:QUESTIONable:CALibration[:EVENT]**

**Supported** All

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

:STATus:QUESTionable:CALibration[:EVENT]?

This command returns the decimal sum of the bits in the Data Questionable Calibration Event Register.

**Range** 0–32767

**Remarks** The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTIONable:CONDition**

**Supported** All

:STATus:QUESTionable:CONDition?

This query returns the decimal sum of the bits in the Data Questionable Condition Register. For example, if the reference oscillator oven is cold (bit 4), a value of 16 is returned.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTionable:ENABle****Supported** All`:STATUS:QUESTionable:ENABle <val>``:STATUS:QUESTionable:ENABle?`

This command determines which bits in the Data Questionable Event Register will set the Data Questionable Status Group Summary bit (bit 3) in the Status Byte Register.

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTionable:FREQuency:CONDition****Supported** All`:STATUS:QUESTionable:FREQuency:CONDition?`

This query returns the decimal sum of the bits in the Data Questionable Frequency Condition Register. For example, if the 1 GHz internal reference clock is unlocked (bit 2), a value of 4 is returned.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTionable:FREQuency:ENABle****Supported** All`:STATUS:QUESTionable:FREQuency:ENABle <val>``:STATUS:QUESTionable:FREQuency:ENABle?`

This command determines which bits in the Data Questionable Frequency Event Register will set the frequency summary bit (bit 5) in the Data Questionable Condition Register.

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:FREQuency:NTRansition**

**Supported** All

```
:STATUS:QUESTionable:FREQuency:NTRansition <val>  
:STATUS:QUESTionable:FREQuency:NTRansition?
```

This command determines which bits in the Data Questionable Frequency Condition Register will set the corresponding bit in the Data Questionable Frequency Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:FREQuency:PTRansition**

**Supported** All

```
:STATUS:QUESTionable:FREQuency:PTRansition <val>  
:STATUS:QUESTionable:FREQuency:PTRansition?
```

This command determines which bits in the Data Questionable Frequency Condition Register will set the corresponding bit in the Data Questionable Frequency Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:FREQuency[:EVENT]**

**Supported** All

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

```
:STATUS:QUESTionable:FREQuency[:EVENT]?
```

This query returns the decimal sum of the bits in the Data Questionable Frequency Event Register.

**Range** 0–32767

**Status Subsystem (:STATus)**

**Remarks** The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTionable:MODulation:CONDition**

**Supported** All

`:STATus:QUESTionable:MODulation:CONDition?`

This command returns the decimal sum of the bits in the Data Questionable Modulation Condition Register. For example, if the modulation is uncalibrated (bit 4), a value of 16 is returned.

**Range** 0–32767

**Remarks** The data in this register is continuously updated and reflects current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTionable:MODulation:ENABLE**

**Supported** All

`:STATus:QUESTionable:MODulation:ENABLE <val>`

`:STATus:QUESTionable:MODulation:ENABLE?`

This command determines which bits in the Data Questionable Modulation Event Register will set the modulation summary bit (bit 7) in the Data Questionable Condition Register.

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:MODulation:NTRansition**

**Supported**            All

```
:STATUS:QUESTionable:MODulation:NTRansition <val>
:STATUS:QUESTionable:MODulation:NTRansition?
```

This command determines which bits in the Data Questionable Modulation Condition Register will set the corresponding bit in the Data Questionable Modulation Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range**                0–32767

**Remarks**            Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:MODulation:PTRansition**

**Supported**            All

```
:STATUS:QUESTionable:MODulation:PTRansition <val>
:STATUS:QUESTionable:MODulation:PTRansition?
```

This command determines which bits in the Data Questionable Modulation Condition Register will set the corresponding bit in the Data Questionable Modulation Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range**                0–32767

**Remarks**            Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:MODulation[:EVENT]**

**Supported**            All

---

**CAUTION**            This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

```
:STATUS:QUESTionable:MODulation[:EVENT]?
```

This query returns the decimal sum of the bits in the Data Questionable Modulation Event Register.

**Range**                0–32767

**Status Subsystem (:STATus)**

**Remarks**            The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUEStionable:NTRansition**

**Supported**            All

```
:STATus:QUEStionable:NTRansition <val>  
:STATus:QUEStionable:NTRansition?
```

This command determines which bits in the Data Questionable Condition Register will set the corresponding bit in the Data Questionable Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range**                0–32767

**Remarks**            Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUEStionable:POWer:CONDition**

**Supported**            All

```
:STATus:QUEStionable:POWer:CONDition?
```

This query returns the decimal sum of the bits in the Data Questionable Power Condition Register. For example, if the RF output signal is unlevelled (bit 1), a value of 2 is returned.

**Range**                0–32767

**Remarks**            The data in this register is continuously updated and reflects current conditions.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:POWer:ENABle**

**Supported** All

```
:STATus:QUESTionable:POWer:ENABle <val>  
:STATus:QUESTionable:POWer:ENABle?
```

This command determines which bits in the Data Questionable Power Event Register will set the power summary bit (bit 3) in the Data Questionable Condition Register.

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:POWer:NTRansition**

**Supported** All

```
:STATus:QUESTionable:POWer:NTRansition <val>  
:STATus:QUESTionable:POWer:NTRansition?
```

This command determines which bits in the Data Questionable Power Condition Register will set the corresponding bit in the Data Questionable Power Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

### **:QUESTionable:POWer:PTRansition**

**Supported** All

```
:STATus:QUESTionable:POWer:PTRansition <val>  
:STATus:QUESTionable:POWer:PTRansition?
```

This command determines which bits in the Data Questionable Power Condition Register will set the corresponding bit in the Data Questionable Power Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Status Subsystem (:STATUS)**

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTionable:POWer[:EVENT]**

**Supported** All

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

`:STATUS:QUESTionable:POWer[:EVENT]?`

This query returns the decimal sum of the bits in the Data Questionable Power Event Register.

**Range** 0–32767

**Remarks** The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

**:QUESTionable:PTRansition**

**Supported** All

`:STATUS:QUESTionable:PTRansition <val>`

`:STATUS:QUESTionable:PTRansition?`

This command determines which bits in the Data Questionable Condition Register will set the corresponding bit in the Data Questionable Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

**Range** 0–32767

**Remarks** Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.



## :QUEStionable[:EVENT]

**Supported** All

---

**CAUTION** This is a destructive read. The data in the register is latched until it is queried. Once queried, the data is cleared.

---

:STATUs:QUEStionable[:EVENT]?

This query returns the decimal sum of the bits in the Data Questionable Event Register.

**Range** 0–32767

**Remarks** The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming Guide* for more information.

---

## System Subsystem (:SYSTem)

### :CAPability

**Supported**      All

:SYSTem:CAPability?

This query returns the signal generator's capabilities and outputs the appropriate specifiers:

```
(RFSOURCE WITH ( (AM|FM|PULM|PM|LFO) & (FSSWEEP|FLIST) & (PSSWEEP|PLIST)
&TRIGGER&REFERENCE) )
```

This is a list of the SCPI-defined basic functionality of the signal generator and the additional capabilities it has in parallel (a&b) and singularly (alb).

### :DATE

**Supported**      All

:SYSTem:DATE <year>, <month>, <day>

:SYSTem:DATE?

This command sets the date as shown in the lower right area of the signal generator display.

<year>              This variable requires a four digit integer.

The query returns the date in the following format:

```
<+year>, <+month>, <+day>
```

**Range**              <month>: 1–12      <day>: 1–31

**Key Entry**          **Time/Date**

## **:ERRor[:NEXT]**

**Supported** All

:SYSTem:ERRor[:NEXT]?

This query returns the most recent error message from the signal generator error queue. If there are no error messages, the query returns the following output:

```
+0, "No error"
```

When there is more than one error message, the query will need to be sent for each message.

**Key Entry**            **Error Info**    **View Next Error Message**

**Remarks**            The ESG deletes the error messages after viewing the last message.

## **:ERRor:SCPI[:SYNTax]**

**Supported** All

:SYSTem:ERRor:SCPI[:SYNTax] ON|OFF|1|0

:SYSTem:ERRor:SCPI[:SYNTax]?

This command enables or disables the reporting of SCPI syntax errors to the error queue. The query returns only the numeric value of 1 or 0.

**\*RST**                    0

**Remarks**            The setting ON/1 is persistent through preset and \*RST. This setting will not survive a power cycle.

## **:FILEsystem:SAFEmode**

**Supported** All

:SYSTem:FILEsystem:SAFEmode ON|OFF|1|0

:SYSTem:FILEsystem:SAFEmode?

This command selects the safe mode for file handling. When safe mode is set to OFF, volatile waveform files can be edited and saved while the signal generator plays the file without signal interruption. However, it is possible with complex waveforms, for corruption of memory to occur which will be reported as an error on the front-panel display and require a reboot of the signal generator to resolve.

### **Example**

```
:SYST:FILE:SAVE ON
```

The preceding example enables the safe mode setting and waveform files cannot be edited without

## System Commands

### System Subsystem (:SYSTem)

signal disruption while the signal generator plays them.

**\*RST**                    On

#### **:HELP:MODE**

**Supported**            All

:SYSTem:HELP:MODE SINGle|CONTInuous

:SYSTem:HELP:MODE?

This command sets the help function mode of the signal generator.

**SINGle**                Help is provided only for the next key that you press.

**CONTInuous**        Help is provided for each key you press. In addition, the function of the key is executed.

When the help dialog box is displayed, pressing the **Help** hardkey in either mode will turn help off.

**Key Entry**            **Help Mode Single Cont**

**Remarks**            The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

#### **:IDN**

**Supported**            All

:SYSTem:IDN "<string>"

This command modifies the identification string that the \*IDN? query returns. Sending an empty string returns the query output of \*IDN? to its factory shipped setting. The maximum string length is 72 characters.

**Remarks**            Modification of the \*IDN? query output enables the signal generator to identify itself as another signal generator when used as a replacement.

The display diagnostic information, shown by pressing the **Diagnostic Info** softkey, is not affected by this command.

#### **:LANGuage**

**Supported**            All

:SYSTem:LANGuage "SCPI"|"COMP"|"NADC"|"PDC"|"PHS"|"8648"

:SYSTem:LANGuage?

This command sets the remote language for the signal generator.

SCPI	This choice provides compatibility for SCPI commands.
COMP	This choice provides compatibility for the 8656B, 8657A/B signal generator which is supported by using the GPIB interface.
NADC	This choice provides compatibility for the 8657D NADC personality which is supported only through a GPIB interface (E4438C only).
PDC	This choice provides compatibility for the 8657D PDC personality which is supported only through a GPIB interface (E4438C only).
PHS	This choice provides compatibility for the 8657J PHS personality which is supported only through a GPIB interface (E4438C only).
8648	This choice provides compatibility for the 8648A/B/C/D signal generator which is supported only through a GPIB interface.
<b>Key Entry</b>	<b>SCPI    8656B,8657A/B    8657D NADC    8657D PDC    8657J PHS 8648A/B/C/D</b>
<b>Remarks</b>	The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.  For more information on supported SCPI commands and programming codes, refer to the <i>Programming Compatibility Guide</i> .

## :OPT

**Supported**      All

:SYSTem:OPT "<string>"

This command modifies the option string that the \*OPT? query returns. Sending an empty string sets the query output of \*OPT? to the signal generator's factory shipped setting. The maximum string length is 72 characters.

**Remarks**      Modification of the \*OPT? query output enables the signal generator, with a set of options, to *identify* itself as another signal generator when used as a replacement  
  
The display diagnostic information, shown by pressing the **Diagnostic Info** softkey, is not affected by this command.

## :PON:TYPE

**Supported**      All

:SYSTem:PON:TYPE PRESet | LAST

:SYSTem:PON:TYPE?

## System Commands

### System Subsystem (:SYSTem)

This command sets the defined conditions for the signal generator at power on.

<b>PRESet</b>	This choice sets the conditions to factory- or user-defined as determined by the choice for the preset type. Refer to “:PRESet:TYPE” on page 160 for selecting the type of preset.
<b>LAST</b>	This choice retains the settings at the time the signal generator was last powered down.

---

**NOTE** When LAST is selected, no signal generator interaction can occur for at least 3 seconds prior to cycling the power for the current settings to be saved.

---

<b>Key Entry</b>	<b>Power On Last Preset</b>
<b>Remarks</b>	The setting enabled by this command is not affected by signal generator power-on, preset, or *RST.

### :PRESet

**Supported** All

SYSTem:PRESet

This command returns the signal generator to a set of defined conditions. It is equivalent to pressing the front panel **Preset** hardkey.

**Key Entry** **Preset**

**Remarks** The defined conditions are either factory- or user-defined. Refer to “:PRESet:TYPE” on page 160 for selecting the type of defined conditions.

### :PRESet:ALL

**Supported** All

:SYSTem:PRESet:ALL

This command sets all states of the signal generator back to their factory default settings, including states that are not normally affected by signal generator power-on, preset, or \*RST.

### :PRESet:LANGUage

**Supported** All

:SYSTem:PRESet:LANGUage"SCPI" | "COMP" | "NADC" | "PDC" | "PHS" | "8648"  
:SYSTem:PRESet:LANGUage?

This command sets the remote language that is available when the signal generator is preset.

SCPI	This choice provides compatibility for SCPI commands.				
COMP	This choice provides compatibility for the 8656B, 8657A/B signal generator which is supported by using the GPIB interface.				
NADC	This choice provides compatibility for the 8657D NADC personality which is supported only through a GPIB interface (E4438C only).				
PDC	This choice provides compatibility for the 8657D PDC personality which is supported only through a GPIB interface (E4438C only).				
PHS	This choice provides compatibility for the 8657J PHS personality which is supported only through a GPIB interface (E4438C only).				
8648	This choice provides compatibility for the 8648A/B/C/D signal generator which is supported only through a GPIB interface.				
*RST	"SCPI"				
<b>Key Entry</b>	<b>SCPI</b>	<b>8656B,8657A/B</b>	<b>8657D NADC</b>	<b>8657D PDC</b>	<b>8657J PHS</b>
	<b>8648A/B/C/D</b>				

### **:PRESet:PERSistent**

**Supported** All

:SYSTem:PRESet:PERSistent

This command sets the states that are not affected by signal generator power-on, preset, or \*RST to their factory default settings.

**Key Entry**            **Restore Sys Defaults**

### **:PRESet:PN9**

**Supported** E4438C Option with Option 001/601 or 002/602

:SYSTem:PRESet:PN9 NORMal | QUICk

:SYSTem:PRESet:PN9?

This command sets the preset length of the PN9 sequence for personalities that require software PRBS generation.

NORMal            This choice produces a maximal length PN9 sequence.

QUICk            This choice produces a truncated (216 bits) PN9 sequence.

\*RST            NORM

**Key Entry**            **PN9 Mode Preset**

### **:PRESet:TYPE**

**Supported**            All

```
:SYSTem:PRESet:TYPE NORMAL|USER
:SYSTem:PRESet:TYPE?
```

This command toggles the preset state between factory- and user-defined conditions.

**Key Entry**            **Preset Normal User**

**Remarks**            Refer to “:PRESet[:USER]:SAVE” for saving the USER choice preset settings.

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### **:PRESet[:USER]:SAVE**

**Supported**            All

```
:SYSTem:PRESet [:USER] :SAVE
```

This command saves your user-defined preset conditions to a state file.

**Key Entry**            **Save User Preset**

**Remarks**            Only one user-defined preset file can be saved. Subsequent saved user-defined preset files will overwrite the previously saved file.

### **:SECurity:DISPlay**

**Supported**            All Models

```
:SYSTem:SECurity:DISPlay ON|OFF|1|0
:SYSTem:SECurity:DISPlay?
```

This command enables or disables the secure display mode.

On(1)                    This selection turns the signal generator display back on, showing the current settings. Cycling the signal generator power also restores the display, however the current settings may change depending on the power-on configuration choice. See “:PON:TYPE” on page 157 for information on the power-on choices available.

OFF(0)                   This selection blanks the signal generator’s display, hiding the settings and disabling the front panel keys. While in this mode, the display shows  
\*\*\* SECURE DISPLAY ACTIVATED \*\*\*.

For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.



**Example**

```
:SYST:SEC:DISP OFF
```

The preceding example enables the secure display mode.

<b>*RST</b>	1
<b>Range</b>	N/A
<b>Key Entry</b>	<b>Activate Security Display</b>

**:SECurity:ERASeall**

**Supported** All Models

```
:SYSTem:SECurity:ERASall
```

This command removes all user files, flatness correction files, and baseband generator files. In addition, all table editor files are returned to their original factory values.

This command differs from the :DELEte:ALL command, which does not reset table editors to factory values. For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

<b>Key Entry</b>	<b>Erase All</b>
------------------	------------------

**:SECurity:LEVel**

**Supported** All Models

```
:SYSTem:SECurity:LEVel NONE|ERASe|OVERwrite|SANitize  
:SYSTem:SECurity:LEVel?
```

This command selects the security level operation for the signal generator.

NONE	This selection causes the signal generator to reset to factory default settings.
ERASe	This selection removes all user files, table editor files, flatness correction files, and baseband generator files.
OVERwrite	This selection removes all user files, table editor files, flatness correction files, and baseband generator files. The memory is then overwritten with random data.
SRAM	All addressable locations will be overwritten with random characters.
Hard Disk	All addressable locations will be overwritten with random characters.
Flash Memory	The flash blocks will be erased.

**System Subsystem (:SYSTem)**

**SANitize** This selection removes all user files, table editor files, flatness correction files, and baseband generator files using the same techniques as the **OVERwrite** selection for SRAM and flash memory. For the hard disk, the signal generator overwrites all addressable locations with a single character, its complement, and then with a random character.

Once you select the security level, you must execute the command from “:SECurity:LEVel:STATe” to arm the security level.

---

**NOTE** Once you select a security level and arm it, you cannot change the level.

---

For other cleaning and security operation descriptions, see “:SECurity:ERASeall” on page 161, “:SECurity:OVERwrite” on page 163, and “:SECurity:SANitize” on page 163. For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.

**Example**

```
:SYST:SEC:LEV NONE
```

The preceding example sets the secure mode so it resets the signal generator to factory settings after completing the security operation.

**Key Entry**      **None**   **Erase**   **Overwrite**   **Sanitize**

**:SECurity:LEVel:STATe**

**Supported**      All Models

---

**CAUTION** Ensure that you select the security level prior to executing this command with the **ON (1)** selection. Once you enable the state, you cannot reduce the security level.

---

```
:SYSTem:SECurity:LEVel:STATe ON|OFF|1|0  
:SYSTem:SECurity:LEVel:STATe?
```

This command arms and executes the current security level parameter.

**On (1)** This selection arms and prevents any changes to the current security level. Refer to “:SECurity:LEVel” on page 161 for setting the security level.

**OFF (0)** This selection performs the actions required for the current security level setting. Cycling the signal generator power also performs the same function.

For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.

### Example

```
:SYST:SEC:LEV:STAT ON
```

The preceding example arms the secure mode selected with the SYSTem:SECurity:LEVel command.

**Key Entry**            **Enter Secure Mode**

### :SECurity:OVERwrite

**Supported**            All Models

```
:SYSTem:SECurity:OVERwrite
```

This command removes all user files, table editor files values, flatness correction files, and baseband generator files. The memory is then overwritten with random data as described below. For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

SRAM                    All addressable locations will be overwritten with random characters.

HARD DISK              All addressable locations will be overwritten with random characters.

FLASH MEMORY         The flash blocks will be erased.

**Key Entry**            **Erase and Overwrite All**

### :SECurity:SANitize

**Supported**            All Models

```
:SYSTem:SECurity:SANitize
```

This command removes all user files, table editor files values, flatness correction files, and baseband generator files. The memory is then overwritten with a sequence of data as described below. For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

SRAM                    All addressable locations will be overwritten with random characters.

HARD DISK              All addressable locations will be overwritten with a single character and then a random character.

FLASH MEMORY         The flash blocks will be erased.

**Key Entry**            **Erase and Sanitize All**

### :SSAVer:DELAy

**Supported**            All

```
:SYSTem:SSAVer:DELAy <val>  
:SYSTem:SSAVer:DELAy?
```

This command sets the amount of time before the display light or display light and text is switched off. This will occur if there is no input via the front panel during the delay period.

The variable <val> is a whole number measured in hours.

**Range** 1–12

**Key Entry** **Screen Saver Delay:**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

Refer to “:SSAVer:MODE” on page 164 for selecting the screen saver mode.

### :SSAVer:MODE

**Supported** All

:SYSTem:SSAVer:MODE LIGHT|TEXT

:SYSTem:SSAVer:MODE?

This command toggles the screen saver mode between light only or light and text.

**LIGHT** This choice enables only the light to turn off during the screen saver operation while leaving the text visible on the darkened screen.

**TEXT** This choice enables both the display light and text to turn off during the screen saver operation.

**Key Entry** **Screen Saver Mode**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### :SSAVer:STATe

**Supported** All

:SYSTem:SSAVer:STATe ON|OFF|1|0

:SYSTem:SSAVer:STATe?

This command enables or disables the display screen saver.

**Key Entry** **Screen Saver Off On**

**Remarks** The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## :TIME

**Supported** All

:SYSTem:TIME <hour>, <minute>, <second>

:SYSTem:TIME?

This command sets the time displayed in the lower right area of the signal generator's display.

**Range** <hour>: 0–23 <minute>: 0–59 <second>: 0–59

**Key Entry** Time/Date

## :VERSion

**Supported** All

:SYSTem:VERSion?

This command returns the SCPI version number with which the signal generator complies.

## Trigger Subsystem

### :ABORt

**Supported** All

:ABORt

This command causes the List or Step sweep in progress to abort. If INIT:CONT[:ALL] is set to ON, the sweep will immediately re-initiate. The pending operation flag affecting \*OPC, \*OPC?, and \*WAI will undergo a transition once the sweep has been reset.

### :INITiate:CONTinuous[:ALL]

**Supported** All

:INITiate:CONTinuous[:ALL] ON|OFF|1|0

:INITiate:CONTinuous[:ALL]?

This command selects either a continuous or single list or step sweep. Execution of this command does not affect a sweep in progress.

ON (1) This choice selects continuous sweep where, after the completion of the previous sweep, the current sweep will restart automatically or wait until the appropriate trigger source is received.

OFF (0) This choice selects a single sweep. Refer to “:INITiate:IMMEDIATE[:ALL]” on [page 167](#) for single sweep triggering information.

\*RST 0

**Key Entry** Sweep Repeat Single Cont

**Remarks** Execution of this command will not affect a sweep in progress.

## **:INITiate[:IMMediate][:ALL]**

**Supported**            All

```
:INITiate[:IMMediate] [:ALL]
```

This command either sets or sets and starts a single List or Step sweep, depending on the trigger type. The command performs the following:

- arms a single sweep when BUS, EXTERNAL, or KEY is the trigger source selection
- arms and starts a single sweep when IMMEDIATE is the trigger source selection

This command is ignored if a sweep is in progress. See “:INITiate:CONTinuous[:ALL]” on page 166 for setting continuous or single sweep. See “:TRIGger[:SEQuence]:SOURce” on page 168 to select the trigger source.

In some atypical cases, the :INIT command could be ignored if it immediately follows an \*OPC? command. If the :INIT command is ignored, then use a 10ms sleep function before sending the command.

**Key Entry**            **Single Sweep**

## **:TRIGger:OUTPut:POLarity**

**Supported**            All

```
:TRIGger:OUTPut:POLarity POSitive|NEGative  

:TRIGger:OUTPut:POLarity?
```

Sets the TTL signal level present at the TRIGGER OUT connector to either high (5 vdc) or low (0 vdc). The trigger out is asserted after the frequency and/or power is set while the sweep is waiting for its step trigger. In addition, the swept-sine sends a pulse to the TRIGGER OUT at the beginning of each sweep.

### **Example**

```
:TRIG:OUTP:POL NEG
```

The preceding example enables the continuous mode as the sweep type.

**\*RST**                    POS

**Key Entry**            **Trigger Out Polarity Neg Pos**

## :TRIGger[:SEQuence]:SLOPe

**Supported** All

:TRIGger[:SEQuence]:SLOPe POSitive|NEGative

:TRIGger[:SEQuence]:SLOPe?

This command sets the polarity of the ramp or sawtooth waveform slope present at the TRIG IN connector that will trigger a list or step sweep.

**\*RST** POS

**Key Entry** **Trigger In Polarity Neg Pos**

## :TRIGger[:SEQuence]:SOURce

**Supported** All

:TRIGger[:SEQuence]:SOURce BUS|IMMEDIATE|EXTernal|KEY

:TRIGger[:SEQuence]:SOURce?

This command sets the sweep trigger source for a list or step sweep.

**BUS** This choice enables GPIB triggering using the \*TRG or GET command or LAN and RS-232 triggering using the \*TRG command.

**IMMEDIATE** This choice enables immediate triggering of the sweep event.

**EXTernal** This choice enables the triggering of a sweep event by an externally applied signal at the TRIG IN connector.

**KEY** This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

**\*RST** IMM

**Remarks** The wait for the BUS, EXTernal, or KEY trigger can be bypassed by sending the :TRIGger[:SEQuence][:IMMEDIATE] command.

### Example

```
:TRIG:SOUR BUS
```

The preceding example sets the sweep trigger source to BUS.

**\*RST** IMM

**Key Entry** **Bus Free Run Ext Trigger Key**



## **:TRIGger[:SEQuence][:IMMediate]**

**Supported**            All Models

:TRIGger [:SEQuence] [:IMMediate]

This event command causes an armed List or Step sweep to immediately start without the selected trigger occurring.

In some atypical cases, the :TRIG command could be ignored if it immediately follows an\*OPC? command. If the :TRIG command is ignored, then use a 10ms sleep function before sending the command.

## Unit Subsystem (:UNIT)

### :POWer

**Supported** All

:UNIT:POWer DBM|DBuV|DBuVemf|V|Vemf|DB

:UNIT:POWer?

This command terminates an amplitude value in the selected unit of measure.

If the amplitude reference state is set to on, the query returns units expressed in DB and the DB choice will be displayed. Setting any other unit will cause a setting conflict error stating that the amplitude reference state must be set to off. Refer to, “[:REFerence:STATe](#)” on page 67 for more information.

**\*RST** DBM

**Key Entry** dBm dBuV dBuVemf mV uV mVemf uVemf DB

**Remarks** All power values in this chapter are shown with DBM as the unit of measure. If a different unit of measure is selected, replace DBM with the newly selected unit whenever it is indicated for the value.

---

## 4 Analog Commands

This chapter provides SCPI descriptions for subsystems dedicated to analog commands common to all ESG signal generator models. This chapter contains the following major sections:

- “Amplitude Modulation Subsystem ([:SOURce])” on page 172
- “Frequency Modulation Subsystem ([:SOURce])” on page 179
- “Low Frequency Output Subsystem ([:SOURce]:LFOOutput)” on page 186
- “Phase Modulation Subsystem ([:SOURce])” on page 191
- “Pulse Modulation Subsystem ([:SOURce]:PULM)” on page 199

---

## Amplitude Modulation Subsystem ([:SOURce])

### :AM[1]|2...

**Supported** All Models

[:SOURce]:AM[1]|2...

This prefix enables the selection of the AM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **AM Path 1 2** softkey.

AM[1] **AM Path 1 2** with 1 selected

AM2 **AM Path 1 2** with 2 selected

When just AM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses AM[1], only path one is affected. Consequently, when AM2 is selected, only path two is set up. However, the depth of the signals for the two paths can be coupled.

Depth coupling links the depth value of AM[1] to AM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPTSine is not the selection for the waveform type
- each path uses a different source (Internal 1, Ext1, or Ext2)

### :AM:INTernal:FREQuency:STEP[:INCRement]

**Supported** All Models

[:SOURce]:AM:INTernal:FREQuency:STEP[:INCRement] <num>

[:SOURce]:AM:INTernal:FREQuency:STEP[:INCRement]?

This command sets the step increment for the amplitude modulation internal frequency.

The variable <num> is expressed in units of Hertz.

**Range** 0.5–1E6

**Key Entry** **Incr Set**

**Remarks** The value set by this command is used with the UP and DOWN choices for the AM frequency setting. Refer to “:AM[1]|2:INTERNAL[1]:FREQUENCY” on page 174 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

### :AM:WIDeband:STATe

**Supported** All Models

[ :SOURCE ] :AM:WIDeband:STATe ON|OFF|1|0

[ :SOURCE ] :AM:WIDeband:STATe?

This command enables or disables the wideband amplitude modulation for the selected path.

**\*RST** 0

**Key Entry** **AM Off On**

**Remarks** The RF carrier is modulated when the modulation state of the signal generator is set to ON, see “:MODulation[:STATe]” on page 129 for more information.

Whenever amplitude modulation is enabled, the AM annunciator is turned on in the display

### :AM[1]|2:EXTeRnal[1]|2:COUPling

**Supported** All Models

[ :SOURCE ] :AM[1]|2:EXTeRnal[1]|2:COUPling AC|DC

[ :SOURCE ] :AM[1]|2:EXTeRnal[1]|2:COUPling?

This command sets the coupling for the amplitude modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

**\*RST** DC

**Key Entry** **Ext Coupling DC AC**

**Remarks** The command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

**Amplitude Modulation Subsystem ([:SOURce])****:AM[1] | 2:INTernal[1]:FREQuency****Supported** All Models

```
[:SOURce]:AM[1] | 2:INTernal [1] :FREQuency <val><unit> | UP | DOWN
[:SOURce]:AM[1] | 2:INTernal [1] :FREQuency?
```

This command sets the internal amplitude modulation rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

**\*RST** +4.00000000E+002

**Range** Dual Sine, Swept-Sine & Sine: 0.1HZ–100kHz  
All Other Waveforms: 0.1HZ–20kHz

**Key Entry**      **AM Tone 1 Rate**      **AM Start Rate**      **AM Rate**

**:AM[1] | 2:INTernal[1]:FREQuency:ALternate****Supported** All Models

```
[:SOURce]:AM[1] | 2:INTernal [1] :FREQuency:ALternate <val><unit>
[:SOURce]:AM[1] | 2:INTernal [1] :FREQuency:ALternate?
```

This command sets the frequency for the alternate signal.

**\*RST** +4.00000000E+002

**Range** Dual-Sine: 0.1HZ–100kHz      Swept-Sine: 0.1HZ–100kHz

**Key Entry**      **AM Tone 2 Rate**      **AM Stop Rate**

**Remarks** The alternate signal frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to “:AM[1]2:INTernal[1]:FUNctioN:SHAPE” on page 175 for the waveform selection.

### **:AM[1]|2:INteRnal[1]:FREQuency:ALteRnate:AMPLitude:PERCent**

**Supported**            All Models

```
[ :SOURCE ] :AM [ 1 ] | 2 : INteRnal [ 1 ] : FREQuency : ALteRnate : AMPLitude :  

PERCent <val><unit>  

[ :SOURCE ] :AM [ 1 ] | 2 : INteRnal [ 1 ] : FREQuency : ALteRnate : AMPLitude : PERCent ?
```

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

**\*RST**                    +5.00000000E+001

**Range**                    0–100PCT

**Key Entry**                **AM Tone 2 Ampl Percent Of Peak**

**Remarks**                Refer to “:AM[1]2:INteRnal[1]:FUNctIon:SHAPE” on page 175 for the waveform selection.

### **:AM[1]|2:INteRnal[1]:FUNctIon:SHAPE**

**Supported**            All Models

```
[ :SOURCE ] :AM [ 1 ] | 2 : INteRnal [ 1 ] : FUNctIon : SHAPE SINE | TRIangle | SQUare | RAMP |  

NOISe | DUALsine | SWEPTsine  

[ :SOURCE ] :AM [ 1 ] | 2 : INteRnal [ 1 ] : FUNctIon : SHAPE ?
```

This command sets the AM waveform type.

**\*RST**                    SINE

**Key Entry**                **Sine    Triangle    Square    Ramp    Noise    Dual-Sine    Swept-Sine**

### **:AM[1]|2:INteRnal[1]:SWEep:TIME**

**Supported**            All Models

```
[ :SOURCE ] :AM [ 1 ] | 2 : INteRnal [ 1 ] : SWEep : TIME <val><unit>  

[ :SOURCE ] :AM [ 1 ] | 2 : INteRnal [ 1 ] : SWEep : TIME ?
```

This command sets the sweep rate for the amplitude-modulated, swept-sine waveform.

**\*RST**                    +1.00000000E–001

**Range**                    1mS–65.535S

**Key Entry**                **AM Sweep Time**

**:AM[1] | 2:INTernal[1]:SWEep:TRIGger****Supported** All Models

```
[:SOURce]:AM[1] | 2:INTernal [1] :SWEep:TRIGger BUS | IMMEDIATE | EXTernal | KEY
[:SOURce]:AM[1] | 2:INTernal [1] :SWEep:TRIGger?
```

This command sets the trigger source for the amplitude modulated swept-sine waveform.

**BUS** This choice enables GPIB triggering using the \*TRG or GET command or LAN and RS-232 triggering using the \*TRG command.

**IMMEDIATE** This choice enables immediate triggering of the sweep event.

**EXTernal** This choice enables the triggering of a sweep event by an externally applied signal at the TRIG IN connector.

**KEY** This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

**\*RST** IMM

**Key Entry** **Bus** **Free Run** **Ext** **Trigger Key**

**Remarks** Refer to “:AM[1]2:INTernal[1]:FUNCTION:SHAPE” on page 175 for the waveform selection.

**:AM[1] | 2:SOURce****Supported** All Models

```
[:SOURce]:AM[1] | 2:SOURce INT [1] | EXT [1] | EXT2
[:SOURce]:AM[1] | 2:SOURce?
```

This command sets the source to generate the amplitude modulation.

**INT** This choice selects the internal source to provide an ac-coupled signal.

**EXT** This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.

**\*RST** INT

**Key Entry** **Internal** **Ext1** **Ext2**

**Remarks** A  $1.0 V_p$  input is required for calibrated AM depth settings.

The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is  $> \pm 3\%$  of  $1 V_p$ .



## **:AM[1] | 2:STATe**

**Supported**            All Models

[ :SOURce ] :AM [1] | 2 :STATe ON | OFF | 1 | 0

[ :SOURce ] :AM [1] | 2 :STATe?

This command enables or disables the amplitude modulation for the selected path.

**\*RST**                    0

**Key Entry**            **AM Off On**

**Remarks**            The RF carrier is modulated when you have set the signal generator’s modulation state to ON, see “:MODulation[:STATe]” on page 129 for more information.

Whenever amplitude modulation is enabled, the AM annunciator is turned on in the display.

The two paths for amplitude modulation can be simultaneously enabled. Refer to “:AM[1]2...” on page 172 for more information.

## **:AM[1] | 2[:DEPTH]**

**Supported**            All Models

[ :SOURce ] :AM [1] | 2 [ :DEPTH ] [ :LINear ] <val><unit> | UP | DOWN

[ :SOURce ] :AM [1] | 2 [ :DEPTH ] [ :LINear ] ?

This commands sets the amplitude modulation depth in percent.

**\*RST**                    +1.00000000E-001

**Range**                    0.00–100PCT

**Key Entry**            **AM Depth**

**Remarks**            The value of AM depth applies only to whichever AM path configuration (AM[1]2) you have currently selected. AM Depth is fixed for wideband AM.

When the depth values are coupled, a change made to one path is applied to both. Refer to “:AM[1]2[:DEPTH]:TRACK” on page 178 for AM depth value coupling.

Refer to “:AM[:DEPTH]:STEP[:INCRement]” on page 178 for setting the value associated with UP and DOWN choices.

**:AM[1] | 2[:DEPTH]:TRACK****Supported** All Models

[:SOURce] :AM[1] | 2[:DEPTH] [:LINear] :TRACk ON|OFF|1|0

[:SOURce] :AM[1] | 2[:DEPTH] [LINear] :TRACk?

This command enables or disables the coupling of the AM depth values between the paths (AM[1] and AM2).

ON (1) This choice will link the depth value of AM[1] with AM2; AM2 will assume the AM[1] depth value. For example, if AM[1] depth is set to 15% and AM2 is set to 11%, enabling the depth tracking will cause the AM2 depth value to change to 15%. This applies regardless of the path (AM[1] or AM2) selected in this command

OFF (0) This choice disables the coupling and both paths will have independent depth values.

**\*RST** 0**Key Entry** **AM Depth Couple Off On****Remarks** When the depth values are coupled, a change made to one path is applied both.**:AM[:DEPTH]:STEP[:INCRement]****Supported** All Models

[:SOURce] :AM[:DEPTH] :STEP[:INCRement] &lt;val&gt;&lt;unit&gt;

[:SOURce] :AM[:DEPTH] :STEP[:INCRement] ?

This command sets the AM depth step increment.

**Range** 0.1–100PCT**Key Entry** **Incr Set**

**Remarks** The value set by this command is used with the UP and DOWN choices for the AM depth setting. Refer to “:AM[1]2[:DEPTH]” on page 177 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## Frequency Modulation Subsystem ([:SOURce])

### :FM[1] | 2...

**Supported**            All Models

[[:SOURce] :FM[1] | 2 . . .

This prefix enables the selection of the FM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **FM Path 1 2** softkey.

FM[1]                    **FM Path 1 2** with 1 selected

FM2                     **FM Path 1 2** with 2 selected

When just FM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses FM[1], only path one is affected. Consequently, when FM2 is selected, only path two is set up. However, the deviation of the signals for the two paths can be coupled.

Deviation coupling links the deviation value of FM[1] to FM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPTSine is not the selection for the waveform type
- each path uses a different source (Internal 1, Ext1, or Ext2)
- FM2 must be set to a deviation less than FM[1]

**:FM:INTernal:FREQuency:STEP[:INCRement]****Supported** All Models

[:SOURce] :FM:INTernal:FREQuency:STEP[:INCRement] &lt;num&gt;

[:SOURce] :FM:INTernal:FREQuency:STEP[:INCRement] ?

This command sets the step increment for the internal frequency modulation.

The variable <num> sets the entered value in units of Hertz.

**\*RST** +5.00000000E+002**Range** 0.5–1E6**Key Entry** **Incr Set**

**Remarks** The value set by this command is used with the UP and DOWN choices for the FM frequency setting. Refer to “:FM[1]|2:INTernal[1]:FREQuency” on page 181 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

**:FM[1] | 2:EXTernal[1] | 2:COUPLing****Supported** All Models

[:SOURce] :FM[1] | 2:EXTernal [1] | 2:COUPLing AC|DC

[:SOURce] :FM[1] | 2:EXTernal [1] | 2:COUPLing?

This command sets the coupling for the frequency modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

**\*RST** DC**Key Entry** **Ext Coupling DC AC**

**Remarks** The command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

**:FM[1] | 2:INTernal[1]:FREQuency**

**Supported**            All Models

```
[ :SOURce ] : FM [ 1 ] | 2 : INTernal [ 1 ] : FREQuency <val><unit> | UP | DOWN
[ :SOURce ] : FM [ 1 ] | 2 : INTernal [ 1 ] : FREQuency?
```

This command sets the internal frequency modulation rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

**\*RST**                    +4.00000000E+002

**Range**                Dual-Sine: 0.1HZ–100KHZ      Swept-Sine: 0.1HZ–100KHZ  
                          All Other Waveforms: 0.1HZ–20KHZ

**Key Entry**            **FM Tone 1 Rate**      **FM Start Rate**      **FM Rate**

**:FM[1] | 2:INTernal[1]:FREQuency:ALternate**

**Supported**            All Models

```
[ :SOURce ] : FM [ 1 ] | 2 : INTernal [ 1 ] : FREQuency:ALternate <val><unit>
[ :SOURce ] : FM [ 1 ] | 2 : INTernal [ 1 ] : FREQuency:ALternate?
```

This command sets the frequency for the alternate signal.

**\*RST**                    +4.00000000E+002

**Range**                Dual-Sine: 0.5HZ–1MHZ      Swept-Sine: 1HZ–1MHZ

**Key Entry**            **FM Tone 2 Rate**      **FM Stop Rate**

**Remarks**            The alternate signal frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to “:FM[1]2:INTernal[1]:FUNctio:n:SHAPE” on page 182 for the waveform selection.

**:FM[1] | 2:INTernal[1]:FREQuency:ALternate:AMPLitude:PERCent****Supported** All Models[:SOURce] :FM[1] | 2:INTernal [1] :FREQuency:ALternate:AMPLitude:  
PERCent <val><unit>

[:SOURce] :FM[1] | 2:INTernal [1] :FREQuency:ALternate:AMPLitude:PERCent?

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

**\*RST** +1.00000000E+002**Range** 0–100PCT**Key Entry** **FM Tone 2 Ampl Percent Of Peak****Remarks** Refer to “:FM[1]2:INTernal[1]:FUNction:SHAPE” for the waveform selection.**:FM[1] | 2:INTernal[1]:FUNction:SHAPE****Supported** All Models[:SOURce] :FM[1] | 2:INTernal [1] | :FUNction:SHAPE SINE|TRIangle|SQUare|RAMP|  
NOISE|DUALsine|SWEPTsine

[:SOURce] :FM[1] | 2:INTernal [1] | :FUNction:SHAPE?

This command sets the FM waveform type.

**\*RST** SINE**Key Entry** **Sine Triangle Square Ramp Noise Dual-Sine Swept-Sine****Remarks** The waveform selection is only valid when INT[1] is the source selection. Refer to “:FM[1]2:SOURce” on page 184 for type source selection.

### **:FM[1] | 2:INteRnal[1]:SWEep:TIME**

**Supported**            All Models

[ :SOURce ] :FM[1] | 2 :INteRnal [1] :SWEep:TIME <val><unit>

[ :SOURce ] :FM[1] | 2 :INteRnal [1] :SWEep:TIME?

This command sets the sweep time for the swept-sine waveform.

**\*RST**                    +1.00000000E-001

**Range**                    1.0mS-65.535S

**Key Entry**            **FM Sweep Time**

**Remarks**            Refer to “:FM[1]2:INteRnal[1]:FUNctIon:SHApe” on page 182 for the waveform selection.

### **:FM[1] | 2:INteRnal[1]:SWEep:TRIGger**

**Supported**            All Models

[ :SOURce ] :FM[1] | 2 :INteRnal [1] :SWEep:TRIGger BUS | IMMEDIATE | EXteRnal | KEY

[ :SOURce ] :FM[1] | 2 :INteRnal [1] :SWEep:TRIGger?

This command sets the trigger source for the frequency modulated swept-sine waveform.

**BUS**                    This choice enables GPIB triggering using the \*TRG or GET command or LAN and RS-232 triggering using the \*TRG command.

**IMMEDIATE**            This choice enables immediate triggering of the sweep event.

**EXteRnal**              This choice enables the triggering of a sweep event by an externally applied signal at the TRIG IN connector.

**KEY**                    This choice enables triggering through front panel interaction by pressing the **Trigger** hardkey.

**\*RST**                    IMM

**Key Entry**            **Bus    Free Run    Ext    Trigger Key**

**Remarks**            Refer to “:FM[1]2:INteRnal[1]:FUNctIon:SHApe” on page 182 for the waveform selection.

## Frequency Modulation Subsystem ([:SOURce])

**:FM[1] | 2:SOURce****Supported** All Models

[:SOURce] :FM[1] | 2:SOURce INT [1] | EXT1 | EXT2

[:SOURce] :FM[1] | 2:SOURce?

This command sets the source to generate the frequency modulation.

**INT** This choice selects the internal source to provide an ac-coupled signal.**EXT** This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.**\*RST** INT**Key Entry** **Internal Ext1 Ext2****Remarks** The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is  $> \pm 3\%$  of  $1 V_p$ .**:FM[1] | 2:STATe****Supported** All Models

[:SOURce] :FM[1] | 2:STATe ON | OFF | 1 | 0

[:SOURce] :FM[1] | 2:STATe?

This command enables or disables the frequency modulation for the selected path.

**\*RST** 0**Key Entry** **FM Off On****Remarks** The RF carrier is modulated when you set the signal generator's modulation state to ON, see “[:MODulation[:STATe]]” on page 129 for more information.

Whenever frequency modulation is enabled, the FM annunciator is turned on in the display.

The two paths for frequency modulation can be simultaneously enabled. Refer to “[:FM[1]2...” on page 179 for more information.



### **:FM[1] | 2[:DEVIation]**

**Supported**            All Models

[:SOURCE] :FM[1] | 2[:DEVIation] <val><unit>

[:SOURCE] :FM[1] | 2[:DEVIation] ?

This command sets the frequency modulation deviation.

**\*RST**                    +1.00000000E+003

<b>Range</b>	<i>Frequency</i>	<i>Deviation</i>	Deviation Option UNJ
	250kHz–249.999MHZ	0–8MHZ	0–1MHZ
	> 249.999–500MHZ	0–4MHZ	0–500kHz
	> 500MHZ–1GHZ	0–8MHZ	0–1MHZ
	> 1–2GHZ	0–16MHZ	0–2MHZ
	> 2–4GHZ	0–32MHZ	0–4MHZ
	> 4–6GHZ	0–8MHZ	0–8MHZ

**Key Entry**            **FM DEV**

**Remarks**            If deviation tracking is ON, a change to the deviation value on one path will apply to both. Refer to “[:FM\[1\]|2\[:DEVIation\]:TRACK](#)” on page 185 for more information and setting the deviation tracking.

### **:FM[1] | 2[:DEVIation]:TRACK**

**Supported**            All Models

[:SOURCE] :FM[1] | 2[:DEVIation] :TRACK ON|OFF|1|0

[:SOURCE] :FM[1] | 2[:DEVIation] :TRACK?

This command enables or disables the deviation coupling between the paths (FM[1] and FM2).

ON (1)                    This choice will link the deviation value of FM[1] with FM2; FM2 will assume the FM[1] deviation value. For example, if FM[1] deviation is set to 500 Hz and FM2 is set to 2 kHz, enabling the deviation tracking will cause the FM2 deviation value to change to 500 Hz. This applies regardless of the path (FM[1] or FM2) selected in this command

OFF (0)                    This choice disables the coupling and both paths will have independent deviation values.

**\*RST**                    0

**Key Entry**            **FM Dev Couple Off On**

**Remarks**            This command uses exact match tracking, not offset tracking.

---

## Low Frequency Output Subsystem ([:SOURce]:LFOutput)

### :AMPLitude

**Supported** All Models

[:SOURce]:LFOutput:AMPLitude <val><unit>

[:SOURce]:LFOutput:AMPLitude?

This command sets the amplitude for the signal at the LF OUTPUT connector.

**\*RST** 0.00

**Range** 0.000VP–5.0VP

**Key Entry** **LF Out Amplitude**

### :FUNction[1]:FREQuency

**Supported** All Models

[:SOURce]:LFOutput:FUNction[1]:FREQuency <val><unit>

[:SOURce]:LFOutput:FUNction[1]:FREQuency?

This command sets the internal modulation frequency for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

**\*RST** +4.00000000E+002

**Range** Sine: 0.1HZ–100KHZ    Dual-Sine: 0.1HZ–100KHZ  
Swept-Sine: 0.1HZ–100KHZ  
All Other Waveforms: 0.1HZ–20KHZ

**Key Entry** **LF Out Tone 1 Freq**    **LF Out Start Freq**    **LF Out Freq**

**Remarks** Refer to “:FUNction[1]:SHApe” on page 189 for selecting the waveform type.

**:FUNCTION[1]:FREQUENCY:ALTERNATE****Supported** All Models

[:SOURce]:LFOutput:FUNCTION[1]:FREQUENCY:ALTERNATE &lt;val&gt;&lt;unit&gt;

[:SOURce]:LFOutput:FUNCTION[1]:FREQUENCY:ALTERNATE?

This command sets the frequency for the alternate LF output signal.

**\*RST** +4.00000000E+002**Range** Dual-Sine: 0.1HZ–100KHZ Swept-Sine: 0.1HZ–100KHZ**Key Entry** **LF Out Tone 2 Freq** **LF Out Stop Freq****Remarks** The alternate frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to “:FUNCTION[1]:SHAPE” on page 189 for selecting the waveform type.

**:FUNCTION[1]:FREQUENCY:ALTERNATE:AMPLITUDE:PERCENT****Supported** All Models

[:SOURce]:LFOutput:FUNCTION[1]:FREQUENCY:ALTERNATE:AMPLITUDE:

PERCENT &lt;val&gt;&lt;unit&gt;

[:SOURce]:LFOutput:FUNCTION[1]:FREQUENCY:ALTERNATE:AMPLITUDE:PERCENT?

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total LF output amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

**\*RST** +5.00000000E+001**Range** 0–100PCT**Key Entry** **LF Out Tone 2 Ampl % of Peak****Remarks** Refer to “:FUNCTION[1]:SHAPE” on page 189 for selecting the waveform type.

**:FUNction[1]:PERiod****Supported** All Models

[:SOURce]:LFOutput:FUNction[1]:PERiod &lt;val&gt;&lt;unit&gt;

[:SOURce]:LFOutput:FUNction[1]:PERiod?

This command sets the pulse period of the internally generated pulsed low frequency waveform.

**\*RST** +1.60000000E-005**Range** 16uS-30S**Key Entry** **LF Out Period****:FUNction[1]:PWIDth****Supported** All Models

[:SOURce]:LFOutput:FUNction[1]:PWIDth &lt;val&gt;&lt;unit&gt;

[:SOURce]:LFOutput:FUNction[1]:PWIDth?

This command sets the pulse width of the internally-generated pulsed low frequency waveform.

The upper limit range value is restricted by the current value of the pulse period. For example, if the pulse period value is set to 16  $\mu$ S, the pulse width is limited to a maximum range value of 16  $\mu$ S.

**\*RST** +8.00000000E-006**Range** 8uS-30S**Key Entry** **LF Out Width****Remarks** To change the pulse period value, refer to “:FUNction[1]:PERiod” on page 188.

**:FUNCTION[1]:SHAPE****Supported** All Models

[:SOURce]:LFOutput:FUNCTION[1]:SHAPE SINE|DUALsine|SWEptsine|TRIangle|SQUare|RAMP|PULSe|NOISe|DC

[:SOURce]:LFOutput:FUNCTION[1]:SHAPE?

This command sets the waveform type for the generated signal at the LF output.

**\*RST** SINE

<b>Key Entry</b>	<b>Sine</b>	<b>Dual-Sine</b>	<b>Swept-Sine</b>	<b>Triangle</b>	<b>Square</b>	<b>Ramp</b>	<b>Pulse</b>
	<b>Noise</b>	<b>DC</b>					

**Remarks** Function Generator must be the source selection to support DUALsine or the SWEptsine waveform. Refer to “[:SOURce]” on page 190.**:FUNCTION[1]:SWEep:TIME****Supported** All Models

[:SOURce]:LFOutput:FUNCTION[1]:SWEep:TIME &lt;val&gt;&lt;unit&gt;

[:SOURce]:LFOutput:FUNCTION[1]:SWEep:TIME?

This command sets the sweep time for an internally generated swept-sine signal at the LF output.

**\*RST** +1.00000000E-001**Range** 1mS-65.535S**Key Entry** **LF Out Sweep Time****:FUNCTION[1]:SWEep:TRIGger****Supported** All Models

[:SOURce]:LFOutput:FUNCTION[1]:SWEep:TRIGger BUS|IMMEDIATE|EXTernal|KEY

[:SOURce]:LFOutput:FUNCTION[1]:SWEep:TRIGger?

This command sets the trigger source for the internally generated swept-sine waveform signal at the LF output.

**BUS** This choice enables GPIB triggering using the \*TRG or GET command or LAN and RS-232 triggering using the \*TRG command.**IMMEDIATE** This choice enables immediate triggering of the sweep event.**EXTernal** This choice enables the triggering of a sweep event by an externally applied signal at the TRIG IN connector.

## Analog Commands

### Low Frequency Output Subsystem ([:SOURce]:LFOutput)

<b>KEY</b>	This choice enables triggering through front panel interaction by pressing the <b>Trigger</b> hardkey.
<b>*RST</b>	IMM
<b>Key Entry</b>	<b>Bus</b> <b>Free Run</b> <b>Ext</b> <b>Trigger Key</b>
<b>Remarks</b>	Refer to “:FUNCTION[1]:SHAPE” on page 189 for selecting the waveform type.

### :SOURce

**Supported**      All Models

```
[ :SOURce ] :LFOutput :SOURce INT [ 1 ] | FUNction  
[ :SOURce ] :LFOutput :SOURce ?
```

This command sets the low frequency source for the LF output.

**INT[1]**      This choice enables you to output a signal where the frequency and shape of the signal is set by the internal source as it is being used by a modulation. For example, if the internal source is currently assigned to an AM path configuration and AM is turned on, the signal output at the LF OUTPUT connector will have the frequency and shape of the amplitude modulating signal.

**FUNction**      This choice enables the selection of an internal function generator.

**\*RST**      FUNC

**Key Entry**      **Internal Monitor**      **Function Generator**

### :STATe

**Supported**      All Models

```
[ :SOURce ] :LFOutput :STATe ON | OFF | 1 | 0  
[ :SOURce ] :LFOutput :STATe ?
```

This command enables or disables the low frequency output.

**\*RST**      0

**Key Entry**      **LF Out Off On**

---

## Phase Modulation Subsystem ([:SOURCE])

### :PM[1]|2...

**Supported**            All Models

[[:SOURCE] :PM[1] | 2 . . .

This prefix enables the selection of the  $\Phi$ M path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the  $\Phi$ M Path 1 2 softkey.

PM[1]                     $\Phi$ M Path 1 2 with 1 selected

PM2                      $\Phi$ M Path 1 2 with 2 selected

When just PM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses PM[1], only path one is affected. Consequently, when PM2 is selected, only path two is set up. However, the deviation of the signals for the two paths can be coupled.

Deviation coupling links the deviation value of PM[1] to PM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPTSine is not the selection for the waveform type
- each path uses a different source (Internal 1, Ext1, or Ext2)
- PM2 must be set to a deviation less than or equal to PM[1]

**Phase Modulation Subsystem (:SOURce)****:PM:INTernal:FREQuency:STEP[:INCRement]****Supported** All Models

[:SOURce] :PM:INTernal:FREQuency:STEP[:INCRement] &lt;num&gt;

[:SOURce] :PM:INTernal:FREQuency:STEP[:INCRement] ?

This command sets the step increment of the phase modulation internal frequency.

The variable <num> sets the entered value in units of Hertz.

**Range** 0.5–1E6**Key Entry** **Incr Set**

**Remarks** The value set by this command is used with the UP and DOWN choices for the FM frequency command. Refer to “:PM[1]2:INTernal[1]:FREQuency” on [page 193](#) for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

**:PM[1] | 2:BANDwidth | BWIDth****Supported** All Models

[:SOURce] :PM[1] | 2:BANDwidth | BWIDth NORMal | HIGH

[:SOURce] :PM[1] | 2:BANDwidth | BWIDth ?

This command toggles between normal phase modulation and high bandwidth phase modulation mode.

**\*RST** NORM**Key Entry** **FM ΦM Normal High BW**



### **:PM[1] | 2:EXtErnal[1]:COUPling**

**Supported**            All Models

[ :SOURce ] : PM [ 1 ] | 2 : EXtErnal [ 1 ] : COUPling AC | DC

[ :SOURce ] : PM [ 1 ] | 2 : EXtErnal [ 1 ] : COUPling?

This command sets the coupling for the phase modulation source through the selected external input connector.

AC                      This choice will only pass ac signal components.

DC                      This choice will pass both ac and dc signal components.

**\*RST**                    DC

**Key Entry**            **Ext Coupling DC AC**

**Remarks**            This command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

### **:PM[1] | 2:INtErnal[1]:FREQuency**

**Supported**            All Models

[ :SOURce ] : PM [ 1 ] | 2 : INtErnal [ 1 ] : FREQuency <val><unit> | UP | DOWN

[ :SOURce ] : PM [ 1 ] | 2 : INtErnal [ 1 ] : FREQuency?

This command sets the internal modulation frequency rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

**\*RST**                    +4.00000000E+002

**Range**                    Dual-Sine: 0.1HZ–100KHZ      Swept-Sine: 0.1HZ–100KHZ

All Other Waveforms: 0.1HZ–20KHZ

**Key Entry**            **ΦMTone 1 Rate      ΦM Start Rate      ΦM Rate**

**Remarks**            Refer to [“:FUNCTION\[1\]:SHAPE” on page 189](#) for selecting the waveform type.

**:PM[1]|2:INTernal[1]:FREQuency:ALternate****Supported** All Models

[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALternate &lt;val&gt;&lt;unit&gt;

[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALternate?

This command sets the frequency for the alternate signal.

**\*RST** +4.00000000E+002**Range** Dual-Sine: 0.1HZ–100KHZ Swept-Sine: 0.1HZ–100KHZ**Key Entry** **ΦM Stop Rate** **ΦM Tone 2 Rate****Remarks** The alternate frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to “:PM[1]|2:INTernal[1]:FUNctIon:SHApe” on page 195 for the waveform selection.

**:PM[1]|2:INTernal[1]:FREQuency:ALternate:AMPLitude:PERCent****Supported** All Models

[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALternate:AMPLitude:

PERCent &lt;val&gt;&lt;unit&gt;

[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALternate:AMPLitude:PERCent?

This command sets the amplitude of the second tone for the dual-sine waveform as a percentage of the total amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

**\*RST** +5.00000000E+001**Range** 0–100PCT**Key Entry** **ΦM Tone 2 Ampl Percent of Peak****Remarks** Refer to “:PM[1]|2:INTernal[1]:FUNctIon:SHApe” on page 195 for the waveform selection.

### **:PM[1] | 2:INTernal[1]:FUNction:SHAPE**

**Supported** All Models

```
[:SOURCE]:PM[1] | 2:INTernal[1]:FUNction:SHAPE SINE|TRIangle|SQUare|RAMP|
NOISe|DUALsine|SWEPTsine
```

```
[:SOURCE]:PM[1] | 2:INTernal[1]:FUNction:SHAPE?
```

This command sets the phase modulation waveform type.

**\*RST** SINE

**Key Entry** Sine Triangle Square Ramp Noise Dual-Sine Swept-Sine

**Remarks** The waveform selection is only valid when INT[1] is the source selection. Refer to “:PM[1]2:SOURCE” on page 196 for type source selection.

### **:PM[1] | 2:INTernal[1]:SWEep:TIME**

**Supported** All Models

```
[:SOURCE]:PM[1] | 2:INTernal[1]:SWEep:TIME <val><unit>
```

```
[:SOURCE]:PM[1] | 2:INTernal[1]:SWEep:TIME?
```

This command sets the sweep time for a phase-modulated, swept-sine waveform.

**\*RST** +1.00000000E-001

**Range** 1.0mS-65.535S

**Key Entry**  $\Phi$ M Sweep Time

**Remarks** Refer to “:PM[1]2:INTernal[1]:FUNction:SHAPE” for the waveform selection.

### **:PM[1] | 2:INTernal[1]:SWEep:TRIGger**

**Supported** All Models

```
[:SOURCE]:PM[1] | 2:INTernal[1]:SWEep:TRIGger BUS|IMMediate|EXTernal|KEY
```

```
[:SOURCE]:PM[1] | 2:INTernal[1]:SWEep:TRIGger?
```

This command sets the trigger source for the phase-modulated, swept-sine waveform.

**BUS** This choice enables GPIB triggering using the \*TRG or GET command or LAN and RS-232 triggering using the \*TRG command.

**IMMediate** This choice enables immediate triggering of the sweep event.

**EXTernal** This choice enables the triggering of a sweep event by an externally applied signal at the TRIG IN connector.

**Phase Modulation Subsystem ([:SOURce])**

<b>KEY</b>	This choice enables triggering through front panel interaction by pressing the <b>Trigger</b> hardkey.
<b>*RST</b>	IMM
<b>Key Entry</b>	<b>Bus</b> <b>Free Run</b> <b>Ext</b> <b>Trigger Key</b>
<b>Remarks</b>	Refer to “:PM[1]2:INTernal[1]:FUNcTION:SHAPE” on page 195 for the waveform selection.

**:PM[1] | 2:SOURce**

<b>Supported</b>	All Models
	[ :SOURce ] :PM[1]   2:SOURce INT [1]   EXT1   EXT2 [ :SOURce ] :PM[1]   2:SOURce?
	This command sets the source to generate the phase modulation.
<b>INT</b>	This choice selects internal source 1 to provide an ac-coupled signal.
<b>EXT</b>	This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.
<b>*RST</b>	INT
<b>Key Entry</b>	<b>Internal 1</b> <b>Ext1</b> <b>Ext2</b>
<b>Remarks</b>	The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is $> \pm 3\%$ of $1 V_p$ .

**:PM[1] | 2:STATe**

<b>Supported</b>	All Models
	[ :SOURce ] :PM[1]   2:STATe ON   OFF   1   0 [ :SOURce ] :PM[1]   2:STATe?
	This command enables or disables the phase modulation for the selected path.
<b>*RST</b>	0
<b>Key Entry</b>	<b>ΦM Off On</b>
<b>Remarks</b>	The RF carrier is modulated when you set the signal generator’s modulation state to ON, see “:MODulation[:STATe]” on page 129 for more information.  Whenever phase modulation is enabled, the ΦM annunciator is turned on in the display

The two paths for phase modulation can be simultaneously enabled. Refer to “:PM[1]2...” on page 191 for more information.

### **:PM[1] | 2[:DEVIation]**

**Supported** All Models

```
[:SOURce]:PM[1] | 2[:DEVIation] <val><unit>|UP|DOWN
[:SOURce]:PM[1] | 2[:DEVIation]?
```

This command sets the deviation of the phase modulation.

The variable <unit> will accept RAD (radians), PIRAD (pi-radians), and DEG (degrees); however, the query will only return values in radians.

**\*RST** +0.00000000E+000

<b>Range</b>	<i>Frequency</i>	<i>Normal Bandwidth</i>	<i>High Bandwidth</i>
	250kHz–249.999MHz	0–10RAD	0–1RAD
	> 249.999–500MHz	0–5RAD	0–0.5RAD
	> 500MHz–1GHz	0–10RAD	0–1RAD
	> 1–2GHz	0–20RAD	0–2RAD
	> 2–4GHz	0–40RAD	0–4RAD
	> 4–6GHz	0–80RAD	0–8RAD

**Key Entry**  $\Phi$ M Dev

**Remarks** If deviation tracking is active, a change to the deviation value on one path will apply to both.

Refer to “:PM[:DEVIation]:STEP[:INCRement]” on page 198 for setting the value associated with the UP and DOWN choices.

### **:PM[1] | 2[:DEVIation]:TRACk**

**Supported** All Models

```
[:SOURce]:PM[1] | 2[:DEVIation]:TRACk ON|OFF|1|0
[:SOURce]:PM[1] | 2[:DEVIation]:TRACk?
```

This command enables or disables the deviation coupling between the paths (PM[1] and PM2).

ON (1) This choice will link the deviation value of PM[1] with PM2; PM2 will assume the PM[1] deviation value. For example, if PM[1] deviation is set to 500 Hz and

**Phase Modulation Subsystem ([:SOURce])**

PM2 is set to 2 KHZ, enabling the deviation tracking will cause the PM2 deviation value to change to 500 Hz. This applies regardless of the path (PM[1] or PM2) selected in this command.

**OFF (0)** This choice disables the coupling and both paths will have independent deviation values.

**\*RST** 0

**Key Entry** **ΦM Dev Couple Off On**

**Remarks** This command uses exact match tracking, not offset tracking.

**:PM[:DEVIation]:STEP[:INCRement]**

**Supported** All Models

[:SOURce]:PM[:DEVIation]:STEP[:INCRement] <val><unit>  
[:SOURce]:PM[:DEVIation]:STEP[:INCRement]?

This command sets the phase modulation deviation step increment.

**Range** 0.001–1E3RAD

**Key Entry** **Incr Set**

**Remarks** The value set by this command is used with the UP and DOWN choices for the FM deviation command. Refer to “:PM[1]2[:DEVIation]” on page 197 for more information.

The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

## Pulse Modulation Subsystem ([:SOURce]:PULM)

### :INTErnal[1]:FREQUency

**Supported**            All Models

```
[:SOURce]:PULM:INTErnal [1]:FREQUency <val><unit>|UP|DOWN
[:SOURce]:PULM:INTErnal [1]:FREQUency?
```

This command sets the rate of the internal square wave pulse modulation source.

**\*RST**                    +4.00000000E+002

**Range**                 0.1HZ–20.0kHz

**Key Entry**            **Pulse Rate**

**Remarks**            This command is used when SQUare is the current pulse modulation type. Refer to “[:SOURce]” on page 202 for the pulse modulation type selection.

### :INTErnal[1]:FREQUency:STEP

Supported            All Models

```
[:SOURce]:PULM:INTErnal [1]:FREQUency:STEP [:INCREment] <frequency>MIN|MAX
[:SOURce]:PULM:INTErnal [1]:FREQUency:STEP [INCREment]?
```

This command sets the step value for the internally-generated square wave pulse rate.

This command is used when SQUare is the pulse modulation type. Refer to “[:SOURce]” on page 202 for the pulse modulation type selection. The step value, set with this command, is used with the UP and DOWN choices in the :INTErnal[1]:FREQUency command.

The step value set with this command is not affected by a power-on, preset, or \*RST command.

#### Example

```
:PULM:INT:FREQ:STEP MIN
```

The preceding example sets the step value for the square wave pulse rate to 0.1 Hz, the minimum rate.

**Range**                 0.1HZ–20kHz

**:INteRnal[1]:FUNctIon:SHApe****Supported** All Models

[:SOURce]:PULM:INteRnal[1]:FUNctIon:SHApe PULSe|SQUare

[:SOURce]:PULM:INteRnal[1]:FUNctIon:SHApe?

This command sets the internal pulse modulation waveform type.

**\*RST** PULS**Key Entry** Internal Square Internal Pulse**:INteRnal[1]:PERiod****Supported** All Models

[:SOURce]:PULM:INteRnal[1]:PERiod &lt;val&gt;&lt;unit&gt;|UP|DOWN

[:SOURce]:PULM:INteRnal[1]:PERiod?

This command sets the period for the internally generated pulse modulation source.

**\*RST** +8.00000000E-005**Range** 8uS–30S**Key Entry** Pulse Period**Remarks** If the entered value for the pulse period is equal to or less than the value for the pulse width, the pulse width changes to a value that is equal to the pulse period.Refer to “[:INteRnal\[1\]:PERiod:STEP\[:INCRement\]](#)” on page 200 for setting the value associated with the UP and DOWN choices.**:INteRnal[1]:PERiod:STEP[:INCRement]****Supported** All Models

[:SOURce]:PULM:INteRnal[1]:PERiod:STEP[:INCRement] &lt;val&gt;&lt;unit&gt;|UP|DOWN

[:SOURce]:PULM:INteRnal[1]:PERiod:STEP[:INCRement]?

This command sets the period time step increment for the internally-generated pulse modulation source.

**\*RST** +1.00000000E-006**Range** 4uS–30S**Key Entry** Incr Set



**Remarks**            The value set by this command is used with the UP and DOWN choices for the pulse period command. Refer to “:INTernal[1]:PERiod” on page 200 for more information.

### **:INTernal[1]:PWIDth**

**Supported**            All Models

```
[:SOURce]:PULM:INTernal [1]:PWIDth <val><unit> |UP|DOWN
[:SOURce]:PULM:INTernal [1]:PWIDth?
```

This command sets the pulse width for the internally generated pulse modulation source.

**NOTE**                A power search is recommended for signals with pulse widths less than one microsecond. Refer to “:ALC:SEARch” on page 60.

**\*RST**                 +4.00000000E-005

**Range**                4uS–30S

**Key Entry**           **Pulse Width**

**Remarks**            If the entered value for the pulse width is equal to or greater than the value for the pulse period, the pulse width will change to a value that is equal to the pulse period.

Refer to “:INTernal[1]:PWIDth:STEP” on page 201 for setting the value associated with the UP and DOWN choices.

### **:INTernal[1]:PWIDth:STEP**

**Supported**            All Models

```
[:SOURce]:PULM:INTernal [1]:PWIDth:STEP <num> [<time suffix>]
[:SOURce]:PULM:INTernal [1]:PWIDth:STEP?
```

This command sets the step increment for the pulse width.

The optional variable [<time suffix>] accepts nS (nano-seconds) to S (seconds).

**\*RST**                 +1.00000000E-006

**Range**                4uS–30S

**Remarks**            The value set by this command is used by the UP and DOWN choices for the pulse width command. Refer to “:INTernal[1]:PWIDth” on page 201 for more information.

**Pulse Modulation Subsystem ([:SOURce]:PULM)**

**:SOURce**

**Supported** All Models

[ :SOURce ] :PULM :SOURce INT | EXT [1] | EXT2

[ :SOURce ] :PULM :SOURce?

This command sets the source that will generate the pulse modulation.

**\*RST** INT

**Key Entry** Internal Square Internal Pulse Ext1 DC-Coupled Ext2 DC-Coupled

**:STATe**

**Supported** All Models

[ :SOURce ] :PULM :STATe ON | OFF | 1 | 0

[ :SOURce ] :PULM :STATe?

This command enables or disables the operating state of the pulse modulation source.

**\*RST** 0

**Key Entry** Pulse Off On

**Remarks** When pulse modulation is enabled, the PULSE annunciator is shown in the display

---

## 5 Component Test Digital Commands

This chapter provides SCPI descriptions for commands dedicated to digital component testing using the E4438C ESG Vector Signal Generator. This chapter contains the following major sections:

- “All Subsystem–Option 001/601 or 002/602 ([:SOURce])” on page 204
- “AWGN ARB Subsystem–Option 403 ([:SOURce]:RADio:AWGN:ARB)” on page 205
- “CDMA ARB Subsystem–Option 401 ([:SOURce]:RADio:CDMA:ARB)” on page 215
- “CDMA2000 ARB Subsystem–Option 401 ([:SOURce]:RADio:CDMA2000:ARB)” on page 240
- “Dmodulation Subsystem–Option 001/601 or 002/602 ([:SOURce]:RADio:DMODulation:ARB)” on page 270
- “Dual ARB Subsystem–Option 001/601 or 002/602 ([:SOURce]:RADio:ARB)” on page 294
- “Multitone Subsystem–Option 001/601 or 002/602 ([:SOURce]:RADio:MTONe:ARB)” on page 326
- “Wideband CDMA ARB Subsystem–Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)” on page 340

## All Subsystem–Option 001/601 or 002/602 ([:SOURce])

### :RADio:ALL:OFF

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURce ] :RADio:ALL:OFF

This command disables the digital modulation formats.

**Remarks** This command does not affect analog modulation.

---

## AWGN ARB Subsystem—Option 403 ([:SOURce]:RADio:AWGN:ARB)

### :BWIDth

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:BWIDth <val>

[ :SOURce ] :RADio:AWGN:ARB:BWIDth?

This command adjusts the bandwidth of the AWGN waveform.

The variable <val> is expressed in units of Hertz (Hz–MHz).

**\*RST** +1.00000000E+006

**Range** 5E4–1.5E7

**Key Entry** **Bandwidth**

### :IQ:EXTernal:FILTer

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:IQ:EXTernal:FILTer 40e6 |THRough

[ :SOURce ] :RADio:AWGN:ARB:IQ:EXTernal:FILTer?

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter setting with this command will automatically set the “:IQ:EXTernal:FILTer:AUTO” on page 206 command to Off mode.

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

**\*RST** THR

**Key Entry** **40.000 MHz** **Through**

**:IQ:EXternal:FILTer:AUTO**

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:IQ:EXternal:FILTer:AUTO ON|OFF|1|0

[ :SOURce ] :RADio:AWGN:ARB:IQ:EXternal:FILTer:AUTO?

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel I/Q outputs.

ON(1) This choice will automatically select a digital modulation filter optimized for the current signal generator settings.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “[:IQ:EXternal:FILTer](#)” on page 205 for selecting a filter or through path.

\*RST ON

**Key Entry** I/Q Output Filter Manual Auto

**:HEADer:CLEar**

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:HEADer:CLEar

This command clears the header information from the file header used by this modulation format.

**Key Entry** Clear Header

**Remarks** The **AWGN Off On** softkey must be set to On for this command to function.

**:HEADer:SAVE**

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

**Key Entry** Save Setup To Header

**Remarks** The **AWGN Off On** softkey must be set to On for this command to function.

## **:IQ:MODulation:ATTen**

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:IQ:MODulation:ATTen <val>

[ :SOURce ] :RADio:AWGN:ARB:IQ:MODulation:ATTen?

This command attenuates the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +2.00000000E+000

**Range** 0–40

**Key Entry** **Modulator Atten Manual Auto**

## **:IQ:MODulation:ATTen:AUTO**

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[ :SOURce ] :RADio:AWGN:ARB:IQ:MODulation:ATTen:AUTO?

This command enables or disables the I/Q attenuation auto mode.

**ON (1)** This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

**OFF (0)** This choice holds the attenuator at its current setting or at a selected value. Refer to “:IQ:MODulation:ATTen” for setting the attenuation value.

**\*RST** 1

**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:FILTer**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:AWGN:ARB:IQ:MODulation:FILTer 2.1e6|40e6|THROUGH
[:SOURce]:RADio:AWGN:ARB:IQ:MODulation:FILTer?
```

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter with this command will automatically set “:IQ:MODulation:ATTen:AUTO” on page 207 to Off(0) mode.

2.1E6 This choice applies a 2.1 MHz baseband filter to the I/Q signals.

40E6 This choice applies a 40 MHz baseband filter to the I/Q signals.

THROUGH This choice bypasses filtering.

**\*RST** THR

**Key Entry** 2.100 MHz 40.000 MHz Through

**:IQ:MODulation:FILTer:AUTO**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:AWGN:ARB:IQ:MODulation:FILTer:AUTO ON|OFF|1|0
[:SOURce]:RADio:AWGN:ARB:IQ:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1) This choice will automatically select a digital modulation filter.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:MODulation:FILTer” on page 299 for selecting a filter or through path.

**\*RST** 1

**Key Entry** I/Q Mod Filter Manual Auto



## **:MDEStination:AAMPlitude**

**Supported** E4438C with Option 403

```
[:SOURCE]:RADio:AWGN:ARB:MDEStination:AAMPlitude NONE | M1 | M2 | M3 | M4  
[:SOURCE]:RADio:AWGN:ARB:MDEStination:AAMPlitude?
```

This command routes the selected marker to the Alternate Amplitude function. The `NONE` parameter clears the marker for the Alternate Amplitude function.

**\*RST** NONE

**Key Entry**      **None**    **Marker 1**    **Marker 2**    **Marker 3**    **Marker 4**

## **:MDEStination:ALCHold**

**Supported** E4438C with Option 403

---

**CAUTION**      Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[:SOURCE]:RADio:AWGN:ARB:MDEStination:ALCHold NONE | M1 | M2 | M3 | M4  
[:SOURCE]:RADio:AWGN:ARB:MDEStination:ALCHold?
```

This command enables or disables the marker ALC hold function for the selected marker. For setting markers, see “[:MARKer:\[SET\]](#)” on page 302.

Use the ALC hold function when you have a waveform signal that has idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[:MPOLarity:MARKer1|2|3|4](#)” on page 370.

---

**NOTE**      Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings.

---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User’s Guide*. For setting the marker points, see “:MARKer:[SET]” on page 302.

- NONE This terminates the marker ALC hold function.
- M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.
- \*RST NONE

**Example**

```
:RAD:AWGB:ARB:MDES:ALCH M1
```

The preceding example routes marker 1 to the ALC Hold function.

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
<b>Remarks</b>	N/A				

**:MDEStination:PULSe**

**Supported** E4438C with Option 403

---

**CAUTION** The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURce ] :RADio:ARB:MDEStination:PULSe NONE | M1 | M2 | M3 | M4  
[ :SOURce ] :RADio:ARB:MDEStination:PULSe?
```

This command enables or disables the marker pulse/RF blanking function for the selected marker.

This function automatically uses the ALC hold function, so there is no need to select both the ALC hold and the pulse/RF blanking for the same marker.

---

**NOTE** Do not use ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 333.

---

**NOTE** Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “:MARKer:[SET]” on page 302 for setting the marker points.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

**Example**

```
:RAD:ARB:MDES:PULS M2
```

The preceding example routes marker 2 to Pulse/RF Blanking.

```
*RST NONE
```

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
------------------	-------------	-----------------	-----------------	-----------------	-----------------

**:MPOLarity:MARKer1 | 2 | 3 | 4**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:AWGN:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 NEGative | POSitive
[ :SOURce ] :RADio:AWGN:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 ?
```

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

**\*RST** POS

**Key Entry**            **Marker 1 Polarity Neg Pos    Marker 2 Polarity Neg Pos    Marker 3 Polarity Neg Pos**  
**Marker 4 Polarity Neg Pos**

**:LENGth**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:AWGN:ARB:LENGth 1048576 | 524288 | 262144 | 131072 | 65536 |
32768 | 16384
[ :SOURce ] :RADio:AWGN:ARB:LENGth ?
```

This command specifies the length (number of points) of the AWGN waveform.

**\*RST** +524288

**Key Entry**            **1048576    524288    262144    131072    65536    32768    16384**

**Remarks** A longer waveform yields a statistically more correct waveform.

**:REference:EXternal:FREQuency**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:AWGN:ARB:REference:EXternal:FREQuency <val>
[ :SOURce ] :RADio:AWGN:ARB:REference:EXternal:FREQuency ?
```

This command allows you to enter the frequency of the applied external reference.

The variable <val> is expressed in units of hertz (Hz–MHz).

**\*RST** +1.00000000E+007

**Range** 2.5E5–1E8

**Key Entry**            **Reference Freq**

**Remarks** The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “[:REFerence[:SOURce]]” on page 281.

### **:REFerence[:SOURce]**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:AWGN:ARB:REFerence [ :SOURce ] INTernal | EXTernal  
[ :SOURce ] :RADio:AWGN:ARB:REFerence [ :SOURce ] ?
```

This command selects either an internal or external reference for the waveform clock.

**\*RST** INT

**Key Entry** **ARB Reference Ext Int**

**Remarks** If the EXTernal choice is selected, the external frequency *value must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.

Refer to “[:REFerence:EXTernal:FREQuency]” on page 280 to enter the external reference frequency.

### **:SCLock:RATE**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:AWGN:ARB:SCLock:RATE <val>  
[ :SOURce ] :RADio:AWGN:ARB:SCLock:RATE?
```

This command sets the sample clock rate for the AWGN modulation format.

The variable <val> is expressed in units of hertz.

**\*RST** +1.00000000E+008

**Range** 1–1E8

**Key Entry** **ARB Sample Clock**

**Remarks** The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[:STATE]” on page 214 to activate the modulation format.

**:SEED**

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB:SEED FIXed | RANDom

[ :SOURce ] :RADio:AWGN:ARB:SEED?

This command toggles the AWGN waveform noise seed value type.

**FIXed** This choice selects a fixed noise seed value.

**RANDom** This choice selects a randomly generated noise seed value.

**\*RST** FIX

**Key Entry** **Noise Seed Fixed Random**

**[:STATe]**

**Supported** E4438C with Option 403

[ :SOURce ] :RADio:AWGN:ARB [ :STATe ] ON | OFF | 1 | 0

[ :SOURce ] :RADio:AWGN:ARB [ :STATe ] ?

This command enables or disables the AWGN generator function.

**\*RST** 0

**Key Entry** **Arb AWGN Off On**

---

## CDMA ARB Subsystem—Option 401 ([:SOURce]:RADio:CDMA:ARB)

### :CLIPping:I

**Supported** E4438C with Option 401

[:SOURce]:RADio:CDMA:ARB:CLIPping:I <val>

[:SOURce]:RADio:CDMA:ARB:CLIPping:I?

This command clips (limits) the modulation level of the waveform's I component to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100

**Key Entry** **Clip |I| To**

### :CLIPping:POSition

**Supported** E4438C with Option 401

[:SOURce]:RADio:CDMA:ARB:CLIPping:POSition PRE|POST

[:SOURce]:RADio:CDMA:ARB:CLIPping:POSition?

This command specifies whether a waveform is clipped before (PRE) or after (POST) FIR filtering.

**\*RST** PRE

**Key Entry** **Clip At PRE POST FIR Filter**

### :CLIPping:Q

**Supported** E4438C with Option 401

[:SOURce]:RADio:CDMA:ARB:CLIPping:Q <val>

[:SOURce]:RADio:CDMA:ARB:CLIPping:Q?

This command clips (limits) the modulation level of the waveform's Q component to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100  
**Key Entry** **Clip |Q| To**

**:CLIPping:TYPE**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADIO:CDMA:ARB:CLIPping:TYPE IJQ|IORQ
[:SOURCE]:RADIO:CDMA:ARB:CLIPping:TYPE?
```

This command selects either IJQ or IORQ as the clipping type.

**IJQ** The combined I and Q waveform will be clipped (*circular clipping*).

**IORQ** The I and Q components of the waveform are clipped independently (*rectangular clipping*). I and Q can be clipped to different levels using this mode.

**\*RST** IJQ

**Key Entry** **Clipping Type |I+jQ| |I|,|Q|**

**:CLIPping[:IJQ]**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADIO:CDMA:ARB:CLIPping[:IJQ] <val>
[:SOURCE]:RADIO:CDMA:ARB:CLIPping[:IJQ]?
```

This command clips (limits) the modulation level of the combined I and Q waveform to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100

**Key Entry** **Clip |I+jQ| To**

**:CRATe**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADIO:CDMA:ARB:CRATe <val>
[:SOURCE]:RADIO:CDMA:ARB:CRATe?
```

This command sets the chip rate value.

The variable <val> is expressed as chips per second (cps–Mcps).



**\*RST** +1.22880000E+006  
**Range** 10–8E6  
**Key Entry** **Chip Rate**

### **:IQ:EXTernal:FILTer**

**Supported** E4438C with Option 401  
[:SOURce]:RADio:CDMA:ARB:IQ:EXTernal:FILTer 40e6|THRough  
[:SOURce]:RADio:CDMA:ARB:IQ:EXTernal:FILTer?

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter using this command will automatically set “:IQ:EXTernal:FILTer:AUTO” on [page 217](#) to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.  
THRough This choice bypasses filtering.  
**\*RST** THR  
**Key Entry** **40.000 MHz** **Through**

### **:IQ:EXTernal:FILTer:AUTO**

**Supported** E4438C with Option 401  
[:SOURce]:RADio:CDMA:ARB:IQ:EXTernal:FILTer:AUTO ON|OFF|1|0  
[:SOURce]:RADio:CDMA:ARB:IQ:EXTernal:FILTer:AUTO?

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel I/Q outputs.

ON(1) This choice will automatically select a digital modulation filter optimized for the current signal generator settings.  
OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:EXTernal:FILTer” on [page 217](#) for selecting a filter or through path.  
**\*RST** 1  
**Key Entry** **I/Q Output Filter Manual Auto**

**:FILTer**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADIO:CDMA:ARB:FILTer RNYquist|NYquist|GAUSSian|RECTangle|
IS95|IS95_EQ|IS95_MOD|IS95_MOD_EQ|WCDMA|AC4Fm|IS2000SR3DS|UGGaussian|
"<user FIR>"
[:SOURCE]:RADIO:CDMA:ARB:FILTer?
```

This command selects the pre-modulation filter type.

- IS95 This choice selects a filter that meets the criteria of the IS-95 standard.
- IS95\_EQ This choice selects a filter which is a combination of the IS-95 filter (above) and the equalizer filter described in the IS-95 standard. This filter is only used for IS-95 baseband filtering.
- IS95\_MOD This choice selects a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance) with lower passband rejection than the filter specified in the IS-95 standard.
- IS95\_MOD\_EQ This choice selects a filter which is a combination of the equalizer filter described in the IS-95 standard and a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance), with lower passband rejection.
- WCDMa This choice selects a 0.22 Nyquist filter optimized for ACP.
- AC4Fm This choice selects a predefined Association of Public Safety Communications Officials (APCO) specified compatible 4-level frequency modulation (C4FM) filter.
- IS2000SR3DS This choice selects an IS-2000 standard, spread rate 3 direct spread filter.
- UGGaussian This choice selects a backwards compatible GSM Gaussian filter (Gaussian filter with a fixed BbT value of 0.300) for the ESG E44xxB Option UN3 or UN4.
- "<user FIR>" This variable is any FIR filter file that you have stored in memory. The variable needs no directory path indicating the location of the file, such as FIR: or /USER/FIR. The command assumes the FIR directory. Refer to [“File Name Variables” on page 13](#) for more information on file names.

**\*RST** IS95\_MOD\_EQ

<b>Key Entry</b>	<b>Root Nyquist</b>	<b>Nyquist</b>	<b>Gaussian</b>	<b>Rectangle</b>	<b>IS-95</b>	<b>IS-95 w/EQ</b>
	<b>IS-95 Mod</b>	<b>IS-95 Mod w/EQ</b>	<b>WCDMA</b>	<b>APCO 25 C4FM</b>	<b>IS-2000 SR3 DS</b>	
	<b>UN3/4 GSM Gaussian</b>	<b>User FIR</b>				

## :FILTer:ALPHA

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA:ARB:FILTer:ALPHA <val>

[ :SOURce ] :RADio:CDMA:ARB:FILTer:ALPHA?

This command changes the Nyquist or root Nyquist filter's alpha value.

The filter alpha value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +5.00000000E–001

**Range** 0.000–1.000

**Key Entry** Filter Alpha

**Remarks** To change the current filter type, refer to “:FILTer” on page 218.

## :FILTer:BBT

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA:ARB:FILTer:BBT <val>

[ :SOURce ] :RADio:CDMA:ARB:FILTer:BBT?

This command changes the bandwidth-multiplied-by-bit-time (BbT) filter parameter.

The filter BbT value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +5.00000000E–001

**Range** 0.000–1.000

**Key Entry** Filter BbT

**Remarks** This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.

To change the current filter type, refer to “:FILTer” on page 218.

**:FILTER:CHANnel**

**Supported** E4438C with Option 401

[ :SOURCE ] :RADIO:CDMA:ARB:FILTer:CHANnel EVM|ACP

[ :SOURCE ] :RADIO:CDMA:ARB:FILTer:CHANnel ?

This command optimizes the Nyquist and root Nyquist filters to minimize error vector magnitude (EVM) or to minimize adjacent channel power (ACP).

**EVM** This choice provides the most ideal passband.

**ACP** This choice improves stopband rejection.

**\*RST** EVM

**Key Entry** **Optimize FIR For EVM ACP**

**Remarks** To change the current filter type, refer to “:FILTer” on page 218.

**:HEADer:CLEar**

**Supported** E4438C with Option 401

[ :SOURCE ] :RADIO:CDMA:ARB:HEADer:CLEar

This command clears the header information from the file header used by this modulation format.

**Key Entry** **Clear Header**

**Remarks** The **CDMA Off On** softkey must be set to On for this command to function.

**:HEADer:SAVE**

**Supported** E4438C with Option 401

[ :SOURCE ] :RADIO:CDMA:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

**Key Entry** **Save Setup To Header**

**Remarks** The **CDMA Off On** softkey must be set to On for this command to function.

## **:IQMap**

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA:ARB:IQMap NORMAL|INVerted
[:SOURce]:RADio:CDMA:ARB:IQMap?
```

This command selects whether the Q output will be normal or inverted.

**NORMAL** This choice selects normal polarity.

**INVerted** This choice inverts the internal Q signal.

**\*RST** NORM

**Key Entry** **I/Q Mapping Normal Invert**

**Remarks** Inverting the Q output inverts the RF spectrum after the modulation.

## **:IQ:MODulation:ATTen**

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen <val>
[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen?
```

This command attenuates the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +2.00000000E+000

**Range** 0–40

**Key Entry** **Modulator Atten Manual Auto**

## **:IQ:MODulation:ATTen:AUTO**

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0
[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen:AUTO?
```

This command enables or disables the I/Q attenuation auto mode.

**ON (1)** This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

**OFF (0)** This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” on page 221 for setting the attenuation value.

**CDMA ARB Subsystem—Option 401 ([:SOURce]:RADio:CDMA:ARB)**

**\*RST** 1  
**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:FILTer**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:IQ:MODulation:FILTer 2.1e6 | 40e6 | THROugh
[ :SOURce ] :RADio:CDMA:ARB:IQ:MODulation:FILTer?
```

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter using this command will automatically set “[:IQ:MODulation:ATTen:AUTO](#)” on page 221 to OFF(0) mode.

2.1E6 This choice applies a 2.1 MHz baseband filter to the I/Q signals.  
 40E6 This choice applies a 40 MHz baseband filter to the I/Q signals.  
 THROugh This choice bypasses filtering.

**\*RST** THR  
**Key Entry** **2.100 MHz 40.000 MHz Through**

**:IQ:MODulation:FILTer:AUTO**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:IQ:MODulation:FILTer:AUTO ON | OFF | 1 | 0
[ :SOURce ] :RADio:CDMA:ARB:IQ:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1) This choice will automatically select a digital modulation filter.  
 OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “[:IQ:MODulation:FILTer](#)” on page 299 for selecting a filter or through path.

**\*RST** 1  
**Key Entry** **I/Q Mod Filter Manual Auto**

**:MDESTination:AAMPLitude**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:MDESTination:AAMPLitude NONE | M1 | M2 | M3 | M4
```

[:SOURce]:RADio:CDMA:ARB:MDEStination:AAMPlitude?

This command routes the selected marker to the Alternate Amplitude function. The NONE parameter clears the marker for the Alternate Amplitude function.

<b>*RST</b>	NONE				
<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>

## **:MDEStination:ALCHold**

**Supported** E4438C with Option 401

---

**CAUTION** Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[:SOURce]:RADio:CDMA:ARB:MDEStination:ALCHold NONE|M1|M2|M3|M4
[:SOURce]:RADio:CDMA:ARB:MDEStination:ALCHold?
```

This command enables or disables the marker ALC hold function for the selected marker. For setting markers, see “:MARKer:[SET]” on page 302.

Use the ALC hold function when you have a waveform signal that has idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 226.

---

**NOTE** Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings.

---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User’s Guide*. For setting the marker points, see “[:MARKer:[SET]]” on page 302.

**NONE** This terminates the marker ALC hold function.

**M1–M4** These are the marker choices. The ALC hold feature uses only one marker at a time.

**\*RST** NONE

### Example

```
:RAD:AWGB:ARB:MDES:ALCH M1
```

The preceding example routes marker 1 to the ALC Hold function.

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
<b>Remarks</b>	N/A				

## :MDEStination:PULSe

**Supported** E4438C with Option 401

---

**CAUTION** The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[:SOURce]:RADio:ARB:MDEStination:PULSe NONE|M1|M2|M3|M4
[:SOURce]:RADio:ARB:MDEStination:PULSe?
```

This command enables or disables the marker pulse/RF blanking function for the selected marker.

This function automatically uses the ALC hold function, so there is no need to select both the ALC hold and the pulse/RF blanking for the same marker.

---

**NOTE** Do not use ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---



The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker's polarity, see “:MPOLarity:MARKer1|2|3|4” on page 226.

---

**NOTE** Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “:MARKer:[SET]” on page 302 for setting the marker points.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User's Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

### Example

```
:RAD:ARB:MDES:PULS M2
```

The preceding example routes marker 2 to Pulse/RF Blanking.

<b>*RST</b>	NONE				
<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>

**:MPOLarity:MARKer1 | 2 | 3 | 4****Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 NEGative | POSitive
[:SOURCE]:RADio:CDMA:ARB:MPOLarity:MARKer1 | 2 | 3 | 4?
```

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

**\*RST** POS

**Key Entry**            **Marker 1 Polarity Neg Pos    Marker 2 Polarity Neg Pos    Marker 3 Polarity Neg Pos**  
**Marker 4 Polarity Neg Pos**

**:OSAMple****Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:OSAMple <val>
[:SOURCE]:RADio:CDMA:ARB:OSAMple?
```

This command sets the oversampling ratio (number of filter taps per symbol) for CDMA modulation.

**\*RST** +5**Range** 2–8**Key Entry**            **Oversample Ratio**

**Remarks**            The upper limit of the oversample ratio is adjusted based on the waveform length and chip rate.

Using larger oversample ratios result in more completely filtered images, but this action also uses up more waveform memory.

The maximum oversample ratio is the smaller of 8, 40 Mcps/Chip Rate, or 32/Waveform Length (number of CDMA short codes).

**:REFerence:EXTernal:FREQuency****Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:REFerence:EXTernal:FREQuency <val>
[:SOURCE]:RADio:CDMA:ARB:REFerence:EXTernal:FREQuency?
```

This command allows you to enter the frequency of the applied external reference.

The variable <val> is expressed in units of Hertz (Hz–MHz).

**\*RST** +1.00000000E+007

**Range** 2.5E5–1E8

**Key Entry** **Reference Freq**

**Remarks** The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “:REFerence[:SOURce]” on page 227.

### **:REFerence[:SOURce]**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:REFerence [ :SOURce ] INTernal | EXTernal
[ :SOURce ] :RADio:CDMA:ARB:REFerence [ :SOURce ] ?
```

This command selects either an internal or external reference for the waveform clock.

**\*RST** INT

**Key Entry** **ARB Reference Ext Int**

**Remarks** If the EXTernal choice is selected, the external frequency value *must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.

Refer to “:REFerence:EXTernal:FREQuency” on page 226 to enter the external reference frequency.

### **:RETRigger**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:RETRigger ON | OFF | IMMEDIATE
[ :SOURce ] :RADio:CDMA:ARB:RETRigger ?
```

This command enables or disables the ARB retriggering mode; the retrigger mode controls how the retriggering function performs while a waveform is playing.

ON(1) This choice specifies that if a trigger occurs while a waveform is playing, the waveform will retrigger at the end of the current waveform sequence and play once more.

OFF(0) This choice specifies that if a trigger occurs while a waveform is playing, the trigger will be ignored.

**CDMA ARB Subsystem–Option 401 ([:SOURce]:RADio:CDMA:ARB)**

**IMMEDIATE** This choice specifies that if a trigger occurs while a waveform is playing, the waveform will reset and replay from the start immediately upon receiving a trigger.

**\*RST** ON

**Key Entry** **On Off Immediate**

**:SCLock:RATE**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA:ARB:SCLock:RATE <val>

[ :SOURce ] :RADio:CDMA:ARB:SCLock:RATE?

This command sets the sample clock rate for the CDMA modulation format.

The variable <val> is expressed in units of hertz.

**\*RST** +1.00000000E+008

**Range** 1–1E8

**Key Entry** **ARB Sample Clock**

**Remarks** The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[:STATe]” on [page 239](#) to activate the modulation format.

**:SETup**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA:ARB:SETup FWD9 | FWD32 | FWD64 | PILot | REVerse | MCArrier |  
" <file name> "

[ :SOURce ] :RADio:CDMA:ARB:SETup?

This command selects a pre-defined CDMA channel setup or multicarrier, and turns multicarrier off or on (see the MCArrier choice description).

**FWD9** This CDMA setup consists of 9 forward channels (pilot, paging, sync, and 6 traffic channels) at IS-97-defined power levels.

**FWD32** This CDMA setup consists of 32 forward channels (pilot, paging, sync, and 29 traffic channels) at IS-97-defined power levels.

**FWD64** This CDMA setup consists of 64 forward channels (pilot, 7 paging, sync, and 55 traffic channels) at IS-97-defined power levels.

**PILot** This choice selects single pilot channel.

REVerse	A single reverse link traffic channel.
MCARrier	This choice selects multicarrier and turns it on. Selecting any other setup such as FWD9 or FWD64 turns multicarrier off. To select the multicarrier setup, see “:SETup:MCARrier” on page 230.
*RST	FWD9
<b>Key Entry</b>	<b>9 Ch Fwd    32 Ch Fwd    64 Ch Fwd    Pilot    Reverse    Multicarrier Off On</b> <b>Multicarrier Off On    Custom CDMA State</b>
<b>Remarks</b>	Refer to “File Name Variables” on page 13 for information on the file name syntax.

### **:SETup:CHANnel**

**Supported**            E4438C with Option 401

```
[:SOURce]:RADio:CDMA:ARB:SETup:CHANnel IS97|EQUAL|SCALE|NONE {,PILOt|
SYNC|PAGing|TRAFFic,<walsh_value>,<power_value>,<pn_offset>,RANDOM|
<data_value>}
[:SOURce]:RADio:CDMA:ARB:SETup:CHANnel?
```

This command defines the channel parameters of the CDMA signal. This allows for customizing of the channel type, the channel parameters, and the data value.

The variable <power\_value> is expressed in units of decibels (dB).

IS97	This choice sets the channel power levels to IS-97-defined power levels.
EQUAL	This choice sets the channel power levels so that all channels are of equal power and the total power equals 0 dBm.
SCALE	This choice scales all of the current channel powers so that the total power equals 0 dB while keeping the previous power ratios between the individual channels.
NONE	This choice bypasses the power level setting.
PILOt	This choice selects a single traffic channel.
SYNC	This choice selects a sync channel.
PAGing	This choice selects a paging channel.
TRAFFic	This choice selects a traffic channel.
RANDom	This choice selects a randomly generated data value.

**CDMA ARB Subsystem—Option 401 ([:SOURCE]:RADio:CDMA:ARB)**

The channel type, walsh code, power, PN offset, and data values are returned when a query is initiated. The output format is as follows:

<channel\_type>, <walsh\_value>, <power>, <pn\_offset>, <data\_value>

*RST	Channel #	Channel Type	Walsh Code	Power	PN Offset	Data
	1	PIL	+0	-7.0000000E+000	+0	+0
	2	PAG	+1	-7.26000023E+000	+0	RAND
	3	TRAF	+8	-1.02600002E+001	+0	RAND
	4	TRAF	+9	-1.02600002E+001	+0	RAND
	5	TRAF	+10	-1.02600002E+001	+0	RAND
	6	TRAF	+11	-1.02600002E+001	+0	RAND
	7	TRAF	+12	-1.02600002E+001	+0	RAND
	8	TRAF	+13	-1.02600002E+001	+0	RAND
	9	SYNC	+32	-1.02600002E+001	+0	RAND

**Range** <power\_value>: -40 to 0 <walsh\_value>: 0-63 <pn\_offset>: 0-511

**Key Entry** **IS-97 Levels** **Equal Powers** **Scale to 0dB** **Sync** **Pilot** **Paging** **Traffic**

**:SETup:MCARrier**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:SETup:MCARrier CAR3|CAR4| "<file name>"
[:SOURCE]:RADio:CDMA:ARB:SETup:MCARrier?
```

This command selects a pre-defined or user-defined multicarrier CDMA setup.

**CAR3** This choice selects three 9 channel forward carriers with a power level of 0.00 dB, the first with a -1.25 MHz frequency offset, the second with no frequency offset, and the third with +1.25 MHz frequency offset.

**CAR4** This choice selects four 9 channel forward carriers with a power level of 0.00 dB, the first with a -1.875 MHz frequency offset, the second with a -625 kHz frequency offset, the third with +625 kHz frequency offset, and the fourth with a +1.875 MHz frequency offset.

"<file name>" This choice selects a file consisting of the user-defined number of channel forward carriers, power levels, and frequency offsets.

**\*RST** CAR3

**Key Entry** **3 Carriers** **4 Carriers** **Custom CDMA Multicarrier**

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## **:SETup:MCARrier:STORe**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:SETup:MCARrier:STORe "<file name>"
```

This command stores the current multicarrier setup information.

The stored file contains information including the digital modulation format, number of carriers, frequency spacing, and power settings for the multicarrier setup.

**Key Entry** **Store Custom Multicarrier**

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## **:SETup:MCARrier:TABLE**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:SETup:MCARrier:TABLE {FWD9|FWD32|FWD64|PILot|
CUSTom,"<file name>"|"",<freq_offset>,<power>}
[:SOURCE]:RADio:CDMA:ARB:SETup:MCARrier:TABLE?
```

This command defines the multicarrier CDMA waveform.

The variable <freq\_offset> is expressed in units of Hertz (kHz to MHz).

The variable <power> is expressed in units of decibels (dB).

The carrier type, carrier name, frequency offset, and power level are returned when a query is initiated. The output format is as follows:

```
<carrier type>,<carrier_name>,<freq_offset>,<power>
```

**FWD9** This CDMA setup consists of 9 forward channels (pilot, paging, sync, and 6 traffic channels) at IS-97-defined power levels.

**FWD32** This CDMA setup consists of 32 forward channels (pilot, paging, sync, and 29 traffic channels) at IS-97-defined power levels.

**FWD64** This CDMA setup consists of 64 forward channels (pilot, 7 paging, sync, and 55 traffic channels) at IS-97-defined power levels.

**PILot** This choice selects single pilot channel.

**CUSTom,"<file name>"** This choice selects a custom user-defined CDMA setup.

**" "** A null string, entered for any non-custom carrier.

**CDMA ARB Subsystem—Option 401 ([:SOURCE]:RADio:CDMA:ARB)**

<b>*RST</b>	carrier type: FWD9      <freq_offset>: +1.25000000E+006 <power>: +0.00000000E+000
<b>Range</b>	<freq_offset>: -7.5E6 to 7.5E6      <power>: -40 to 0
<b>Key Entry</b>	<b>9 Ch Fwd    32 Ch Fwd    64 Ch Fwd    Pilot    Custom CDMA State</b>
<b>Remarks</b>	Refer to “ <a href="#">File Name Variables</a> ” on page 13 for information on the file name syntax. To store a multicarrier setup refer to “ <a href="#">:SETup:MCARrier:STORE</a> ” on page 231  The file name specified must be a single carrier CDMA file.

**:SETup:STORe**

**Supported**            E4438C with Option 401

`[:SOURCE]:RADio:CDMA:ARB:SETup:STORe "<file name>"`

This command stores the current custom CDMA state, using a designated file name, to the signal generator non-volatile memory.

Along with the contents of the CDMA channel table editor (channel types, Walsh code, power levels, PN offset, and data), this command stores the following information to the signal generator non-volatile memory:

- FIR filter
- FIR filter file name
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- chip rate
- waveform length
- oversample ratio
- ARB reference clock source (internal or external)
- ARB reference clock frequency

**Key Entry**            **Store Custom CDMA State**

**Remarks**            Recall the stored file by executing the following command:

`[:SOURCE]:RADio:CDMA:ARB:SETup: "<file name>"`

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.



## :TRIGger:TYPE

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger:TYPE CONTInuous | SINGle | GATE  
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger:TYPE?
```

This command sets the trigger mode (type) that controls the waveform’s playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform’s final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform’s transmission.
- Setting the waveform’s response to triggers:
  - CONTInuous, see “:TRIGger:TYPE:CONTInuous[:TYPE]” on page 234
  - SINGle, see “:RETRigger” on page 227
  - GATE, selecting the mode also sets the response
- Selecting the trigger source (see “:TRIGger[:SOURCE]” on page 235), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
  - CONTInuous and SINGle see “:TRIGger[:SOURCE]:EXTErnal:SLOPe” on page 237
  - GATE, see “:TRIGger:TYPE:GATE:ACTive” on page 235

For more information on triggering, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the trigger type command choices:

CONTInuous      Upon triggering, the waveform repeats continuously.

SINGLE	Upon triggering, the waveform segment or sequence plays once.
GATE	An external trigger signal repeatedly starts and stops the waveform’s playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see <a href="#">“:TRIGger:TYPE:GATE:ACTive” on page 235</a> ). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

---

**NOTE** The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.

---

*RST	CONT
Key Entry	<b>Continuous</b> <b>Single</b> <b>Gated</b>

### :TRIGger:TYPE:CONTInuous[:TYPE]

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] FREE | TRIGger |
RESet
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] ?
```

This commands selects the waveform’s response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see [“:TRIGger:TYPE” on page 233](#).

The following list describes the waveform’s response to each of the command choices:

FREE	Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.
TRIGger	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.
RESet	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.

<b>*RST</b>	FREE		
<b>Key Entry</b>	<b>Free Run</b>	<b>Trigger &amp; Run</b>	<b>Reset &amp; Run</b>

### **:TRIGger:TYPE:GATE:ACTive**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:TRIGger:TYPE:GATE:ACTive LOW|HIGH
[ :SOURce ] :RADio:CDMA:ARB:TRIGger:TYPE:GATE:ACTive?
```

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see “:TRIGger:TYPE” on page 233.

The following list describes the ESG’s gating behavior for the polarity selections:

- |      |  |
|------|--|
| LOW  | The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state). |
| HIGH | The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state). |

<b>*RST</b>	HIGH
<b>Key Entry</b>	<b>Gate Active Low High</b>

### **:TRIGger[:SOURce]**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:TRIGger [ :SOURce ] KEY|EXT|BUS
[ :SOURce ] :RADio:CDMA:ARB:TRIGger [ :SOURce ] ?
```

This command sets the trigger source.

For more information on triggering, see “:TRIGger:TYPE” on page 233. The following list describes the command choices:

- |     |  |
|-----|--|
| KEY | This choice enables manual triggering by pressing the front-panel <b>Trigger</b> hardkey.  |
| EXT | An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger: |

**CDMA ARB Subsystem—Option 401 ([:SOURCE]:RADio:CDMA:ARB)**

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “:TRIGger[:SOURCE]:EXTErnal[:SOURCE]” on page 238.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.

- The trigger signal polarity:
  - gating mode, see “:TRIGger:TYPE:GATE:ACTive” on page 235
  - continuous and single modes, see “:TRIGger[:SOURCE]:EXTErnal:SLOPe” on page 237
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
  - setting the amount of delay, see “:TRIGger[:SOURCE]:EXTErnal:DELaY” on page 236
  - turning the delay on, see “:TRIGger[:SOURCE]:EXTErnal:DELaY:STATe” on page 237

**BUS** This choice enables triggering over the GPIB or LAN using the \*TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the \*TRG command.

**\*RST** KEY

Key Entry	Trigger Key	Ext	Bus
-----------	-------------	-----	-----

**:TRIGger[:SOURCE]:EXTErnal:DELaY**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELaY <val>
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELaY?
```

This command sets the amount of time to delay the ESG’s response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “:TRIGger[:SOURCE]:EXTErnal:DELaY:STATe” on page 237). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 235.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

**\*RST**                    +1.00000000E-003  
**Range**                1E-8 to 4E1  
**Key Entry**            **Ext Delay Time**

### **:TRIGger[:SOURce]:EXTernal:DELay:STATe**

**Supported**            E4438C with Option 401

```
[:SOURce]:RADio:CDMA:ARB:TRIGger[:SOURce]:EXTernal:DELay:STATe ON|OFF|
1|0
[:SOURce]:RADio:CDMA:ARB:TRIGger[:SOURce]:EXTernal:DELay:STATe?
```

This command enables or disables the operating state of the external trigger delay function.

For setting the delay time, see “:TRIGger[:SOURce]:EXTernal:DELay” on page 236, and for more information on configuring an external source, see “:TRIGger[:SOURce]” on page 235.

**\*RST**                    0  
**Key Entry**            **Ext Delay Off On**

### **:TRIGger[:SOURce]:EXTernal:SLOPe**

**Supported**            E4438C with Option 401

```
[:SOURce]:RADio:CDMA:ARB:TRIGger[:SOURce]:EXTernal:SLOPe POSitive|
NEGative
[:SOURce]:RADio:CDMA:ARB:TRIGger[:SOURce]:EXTernal:SLOPe?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “:TRIGger:TYPE:GATE:ACTive” on page 235.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURce]” on page 235.

**\*RST**                    NEG  
**Key Entry**            **Ext Polarity Neg Pos**

**:TRIGger[:SOURCE]:EXTernal[:SOURCE]**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:TRIGger[:SOURCE]:EXTernal[:SOURCE] EPT1|EPT2|
EPTRIGGER1|EPTRIGGER2
```

```
[:SOURCE]:RADio:CDMA:ARB:TRIGger[:SOURCE]:EXTernal[:SOURCE]?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 235. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

**EPT1** This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.

**EPT2** This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.

**EPTRIGGER1** This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.

**EPTRIGGER2** This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.

**\*RST** EPT1

**Key Entry** **Patt Trig In 1** **Patt Trig In 2**

**:WLENgth**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA:ARB:WLENgth <val>
```

```
[:SOURCE]:RADio:CDMA:ARB:WLENgth?
```

This command specifies the waveform length (in short codes).

**\*RST** +1

**Range** 1–6

**Key Entry** **Waveform Length**

**Remarks** The upper limit is adjusted based on the oversample ratio to fit the signal within the available memory.

The maximum waveform length is 32/oversample ratio.

## [:STATe]

**Supported** E4438C with Option 401

[:SOURCE]:RADIO:CDMA:ARB[:STATe] ON|OFF|1|0

[:SOURCE]:RADIO:CDMA:ARB[:STATe]?

This command enables or disables the CDMA modulation format.

Executing the command [:SOURCE]:RADIO:CDMA:ARB[:STATe] ON sets up the internal hardware to generate the currently selected CDMA signal selection. This also activates the I/Q state and sets the I/Q source to internal.

ON (1) This choice sets up the internal hardware to generate the currently selected CDMA signal selection. This also activates the I/Q state and sets the I/Q source to internal.

OFF (0) This choice disables the CDMA modulation format.

\*RST 0

**Key Entry** **CDMA Off On**

**Remarks** The enabled modulation is not present on RF carrier until you have activated the modulation by executing the command :OUTPut:MODulation[:STATe] ON.

Overriding the I/Q state and I/Q source functions can be achieved by using the I/Q menu.

---

## CDMA2000 ARB Subsystem—Option 401 ([:SOURce]:RADio:CDMA2000:ARB)

### :CLIPping:I

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:CLIPping:I <val>
```

```
[:SOURce]:RADio:CDMA2000:ARB:CLIPping:I?
```

This command clips (limits) the modulation level of the waveform's I component to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100

**Key Entry** **Clip |I| To**

### :CLIPping:POSition

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:CLIPping:POSition PRE|POST
```

```
[:SOURce]:RADio:CDMA2000:ARB:CLIPping:POSition?
```

This command specifies whether a waveform is clipped before (PRE) or after (POST) FIR filtering.

**\*RST** PRE

**Key Entry** **Clip At PRE POST FIR Filter**

### :CLIPping:Q

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:CLIPping:Q <val>
```

```
[:SOURce]:RADio:CDMA2000:ARB:CLIPping:Q?
```

This command clips (limits) the modulation level of the waveform's Q component to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100

**Key Entry** **Clip |Q| To**



## **:CLIPping:TYPE**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:CLIPping:TYPE IJQ | IORQ  
[ :SOURce ] :RADio:CDMA2000:ARB:CLIPping:TYPE?
```

This command selects either IJQ or IORQ as the clipping type.

**IJQ** This choice clips (circular clipping) the combined I and Q waveform.

**IORQ** This choice independently clips (rectangular clipping) I and Q components of the waveform. I and Q can be clipped to different levels using this mode.

**\*RST** IORQ

**Key Entry** **Clipping Type** |I+jQ| |I|,|Q|

## **:CLIPping[:IJQ]**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:CLIPping[:IJQ] <val>  
[ :SOURce ] :RADio:CDMA2000:ARB:CLIPping[:IJQ] ?
```

This command clips (limits) the modulation level of the combined I and Q waveform to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100

**Key Entry** **Clip** |I+jQ| **To**

## **:IQ:EXTernal:FILTer**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:IQ:EXTernal:FILTer 40e6 | THROugh  
[ :SOURce ] :RADio:CDMA2000:ARB:IQ:EXTernal:FILTer?
```

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter using this command will automatically set “:IQ:EXTernal:FILTer:AUTO” on [page 242](#) to OFF(0) mode.

**40e6** This choice applies a 40 MHz baseband filter.

**THROugh** This choice bypasses filtering.

**\*RST**                   THR  
**Key Entry**           **40.000 MHz**   **Through**

**:IQ:EXtErnal:FILTer:AUTO**

**Supported**           E4438C with Option 401

```
[ :SOURce ] :RADio:ARB:IQ:EXtErnal:FILTer:AUTO ON|OFF|1|0
[:SOURce]:RADio:ARB:IQ:EXtErnal:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel I/Q outputs.

ON(1)                   This choice will automatically select a digital modulation filter optimized for the current signal generator settings.

OFF(0)                  This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:EXtErnal:FILTer” on page 241 for selecting a filter or through path.

**\*RST**                   1

**Key Entry**           **I/Q Output Filter Manual Auto**

**:FILTer**

**Supported**           E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:FILTer RNYQuist|NYQuist|GAUSSian|RECTangle|
IS95|IS95_EQ|IS95_MOD|IS95_MOD_EQ|AC4Fm|WCDMA|IS2000SR3DS|UGGaussian|
"<user FIR>"
[:SOURce]:RADio:CDMA2000:ARB:FILTer?
```

This command selects the pre-modulation filter type.

IS95                    This choice selects a filter that meets the criteria of the IS-95 standard.

IS95\_EQ                This choice selects a filter which is a combination of the IS-95 filter (above) and the equalizer filter described in the IS-95 standard. This filter is only used for IS-95 baseband filtering.

IS95\_MOD               This choice selects a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance) with lower passband rejection than the filter specified in the IS-95 standard.

IS95\_MOD\_EQ           This choice selects a filter which is a combination of the equalizer filter described in the IS-95 standard and a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance), with lower passband rejection.

WCDMa	This choice selects a 0.22 Nyquist filter optimized for ACP.																		
AC4Fm	This choice selects the Association of Public Safety Communications Officials (APCO) specified compatible 4-level frequency modulation (C4FM) filter.																		
IS2000SR3DS	This choice selects an IS-2000 standard, spread rate 3 direct spread filter.																		
UGGaussian	This choice selects a backwards compatible GSM Gaussian filter (Gaussian filter with a fixed BbT value of 0.300) for the ESG E44xxB Option UN3 or UN4.																		
"<user FIR>"	This variable is any FIR filter file that you have stored in memory. The variable needs no directory path indicating the location of the file, such as FIR: or /USER/FIR. The command assumes the FIR directory. Refer to “File Name Variables” on page 13 for more information on file names.																		
<b>*RST</b>	IS95_MOD_EQ																		
<b>Key Entry</b>	<table> <tr> <td><b>Root Nyquist</b></td> <td><b>Nyquist</b></td> <td><b>Gaussian</b></td> <td><b>Rectangle</b></td> <td><b>IS-95</b></td> <td><b>IS-95 w/EQ</b></td> </tr> <tr> <td><b>IS-95 Mod</b></td> <td><b>IS-95 Mod w/EQ</b></td> <td><b>APCO 25 C4FM</b></td> <td><b>WCDMA</b></td> <td></td> <td></td> </tr> <tr> <td><b>UN3/4 GSM Gaussian</b></td> <td><b>IS-2000 SR3 DS</b></td> <td><b>User FIR</b></td> <td></td> <td></td> <td></td> </tr> </table>	<b>Root Nyquist</b>	<b>Nyquist</b>	<b>Gaussian</b>	<b>Rectangle</b>	<b>IS-95</b>	<b>IS-95 w/EQ</b>	<b>IS-95 Mod</b>	<b>IS-95 Mod w/EQ</b>	<b>APCO 25 C4FM</b>	<b>WCDMA</b>			<b>UN3/4 GSM Gaussian</b>	<b>IS-2000 SR3 DS</b>	<b>User FIR</b>			
<b>Root Nyquist</b>	<b>Nyquist</b>	<b>Gaussian</b>	<b>Rectangle</b>	<b>IS-95</b>	<b>IS-95 w/EQ</b>														
<b>IS-95 Mod</b>	<b>IS-95 Mod w/EQ</b>	<b>APCO 25 C4FM</b>	<b>WCDMA</b>																
<b>UN3/4 GSM Gaussian</b>	<b>IS-2000 SR3 DS</b>	<b>User FIR</b>																	

**:FILTer:ALPHa**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:FILTer:ALPHa <val>
[ :SOURce ] :RADio:CDMA2000:ARB:FILTer:ALPHa?
```

This command changes the Nyquist or root Nyquist filter alpha value.

The filter alpha value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +5.00000000E–001

**Range** 0.000–1.000

**Key Entry** **Filter Alpha**

**Remarks** To change the current filter type, refer to “:FILTer” on page 242.

**:FILTER:BBT**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADIO:CDMA2000:ARB:FILTER:BBT <val>
```

```
[ :SOURCE ] :RADIO:CDMA2000:ARB:FILTER:BBT?
```

This command changes the bandwidth-multiplied-by-bit-time (BbT) filter parameter.

The filter BbT value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +5.00000000E–001

**Range** 0.000–1.000

**Key Entry** **Filter BbT**

**Remarks** This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.

To change the current filter type, refer to “[:FILTER](#)” on page 242.

**:FILTER:CHANnel**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADIO:CDMA2000:ARB:FILTER:CHANnel EVM|ACP
```

```
[ :SOURCE ] :RADIO:CDMA2000:ARB:FILTER:CHANnel?
```

This command optimizes the Nyquist and root Nyquist filters to minimize error vector magnitude (EVM) or to minimize adjacent channel power (ACP).

**EVM** This choice provides the most ideal passband.

**ACP** This choice improves stopband rejection.

**\*RST** EVM

**Key Entry** **Optimize FIR For EVM ACP**

**Remarks** To change the current filter type, refer to “[:FILTER](#)” on page 242.

### **:HEADer:CLEar**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA2000:ARB:HEADer:CLEar

This command clears the header information from the file header used by this modulation format.

**Key Entry** **Clear Header**

**Remarks** The **CDMA2000 Off On** softkey must be set to On for this command to function.

### **:HEADer:SAVE**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA2000:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

**Key Entry** **Save Setup To Header**

**Remarks** The **CDMA2000 Off On** softkey must be set to On for this command to function.

### **:IQ:MODulation:ATTen**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA2000:ARB:IQ:MODulation:ATTen <val>

[ :SOURce ] :RADio:CDMA2000:ARB:IQ:MODulation:ATTen?

This command attenuates the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +2.00000000E+000

**Range** 0–40

**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:ATTen:AUTO****Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:IQ:MODualtion:ATTen:AUTO ON|OFF|1|0
[:SOURce]:RADio:CDMA2000:ARB:IQ:MODulation:ATTen:AUTO?
```

This command enables or disables the I/Q attenuation auto mode.

ON (1) This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “:IQ:MODulation:ATTen” on page 245 for setting the attenuation value.

\*RST 1

**Key Entry** Modulator Atten Manual Auto

**:IQ:MODulation:FILTer****Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:IQ:MODulation:FILTer 2.1e6|40e6|THROUGH
[:SOURce]:RADio:CDMA2000:ARB:IQ:MODulation:FILTer?
```

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter using this command will automatically set “:IQ:MODulation:FILTer:AUTO” on page 246 to OFF(0) mode.

2.1E6 This choice applies a 2.1 MHz baseband filter to the I/Q signals.

40E6 This choice applies a 40 MHz baseband filter to the I/Q signals.

THROUGH This choice bypasses filtering.

\*RST THR

**Key Entry** 2.100 MHz 40.000 MHz Through

**:IQ:MODulation:FILTer:AUTO****Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:IQ:MODulation:FILTer:AUTO ON|OFF|1|0
[:SOURce]:RADio:CDMA2000:ARB:IQ:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1) This choice will automatically select a digital modulation filter.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:MODulation:FILTer” on page 246 for selecting a filter or through path.

\*RST 1

**Key Entry** I/Q Mod Filter Manual Auto

## :IQMap

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:IQMap NORMal | INVerted
[ :SOURce ] :RADio:CDMA2000:ARB:IQMap?
```

This command selects whether the Q output will be normal or inverted.

NORMal This choice selects normal polarity.

INVerted This choice inverts the internal Q signal.

\*RST NORM

**Key Entry** I/Q Mapping Normal Invert

**Remarks** Inverting the Q output inverts the RF spectrum after the modulation.

## :LINK

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:LINK FORWard | REVerse
[ :SOURce ] :RADio:CDMA2000:ARB:LINK?
```

This command selects the CDMA2000 forward or reverse link channel setup.

FORW This choice selects a basestation to mobile configuration.

REV This choice selects a mobile to basestation configuration.

\*RST FORW

**Key Entry** Link Forward Reverse

## :LINK:FORWard:SETup

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:LINK:FORWard:SETup S1Pilot | S3DPilot |
S3MPilot | S19Chan | S3D9chan | S3M9chan | MCArrier | "<file name>"
[ :SOURce ] :RADio:CDMA2000:ARB:LINK:FORWard:SETup?
```

This command selects a previously defined channel configuration for the CDMA2000 forward link or multicarrier, and turns multicarrier off or on (see the MCARrier choice description).

S1Pilot	This choice selects a spread rate 1, pilot-channel setup.										
S3DPilot	This choice selects a spread rate 3, direct spread, pilot-channel setup.										
S3MPilot	This choice selects a spread rate 3, multicarrier spread, pilot-channel setup.										
S19Chan	This choice selects a spread rate 1, 9-channel setup.										
S3D9Chan	This choice selects a spread rate 3, direct spread, 9-channel setup.										
S3M9Chan	This choice selects a spread rate 3, multicarrier spread, 9-channel setup.										
MCARrier	This choice selects multicarrier and turns it on. Selecting any other setup such as S1Pilot or S3D9Chan turns multicarrier off. To select the multicarrier setup, see “:LINK:FORWARD:SETup:MCARrier” .										
*RST	S19C										
<b>Key Entry</b>	<table> <thead> <tr> <th><b>Pilot</b></th> <th><b>9 Channel</b></th> <th><b>Spread Rate 1</b></th> <th><b>Spread Rate 3</b></th> <th><b>Multicarrier Off On</b></th> </tr> </thead> <tbody> <tr> <td></td> <td><b>Spreading Type</b></td> <td><b>Direct</b></td> <td><b>Mcarrier</b></td> <td><b>Custom CDMA2000 Carrier</b></td> </tr> </tbody> </table>	<b>Pilot</b>	<b>9 Channel</b>	<b>Spread Rate 1</b>	<b>Spread Rate 3</b>	<b>Multicarrier Off On</b>		<b>Spreading Type</b>	<b>Direct</b>	<b>Mcarrier</b>	<b>Custom CDMA2000 Carrier</b>
<b>Pilot</b>	<b>9 Channel</b>	<b>Spread Rate 1</b>	<b>Spread Rate 3</b>	<b>Multicarrier Off On</b>							
	<b>Spreading Type</b>	<b>Direct</b>	<b>Mcarrier</b>	<b>Custom CDMA2000 Carrier</b>							
<b>Remarks</b>	Refer to “File Name Variables” on page 13 for information on the file name syntax.										

### :LINK:FORWARD:SETup:MCARrier

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:LINK:FORWARD:SETup:MCARrier CAR2 | CAR3 | CAR4 |
"<file name>"
```

```
[ :SOURce ] :RADio:CDMA2000:ARB:LINK:FORWARD:SETup:MCARrier?
```

This command defines the type of multicarrier CDMA2000 setup.

CAR2	This choice specifies the following standard 2-carrier setup:  Carrier 1: spread rate 3, direct spread, 9 channel; -2.5 MHz frequency offset; 0 dB power  Carrier 2: spread rate 3, direct spread, 9 channel; 2.5 MHz frequency offset; 0 dB power
CAR3	This choice specifies the following standard 3-carrier setup:  Carrier 1: spread rate 1, 9 channel; -1.25 MHz frequency offset; 0 dB power Carrier 2: spread rate 1, 9 channel; 0 kHz frequency offset; 0 dB power Carrier 3: spread rate 1, 9 channel; 1.25 MHz frequency offset; 0 dB power



CAR4	This choice specifies the following standard 2-carrier setup: Carrier 1: spread rate 1, 9 channel; –1.875 MHz frequency offset; 0 dB power Carrier 2: spread rate 1, 9 channel; –625 kHz frequency offset; 0 dB power Carrier 3: spread rate 1, 9 channel; 625 kHz frequency offset; 0 dB power Carrier 4: spread rate 1, 9 channel; 1.875 MHz frequency offset; 0 dB power
*RST	CAR2
<b>Key Entry</b>	<b>2 SR3 Carriers      3 Carriers      4 Carriers      Custom CDMA2000 Multicarrier</b>
<b>Remarks</b>	Refer to “ <a href="#">File Name Variables</a> ” on page 13 for information on the file name syntax.

### **:LINK:FORWARD:SETup:MCARrier:STORe**

**Supported**      E4438C with Option 401

```
[:SOURCE]:RADio:CDMA2000:ARB:LINK:FORWARD:SETup:MCARrier:
STORe "<file name>"
```

This command stores the current multicarrier setup information.

The stored file contains information including the digital modulation format, number of carriers, frequency spacing, and power settings for the multicarrier setup.

**Key Entry**      Store Custom Multicarrier

**Remarks**      Recall stored files from memory by executing the following command:

```
[:SOURCE]:RADio:CDMA2000:ARB:LINK:FORWARD:SETup:
MCARrier "<file name>"
```

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

### **:LINK:FORWARD:SETup:MCARrier:TABLE**

**Supported**      E4438C with Option 401

```
[:SOURCE]:RADio:CDMA2000:ARB:LINK:FORWARD:SETup:MCARrier:TABLE INIT |
APPend|<chan_num>,S1Pilot|S3DPilot|S3MPilot|S19Chan|S3D9chan|S3M9chan|
"<file name>",<freq_offset>,<power>
[:SOURCE]:RADio:CDMA2000:ARB:LINK:FORWARD:SETup:MCARrier:
TABLE? <chan_num>
```

This command defines the multicarrier CDMA2000 waveform.

**CDMA2000 ARB Subsystem—Option 401 ([:SOURce]:RADio:CDMA2000:ARB)**

The variable <freq\_offset> is expressed in units of Hertz (MHz).

The variable <power> is expressed in units of decibels (dB).

Channel type, frequency offset, and power level are returned when a query is initiated. The output format is as follows:

<channel type>, <freq\_offset>, <power>

<b>INIT</b>	This choice clears the current information and creates a new one-row table, allowing for further definition using additional parameters.				
<b>APPend</b>	This choice adds rows to an existing table. The maximum number of rows for one table is 25.				
<b>S1Pilot</b>	This choice sets a single SR1 Pilot forward channel.				
<b>S3DPilot</b>	This choice sets a single direct spread pilot forward channel.				
<b>S3MPilot</b>	This choice sets a single SR3 multicarrier spread pilot forward channel.				
<b>S19Chan</b>	This choice sets a SR1 9 forward channel.				
<b>S3D9chan</b>	This choice sets a SR3 direct spread forward channel.				
<b>S3M9chan</b>	This choice sets a SR3 multicarrier spread 9 forward channel.				
<b>*RST</b>	channel type: S3D9CHAN      <freq_offset>: -2.50000000E+006 <power>: +0.00000000E+000				
<b>Range</b>	<freq_offset>: -15E6 to 15E6      <power>: -40 to 0				
<b>Key Entry</b>	<b>Select File</b>	<b>Insert Row</b>	<b>SR1 Pilot</b>	<b>SR3 Direct Pilot</b>	<b>SR3 Mcarrier Pilot</b>
	<b>SR3 Mcarrier Pilot</b>	<b>SR1 9 Channel</b>	<b>SR3 Direct 9 Channel</b>		
	<b>SR3 Mcarrier 9 Channel</b>	<b>Custom CDMA2000 Carrier</b>			
<b>Field Entry</b>	Freq Offset		Power		
<b>Remarks</b>	Refer to “File Name Variables” on page 13 for information on the file name syntax.				

**:LINK:FORWARD:SETup:MCARrier:TABLE:NCARriers**

**Supported**      E4438C with Option 401

[ :SOURce ] :RADio:CDMA2000:ARB:LINK:FORWARD:SETup:MCARrier:TABLE:NCARriers?

This command queries the number of carriers specified for the multicarrier CDMA2000 waveform.

**\*RST**      +2

## **:LINK:FORWARD:SETup:STORe**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:LINK:FORWARD:SETup:STORe "<file name>"
```

This command stores the current custom CDMA2000 state, using a designated file name, to the signal generator memory.

Along with the contents of the CDMA2000 channel table editor (channel types, Walsh code, power levels, PN offset, and data), this command stores the following information to the signal generator memory:

- FIR filter
- FIR filter file name
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- I/Q mapping
- link
- spread type
- spread rate
- ARB reference clock source (internal or external)
- ARB reference clock frequency
- clipping
- multicarrier spacing
- radio configuration

**Key Entry**            **Store Custom CDMA State**

**Remarks**            Recall this stored file by executing the following command:

```
[ :SOURCE ] :RADio:CDMA2000:ARB:LINK:FORWARD:  
SETup "<file name>"
```

Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

## **:LINK:FORWARD:SETup:TABLE:APPLy**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:LINK:FORWARD:SETup:TABLE:APPLy
```

This command generates a CDMA2000 signal based on the current values in the CDMA2000 channel setup table editor.

**Key Entry**            Apply Channel Setup

**:LINK:FORWARD:SETUP:TABLE:CHANNEL**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADIO:CDMA2000:ARB:LINK:FORWARD:SETUP:TABLE:CHANNEL INIT|
APPend|<chan_num>,<chan_type>,<config>,<data_rate>,<walsh>,<power>,<
pn_offset>,RANDOM|<data_val>
```

```
[ :SOURCE ] :RADIO:CDMA2000:ARB:LINK:FORWARD:SETUP:TABLE:
CHANNEL? <chan_num>
```

This command defines the channel parameters of the CDMA2000 signal.

The variable <power> is expressed in units of decibels (dB).

The variable <data\_rate> is expressed in units bits per second (bps).

The channel type, configuration type, data rate, walsh code, power, pn offset, and data value are returned when a query is initiated. The output format is as follows:

```
<chan_type>,<config>,<data_rate>,<walsh>,<power>,<pn_offset>,<data_val>
```

**INIT** This choice clears the current information and creates a new one-row table, allowing for further definition using additional parameters.

**APPend** This choice adds rows to an existing table.

**RANDom** This choice selects a randomly generated data value.

<data\_val> This variable specifies a specific data value.

**\*RST** channel type: PIL <config>: +3 <data\_rate>: +3.84000000E+004  
<walsh>: +0 <power>: -7.00000000E+000 <pn\_offset>: +0  
<data\_val>: 0

**Range** <data\_rate>: 1500–307200 <walsh>: 0–63 <power>: –40 to 0  
<pn\_offset>: 0–511 <data\_val>: 0000000–11111111

**Key Entry** **Edit Channel Setup** **Insert Row** **Config** **Rate**  
**Walsh Code** **PN Offset**

**Remarks** Queries initiated for this command must be followed by a specific channel number.

The above \*RST value represents a query of channel one.

### **:LINK:FORWard:SETup:TABLE:NCHannels**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA2000:ARB:LINK:FORWard:SETup:TABLE:NCHannels?

This command queries the number of channels specified for the CDMA2000 link setup.

**\*RST** +9

### **:LINK:FORWard:SETup:TABLE:PADJust**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA2000:ARB:LINK:FORWard:SETup:TABLE:PADJust EQUal |  
SCALE

This command sets the code domain power (the relative power in each of the channels).

**EQUal** Sets all channels to equal power, and the total power to 0 dB.

**SCALE** Scales all of the current channel powers so that the total power equals 0 dB, keeping the previous power ratios between the individual channels.

**Key Entry** **Equal Powers** **Scale To 0dB**

### **:LINK:REVerse:RCONfig**

**Supported** E4438C with Option 401

[ :SOURce ] :RADio:CDMA2000:ARB:LINK:REVerse:RCONfig <val>  
[ :SOURce ] :RADio:CDMA2000:ARB:LINK:REVerse:RCONfig?

This command sets the radio configuration for all reverse link channels.

**\*RST** +1

**Range** 1–4

**Key Entry** **Radio Config**

**Remarks** Changing the radio configuration results in changes to the channel data rate.

**:LINK:REVerse:SETup****Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:LINK:REVerse:SETup S1Pilot|S3Pilot|
S15Chan|S35Chan|S18Chan| "<file name>"
[:SOURce]:RADio:CDMA2000:ARB:LINK:REVerse:SETup?
```

This command selects a previously defined channel configuration for the CDMA2000 reverse link.

S1Pilot This choice selects a spread rate 1, pilot-channel setup.

S3Pilot This choice selects a spread rate 3, pilot-channel setup.

S15Chan This choice selects a spread rate 1, 5-channel setup.

S35Chan This choice selects a spread rate 3, 5-channel setup.

S18Chan This choice selects a spread rate 1, 8-channel setup.

**\*RST** S15Chan

Key Entry	Pilot	5 Channel	8 Channel	Custom CDMA2000 State
	Spread Rate 1		Spread Rate 3	

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

**:LINK:REVerse:SETup:STORE****Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:LINK:REVerse:SETup:STORE "<file name>"
```

This command stores the current custom CDMA2000 state, using a designated file name, to the signal generator memory.

Along with the contents of the CDMA2000 channel table editor (channel types, Walsh code, power levels, PN offset, and data), this command stores the following information to the signal generator memory:

- FIR filter
- FIR filter file name
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- I/Q mapping
- link
- spread type

spread rate  
 ARB reference clock source (internal or external)  
 ARB reference clock frequency  
 clipping  
 multicarrier spacing  
 radio configuration

**Key Entry**            **Store Custom CDMA State**

**Remarks**            Recall this stored file by executing the following command:

```
[ :SOURCE ] :RADio:CDMA2000:ARB:LINK:REVerse:
SETUp "<file name>"
```

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

### **:LINK:REVerse:SETUp:TABLE:APPLY**

**Supported**            E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:LINK:REVerse:SETUp:TABLE:APPLY
```

This command generates a CDMA2000 signal based on the current values in the CDMA2000 channel setup table editor.

**Key Entry**            **Apply Channel Setup**

### **:LINK:REVerse:SETUp:TABLE:CHANnel**

**Supported**            E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:LINK:REVerse:SETUp:TABLE:CHANnel INIT |
APPend|<chan_num>, <chan_type>, <data_rate>, <power>, RANDOM|<data_val>
[ :SOURCE ] :RADio:CDMA2000:ARB:LINK:REVerse:SETUp:TABLE:
CHANnel? <chan_num>
```

This command defines the channel parameters for the CDMA2000 signal.

The channel number, configuration type, data rate, walsh code, power, pn offset, and data value are returned when a query is initiated. The output format is as follows:

```
<chan_type>,<data_rate>,<power>,<data_val>
```

The variable <data\_rate> is expressed as bits per second (bps).

The variable <power> is expressed in units of decibels (dB).

INIT                    This choice clears the current information and creates a new one-row table, allowing for further definition using additional parameters.

**CDMA2000 ARB Subsystem—Option 401 ([:SOURce]:RADio:CDMA2000:ARB)**

<b>APPend</b>	This choice adds rows to an existing table. The maximum number of channels in a table is eight.
<b>RANDom</b>	This choice selects a randomly generated data value.
<b>&lt;data_val&gt;</b>	This variable customizes a specific data value.
<b>*RST</b>	<i>channel type</i> : PIL <i>&lt;data_rate&gt;</i> : +3.84000000E+004 <i>&lt;power&gt;</i> : -7.00000000E+000 <i>&lt;pn_offset&gt;</i> : +0 <i>&lt;data_val&gt;</i> : 0
<b>Range</b>	<i>&lt;data_rate&gt;</i> : 1500–9600 <i>&lt;power&gt;</i> : –40 to 0 <i>&lt;data_val&gt;</i> : 0000000–11111111
<b>Key Entry</b>	<b>Edit Channel Setup      Insert Row      Config      Rate</b> <b>Walsh Code      PN Offset</b>
<b>Remarks</b>	Queries initiated for this command must be followed by a specific channel number.  The above *RST value represents a query of channel one.

**:LINK:REVerse:SEtUp:TABLE:NCHannels**

<b>Supported</b>	E4438C with Option 401
	[ :SOURce ] :RADio:CDMA2000:ARB:LINK:REVerse:SEtUp:TABLE:NCHannels?
	This command query returns the number of channels for the CDMA2000 link reverse setup.
<b>*RST</b>	+5

**:LINK:REVerse:SEtUp:TABLE:PADJust**

<b>Supported</b>	E4438C with Option 401
	[ :SOURce ] :RADio:CDMA2000:ARB:LINK:REVerse:SEtUp:TABLE:PADJust EQUal   SCALE
	This command customizes the code domain power (the relative power in each of the channels).
<b>EQUal</b>	This choice changes all channels to equal power, and the total power to 0 dB.
<b>SCALE</b>	This choice scales all of the current channel powers so that the total power equals 0 dB, keeping the previous power ratios between the individual channels.
<b>Key Entry</b>	<b>Equal Powers      Scale To 0dB</b>



## **:MDEStination:AAMPlitude**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:MDEStination:AAMPlitude NONE | M1 | M2 | M3 | M4  
[ :SOURce ] :RADio:CDMA2000:ARB:MDEStination:AAMPlitude?
```

This command routes the selected marker to the Alternate Amplitude function. The NONE parameter clears the marker for the Alternate Amplitude function.

**\*RST** NONE

**Key Entry**        **None**    **Marker 1**    **Marker 2**    **Marker 3**    **Marker 4**

## **:MDEStination:ALCHold**

**Supported** E4438C with Option 401

---

**CAUTION**        Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURce ] :RADio:CDMA2000:ARB:MDEStination:ALCHold NONE | M1 | M2 | M3 | M4  
[ :SOURce ] :RADio:CDMA2000:ARB:MDEStination:ALCHold?
```

This command enables or disables the marker ALC hold function for the selected marker. For setting markers, see “:MARKer:[SET]” on page 302.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 260.

---

**NOTE**            Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings.

---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User’s Guide*. For setting the marker points, see “:MARKer:[SET]” on page 302.

**NONE** This terminates the marker ALC hold function.

**M1–M4** These are the marker choices. The ALC hold feature uses only one marker at a time.

**\*RST** NONE

**Example**

```
:RAD:AWGB:ARB:MDES:ALCH M1
```

The preceding example routes marker 1 to the ALC Hold function.

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
<b>Remarks</b>	N/A				

**:MDEStination:PULSe**

**Supported** E4438C with Option 401

---

**CAUTION** The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURce ] :RADio:CDMA2000:ARB:MDEStination:PULSe NONE | M1 | M2 | M3 | M4
[ :SOURce ] :RADio:CDMA2000:ARB:MDEStination:PULSe?
```

This command enables or disables the marker pulse/RF blanking function for the selected marker.

This function automatically uses the ALC hold function, so there is no need to select both the ALC hold and pulse/RF blanking functions for the same marker.

---

**NOTE** Do not use ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 260.

---

**NOTE** Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “:MARKer:[SET]” on page 302 for setting the marker points.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

**Example**

```
:RAD:ARB:MDES:PULS M2
```

The preceding example routes marker 2 to Pulse/RF Blanking.

```
*RST NONE
```

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
------------------	-------------	-----------------	-----------------	-----------------	-----------------

**:MPOLarity:MARKer1 | 2 | 3 | 4****Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA2000:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 NEGative | POSitive
[:SOURCE]:RADio:CDMA2000:ARB:MPOLarity:MARKer1 | 2 | 3 | 4?
```

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

**\*RST** POS

**Key Entry**            **Marker 1 Polarity Neg Pos    Marker 2 Polarity Neg Pos    Marker 3 Polarity Neg Pos**  
**Marker 4 Polarity Neg Pos**

**:REFerence:EXTernal:FREQuency****Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA2000:ARB:REFerence:EXTernal:FREQuency <val>
[:SOURCE]:RADio:CDMA2000:ARB:REFerence:EXTernal:FREQuency?
```

This command allows you to enter the frequency of the applied external reference.

The variable <val> is expressed in units of Hertz (KHz–MHz).

**\*RST** +1.00000000E+007**Range** 2.5E5–1E8**Key Entry**            **Reference Freq**

**Remarks**            The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to  
[“:REFerence\[:SOURCE\]” on page 260.](#)

**:REFerence[:SOURCE]****Supported** E4438C with Option 401

```
[:SOURCE]:RADio:CDMA2000:ARB:REFerence[:SOURCE] INTernal | EXTernal
[:SOURCE]:RADio:CDMA2000:ARB:REFerence[:SOURCE] ?
```

This command selects either an internal or external reference for the waveform clock.

**\*RST** INT

<b>Key Entry</b>	ARB Reference Ext Int
<b>Remarks</b>	<p>If the EXTERNAL choice is selected, the external frequency value <i>must</i> be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.</p> <p>Refer to “:REFERENCE:EXTERNAL:FREQUENCY” on page 260 to enter the external reference frequency.</p>

**:RETRigger**

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA:ARB:RETRigger ON|OFF|IMMEDIATE
[:SOURce]:RADio:CDMA:ARB:RETRigger?
```

This command enables or disables the ARB retriggering mode; the retrigger mode controls how the retriggering function performs while a waveform is playing.

**ON (1)** This choice specifies that if a trigger occurs while a waveform is playing, the waveform will retrigger at the end of the current waveform sequence and play once more.

**OFF (0)** This choice specifies that if a trigger occurs while a waveform is playing, the trigger will be ignored.

**IMMEDIATE** This choice specifies that if a trigger occurs while a waveform is playing, the waveform will reset and replay from the start immediately upon receiving a trigger.

**\*RST** ON

**Key Entry** **On Off Immediate**

**:REVISION**

**Supported** E4438C with Option 401

```
[:SOURce]:RADio:CDMA2000:ARB:REVISION?
```

This command queries the revision number of the current CDMA2000 format.

**\*RST** 8

**:SCLock:RATE**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:SCLock:RATE <val>
```

```
[ :SOURce ] :RADio:CDMA2000:ARB:SCLock:RATE?
```

This command sets the sample clock rate for the CDMA2000 modulation format.

The variable <val> is expressed in units of hertz.

**\*RST** +1.00000000E+008

**Range** 1–1E8

**Key Entry** **ARB Sample Clock**

**Remarks** The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[:STaTe]” on [page 269](#) to activate the modulation format.

**:SPReading:RATE**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:SPReading:RATE 1 | 3
```

```
[ :SOURce ] :RADio:CDMA2000:ARB:SPReading:RATE?
```

This command opens a submenu that provides the available spread rate choices for the CDMA2000 waveform.

**\*RST** +1

**Key Entry** **Spread Rate 1**      **Spread Rate 3**

**Remarks** The spread rate multiplied by 1.2288 MHz is equal to the chip rate. For example, spread rate 3 equals a 3.6864 Mcps chip rate.

Higher data rates can be achieved using spread rate 3, though offset by greater bandwidth/spectrum usage.

Changing the spread rate to either 1 or 3 will also change the initial setup menu, resulting in a configuration that is specific to the current spread rate.

## :SPReading:TYPE

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:SPReading:TYPE DIRect |MCARrier  
[ :SOURCE ] :RADio:CDMA2000:ARB:SPReading:TYPE?
```

This command selects the spreading type for a CDMA2000 waveform.

**\*RST** DIR

**Key Entry** **Spreading Type Direct Mcarrier**

**Remarks** Multicarrier is not available in the reverse link setup.

Note that changing the spreading type will result in the setup changing to a setup for the current spreading type.

## :SPReading:TYPE:MCARrier:SPACing

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:SPReading:TYPE:MCARrier:SPACing 1.23MHz |  
1.25MHz  
[ :SOURCE ] :RADio:CDMA2000:ARB:SPReading:TYPE:MCARrier:SPACing?
```

This command selects the multicarrier frequency spacing.

**\*RST** +1.25000000E+006

**Key Entry** **1.23 MHz 1.25 MHz**

**Remarks** Cellular band uses 1.23 MHz and PCS band uses 1.25 MHz.

## :TRIGger:TYPE

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger:TYPE CONTinuous |SINGLE |GATE  
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger:TYPE?
```

### :TRIGger:TYPE

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger:TYPE CONTinuous |SINGLE |GATE  
[ :SOURCE ] :RADio:CDMA:ARB:TRIGger:TYPE?
```

This command sets the trigger mode (type) that controls the waveform's playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform's final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform's transmission.
- Setting the waveform's response to triggers:
  - CONTInuous, see “:TRIGger:TYPE:CONTInuous[:TYPE]” on page 265
  - SINGle, see “:RETRigger” on page 261
  - GATE, selecting the mode also sets the response
- Selecting the trigger source (see “:TRIGger[:SOURce]” on page 266), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
  - CONTInuous and SINGle see “:TRIGger[:SOURce]:EXTernal:SLOPe” on page 268
  - GATE, see “:TRIGger:TYPE:GATE:ACTive” on page 266

For more information on triggering, see the *E4428C/38C ESG Signal Generators User's Guide*.

The following list describes the trigger type command choices:

CONTInuous	Upon triggering, the waveform repeats continuously.
SINGle	Upon triggering, the waveform segment or sequence plays once.



**GATE** An external trigger signal repeatedly starts and stops the waveform’s playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see “:TRIGger:TYPE:GATE:ACTive” on page 266). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

---

**NOTE** The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.

---

**\*RST** CONT  
**Key Entry** Continuous Single Gated

### :TRIGger:TYPE:CONTInuous[:TYPE]

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] FREE |
TRIGger | RESet
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] ?
```

This commands selects the waveform’s response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see “:TRIGger:TYPE” on page 263.

The following list describes the waveform’s response to each of the command choices:

<b>FREE</b>	Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.
<b>TRIGger</b>	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.
<b>RESet</b>	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.
<b>*RST</b>	FREE
<b>Key Entry</b>	Free Run Trigger & Run Reset & Run

**:TRIGger:TYPE:GATE:ACTive**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger:TYPE:GATE:ACTive LOW|HIGH
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger:TYPE:GATE:ACTive?
```

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see “:TRIGger:TYPE” on page 263.

The following list describes the ESG’s gating behavior for the polarity selections:

LOW The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state).

HIGH The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state).

\*RST HIGH

**Key Entry** Gate Active Low High

**:TRIGger[:SOURCE]**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger [ :SOURCE ] KEY|EXT|BUS
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger [ :SOURCE ] ?
```

This command sets the trigger source.

For more information on triggering, see “:TRIGger:TYPE” on page 263. The following list describes the command choices:

KEY This choice enables manual triggering by pressing the front-panel **Trigger** hardkey.

EXT An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger:

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “:TRIGger[:SOURCE]:EXTernal[:SOURCE]” on page 269.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User's Guide*.

- The trigger signal polarity:
  - gating mode, see “:TRIGger:TYPE:GATE:ACTive” on page 266
  - continuous and single modes, see “:TRIGger[:SOURce]:EXTernal:SLOPe” on page 268
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
  - setting the amount of delay, see “:TRIGger[:SOURce]:EXTernal:DELay” on page 267
  - turning the delay on, see “:TRIGger[:SOURce]:EXTernal:DELay:STATe” on page 268

**BUS** This choice enables triggering over the GPIB or LAN using the \*TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the \*TRG command.

**\*RST** EXT

Key Entry	Trigger Key	Ext	Bus
-----------	-------------	-----	-----

## **:TRIGger[:SOURce]:EXTernal:DELay**

**Supported** E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger [ :SOURce ] :EXTernal:DELay <val>
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger [ :SOURce ] :EXTernal:DELay?
```

This command sets the amount of time to delay the ESG's response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “:TRIGger[:SOURce]:EXTernal:DELay:STATe” on page 268). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURce]” on page 266.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

**\*RST** +1.00000000E-003

**Range** 1E–8 to 4E1

**Key Entry** Ext Delay Time

### **:TRIGger[:SOURCE]:EXTErnal:DELAy:STATe**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELAy:STATe ON | OFF | 1 | 0
```

```
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELAy:STATe?
```

This command enables or disables the operating state of the external trigger delay function.

For setting the delay time, see “:TRIGger[:SOURCE]:EXTErnal:DELAy” on page 267, and for more information on configuring an external source, see “:TRIGger[:SOURCE]” on page 266.

**\*RST** 0

**Key Entry** Ext Delay Off On

### **:TRIGger[:SOURCE]:EXTErnal:SLOPe**

**Supported** E4438C with Option 401

```
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger [ :SOURCE ] :EXTErnal:SLOPe POSitive | NEGative
```

```
[ :SOURCE ] :RADio:CDMA2000:ARB:TRIGger [ :SOURCE ] :EXTErnal:SLOPe?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “:TRIGger:TYPE:GATE:ACTive” on page 266.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 266.

**\*RST** NEG

**Key Entry** Ext Polarity Neg Pos

**:TRIGger[:SOURCE]:EXTeRnal[:SOURCE]**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADIO:CDMA2000:ARB:TRIGger[:SOURCE]:EXTeRnal[:SOURCE] EPT1 |
EPT2 | EPTRIGGER1 | EPTRIGGER2
[:SOURCE]:RADIO:CDMA2000:ARB:TRIGger[:SOURCE]:EXTeRnal[:SOURCE] ?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 266. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

EPT1	This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.
EPT2	This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
EPTRIGGER1	This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.
EPTRIGGER2	This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
<b>*RST</b>	EPT1
<b>Key Entry</b>	<b>Patt Trig In 1      Patt Trig In 2</b>

**[:STAtE]**

**Supported** E4438C with Option 401

```
[:SOURCE]:RADIO:CDMA2000:ARB[:STAtE] ON|OFF|1|0
[:SOURCE]:RADIO:CDMA2000:ARB[:STAtE] ?
```

This command enables or disables the CDMA2000 modulation format.

ON (1)	This choice enables the CDMA2000 modulation capability and sets up the internal hardware to generate the currently selected CDMA2000 signal selection.  This choice also activates the I/Q state and sets the I/Q source to internal.
OFF (0)	This choice disables the CDMA2000 baseband signal capability.
<b>*RST</b>	0
<b>Key Entry</b>	<b>CDMA2000 Off On</b>

## Dmodulation Subsystem—Option 001/601 or 002/602 ([:SOURce]:RADio:DMODulation:ARB)

### :IQ:EXTernal:FILTer

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURce]:RADio:DMODulation:ARB:IQ:EXTernal:FILTer 40e6|THROUGH
[:SOURce]:RADio:DMODulation:ARB:IQ:EXTernal:FILTer?
```

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter using this command will automatically set “:IQ:EXTernal:FILTer:AUTO” on [page 270](#) to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THROUGH This choice bypasses filtering.

\*RST THR

**Key Entry** 40.000 MHz Through

### :IQ:EXTernal:FILTer:AUTO

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURce]:RADio:DMODulation:ARB:IQ:EXTernal:FILTer:AUTO ON|OFF|1|0
[:SOURce]:RADio:DMODulation:ARB:IQ:EXTernal:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel I/Q outputs.

ON(1) This choice will automatically select a digital modulation filter optimized for the current signal generator settings.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:EXTernal:FILTer” on [page 270](#) for selecting a filter or through path.

\*RST 1

**Key Entry** I/Q Output Filter Manual Auto

**:FILTer**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce] :RADio:DMODulation:ARB:FILTer RNYQuist|NYQuist|GAUSSian|
RECTangle|IS95|IS95_EQ|IS95_MOD|IS95_MOD_EQ|WCDMa|AC4Fm|IS2000SR3DS|
UGGaussian|"<user FIR>"
[:SOURce]:RADio:DMODulation:ARB:FILTer?
```

This command specifies the pre-modulation filter type.

IS95	This choice selects a filter that meets the criteria of the IS-95 standard.
IS95_EQ	This choice selects a filter which is a combination of the IS-95 filter (above) and the equalizer filter described in the IS-95 standard. This filter is only used for IS-95 baseband filtering.
IS95_MOD	This choice selects a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance) with lower passband rejection than the filter specified in the IS-95 standard.
IS95_MOD_EQ	This choice selects a filter which is a combination of the equalizer filter described in the IS-95 standard and a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance), with lower passband rejection.
WCDMa	This choice selects a 0.22 Nyquist filter optimized for ACP.
AC4Fm	This choice selects a predefined Association of Public Safety Communications Officials (APCO) specified compatible 4-level frequency modulation (C4FM) filter.
IS2000SR3DS	This choice selects an IS-2000 standard, spread rate 3 direct spread filter.
UGGaussian	This choice selects a backwards compatible GSM Gaussian filter (Gaussian filter with a fixed BbT value of 0.300) for the ESG E44xxB Option UN3 or UN4.
"<user FIR>"	This variable is any FIR filter file that you have stored in memory. The variable needs no directory path indicating the location of the file, such as FIR: or /USER/FIR. The command assumes the FIR directory. Refer to <a href="#">“File Name Variables” on page 13</a> for more information on file names.

**\*RST** RNYQ

<b>Key Entry</b>	<b>Root Nyquist</b>	<b>Nyquist</b>	<b>Gaussian</b>	<b>Rectangle</b>	<b>IS-95</b>	<b>IS-95 w/EQ</b>
	<b>IS-95 Mod</b>	<b>IS-95 Mod w/EQ</b>	<b>WCDMA</b>	<b>IS-2000 SR3 DS</b>	<b>APCO 25 C4FM</b>	
	<b>UN3/4 GSM Gaussian</b>	<b>User FIR</b>				

**:FILTer:ALPHa**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:FILTer:ALPHa <val>
```

```
[ :SOURce ] :RADio:DMODulation:ARB:FILTer:ALPHa?
```

This command changes the Nyquist or root Nyquist filter alpha value.

The filter alpha value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +3.50000000E–001

**Range** 0.000–1.000

**Key Entry** **Filter Alpha**

**Remarks** To change the current filter type, refer to “:FILTer” on page 271.

**:FILTer:BBT**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:FILTer:BBT <val>
```

```
[ :SOURce ] :RADio:DMODulation:ARB:FILTer:BBT?
```

This command changes the bandwidth-multiplied-by-bit-time (BbT) filter parameter.

The filter BbT value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +5.00000000E–001

**Range** 0.000–1.000

**Key Entry** **Filter BbT**

**Remarks** This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.

To change the current filter type, refer to “:FILTer” on page 271.



**:FILTer:CHANnel**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:FILTer:CHANnel EVM|ACP
[ :SOURce ] :RADio:DMODulation:ARB:FILTer:CHANnel?
```

This command optimizes the Nyquist and root Nyquist filters to minimize error vector magnitude (EVM) or to minimize adjacent channel power (ACP).

**EVM** This choice provides the most ideal passband.

**ACP** This choice improves stopband rejection.

**\*RST** EVM

**Key Entry** **Optimize FIR For EVM ACP**

**Remarks** To change the current filter type, refer to “:FILTer” on page 271.

**:HEADer:CLEar**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:HEADer:CLEar
```

This command clears the header information from the file header used by this modulation format.

**Key Entry** **Clear Header**

**Remarks** The **Digital Modulation Off On** softkey must be set to On for this command to function.

**:HEADer:SAVE**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:HEADer:SAVE
```

This command saves the header information to the file header used by this modulation format.

**Key Entry** **Save Setup To Header**

**Remarks** The **Digital Modulation Off On** softkey must be set to On for this command to function.

**:IQ:MODulation:ATTen**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:ATTen <val>
```

```
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:ATTen?
```

This command sets the attenuation level of the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +2.00000000E+000

**Range** 0–40

**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:ATTen:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0
```

```
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:ATTen:AUTO?
```

This command enables or disables the I/Q attenuation auto mode.

**ON (1)** This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

**OFF (0)** This choice holds the attenuator at its current setting or at a selected value. Refer to “:IQ:MODulation:ATTen” on page 207 for setting the attenuation value.

**\*RST** 1

**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:FILTer**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:FILTer 2.1e6 | 40e6 | THROugh
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:FILTer?
```

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter using this command will automatically set “[:IQ:MODulation:FILTer:AUTO](#)” on page 275 to OFF(0) mode.

2.1E6 This choice applies a 2.1 MHz baseband filter to the I/Q signals.

40E6 This choice applies a 40 MHz baseband filter to the I/Q signals.

THROugh This choice bypasses filtering.

**\*RST** THR

**Key Entry** 2.100 MHz 40.000 MHz Through

**:IQ:MODulation:FILTer:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:FILTer:AUTO ON | OFF | 1 | 0
[ :SOURce ] :RADio:DMODulation:ARB:IQ:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1) This choice will automatically select a digital modulation filter.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “[:IQ:MODulation:FILTer](#)” on page 275 for selecting a filter or through path.

**\*RST** 1

**Key Entry** I/Q Mod Filter Manual Auto

**:MDEStination:AAMPLitude**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:MDEStination:AAMPLitude NONE | M1 | M2 | M3 | M4
[ :SOURCE ] :RADio:DMODulation:ARB:MDEStination:AAMPLitude?
```

This command routes the selected marker to the Alternate Amplitude function. The `NONE` parameter clears the marker for the Alternate Amplitude function.

**\*RST** NONE

**Key Entry**      **None**    **Marker 1**    **Marker 2**    **Marker 3**    **Marker 4**

**:MDEStination:ALCHold**

**Supported** E4438C with Option 403

---

**CAUTION** Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURCE ] :RADio:DMODulation:ARB:MDEStination:ALCHold NONE | M1 | M2 | M3 | M4
[ :SOURCE ] :RADio:DMODulation:ARB:MDEStination:ALCHold?
```

This command enables or disables the marker ALC hold function for the selected marker. For setting markers, see “[:MARKer:SET]” on page 302.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[:MPOlarity:MARKer1|2|3|4]” on page 280.

---

**NOTE** Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

**Dmodulation Subsystem—Option 001/601 or 002/602 ([:SOURCE]:RADio:DMODulation:ARB)**

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings.

---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “:MARKer:[SET]” on page 302.

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

\*RST NONE

**Example**

```
:RAD:AWGB:ARB:MDES:ALCH M1
```

The preceding example routes marker 1 to the ALC Hold function.

**Key Entry**            **None**   **Marker 1**   **Marker 2**   **Marker 3**   **Marker 4**

**Remarks**            N/A

**:MDEStination:PULSe**

**Supported**            E4438C with Option 001/601 or 002/602

---

**CAUTION** The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURCE ] :RADio:DMODulation:ARB:MDEStination:PULSe NONE | M1 | M2 | M3 | M4
[:SOURCE]:RADio:DMODulation:ARB:MDEStination:PULSe?
```

This command enables or disables the marker pulse/RF blanking function for the selected marker.

This function automatically uses the ALC hold function, so there is no need to select both the ALC hold and pulse/RF blanking functions for the same marker.

---

**NOTE** Do not use ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 280.

---

**NOTE** Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “:MARKer:[SET]” on page 302 for setting the marker points.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

### Example

```
:RAD:ARB:MDES:PULS M2
```

The preceding example routes marker 2 to Pulse/RF Blanking.

```
*RST NONE
```

Key Entry	None	Marker 1	Marker 2	Marker 3	Marker 4
-----------	------	----------	----------	----------	----------

**:MODulation:FSK[:DEVIation]**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:MODulation:FSK[:DEVIation] <val>
```

```
[ :SOURCE ] :RADio:DMODulation:ARB:MODulation:FSK[:DEVIation] ?
```

This command sets the symmetric FSK frequency deviation value.

The variable <val> is expressed in units of Hertz and the maximum range value equals the current symbol rate value multiplied by ten, limited to 20 MHz.

**\*RST** +4.00000000E+002

**Range** 0–2E7

**Key Entry** **Freq Dev**

**Remarks** To change the modulation type, refer to “:MODulation[:TYPE]” on page 279.

Refer to “:SRATe” on page 286 for a list of the minimum and maximum symbol rate values.

To set an asymmetric FSK deviation value, refer to the *E4428C/38C ESG Signal Generators User’s Guide* for more information.

**:MODulation[:TYPE]**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:MODulation[:TYPE] BPSK | QPSK | IS95QPSK |
GRAYQPSK | OQPSK | IS95OQPSK | P4DQPSK | PSK8 | PSK16 | D8PSK | EDGE | MSK | FSK2 | FSK4 |
FSK8 | FSK16 | C4FM | QAM4 | QAM16 | QAM32 | QAM64 | QAM128 | QAM256
[ :SOURCE ] :RADio:DMODulation:ARB:MODulation[:TYPE] ?
```

This command sets the modulation type for the digital modulation personality.

**\*RST** P4DQPSK

<b>Key Entry</b>	<b>BPSK</b>	<b>QPSK</b>	<b>IS-95 QPSK</b>	<b>Gray Coded QPSK</b>	<b>OQPSK</b>			
	<b>IS-95 OQPSK</b>	<b><math>\pi/4</math> DQPSK</b>	<b>8PSK</b>	<b>16PSK</b>	<b>D8PSK</b>	<b>EDGE</b>	<b>MSK</b>	
	<b>2-Lvl FSK</b>	<b>4-Lvl FSK</b>	<b>8-Lvl FSK</b>	<b>16-Lvl FSK</b>	<b>C4FM</b>	<b>4QAM</b>	<b>16QAM</b>	
	<b>32QAM</b>	<b>64QAM</b>	<b>128QAM</b>	<b>256QAM</b>				

**:MPOLarity:MARKer1 | 2 | 3 | 4****Supported** E4438C with Option 401

[:SOURce]:RADio:DMODulation:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 NEGative | POSitive

[:SOURce]:RADio:DMODulation:ARB:MPOLarity:MARKer1 | 2 | 3 | 4?

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

**\*RST** POS

**Key Entry**            **Marker 1 Polarity Neg Pos    Marker 2 Polarity Neg Pos    Marker 3 Polarity Neg Pos**  
**Marker 4 Polarity Neg Pos**

**:REFerence:EXTernal:FREQuency****Supported** E4438C with Option 001/601 or 002/602

[:SOURce]:RADio:DMODulation:ARB:REFerence:EXTernal:FREQuency &lt;val&gt;

[:SOURce]:RADio:DMODulation:ARB:REFerence:EXTernal:FREQuency?

This command conveys the expected reference frequency value of an externally applied reference the signal generator.

The variable <val> is expressed in units of Hertz (Hz–MHz).

**\*RST** +1.00000000E+007**Range** 2.5E5–1E8**Key Entry**            **Reference Freq**

**Remarks**            The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “:REFerence[:SOURce]” on page 281.



**:REFerence[:SOURce]**

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:DMODulation:ARB:REFerence[:SOURCE] INTernal | EXTernal
[:SOURCE]:RADio:DMODulation:ARB:REFerence[:SOURCE] ?
```

This command selects either an internal or external reference for the waveform clock.

**\*RST** INT

**Key Entry** **ARB Reference Ext Int**

**Remarks** If the EXTernal choice is selected, the external frequency value *must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.

Refer to “:REFerence:EXTernal:FREQuency” on page 280 to enter the external reference frequency.

**:RETRigger**

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:DMODulation:ARB:RETRigger ON | OFF | IMMEDIATE
[:SOURCE]:RADio:DMODulation:ARB:RETRigger ?
```

This command enables or disables the ARB retriggering mode; the retrigger mode controls how the retriggering function performs while a waveform is playing.

ON (1) This choice specifies that if a trigger occurs while a waveform is playing, the waveform will retrigger at the end of the current waveform sequence and play once more.

OFF (0) This choice specifies that if a trigger occurs while a waveform is playing, the trigger will be ignored.

IMMEDIATE This choice specifies that if a trigger occurs while a waveform is playing, the waveform will reset and replay from the start immediately upon receiving a trigger.

**\*RST** ON

**Key Entry** **On Off Immediate**

**:SCLock:RATE**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:SCLock:RATE <val>
```

```
[ :SOURce ] :RADio:DMODulation:ARB:SCLock:RATE?
```

This command sets the sample clock rate.

The variable <val> is expressed in units of Hertz (Hz – MHz)

**\*RST** +1.00000000E+008

**Range** 1–1E8

**Key Entry** **ARB Sample Clock**

**Remarks** The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[:STATe]” on [page 293](#) to activate the modulation format.

**:SETup**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:SETup GSM|NADC|PDC|PHS|DECT|AC4Fm|
```

```
ACQPsk|CDPD|PWT|EDGE|TETRA|MCARrier| "<file name>"
```

```
[ :SOURce ] :RADio:DMODulation:ARB:SETup?
```

This command selects the digital modulation format type or multicarrier, and turns multicarrier off or on (see the MCARrier choice description).

The *MCARrier* choice selects multicarrier and turns it on. Selecting any other setup such as GSM or CDPD turns multicarrier off. To select the multicarrier setup, see “[:SETup:MCARrier]” .

**\*RST** NADC

<b>Key Entry</b>	<b>GSM</b>	<b>NADC</b>	<b>PDC</b>	<b>PHS</b>	<b>DECT</b>	<b>APCO 25 w/C4FM</b>	<b>APCO w/CQPSK</b>
	<b>CDPD</b>	<b>PWT</b>	<b>EDGE</b>	<b>TETRA</b>	<b>Multicarrier Off On</b>	<b>Select File</b>	

**Remarks** Refer to “File Name Variables” on [page 13](#) for information on the file name syntax.

**:SETup:MCARrier**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:SETup:MCARrier GSM|NADC|PDC|PHS|DECT|
AC4Fm|ACQPsK|CDPD|PWT|EDGE|TETRA, <num carriers>, <freq spacing> |
"<file name>"
[ :SOURCE ] :RADio:DMODulation:ARB:SETup:MCARrier?
```

This command builds a table with the specified number of carriers and frequency spacing or retrieves the setup stored in the specified user file.

The carrier type, number of carriers, and frequency spacing value are returned when a query is initiated. The output format is as follows:

```
<carrier type>, <num carriers>, <freq spacing>
```

If a specific file is loaded and then queried, only the file name is returned.

The variable <freq spacing> is expressed in units of Hertz (kHz–MHz).

```
*RST          Carrier: NADC    <num carriers>: 2
              <freq spacing>: +1.0000000000000E+06
```

```
Range          <num carriers>: 2–100
              <freq spacing>: 2 ÷ (<num carriers> – 1) × 80 MHz
```

```
Key Entry     GSM   NADC   PDC   PHS   DECT   APCO 25 w/C4FM   APCO w/CQPSK
CDPD   PWT   EDGE   TETRA   # of Carriers   Freq Spacing
Custom Digital Mod State
```

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

To store a multicarrier setup refer to [“:SETup:MCARrier:STORe” on page 284](#).

**:SETup:MCARrier:PHASe**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:SETup:MCARrier:PHASe FIXed|RANDOM
[ :SOURCE ] :RADio:DMODulation:ARB:SETup:MCARrier:PHASe?
```

This command toggles the phase settings for multicarrier digital modulation.

**FIXed** This choice sets the phase of all carriers to 0.

**RANDom** This choice sets random phase values for all of the carriers.

**\*RST**                      FIX

**Key Entry**                **Carrier Phases Fixed Random**

### **:SETup:MCARrier:STORE**

**Supported**                E4438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:DMODulation:ARB:SETup:MCARrier:STORE "<file name>"
```

This command stores the current multicarrier setup information.

The stored file contains information that includes the digital modulation format, number of carriers, frequency spacing, and power settings for the multicarrier setup.

**Key Entry**                **Load/Store**

**Remarks**                The setting enabled by this command is not affected by signal generator power-on, preset, or \*RST.

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

### **:SETup:MCARrier:TABLE**

**Supported**                E4438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:DMODulation:ARB:SETup:MCARrier:TABLE INIT|APPend|
<carrier_num>, GSM|NADC|PDC|PHS|DECT|AC4Fm|ACQpsk|CDPD|PWT|EDGE|TETRA|
"<file name>",<freq_offset>,<power>
[:SOURCE]:RADio:DMODulation:ARB:SETup:MCARrier:TABLE? <carrier_num>
```

This command modifies the parameters of one of the available multicarrier digital modulation formats.

The variable <freq\_offset> is expressed in units of Hertz (kHz–MHz).

The variable <power> is expressed in units of decibels (dB).

**INIT**                        This choice clears the current information and creates a new one-row table, allowing for further definition using additional parameters.

**APPend**                    This choice adds rows to an existing table.

**<carrier\_num>**            This variable specifies the number of the carriers in the multicarrier table that will be modified.

The value of the variable <carrier\_num> must be specified prior to selecting the digital modulation format.

**Dmodulation Subsystem—Option 001/601 or 002/602 ([:SOURCE]:RADio:DMODulation:ARB)**

Carrier type, frequency offset, and power level are returned when a query is initiated. The output format is as follows:

<carrier type>, <freq\_offset>, <power>

**\*RST**            *carrier type*: NADC    <freq\_offset>: -5.00000000E+004  
                   <power>: +0.00000000E+000

**Range**            <freq\_offset>: -1E5 to 1E6    <power>: -40 to 0

**Key Entry**        **Initialize Table    Insert Row    GSM    NADC    PDC    PHS    DECT**  
**APCO 25 w/C4FM    APCO w/CQPSK    CDPD    PWT    EDGE    TETRA**  
**Custom Digital Mod State**

**Remarks**        Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

To store a multicarrier setup refer to “[:SETup:MCARrier:STORE](#)” on page 284.

**:SETup:MCARrier:TABLE:NCARriers**

**Supported**        E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:DMODulation:ARB:SETup:MCARrier:TABLE:NCARriers?

This query returns the number of carriers in the current multicarrier setup.

**\*RST**            +2

**Range**            1–100

**Key Entry**        **# of Carriers**

**:SETup:STORE**

**Supported**        E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:DMODulation:ARB:SETup:STORE "<file name>"

This command stores the current custom digital modulation state.

The saved file contains information that includes the modulation type, filter and symbol rate for the custom modulation setup.

**Key Entry**        **Store Custom Dig Mod State**

**Remarks**        Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

**:SRATe**

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:DMODulation:ARB:SRATe <val>

[ :SOURCE ] :RADio:DMODulation:ARB:SRATe?

This command sets the transmission symbol rate.

The variable <val> is expressed in units of symbols per second (sps–Mps) and the maximum range value is dependent upon the modulation type, and filter.

**\*RST** +2.43000000E+004

**Range**

<i>Modulation Type</i>	<i>Bits per Symbol</i>	<i>Internal Data</i>
BPSK	1	1sps–50 Mps
FSK2		
MSK		
C4FM	2	1sps–50 Mps
FSK4		
OQPSK		
OQPSK195		
P4QPPSK		
QAM4		
QPSK		
QPSKIS95		
QPSKISAT		
D8PSK		
EDGE		
FSK8		
PSK8		
FSK16	4	1sps–25 Mps
PSK16		
QAM16		
QAM32	5	1sps–20 Mps
QAM64	6	1sps–16.67 Mps
QAM256	8	1sps–12.50 Mps

**Key Entry**

**Symbol Rate**

**Remarks**

When user-defined filters are selected using the command in section “[:FILTer](#)” on [page 271](#), the upper bit rate will be restricted in line with the following symbol rate restriction:

- FIR filter length > 32 symbols: upper limit is 12.5 Mps

- FIR filter length > 16 symbols: upper limit is 25 Msps

When internal FIR filters are used, the limits of the above table always apply. For higher symbol rates, the FIR filter length will be truncated as follows:

- Above 12.5 Msps, the FIR length will be truncated to 32 symbols
- Above 25 Msps, the FIR length will be truncated to 16 symbols

This will impact the relative timing of the modulated data, as well as the actual filter response.

To change the modulation type, refer to “:MODulation[:TYPE]” on page 279.

## :TRIGger:TYPE

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURce]:RADio:DMODulation:ARB:TRIGger:TYPE CONTInuous|SINGLE|GATE
[:SOURce]:RADio:DMODulation:ARB:TRIGger:TYPE?
```

This command sets the trigger mode (type) that controls the waveform’s playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform’s final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform’s transmission.
- Setting the waveform’s response to triggers:
  - CONTInuous, see “:TRIGger:TYPE:CONTInuous[:TYPE]” on page 288
  - SINGLE, see “:RETRigger” on page 281
  - GATE, selecting the mode also sets the response

**Dmodulation Subsystem—Option 001/601 or 002/602 (:SOURce]:RADio:DMODulation:ARB)**

- Selecting the trigger source (see “:TRIGger[:SOURce]” on page 290), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
  - CONTInuous and SINGle see “:TRIGger[:SOURce]:EXTErnal:SLOPe” on page 292
  - GATE, see “:TRIGger:TYPE:GATE:ACTIve” on page 289

For more information on triggering, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the trigger type command choices:

CONTInuous	Upon triggering, the waveform repeats continuously.
SINGle	Upon triggering, the waveform segment or sequence plays once.
GATE	An external trigger signal repeatedly starts and stops the waveform’s playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see “:TRIGger:TYPE:GATE:ACTIve” on page 289). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

---

**NOTE** The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.

---

<b>*RST</b>	CONT		
<b>Key Entry</b>	<b>Continuous</b>	<b>Single</b>	<b>Gated</b>

**:TRIGger:TYPE:CONTInuous[:TYPE]**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] FREE |
TRIGger | RESet
[ :SOURce ] :RADio:DMODulation:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] ?
```

This commands selects the waveform’s response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see “:TRIGger:TYPE” on page 287.



The following list describes the waveform's response to each of the command choices:

<b>FREE</b>	Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.
<b>TRIGger</b>	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.
<b>RESet</b>	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.
<b>*RST</b>	FREE
<b>Key Entry</b>	<b>Free Run      Trigger &amp; Run      Reset &amp; Run</b>

### **:TRIGger:TYPE:GATE:ACTive**

**Supported**      E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger:TYPE:GATE:ACTive LOW|HIGH
[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger:TYPE:GATE:ACTive?
```

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see “:TRIGger:TYPE” on page 287.

The following list describes the ESG's gating behavior for the polarity selections:

<b>LOW</b>	The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state).
<b>HIGH</b>	The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state).
<b>*RST</b>	HIGH
<b>Key Entry</b>	<b>Gate Active Low High</b>

**:TRIGger[:SOURCE]**

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger [ :SOURCE ] KEY | EXT | BUS

[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger [ :SOURCE ] ?

This command sets the trigger source.

For more information on triggering, see “[:TRIGger:TYPE](#)” on page 287. The following list describes the command choices:

**KEY** This choice enables manual triggering by pressing the front-panel **Trigger** hardkey.

**EXT** An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger:

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “[:TRIGger\[:SOURCE\]:EXTErnal\[:SOURCE\]](#)” on page 292.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.

- The trigger signal polarity:
  - gating mode, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 289
  - continuous and single modes, see “[:TRIGger\[:SOURCE\]:EXTErnal:SLOPe](#)” on page 292
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
  - setting the amount of delay, see “[:TRIGger\[:SOURCE\]:EXTErnal:DELAy](#)” on page 291
  - turning the delay on, see “[:TRIGger\[:SOURCE\]:EXTErnal:DELAy:STATe](#)” on page 291

**BUS** This choice enables triggering over the GPIB or LAN using the \*TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the \*TRG command.

**\*RST** EXT

**Key Entry**      **Trigger Key**      **Ext**      **Bus**

**:TRIGger[:SOURCE]:EXTErnal:DELay**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELay <val>
[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELay?
```

This command sets the amount of time to delay the ESG's response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “:TRIGger[:SOURCE]:EXTErnal:DELay:STATE” on page 291). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 290.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

**\*RST** +1.00000000E-003

**Range** 1E-8 to 4E1

**Key Entry** Ext Delay Time

**:TRIGger[:SOURCE]:EXTErnal:DELay:STATE**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELay:
STATE ON|OFF|1|0
[ :SOURCE ] :RADio:DMODulation:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELay:STATE?
```

This command enables or disables the external trigger delay function.

For setting the delay time, see “:TRIGger[:SOURCE]:EXTErnal:DELay” on page 291, and for more information on configuring an external source, see “:TRIGger[:SOURCE]” on page 290.

**\*RST** 0

**Key Entry** Ext Delay Off On

**:TRIGger[:SOURce]:EXTErnal:SLOPe**

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURce]:RADio:DMODulation:ARB:TRIGger[:SOURce]:EXTErnal:
SLOPe POSitive|NEGative
[:SOURce]:RADio:DMODulation:ARB:TRIGger[:SOURce]:EXTErnal:SLOPe?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “**:TRIGger:TYPE:GATE:ACTive**” on page 289.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “**:TRIGger[:SOURce]**” on page 290.

**\*RST** NEG

**Key Entry** Ext Polarity Neg Pos

**:TRIGger[:SOURce]:EXTErnal[:SOURce]**

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURce]:RADio:DMODulation:ARB:TRIGger[:SOURce]:
EXTErnal[:SOURce] EPT1|EPT2|EPTRIGGER1|EPTRIGGER2
[:SOURce]:RADio:DMODulation:ARB:TRIGger[:SOURce]:EXTErnal[:SOURce]?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “**:TRIGger[:SOURce]**” on page 290. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

- EPT1 This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.
- EPT2 This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
- EPTRIGGER1 This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.

**Dmodulation Subsystem—Option 001/601 or 002/602 ([:SOURCE]:RADio:DMODulation:ARB)**

**EPTRIGGER2** This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.

**\*RST** EPT1

**Key Entry** **Patt Trig In 1** **Patt Trig In 2**

**[ :STATE ]**

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:DMODulation:ARB [ :STATE ] ON | OFF | 1 | 0  
[ :SOURCE ] :RADio:DMODulation:ARB [ :STATE ] ?

This command enables or disables the digital modulation capability.

**ON (1)** This choice sets up the internal hardware to generate the currently selected digital modulation format signal selection.

**OFF (0)** This choice disables the digital modulation capability.

**\*RST** 0

**Key Entry** **Digital Modulation Off On**

**Remarks** When ON is selected, the I/Q state is activated and the I/Q source is set to internal.

---

## Dual ARB Subsystem—Option 001/601 or 002/602 ([:SOURce]:RADio:ARB)

### :CLIPping

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURce]:RADio:ARB:CLIPping "<file name>", IJQ| IORQ, <val> [, <val>]
```

This command sets the clipping level of the selected waveform segment to a percentage of its highest peak.

The variable <val> is expressed in units of percent.

**IJQ** This choice clips the composite I/Q waveform.

**IORQ** This choice clips I and Q separately. When this choice is enabled, percentage values for both I and Q must be specified.

**\*RST** IJQ <val>: +100

**Range** <val>: 10–100 (0.1% resolution)

**Key Entry** **Clipping Type** |I+jQ| |I|,|Q|

**Remarks** A value of 100 percent equates to no clipping.

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

### :GENerate:SINE

**Supported** E4438C with Option 001/ 601 or 002/602

```
[:SOURce]:RADio:ARB:GENerate:SINE ["<file_name>"] [, <osr>] , [<scale>] ,  
[I|Q|IQ]
```

This command creates a sine wave waveform file and saves it in the signal generator’s volatile waveform memory (WFM1).

"<file\_name>" This variable names the file used to save the generated sine wave data.

<osr> This variable sets the oversample ratio, which must be an even number and  $\geq 4$ . The <osr> variable is expressed in samples. If the oversample ratio is  $< 60$  (the minimum number of samples or I/Q points required for a waveform), multiple waveform periods are generated to create a waveform file with  $\geq 60$  samples. The number of periods created is  $60 \div \text{<osr>}$  (quotient will round up to an integer value). A waveform with an oversample ratio  $\geq 60$  has one period.

<scale>	This variable sets the scale factor for the waveform. The scale factor is a real number from zero to one.
I Q IQ	Selects I, Q, or I and Q paths for the waveform data. Sinewave data is generated and applied to the I path if the I path is selected; Q data are set to zeros. Sine data is generated and applied to the Q path if the Q path is selected; I data are set to zeros. If the I and Q paths are selected, sinewave data are applied to the I and Q paths.

**Example**

```
:RAD:ARB:GEN:SINE "Sine_Wave",60,.5,IQ
```

The preceding example generates an I/Q sine wave and saves the data to a file named Sine\_Wave. The oversampling ratio is 60, the scaling is set for 50%, and the data is applied to both the I and Q paths.

The signal generator's baseband option and available baseband memory determine the maximum number of samples for the waveform.

<b>Range</b>	<i>OSR Option 001/601:</i> 4E0 – 8E6
	<i>OSR Option 002/602:</i> 4E0 – 32E6
	<i>Scale:</i> 0–1

**:HEADer:CLEar**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:HEADer:CLEar
```

This command clears the header information from the file header used by this modulation format.

**Key Entry** **Clear Header**

**Remarks** The **ARB Off On** softkey must be set to On for this command to function.

**:HEADer:RMS**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:HEADer:RMS "<file_name>",<val>|UNSPecified  
[ :SOURce ] :RADio:ARB:HEADer:RMS? "<file_name>"
```

This command sets the file header RMS value for the selected waveform file. The ESG uses the RMS value with the dual ARB's real-time noise function.

The signal generator reads the RMS value from the file header when real-time noise is enabled and the dual ARB turned on.

When the waveform file is saved from volatile waveform memory (WFM1) to non-volatile waveform memory (NVWFM), the RMS value, auto-calculated or user-defined, is also saved.

"<file\_name>" This variable names the waveform file to which the RMS value will be applied. The file name variable can designate a file in the WFM1, NVWFM, or SEQ directories. For information on the file name syntax, refer to [“File Name Variables” on page 13](#).

<val> This variable is the user-measured RMS value for the specified waveform. The following figure shows the RMS calculation.

$$\sqrt{\sum_{n=1}^N (i_n^2 + q_n^2) \times \frac{1}{N}}$$

N = # of Samples

UNSPecified Using this variable in the command clears the RMS value and sets it to unspecified. An unspecified RMS value causes the signal generator to calculate the value when real-time noise is applied to the waveform during play back by the dual ARB player. The RMS calculation includes rise times and does not include consecutive zero level samples. DC offsets and noise are also included in the RMS measurement. Because the signal generator calculation uses so many parameters, you may achieve better results calculating your own RMS value.

### Examples

```
[:SOURCE]:RADio:ARB:HEADER:RMS "WFM1:Sine_Wave", .835
```

The first example shows a user-measured RMS value for the Sine\_Wave waveform file in the waveform's file header.

```
:RAD:ARB:HEADER:RMS "WFM1:Sine_Wave", UNSP
```

In the second example, the signal generator calculates the RMS value.

The RMS value is expressed in volts.

Range 0 – 1.414213562373095



## :HEADer:SAVE

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

**Key Entry** **Save Setup To Header**

**Remarks** The **ARB Off On** softkey must be set to On for this command to function.

## :HCRest[:STATe]

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:ARB:HCRest [ :STATe ] ON | OFF | 1 | 0

[ :SOURCE ] :RADio:ARB:HCRest [ :STATe ] ?

This command enables or disables the operating state of the high crest mode.

ON(1) This choice turns high crest mode on for arbitrary I/Q waveforms with high crest factors (such as downloaded Signal Studio for 802.11 signals). High crest mode reduces the ALC vernier level by 7.5 dB, allowing the signal generator to process these signals with less distortion and improved EVM. For crest factors higher than 4 dB, I/Q drive levels should be reduced by 1 dB for each dB above that level. In high crest mode, the maximum output level is reduced and power level accuracy is degraded.

OFF(0) This choice disables the high crest mode.

**\*RST** 0

**Key Entry** **High Crest Mode Off On**

**Remarks** The high crest mode is automatically turned on by some Signal Studio applications. You can manually override this automatic selection at any time.

**:IQ:EXTeRnal:FiLTeR**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:IQ:EXTeRnal:FiLTeR 40e6 | THROugh
[ :SOURce ] :RADio:ARB:IQ:EXTeRnal:FiLTeR?
```

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. The filter has not effect on the modulated RF signal. Selecting a filter using this command will automatically set “:IQ:EXTeRnal:FiLTeR:AUTO” on page 298 to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THROugh This choice bypasses filtering.

**\*RST** THR

**Key Entry** 40.000 MHz Through

**:IQ:EXTeRnal:FiLTeR:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:IQ:EXTeRnal:FiLTeR:AUTO ON | OFF | 1 | 0
[ :SOURce ] :RADio:ARB:IQ:EXTeRnal:FiLTeR:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel I/Q outputs.

ON(1) This choice will automatically select a digital modulation filter optimized for the current signal generator settings.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:EXTeRnal:FiLTeR” on page 298 for selecting a filter or through path.

**\*RST** 1

**Key Entry** I/Q Output Filter Manual Auto

**:IQ:MODulation:ATTen**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:IQ:MODulation:ATTen <val>
[ :SOURce ] :RADio:ARB:IQ:MODulation:ATTen?
```

This command sets the attenuation level of the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +2.00000000E+000  
**Range** 0–40  
**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:ATTen:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:IQ:MODulation:ATTen:AUTO ON | OFF | 1 | 0
[ :SOURce ] :RADio:ARB:IQ:MODulation:ATTen:AUTO?
```

This command enables or disables the I/Q attenuation auto mode.

**ON (1)** This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

**OFF (0)** This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” on page 298 for setting the attenuation value.

**\*RST** 1  
**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:FILTer**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:IQ:MODulation:FILTer 2.1e6 | 40e6 | THROugh
[ :SOURce ] :RADio:ARB:IQ:MODulation:FILTer?
```

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. This filter has no effect on the I/Q signal out the rear panel. Selecting a filter using this command will automatically set “[:IQ:MODulation:FILTer:AUTO](#)” on page 300 to OFF(0) mode.

**2.1E6** This choice applies a 2.1 MHz baseband filter to the I/Q signals.

**40E6** This choice applies a 40 MHz baseband filter to the I/Q signals.

**THROugh** This choice bypasses filtering.

**\*RST** THR  
**Key Entry** **2.100 MHz    40.000 MHz    Through**

**:IQ:MODulation:FILTer:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:IQ:MODulation:FILTer:AUTO ON|OFF|1|0
[ :SOURce ] :RADio:ARB:IQ:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1) This choice will automatically select a digital modulation filter.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “[:IQ:MODulation:FILTer](#)” on page 299 for selecting a filter or through path.

\*RST 1

**Key Entry** I/Q Mod Filter Manual Auto

**:MARKer:CLEar**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:MARKer:CLEar "<file_name>",<marker>,<first_point>,<last_point>
```

This command clears a single marker point or a range of marker points on a waveform segment for the selected marker (1–4). The dual ARB player and all of the ARB modulation formats use this command.

"<file\_name>" This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN\_WAVEFORM file when clearing marker points for an active ARB format. The ESG automatically creates a file, using current settings, and names it AUTOGEN\_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the dual ARB player. For information on the file name syntax, see “[File Name Variables](#)” on page 13.

<marker> This variable selects the marker number; an integer value from one to four.

<first\_point> This variable defines the first point in a range of points. The number must be greater than or equal to one, and less than or equal to the total number of waveform points.

If you enter a value for either the first marker point or the last marker point that would make the first marker point occur after the last, the last marker point automatically adjusts to match the first marker point.

<last\_point> This variable defines the last point in a range of points. The number must be greater than or equal to the first point, and less than or equal to the total number of waveform points.

To clear a single marker point, use the same marker point for the first and last point variables. For more information on markers and ARB files, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

### Example

```
:RAD:ARB:MARK:CLE "Test_Data",1,1,300
```

The preceding example clears marker 1 from the first point through the 300th point in the Test\_Data file.

**Range**                    <marker>: 1–4  
                              <first\_Point>: 1–number of waveform points  
                              <last\_point>: <first\_Point>–number of waveform points

**Key Entry**                **Set Marker Off Range Of Points    Marker 1 2 3 4    First Mkr Point    Last Mkr Point**

## :MARKer:CLEar:ALL

**Supported**                E4438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:ARB:MARKer:CLEar:ALL "<file_name>",<marker>
```

This command clears all marker points on a waveform segment for the selected marker (1–4). The dual ARB player and all of the ARB formats use this command. With all marker points cleared, the event output signal level is set low.

"<file\_name>"              This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN\_WAVEFORM file when clearing all marker points for the currently active ARB format. The ESG automatically creates a file, using current settings, and names it AUTOGEN\_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the dual ARB player. For information on the file name syntax, see [“File Name Variables” on page 13](#).

<marker>                    This variable selects the marker number; an integer value from one to four.

### Example

```
:RAD:ARB:MARK:CLE:ALL "Test_Data",1
```

The preceding example clears marker 1 from the all waveform points in the Test\_Data file.

**Range**                    1–4  
**Key Entry**                **Marker 1 2 3 4    Set Marker Off All Points**

**:MARKer:ROtate**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:MARKer:ROtate "<file_name>", <rotate_count>
```

This command shifts the marker points for all markers in a waveform segment earlier or later by the value of the <rotate\_count> variable. The dual ARB player and all of the ARB formats use this command.

You can use a positive or negative value. When a marker point is close to the end of the waveform and the <rotate\_count> value is greater than the number of remaining marker points, but less than the total number of marker points, the marker points that would move beyond the end of the waveform wrap to the beginning of the waveform. For example, if a marker point resides at sample point 195 out of 200, and the <rotate\_count> value is twenty-five, the marker point wraps to the beginning of the waveform and continues out to the twentieth waveform point.

To set the marker points in a waveform, refer to “:MARKer:[SET]” on page 302.

"<file\_name>" This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN\_WAVEFORM file when rotating marker points for the currently active ARB format and then save the file using a different file name. The ESG automatically creates a file, using current settings, and names it AUTOGEN\_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the dual ARB player. For information on the file name syntax, see “File Name Variables” on page 13.

**Example**

```
:RAD:ARB:MARK:ROT "Test_Data", 100
```

The preceding example shifts all markers set in the Test\_Data file 100 points later. If the first set point in the file is at 50, then after sending this command, the first set point will be 150 (assuming the Test\_Data file has at least 150 points) and no later set points wrapped around to the beginning of the file.

**Range**  $-(n - 1)$  to  $(n - 1)$   
 $n$  = number of points in the waveform

**:MARKer:[SET]**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:MARKer: [SET] "<file_name>", <marker>, <first_point>, <last_point>, <skip_count>
```

This command sets a single marker point or a range of marker points on a waveform segment for the selected marker (1–4). The dual ARB player and all of the ARB formats use this command.

The ESG provides four independent markers. Each marker routes an output signal to the rear-panel event connector number (BNC—EVENT 1 and EVENT 2 or AUXILIARY I/O—EVENT 3 and EVENT 4) that corresponds to the marker number. A marker consists of marker points placed at defined sample points in a waveform segment. This means that a marker point cannot be less than one or greater than the last sample point in the waveform. Marker points are cumulative, so multiple command executions with different range values, without first clearing the existing points, places additional marker points on the waveform. Because of this cumulative behavior, it is a good practice to clear existing marker points prior to setting new points. This will eliminate unexpected marker pulses. Refer to “:MARKer:CLEar” on page 300 and “:MARKer:CLEar:ALL” on page 301 for information on clearing marker points.

For waveforms generated on the signal generator (baseband generator), the ESG automatically places a marker point at the first waveform sample for markers one and two.

---

**NOTE** You can set markers for either positive or negative polarity. The following discussions for this command assume positive marker polarity. When using negative marker polarity, the marker pulses occur during the periods of no marker points.

---

There are three ways to place marker points using this command:

- consecutive marker points over a range that collectively create a single marker pulse that spans the range
- equally spaced marker points over a range, so that a marker pulse occurs at each sample point that coincides with a marker point (Using this method, you can configure a clock signal by setting the <skip\_count> variable to one.)
- a single marker point placed at a specific sample point in the waveform, which outputs a single pulse relative to the marker point location (To configure a single marker point, set the first and last points to the same number.)

For more information on markers, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command variables:

"<file\_name>" This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN\_WAVEFORM file when setting marker points for the currently active ARB format and then save the file using a different file name. The ESG automatically creates a file, using current settings, and names it AUTOGEN\_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the

dual ARB player. For information on the file name syntax, see “File Name Variables” on page 13.

- <marker> This variable selects the marker number; an integer value from one to four.
- <first\_point> This variable defines the first point in the range over which the marker is placed. This number must be greater than or equal to one, and less than or equal to the total number of waveform points.  
  
If you enter a value for either the first marker point or the last marker point that would make the first marker point occur after the last, the last marker point is automatically adjusted to match the first marker point.
- <last\_point> This variable defines the last point in the range over which the marker will be placed. This value must be greater than or equal to the first point, and less than or equal to the total number of waveform points.
- <skip\_count> This variable defines the marker point pattern across the range. A zero value means the marker points occur consecutively across the range. A value greater than zero creates a repeating marker point pattern across the range, where the gap between the marker points is equal to the <skip\_count> value. The gaps begin after the first marker point. Each marker point in the pattern, which is only one point wide, produces a marker pulse.

**Example**

```
:RAD:ARB:MARK "Test_Data",1,40,100,2
```

The preceding example sets marker 1 on the first point, 40, the last point, 100, and every third point (skip 2) between 40 and 100 (assuming the Test\_Data file has at least 100 points).

**Range**

- <marker>: 1–4
- <first\_Point>: 1–number of waveform points
- <last\_point>: <first\_Point>–number of waveform points
- <skip\_count>: 0–number of points in the range

**Key Entry**

**Set Marker on Range Of Points**    **Marker 1 2 3 4**    **First Mkr Point**    **Last Mkr Point**  
**# Skipped Points**    **Apply to Waveform**



## :MDEStination:AAMPlitude

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:MDEStination:AAMPlitude NONE | M1 | M2 | M3 | M4  
[ :SOURce ] :RADio:ARB:MDEStination:AAMPlitude?
```

This command routes the selected marker to the Alternate Amplitude function. The `NONE` parameter clears the marker for the Alternate Amplitude function.

**\*RST** NONE

**Key Entry**        **None**    **Marker 1**    **Marker 2**    **Marker 3**    **Marker 4**

## :MDEStination:ALCHold

**Supported** E4438C with Option 001/601 or 002/602

---

**CAUTION**        Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURce ] :RADio:ARB:MDEStination:ALCHold NONE | M1 | M2 | M3 | M4  
[ :SOURce ] :RADio:ARB:MDEStination:ALCHold?
```

This command enables or disables the marker ALC hold function for the selected marker. For setting markers, see “[:MARKer:SET]” on page 302.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[:MPOlarity:MARKer1|2|3|4]” on page 308.

---

**NOTE**            Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings.

---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User’s Guide*. For setting the marker points, see “:MARKer:[SET]” on page 302.

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

\*RST NONE

**Example**

:RAD:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
<b>Remarks</b>	N/A				

**:MDEStination:PULSe**

**Supported** E4438C with Option 001/601 or 002/602

---

**CAUTION** The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

[:SOURce]:RADio:ARB:MDEStination:PULSe NONE|M1|M2|M3|M4  
[:SOURce]:RADio:ARB:MDEStination:PULSe?

This command enables or disables the marker pulse/RF blanking function for the selected marker.

This function automatically uses the ALC hold function, so there is no need to select both the ALC hold and pulse/RF blanking functions for the same marker.

---

**NOTE** Do not use ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 308.

---

**NOTE** Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “:MARKer:[SET]” on page 302 for setting the marker points.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

**NONE** This terminates the marker RF blanking/pulse function.

**M1–M4** These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

### Example

```
:RAD:ARB:MDES:PULS M2
```

The preceding example routes marker 2 to Pulse/RF Blanking.

```
*RST NONE
```

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
------------------	-------------	-----------------	-----------------	-----------------	-----------------

**:MPOLarity:MARKer1 | 2 | 3 | 4**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 NEGative | POSitive
[ :SOURce ] :RADio:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 ?
```

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

**Example**

```
:RAD:ARB:MPOL:MARK3 NEG
```

The preceding example sets the polarity for marker 3 to negative.

**\*RST** POS

Key Entry	Marker 1 Polarity Neg Pos	Marker 2 Polarity Neg Pos	Marker 3 Polarity Neg Pos
	Marker 4 Polarity Neg Pos		

**:NOISe:BFACTOR**

**Supported** E4438C with Option 403

```
[ :SOURce ] :RADio:ARB:NOISe:BFACTOR 1 | 2
[ :SOURce ] :RADio:ARB:NOISe:BFACTOR ?
```

This command sets the flat noise bandwidth for the real-time noise applied to the waveform.

- |   |  |
|---|--|
| 1 | This sets the noise bandwidth to at least 0.8 times the sample rate.                                     |
| 2 | This sets the noise bandwidth to at least 1.6 times the sample rate, with a maximum bandwidth of 80 MHz. |

---

**NOTE** For the bandwidth factor of 2, 50 MHz is the maximum sample rate. If 2 is the current selection, you cannot set the sample rate above 50 MHz, and if the sample rate is above 50 MHz, you cannot select 2. See “:SCLock:RATE” on page 313 for setting the sample rate.

The flat noise bandwidth increases with any oversampling by a factor equal to the oversampling amount.

---

### Example

```
:RAD:ARB:NOIS:BFAC 2
```

The preceding example sets the bandwidth factor to 2 and increases the flat noise bandwidth by at least 1.6 times the ARB sample clock rate.

```
*RST +1
```

**Key Entry**            **Noise Bandwidth Factor**

### **:NOIS:CBWidth**

**Supported**            E4438C with Option 403

```
[ :SOURCE ] :RADio:ARB:NOIS:CBWidth <val><unit>  
[ :SOURCE ] :RADio:ARB:NOIS:CBWidth?
```

This command selects the carrier bandwidth over which the additive white gaussian noise (AWGN) is applied. The noise power will be integrated over the selected bandwidth for the purposes of calculating carrier to noise ratio (C/N). The carrier bandwidth is limited to the ARB sample rate, but cannot exceed 80 MHz. For more information, refer to “:NOIS[:STATe]” and “:NOIS:BFACtor”.

```
*RST +1.00000000E+000
```

**Range**                1HZ–80 MHZ

**Key Entry**            **Carrier Bandwidth**

### **:NOIS:CN**

**Supported**            E4438C with Option 403

```
[ :SOURCE ] :RADio:ARB:NOIS:CN <val><unit>  
[ :SOURCE ] :RADio:ARB:NOIS:CN?
```

This command sets the carrier to noise ratio (C/N) in dB. The carrier power is defined as the total modulated signal power without noise power added. The noise power is applied over the specified bandwidth of the carrier signal. For more information, refer to “:NOIS:CBWidth” on page 309.

### Example

```
:RAD:ARB:NOIS:CN 50DB
```

The preceding example sets the carrier to noise ratio to 50 dB.

```
*RST +0.00000000E+000
```

**Range**                –100 to 100DB

**Key Entry**            **Carrier to Noise Ratio**

**:NOISe[:STATe]****Supported** E4438C with Option 403

```
[:SOURce]:RADio:ARB:NOISe[:STATe] ON|OFF|1|0
[:SOURce]:RADio:ARB:NOISe[:STATe]?
```

This command enables or disables adding real-time additive white gaussian noise (AWGN) to the carrier modulated by the waveform being played by the dual ARB waveform player. The noise bandwidth will be at least 0.8 times the sample rate, or 1.6 times the sample rate depending on the bandwidth factor. For information on the bandwidth factor, refer to “:NOISe:BFACtor”.

When the bandwidth factor is 2 and the sample rate is greater than 50 megasamples per/second, noise cannot be enabled. Maximum bandwidth cannot exceed 80 MHz. Any oversampling in the waveform increases the noise bandwidth by a factor equal to the oversampling.

**Example**

```
:RAD:ARB:NOIS ON
```

The preceding example applies real-time AWGN to the carrier.

```
*RST 0
```

**Key Entry** Real-time Noise Off On**:REFerence:EXTernal:FREQuency****Supported** E4438C with Option 001/601 or 002/602

```
[:SOURce]:RADio:ARB:REFerence:EXTernal:FREQuency <value>
[:SOURce]:RADio:ARB:REFerence:EXTernal:FREQuency?
```

This command enters the frequency of the applied external reference.

The variable <val> is expressed in units of Hertz (Hz–MHz).

```
*RST +1.00000000E+007
```

```
Range 2.5E5–1E8
```

**Key Entry** Reference Freq

**Remarks** The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “:REFerence[:SOURce]” on page 311.

**:REFerence[:SOURce]**

**Supported**            E4438C with Option 001/601 or 002/602  
[:SOURCE]:RADio:ARB:REFerence[:SOURce] INTernal|EXTernal  
[:SOURCE]:RADio:ARB:REFerence[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

**\*RST**                    INT  
**Key Entry**            **ARB Reference Ext Int**

**Remarks**            If the EXTernal choice is selected, the external frequency value *must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.  
  
Refer to “:REFerence:EXTernal:FREQuency” on page 310 to enter the external reference frequency.

**:RETRigger**

**Supported**            E4438C with Option 001/601 or 002/602  
[:SOURCE]:RADio:ARB:RETRigger ON|OFF|1|0|IMMediate  
[:SOURCE]:RADio:ARB:RETRigger?

This command enables or disables the ARB retriggering mode; the retrigger mode controls how the retriggering function performs while a waveform is playing.

ON (1)                    This choice specifies that if a trigger occurs while a waveform is playing, the waveform will retrigger at the end of the current waveform sequence and play once more.  
  
OFF (0)                    This choice specifies that if a trigger occurs while a waveform is playing, the trigger will be ignored.  
  
IMMediate                This choice specifies that if a trigger occurs while a waveform is playing, the waveform will reset and replay from the start immediately upon receiving a trigger.

**\*RST**                    ON  
**Key Entry**            **On   Off   Immediate**

**:RSCALing**

**Supported** E4438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:ARB:RSCALing <val>
```

```
[:SOURCE]:RADio:ARB:RSCALing?
```

This command adjusts the scaling value that is applied to a waveform while it is playing. The variable <val> is expressed as a percentage. Runtime scaling does not alter the waveform data file. For more information about runtime scaling, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

**Example**

```
:RAD:ARB:RSC 50
```

The preceding example applies a 50% scaling factor to the selected waveform.

**\*RST** +7.00000000E+001

**Range** 1–100

**Key Entry** **Waveform Runtime Scaling**

**Remarks** Runtime scaling does not alter the waveform data file.

**:SCALing**

**Supported** E84438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:ARB:SCALing "<file_name>", <val>
```

This command scales the designated "<file\_name>" waveform file while it is being played by the dual ARB player. The variable <val> is expressed as a percentage, 1–100%. For information on file name syntax, see [“File Name Variables” on page 13](#).

Scaling is additive and permanent. You cannot scale up. If you scale a waveform file by 60% and then scale it again to 80% you will scale down the 60% waveform file. For more information about waveform file scaling, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

**Example**

```
:RAD:ARB:SCAL "Test_Data", 50
```

The preceding example applies a 50% scaling factor to the Test\_Data waveform file.

**Range** 1–100

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.



<b>Key Entry</b>	<b>Scaling</b>	<b>Scale Waveform Data</b>
<b>Remarks</b>	Refer to “File Name Variables” on page 13 for information on the file name syntax.	

**:SCLock:RATE**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:SClock:RATE <val>
```

```
[ :SOURce ] :RADio:ARB:SClock:RATE?
```

This command sets the sample clock rate for the dual ARB format.

The variable <val> is expressed in units of hertz.

**\*RST** +1.00000000E+008

**Range** 1–1E8

**Key Entry** **ARB Sample Clock**

**:SEquence**

**Supported** All with Option 001/601 or 002/602

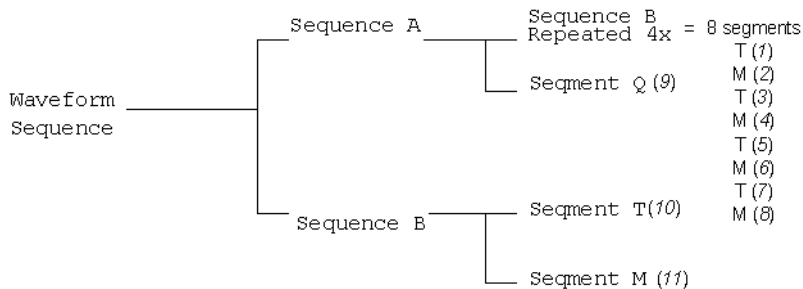
```
[ :SOURce ] :RADio:ARB:SEquence
```

```
"<file_name>", "<waveform1>", <reps>, NONE | M1 | M2 | M3 | M4 | M1M2 | M1M3 | M1M4 | M2M3 | M2M4 | M3M4 | M1M2M3 | M1M2M4 | M1M3M4 | M2M3M4 | ALL, { "<waveform2>", <reps>, NONE | M1 | M2 | M3 | M4 | M1M2 | M1M3 | M1M4 | M2M3 | M2M4 | M3M4 | M1M2M3 | M1M2M4 | M1M3M4 | M2M3M4 | ALL }
```

```
[ :SOURce ] :RADio:ARB:SEquence? "<file_name>"
```

This command creates a waveform sequence. A waveform sequence is made up of segments and other sequences. Any number of segments, up to a segment count limit of 32768, can be used to create a sequence. The count limit is determined by the number of segments in the waveform sequence. Repeated segments are included in the count limit.

For example, using the figure below, suppose a waveform is created using two sequences: Sequence\_A and Sequence\_B. Sequence\_A consists of Sequence\_B and Segment\_Q with Sequence\_B repeated four times. The total segment count for this waveform sequence would be eleven.



The query returns the contents and segment settings of the waveform sequence file

The segments and sequences play in the same order as placed into the waveform sequence by the command. Once you create the file, you cannot edit the segment settings or add further waveform segments unless you use the signal generator's front panel. Using the same waveform sequence name overwrites the existing file with that name. To use a segment's marker settings, you must enable the segment's markers within the segment or within the waveform sequence. A sequence is stored in the catalog of SEQ files USER/SEQ or SEQ: directory.

When you create a waveform sequence, the ESG also creates a file header for the sequence. This file header takes priority over segment or nested sequence file headers. Refer to the *E4428C/38C ESG Signal Generators User's Guide* for more information on file headers. To save the file header, see [":HEADer:SAVE" on page 297](#).

- "<file\_name>" This variable names the waveform *sequence* file. For information on the file name syntax, see ["File Name Variables" on page 13](#).
- "<waveform1>" This variable specifies the name of an existing waveform *segment* or sequence file. A waveform segment or the waveform segments in a specified sequence must reside in volatile memory, WFM1, before it can be played by the dual ARB player. For information on the file name syntax, see ["File Name Variables" on page 13](#), and for more information on waveform segments, see the *E4428C/38C ESG Signal Generators User's Guide*.
- "<waveform2>" This variable specifies the name of a second existing waveform *segment* or sequence file. The same conditions required for waveform1 apply for this segment or sequence. Additional segments and other sequences can be inserted into the file.
- <reps> This variable sets the number of times a segment or sequence plays (repeats) before the next segment or sequence plays.

NONE	This choice disables all four markers for the waveform. Disabling markers means that the waveform sequence ignores the segment's or sequence's marker settings.
M1, M2, M3, M4	These choices, either individually or a combination of them, enable the markers for the waveform segment or sequence. Markers not specified are ignored for that segment or sequence.
ALL	This choice enables all four markers in the waveform segment or sequence.

**Example**

```
:RAD:ARB:SEQ "SEQ:Test_Data","WFM1:ramp_test_wfm",25,M1M4,
"WFM1:sine_test_wfm",100,ALL
```

---

**NOTE** A carriage return or line feed is never included in a SCPI command. The example above contains a carriage return so that the text will fit on the page.

---

The preceding example creates a waveform sequence file named Test\_Data. This file consists of the factory-supplied waveform segments, ramp\_test\_wfm and sine\_test\_wfm. The waveform is stored in the signal generator's SEQ: directory.

- The first segment, ramp\_test\_wfm, has 25 repetitions with markers 1 and 4 enabled.
- The second segment, sine\_test\_wfm, has 100 repetitions with all four markers enabled.

**Range** <reps>: 1–65535

**Key Entry**      **Build New Waveform Sequence**    **Name and Store**      **Insert Waveform**  
**Edit Repetitions**    **Toggle Marker 1**    **Toggle Marker 2**    **Toggle Marker 3**  
**Toggle Marker 4**

**:TRIGger:TYPE**

**Supported**      E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:TRIGger:TYPE CONTInuous | SINGle | GATE | SADVance
[ :SOURce ] :RADio:ARB:TRIGger:TYPE?
```

This command sets the trigger mode (type) that controls the waveform's playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the

signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform's final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform's transmission.
- Setting the waveform's response to triggers:
  - CONTInuous, see [“:TRIGger:TYPE:CONTInuous\[:TYPE\]” on page 317](#)
  - SINGle, see [“:RETRigger” on page 311](#)
  - GATE, selecting the mode also sets the response
- Selecting the trigger source (see [“:TRIGger\[:SOURce\]” on page 320](#)), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
  - CONTInuous and SINGle see [“:TRIGger\[:SOURce\]:EXTErnal:SLOPe” on page 322](#)
  - GATE, see [“:TRIGger:TYPE:GATE:ACTive” on page 317](#)

For more information on triggering, see the *E4428C/38C ESG Signal Generators User's Guide*.

The following list describes the trigger type command choices:

CONTInuous	Upon triggering, the waveform repeats continuously.
SINGle	Upon triggering, the waveform segment or sequence plays once.
GATE	An external trigger signal repeatedly starts and stops the waveform's playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see <a href="#">“:TRIGger:TYPE:GATE:ACTive” on page 317</a> ). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

---

**NOTE** The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.

---

<b>*RST</b>	CONT			
<b>Key Entry</b>	<b>Continuous</b>	<b>Single</b>	<b>Gate</b>	<b>Segment Advance</b>

**:TRIGger:TYPE:CONTInuous[:TYPE]**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] FREE | TRIGger | RESet
[ :SOURce ] :RADio:ARB:TRIGger:TYPE:CONTInuous [ :TYPE ] ?
```

This commands selects the waveform’s response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see “:TRIGger:TYPE” on page 315.

The following list describes the waveform’s response to each of the command choices:

FREE	Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.
TRIGger	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.
RESet	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.
<b>*RST</b>	FREE
<b>Key Entry</b>	<b>Free Run</b> <b>Trigger &amp; Run</b> <b>Reset &amp; Run</b>

**:TRIGger:TYPE:GATE:ACTive**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB:TRIGger:TYPE:GATE:ACTive LOW | HIGH
[ :SOURce ] :RADio:ARB:TRIGger:TYPE:GATE:ACTive ?
```

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see “:TRIGger:TYPE” on page 315.

The following list describes the ESG’s gating behavior for the polarity selections:

LOW	The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state).
HIGH	The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state).
*RST	HIGH
<b>Key Entry</b>	<b>Gate Active Low High</b>

**:TRIGger:TYPE:SADVance[:TYPE]**

**Supported** E4438C with Option 001/601 or 002/602  
[:SOURce]:RADio:ARB:TRIGger:TYPE:SADVance[:TYPE] SINGLE|CONTinuous  
[:SOURce]:RADio:ARB:TRIGger:TYPE:SADVance[:TYPE] ?

This command customizes the segment advance trigger type setting.

SINGLE	This choice will play the next segment in the sequence only once.
CONTinuous	This choice will instruct the sequencer to continually play the next segments in the waveform sequence in a continuous pattern.
*RST	CONT
<b>Key Entry</b>	<b>Single    Continuous</b>

**Remarks** This command is valid when SADVance has been selected as the trigger type.  
To select SADVance as the trigger type, refer to “:TRIGger:TYPE” on page 315.

**:TRIGger:TYPE:SADVance[:TYPE]**

**Supported** E4438C with Option 001/601 or 002/602  
[:SOURce]:RADio:ARB:TRIGger:TYPE:SADVance[:TYPE] SINGLE|CONTinuous  
[:SOURce]:RADio:ARB:TRIGger:TYPE:SADVance[:TYPE] ?

This commands selects the waveform’s response to a trigger signal while using the segment advance (SADVance) trigger mode.

When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest. For more information on triggering and to select segment advance as the trigger mode, see “:TRIGger:TYPE” on page 315.

The following list describes the waveform’s response to each of the command choices:

- |            |  |
|------------|--|
| SINGle     | <p>Each segment in the sequence requires a trigger to play, and a segment plays only once, ignoring a segment’s repetition value (see “:SEQuence” on page 313 for repetition information). The following list describes a sequence’s playback behavior with this choice:</p> <ul style="list-style-type: none"><li>• After receiving the first trigger, the first segment plays to completion.</li><li>• When the waveform receives a trigger after a segment completes, the sequence advances to the next segment and plays that segment to completion.</li><li>• When the waveform receives a trigger during play, the current segment plays to completion. Then the sequence advances to the next segment, and it plays to completion.</li><li>• When the waveform receives a trigger either during or after the last segment in a sequence plays, the sequence resets and the first segment plays to completion.</li></ul> |
| CONTInuous | <p>Each segment in the sequence requires a trigger to play. After receiving a trigger, a segment plays continuously until the waveform receives another trigger. The following list describes a sequence’s playback behavior with this choice:</p> <ul style="list-style-type: none"><li>• After receiving the first trigger, the first segment plays continuously.</li><li>• A trigger during the current segment play causes the segment to play to the end of the segment file, then the sequence advances to the next segment, which plays continuously.</li><li>• When last segment in the sequence receives a trigger, the sequence resets and the first segment plays continuously.</li></ul>   |

**Example**

```
:RAD:ARB:TRIG:TYPE:SADV CONT
```

The preceding example selects the continuous segment advance mode.

<b>*RST</b>	<b>CONT</b>
<b>Key Entry</b>	<b>Single    Continuous</b>

**:TRIGger[:SOURce]**

**Supported** E4438C with Option 001/601 or 002/602

[:SOURce]:RADio:ARB:TRIGger[:SOURce] KEY|EXT|BUS

[:SOURce]:RADio:ARB:TRIGger[:SOURce]?

This command sets the trigger source.

For more information on triggering, see “:TRIGger:TYPE” on page 315. The following list describes the command choices:

**KEY** This choice enables manual triggering by pressing the front-panel **Trigger** hardkey.

**EXT** An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger:

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “:TRIGger[:SOURce]:EXTErnal[:SOURce]” on page 323.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.

- The trigger signal polarity:
  - gating mode, see “:TRIGger:TYPE:GATE:ACTive” on page 317
  - continuous and single modes, see “:TRIGger[:SOURce]:EXTErnal:SLOPe” on page 322
- The delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
  - setting the amount of delay, see “:TRIGger[SOURce]:EXTErnal:DELAy[:TIME]” on page 322 or “:TRIGger[:SOURce]:EXTErnal:DELAy:SAMPles” on page 321
  - turning the delay on, see “:TRIGger[:SOURce]:EXTErnal:DELAy:STATe” on page 321

**BUS** This choice enables triggering over the GPIB or LAN using the \*TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the \*TRG command.

**\*RST** EXT

**Key Entry**      **Trigger Key**      **Ext**      **Bus**



## **:TRIGger[:SOURCE]:EXTeRnal:DELAy:SAMPles**

**Supported**            E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTeRnal:DELAy:SAMPles <val>  
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTeRnal:DELAy:SAMPles?
```

This command sets the number of samples to delay the ESG's response to an external trigger.

The delay is between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of 100 samples, causes the ESG to wait 100 samples after receipt of the external trigger before the ESG plays the waveform. The delay does not occur until you select **SAMPles** as the delay type. For more information, see “[:TRIGger\[:SOURCE\]:EXTeRnal:DELAy:STATe](#)” on page 321). You can set the delay value either before or after selecting **SAMPles**.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURCE\]](#)” on page 320.

The unit of measurement for the variable <val> is in samples.

**\*RST**                    +0

**Range**                   0–100E6

**Key Entry**              **Ext Delay Samples**

## **:TRIGger[:SOURCE]:EXTeRnal:DELAy:STATe OFF | ON | 1 | 0**

**Supported**            E4438C with Option 001/601 or 002/602

---

**NOTE**                    Refer to the *Programming Compatibility Guide* for information on this command. This command was replaced by the “[:TRIGger\[:SOURCE\]:EXTeRnal:DELAy:STATe](#)” command.

---

## **:TRIGger[:SOURCE]:EXTeRnal:DELAy:STATe**

**Supported**            E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTeRnal:DELAy:STATe OFF | TIME |  
SAMPles  
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTeRnal:DELAy:STATe?
```

This command enables the delay feature by selecting the external trigger delay type or disables the external trigger delay function.

**TIME** Selects time as the delay value in units of nanoseconds to seconds. For setting the time delay value, see “[:TRIGger[:SOURCE]:EXTErnal:DELay[:TIME]]” on page 322.

**SAMPles** Selects samples as the delay value. For setting the sample delay value, see “[:TRIGger[:SOURCE]:EXTErnal:DELay:SAMPles]” on page 321.

For information on configuring an external source, see “[:TRIGger[:SOURCE]]” on page 320.

**\*RST** OFF

**Key Entry** Ext Delay Off Time Samples

### **:TRIGger[:SOURCE]:EXTErnal:DELay[:TIME]**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELay [ :TIME ] <val>
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTErnal:DELay [ :TIME ] ?
```

This command sets the amount of time to delay the ESG’s response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform. The delay does not occur until you select TIME as the delay type. For more information, see “[:TRIGger[:SOURCE]:EXTErnal:DELay:STATE]” on page 321. You can set the delay value either before or after selecting TIME.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger[:SOURCE]]” on page 320.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

**\*RST** +1.00000000E–003

**Range** 1E–8 to 4E1

**Key Entry** Ext Delay Time

### **:TRIGger[:SOURCE]:EXTErnal:SLOPe**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTErnal:SLOPe POSitive|NEGative
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXTErnal:SLOPe ?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “[:TRIGger:TYPE:GATE:ACTive]” on page 317.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 320.

<b>*RST</b>	NEG
<b>Key Entry</b>	<b>Ext Polarity Neg Pos</b>

### **:TRIGger[:SOURCE]:EXtErnal[:SOURCE]**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXtErnal [ :SOURCE ] EPT1 | EPT2 |
EPTRIGGER1 | EPTRIGGER2
[ :SOURCE ] :RADio:ARB:TRIGger [ :SOURCE ] :EXtErnal [ :SOURCE ] ?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 320. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

EPT1	This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.
EPT2	This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
EPTRIGGER1	This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.
EPTRIGGER2	This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
<b>*RST</b>	EPT1
<b>Key Entry</b>	<b>Patt Trig In 1      Patt Trig In 2</b>

### **:WAVeform**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:WAVeform "WFM1:file_name" | "SEQ:file_name"
```

```
[:SOURCE]:RADio:ARB:WAVEform?
```

This command selects a waveform file or sequence, for the dual ARB player to play. The file must be present in volatile memory, WFM1, or in the SEQ directory. If a file is in non-volatile memory (NVWFM), use the command “:COPY[:NAME]” on page 105 to copy the file to WFM1.

"WFM1:file\_name" This variable names a waveform file residing in volatile memory (WFM1:). For information on the file name syntax, see “File Name Variables” on page 13.

"SEQ:file\_name" This variable names a sequence file residing in the catalog of sequence files. For more information on the file name syntax, see “File Name Variables” on page 13.

### Example

```
:RAD:ARB:WAV "WFM1:Test_Data"
```

The preceding example selects the file Test\_Data from the list of files in volatile waveform memory, WFM1, and applies its file header settings.

**Key Entry**                    **Select Waveform**

## :Waveform:NHEAders

**Supported**                    E4438C with Option 001/601 or 002/602

```
[:SOURCE]:RADio:ARB:WAVEform:NHEAders "WFM1:file_name" | "SEQ:filename"
[:SOURCE]:RADio:ARB:WAVEform:NHEAders?
```

This command, for the dual ARB mode, allows for a fast selection of a segment or sequence waveform file. No header information or settings are applied to the segment or sequence waveform file when this command is used. This will improve the access or loading speed of the waveform file to approximately 100 mS for a single segment. The file must be in volatile waveform memory (WFM1), or in the SEQ directory. If a file is in non-volatile waveform memory (NVWFM), use the command “:COPY[:NAME]” on page 105 to copy files to WFM1.

"WFM1:file\_name" This variable names a waveform file residing in volatile memory:WFM1. For information on the file name syntax, see “File Name Variables” on page 13.

"SEQ:filename" This variable names a sequence file residing in the catalog of sequence files. For more information on the file name syntax, see “File Name Variables” on page 13.

### Example

```
:RAD:ARB:WAV:NHEA "Test_Data"
```

The preceding example selects the file Test\_Data, without applying header settings.

## [:STATe]

**Supported**                    E4438C with Option 001/601 or 002/602

**Dual ARB Subsystem—Option 001/601 or 002/602 ([:SOURce]:RADio:ARB)**

```
[:SOURce]:RADio:ARB[:STATe] ON|OFF|1|0  
[:SOURce]:RADio:ARB[:STATe] ?
```

This command enables or disables the arbitrary waveform generator function.

**\*RST**                    0

**Key Entry**            **ARB Off On**

---

## Multitone Subsystem—Option 001/601 or 002/602 ([:SOURce]:RADio:MTONe:ARB)

### Creating a Multitone Waveform

Use the following steps to create a multitone waveform:

1. Initialize the phase for the multitone waveform. Refer to “:SETup:TABLE:PHASe:INITialize” on page 338.
2. Assign the frequency spacing between the tones. Refer to “:SETup:TABLE:FSPacing” on page 337.
3. Define the number of tones within the waveform. Refer to “:SETup:TABLE:NTONes” on page 337.
4. Modify the power level, phase, and state of any individual tones. Refer to “:ROW” on page 334.

### :HEADer:CLEAr

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURce ] :RADio:MTONe:ARB:HEADer:CLEAr

This command clears the header information from the file header used by this modulation format.

**Key Entry** **Clear Header**

**Remarks** The **Multitone Off On** softkey must be set to On for this command to function.

### :HEADer:SAVE

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURce ] :RADio:MTONe:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

**Key Entry** **Save Setup To Header**

**Remarks** The **Multitone Off On** softkey must be set to On for this command to function.

**:IQ:EXternal:FILTer**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:MTONE:ARB:IQ:EXternal:FILTer 40e6 | THROugh
[ :SOURCE ] :RADio:MTONE:ARB:IQ:EXternal:FILTer?
```

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter using this command will automatically set “:IQ:EXternal:FILTer:AUTO” on [page 327](#) to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THROugh This choice bypasses filtering.

**\*RST** THR

**Key Entry** 40.000 MHz Through

**:IQ:EXternal:FILTer:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:MTONE:ARB:IQ:EXternal:FILTer:AUTO ON | OFF | 1 | 0
[ :SOURCE ] :RADio:MTONE:ARB:IQ:EXternal:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel I/Q outputs.

ON(1) This choice will automatically select a digital modulation filter optimized for the current signal generator settings.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:EXternal:FILTer” on [page 327](#) for selecting a filter or through path.

**\*RST** 1

**Key Entry** I/Q Output Filter Manual Auto

**:IQ:MODulation:ATTen**

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURce ] :RADio:MTONe:ARB:IQ:MODulation:ATTen <val>

[ :SOURce ] :RADio:MTONe:ARB:IQ:MODulation:ATTen?

This command attenuates the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +2.00000000E+000

**Range** 0–40

**Key Entry** **Modulator Atten Manual Auto**

**:IQ:MODulation:ATTen:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURce ] :RADio:MTONe:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[ :SOURce ] :RADio:MTONe:ARB:IQ:MODulation:ATTen:AUTO?

This command enables or disables the I/Q attenuation auto mode.

ON (1) This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “:IQ:MODulation:ATTen” on page 328 for setting the attenuation value.

**\*RST** 1

**Key Entry** **Modulator Atten Manual Auto**



**:IQ:MODulation:FILTer**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONE:ARB:IQ:MODulation:FILTer 2.1e6 | 40e6 | THROugh
[ :SOURce ] :RADio:MTONE:ARB:IQ:MODulation:FILTer?
```

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter using this command will automatically set “:IQ:MODulation:FILTer:AUTO” on page 329 to OFF(0) mode.

2.1E6 This choice applies a 2.1 MHz baseband filter to the I/Q signals.

40E6 This choice applies a 40 MHz baseband filter to the I/Q signals.

THROugh This choice bypasses filtering.

**\*RST** THR

**Key Entry** 2.100 MHz 40.000 MHz Through

**:IQ:MODulation:FILTer:AUTO**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONE:ARB:IQ:MODulation:FILTer:AUTO ON | OFF | 1 | 0
[ :SOURce ] :RADio:MTONE:ARB:IQ:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1) This choice will automatically select a digital modulation filter.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:MODulation:FILTer” on page 329 for selecting a filter or through path.

**\*RST** 1

**Key Entry** I/Q Mod Filter Manual Auto

**:MDEStination:AAMPlitude**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONE:ARB:MDEStination:AAMPlitude NONE | M1 | M2 | M3 | M4
[ :SOURce ] :RADio:MTONE:ARB:MDEStination:AAMPlitude?
```

This command routes the selected marker to the Alternate Amplitude function. The NONE parameter clears the marker for the Alternate Amplitude function.

*RST	NONE				
Key Entry	None	Marker 1	Marker 2	Marker 3	Marker 4

**:MDEStination:ALCHold**

**Supported** E4438C with Option 001/601 or 002/602

---

**CAUTION** Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[:SOURce]:RADio:MTONe:ARB:MDEStination:ALCHold NONE|M1|M2|M3|M4
[:SOURce]:RADio:MTONe:ARB:MDEStination:ALCHold?
```

This command enables or disables the marker ALC hold function for the selected marker. For setting markers, see “:MARKer:[SET]” on page 302.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 333.

---

**NOTE** Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings.

---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “:MARKer:[SET]” on page 302.

NONE	This terminates the marker ALC hold function.
M1–M4	These are the marker choices. The ALC hold feature uses only one marker at a time.
*RST	NONE

### Example

```
:RAD:AWGB:ARB:MDES:ALCH M1
```

The preceding example routes marker 1 to the ALC Hold function.

<b>Key Entry</b>	<b>None</b>	<b>Marker 1</b>	<b>Marker 2</b>	<b>Marker 3</b>	<b>Marker 4</b>
<b>Remarks</b>	N/A				

## :MDEStination:PULSe

**Supported** E4438C with Option 001/601 or 002/602

---

**CAUTION** The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURce ] :RADio:MTONe:ARB:MDEStination:PULSe NONE | M1 | M2 | M3 | M4
[:SOURce]:RADio:MTONe:ARB:MDEStination:PULSe?
```

This command enables or disables the marker pulse/RF blanking function for the selected marker.

This function automatically incorporates the ALC hold function, so there is no need to select both the ALC hold and pulse/RF blanking functions for the same marker.

---

**NOTE** Do not use ALC hold for more than 100 ms, because it can affect the waveform's output amplitude.

---

The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker's polarity, see “:MPOLarity:MARKer1|2|3|4” on page 333.

---

**NOTE** Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “:MARKer:[SET]” on page 302 for setting the marker points.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

### Example

```
:RAD:ARB:MDES:PULS M2
```

The preceding example routes marker 2 to Pulse/RF Blanking.

```
*RST NONE
```

Key Entry	None	Marker 1	Marker 2	Marker 3	Marker 4
-----------	------	----------	----------	----------	----------

### **:MPOLarity:MARKer1 | 2 | 3 | 4**

**Supported**            E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONe:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 NEGative | POSitive
[ :SOURce ] :RADio:MTONe:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 ?
```

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

**\*RST**                    POS

**Key Entry**            **Marker 1 Polarity Neg Pos    Marker 2 Polarity Neg Pos    Marker 3 Polarity Neg Pos**  
**Marker 4 Polarity Neg Pos**

### **:REFerence:EXTernal:FREQuency**

**Supported**            E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONe:ARB:REFerence:EXTernal:FREQuency <val>
[ :SOURce ] :RADio:MTONe:ARB:REFerence:EXTernal:FREQuency ?
```

This command allows you to enter the frequency of the applied external reference.

The variable <val> is expressed in units of Hertz (Hz–MHz).

**\*RST**                    +1.00000000E+007

**Range**                    2.5E5–1E8

**Key Entry**            **Reference Freq**

**Remarks**            The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to  
[“:REFerence\[:SOURce\]” on page 333.](#)

### **:REFerence[:SOURce]**

**Supported**            E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONe:ARB:REFerence [ :SOURce ] INTernal | EXTernal
[ :SOURce ] :RADio:MTONe:ARB:REFerence [ :SOURce ] ?
```

This command selects either an internal or external reference for the waveform clock.

**Multitone Subsystem—Option 001/601 or 002/602 ([:SOURce]:RADio:MTONe:ARB)**

<b>*RST</b>	INT
<b>Key Entry</b>	ARB Reference Ext Int
<b>Remarks</b>	<p>If the EXTERNAL choice is selected, the external frequency <i>value must</i> be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.</p> <p>Refer to “:REFERENCE:EXTERNAL:FREQUENCY” on page 333 to enter the external reference frequency.</p>

**:ROW**

<b>Supported</b>	E4438C with Option 001/601 or 002/602
	<pre>[:SOURce]:RADio:MTONe:ARB:SETup:TABLE:ROW &lt;row_number&gt;, &lt;power&gt;, &lt;phase&gt;, &lt;state&gt; [:SOURce]:RADio:MTONe:ARB:SETup:TABLE:ROW? &lt;row_number&gt;</pre>
	This command modifies the indicated tone (row) of the multitone waveform.
<b>&lt;row_number&gt;</b>	The number of rows for this variable are determined by the :SETup:TABLE command.
	The variable <power> is expressed in units of decibels (dB).
	The variable <phase> is expressed in units of degrees (deg).
	Frequency offset, power, phase, and state value are returned when a query is initiated. The output format is as follows:
	<pre>&lt;frequency offset&gt;, &lt;power&gt;, &lt;phase&gt;, &lt;state&gt;</pre>
<b>*RST</b>	<pre>frequency offset: -3.50000000E+004      &lt;power&gt;: +0.00000000E+000 &lt;phase&gt;: +0.00000000E+000      &lt;state&gt;: 1</pre>
<b>Range</b>	<pre>frequency offset: -4E7 to 4E7      &lt;power&gt;: -80 to 0      &lt;phase&gt;: 0-359 &lt;state&gt;: 1</pre>
<b>Key Entry</b>	<b>Goto Row    Toggle State</b>
<b>Remarks</b>	<p>Refer to “:SETup:TABLE” on page 336 for information on how to change the number of rows.</p> <p>This command is the final step in creating a multitone waveform. Refer to “Creating a Multitone Waveform” on page 326 for all four steps.</p>

**:RSCAling**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:MTONe:ARB:RSCAling <val>
```

```
[ :SOURCE ] :RADio:MTONe:ARB:RSCAling?
```

This command adjusts the scaling value that is applied to the Multitone waveform while it is playing. The variable <val> is expressed as a percentage. Runtime scaling does not alter the waveform data file. For more information about runtime scaling, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

**Example**

```
:RAD:MTON:ARB:RSC 50
```

The preceding example applies a 50% scaling factor to the selected waveform.

**\*RST** +7.00000000E+001

**Range** 1–100

**Key Entry** **Waveform Runtime Scaling**

**Remarks** Runtime scaling does not alter the waveform data file.

**:SCLock:RATE**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:MTONe:ARB:SCLock:RATE <val>
```

```
[ :SOURCE ] :RADio:MTONe:ARB:SCLock:RATE?
```

This command sets the sample clock rate for the Multitone modulation format.

The variable <val> is expressed in units of hertz.

**\*RST** +1.00000000E+008

**Range** 1–1E8

**Key Entry** **ARB Sample Clock**

**Remarks** The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[:STATE]” on [page 339](#) to activate the modulation format.

**:SETup**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONE:ARB:SETup "<file name>"
```

```
[ :SOURce ] :RADio:MTONE:ARB:SETup?
```

This command retrieves a multitone waveform file.

**Key Entry** Load From Selected File

**Remarks** The name of a multitone waveform file is stored in the signal generator file system of MTONE files. This information is held in memory until you send the command that turns the waveform on.

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

**:SETup:STORe**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONE:ARB:SETup:STORe "<file name>"
```

This command stores the current multitone waveform setup in the signal generator file system of MTONE files.

**Key Entry** **Store To File**

**:SETup:TABLE**

**Supported** E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:MTONE:ARB:SETup:TABLE <freq_spacing>,
<num_tones>, {<phase>, <state>}
```

```
[ :SOURce ] :RADio:MTONE:ARB:SETup:TABLE?
```

This command creates and configures a multitone waveform.

The frequency offset, power, phase, and state value are returned when a query is initiated. The output format is as follows:

```
<frequency offset>, <power>, <phase>, <state>
```

The variable <freq\_spacing> is expressed in units of Hertz (Hz–MHz).

The variable <power> is expressed in units of decibels (dB).

*RST	Tone	<frequency offset>	<power>	<phase>	<state>
	Tone 1	-35000	+0.00000000E+000	+0	+1



## Multitone Subsystem—Option 001/601 or 002/602 ([:SOURCE]:RADio:MTONE:ARB)

*RST	Tone	<frequency offset>	<power>	<phase>	<state>
	Tone 2	-25000	+0.00000000E+000	+0	+1
	Tone 3	-15000	+0.00000000E+000	+0	+1
	Tone 4	-5000	+0.00000000E+000	+0	+1
	Tone 5	+5000	+0.00000000E+000	+0	+1
	Tone 6	+15000	+0.00000000E+000	+0	+1
	Tone 7	+25000	+0.00000000E+000	+0	+1
	Tone 8	+35000	+0.00000000E+000	+0	+1

**Range** <freq\_spacing> (2 tones): 1E4–8E7 <num\_tones>: 2–64  
 <freq\_spacing> (>2 tones): 1E4 to (80 MHz ÷ (num\_tones – 1))  
 <phase>: 0–359

**Key Entry** Freq Spacing      Number Of Tones      Toggle State

**Remarks** To set the frequency spacing, refer to “:SETup:TABLE:FSPacing” on page 337.

**:SETup:TABLE:FSPacing**

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:MTONE:ARB:SETup:TABLE:FSPacing <freq\_spacing>

[ :SOURCE ] :RADio:MTONE:ARB:SETup:TABLE:FSPacing?

This command sets the frequency spacing between the tones.

The variable <freq\_spacing> is expressed in units of Hertz (Hz–MHz).

\*RST +1.00000000E+004

**Range** <freq\_spacing> (2 tones): 1E4–8E7  
 <freq\_spacing> (>2 tones): 1E4 to (80 MHz ÷ (num\_tones – 1))

**Key Entry** Freq Spacing

**Remarks** To set frequency spacing and additional parameters required to create or configure a multitone waveform, refer to “:SETup:TABLE” on page 336.

This command is the second step in creating a multitone waveform. Refer to “Creating a Multitone Waveform” on page 326 for all four steps.

**:SETup:TABLE:NTONes**

**Supported** E4438C with Option 001/601 or 002/602

[ :SOURCE ] :RADio:MTONE:ARB:SETup:TABLE:NTONes <num\_tones>

[ :SOURCE ] :RADio:MTONE:ARB:SETup:TABLE:NTONes?

This command defines the number of tones in the multitone waveform.

<b>*RST</b>	+8
<b>Range</b>	2–64
<b>Key Entry</b>	<b>Number Of Tones</b>
<b>Remarks</b>	To specify the number of tones and additional parameters required to create or configure a multitone waveform, refer to “:SETup:TABLE” on page 336.  This command is the third step in creating a multitone waveform. Refer to “Creating a Multitone Waveform” on page 326 for all four steps.

**:SETup:TABLE:PHASe:INITialize**

<b>Supported</b>	E4438C with Option 001/601 or 002/602
	[ :SOURCE ] :RADio:MTONe:ARB:SETup:TABLE:PHASe:INITialize FIXed RANDOM [ :SOURCE ] :RADio:MTONe:ARB:SETup:TABLE:PHASe:INITialize?

This command initializes the phase in the multitone waveform table.

<b>FIXed</b>	This choice sets the phase of all tones to the fixed value of 0 degrees.
<b>RANDom</b>	This choice sets the phase of all tones to random values based on the setting on the random seed generator.
<b>*RST</b>	FIX

**Key Entry**      **Initialize Phase Fixed Random**

**Remarks**      To change the random number generator seed value, refer to “:SETup:TABLE:PHASe:INITialize:SEED” on page 338.  
  
This command is the first step in creating a multitone waveform. Refer to “Creating a Multitone Waveform” on page 326 for all four steps.

**:SETup:TABLE:PHASe:INITialize:SEED**

<b>Supported</b>	E4438C with Option 001/601 or 002/602
	[ :SOURCE ] :RADio:MTONe:ARB:SETup:TABLE:PHASe:INITialize:SEED FIXed RANDOM [ :SOURCE ] :RADio:MTONe:ARB:SETup:TABLE:PHASe:INITialize:SEED?

This command initializes the random number generator seed that is used to generate the random phase values for the multitone waveform.

<b>FIXed</b>	This choice sets the random number generator seed to a fixed value.
<b>RANDom</b>	This choice sets the random number generator seed to a random value. This changes the phase value after each initialization of the phase.

**Multitone Subsystem—Option 001/601 or 002/602 (:SOURce:RADio:MTONE:ARB)**

**\*RST**                   FIX

**Key Entry**           **Random Seed Fixed Random**

**[:STATe]**

**Supported**           E4438C with Option 001/601 or 002/602

[ :SOURce ] :RADio:MTONE:ARB [ :STATe ] ON | OFF | 1 | 0

[ :SOURce ] :RADio:MTONE:ARB [ :STATe ] ?

This command enables or disables the multitone waveform generator function.

**\*RST**                   0

**Key Entry**           **Multitone Off On**

## Wideband CDMA ARB Subsystem–Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)

### :CLIPping:I

**Supported** E4438C with Option 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:I <val>
```

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:I?
```

This command limits the modulation level of the waveform's I component to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100

**Key Entry** **Clip |I| To**

### :CLIPping:POSition

**Supported** E4438C with Option 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:POSition PRE|POST
```

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:POSition?
```

This command specifies whether a waveform is clipped before (PRE) or after (POST) FIR filtering.

**\*RST** PRE

**Key Entry** **Clip At PRE POST FIR Filter**

### :CLIPping:Q

**Supported** E4438C with Option 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:Q <val>
```

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:Q?
```

This command limits the modulation level of the waveform's Q component to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100  
**Key Entry** **Clip |Q| To**

**:CLIPping:TYPE**

**Supported** E4438C with Option 400

```
[:SOURCE]:RADIO:WCDMA:TGPP:ARB:CLIPping:TYPE IJQ|IORQ
[:SOURCE]:RADIO:WCDMA:TGPP:ARB:CLIPping:TYPE?
```

This command selects either IJQ or IORQ as the clipping type.

**IJQ** The combined I and Q waveform will be clipped (*circular clipping*).

**IORQ** The I and Q components of the waveform are clipped independently (*rectangular clipping*). I and Q can be clipped to different levels using this mode.

**\*RST** IJQ

**Key Entry** **Clipping Type |I+jQ| |I|,|Q|**

**:CLIPping[:IJQ]**

**Supported** E4438C with Option 400

```
[:SOURCE]:RADIO:WCDMA:TGPP:ARB:CLIPping[:IJQ] <val>
[:SOURCE]:RADIO:WCDMA:TGPP:ARB:CLIPping[:IJQ]?
```

This command clips (limits) the modulation level of the combined I and Q waveform to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

**Range** 10–100

**Key Entry** **Clip |I+jQ| To**

**:CRATe**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:CRATe <val>
```

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:CRATe?
```

This command sets the chip rate value.

**\*RST** +3.84000000E+006

**Range** 3456000–4224000

**Key Entry** **Chip Rate**

**:FILTer**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:FILTer RNYquist | NYquist | GAUSSian |  
RECTangle | WCDMA | AC4Fm | IS2000SR3DS | UGGaussian | "<user FIR>"
```

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:FILTer?
```

This command selects the pre-modulation filter type.

**WCDMA** This choice selects a 0.22 Nyquist filter optimized for ACP.

**AC4Fm** This choice selects a predefined Association of Public Safety Communications Officials (APCO) specified compatible 4-level frequency modulation (C4FM) filter.

**IS2000SR3DS** This choice selects an IS-2000 standard, spread rate 3 direct spread filter.

**UGGaussian** This choice selects a backwards compatible GSM Gaussian filter (Gaussian filter with a fixed BbT value of 0.300) for the ESG E44xxB Option UN3 or UN4.

**"<user FIR>"** This variable is any FIR filter file that you have stored in memory. The variable needs no directory path indicating the location of the file, such as **FIR:** or **/USER/FIR**. The command assumes the **FIR** directory. Refer to [“File Name Variables” on page 13](#) for more information on file names.

**\*RST** NYQ

<b>Key Entry</b>	<b>Root Nyquist</b>	<b>Nyquist</b>	<b>Gaussian</b>	<b>Rectangle</b>	<b>WCDMA</b>
	<b>APCO 25 C4FM</b>	<b>IS-95</b>	<b>UN3/4 GSM Gaussian</b>	<b>IS-2000 SR3 DS</b>	
	<b>User FIR</b>				

**:FILTer:ALPHa**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADIo:WCDMa:TGPP:ARB:FILTer:ALPHa <val>
```

```
[ :SOURCE ] :RADIo:WCDMa:TGPP:ARB:FILTer:ALPHa?
```

This command sets the alpha value for the Nyquist or root Nyquist filter.

The filter alpha value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +2.20000000E–001

**Range** 0.000–1.000

**Key Entry** **Filter Alpha**

**Remarks** To change the current filter type, refer to “:FILTer” on page 342.

**:FILTer:BBT**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADIo:WCDMa:TGPP:ARB:FILTer:BBT <val>
```

```
[ :SOURCE ] :RADIo:WCDMa:TGPP:ARB:FILTer:BBT?
```

This command changes the bandwidth-multiplied-by-bit-time (BbT) filter parameter.

The filter BbT value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

**\*RST** +5.00000000E–001

**Range** 0.000–1.000

**Key Entry** **Filter BbT**

**Remarks** This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.

To change the current filter type, refer to “:FILTer” on page 342.

**:FILTer:CHANnel**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:FILTer:CHANnel EVM|ACP
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:FILTer:CHANnel?
```

This command optimizes the Nyquist and root Nyquist filters to minimize error vector magnitude (EVM) or to minimize adjacent channel power (ACP).

**EVM** This choice provides the most ideal passband.

**ACP** This choice improves stopband rejection.

**\*RST** ACP

**Key Entry** **Optimize FIR For EVM ACP**

**Remarks** To change the current filter type, refer to “:FILTer” on page 342.

**:HEADer:CLEAr**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:HEADer:CLEAr
```

This command clears the header information from the file header used by this modulation format.

**Key Entry** **Clear Header**

**Remarks** The **W-CDMA Off On** softkey must be set to On for this command to function.

**:HEADer:SAVE**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:HEADer:SAVE
```

This command saves the header information to the file header used by this modulation format.

**Key Entry** **Save Setup To Header**

**Remarks** The **W-CDMA Off On** softkey must be set to On for this command to function.

**:IQ:EXTErnal:FILTer**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:IQ:EXTErnal:FILTer 40e6|THROUGH
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:IQ:EXTErnal:FILTer?
```



**Wideband CDMA ARB Subsystem—Option 400 ([:SOURCE]:RADIO:WCDMA:TGPP:ARB)**

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter using this command will automatically set “:IQ:EXTERNAL:FILTER:AUTO” on [page 345](#) to OFF(0) mode.

40e6                      This choice applies a 40 MHz baseband filter.

THRough                This choice bypasses filtering.

\*RST                    THR

**Key Entry            40.000 MHz      Through**

**:IQ:EXTERNAL:FILTER:AUTO**

**Supported            E4438C with Option 400**

```
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:IQ:EXTERNAL:FILTER:AUTO ON|OFF|1|0
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:IQ:EXTERNAL:FILTER:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals routed to the rear panel I/Q outputs.

ON(1)                    This choice will automatically select a digital modulation filter optimized for the current signal generator settings.

OFF(0)                   This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “:IQ:EXTERNAL:FILTER” on [page 344](#) for selecting a filter or through path.

\*RST                    1

**Key Entry            I/Q Output Filter Manual Auto**

**:IQMap**

**Supported            E4438C with Option 400**

```
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:IQMap NORMAL|INVERT
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:IQMap?
```

This command selects whether or not the I/Q outputs will be inverted.

NORMAL                This choice selects normal polarity.

INVERTed               This choice inverts the internal Q signal.

\*RST                    NORM

**Key Entry            I/Q Mapping Normal Invert**

**:IQ:MODulation:ATTen****Supported** E4438C with Option 400

[:SOURce]:RADio:WCDMa:TGPP:ARB:IQ:MODulation:ATTen &lt;val&gt;

[:SOURce]:RADio:WCDMa:TGPP:ARB:IQ:MODulation:ATTen?

This command attenuates the I/Q signals being modulated through the signal generator RF path.

The variable <val> is expressed in units of decibels (dB).

**\*RST** +2.00000000E+00**Range** 0–40**Key Entry** **Modulator Atten Manual Auto****:IQ:MODulation:ATTen:AUTO****Supported** E4438C with Option 400

[:SOURce]:RADio:WCDMa:TGPP:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[:SOURce]:RADio:WCDMa:TGPP:ARB:IQ:MODulation:ATTen:AUTO?

This command enables or disables the I/Q attenuation auto mode.

ON (1) This choice enables the attenuation auto mode which optimizes the modulator attenuation for the current conditions.

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “:IQ:MODulation:ATTen” on page 346 for setting the attenuation value.

**\*RST** 1**Key Entry** **Modulator Atten Manual Auto****:IQ:MODulation:FILTer****Supported** E4438C with Option 400

[:SOURce]:RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTer 2.1e6|40e6|THROUGH

[:SOURce]:RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTer?

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter using this command will automatically set “:IQ:MODulation:FILTer:AUTO” on page 347 to OFF(0) mode.

2.1E6 This choice applies a 2.1 MHz baseband filter to the I/Q signals.

40E6 This choice applies a 40 MHz baseband filter to the I/Q signals.

THROUGH This choice bypasses filtering.

**\*RST**                    THR  
**Key Entry**            2.100 MHz    40.000 MHz    Through

### **:IQ:MODulation:FILTer:AUTO**

**Supported**            E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTer:AUTO ON|OFF|1|0
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTer:AUTO?
```

This command enables or disables the automatic selection of the filters for I/Q signals modulated onto the RF carrier.

ON(1)                    This choice will automatically select a digital modulation filter.

OFF(0)                   This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “[:IQ:MODulation:FILTer](#)” on page 346 for selecting a filter or through path.

**\*RST**                    1  
**Key Entry**            **I/Q Mod Filter Manual Auto**

### **:LINK**

**Supported**            E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK DOWN|UP
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK?
```

This command selects either a downlink or uplink channel configuration.

**\*RST**                    DOWN  
**Key Entry**            **Link Down Up**

### **:LINK:DOWN:OACP**

**Supported**            E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:OACP ADJ|ALT
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:OACP?
```

This command selects the channel power optimization type for any downlink channel W-CDMA setup.

ADJ                      This choice optimizes for adjacent channel power.

ALT                      This choice optimizes for alternate channel power.

<b>*RST</b>	ADJ
<b>Key Entry</b>	<b>Optimize ACP ADJ ALT</b>
<b>Remarks</b>	This command is operational for any downlink channel W-CDMA setup. To change the current W-CDMA setup information, refer to “:LINK:DOWN:SETup” on page 348.

**:LINK:DOWN:SETup**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup DPCH1 | DPCH3 | PPSCH |
PPDPCH1 | PPDPCH3 | TM1D16 | TM1D32 | TM1D64 | TM2 | TM3D16 | TM3D32 | TM4 | TM5H2 | TM5H4 |
TM5H8 | MCArrier | "<file name>"
```

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup?
```

This command selects a predefined channel setup or multicarrier, and turns multicarrier off or on (see the MCArrier choice description).

DPCH1	This choice selects 1 dedicated physical channel.
DPCH3	This choice selects 3 dedicated physical channels.
PPSCH	This choice selects a primary command control physical channel (PCCPCH) with a synchronization channel (SCH).
PPDPCH1	This choice selects a primary command control physical channel (PCCPCH) with a dedicated physical channel (DPCH).
PPDPCH3	This choice selects a primary command control physical channel (PCCPCH) with 3 dedicated physical channels.
TM1D16	This choice selects a Test Model 1 with 16 dedicated physical channels.
TM1D32	This choice selects a Test Model 1 with 32 dedicated physical channels.
TM1D64	This choice selects a Test Model 1 with 64 dedicated physical channels.
TM2	This choice selects a Test Model 2 downlink W-CDMA setup.
TM3D16	This choice selects a Test Model 3 with 16 dedicated physical channels.
TM3D32	This choice selects a Test Model 3 with 32 dedicated physical channels.
TM4	This choice selects a Test Model 4 downlink W-CDMA setup.
TM5H2	This choice selects a Test Model 5 with 6 DPCH and 2 HS-PDSCH (high speed physical shared channel) channels downlink W-CDMA setup.
TM5H4	This choice selects a Test Model 5 with 14 DPCH and 4 HS-PDSCH (high

## Wideband CDMA ARB Subsystem—Option 400 ([:SOURCE]:RADIO:WCDMA:TGPP:ARB)

	speed-physical downlink shared channel) channels downlink W-CDMA setup.																								
TM5H8	This choice selects a Test Model 5 with 30 DPCH and 8 HS-PDSCH (high speed physical shared channel) channels downlink WCDMA setup.																								
MCARrier	This choice selects multicarrier and turns it on. Selecting any other setup such as DPCH1 or TM1D16 turns multicarrier off. To select the multicarrier setup, see “:LINK:DOWN:SETup:MCARrier”.																								
"<file name>"	This choice selects a user-defined channel setup file. Refer to “File Name Variables” on page 13 for information on the file name syntax.																								
*RST	DPCH1																								
Key Entry	<table> <tr> <td>1 DPCH</td> <td>3DPCH</td> <td>PCCPCH + SCH</td> <td>PCCPCH + SCH + 1 DPCH</td> </tr> <tr> <td>PCCPCH + SCH + 3 DPCH</td> <td></td> <td>Test Model 1 w/ 16 DPCH</td> <td></td> </tr> <tr> <td>Test Model 1 w/ 32 DPCH</td> <td></td> <td>Test Model 1 w/ 64 DPCH</td> <td>Test Model 2</td> </tr> <tr> <td>Test Model 3 w/ 16 DPCH</td> <td></td> <td>Test Model 3 w/ 32 DPCH</td> <td>Test Model 4</td> </tr> <tr> <td>Test Model 5 w/2HSPDSCH</td> <td></td> <td>Test Model 5 w/4HSPDSCH</td> <td></td> </tr> <tr> <td>Test Model 5 w/ 8HSPDPCH</td> <td></td> <td>Multicarrier Off On</td> <td>Custom W-CDMA State</td> </tr> </table>	1 DPCH	3DPCH	PCCPCH + SCH	PCCPCH + SCH + 1 DPCH	PCCPCH + SCH + 3 DPCH		Test Model 1 w/ 16 DPCH		Test Model 1 w/ 32 DPCH		Test Model 1 w/ 64 DPCH	Test Model 2	Test Model 3 w/ 16 DPCH		Test Model 3 w/ 32 DPCH	Test Model 4	Test Model 5 w/2HSPDSCH		Test Model 5 w/4HSPDSCH		Test Model 5 w/ 8HSPDPCH		Multicarrier Off On	Custom W-CDMA State
1 DPCH	3DPCH	PCCPCH + SCH	PCCPCH + SCH + 1 DPCH																						
PCCPCH + SCH + 3 DPCH		Test Model 1 w/ 16 DPCH																							
Test Model 1 w/ 32 DPCH		Test Model 1 w/ 64 DPCH	Test Model 2																						
Test Model 3 w/ 16 DPCH		Test Model 3 w/ 32 DPCH	Test Model 4																						
Test Model 5 w/2HSPDSCH		Test Model 5 w/4HSPDSCH																							
Test Model 5 w/ 8HSPDPCH		Multicarrier Off On	Custom W-CDMA State																						

**:LINK:DOWN:SETup:MCARrier**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier CAR2 | CAR3 | CAR4 |
CAR4TM1D64 | "<file name>"
```

```
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier?
```

This command defines the type of multicarrier W-CDMA setup.

CAR2 a standard 2-carrier setup with the following settings:

Carrier 1: PCCPCH + SCH, -7.5 MHz frequency offset, 0 dB power

Carrier 2: PCCPCH + SCH, 7.5 MHz frequency offset, 0 dB power

CAR3 a standard 3-carrier setup with the following settings:

Carrier 1: PCCPCH + SCH, -5 MHz frequency offset, 0 dB power

Carrier 2: PCCPCH + SCH, 0 kHz frequency offset, 0 dB power

Carrier 3: PCCPCH + SCH, 5 MHz frequency offset, 0 dB power

CAR4	a standard 4-carrier setup with the following settings:  Carrier 1: PCCPCH + SCH, -7.5 MHz frequency offset, 0 dB power Carrier 2: PCCPCH + SCH, -2.5 MHz frequency offset, 0 dB power Carrier 3: PCCPCH + SCH, 2.5 MHz frequency offset, 0 dB power Carrier 4: PCCPCH + SCH, 7.5 MHz frequency offset, 0 dB power
CAR4TM1D64	a standard 4-carrier test model 1 with 64 dedicated physical channels setup with the following settings:  Carrier 1: Test Model 1 w/64 DPCH, -7.5 MHz frequency offset, 0 dB power Carrier 2: Test Model 1 w/64 DPCH, -2.5 MHz frequency offset, 0 dB power Carrier 3: Test Model 1 w/64 DPCH, 2.5 MHz frequency offset, 0 dB power Carrier 4: Test Model 1 w/64 DPCH, 7.5 MHz frequency offset, 0 dB power
<b>*RST</b>	CAR2
<b>Key Entry</b>	<b>2 Carriers    3 Carriers    4 Carriers</b>
<b>Remarks</b>	Refer to <a href="#">“File Name Variables” on page 13</a> for information on the file name syntax.

**:LINK:DOWN:SETup:MCARrier:CLIPping:I**

<b>Supported</b>	E4438C with Option 400
	<code>[:SOURce]:RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:I &lt;val&gt;</code> <code>[:SOURce]:RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:I?</code>
	This command limits the modulation level of the waveform’s I component to a percentage of full scale.
	The variable <val> is expressed in units of percent.
<b>*RST</b>	+1.00000000E+002
<b>Range</b>	10–100
<b>Key Entry</b>	<b>Clip  I  To</b>

**:LINK:DOWN:SETup:MCARrier:CLIPping:Q****Supported** E4438C with Option 400

[:SOURCE]:RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:Q &lt;val&gt;

[:SOURCE]:RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:Q?

This command limits the modulation level of the waveform's Q component to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002**Range** 10–100**Key Entry** **Clip | Q | To****:LINK:DOWN:SETup:MCARrier:CLIPping:TYPE****Supported** E4438C with Option 400

[:SOURCE]:RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:

TYPE IJQ | IORQ

[:SOURCE]:RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:TYPE?

This command selects either IJQ or IORQ as the clipping type.

**IJQ** The combined I and Q waveform will be clipped (*circular* clipping).**IORQ** The I and Q components of the waveform are clipped independently (*rectangular* clipping). I and Q can be clipped to different levels using this mode.**\*RST** IJQ**Key Entry** **Clipping Type |I+jQ| |I|,|Q|****:LINK:DOWN:SETup:MCARrier:CLIPping[:IJQ]****Supported** E4438C with Option 400

[:SOURCE]:RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:

CLIPping[:IJQ] &lt;val&gt;

[:SOURCE]:RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping[:IJQ]?

This command clips (limits) the modulation level of the combined I and Q waveform to a percentage of full scale.

The variable <val> is expressed in units of percent.

**\*RST** +1.00000000E+002

<b>Range</b>	10–100
<b>Key Entry</b>	<b>Clip  I+jQ  To</b>

**:LINK:DOWN:SETup:MCARrier:SCODE:AINCrement**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:SCODE:AINCrement
```

This command will sort carriers by frequency offset and auto-increment scramble codes starting from the current scramble code value for the lowest frequency carrier.

**Key Entry** **Increment Scramble Code**

**Remarks** If the lowest frequency carrier has a scramble code value of N/A, the auto-increment value will start at 0.

**:LINK:DOWN:SETup:MCARrier:STORE**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:STORE "<file name>"
```

This command stores the current multicarrier setup information.

The stored file contains information including the digital modulation format, number of carriers, frequency spacing, and power settings for the multicarrier setup.

**Key Entry** **Store Custom Multicarrier**

**Remarks** User defined files created using firmware prior to C.02.40 did not save the setting for Increment Scramble Code, Increment Timing Offset, and Clipping Type settings. When loading user defined files created with firmware prior to C.02.40, Increment Scramble Code and Increment Timing Offset will default to Off and the Clipping Type settings will default to 100%. Firmware C.02.40 will save the Increment Scramble Code, Increment Timing Offset and Clipping Type settings.

Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.



**:LINK:DOWN:SETup:MCARrier:TABLE****Supported** E4438C with Option 400

```
[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:TABLE INIT|
APPend|<carrier_num>,DPCH1|DPCH3|PPSCH|PPDPCH1|PPDPCH3|TM1D16|TM1D32|
TM1D64|TM2|TM3D16|TM3D32|TM4|TM5H2|TM5H4|TM5H8|"<filename>",<freq_offset
>,<power>[,<scramble code>,<timing offset>,<initial phase>,<pre-FIR circular clipping>[<clipping units {pct}|dB>],
<post-FIR circularclipping>[<clipping units {pct}|dB>]]
[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:
TABLE? <carrier_num>
```

This command defines the multicarrier format and waveform.

Use INIT to clear the table and define the parameters for the first carrier; use APPend to add new channels. To edit an existing carrier, use its carrier number (<carrier\_num>).

The variable <freq\_offset> is expressed in units of Hertz (kHz–MHz).

The variable <power> is expressed in units of decibels (dB).

The carrier type, frequency offset, and power level are returned when a query is initiated. The output format is as follows:

```
<carrier type>,<freq_offset>,<power>
```

INIT	This choice clears the current information and creates a new one-row table, allowing for further definition using additional parameters.
APPend	This choice adds rows to an existing table. The maximum number of rows for one table is 16.
DPCH1	This choice selects 1 dedicated physical channel.
DPCH3	This choice selects 3 dedicated physical channels.
PPSCH	This choice selects a primary command control physical channel (PCCPCH) with a synchronization channel (SCH).
PPDPCH1	This choice selects a primary command control physical channel (PCCPCH) with a dedicated physical channel (DPCH).
PPDPCH3	This choice selects a primary command control physical channel (PCCPCH) with 3 dedicated physical channels.
TM1D16	This choice selects a test model 1 with 16 dedicated physical channels.
TM1D32	This choice selects a test model 1 with 32 dedicated physical channels.
TM1D64	This choice selects a test model 1 with 64 dedicated physical channels.

**Wideband CDMA ARB Subsystem—Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)**

TM2	This choice selects a test model 2.
TM3D16	This choice selects a test model 3 with 16 dedicated physical channels.
TM3D32	This choice selects a test model 3 with 32 dedicated physical channels.
TM4	This choice selects a test model 4.
TM5H2	This choice selects a Test Model 5 with 6 DPCH and 2 HS-PDSCH (high speed physical shared channel) channels downlink W-CDMA setup.
TM5H4	This choice selects a Test Model 5 with 14 DPCH and 4 HS-PDSCH (high speed-physical downlink shared channel) channels downlink W-CDMA setup.
TM5H8	This choice selects a Test Model 5 with 30 DPCH and 8 HS-PDSCH (high speed physical shared channel) channels downlink W-CDMA setup.
<scramble code>	This variable sets the scramble code value.
<timing offset>	This variable sets the timing offset value.
<initial phase>	This variable sets the initial phase value. The units are not specified but the value represents degrees.
<clipping>	This variable sets the clipping value. If the units are not specified, the value will default to percent.
<carrier_num>	This variable specifies the number of multicarriers.
<b>*RST</b>	<i>carrier type</i> : PPSCH <i>&lt;freq_offset&gt;</i> : +7.50000000E+006 <i>&lt;power&gt;</i> : +0.00000000E+000
<b>Range</b>	<i>&lt;freq_offset&gt;</i> : -37.5E6 to 37.5E6 <i>&lt;power&gt;</i> : -40 to 0 <i>scramble code</i> : 0-511 <i>timing offset</i> : 0-149 <i>initial phase</i> : 0-359 <i>clipping(in units of percent)</i> : 0.0-100.0 or 0.0 to -20.0 (if units are dB)
<b>Key Entry</b>	<b>1 DPCH      3 DPCH      PCCPCH + SCH      PCCPCH + SCH + 1 DPCH</b> <b>PCCPCH + SCH + 3 DPCH      Test Model 1 w/ 16 DPCH</b> <b>Test Model 1 w/ 32 DPCH      Test Model 1 w/ 64 DPCH      Test Model 2</b> <b>Test Model 3 w/ 16 DPCH      Test Model 3 w/ 32 DPCH      Test Model 4</b> <b>Test Model 5 w/2HSPDSCH      Test Model 5 w/4HSPDSCH</b> <b>Test Model 5 w/8HSPDSCH</b>
<b>Remarks</b>	Refer to <a href="#">“File Name Variables” on page 13</a> for information on the file name syntax.  If the parameter set by this command is changed while the signal is active, the apply command must be executed for the change to occur. Refer to

“:LINK:DOWN:SETup:TABLE:APPLY” on page 356.

### **:LINK:DOWN:SETup:MCARrier:TABLE:NCARriers**

**Supported**            E4438C with Option 400

[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:TABLE:NCARriers?

This command queries the number of carriers specified for the W-CDMA multicarrier waveform.

**\*RST**                    +2

### **:LINK:DOWN:SETup:MCARrier:TOFFset:AInCrement**

**Supported**            E4438C with Option 400

[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:MCARrier:TOFFset:  
AInCrement

This command will sort carriers by frequency offset and auto-increment timing offsets. The new values will start with the current timing offset for the lowest frequency carrier and increment by one for each subsequent carrier.

**Key Entry**            **Increment Timing Offset**

### **:LINK:DOWN:SETup:STORe**

**Supported**            E4438C with Option 400

[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:STORe "<file name>"

This command stores the current downlink setup information into the memory catalog with the entered file name.

Along with the contents of the W-CDMA channel table editor (channel types, Walsh code, power levels, PN offset, and data), this command stores the following information to the signal generator memory:

- FIR filter
- FIR filter file name
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- I/Q mapping
- increment scramble code
- increment timing offset
- link
- spread type

**Wideband CDMA ARB Subsystem—Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)**

spread rate  
 ARB reference clock source (internal or external)  
 ARB reference clock frequency  
 clipping  
 multicarrier spacing  
 radio configuration

**Key Entry**            **Store Custom W-CDMA State**

**Remarks**            Refer to “File Name Variables” on page 13 for information on the file name syntax.

**:LINK:DOWN:SETup:TABLE:APPLY**

**Supported**            E4438C with Option 400

[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:APPLY

This command generates a W-CDMA signal based on the current values in the W-CDMA channel setup table editor.

**Key Entry**            **Apply Channel Setup**

**:LINK:DOWN:SETup:TABLE:CHANnel**

**Supported**            E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:CHANnel INIT |
APPend | <chan_num>, <chan_type>, <symbol_rate>, <spread_code>, <power>,
<timing_offset>, <TFCI>, <TPC>, <scramble_code>, STANdard | RALTErnate |
LALTErnate, <scramble_offset>, RANDom | PN9 | PINdicator |
<data_val>, <TFCI_power>, <TPC_power>, <pilot_power>, <pilot_bits>
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:CHANnel? <chan_num>
```

This command sets up the W-CDMA downlink channel type parameters.

Use INIT to clear the table editor and define the parameters for the first channel; use APPend to add new channels. To edit an existing channel, use its channel number <chan\_num>.

The <power>, <TFCI\_power>, <TPC\_power>, and <pilot\_power> variables are expressed in units of decibels (dB).

The channel type, symbol rate, spread code, power, timing offset, TFCI value, TPC value, scramble code, scramble type, scramble offset, data type, TFCI power, TPC power, pilot power, and the number of pilot bits are returned when a query is initiated. The output format is as follows:

```
<chan_type>, <symbol_rate>, <spread_code>, <power>, <tDPCH_offset>, <TFCI>,
<TPC>, <scramble_code>, <scramble_type>, <scramble_code>, <scramble_offset>,</pre>

```

<data\_type>, <TFCI\_power>, <TPC\_power>, <pilot\_power>, <pilot\_bits>

INIT This choice clears the current information and creates a new one-row table, allowing for further definition using additional parameters.

APPend This choice adds a row to an existing table.

<chan\_num> This variable sets the physical channel number.

<chan\_type> This variable sets the channel type.

<timing\_offset> This variable sets the symbol offset.

<TFCI> This variable sets the transport format combination indicator.

<TPC> This variable sets the transmit power control.

STANdard This choice sets the scramble type to standard.

RALternate This choice sets the scramble type to right alternate.

LALternate This choice sets the scramble type to left alternate.

RANDom This choice sets a randomly generated pseudo-random sequence pattern as output data.

PN9 This choice sets an internally generated 9-bit pseudo-random sequence pattern as output data.

PINDicator This choice sets the paging indicator channel (PICH).

<data\_val> This variable sets the data value.

<TFCI\_power> This variable sets the transport format combination indicator power offset.

<TPC\_power> This variable sets the transport power control power offset.

<pilot\_power> This variable sets the pilot power offset.

<pilot\_bits> This variable sets the number of pilot bits that will be in the dedicated physical channel (DPCH).

**Table 5-1 Variables and Channel Types**

	<b>SSCH</b>	<b>CPICH</b>	<b>PCCPCH</b>	<b>SCCPCH</b>	<b>PICH</b>	<b>DPCH</b>	<b>OCNS</b>	<b>PSCH</b>
Channel number	X	X	X	X	X	X	X	X
Symbol rate	N/A	N/A	N/A	X	N/A	X	X	N/A
Spread code	N/A	X	X	X	X	X	X	N/A

**Table 5-1** Variables and Channel Types

	<b>SSCH</b>	<b>CPICH</b>	<b>PCCPCH</b>	<b>SCCPCH</b>	<b>PICH</b>	<b>DPCH</b>	<b>OCNS</b>	<b>PSCH</b>
Power	X	X	X	X	X	X	X	X
Symbol offset	N/A	N/A	N/A	N/A	X	X	N/A	N/A
TFCI	N/A	N/A	N/A	X	N/A	X	N/A	N/A
TPC	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A
Scramble code	X	X	X	X	X	X	X	N/A
Standard	X	X	X	N/A	X	X	X	N/A
Right alternate	X	X	X	N/A	X	X	X	N/A
Left alternate	X	X	X	N/A	X	X	X	N/A
Scramble offset	X	X	X	X	X	X	X	N/A
Random	N/A	N/A	X	X	X	X	X	N/A
PN9	N/A	N/A	X	X	X	X	X	N/A
Paging Indicator	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A
Data value	N/A	N/A	X	N/A	X	X	X	N/A
TFCI power	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A
Pilot power offset	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A
Pilot bits	N/A	N/A	N/A	X	X	N/A	N/A	N/A

**Table 5-2** Variables and Channel Types

	<b>HSPDSCH</b>	<b>HSSCCH</b>
Channel number	X	X
Symbol rate	N/A (fixed to 30ksps)	N/A (fixed to 240ksps)
Spread code	X	X

**Table 5-2**                      **Variables and Channel Types**

	<b>HSPDSCH</b>	<b>HSSCCH</b>
Power	X	X
Symbol offset	X	X
TFCI	N/A	N/A
TPC	N/A	N/A
Scramble code	X	X
Standard	X	X
Right alternate	X	X
Left alternate	X	X
Scramble offset	X	X
Random	X	X
PN9	X	X
Paging Indicator	N/A	N/A
Data value	X	X
TFCI power	N/A	N/A
Pilot power offset	N/A	N/A
Pilot bits	N/A	N/A

```
*RST
<chan_type>: DPCH <symbol_rate>: +3.00000000E+004
<spread_code>: +8 <scramble_offset>: +0.00000000E+000
power: +0.00000000E+000 <tDPCH_offset>: +0 <TFCI>: +0
<TPC>: #H5555 <scramble_code>: +0 scramble type: STAN
<TFCI_power>: +0.00000000E+000
<TPC_power>: +0.00000000E+000 <pilot_power>: +0.00000000E+000
<pilot_bits>: +4
```

**Range**

<chan\_type>: PSCH SSCH CPICH PCCPch SCCPch  
 DPCH PICH OCNS HSSCch HSPDsch  
 <power>: -40 to 0 <tDPCH\_offset>: 0-149 <TFCI>: 0-1023  
 <TPC>: 0000-7FFF <scramble\_code>: 0-511  
 <scramble\_offset>: 0-15 <data\_val>: 00000000-11111111  
 <TFCI\_power>: -20 to 20 <TPC\_power>: -20 to 20  
 <pilot\_power>: 0000-7FFF <pilot\_bits>: 0-511

**SCCPCH Channel**

<symbol_rate>	<spread_code>	*<pilot_bits>
15 ksps	0-256	0,8
30 ksps	0-128	0,8
60 ksps	0-64	0,8
120 ksps	0-32	0,8
240 ksps	0-16	0,16
480 ksps	0-8	0,16
960 ksps	0-4	0,16

**All Other Channels**

<symbol_rate>	<spread_code>	<pilot_bits>
7.5 ksps	0-511	4
15 ksps	0-255	2,4,8
30 ksps	0-127	4,8
60 ksps	0-63	8
120 ksps	0-31	8
240 ksps	0-15	16
480 ksps	0-7	16
960 ksps	0-3	16

**Key Entry**

Channel	Type	Symbol Rate	First Spread Code	Power			
<b>Spread Code</b>		<b>TFCI Field Off On</b>	<b>Scramble Code</b>	<b>Scramble Offset</b>			
<b>Random</b>	<b>PN9</b>	<b>Standard</b>	<b>Left Alternate</b>	<b>Right Alternate</b>			
<b>PCCPCH</b>	<b>SCCPCH</b>	<b>PSCH</b>	<b>SSCH</b>	<b>CPICH</b>	<b>DPCH</b>	<b>PICH</b>	<b>OCNS</b>
<b>HSPDSCH</b>	<b>HSSCCH</b>						

**Field Entry**

Spread Code	Power	Timing Offset	TFCI	Scramble Code
TFCI Power	TPC Power	Pilot Power	Pilot Bits	Data
Scramble Type	Scramble Offset			



**Remarks** For additional information, refer to the 3GPP TS 25.211 (V 3.7) standard.

If the parameter set by this command is changed while the signal is active, the apply command must be executed for the change to occur. Refer to “:LINK:DOWN:SETup:TABLE:APPLY” on page 356.

### **:LINK:DOWN:SETup:TABLE:NCHannels?**

**Supported** E4438C with Option 400

[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:TABLE:NCHannel?

This command queries the number of channels being used for the carrier.

**\*RST** 1

### **:LINK:DOWN:SETup:TABLE:PADJust**

**Supported** E4438C with Option 400

[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:SETup:TABLE:PADJust EQUalSCALE

This command sets the code domain power.

**EQUal** This choice will adjust all channel powers to have equal energy per symbol, referenced to 7.5 ksps and increasing by 3 dB for each doubling of the symbol rate.

**SCALE** This choice will scale the channel power levels so that the sum of the powers are equal to 0 dB.

**Key Entry** **Equal Energy per Symbol** **Scale To 0dB**

**Remarks** This command is available in downlink only.

### **:LINK:DOWN:TFCI**

**Supported** E4438C with Option 400

[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:TFCI ON|OFF|1|0

[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:LINK:DOWN:TFCI?

This command enables or disables the transport format combination indicator (TFCI) field for all channels.

**\*RST** 1

**Key Entry** **TCFI Field Off On**

**:LINK:UP:OACP****Supported** E4438C with Option 400[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:UP:OACP ADJ|ALT  
[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:UP:OACP?

This command selects the channel power optimization type for any uplink channel W-CDMA setup.

ADJ This choice optimizes for adjacent channel power.

ALT This choice optimizes for alternate channel power.

**\*RST** ADJ**Key Entry** **Optimize ACP ADJ ALT****Remarks** This command is only operational for any uplink channel W-CDMA setup.

To change the current W-CDMA setup information, refer to “:LINK:UP:SETup” on page 363.

**:LINK:UP:SCRAMBLE****Supported** E4438C with Option 400[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:UP:SCRAMBLE <val>  
[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:UP:SCRAMBLE?

This command sets the scramble code for the uplink.

**\*RST** #H000000**Range** #H0–FFFFFFF**Key Entry** **Scramble Code****:LINK:UP:SDPDch****Supported** E4438C with Option 400[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:UP:SDPDch I|Q  
[:SOURCE]:RADio:WCDMa:TGPP:ARB:LINK:UP:SDPDch?

This command selects whether the second dedicated physical data channel (SDPDCH) will be put onto I or Q.

**\*RST** Q**Key Entry** **Second DPDCH I Q**

**:LINK:UP:SETup**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup DPCCH|DDPDCH1|DDPDCH2|
DDPDCH3|DDPDCH4|DDPDCH5|"<file name>"
[:SOURCE] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup?
```

This command selects a dedicated physical control channel (DPCCH) for uplink with the option to add one or more dedicated physical data channel (DPDCH) or a previously stored setup.

DPCCH	This choice selects 1 dedicated physical control channel.
DDPDCH1	This choice selects 1 dedicated physical control channel and 1 dedicated physical data channel.
DDPDCH2	This choice selects 1 dedicated physical control channel and 2 dedicated physical data channel.
DDPDCH3	This choice selects 1 dedicated physical control channel and 3 dedicated physical data channel.
DDPDCH4	This choice selects 1 dedicated physical control channel and 4 dedicated physical data channel.
DDPDCH5	This choice selects 1 dedicated physical control channel and 5 dedicated physical data channel.

**\*RST** DPCCH

Key Entry	<b>DPCCH</b>	<b>DPCCH + 1 DPDCH</b>	<b>DPCCH + 2 DPDCH</b>	<b>DPCCH + 3 DPDCH</b>
	<b>DPCCH + 4 DPDCH</b>	<b>DPCCH + 5 DPDCH</b>	<b>Custom WCDMA State</b>	

**Remarks** Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

If the parameter set by this command is changed while the signal is active, the apply command must be executed for the change to occur. Refer to [“:LINK:UP:SETup:TABLE:APPLY” on page 364](#).

**:LINK:UP:SETup:STORe**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:STORe "<file name>"
```

This command stores the current state into a designated file name.

**Key Entry** **Store To File**

**Remarks** You can recall a saved state from signal generator memory (non-volatile) by executing the following commands (using a designated file name):

For downlink, refer to “:LINK:DOWN:SETup” on page 348.

For uplink, refer to “:LINK:UP:SETup” on page 363.

Refer to “File Name Variables” on page 13 for information on the file name syntax.

**:LINK:UP:SETup:TABLE:APPLy**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:APPLy
```

This command applies the signal based on the current values in the W-CDMA channel setup table editor.

**Key Entry** **Apply Channel Setup**

**Remarks** Refer to “File Name Variables” on page 13 for information on the file name syntax.

**:LINK:UP:SETup:TABLE:CHANnel**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:CHANnel  
INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,<TF  
CI>,<TCP>,RANDOM|<data_val>,<fbi_bits_count>,<fbi_bits_value>  
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:CHANnel? <chan_num>
```

This command defines the channel parameters of the signal.

Use INIT to clear the table editor and define the parameters for the first channel; use APPend to add new channels. To edit an existing channel, use its channel number <chan\_num>.

The variable <power> is expressed in units of decibels (dB).

## Wideband CDMA ARB Subsystem—Option 400 ([:SOURCE]:RADio:WCDMa:TGPP:ARB)

The channel type, symbol rate, spread code, power, TFCI value, TPC value, data value, FBI bit count, and FBI bit value are returned when a query is initiated. The output format is as follows:

```
<chan_type>, <symbol_rate>, <spread_code>, <power>, <TFCI>, <TCP>, <data_val>,
<fbi_bits_count>, <fbi_bits_value>
```

**INIT** This choice clears the current information and creates a new one-row table, allowing for further definition using additional parameters.

**APPend** This choice adds a row to an existing table.

**RANDom** This choice selects random data format for the digital modulation signal.

**<fbi\_bits\_count>** This variable sets the number of feedback information (FBI) bits.

**<fbi\_bits\_value>** This variable sets the value of the FBI bits.

```
*RST      <chan_type>: DPCH      <symbol_rate>: +1.50000000E+
          <spread_code>: +0      <power>: +0.00000000E+000      <TFCI>: +0
          <TPC>: #H5555      <data_val>: RAND      <FBI Bits Count>: +0
          <FBI Bit Count>: +0
```

```
Range  <power>: -40 to 0      <data_val>: 00000000-11111111
          <fbi_bits_count>: 0-2      <fbi_bits_value>: 0-3
```

<b>&lt;symbol_rate&gt;</b>	<b>&lt;spread_rate&gt;</b>
7.5 ksps	0-511
15 ksps	0-255
30 ksps	0-127
60 ksps	0-63
120 ksps	0-31
240 ksps	0-15
480 ksps	0-7
960 ksps	0-3

<b>Key Entry</b>	<b>Channel</b>	<b>Type</b>	<b>Symbol Rate</b>	<b>First Spread Code</b>	<b>Power</b>
	<b>Spread Code</b>		<b>TFCI Field Off On</b>	<b>Scramble Code</b>	<b>Scramble Offset</b>
	<b>Random</b>				

**Remarks** If the parameter set by this command is changed while the signal is active, the apply command must be executed for the change to occur. Refer to [“:LINK:UP:SETup:TABLE:APPLY” on page 364](#).

**:LINK:UP:SETup:TABLE:GUNit**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:GUNit DB|LINear|INDex
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:GUNit?
```

This command selects the uplink power measurement units.

**DB** The power is set in decibels-exponential.

**LINear** The power is set to increase linearly.

**INDex** The power is set at an index level - steps.

**\*RST** DB

**Key Entry** **Gain Unit dB Lin Index**

**Remarks** If the parameter set by this command is changed while the signal is active, the apply command must be executed for the change to occur. Refer to [“:LINK:UP:SETup:TABLE:APPLY”](#) on page 364.

**:LINK:UP:SETup:TABLE:NCHannel**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:NCHannels?
```

This command queries the setup table for the number of uplink channels.

**\*RST** 1

**:LINK:UP:TFCI**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:UP:TFCI ON|OFF|1|0
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:LINK:UP:TFCI?
```

This command enables or disables the transport format combination indicator (TFCI) field for all channels in the table.

**\*RST** 1

**Key Entry** **TFCI Field Off On**

**:MDEStination:AAMPlitude****Supported** E4438C with Option 400

```
[:SOURCE]:RADio:WCDMa:TGPP:ARB:MDEStination:AAMPlitude NONE | M1 | M2 | M3 | M4
[:SOURCE]:RADio:WCDMa:TGPP:ARB:MDEStination:AAMPlitude?
```

This command routes the selected marker to the Alternate Amplitude function. The NONE parameter clears the marker to the Alternate Amplitude function.

**\*RST** NONE**Key Entry** **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4****:MDEStination:ALCHold****Supported** E4438C with Option 400

---

**CAUTION** Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[:SOURCE]:RADio:WCDMa:TGPP:ARB:MDEStination:ALCHold NONE | M1 | M2 | M3 | M4
[:SOURCE]:RADio:WCDMa:TGPP:ARB:MDEStination:ALCHold?
```

This command enables or disables the marker ALC hold function for the selected marker. For setting markers, see “:MARKer:[SET]” on page 302.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 370.

---

**NOTE** Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings.

---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “:MARKer:[SET]” on page 302.

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

\*RST NONE

### Example

```
:RAD:AWGB:ARB:MDES:ALCH M1
```

The preceding example routes marker 1 to the ALC Hold function.

**Key Entry**        **None**   **Marker 1**   **Marker 2**   **Marker 3**   **Marker 4**

**Remarks**        N/A

## :MDEStination:PULSe

**Supported**        E4438C with Option 400

---

**CAUTION** The pulse function uses the ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unlevelled condition that may create a spike in the RF output potentially damaging a DUT or connected instrument. Ensure that you set markers to let the ALC sample over an amplitude that accounts for the high power levels within the signal.

---

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:MDEStination:PULSe NONE | M1 | M2 | M3 | M4
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:MDEStination:PULSe?
```

This command enables or disables the marker pulse/RF blanking function for the selected marker.



This function automatically uses the ALC hold function, so there is no need to select both the ALC hold and the pulse/RF blanking for the same marker.

---

**NOTE** Do not use ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

---

The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “:MPOLarity:MARKer1|2|3|4” on page 370.

---

**NOTE** Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “:MARKer:[SET]” on page 302 for setting the marker points.

---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

---

**NOTE** A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

**NONE** This terminates the marker RF blanking/pulse function.

**M1–M4** These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

### Example

```
:RAD:ARB:MDES:PULS M2
```

The preceding example routes marker 2 to Pulse/RF Blanking.

```
*RST NONE
```

Key Entry	None	Marker 1	Marker 2	Marker 3	Marker 4
-----------	------	----------	----------	----------	----------

**:MPOLarity:MARKer1 | 2 | 3 | 4**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 NEGative | POSitive
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:MPOLarity:MARKer1 | 2 | 3 | 4 ?
```

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

**\*RST** POS

**Key Entry**            **Marker 1 Polarity Neg Pos    Marker 2 Polarity Neg Pos    Marker 3 Polarity Neg Pos**  
**Marker 4 Polarity Neg Pos**

**:REFerence:EXTernal:FREQuency**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:REFerence:EXTernal:FREQuency <val>
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:REFerence:EXTernal:FREQuency ?
```

This command sets the external reference frequency.

The variable <val> is expressed in hertz (Hz).

**\*RST** +1.00000000E+007

**Range** 2.5E5–1E8

**Remarks** The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to  
[“:REFerence\[:SOURCE\]” on page 370.](#)

**:REFerence[:SOURCE]**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:REFerence [ :SOURCE ] INTernal | EXTernal
[ :SOURCE ] :RADIO:WCDMA:TGPP:ARB:REFerence [ :SOURCE ] ?
```

This command selects either an internal or external reference for the waveform clock.

**\*RST** 0

<b>Key Entry</b>	<b>ARB Reference Ext Int</b>
<b>Remarks</b>	<p>If the EXTERNAL choice is selected, the external frequency value <i>must</i> be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.</p> <p>Refer to “:REFERENCE:EXTERNAL:FREQUENCY” on page 370 to enter the external reference frequency.</p>

**:RETRigger**

**Supported** E4438C with Option 400

```
[:SOURCE]:RADIO:WCDMA:TGPP:ARB:RETRigger ON|OFF|IMMEDIATE
[:SOURCE]:RADIO:WCDMA:TGPP:ARB:RETRigger?
```

This command sets the retrigger mode.

ON	This choice specifies that if a trigger occurs while a waveform is initiated, the waveform will retrigger at the end of the previous waveform sequence and play once more.
OFF	This choice specifies that if a trigger occurs while a waveform is initiated, the action will be ignored.
IMMEDIATE	This choice specifies that if a trigger occurs while a waveform is playing, the waveform will reset and replay from the start immediately upon receiving a trigger.

**\*RST** 0

**Key Entry** **Retrigger Mode Off On**

**:REVISION**

**Supported** E4438C with Option 400

```
[:SOURCE]:RADIO:WCDMA:TGPP:ARB:REVISION?
```

This command checks the 3GPP supported standard for the arbitrary waveform generator firmware.

**:SCLock:RATE**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:SCLock:RATE <val>
```

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:SCLock:RATE?
```

This command sets the sample clock rate for the W-CDMA modulation format.

The variable <val> is expressed in units of hertz.

**\*RST** +1.00000000E+008

**Range** 1–1E8

**Key Entry** **ARB Sample Clock**

**Remarks** The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[:STATe]” on [page 378](#) to activate the modulation format.

**:TRIGger:TYPE**

**Supported** E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:TRIGger:TYPE CONTinuous | SINGLE | GATE
```

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:TRIGger:TYPE?
```

This command sets the trigger mode (type) that controls the waveform’s playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform’s final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform’s transmission.
- Setting the waveform’s response to triggers:
  - CONTInuous, see “:TRIGger:TYPE:CONTInuous[:TYPE]” on page 374
  - SINGle, see “:RETRigger” on page 371
  - GATE, selecting the mode also sets the response
- Selecting the trigger source (see “:TRIGger[:SOURCE]” on page 375), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
  - CONTInuous and SINGle see “:TRIGger[:SOURCE]:EXTernal:SLOPe” on page 377
  - GATE, see “:TRIGger:TYPE:GATE:ACTive” on page 374

For more information on triggering, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the trigger type command choices:

CONTInuous	Upon triggering, the waveform repeats continuously.
SINGle	Upon triggering, the waveform segment or sequence plays once.
GATE	An external trigger signal repeatedly starts and stops the waveform’s playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see “:TRIGger:TYPE:GATE:ACTive” on page 374). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

---

**NOTE** The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.

---

<b>*RST</b>	CONT		
<b>Key Entry</b>	<b>Continuous</b>	<b>Single</b>	<b>Gated</b>

**:TRIGger:TYPE:CONTInuous[:TYPE]**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:TRIGger:CONTInuous [ :TYPE ] FREE |
TRIGger | RESet
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:TRIGger:CONTInuous [ :TYPE ] ?
```

This command selects the waveform's response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see [“:TRIGger:TYPE” on page 372](#).

The following list describes the waveform's response to each of the command choices:

FREE	Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.
TRIGger	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.
RESet	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.
*RST	FREE
<b>Key Entry</b>	<b>Free Run      Trigger &amp; Run      Reset &amp; Run</b>

**:TRIGger:TYPE:GATE:ACTive**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:TRIGger:TYPE:GATE:ACTive LOW | HIGH
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:TRIGger:TYPE:GATE:ACTive ?
```

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see [“:TRIGger:TYPE” on page 372](#).

The following list describes the ESG's gating behavior for the polarity selections:

LOW	The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state).
HIGH	The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state).
*RST	HIGH
<b>Key Entry</b>	Gate Active Low High

**:TRIGger[:SOURCE]**

**Supported** E4438C with Option 400

```
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:TRIGger [ :SOURCE ] KEY | EXT | BUS
[ :SOURCE ] :RADio:WCDMa:TGPP:ARB:TRIGger [ :SOURCE ] ?
```

This command sets the trigger source.

For more information on triggering, see “[:TRIGger:TYPE](#)” on page 372. The following list describes the command choices:

KEY	This choice enables manual triggering by pressing the front-panel <b>Trigger</b> hardkey.
EXT	An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger:

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “[:TRIGger\[:SOURCE\]:EXTErnal\[:SOURCE\]](#)” on page 377.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.

- The trigger signal polarity:
  - gating mode, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 374
  - continuous and single modes, see “[:TRIGger\[:SOURCE\]:EXTErnal:SLOPe](#)” on page 377
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
  - setting the amount of delay, see “[:TRIGger\[:SOURCE\]:EXTErnal:DELAy](#)” on page 376
  - turning the delay on, see “[:TRIGger\[:SOURCE\]:EXTErnal:DELAy:STATe](#)” on page 376

**Wideband CDMA ARB Subsystem—Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)**

**BUS** This choice enables triggering over the GPIB or LAN using the \*TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the \*TRG command.

**Key Entry**      **Trigger Key**      **Bus**      **Ext**

**:TRIGger[:SOURce]:EXTernal:DELay**

**Supported**      E4438C with Option 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce]:EXTernal:DELay <val>
[:SOURce]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce]:EXTernal:DELay?
```

This command sets the amount of time to delay the ESG's response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATe](#)” on [page 376](#)). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on [page 375](#).

The unit of measurement for the variable <val> is in seconds (nsec–sec).

**\*RST**      +1.00000000E–003

**Range**      1E–8 to 4E1

**Key Entry**      **Ext Delay Time**

**Remarks**      This command is effective only if an external trigger is selected as the trigger source. Refer to “[:TRIGger\[:SOURce\]](#)” on [page 375](#).

**:TRIGger[:SOURce]:EXTernal:DELay:STATe**

**Supported**      E4438C with Option 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce]:EXTernal:DELay:
STATe ON|OFF|1|0
[:SOURce]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce]:EXTernal:DELay:STATe?
```

This command enables or disables the arbitrary waveform generator's external trigger delay.



For setting the delay time, see “:TRIGger[:SOURCE]:EXternal:DELay” on page 376, and for more information on configuring an external source, see “:TRIGger[:SOURCE]” on page 375.

\*RST 0

**Key Entry** Ext Delay Off On

### :TRIGger[:SOURCE]:EXternal:SLOPe

**Supported** E4438C with Option 400

```
[:SOURCE]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURCE]:EXternal:
SLOPe POSitive|NEGative
```

```
[:SOURCE]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURCE]:EXternal:SLOPe?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “:TRIGger:TYPE:GATE:ACTive” on page 374.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 375.

\*RST NEG

**Key Entry** Ext Polarity Neg Pos

### :TRIGger[:SOURCE]:EXternal[:SOURCE]

**Supported** E4438C with Option 400

```
[:SOURCE]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURCE]:EXternal
```

```
[:SOURCE] EPT1|EPT2|EPTRIGGER1|EPTRIGGER2
```

```
[:SOURCE]:RADio:WCDMa:TGPP:ARB:TRIGger[:SOURCE]:EXternal[:SOURCE]?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “:TRIGger[:SOURCE]” on page 375. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

**Wideband CDMA ARB Subsystem—Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)**

The following list describes the command choices:

<b>EPT1</b>	This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.
<b>EPT2</b>	This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
<b>EPTRIGGER1</b>	This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.
<b>EPTRIGGER2</b>	This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
<b>*RST</b>	EPT1
<b>Choices</b>	EPT1    EPT2    EPTRIGGER1    EPTRIGGER2

**[:STATe]**

**Supported**            E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB [ :STATe ] ON | OFF | 1 | 0
[ :SOURce ] :RADio:WCDMa:TGPP:ARB [ :STATe ] ?
```

This command enables or disables the W-CDMA modulation format.

<b>ON (1)</b>	This choice enables the W-CDMA modulation capability and sets up the internal hardware to generate the currently selected W-CDMA signal selection.
<b>OFF (0)</b>	This choice disables the W-CDMA baseband signal capability.
<b>*RST</b>	0
<b>Key Entry</b>	<b>W-CDMA Off On</b>
<b>Remarks</b>	This choice also activates the I/Q state and sets the I/Q source to internal.

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