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

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http://www.agilent.com/find/esg

Agilent Technologies

Manufacturing Part Number: E4400-90506

Printed in USA

August 2005

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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 alterative 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 "Command Parameters and Responses" on page 7 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 "Command Tree" on page 6 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`

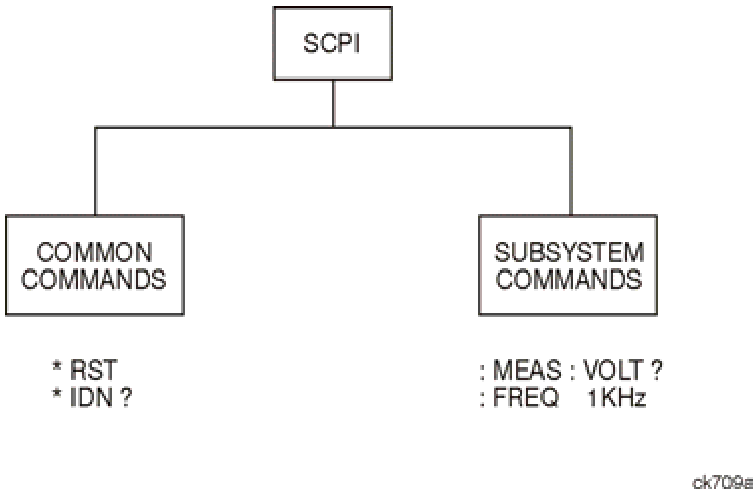
Command Types

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.

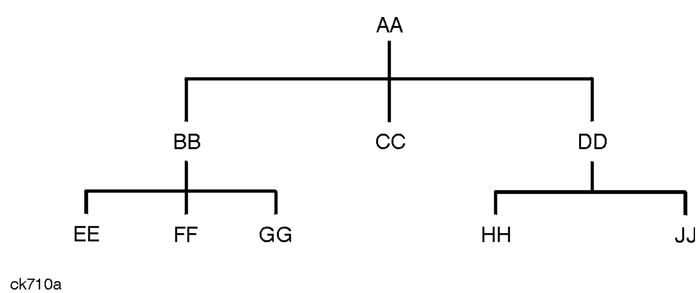
Figure 1-1 Command Types



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

Parameter Types	Response Data Types
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:

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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
```

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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

+4.0000000000000E+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!"
```

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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 infomation 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 103 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[a]	BIN	/USER/BIN	BINARY:[b]
BIT[a]	BIT	/USER/BIT	BIT:

Table 1-4 File Types and Directory Structures

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

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Table 1-4 File Types and Directory Structures

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

: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.>[<freq suffix>], <corr.>[<corr suffix>]`

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 be 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 57 and the ":ALC:BANDwidth" command on page 58.

: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.

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

:DM:EXTernal:POLarity

Supported E4438C

```
[:SOURce]:DM:EXTernal:POLarity NORMal|INVert
[:SOURce]:DM:EXTernal:POLarity?
```

This command sets the phase polarity for the I/Q signal.

***RST**	NORM
Key Entry	**Int Phase Polarity Normal Invert**
Remarks	This command is for backward compatibility with the appropriate ESG E44xxB.

:DM:EXTernal:SOURce

Supported 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.

SUM	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 35 for setting the summing ratio of the I/Q signals between source one and two.
***RST**	EXT
Key Entry	**Ext 50 Ohm** **BBG1** **Ext 600 Ohm** **Off** **Sum**
Remarks	The output is the analog component of the I and Q signals. For selecting the I/Q source, refer to “:DM:SOURce” on page 34.

:DM:IQADjustment:EXTernal:COFFset

Supported E4438C

```
[:SOURce]:DM:IQADjustment:EXTernal:COFFset <val>
[: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 31.

:DM:IQADjustment:EXTernal:DIOFfset

Supported E4438C

```
[:SOURce]:DM:IQADjustment:EXTernal:DIOFfset <val>
[: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 31.

: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 31.

: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 31.

:DM:IQADjustment:EXTernal:IOFFset

Supported E4438C

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

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 31.

: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 31.

: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 31.

: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 31.

: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 31.

: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.

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

If the signal generator is operating at frequencies greater than 3.3 GHz, quadrature skew settings greater than ±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.

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 31.

Example

```
:DM:IQAD:QSK 4.5
```

The preceding example increases the phase angle by 4.5 degrees.

***RST** +0.00000000E+000

Range –1E1 to +1E1

Key Entry **Quadrature Angle Adjustment**

: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 ± 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 30 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 31 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 32 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.

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 001/601or 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
Key Entry	**Ext 50 Ohm** **BBG1** **Ext 600 Ohm** **Off**

: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:

± Range = 50 dB + Mod Atten

***RST**	+0.00000000E+000
Range	*Min*: ± 50 dB *Max*: ± 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 32 and ":DM:MODulation:ATTen:AUTO" on page 33. 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 **P-GSM Base** **E-GSM Base** **R-GSM Base** **DCS Base**
PCS Base **GSM 450 Base** **GSM 480 Base** **GSM 850 Base**
NADC Base **800MHZ Base** **1500MHZ Base**
Tetra Base 390/400 **Tetra Base 420/430** **Tetra Base 460/470**
Tetra Base 915/921 **PHS Standard** **DECT Standard**
P-GSM Mobile **E-GSM Mobile** **R-GSM Mobile** **DCS Mobile**
PCS Mobile **GSM 450 Mobile** **GSM 480 Mobile** **GSM 850 Mobile**
NADC Mobile **800MHZ Mobile** **1500MHZ Mobile**
Tetra Mobile 380/390 **Tetra Mobile 410/420** **Tetra Mobile 450/460**
Tetra Mobile 870/876

Remarks The frequency channel state must be enabled for this command to work. Refer to ":FREQuency:CHANnels[:STATe]" on page 40.

: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

Range

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 40.

: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 37.

:FREQuency:FIXed

Supported All Models

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

This command sets the signal generator output frequency.

***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

Remarks A frequency change may affect the current output power. Refer to "[:LEVel][:IMMediate][:AMPLitude]" on page 68 for the correct specified frequency and amplitude settings. To set the frequency mode refer to ":FREQuency:MODE" on page 41. Options 501, 502, and 504 are specific to the E4438C.

: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 45 for setting the frequency in the CW mode and to “:FREQuency:FIXed” on page 40 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 65 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** +0.0000000000000E+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.

***RST** +0.0000000000000E+00

Range Option 501: 0HZ–1GHZ
Option 502: 0HZ–2GHZ
Option 503: 0HZ–3GHZ
Option 504: 0HZ–4GHZ
Option 506: 0HZ–6GHZ

Key Entry **Freq Ref Set**

Remarks 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
Key Entry	**Freq Start**
Remarks	Options 501, 502, and 504 are specific to the E4438C.

:FREQuency:STOP

Supported All Models

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

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

***RST**	Option 501: +1000000000000E+09
	Option 502: +2000000000000E+09
	Option 503: +3000000000000E+09
	Option 504: +4000000000000E+09
	Option 506: +6000000000000E+09
Range	Option 501: 100kHZ–1GHZ
	Option 502: 100kHZ–2GHZ
	Option 503: 100kHZ–3GHZ
	Option 504: 100kHZ–4GHZ
	Option 506: 100kHZ–6GHZ
Key Entry	**Freq Stop**
Remarks	Options 501, 502, and 504 are specific to the E4438C.

:FREQuency:SYNThesis

Supported E4438C except with Option UNJ

```
[:SOURce]:FREQuency:SYNThesis 1|2
[:SOURce]:FREQuency:SYNThesis?
```

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 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>
[:SOURce]:FREQuency[:CW]?
```

This command sets the signal generator output frequency for the CW frequency mode.

***RST** Option 501: +1000000000000E+09

Option 502: +2000000000000E+09

Option 503: +3000000000000E+09

Option 504: +4000000000000E+09

Option 506: +6000000000000E+09

Range Option 501: 100kHZ–1GHZ

Option 502: 100kHZ–2GHZ

Option 503: 100kHZ–3GHZ

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 41.

Options 501, 502, and 504 are specific to the E4438C.

:FREQuency[:CW][:STEP[:INCRement

Supported All Models

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

This command sets the incremental step value for the frequency parameter, or increments or decrements the current RF frequency by the specified `<val>` parameter value.

`<val>` The increment frequency value.

`UP` Increases the current frequency setting by the value set with `<val>`. The front-panel up arrow key performs the same function.

`DOWN` Decreases the current frequency setting by the value set with `<val>`. The front-panel down arrow key performs the same function.

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 41	**Freq Off**
	Start/stop amplitude sweep	":MODE" on page 65	**Ampl Off**
	Start/stop frequency and amplitude sweep[1]	":MODE" on page 65 ":FREQuency:MODE" on page 41	**Freq & Ampl Off**
	Set up and control sweep triggering[2]	"Trigger Subsystem" on page 164	See the "Trigger Subsystem"
List	Load a list sweep file	":LOAD:LIST" on page 120 and page 125	**Load From Selected File**
	Store list sweep data to a file	":STORe:LIST" on page 121 and page 125	**Store To File**
Step	Start frequency sweep	":FREQuency:STARt" on page 43	**Freq Start**
	Store list sweep data to a file	":STORe:LIST" on page 121 and page 125	**Store To File**
	Start amplitude sweep	":STARt" on page 66	**Ampl Start**
	Stop amplitude sweep	":STOP" on page 67	**Ampl Stop**

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 53.

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

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

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.

Range 0.001–60

Remarks Dwell time is used when IMMediate is the trigger source. Refer to ":LIST:TRIGger:SOURce" on page 53 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:DWELl: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:DWELl: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:DWELl" on page 49 for setting the list dwell points.
STEP	This choice selects the dwell time from the step sweep. Refer to ":SWEep:DWELl" on page 55 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

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 52 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 51 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 68 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 166.

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 121 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 121 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 53 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 58.

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 61 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 57.

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[1] 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 57.

***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 64 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 enables or disables the internal power search calibration. 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 61 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:ALTernal:MANual MAIN|DELTa
[:SOURce]:POWer:ALTernal: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 63 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 001/601or 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

Key Entry	**Atten Hold Off On**
Remarks	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 59 for more information.

:MODE

Supported All Models

```
[:SOURce]:POWer:MODE FIXed|LIST
[:SOURce]:POWer:MODE?
```

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 68 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 41 for selecting the list mode for a frequency sweep.

***RST**	FIX
Key Entry	**Amplitude** **Ampl** **Off**

:REFerence

Supported All Models

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

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

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

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 83 and “:POWer” on page 168 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 68 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 <val><unit>
[: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 68 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 <val><unit>
[: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

Range

Frequency	*Standard*	*Option UNB*	*Option 506*
250kHZ–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)

:DCFM

Supported All

`:CALibration:DCFM`

This command initiates a DCFM or DCΦM 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 (±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:ADDRess

Supported All

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

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.

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 81.

: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 82 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 80.

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**

: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:WLICense[: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 ":LICense:WAVeform" command shown on page 81. Zero is returned for non-existent and expired licenses. The value 2^32 -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|DBUVEMF|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 66 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 154 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.

*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>.

Range	Registers: 0–99	Sequences: 0–9
Key Entry	**RECALL Reg**	**Select Seq:**

*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>`.

Range *Registers*: 0–99 *Sequences*: 0–9

Key Entry **Save Reg** **Save Seq[n] Reg[nn]**

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 88 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 001/601or 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 001/601or 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

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 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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 114.

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 001/601or 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 001/601or 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.

•	"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 001/601or 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 001/601or 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 001/601or 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

Range	*num_states:* 2–256
	i0–i(n): –1 to 1
	q0–q(n): –1 to 1
	num_diff_states: 0–256
	diff0–diff(n): -128 to 127
Remarks	Refer to “File Name Variables” on page 13 for information on the file name syntax.

:DATA:PRAM:FILE:BLOCk

Supported E4438C with Option 001/601or 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 001/601or 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.

Range 0–255

Remarks Refer to "File Name Variables" on page 13 for information on the file name syntax.

:DATA:PRAM

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 with earlier signal generator models.

:DATA:PRAM:BLOCk

NOTE Refer to the *E4428C/38C ESG Signal Generators Programming Compatibility Guide* for information on this command. This command was replaced by ":DATA:PRAM:FILE:BLOCk" on page 110.

:DATA:PRAM:LIST

NOTE Refer to the *E4428C/38C ESG Signal Generators Programming Compatibility Guide* for information on this command. This command has been replaced by ":DATA:PRAM:FILE:LIST" on page 111.

:DATA:SHAPe

Supported E4438C with Option 001/601or 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 001/601or 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.

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:UNPRotected

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

`:MEMory:DELete:BINary`

This command deletes all binary files.

Key Entry **Delete All Binary Files**

:DELete:BIT

Supported E4438C with Option 001/601or 002/602

`:MEMory:DELete:BIT`

This command deletes all bit files.

Key Entry **Delete All Bit Files**

: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 001/601or 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 001/601or 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 001/601or 002/602

`:MEMory:DELete:FSK`

This command deletes all FSK files.

Key Entry **Delete All FSK Files**

:DELete:IQ

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

`:MEMory:DELete:SEQ`

This command deletes all sequence files.

Key Entry **Delete All Sequence Files**

:DELete:SHAPe

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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:WFM" .

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 001/601or 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 001/601or 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 001/601or 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 129.

:INPut:CPOLarity

Supported E4438C with Option 001/601or 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 130.

:INPut:DPOLarity

Supported E4438C with Option 001/601or 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 130.

:INPut:SPOLarity

Supported E4438C with Option 001/601or 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 130.

:IPOLarity:BGATe

Supported E4438C with Option 001/601or 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 128.

:IPOLarity:CLOCk

Supported E4438C with Option 001/601or 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 128.

:IPOLarity:DATA

Supported E4438C with Option 001/601or 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 129.

:IPOLarity:SSYNc

Supported E4438C with Option 001/601or 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 129.

:OPOLarity:CLOCk

Supported E4438C with Option 001/601or 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 132.

:OPOLarity:DATA

Supported E4438C with Option 001/601or 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 133.

:OPOLarity:SSYNc

Supported E4438C with Option 001/601or 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 133.

:OUTPut:CPOLarity

Supported E4438C with Option 001/601or 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 131.

:OUTPut:DCS[:STATe]

Supported E4438C with Option 001/601or 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 001/601or 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 131.

:OUTPut:SPOLarity

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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 001/601or 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.

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

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

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 unleveled (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

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 (a|b).

: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.

***RST** 1

: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 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.

Key Entry **SCPI** **8656B,8657A/B** **8657D NADC** **8657D PDC** **8657J PHS** **8648A/B/C/D**

Remarks 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 *Programming Compatibility Guide*.

:PON:TYPE

Supported All

```
:SYSTem:PON:TYPE PRESet|LAST
:SYSTem:PON:TYPE?
```

This command sets the defined conditions for the signal generator at power on.

PRESet — 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 157 for selecting the type of preset.

LAST — 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.

Key Entry **Power On Last Preset**

Remarks 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 157 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"
Key Entry	**SCPI** **8656B,8657A/B** **8657D NADC** **8657D PDC** **8657J PHS** **8648A/B/C/D**

: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 001/601or 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 155 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.

***RST** 1

Range N/A

Key Entry **Activate Security Display**

: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*.

Key Entry	**Erase All**

: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.

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 159, “:SECurity:OVERwrite” on page 161, and “:SECurity:SANitize” on page 161. 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 159 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 162 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 165 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 164 for setting continuous or single sweep. See ":TRIGger[:SEQuence]:SOURce" on page 166 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 continuos 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 66 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])

: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 172 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 127 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.

: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 173 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 173 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 173 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 > ±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 127 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 170 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 176 for AM depth value coupling.

Refer to ":AM[:DEPTh]:STEP[:INCRement]" on page 176 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] <val><unit>
[: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 175 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] <num>
[: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 179 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]:FUNCtion:SHAPe" on page 180 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 182 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 180 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 180 for the waveform selection.

: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 > ±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 127 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 177 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

Range

Frequency	*Deviation*	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 183 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 187 for selecting the waveform type.

:FUNCtion[1]:FREQuency:ALTernate

Supported All Models

```
[:SOURce]:LFOutput:FUNCtion[1]:FREQuency:ALTernate <val><unit>
[: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 187 for selecting the waveform type.

:FUNCtion[1]:FREQuency:ALTernate:AMPLitude:PERCent

Supported All Models

```
[:SOURce]:LFOutput:FUNCtion[1]:FREQuency:ALTernate:AMPLitude:
PERCent <val><unit>
[: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 187 for selecting the waveform type.

:FUNCtion[1]:PERiod

Supported All Models

```
[:SOURce]:LFOutput:FUNCtion[1]:PERiod <val><unit>
[: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 <val><unit>
[: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 µS, the pulse width is limited to a maximum range value of 16 µS.

***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 186.

: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

Key Entry **Sine** **Dual-Sine** **Swept-Sine** **Triangle** **Square** **Ramp** **Pulse** **Noise** **DC**

Remarks Function Generator must be the source selection to support DUALsine or the SWEPtsine waveform. Refer to ":SOURce" on page 188.

:FUNCtion[1]:SWEep:TIME

Supported All Models

```
[:SOURce]:LFOutput:FUNCtion[1]:SWEep:TIME <val><unit>
[: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.

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 ":FUNCtion[1]:SHAPe" on page 187 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 ΦM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **ΦM Path 1 2** softkey.

PM[1]	**ΦM Path 1 2** with 1 selected
PM2	**ΦM 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]

:PM:INTernal:FREQuency:STEP[:INCRement]

Supported All Models

```
[:SOURce]:PM:INTernal:FREQuency:STEP[:INCRement] <num>
[: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 191for 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 187 for selecting the waveform type.

:PM[1]|2:INTernal[1]:FREQuency:ALTernate

Supported All Models

```
[:SOURce]:PM[1]|2:INTernal[1]:FREQuency:ALTernate <val><unit>
[: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 193 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 <val><unit>
[: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 193 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 INTernal1 source selection does not support the DUALsine and SWEPtsine waveform choices.

: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 **ΦM 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.

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 ":PM[1]|2:INTernal[1]:FUNCtion:SHAPe" on page 193 for the waveform selection.

:PM[1]|2:SOURce

Supported 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.

INT	This choice selects internal source 1 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 1** **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 > ±3% of 1 V_p.

:PM[1]|2:STATe

Supported 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.

***RST**	0
Key Entry	**ΦM Off On**
Remarks	The RF carrier is modulated when you set the signal generator's modulation state to ON, see ":MODulation[:STATe]" on page 127 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 189 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

Range

Frequency	*Normal Bandwidth*	*High Bandwidth*
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 **ΦM 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 196 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

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 195 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 200 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 200 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 <val><unit>|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 198 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] <val><unit>|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 198 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 59.

***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 199 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 199 for more information.

: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])

:RADio:ALL:OFF

Supported E4438C with Option 001/601or 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 204 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 203 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" on page 205 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 205 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 297 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 unleveled 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 300.

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 366.

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 300.

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 403

CAUTION The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unleveled 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 330.

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 300 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 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 279.

: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 278 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 212 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 215 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 215 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`
Key Entry	**Root Nyquist** **Nyquist** **Gaussian** **Rectangle** **IS-95** **IS-95 w/EQ** **IS-95 Mod** **IS-95 Mod w/EQ** **WCDMA** **APCO 25 C4FM** **IS-2000 SR3 DS** **UN3/4 GSM Gaussian** **User FIR**

: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 216.

: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 216.

: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 216.

: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 219 for setting the attenuation value.
***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 219 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 297 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.

***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 unleveled 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 300.

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 224.

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 300.

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 401

CAUTION The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unleveled 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 224.

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 300 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 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 225.

: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 224 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.

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 237 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 multicarrrier off. To select the multicarrier setup, see ":SETup:MCARrier" on page 228.

***RST** FWD9

Key Entry **9 Ch Fwd** **32 Ch Fwd** **64 Ch Fwd** **Pilot** **Reverse** **Multicarrier Off On** **Multicarrier Off On** **Custom CDMA State**

Remarks 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.

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	-7.00000000E+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.

***RST**	carrier type: FWD9 <freq_offset>: +1.25000000E+006 <power>: +0.00000000E+000
Range	<freq_offset>: –7.5E6 to 7.5E6 <power>: –40 to 0
Key Entry	**9 Ch Fwd** **32 Ch Fwd** **64 Ch Fwd** **Pilot** **Custom CDMA 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 229 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 232
  - — SINGle, see ":RETRigger" on page 225
  - — GATE, selecting the mode also sets the response
- Selecting the trigger source (see ":TRIGger[:SOURce]" on page 233), 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 235
  - — GATE, see ":TRIGger:TYPE:GATE:ACTive" on page 233

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 233). 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: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 231.

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		
Key Entry	**Free Run**	**Trigger & Run**	**Reset & Run**

: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 231.

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: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 231. 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 236.

  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 233
  — continuous and single modes, see ":TRIGger[:SOURce]:EXTernal:SLOPe" on page 235

- 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 234
  — turning the delay on, see ":TRIGger[:SOURce]:EXTernal:DELay:STATe" on page 235

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 235). 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 233.

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 234, and for more information on configuring an external source, see":TRIGger[:SOURce]" on page 233.

***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 233.

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 233.

***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 233. 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 240 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 239 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.

***RST** `IS95_MOD_EQ`

Key Entry **Root Nyquist** **Nyquist** **Gaussian** **Rectangle** **IS-95** **IS-95 w/EQ** **IS-95 Mod** **IS-95 Mod w/EQ** **APCO 25 C4FM** **WCDMA** **UN3/4 GSM Gaussian** **IS-2000 SR3 DS** **User FIR**

: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 240.

: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 240.

: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 240.

: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 243 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 244 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 244 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 multicarrrier off. To select the multicarrier setup, see ":LINK:FORWard:SETup:MCARrier" .

***RST** S19C

Key Entry **Pilot** **9 Channel** **Spread Rate 1** **Spread Rate 3** **Multicarrier Off On** **Spreading Type Direct Mcarrier** **Custom CDMA2000 Carrier**

Remarks 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
Key Entry	**2 SR3 Carriers** **3 Carriers** **4 Carriers** **Custom CDMA2000 Multicarrier**
Remarks	Refer to “File Name Variables” 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.

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>`

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 25.

S1Pilot — This choice sets a single SR1 Pilot forward channel.

S3DPilot — This choice sets a single direct spread pilot forward channel.

S3MPilot — This choice sets a single SR3 multicarrier spread pilot forward channel.

S19Chan — This choice sets a SR1 9 forward channel.

S3D9chan — This choice sets a SR3 direct spread forward channel.

S3M9chan — This choice sets a SR3 multicarrier spread 9 forward channel.

***RST** — channel type: S3D9CHAN <freq_offset>: -2.50000000E+006
<power>: +0.00000000E+000

Range — <freq_offset>: –15E6 to 15E6 <power>: –40 to 0

Key Entry — **Select File** **Insert Row** **SR1 Pilot** **SR3 Direct Pilot** **SR3 Mcarrier Pilot** **SR3 Mcarrier Pilot** **SR1 9 Channel** **SR3 Direct 9 Channel** **SR3 Mcarrier 9 Channel** **Custom CDMA2000 Carrier**

Field Entry — `Freq Offset` `Power`

Remarks — 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.

APPend — This choice adds rows to an existing table. The maximum number of channels in a table is eight.

RANDom — This choice selects a randomly generated data value.

<data_val> — This variable customizes a specific data value.

***RST** — *channel type*: PIL   *<data_rate>*: +3.84000000E+004
<power>: -7.00000000E+000   *<pn_offset>*: +0   *<data_val>*: 0

Range — *<data_rate>*: 1500–9600   *<power>*: –40 to 0
<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:REVerse:SETup:TABLe:NCHannels

Supported 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.

***RST** +5

:LINK:REVerse:SETup:TABLe:PADJust

Supported 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).

EQUal — This choice changes all channels to equal power, and the total power to 0 dB.

SCALe — 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.

Key Entry — **Equal Powers**   **Scale To 0dB**

: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 unleveled 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 300.

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 258.

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 300.

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 401

CAUTION	The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unleveled 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 258.

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 300 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 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 258.

: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

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 258 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.

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 267 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 263
  - SINGle, see ":RETRigger" on page 259
  - GATE, selecting the mode also sets the response
- Selecting the trigger source (see ":TRIGger[:SOURce]" on page 264), 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 266
  - GATE, see ":TRIGger:TYPE:GATE:ACTive" on page 264

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 264). 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 261.

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

Key Entry **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 261.

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 261. 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 267.

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 264
  - continuous and single modes, see ":TRIGger[:SOURce]:EXTernal:SLOPe" on page 266
- 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 265
  - turning the delay on, see ":TRIGger[:SOURce]:EXTernal:DELay:STATe" on page 266

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 266). 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 264.

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 265, and for more information on configuring an external source, see":TRIGger[:SOURce]" on page 264.

***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 264.

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 264.

***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 264. 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**

[: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.

***RST** 0

Key Entry **CDMA2000 Off On**

Dmodulation Subsystem–Option 001/601 or 002/602 ([:SOURce]:RADio:DMODulation:ARB)

:IQ:EXTernal:FILTer

Supported E4438C with Option 001/601or 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 268 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 001/601or 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 268 for selecting a filter or through path.

***RST** 1

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

:FILTer

Supported E4438C with Option 001/601or 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 “File Name Variables” on page 13 for more information on file names.

***RST** RNYQ

Key Entry **Root Nyquist** **Nyquist** **Gaussian** **Rectangle** **IS-95** **IS-95 w/EQ** **IS-95 Mod** **IS-95 Mod w/EQ** **WCDMA** **IS-2000 SR3 DS** **APCO 25 C4FM** **UN3/4 GSM Gaussian** **User FIR**

:FILTer:ALPHa

Supported E4438C with Option 001/601or 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 269.

:FILTer:BBT

Supported E4438C with Option 001/601or 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 269.

:FILTer:CHANnel

Supported E4438C with Option 001/601or 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 269.

:HEADer:CLEar

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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 001/601or 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 “” on page 272 for setting the attenuation value.

***RST** 1

Key Entry **Modulator Atten Manual Auto**

:IQ:MODulation:FILTer

Supported E4438C with Option 001/601or 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 273 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 001/601or 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 273 for selecting a filter or through path.

***RST** 1

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

:MDEStination:AAMPlitude

Supported E4438C with Option 001/601or 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 unleveled 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 300.

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 278.

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 300.

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 001/601or 002/602

CAUTION The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unleveled 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 278.

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 300 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 001/601or 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 277.

Refer to ":SRATe" on page 284 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 001/601or 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

Key Entry **BPSK** **QPSK** **IS-95 QPSK** **Gray Coded QPSK** **OQPSK**
IS-95 OQPSK **π/4 DQPSK** **8PSK** **16PSK** **D8PSK** **EDGE** **MSK**
2-Lvl FSK **4-Lvl FSK** **8-Lvl FSK** **16-Lvl FSK** **C4FM** **4QAM** **16QAM**
32QAM **64QAM** **128QAM** **256QAM**

: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 001/601or 002/602

```
[:SOURce]:RADio:DMODulation:ARB:REFerence:EXTernal:FREQuency <val>
[: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 279.

:REFerence[:SOURce]

Supported E4438C with Option 001/601or 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 278 to enter the external reference frequency.

:RETRigger

Supported E4438C with Option 001/601or 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 001/601or 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 291 to activate the modulation format.

:SETup

Supported E4438C with Option 001/601or 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 multicarrrier off. To select the multicarrier setup, see “:SETup:MCARrier” .

***RST** NADC

Key Entry **GSM** **NADC** **PDC** **PHS** **DECT** **APCO 25 w/C4FM** **APCO w/CQPSK**

CDPD **PWT** **EDGE** **TETRA** **Multicarrier Off On** **Select File**

Remarks Refer to “File Name Variables” on page 13 for information on the file name syntax.

:SETup:MCARrier

Supported E4438C with Option 001/601or 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 282.

:SETup:MCARrier:PHASe

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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.

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 282.

:SETup:MCARrier:TABLe:NCARriers

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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–Msps) and the maximum range value is dependent upon the modulation type, and filter.

***RST** +2.43000000E+004

Range

Modulation Type	*Bits per Symbol*	*Internal Data*
BPSK	1	1sps–50 Msps
FSK2		
MSK		
C4FM	2	1sps–50 Msps
FSK4		
OQPSK		
OQPSK195		
P4QPPSK		
QAM4		
QPSK		
QPSKIS95		
QPSKISAT		
D8PSK	3	1sps–33.33 Msps
EDGE		
FSK8		
PSK8		
FSK16	4	1sps–25 Msps
PSK16		
QAM16		
QAM32	5	1sps–20 Msps
QAM64	6	1sps–16.67 Msps
QAM256	8	1sps–12.50 Msps

Key Entry **Symbol Rate**

Remarks When user-defined filters are selected using the command in section “:FILTer” on page 269, 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 Msps

- 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 277.

:TRIGger:TYPE

Supported E4438C with Option 001/601or 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 286
  — SINGle, see ":RETRigger" on page 279
  — GATE, selecting the mode also sets the response

- Selecting the trigger source (see “:TRIGger[:SOURce]” on page 288), 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 290
  - GATE, see “:TRIGger:TYPE:GATE:ACTive” on page 287

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 287). 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 001/601or 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 285.

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
Key Entry	**Free Run** **Trigger & Run** **Reset & Run**

:TRIGger:TYPE:GATE:ACTive

Supported E4438C with Option 001/601or 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 285.

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 001/601or 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 285. 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 290.

  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 287
  — continuous and single modes, see ":TRIGger[:SOURce]:EXTernal:SLOPe" on page 290

- 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 289
  — turning the delay on, see ":TRIGger[:SOURce]:EXTernal:DELay:STATe" on page 289

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 001/601or 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 289). 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 288.

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 001/601or 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 289, and for more information on configuring an external source, see":TRIGger[:SOURce]" on page 288.

***RST** 0

Key Entry **Ext Delay Off On**

:TRIGger[:SOURce]:EXTernal:SLOPe

Supported E4438C with Option 001/601or 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 287.

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 288.

***RST** NEG

Key Entry **Ext Polarity Neg Pos**

:TRIGger[:SOURce]:EXTernal[:SOURce]

Supported E4438C with Option 001/601or 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 288. 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**

[:STATe]

Supported E4438C with Option 001/601or 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 001/601or 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/ 601or 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 ≥ 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 ≥ 60 samples. The number of periods created is 60 ÷ <osr> (quotient will round up to an integer value). A waveform with an oversample ratio ≥ 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.

Range *OSR Option 001/601*: 4E0 – 8E6

OSR Option 002/602: 4E0 – 32E6

Scale: 0–1

:HEADer:CLEar

Supported E4438C with Option 001/601or 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 001/601or 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.

$$\sqrt{\sum_{n=1}^{N}\left(i_n^2 + q_n^2\right) \times \frac{1}{N}}$$

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 001/601or 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 001/601or 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 001/601or 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 296 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 001/601or 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 296 for selecting a filter or through path.

***RST** 1

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

:IQ:MODulation:ATTen

Supported E4438C with Option 001/601or 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 001/601or 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 296 for setting the attenuation value.
***RST**	1
Key Entry	**Modulator Atten Manual Auto**

:IQ:MODulation:FILTer

Supported E4438C with Option 001/601or 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 298 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 001/601or 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 297 for selecting a filter or through path.

***RST** 1

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

:MARKer:CLEar

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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 300.

"<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 001/601or 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 298 and “:MARKer:CLEar:ALL” on page 299 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 001/601or 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 001/601or 002/602

CAUTION Incorrect automatic level control (ALC) sampling can create a sudden unleveled 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 300.

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 306.

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 300.

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.

Key Entry	**None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**
Remarks	N/A

:MDEStination:PULSe

Supported	E4438C with Option 001/601or 002/602

CAUTION	The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unleveled 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 306.

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 300 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 001/601or 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 311 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**

:NOISe:CBWidth

Supported E4438C with Option 403

```
[:SOURce]:RADio:ARB:NOISe:CBWidth <val><unit>
[:SOURce]:RADio:ARB:NOISe: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 ":NOISe[:STATe]" and ":NOISe:BFACtor".

***RST** +1.00000000E+000

Range 1HZ–80 MHZ

Key Entry **Carrier Bandwidth**

:NOISe:CN

Supported E4438C with Option 403

```
[:SOURce]:RADio:ARB:NOISe:CN <val><unit>
[:SOURce]:RADio:ARB:NOISe: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 ":NOISe:CBWidth" on page 307.

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 001/601or 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 309.

:REFerence[:SOURce]

Supported E4438C with Option 001/601or 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 308 to enter the external reference frequency.

:RETRigger

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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.

Key Entry **Scaling** **Scale Waveform Data**

Remarks Refer to "File Name Variables" on page 13 for information on the file name syntax.

:SCLock:RATE

Supported E4438C with Option 001/601or 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**

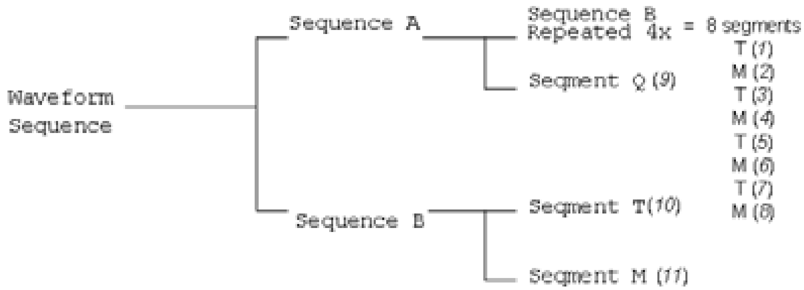
:SEQuence

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 295.

"<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 001/601or 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 315
  - — SINGle, see “:RETRigger” on page 309
  - — GATE, selecting the mode also sets the response
- Selecting the trigger source (see “:TRIGger[:SOURce]” on page 318), 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 320
  - — GATE, see “:TRIGger:TYPE:GATE:ACTive” on page 315

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 315). 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** **Gate** **Segment Advance**

:TRIGger:TYPE:CONTinuous[:TYPE]

Supported E4438C with Option 001/601or 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 313.

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

Key Entry **Free Run** **Trigger & Run** **Reset & Run**

:TRIGger:TYPE:GATE:ACTive

Supported E4438C with Option 001/601or 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 313.

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:TYPE:SADVance[:TYPE]

Supported E4438C with Option 001/601or 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

Key Entry **Single** **Continuous**

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 313.

:TRIGger:TYPE:SADVance[:TYPE]

Supported E4438C with Option 001/601or 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 313.

The following list describes the waveform’s response to each of the command choices:

SINGle 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 311 for repetition information). The following list describes a sequence’s playback behavior with this choice:

- After receiving the first trigger, the first segment plays to completion.
- When the waveform receives a trigger after a segment completes, the sequence advances to the next segment and plays that segment to completion.
- 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.
- 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.

CONTinuous 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:

- After receiving the first trigger, the first segment plays continuously.
- 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.
- When last segment in the sequence receives a trigger, the sequence resets and the first segment plays continuously.

Example

:RAD:ARB:TRIG:TYPE:SADV CONT

The preceding example selects the continuous segment advance mode.

***RST** CONT

Key Entry **Single** **Continuous**

:TRIGger[:SOURce]

Supported E4438C with Option 001/601or 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 313. 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 320.

  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 315
  — continuous and single modes, see ":TRIGger[:SOURce]:EXTernal:SLOPe" on page 320

- 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 319
  — turning the delay on, see ":TRIGger[:SOURce]:EXTernal:DELay:STATe" on page 319

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 001/601or 002/602

```
[:SOURce]:RADio:ARB:TRIGger[:SOURce]:EXTernal:DELay <val>
[:SOURce]:RADio: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 319). 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 318.

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 001/601or 002/602

```
[:SOURce]:RADio:ARB:TRIGger[:SOURce]:EXTernal:DELay:STATe ON|OFF|1|0
[:SOURce]:RADio: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 319, and for more information on configuring an external source, see":TRIGger[:SOURce]" on page 318.

***RST** 0

Key Entry **Ext Delay Off On**

:TRIGger[:SOURce]:EXTernal:SLOPe

Supported E4438C with Option 001/601or 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 315.

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 318.

***RST** NEG

Key Entry **Ext Polarity Neg Pos**

:TRIGger[:SOURce]:EXTernal[:SOURce]

Supported E4438C with Option 001/601or 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 318. 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**

:WAVeform

Supported E4438C with Option 001/601or 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 103 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 001/601or 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 103 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 001/601or 002/602

```
[: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 334.
2. Assign the frequency spacing between the tones. Refer to ":SETup:TABLe:FSPacing" on page 333.
3. Define the number of tones within the waveform. Refer to ":SETup:TABLe:NTONes" on page 334.
4. Modify the power level, phase, and state of any individual tones. Refer to ":ROW" on page 331.

:HEADer:CLEar

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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 324 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 001/601or 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 324 for selecting a filter or through path.
***RST**	1
Key Entry	**I/Q Output Filter Manual Auto**

:IQ:MODulation:ATTen

Supported E4438C with Option 001/601or 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 001/601or 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 325 for setting the attenuation value.

***RST** 1

Key Entry **Modulator Atten Manual Auto**

:IQ:MODulation:FILTer

Supported E4438C with Option 001/601or 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 326 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 001/601or 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 326 for selecting a filter or through path.

***RST** 1

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

:MDEStination:AAMPlitude

Supported E4438C with Option 001/601or 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 unleveled 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 300.

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 330.

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 300.

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 001/601or 002/602

CAUTION The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden unleveled 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 330.

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 300 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 001/601or 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 001/601or 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 330.

:REFerence[:SOURce]

Supported E4438C with Option 001/601or 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.

***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 330 to enter the external reference frequency.

:ROW

Supported E4438C with Option 001/601or 002/602

```
[:SOURce]:RADio:MTONe:ARB:SETup:TABLe:ROW <row_number>,<power>,
<phase>,<state>
[:SOURce]:RADio:MTONe:ARB:SETup:TABLe:ROW? <row_number>
```

This command modifies the indicated tone (row) of the multitone waveform.

<row_number> 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:

```
<frequency offset>,<power>,<phase>,<state>
```

***RST** *frequency offset*: –3.50000000E+004 *<power>*: +0.00000000E+000

<phase>: +0.00000000E+000 *<state>*: 1

Range *frequency offset*: –4E7 to 4E7 *<power>*: –80 to 0 *<phase>*: 0–359

<state>: 1

Key Entry **Goto Row** **Toggle State**

Remarks Refer to ":SETup:TABLe" on page 333 for information on how to change the number of rows.

This command is the final step in creating a multitone waveform. Refer to "Creating a Multitone Waveform" on page 323 for all four steps.

:SCLock:RATE

Supported E4438C with Option 001/601or 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 335 to activate the modulation format.

:SETup

Supported E4438C with Option 001/601or 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 001/601or 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 001/601or 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
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 333.

:SETup:TABLe:FSPacing

Supported E4438C with Option 001/601or 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 333.

This command is the second step in creating a multitone waveform. Refer to "Creating a Multitone Waveform" on page 323 for all four steps.

:SETup:TABLe:NTONes

Supported E4438C with Option 001/601or 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.

***RST** +8

Range 2–64

Key Entry **Number Of Tones**

Remarks To specify the number of tones and additional parameters required to create or configure a multitone waveform, refer to ":SETup:TABLe" on page 333.

This command is the third step in creating a multitone waveform. Refer to "Creating a Multitone Waveform" on page 323 for all four steps.

:SETup:TABLe:PHASe:INITialize

Supported E4438C with Option 001/601or 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.

FIXed This choice sets the phase of all tones to the fixed value of 0 degrees.

RANDom This choice sets the phase of all tones to random values based on the setting on the random seed generator.

***RST** 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 335.

This command is the first step in creating a multitone waveform. Refer to "Creating a Multitone Waveform" on page 323 for all four steps.

:SETup:TABLe:PHASe:INITialize:SEED

Supported E4438C with Option 001/601or 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.

FIXed This choice sets the random number generator seed to a fixed value.

RANDom This choice sets the random number generator seed to a random value. This changes the phase value after each initialization of the phase.

***RST** FIX

Key Entry **Random Seed Fixed Random**

[:STATe]

Supported E4438C with Option 001/601or 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`

Key Entry **Root Nyquist** **Nyquist** **Gaussian** **Rectangle** **WCDMA**
APCO 25 C4FM **IS-95** **UN3/4 GSM Gaussian** **IS-2000 SR3 DS**
User FIR

: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 338.

: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 338.

: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 338.

: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?
```

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 341 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 340 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 <val>
[: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 342 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 343 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 342 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.
***RST**	ADJ
Key Entry	**Optimize ACP ADJ ALT**
Remarks	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 344.

: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 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 multicarrrier 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 **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

***RST** CAR2

Key Entry **2 Carriers** **3 Carriers** **4 Carriers**

Remarks Refer to "File Name Variables" on page 13 for information on the file name syntax.

:LINK:DOWN:SETup:MCARrier:CLIPping:I

Supported E4438C with Option 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:I <val>
[:SOURce]:RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier: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**

:LINK:DOWN:SETup:MCARrier:CLIPping:Q

Supported E4438C with Option 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:MCARrier:CLIPping:Q <val>
[: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] <val>
[: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

Range 10–100

Key Entry **Clip |I+jQ| To**

: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.

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.

***RST** *carrier type*: PPSCH *<freq_offset>*: +7.50000000E+006

<power>: +0.00000000E+000

Range *<freq_offset>*: –37.5E6 to 37.5E6 *<power>*: –40 to 0

scramble code: 0–511 *timing offset*: 0–149 initial phase: 0–359

clipping(in units of percent): 0.0–100.0 or 0.0 to –20.0 (if units are dB)

Key Entry **1 DPCH** **3 DPCH** **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/8HSPDSCH

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:DOWN:SETup:TABLe:APPLy” on page 352.

: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
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>,
<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

	SSCH	CPICH	PCCPCH	SCCPCH	PICH	DPCH	OCNS	PSCH
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
Power	X	X	X	X	X	X	X	X

Table 5-1 Variables and Channel Types

	SSCH	CPICH	PCCPCH	SCCPCH	PICH	DPCH	OCNS	PSCH
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

	HSPDSCH	HSSCCH
Channel number	X	X
Symbol rate	N/A (fixed to 30ksps)	N/A (fixed to 240ksps)
Spread code	X	X
Power	X	X

Table 5-2 Variables and Channel Types

	HSPDSCH	HSSCCH
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**

Spread Code **TFCI Field Off On** **Scramble Code** **Scramble Offset**

Random **PN9** **Standard** **Left Alternate** **Right Alternate**

PCCPCH **SCCPCH** **PSCH** **SSCH** **CPICH** **DPCH** **PICH** **OCNS**

HSPDSCH **HSSCCH**

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 352.

: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` EQUal|SCALe

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 359.

: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 **DPCCH** **DPCCH + 1 DPDCH** **DPCCH + 2 DPDCH** **DPCCH + 3 DPDCH** **DPCCH + 4 DPDCH** **DPCCH + 5 DPDCH** **Custom WCDMA State**

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 360.

: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 344.

For uplink, refer to ":LINK:UP:SETup" on page 359.

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>,
<TFCI>,<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).

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

<symbol_rate>	**<spread_rate>**
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

Key Entry **Channel** **Type** **Symbol Rate** **First Spread Code** **Power**

Spread Code **TFCI Field Off On** **Scramble Code** **Scramble Offset**

Random

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 360.

: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 360.

: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 **TCFI 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 unleveled 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 300.

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 366.

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 300.

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 unleveled 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 366.

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 300 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 366.

: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

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 366 to enter the external reference frequency.

: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 374 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 370
  - — SINGle, see ":RETRigger" on page 367
  - — GATE, selecting the mode also sets the response
- Selecting the trigger source (see ":TRIGger[:SOURce]" on page 371), 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 373
  - — GATE, see ":TRIGger:TYPE:GATE:ACTive" on page 370

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 370). 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 400

```
[:SOURce]:RADio:WCDMa:TGPP:ARB:TRIGger:CONTinuous[:TYPE] FREE|
TRIGger|RESet
[:SOURce]:RADio:WCDMa:TGPP:ARB:TRIGger: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 368.

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

Key Entry **Free Run** **Trigger & Run** **Reset & Run**

: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 368.

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 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 368. 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 373.

  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 370
  — continuous and single modes, see ":TRIGger[:SOURce]:EXTernal:SLOPe" on page 373

- 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 372
  — turning the delay on, see ":TRIGger[:SOURce]:EXTernal:DELay:STATe" on page 372

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 372). 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 371.

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 371.

: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 372, and for more information on configuring an external source, see":TRIGger[:SOURce]" on page 371.

***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 370.

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 371.

***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 371. 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
Choices	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.

ON (1)	This choice enables the W-CDMA modulation capability and sets up the internal hardware to generate the currently selected W-CDMA signal selection.
OFF (0)	This choice disables the W-CDMA baseband signal capability.
***RST**	0
Key Entry	**W-CDMA Off On**
Remarks	This choice also activates the I/Q state and sets the I/Q source to internal.

Symbols

Numerics

C

G

H

I

M

N

O

P

Q

R

T

U

V

W