

SCPI Command Reference Volume 1

Agilent Technologies E4428C/38C ESG Signal Generators

This guide applies to the following signal generator models:

E4428C ESG Analog Signal Generator

E4438C ESG Vector Signal Generator

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

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



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SCPI Command Reference, Volume 1

1. SCPI Basics.....	1
Command Reference Information	2
SCPI Command Listings	2
Key and Data Field Cross Reference	2
Supported Field.....	2
SCPI Basics.....	3
Common Terms.....	3
Command Syntax	4
Command Types	5
Command Tree	6
Command Parameters and Responses	7
Program Messages.....	12
File Name Variables	13
File Types and Directory Structure	14
MSUS (Mass Storage Unit Specifier) Variable.....	16
Quote Usage with SCPI Commands	17
Binary, Decimal, Hexadecimal, and Octal Formats	18
2. Basic Function Commands.....	19
Correction Subsystem ([:SOURce]:CORRection)	20
:FLATness:LOAD	20
:FLATness:PAIR	20
:FLATness:POINts	20
:FLATness:PRESet	21
:FLATness:STORe	21
[:STATE]	21
Digital Modulation Subsystem—E4438C ([:SOURce]).	22
:BURSt:SOURce.....	22
:BURSt:STATe	22
:DM:EXTernal:ALC:BANDwidth BWIDth	22
:DM:EXTernal:HCRest[:STATE]	23
:DM:EXTernal:FILTer.....	23
:DM:EXTernal:FILTer:AUTO.....	23
:DM:EXTernal:POLarity.....	24
:DM:EXTernal:SOURce	24

Contents

:DM:IQADjustment:BBG:QSKEw	25
:DM:IQADjustment:EXTernal:COFFset	26
:DM:IQADjustment:EXTernal:DIOFFset	26
:DM:IQADjustment:EXTernal:DQOFFset	27
:DM:IQADjustment:EXTernal:GAIN	27
:DM:IQADjustment:EXTernal:IOFFset	27
:DM:IQADjustment:EXTernal:IQATten	28
:DM:IQADjustment:EXTernal:QOFFset	28
:DM:IQADjustment:GAIN	29
:DM:IQADjustment:IOFFset	29
:DM:IQADjustment:QOFFset	30
:DM:IQADjustment:QSKEw	30
:DM:IQADjustment:SKEW	31
:DM:IQADjustment:SKEW:Path	32
:DM:IQADjustment[:STATe]	32
:DM:MODulation:FILTer	32
:DM:MODulation:FILTer:AUTO	33
:DM:MODulation:ATTen	33
:DM:MODulation:ATTen:AUTO	34
:DM:Polarity[:ALL]	34
:DM:SKEW:PATH	35
:DM:SKEW[:STATe]	35
:DM:SOURce	35
:DM:SRATio	36
:DM:STATe	37
Frequency Subsystem ([:SOURce])	38
:FREQuency:CHANnels:BAND	38
:FREQuency:CHANnels:NUMBER	40
:FREQuency:CHANnels[:STATe]	41
:FREQuency:FIXed	41
:FREQuency:MODE	42
:FREQuency:MULTiplier	42
:FREQuency:OFFSet	43
:FREQuency:OFFSet:STATe	43
:FREQuency:REFerence	43
:FREQuency:REFerence:STATe	44
:FREQuency:STARt	44
:FREQuency:STOP	45

:FREQuency:SYNthesis	45
:FREQuency[:CW]	46
:FREQuency[:CW]:STEP[:INCrement]	47
:PHASe:REFerence.....	47
:PHASe[:ADJust]	47
:ROSCillator:SOURce	47
:ROSCillator:SOURce:AUTO	48
List/Sweep Subsystem (:SOURce)	49
:LIST:DIRection	50
:LIST:DWEli	50
:LIST:DWEli:POINTs.....	51
:LIST:DWEli:TYPE.....	51
:LIST:FREQuency.....	51
:LIST:FREQuency:POINTs	52
:LIST:MANual	52
:LIST:MODE	53
:LIST:POWER.....	53
:LIST:POWER:POINTs	53
:LIST:RETRace.....	54
:LIST:TRIGger:SOURce	54
:LIST:TYPE	55
:LIST:TYPE:LIST:INITialize:FSTep	55
:LIST:TYPE:LIST:INITialize:PRESet	56
:SWEep:DWEli	56
:SWEep:POINTs	57
Power Subsystem (:SOURce):POWER).....	58
:ALC:BANDwidth BWIDth	58
:ALC:BANDwidth	59
:ALC:LEVel	60
:ALC:SEARch	60
:ALC:SEARch:REFerence	61
:ALC:SEARch:SPAN:START	61
:ALC:SEARch:SPAN:STOP:SPAN:STOP	61
:ALC:SEARch:SPAN:TYPE	62
:ALC:SEARch:SPAN[:STATE]	62
:ALC[:STATE]	62
:ALTernate:AMPLitude	63
:ALTernate:MANual	63

Contents

:ALTerate:STATE.....	64
:ALTerate:TRIGger[:SOURce].....	64
:ATTenuation.....	65
:ATTenuation:AUTO	65
:MODE	66
:REFerence	66
:REFERENCE:STATE	67
:STARt	67
:STOP	68
[:LEVel][:IMMEDIATE]:OFFSet.....	68
[:LEVel][:IMMEDIATE][:AMPLitude].....	69
[:LEVel][:IMMEDIATE][:AMPLitude]:STEP	69
3. System Commands.....	71
Calibration Subsystem (:CALibration).....	72
:DCFM	72
:IQ	72
:IQ:DC	72
:IQ:DEFault	73
:IQ:FULL	73
:IQ:STARt	74
:IQ:STOP	74
Communication Subsystem (:SYSTem:COMMUnicate).....	75
:GPIB:ADDReSS	75
:GTLocal	75
:LAN:CONFig	75
:LAN:GATEway	76
:LAN:HOSTname	76
:LAN:IP	76
:LAN:SUBNet	77
:PMETer:ADDReSS	77
:PMETer:CHANnel	77
:PMETer:IDN	78
:PMETer:TIMEout	78
:SERial:BAUD	79
:SERial:ECHO	79
:SERial:RESet	79
:SERial:TOUT	80

Diagnostic Subsystem (:DIAGnostic[:CPU]:INFOrmation)	81
:BOARds	81
:CCoUnt:ATTenuator	81
:CCoUnt:PON	81
:CCoUnt:PROTection	81
:DISPlay:OTIMe	82
:LIcense:AUXiliary	82
:LIcense:WAVeform	82
:OPTions	83
:OPTions:DETail	83
:OTIMe	83
:REVision	83
:SDATe	84
:WLICence[:VALue].	84
Display Subsystem (:DISPlay)	85
:ANNotation:AMPLitude:UNIT	85
:ANNotation:CLOCK:DATE:FORMAT	85
:ANNotation:CLOCK[:STATE]	85
:BRIGHTness	86
:CAPTURE	86
:CONTRast	86
:INVerse	87
:REMote	87
[:WINDOW][,:STATE].	87
IEEE 488.2 Common Commands.	88
*CLS	88
*ESE	88
*ESE?	88
*ESR?	89
*IDN?	89
*OPC	89
*OPC?	90
*OPT?	90
*PSC	90
*PSC?	90
*RCL	90
*RST	91
*SAV	91

Contents

*SRE	91
*SRE?	92
*STB?	92
*TRG	92
*TST?	92
*WAI	93
Memory Subsystem (:MEMory)	94
:CATalog:BINary	94
:CATalog:BIT	94
:CATalog:CDMa	95
:CATalog:CDMA	95
:CATalog:DMOD	95
:CATalog:DWCdma	96
:CATalog:FCDMA	96
:CATalog:FIR	97
:CATalog:FSK	97
:CATalog:IQ	98
:CATalog:LIST	98
:CATalog:MCDMa	99
:CATalog:MDMod	99
:CATalog:MDWCdma	100
:CATalog:MFCdma	100
:CATalog:MTONE	101
:CATalog:RCDMa	101
:CATalog:SEQ	102
:CATalog:SHAPe	102
:CATalog:STATe	103
:CATalog:UFLT	103
:CATalog:UWCDma	104
:CATalog[:ALL]	104
:COPY[:NAME]	105
:DATA	105
:DATA:APPend	106
:DATA:BIT	107
:DATA:FIR	108
:DATA:FSK	109
:DATA:IQ	110
:DATA:PRAM:FILE:BLOCK	112

Contents

:DATA:PRAM:FILE:LIST	113
:DATA:PRAM	114
:DATA:PRAM:BLOCK	114
:DATA:PRAM:LIST	114
:DATA:SHAPe	114
:DATA:SHAPe	115
:DATA:UNPProtected	116
:DELeTe:ALL	117
:DELeTe:BINary	118
:DELeTe:BIT	118
:DELeTe:CDMa	118
:DELeTe:CDMA	118
:DELeTe:DMOD	118
:DELeTe:DWCdma	119
:DELeTe:FCDMa	119
:DELeTe:FIR	119
:DELeTe:FSK	119
:DELeTe:IQ	119
:DELeTe:LIST	120
:DELeTe:MCDMa	120
:DELeTe:MDMod	120
:DELeTe:MDWCdma	120
:DELeTe:MFCdma	120
:DELeTe:MTOne	121
:DELeTe:RCDMa	121
:DELeTe:SEQ	121
:DELeTe:SHAPe	121
:DELeTe:STATE	121
:DELeTe:UFLT	122
:DELeTe:UWCdma	122
:DELeTe[:NAME]	122
:FREE[:ALL]	122
:LOAD:LIST	123
:MOVE	123
:STATe:COMMent	123
:STORe:LIST	123
Mass Memory Subsystem (:MMEMory)	124
:CATalog	124

Contents

:COPY	124
:DATA	125
:DELetE:NVWFm	125
:DELetE:WFM	125
:DELetE:WFM1	125
:DELetE[:NAME]	126
:HEADer:CLEar	126
:HEADer:DESCription	126
:LOAD:LIST	127
:MOVE	127
:STORe:LIST	127
Output Subsystem (:OUTPut)	128
:BLANking:AUTO	128
:BLANking:STATe	128
:MODulation[:STATe]	129
[:STATe]	129
Route Subsystem (:ROUTe:HARDware:DGENERator)	130
:INPut:BPOLarity	130
:INPut:CPOLarity	130
:INPut:DPOLarity	131
:INPut:SPOLarity	131
:IPOLarity:BGATe	131
:IPOLarity:CLOCK	132
:IPOLarity:DATA	132
:IPOLarity:SSYNc	132
:OPOLarity:CLOCK	133
:OPOLarity:DATA	133
:OPOLarity:SSYNc	134
:OUTPut:CPOLarity	134
:OUTPut:DCS[:STATe]	135
:OUTPut:DPOlarity	135
:OUTPut:SPOLarity	135
Status Subsystem (:STATus)	136
:OPERation:BASEband:CONDition	136
:OPERation:BASEband:ENABLE	136
:OPERation:BASEband:NTRansition	137
:OPERation:BASEband:PTRansition	137
:OPERation:BASEband[:EVENT]	138

Contents

:OPERation:CONDition	138
:OPERation:ENABLE	139
:OPERation:NTRansition	139
:OPERation:PTRansition	140
:OPERation[:EVENT]	140
:PRESet	140
:QUESTIONable:BERT:CONDition	141
:QUESTIONable:BERT:ENABLE	141
:QUESTIONable:BERT:NTRansition	142
:QUESTIONable:BERT:PTRansition	142
:QUESTIONable:BERT[:EVENT]	143
:QUESTIONable:CALibration:CONDition	143
:QUESTIONable:CALibration:ENABLE	143
:QUESTIONable:CALibration:NTRansition	144
:QUESTIONable:CALibration:PTRansition	144
:QUESTIONable:CALibration[:EVENT]	145
:QUESTIONable:CONDition	145
:QUESTIONable:ENABLE	146
:QUESTIONable:FREQuency:CONDition	146
:QUESTIONable:FREQuency:ENABLE	146
:QUESTIONable:FREQuency:NTRansition	147
:QUESTIONable:FREQuency:PTRansition	147
:QUESTIONable:FREQuency[:EVENT]	147
:QUESTIONable:MODulation:CONDition	148
:QUESTIONable:MODulation:ENABLE	148
:QUESTIONable:MODulation:NTRansition	149
:QUESTIONable:MODulation:PTRansition	149
:QUESTIONable:MODulation[:EVENT]	149
:QUESTIONable:NTRansition	150
:QUESTIONable:POWER:CONDition	150
:QUESTIONable:POWER:ENABLE	151
:QUESTIONable:POWER:NTRansition	151
:QUESTIONable:POWER:PTRansition	151
:QUESTIONable:POWER[:EVENT]	152
:QUESTIONable:PTRansition	152
:QUESTIONable[:EVENT]	153
System Subsystem (:SYSTem)	154
:CAPability	154

Contents

:DATE	154
:ERRor[:NEXT]	155
:ERRor:SCPI[:SYNTAX]	155
:FILEsystem:SAFEmode	155
:HELP:MODE	156
:IDN	156
:LANGuage	156
:OPT	157
:PON:TYPE	157
:PRESet	158
:PRESet:ALL	158
:PRESet:LANGuage	158
:PRESet:PERSistent	159
:PRESet:PN9	159
:PRESet:TYPE	160
:PRESet[:USER]:SAVE	160
:SECurity:DISPlay	160
:SECurity:ERASEall	161
:SECurity:LEVel	161
:SECurity:LEVel:STATE	162
:SECurity:OVERwrite	163
:SECurity:SANitize	163
:SSAVer:DELay	163
:SSAVer:MODE	164
:SSAVer:STATE	164
:TIME	165
:VERSion	165
Trigger Subsystem	166
:ABORT	166
:INITiate:CONTinuous[:ALL]	166
:INITiate[:IMMEDIATE][[:ALL]]	167
:TRIGger:OUTPut:POLarity	167
:TRIGger[:SEQUENCE]:SLOPe	168
:TRIGger[:SEQUENCE]:SOURce	168
:TRIGger[:SEQUENCE][[:IMMEDIATE]]	169
Unit Subsystem (:UNIT)	170
:POWER	170

4. Analog Commands171
Amplitude Modulation Subsystem (:SOURce)	172
:AM[1]2.....	172
:AM:INTERNAL:FREQUENCY:STEP[:INCREMENT]	172
:AM:WIDEBAND:STATe	173
:AM[1]2:EXTernal[1]2:COUPLing	173
:AM[1]2:INTERNAL[1]:FREQUENCY	174
:AM[1]2:INTERNAL[1]:FREQUENCY:ALTERNATE	174
:AM[1]2:INTERNAL[1]:FREQUENCY:ALTERNATE:AMPLITUDE:PERCENT	175
:AM[1]2:INTERNAL[1]:FUNCTION:SHAPE	175
:AM[1]2:INTERNAL[1]:SWEep:TIME	175
:AM[1]2:INTERNAL[1]:SWEep:TRIGger	176
:AM[1]2:SOURce	176
:AM[1]2:STATe	177
:AM[1]2[:DEPTH]	177
:AM[1]2[:DEPTH]:TRACK	178
:AM[:DEPTH]:STEP[:INCREMENT]	178
Frequency Modulation Subsystem (:SOURce)	179
:FM[1]2.....	179
:FM:INTERNAL:FREQUENCY:STEP[:INCREMENT]	180
:FM[1]2:EXTernal[1]2:COUPLing	180
:FM[1]2:INTERNAL[1]:FREQUENCY	181
:FM[1]2:INTERNAL[1]:FREQUENCY:ALTERNATE	181
:FM[1]2:INTERNAL[1]:FREQUENCY:ALTERNATE:AMPLITUDE:PERCENT	182
:FM[1]2:INTERNAL[1]:FUNCTION:SHAPE	182
:FM[1]2:INTERNAL[1]:SWEep:TIME	183
:FM[1]2:INTERNAL[1]:SWEep:TRIGger	183
:FM[1]2:SOURce	184
:FM[1]2:STATe	184
:FM[1]2[:DEVIATION]	185
:FM[1]2[:DEVIATION]:TRACK	185
Low Frequency Output Subsystem (:SOURce):LFOOutput	186
:AMPLITUDE	186
:FUNCTION[1]:FREQUENCY	186
:FUNCTION[1]:FREQUENCY:ALTERNATE	187
:FUNCTION[1]:FREQUENCY:ALTERNATE:AMPLITUDE:PERCENT	187
:FUNCTION[1]:PERIOD	188
:FUNCTION[1]:PWIDTH	188

Contents

:FUNCTION[1]:SHAPE	189
:FUNCTION[1]:SWEep:TIME	189
:FUNCTION[1]:SWEep:TRIGger	189
:SOURce	190
:STATe	190
Phase Modulation Subsystem ([:SOURce])	191
:PM[1]2.....	191
:PM:INTERNAL:FREQuency:STEP[:INCREMENT]	192
:PM[1]2:BANDwidth BWIDth	192
:PM[1]2:EXTERNAL[1]:COUpling	193
:PM[1]2:INTERNAL[1]:FREQuency	193
:PM[1]2:INTERNAL[1]:FREQuency:ALTerNate	194
:PM[1]2:INTERNAL[1]:FREQuency:ALTerNate:AMPLitude:PERCent	194
:PM[1]2:INTERNAL[1]:FUNCTION:SHAPE	195
:PM[1]2:INTERNAL[1]:SWEep:TIME	195
:PM[1]2:INTERNAL[1]:SWEep:TRIGger	195
:PM[1]2:SOURce	196
:PM[1]2:STATe	196
:PM[1]2[:DEVIation]	197
:PM[1]2[:DEVIation]:TRACk	197
:PM[:DEVIation]:STEP[:INCREMENT]	198
Pulse Modulation Subsystem ([:SOURce]:PULM)	199
:INTERNAL[1]:FREQuency	199
:INTERNAL[1]:FREQuency:STEP	199
:INTERNAL[1]:FUNCTION:SHAPE	200
:INTERNAL[1]:PERiod	200
:INTERNAL[1]:PERiod:STEP[:INCREMENT]	200
:INTERNAL[1]:PWIDth	201
:INTERNAL[1]:PWIDth:STEP	201
:SOURce	202
:STATe	202
5. Component Test Digital Commands	203
All Subsystem—Option 001/601 or 002/602 ([:SOURce])	204
:RADio:ALL:OFF	204
AWGN ARB Subsystem—Option 403 ([:SOURce]:RADio:AWGN:ARB)	205
:BWIDth	205
:IQ:EXTERNAL:FILTER	205

:IQ:EXTernal:FILT _E r:AUTO	206
:HEADER:CLEAR	206
:HEADer:SAVE	206
:IQ:MODulation:ATTen	207
:IQ:MODulation:ATTen:AUTO	207
:IQ:MODulation:FILT _E r	208
:IQ:MODulation:FILT _E r:AUTO	208
:MDESTination:AAMPlitude	209
:MDESTination:ALCHold	209
:MDESTination:PULSe	210
:MPOLarity:MARKer1 2 3 4	212
:LENgth	212
:REFerence:EXTernal:FREQuency	212
:REFerence[:SOURce]	213
:SClock:RATE	213
:SEED	214
[{:STATe}]	214
CDMA ARB Subsystem—Option 401 ([{:SOURce}]:RADio:CDMA:ARB)	215
:CLIPping:I	215
:CLIPping:POSITION	215
:CLIPping:Q	215
:CLIPping:TYPE	216
:CLIPping[:IJJQ]	216
:CRATe	216
:IQ:EXTernal:FILT _E r	217
:IQ:EXTernal:FILT _E r:AUTO	217
:FILT _E r	218
:FILT _E r:ALPHA	219
:FILT _E r:BBT	219
:FILT _E r:CHANnel	220
:HEADER:CLEAR	220
:HEADer:SAVE	220
:IQMap	221
:IQ:MODulation:ATTen	221
:IQ:MODulation:ATTen:AUTO	221
:IQ:MODulation:FILT _E r	222
:IQ:MODulation:FILT _E r:AUTO	222
:MDESTination:AAMPlitude	222

Contents

:MDESTination:ALCHold	223
:MDESTination:PULSe	224
:MPOLarity:MARKer1 2 3 4	226
:OSAMple	226
:REFERENCE:EXTernal:FREQuency	226
:REFerence[:SOURce]	227
:RETRigger	227
:SCLock:RATE	228
:SETup	228
:SETup:CHANnel	229
:SETup:MCARRIER	230
:SETup:MCARRIER:STORe	231
:SETup:MCARRIER:TABLE	231
:SETup:STORe	232
:TRIGger:TYPE	233
:TRIGger:TYPE:CONTinuous[:TYPE]	234
:TRIGger:TYPE:GATE:ACTive	235
:TRIGger[:SOURce]	235
:TRIGger[:SOURce]:EXTernal:DELay	236
:TRIGger[:SOURce]:EXTernal:DELay:STATe	237
:TRIGger[:SOURce]:EXTernal:SLOPe	237
:TRIGger[:SOURce]:EXTernal[:SOURce]	238
:WLENgth	238
[:STATe]	239
CDMA2000 ARB Subsystem—Option 401 (:SOURce):RADio:CDMA2000:ARB)	240
:CLIPping:I	240
:CLIPping:POSition	240
:CLIPping:Q	240
:CLIPping:TYPE	241
:CLIPping:I Q	241
:IQ:EXTernal:FILTer	241
:IQ:EXTernal:FILTter:AUTO	242
:FILTter	242
:FILTter:ALPHA	243
:FILTter:BBT	244
:FILTter:CHANnel	244
:HEADER:CLEAR	245
:HEADER:SAVE	245

:IQ:MODulation:ATTen	245
:IQ:MODulation:ATTen:AUTO	246
:IQ:MODulation:FILTer	246
:IQ:MODulation:FILTer:AUTO	246
:IQMap	247
:LINK	247
:LINK:FORward:SETup	247
:LINK:FORward:SETup:MCARrier	248
:LINK:FORward:SETup:MCARrier:STORe	249
:LINK:FORward:SETup:MCARrier:TABLE	249
:LINK:FORward:SETup:MCARrier:TABLE:NCARriers	250
:LINK:FORward:SETup:STORe	251
:LINK:FORward:SETup:TABLE:APPLY	251
:LINK:FORward:SETup:TABLE:CHANnel	252
:LINK:FORward:SETup:TABLE:NCHannels	253
:LINK:FORward:SETup:TABLE:PADJust	253
:LINK:REVerse:RCONfig	253
:LINK:REVerse:SETup	254
:LINK:REVerse:SETup:STORe	254
:LINK:REVerse:SETup:TABLE:APPLY	255
:LINK:REVerse:SETup:TABLE:CHANnel	255
:LINK:REVerse:SETup:TABLE:NCHannels	256
:LINK:REVerse:SETup:TABLE:PADJust	256
:MDESTination:AAMplitude	257
:MDESTination:ALCHold	257
:MDESTination:PULSe	258
:MPOLarity:MARKer1 2 3 4	260
:REFERENCE:EXTernal:FREQuency	260
:REFERENCE[:SOURce]	260
:RETRigger	261
:REVision	261
:SClock:RATE	262
:SPReading:RATE	262
:SPReading:TYPE	263
:SPReading:TYPE:MCARRIER:SPACing	263
:TRIGger:TYPE	263
:TRIGger:TYPE:CONTinuous[:TYPE]	265
:TRIGger:TYPE:GATE:ACTive	266

Contents

:TRIGger[:SOURce]	266
:TRIGger[:SOURce]:EXTernal:DELay	267
:TRIGger[:SOURce]:EXTernal:DELay:STATe	268
:TRIGger[:SOURce]:EXTernal:SLOPe	268
:TRIGger[:SOURce]:EXTernal[:SOURce]	269
[:STATe]	269
Dmodulation Subsystem—Option 001/601 or 002/602 (:SOURce):RADio:DModulation:ARB)	270
:IQ:EXTernal:FILTer	270
:IQ:EXTernal:FILTer:AUTO	270
:FILTter	271
:FILTter:ALPHA	272
:FILTter:BBT	272
:FILTter:CHANnel	273
:HEADer:CLEar	273
:HEADer:SAVE	273
:IQ:MODulation:ATTen:AUTO	274
:IQ:MODulation:FILTter	275
:IQ:MODulation:FILTter:AUTO	275
:MDESTination:AAMPplitude	276
:MDESTination:ALCHold	276
:MDESTination:PULSE	277
:MODulation:FSK[:DEViation]	279
:MODulation[:TYPE]	279
:MPOLarity:MARKer1 2 3 4	280
:REFerence:EXTernal:FREQuency	280
:REFerence[:SOURce]	281
:RETRigger	281
:SClock:RATE	282
:SETup	282
:SETup:MCARrier	283
:SETup:MCARrier:PHASE	283
:SETup:MCARrier:STORE	284
:SETup:MCARrier:TABLE	284
:SETup:MCARrier:TABLE:NCARriers	285
:SETup:STORE	285
:SRATE	286
:TRIGger:TYPE	287
:TRIGger:TYPE:CONTinuous[:TYPE]	288

:TRIGger:TYPE:GATE:ACTive	289
:TRIGger[:SOURce]	290
:TRIGger[:SOURce]:EXTernal:DELay	291
:TRIGger[:SOURce]:EXTernal:DELay:STATe	291
:TRIGger[:SOURce]:EXTernal:SLOPe	292
:TRIGger[:SOURce]:EXTernal[:SOURce].....	292
[:STATe]	293
Dual ARB Subsystem—Option 001/601 or 002/602 ([:SOURce]:RADIO:ARB)	294
:CLIPping	294
:GENERate:SINE	294
:HEADER:CLEar	295
:HEADER:RMS	295
:HEADER:SAVE	297
:HCRest[:STATe]	297
:IQ:EXTernal:FILTer	298
:IQ:EXTernal:FILTer:AUTO	298
:IQ:MODulation:ATTen	298
:IQ:MODulation:ATTen:AUTO	299
:IQ:MODulation:FILTter	299
:IQ:MODulation:FILTter:AUTO	300
:MARKer:CLEar	300
:MARKer:CLEar:ALL	301
:MARKer:ROTate	302
:MARKer:[SET]	302
:MDESTination:AAMplitude	305
:MDESTination:ALCHold	305
:MDESTination:PULSe	306
:MPOLarity:MARKer1 2 3 4	308
:NOISE:BFACtor	308
:NOISE:CBWidth	309
:NOISE:CN	309
:NOISE[:STATe]	310
:REFERENCE:EXTernal:FREQuency	310
:REFERENCE[:SOURce]	311
:RETRigger	311
:RSCALing	312
:SCALing	312
:SClock:RATE	313

Contents

:SEQUence	313
:TRIGger:TYPE	315
:TRIGger:TYPE:CONTinuous[:TYPE]	317
:TRIGger:TYPE:GATE:ACTive	317
:TRIGger:TYPE:SADVance[:TYPE]	318
:TRIGger:TYPE:SADVance[:TYPE]	318
:TRIGger[:SOURce]	320
:TRIGger[:SOURce]:EXTernal:DELay:SAMPles	321
:TRIGger[:SOURce]:EXTernal:DELay:STATe OFF ON 0	321
:TRIGger[:SOURce]:EXTernal:DELay:STATe	321
:TRIGger[:SOURce]:EXTernal:DELay[:TIME]	322
:TRIGger[:SOURce]:EXTernal:SLOPe	322
:TRIGger[:SOURce]:EXTernal[:SOURce]	323
:WAVeform	323
:Waveform:NHEAders	324
[:STATe]	324
Multitone Subsystem—Option 001/601 or 002/602 (:SOURce):RADio:MTONe:ARB)	326
Creating a Multitone Waveform	326
:HEADER:CLEar	326
:HEADER:SAVE	326
:IQ:EXTernal:FILTer	327
:IQ:EXTernal:FILTter:AUTO	327
:IQ:MODulation:ATTen	328
:IQ:MODulation:ATTen:AUTO	328
:IQ:MODulation:FILTter	329
:IQ:MODulation:FILTER:AUTO	329
:MDESTination:AAMPplitude	329
:MDESTination:ALCHold	330
:MDESTination:PULSE	331
:MPOLarity:MARKer1 2 3 4	333
:REFERENCE:EXTernal:FREQuency	333
:REFERENCE[:SOURce]	333
:ROW	334
:RSCALing	335
:SCLock:RATE	335
:SETup	336
:SETup:STORe	336
:SETup:TABLE	336

:SETUp:TABLE:FSPacing	337
:SETUp:TABLE:NTONes	337
:SETUp:TABLE:PHASE:INITialize	338
:SETUp:TABLE:PHASE:INITialize:SEED	338
[::STATe]	339
Wideband CDMA ARB Subsystem—Option 400	
([:SOURce]:RADio:WCDMa:TGPP:ARB)	340
:CLIPping:I	340
:CLIPping:POSITION	340
:CLIPping:Q	340
:CLIPping:TYPE	341
:CLIPping[:I Q]	341
:CRATe	342
:FILTER	342
:FILTER:ALPHA	343
:FILTER:BBT	343
:FILTER:CHANnel	344
:HEADER:CLEAR	344
:HEADER:SAVE	344
:IQ:EXTernal:FILTER	344
:IQ:EXTernal:FILTER:AUTO	345
:IQMap	345
:IQ:MODulation:ATTen	346
:IQ:MODulation:ATTen:AUTO	346
:IQ:MODulation:FILTER	346
:IQ:MODulation:FILTER:AUTO	347
:LINK	347
:LINK:DOWN:OACP	347
:LINK:DOWN:SETup	348
:LINK:DOWN:SETup:MCARrier	349
:LINK:DOWN:SETup:MCARrier:CLIPping:I	350
:LINK:DOWN:SETup:MCARrier:CLIPping:Q	351
:LINK:DOWN:SETup:MCARrier:CLIPping:TYPE	351
:LINK:DOWN:SETup:MCARrier:CLIPping[:I Q]	351
:LINK:DOWN:SETup:MCARrier:SCODE:AINCrement	352
:LINK:DOWN:SETup:MCARrier:STORE	352
:LINK:DOWN:SETup:MCARrier:TABLE	353
:LINK:DOWN:SETup:MCARrier:TABLE:NCARriers	355
:LINK:DOWN:SETup:MCARrier:TOFFset:AINCrement	355

Contents

:LINK:DOWN:SETup:STORe	355
:LINK:DOWN:SETup:TABLE:APPLy	356
:LINK:DOWN:SETup:TABLE:CHANnel	356
:LINK:DOWN:SETup:TABLE:NCHannels?	361
:LINK:DOWN:SETup:TABLE:PADJust	361
:LINK:DOWN:TFCI	361
:LINK:UP:OACP	362
:LINK:UP:SCRAMBLE	362
:LINK:UP:SDPDch	362
:LINK:UP:SETup	363
:LINK:UP:SETup:STORe	364
:LINK:UP:SETup:TABLE:APPLY	364
:LINK:UP:SETup:TABLE:CHANnel	364
:LINK:UP:SETup:TABLE:GUNit	366
:LINK:UP:SETup:TABLE:NCHannel	366
:LINK:UP:TFCI	366
:MDESTination:AAMPplitude	367
:MDESTination:ALCHold	367
:MDESTination:PULSe	368
:MPOLarity:MARKer1 2 3 4	370
:REFerence:EXTernal:FREQuency	370
:REFerence[:SOURce]	370
:RETRigger	371
:REVision	371
:SCLock:RATE	372
:TRIGger:TYPE	372
:TRIGger:TYPE:CONTinuous[:TYPE]	374
:TRIGger:TYPE:GATE:ACTive	374
:TRIGger[:SOURce]	375
:TRIGger[:SOURce]:EXTernal:DELay	376
:TRIGger[:SOURce]:EXTernal:DELay:STATe	376
:TRIGger[:SOURce]:EXTernal:SLOPe	377
:TRIGger[:SOURce]:EXTernal[:SOURce] [:STATe]	377

SCPI Command Reference, Volume 2

6. Digital Signal Interface Module Commands	379
Digital Subsystem—Option 003 and 004 ([:SOURce])	380
:DIGItal:CLOCK:CPS 1 2 4	380
:DIGItal:CLOCK:PHASe	380
:DIGItal:CLOCK:POLarity	381
:DIGItal:CLOCK:RATE	382
:DIGItal:CLOCK:REFERENCE:FREQuency	382
:DIGItal:CLOCK:SKEW	383
:DIGItal:CLOCK:SOURCe	383
:DIGItal:DATA:ALIGNment	384
:DIGItal:DATA:BORDER	384
:DIGItal:DATA:DIRection	385
:DIGItal:DATA:IGain	385
:DIGItal:DATA:INEGate	386
:DIGItal:DATA:IOFFset	386
:DIGItal:DATA:IQSWap	387
:DIGItal:DATA:NFORmat	387
:DIGItal:DATA:POLarity:FRAMe	387
:DIGItal:DATA:POLarity:IQ	388
:DIGItal:DATA:QGain	388
:DIGItal:DATA:QNEGate	389
:DIGItal:DATA:QOFFset	390
:DIGItal:DATA:ROTation	390
:DIGItal:DATA:SCALing	391
:DIGItal:DATA:SIZE	391
:DIGItal:DATA:STYPe	392
:DIGItal:DATA:TYPE	392
:DIGItal:DIAGnostic:LOOPback	393
:DIGItal:LOGic[:TYPE]	393
:DIGItal:PConfig	394
:DIGItal:PRESet:PTHRough	395
:DIGItal[:STATe]	395
7. Bit Error Rate Test (BERT) Commands	397
Calculate Subsystem—Option UN7 and 300 (:CALCulate:BERT)	398

Contents

:BTS:LOOPback:EDGE:ETCH:F43:COMParator:CRITeria:ERATe	398
:BTS:LOOPback:EDGE:ETCH:F43:COMParator:CRITeria[:SElect]	398
:BTS:LOOPback:EDGE:MCS5:COMParator:CRITeria:ERATe	399
:BTS:LOOPback:EDGE:MCS5:COMParator:CRITeria[:SElect]	399
:BTS:LOOPback:EDGE:MCS9:COMParator:CRITeria:ERATe	399
:BTS:LOOPback:EDGE:MCS9:COMParator:CRITeria[:SElect]	400
:BTS:LOOPback:EDGE:UNCoded:COMParator:CRITeria:ERATe	400
:BTS:LOOPback:EDGE:UNCoded:COMParator:CRITeria[:SElect]	401
:BTS:LOOPback:GSM:CS1:COMParator:CRITeria:ERATe	401
:BTS:LOOPback:GSM:CS1:COMParator:CRITeria[:SElect]	402
:BTS:LOOPback:GSM:CS4:COMParator:CRITeria:ERATe	402
:BTS:LOOPback:GSM:CS4:COMParator:CRITeria[:SElect]	402
:BTS:LOOPback:GSM:MCS1:COMParator:CRITeria:ERATe	403
:BTS:LOOPback:GSM:MCS1:COMParator:CRITeria[:SElect]	403
:BTS:LOOPback:GSM:COMParator:CRITeria:CIB	404
:BTS:LOOPback:GSM:COMParator:CRITeria:CII	404
:BTS:LOOPback:GSM:COMParator:CRITeria:FERasure	404
:BTS:LOOPback:GSM:COMParator:CRITeria[:SElect]	405
[:BASeband]:COMParator:MODE	405
[:BASeband]:COMParator:THRehold	406
[:BASeband]:COMParator[:STATe]	406
[:BASeband]:DISPlay:MODE	407
[:BASeband]:DISPlay:UPDate	407
Data Subsystem–Option UN7 and 300 (:DATA)	408
:BERT:BTS:LOOPback:EDGE:ETCH:F43[:DATA]	408
:BERT:BTS:LOOPback:EDGE:MCS5[:DATA]	409
:BERT:BTS:LOOPback:EDGE:MCS9[:DATA]	410
:BERT:BTS:LOOPback:EDGE:UNCoded[:DATA]	410
:BERT:BTS:LOOPback:GSM[:DATA]	410
:BERT:BTS:LOOPback:GSM:CS1[:DATA]	412
:BERT:BTS:LOOPback:GSM:CS4[:DATA]	413
:BERT:BTS:LOOPback:GSM:MCS1[:DATA]	413
:BERT:AUXout	413
[:DATA]	415
Input Subsystem–Option UN7 (:INPut:BERT[: BASeband])	416
:CGATe:DELay:CLOCk	416
:CGATe:DELay:MODE	416
:CGATe:DELay:TIME	417

:CGATe:DELaY[:STATe]	417
:CGATe:POLarity	418
:CGATe[:STATe]	418
:CLOCK:DELaY:RESolution	418
:CLOCK:DELaY:TIME	419
:CLOCK:DELaY[:STATe]	419
:CLOCK:POLarity	420
:DATA:POLarity	420
:IMPedance	420
:THreshold	421
Measure Subsystem—Option 300 (:MEASure[:SCALar]:BERT:BTS:LOOPback)	422
:EDGE:MCS5[:SENSitivity]	422
:EDGE:MCS9[:SENSitivity]	422
:EDGE:UNCoded[:SENSitivity]	423
:GSM[:SENSitivity]	424
Sense Subsystem—Options UN7 and 300 ([:SOURce]:SENSe:BERT)	425
:BTS:LOOPback:EDGE:ETCH:F43:BLOCk:COUNt	425
:BTS:LOOPback:EDGE:ETCH:F43:CONTain	425
:BTS:LOOPback:EDGE:ETCH:F43:STOP:CRITeria:EBLocK	426
:BTS:LOOPback:EDGE:ETCH:F43:STOP:CRITeria[:SElect]	426
:BTS:LOOPback:EDGE:FTRigger:EXTernal:DELay	427
:BTS:LOOPback:EDGE:FTRigger:EXTernal:POLarity	427
:BTS:LOOPback:EDGE:FTRigger[SElect]	428
:BTS:LOOPback:EDGE:MCS5:BLOCk:COUNt	428
:BTS:LOOPback:EDGE:MCS5:CONTain	429
:BTS:LOOPback:EDGE:MCS5:ESENSitivity	429
:BTS:LOOPback:EDGE:MCS5:HAMPLitude	429
:BTS:LOOPback:EDGE:MCS5:LAMPLitude	430
:BTS:LOOPback:EDGE:MCS5:PAMPLitude	430
:BTS:LOOPback:EDGE:MCS5:SBlock:COUNt	430
:BTS:LOOPback:EDGE:MCS5:SBlock:INITial	431
:BTS:LOOPback:EDGE:MCS5:STOP:CRITeria:EBLocK	431
:BTS:LOOPback:EDGE:MCS5:STOP:CRITeria[:SElect]	431
:BTS:LOOPback:EDGE:MCS9:BLOCk:COUNt	432
:BTS:LOOPback:EDGE:MCS9:CONTain	432
:BTS:LOOPback:EDGE:MCS9:ESENSitivity	432
:BTS:LOOPback:EDGE:MCS9:HAMPLitude	433
:BTS:LOOPback:EDGE:MCS9:LAMPLitude	433

Contents

:BTS:LOOPback:EDGE:MCS9:PAMPlitude	434
:BTS:LOOPback:EDGE:MCS9:SBLock:COUNt	434
:BTS:LOOPback:EDGE:MCS9:SBLock:INITial	434
:BTS:LOOPback:EDGE:MCS9:STOP:CRITeria:EBLock	435
:BTS:LOOPback:EDGE:MCS9:STOP:CRITeria[:SElect]	435
:BTS:LOOPback:EDGE:MEASurement:STOP	435
:BTS:LOOPback:EDGE:MEASurement:TSLot	436
:BTS:LOOPback:EDGE:MEASurement[:MODE]	436
:BTS:LOOPback:EDGE:SINVert	437
:BTS:LOOPback:EDGE:SYNC:AGAin	437
:BTS:LOOPback:EDGE:SYNC:RF	437
:BTS:LOOPback:EDGE:SYNC[:SOURce]	438
:BTS:LOOPback:EDGE:TRIGger[:SOURce]	438
:BTS:LOOPback:EDGE:ULINK:OFFSet	439
:BTS:LOOPback:EDGE:UNCoded:BIT:COUNt	439
:BTS:LOOPback:EDGE:UNCoded:ESENsitivity	439
:BTS:LOOPback:EDGE:UNCoded:HAMPLitude	440
:BTS:LOOPback:EDGE:UNCoded:LAMPLitude	440
:BTS:LOOPback:EDGE:UNCoded:PAMPlitude	441
:BTS:LOOPback:EDGE:UNCoded:SBIT:COUNt	441
:BTS:LOOPback:EDGE:UNCoded:SBIT:INITial	441
:BTS:LOOPback:EDGE:UNCoded:STOP:CRITeria:EBIT	442
:BTS:LOOPback:EDGE:UNCoded:STOP:CRITeria[:SElect]	442
:BTS:LOOPback:EDGE[:STATe]	442
:BTS:LOOPback:GSM:CS1:BLOCK:COUNt	443
:BTS:LOOPback:GSM:CS1:CONTain	443
:BTS:LOOPback:GSM:CS1:STOP:CRITeria:EBLock	444
:BTS:LOOPback:GSM:CS1:STOP:CRITeria[:SElect]	444
:BTS:LOOPback:GSM:CS4:BLOCK:COUNt	444
:BTS:LOOPback:GSM:CS4:CONTain	445
:BTS:LOOPback:GSM:CS4:STOP:CRITeria:EBLock	445
:BTS:LOOPback:GSM:CS4:STOP:CRITeria[:SElect]	446
:BTS:LOOPback:GSM:ESENsitivity	446
:BTS:LOOPback:GSM:FRAMe:CIB	446
:BTS:LOOPback:GSM:FRAMe:CII	446
:BTS:LOOPback:GSM:FRAMe:COUNt	447
:BTS:LOOPback:GSM:HAMPLitude	447
:BTS:LOOPback:GSM:LAMPLitude	447

:BTS:LOOPback:GSM:MCS1:BLOCK:COUNt	448
:BTS:LOOPback:GSM:MCS1:CONTain	448
:BTS:LOOPback:GSM:MCS1:STOP:CRITeria:EBLock	448
:BTS:LOOPback:GSM:MCS1:STOP:CRITeria[:SElect]	449
:BTS:LOOPback:GSM:MEASurement:STOP	449
:BTS:LOOPback:GSM:MEASurement:TSLot	449
:BTS:LOOPback:GSM:MEASurement[:MODE]	450
:BTS:LOOPback:GSM:PAMPlitude	450
:BTS:LOOPback:GSM:SFRame:COUNt	450
:BTS:LOOPback:GSM:SFRame:INITial	451
:BTS:LOOPback:GSM:SINVert	451
:BTS:LOOPback:GSM:STOP:CRITeria:CIB	451
:BTS:LOOPback:GSM:STOP:CRITeria:CII	452
:BTS:LOOPback:GSM:STOP:CRITeria:FERasure	452
:BTS:LOOPback:GSM:STOP:CRITeria[:SElect]	452
:BTS:LOOPback:GSM:SYNC:RF	453
:BTS:LOOPback:GSM:SYNC[:SOURce]	454
:BTS:LOOPback:GSM:TRIGger[:SOURce]	454
:BTS:LOOPback:GSM:ULINK:OFFSet	455
:BTS:LOOPback:GSM[:STATe]	455
[:BASeband]:PRBS:FUNCTION:SPIGnore:DATA	455
[:BASeband]:PRBS:FUNCTION:SPIGnore[:STATe]	456
[:BASeband]:PRBS[:DATA]	456
[:BASeband]:RSYNc:THreshold	456
[:BASeband]:RSYNc[:STATe]	457
[:BASeband]:STATe	457
[:BASeband]:STOP:CRITeria:EBIT	457
[:BASeband]:STOP:CRITeria[:SElect]	458
[:BASeband]:TBITs	458
[:BASeband]:TRIGger:BDELay	459
[:BASeband]:TRIGger:BDELay:STATe	459
[:BASeband]:TRIGger:COUNt	459
[:BASeband]:TRIGger:POLarity	460
[:BASeband]:TRIGger[:SOURce]	460
8. Receiver Test Digital Commands	461
All Subsystem-Option 001/601 or 002/602 ([:SOURce])	462
:RADio:ALL:OFF	462

Contents

AWGN Real-Time Subsystem—Option 403 ([:SOURce]:RADio:AWGN:RT)	463
:BWIDth	463
[:STATe]	463
Bluetooth Subsystem—Option 406 ([:SOURce]:RADio:BLUEtooth:ARB)	464
:AMADdr	464
:BDADdr	464
:BURSt[:STATe]	464
:CGDelay	465
:DATA	465
:IQ:EXTernal:FILTER	466
:IQ:EXTernal:FILTER:AUTO	466
:HEADER:CLEar	467
:HEADER:SAVE	467
:IMPAIRments	467
:IMPAIRments:AWGN	468
:IMPAIRments:AWGN:CNR	468
:IMPAIRments:AWGN:NSEed	469
:IMPAIRments:DDEViation	469
:IMPAIRments:FDType	470
:IMPAIRments:FOFFset	470
:IMPAIRments:MINdex	471
:IMPAIRments:STERror	472
:IQ:MODulation:ATTen	472
:IQ:MODulation:ATTen:AUTO	473
:IQ:MODulation:FILTER	473
:IQ:MODulation:FILTER:AUTO	474
:MDESTination:AAMPplitude	474
:MDESTination:ALCHold	474
:MDESTination:PULSE	475
:MPOLarity:MARKer1 2 3 4	475
:MPOLarity:MARKer1	475
:MPOLarity:MARKer2	476
:MPOLarity:MARKer3	476
:MPOLarity:MARKer4	476
:PACKet	476
:REFerence:EXTernal:FREQuency	477
:REFERence[:SOURce]	477
:RSYMBOLs	478

:SCLock:RATE	478
[::STATe]	478
CDMA2000 BBG Subsystem—Option 401 ([::SOURce]:RADio:CDMA2000[:BBG])	479
:LMODe	479
[:FORWARD]:BBCLock	480
[:FORWARD]:CHIPrate	480
[:FORWARD]:ESDelay	480
[:FORWARD]:FILTter	481
[:FORWARD]:FILTter:ALPHA	482
[:FORWARD]:FILTter:BBT	482
[:FORWARD]:FILTter:CHANnel	482
[:FORWARD]:LCSTate	483
[:FORWARD]:FFCH:DATA	483
[:FORWARD]:FFCH:DATA:FIX4	484
[:FORWARD]:FFCH:EBNO	484
[:FORWARD]:FFCH:FOFFset	485
[:FORWARD]:FFCH:LCMask	485
[:FORWARD]:FFCH:LCMask:ESN	486
[:FORWARD]:FFCH:LCMask:HEADER	486
[:FORWARD]:FFCH:POWer	486
[:FORWARD]:FFCH:PRAMp	487
[:FORWARD]:FFCH:PRTime	487
[:FORWARD]:FFCH:QOF	487
[:FORWARD]:FFCH:RATE	488
[:FORWARD]:FFCH:RCONfig	488
[:FORWARD]:FFCH:WALSh	488
[:FORWARD]:FFCH[:STATE]	489
[:FORWARD]:FPCH:DATA	489
[:FORWARD]:FPCH:EBNO	489
[:FORWARD]:FPCH:LCMask	490
[:FORWARD]:FPCH:LCMask:F1	490
[:FORWARD]:FPCH:LCMask:F2	490
[:FORWARD]:FPCH:LCMask:F3	491
[:FORWARD]:FPCH:MESSAge	491
[:FORWARD]:FPCH:POWer	491
[:FORWARD]:FPCH:RATE	492
[:FORWARD]:FPCH:WALSh	492
[:FORWARD]:FPCH[:STATE]	492

Contents

[:FORWARD]:FPICh:ECNO	493
[:FORWARD]:FPICh:POWeR	493
[:FORWARD]:FPICh[:STATe]	494
[:FORWARD]:FSCH[1]2:DATA	494
[:FORWARD]:FSCH[1]2:DATA:FIX4	494
[:FORWARD]:FSCH[1]2:EBNO	495
[:FORWARD]:FSCH[1]2:FOFFset	495
[:FORWARD]:FSCH[1]2:LCMask	496
[:FORWARD]:FSCH[1]2:LCMask:ESN	496
[:FORWARD]:FSCH[1]2:LCMask:HEADer	496
[:FORWARD]:FSCH[1]2:POWeR	497
[:FORWARD]:FSCH[1]2:QOF	497
[:FORWARD]:FSCH[1]2:RATE	497
[:FORWARD]:FSCH[1]2:RCONfig	498
[:FORWARD]:FSCH[1]2:TCODe	498
[:FORWARD]:FSCH[1]2:WALSh	498
[:FORWARD]:FSCH[1]2[:STATe]	499
[:FORWARD]:FSYNC:CFReQuency	499
[:FORWARD]:FSYNC:DAYLt	499
[:FORWARD]:FSYNC:EBNO	500
[:FORWARD]:FSYNC:ECFReQuency	500
[:FORWARD]:FSYNC:LPSec	501
[:FORWARD]:FSYNC:LTMoff	501
[:FORWARD]:FSYNC:MPREv	501
[:FORWARD]:FSYNC:MSGType	502
[:FORWARD]:FSYNC:NID	502
[:FORWARD]:FSYNC:POWeR	502
[:FORWARD]:FSYNC:PRATe	503
[:FORWARD]:FSYNC:PREV	503
[:FORWARD]:FSYNC:RESErved	503
[:FORWARD]:FSYNC:SID	504
[:FORWARD]:FSYNC:STYPe	504
[:FORWARD]:FSYNC:SYSTime	504
[:FORWARD]:FSYNC:WALSh	505
[:FORWARD]:FSYNC[:STATe]	505
[:FORWARD]:NOISe:CN	505
[:FORWARD]:NOISe[:STATe]	506
[:FORWARD]:OCNS:EBNO	506

[:FORWARD]:OCNS:POWer	507
[:FORWARD]:OCNS:WALSh	508
[:FORWARD]:OCNS[:STATe]	508
[:FORWARD]:PADJust	508
[:FORWARD]:POLarity	509
[:FORWARD]:QPCH:CCI	509
[:FORWARD]:QPCH:EBNO	509
[:FORWARD]:QPCH:PI	510
[:FORWARD]:QPCH:POWer	510
[:FORWARD]:QPCH:RATE	511
[:FORWARD]:QPCH:WALSh	511
[:FORWARD]:QPCH[:STATe]	511
[:FORWARD]:SRATE	511
:PNOFFset	512
:REVerse:BBClock	512
:REVerse:CHIPRate	513
:REVerse:ESDelay	513
:REVerse:FILTter	514
:REVerse:FILTter:ALPHA	515
:REVerse:FILTter:BBT	515
:REVerse:FILTter:CHANnel	516
:REVerse:LCMask	516
:REVerse:LCSTate	516
:REVerse:PADJust	517
:REVerse:POLarity[:ALL]	517
:REVerse:NOISE:CN	517
:REVerse:NOISe[:STATe]	518
:REVerse:RC12:ACCess:RACH:DATA	518
:REVerse:RC12:ACCess:RACH:DATA:FIX4	519
:REVerse:RC12:ACCess:RACH:EBNO	519
:REVerse:RC12:ACCess:RACH:FLENgth	520
:REVerse:RC12:ACCess:RACH:FOFFset	520
:REVerse:RC12:ACCess:RACH:POWer	520
:REVerse:RC12:ACCess:RACH:RCONfig	521
:REVerse:RC12:ACCess:RACH:RATE	521
:REVerse:RC12:ACCess:RACH[:STATe]	521
:REVerse:RC12:TRAFFic:RSCH:DATA	522
:REVerse:RC12:TRAFFic:RSCH:DATA:FIX4	522

Contents

:REVerse:RC12:TRAFFic:RSCH:FLENgth	522
:REVerse:RC12:TRAFFic:RSCH:FOFFset	523
:REVerse:RC12:TRAFFic:RSCH:POWeR	523
:REVerse:RC12:TRAFFic:RSCH:RATE	523
:REVerse:RC12:TRAFFic:RSCH:RCONfig	524
:REVerse:RC12:TRAFFic:RSCH[:STATe]	524
:REVerse:RC34:CCONtrol:RCCCh:DATA	524
:REVerse:RC34:CCONtrol:RCCCh:DATA:FIX4	525
:REVerse:RC34:CCONtrol:RCCCh:EBNO	525
:REVerse:RC34:CCONtrol:RCCCh:FLENgth	526
:REVerse:RC34:CCONtrol:RCCCh:FOFFset	526
:REVerse:RC34:CCONtrol:RCCCh:POWeR	526
:REVerse:RC34:CCONtrol:RCCCh:RCONfig	527
:REVerse:RC34:CCONtrol:RCCCh:RATE	527
:REVerse:RC34:CCONtrol:RCCCh:WALSh	527
:REVerse:RC34:CCONtrol:RCCCh[:STATe]	528
:REVerse:RC34:CCONtrol:RPICh:ECNO	528
:REVerse:RC34:CCONtrol:RPICh:GRATe	529
:REVerse:RC34:CCONtrol:RPICh:POWeR	529
:REVerse:RC34:CCONtrol:RPICh:WALSh	529
:REVerse:RC34:CCONtrol:RPICh[:STATe]	530
:REVerse:RC34:EACCess:REACH:DATA	530
:REVerse:RC34:EACCess:REACH:DATA:FIX4	530
:REVerse:RC34:EACCess:REACH:EBNO	531
:REVerse:RC34:EACCess:REACH:FOFFset	531
:REVerse:RC34:EACCess:REACH:POWeR	532
:REVerse:RC34:EACCess:REACH:RCONfig	532
:REVerse:RC34:EACCess:REACH:RATE	532
:REVerse:RC34:EACCess:REACH:WALSh	533
:REVerse:RC34:EACCess:REACH[:STATe]	533
:REVerse:RC34:EACCess:RPICh:ECNO	533
:REVerse:RC34:EACCess:RPICh:GRATe	534
:REVerse:RC34:EACCess:RPICh:POWeR	534
:REVerse:RC34:EACCess:RPICh:WALSh	534
:REVerse:RC34:EACCess:RPICh[:STATe]	535
:REVerse:RC34:TRAFFic:RDCCh:DATA	535
:REVerse:RC34:TRAFFic:RDCCh:DATA:FIX4	535
:REVerse:RC34:TRAFFic:RDCCh:EBNO	536

:REVerse:RC34:TRAFFic:RDCCh:FLENgth	536
:REVerse:RC34:TRAFFic:RDCCh:FOFFset	536
:REVerse:RC34:TRAFFic:RDCCh:POWeR	537
:REVerse:RC34:TRAFFic:RDCCh:RATE	537
:REVerse:RC34:TRAFFic:RDDCh:RCONfig	537
:REVerse:RC34:TRAFFic:RDCCh:WALSh	538
:REVerse:RC34:TRAFFic:RDCCh[:STATe]	538
:REVerse:RC34:TRAFFic:RFCH:DATA	538
:REVerse:RC34:TRAFFic:RFCH:DATA:FIX4	539
:REVerse:RC34:TRAFFic:RFCH:EBNO	539
:REVerse:RC34:TRAFFic:RFCH:FLENgth	540
:REVerse:RC34:TRAFFic:RFCH:FOFFset	540
:REVerse:RC34:TRAFFic:RFCH:POWeR	540
:REVerse:RC34:TRAFFic:RFCH:RCONfig	541
:REVerse:RC34:TRAFFic:RFCH:RATE	541
:REVerse:RC34:TRAFFic:RFCH:WALSh	541
:REVerse:RC34:TRAFFic:RFCH[:STATe]	541
:REVerse:RC34:TRAFFic:RSCH[1]:2:DATA	542
:REVerse:RC34:TRAFFic:RSCH[1]:2:DATA:FIX4	542
:REVerse:RC34:TRAFFic:RSCH[1]:2:DATA:EBNO	542
:REVerse:RC34:TRAFFic:RSCH[1]:2:FLENgth	543
:REVerse:RC34:TRAFFic:RSCH[1]:2:FOFFset	543
:REVerse:RC34:TRAFFic:RSCH[1]:2:POWeR	544
:REVerse:RC34:TRAFFic:RSCH[1]:2:RCONfig	544
:REVerse:RC34:TRAFFic:RSCH[1]:2:RATE	544
:REVerse:RC34:TRAFFic:RSCH[1]:2:TCODe	545
:REVerse:RC34:TRAFFic:RSCH[1]:2:WALSh	545
:REVerse:RC34:TRAFFic:RSCH[1]:2[:STATe]	545
:REVerse:REFerence:EXTernal:FREQuency	546
:REVerse:REFerence[:SOURce]	546
:REVerse:TADVance	546
:REVerse:TEDGE	547
:REVerse:SRATE	547
[:STATe]	547
Custom Subsystem—Option 001/601 or 002/602 ([:SOURce]:RADio:CUSTom)	548
:ALPha	548
:ASK	548
:BBClock	549

Contents

:BBT	549
:BRATe	550
:BURSt:SHAPe:FALL:DELay	552
:BURSt:SHAPe:FALL:TIME	552
:BURSt:SHAPe:FDELay	553
:BURSt:SHAPe:FTIME	553
:BURSt:SHAPe:RDELay	554
:BURSt:SHAPe:RISE:DELay	554
:BURSt:SHAPe:RISE:TIME	555
:BURSt:SHAPe:RTIMe	556
:BURSt:SHAPe[:TYPE]	556
:CHANnel	557
:DATA	557
:DATA:FIX4	558
:DATA:PRAM	558
:DENCode	559
:EDATA:DELay	559
:EDClock	559
:EREference	560
:EREference:VALue	560
:FILTer	561
:IQ:SCALE	562
:MODulation:FSK[:DEViation]	563
:MODulation:MSK[:PHASE]	563
:MODulation:UFSK	564
:MODulation:UIQ	564
:MODulation[:TYPE]	564
:POLarity[:ALL]	565
:SRATe	565
:STANDARD:SELect	567
:TRIGger:TYPE	567
:TRIGger:TYPE:CONTinuous[:TYPE]	568
:TRIGger:TYPE:GATE:ACTive	568
:TRIGger[:SOURce]	569
:TRIGger[:SOURce]:EXTernal:DELay	570
:TRIGger[:SOURce]:EXTernal:DELay:STATe	570
:TRIGger[:SOURce]:EXTernal:SLOPe	571
:TRIGger[:SOURce]:EXTernal[:SOURce]	571

[:STATe]	572
DECT Subsystem–Option 402 ([:SOURce]:RADio:DECT)	573
:ALPha	573
:BBClock	573
:BBT	574
:BRATe	574
:BURSt:PN9	575
:BURSt:SHAPe:FALL:DELay	576
:BURSt:SHAPe:FALL:TIME	576
:BURSt:SHAPe:FDELay	577
:BURSt:SHAPe:FTIMe.	577
:BURSt:SHAPe:RDELay	578
:BURSt:SHAPe:RISE:DELay.	578
:BURSt:SHAPe:RISE:TIME	579
:BURSt:SHAPe:RTIMe.	580
:BURSt:SHAPe[:TYPE]	580
:BURSt[:STATe]	581
:CHANnel	581
:DATA	582
:DATA:FIX4	582
:DATA:PRAM	583
:DEFault	583
:EDATA:DELay	583
:EDClock	584
:EREference	584
:EREference:VALue	585
:FILTER.	585
:IQ:SCALe	586
:MODulation:FSK[:DEViation]	586
:MODulation:MSK[:PHASE]	587
:MODulation:UFSK	587
:MODulation:UIQ	588
:MODulation[:TYPE]	588
:Polarity[:ALL]	588
:PPart:SL0T0 [1] 2 3 4 5 6 7 8 9 10 11[:TYPE].	589
:PPart:SL0T0 [1] 2 3 4 5 6 7 8 9 10 11:CUSTom.	589
:PPart:SL0T0 [1] 2 3 4 5 6 7 8 9 10 11:CUSTom:FIX4.	590
:PPart:SL0T0 [1] 2 3 4 5 6 7 8 9 10 11:LCApacity:A	590

Contents

:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity:P	591
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity:S	591
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity[:B]	592
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity[:B]:FIX4	592
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity:POWer	593
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:STATe	593
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:TRAFFic:A	593
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:TRAFFic:P	594
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:TRAFFic:S	594
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:TRAFFic[:B]	595
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:TRAFFic[:B]:FIX4	595
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity:A	596
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity:P.	596
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity:A	596
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity[:B]	597
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity[:B]:FIX4	597
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic:A	598
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic:P	598
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic:S	598
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic[:B]	599
:PPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic[:B]:FIX4	599
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11[:TYPE]	600
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:CUSTom	600
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:CUSTom:FIX4	601
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:DUMM2:A	601
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:DUMM2:P	602
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:DUMM2:S	602
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:DUMM[1]:A	602
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:DUMM[1]:P	603
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:DUMM[1]:S	603
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity:A	603
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity:P	604
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity:S	604
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity[:B]	604
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity[:B]:FIX4	605
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:LCACapacity:POWer	605
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:STATe	606
:RFPart:SLOTO[1]2 3 4 5 6 7 8 9 10 11:TRAFFic:A	606

:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:TRAFFic:P	606
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:TRAFFic:S	607
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:TRAFFic[:B]	607
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:TRAFFic[:B]:FIX4	608
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity:A	608
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity:P	608
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity:S	609
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity[:B]	609
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZLCapacity[:B]:FIX4	610
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic:A	610
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic:P	610
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic:S	611
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic[:B]	611
:RFPart:SLOT0[1]2 3 4 5 6 7 8 9 10 11:ZTRaffic[:B]:FIX4	612
:SECondary:RECall	612
:SECondary:SAVE	612
:SECondary:TRIGger[:SOURce]	613
:SECondary[:STATe]	613
:SOUT	614
:SOUT:OFFSet	614
:SOUT:SLOT	615
:SRATe	615
:TRIGger:TYPE	616
:TRIGger:TYPE:CONTinuous[:TYPE]	617
:TRIGger:TYPE:GATE:ACTive	618
:TRIGger[:SOURce]	618
:TRIGger[:SOURce]:EXTernal:DELay	619
:TRIGger[:SOURce]:EXTernal:SLOPe	620
:TRIGger[:SOURce]:EXTernal[:SOURce]	620
:TRIGger[:SOURce]:EXTernal:DELay:STATe	621
[:STATe]	621
EDGE Subsystem–Option 402 ([:SOURce]:RADio:EDGE)	622
:ALPHa	622
:BBClock	622
:BBT	623
:BURSt:SHAPe:FALL:DELay	623
:BURSt:SHAPe:FDElay	624
:BURSt:SHAPe:FALL:TIME	625

Contents

:BURSt:SHAPe:FTIMe	625
:BURSt:SHAPe:RDElAy	626
:BURSt:SHAPe:RISE:DELay	627
:BURSt:SHAPe:RISE:TIME	627
:BURSt:SHAPe:RTIMe	628
:BURSt:SHAPe[:TYPE]	629
:BURSt[:STATe]	629
:CHANnel	630
:DATA	630
:DATA:PRAM	631
:DATA:FIX4	631
:DEFault	632
:EDATA:DELay	632
:EDClock	632
:EREFerence	633
:EREFerence:VALue	633
:FILTer	634
:IQ:SCALe	635
:MODulation:FSK[:DEViation]	635
:MODulation:MSK[:PHASe]	636
:MODulation:UFSK	636
:MODulation:UIQ	636
:MODulation[:TYPE]	637
:POLarity[:ALL]	637
:SECondary:RECall	638
:SECondary:SAVE	638
:SECondary:TRIGger[:SOURce]	638
:SECondary[:STATe]	639
:SLOT0 [1] 2 3 4 5 6 7:CUSTom	639
:SLOT0 [1] 2 3 4 5 6 7:CUSTom:FIX4	640
:SLOT0 [1] 2 3 4 5 6 7:CUSTom:GUARD	640
:SLOT0 [1] 2 3 4 5 6 7:GMSK:ENCryption	641
:SLOT0 [1] 2 3 4 5 6 7:GMSK:ENCryption:CS1:DATA	642
:SLOT0 [1] 2 3 4 5 6 7:GMSK:ENCryption:CS4:DATA	643
:SLOT0 [1] 2 3 4 5 6 7:GMSK:ENCryption:DLINK:MCS1:DATA	643
:SLOT0 [1] 2 3 4 5 6 7:GMSK:ENCryption:FIX4	643
:SLOT0 [1] 2 3 4 5 6 7:GMSK:ENCryption:TCH:FS:DATA	644
:SLOT0 [1] 2 3 4 5 6 7:GMSK:ENCryption:ULINK:MCS1:DATA	644

:SLOT0 [1] 2 3 4 5 6 7:GMSK:STEal	645
:SLOT0 [1] 2 3 4 5 6 7:GMSK:TSEQUence	645
:SLOT0 [1] 2 3 4 5 6 7:MULTislot	646
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption	646
:SLOT0:NORMAl:ENCryption:BCH:BCC	648
:SLOT0:NORMAl:ENCryption:BCH:CELLid	649
:SLOT0:NORMAl:ENCryption:BCH:LAC	649
:SLOT0:NORMAl:ENCryption:BCH:MCC	649
:SLOT0:NORMAl:ENCryption:BCH:MNC	650
:SLOT0:NORMAl:ENCryption:BCH:PLMN	650
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption:DLINK:MCS5:DATA	650
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption:DLINK:MCS9:DATA	651
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption:ETCH:F43:DATA	651
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption:FIX4	652
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption:ULINK:MCS5:DATA	652
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption:ULINK:MCS9:DATA	653
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:ENCryption:UNCoded	653
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:GUARD	654
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:T1	654
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:T2	655
:SLOT0 [1] 2 3 4 5 6 7:NORMAl:TSEQUence	655
:SLOT0 [1] 2 3 4 5 6 7:LCAPacity:POWER	655
:SLOT0 [1] 2 3 4 5 6 7:STATe	656
:SLOT0 [1] 2 3 4 5 6 7[:TYPE]	656
:SOUT:	657
:SOUT:OFFSet	657
:SOUT:SLOT	658
:SRATe	658
:TRIGger:TYPE	660
:TRIGger:TYPE:CONTinuous[:TYPE]	660
:TRIGger:TYPE:GATE:ACTive	661
:TRIGger[:SOURce]	662
:TRIGger[:SOURce]:EXTernal:DELay	663
:TRIGger[:SOURce]:EXTernal:DELay:FINE	663
:TRIGger[:SOURce]:EXTernal:DELay:STATe	664
:TRIGger[:SOURce]:EXTernal:SLOPe	664
:TRIGger[:SOURce]:EXTernal[:SOURce]	665
[:STATe]	665

Contents

SCPI Command Reference, Volume 3

9. Receiver Test Digital Commands (continued)	667
3GPP W-CDMA HSPA Subsystem—Option 419 ([:SOURce]:RADio:WCDMa:HSPA[:BBG])	668
File Overview	668
Managing ESG Setting Conflicts and Error Messages	670
: DLINK:APPLy	671
: DLINK:AWGN:CN	671
: DLINK:AWGN[:STATe]	672
: DLINK:BBCLock[:SOURce]	672
: DLINK:CPICh:CCODe	672
: DLINK:CPICh:POWer	673
: DLINK:CPICh[:STATe]	673
: DLINK:DPCH:CCODe	673
: DLINK:DPCH:DATA	674
: DLINK:DPCH:DATA:FIX4	674
: DLINK:DPCH:DCH[1 2 3 4 5 6]:BSIZe	675
: DLINK:DPCH:DCH[1 2 3 4 5 6]:CRC	675
: DLINK:DPCH:DCH[1 2 3 4 5 6]:CTYPe	676
: DLINK:DPCH:DCH[1 2 3 4 5 6]:DATA	676
: DLINK:DPCH:DCH[1 2 3 4 5 6]:DATA:FIX4	677
: DLINK:DPCH:DCH[1 2 3 4 5 6]:NBLocks	677
: DLINK:DPCH:DCH[1 2 3 4 5 6]:RMATtribute	678
: DLINK:DPCH:DCH[1 2 3 4 5 6]:TTI	678
: DLINK:DPCH:DCH[1 2 3 4 5 6][:STATe]	678
: DLINK:DPCH:POWer	679
: DLINK:DPCH:SFormat	679
: DLINK:DPCH:SSCoffset	680
: DLINK:DPCH:TFCI	680
: DLINK:DPCH:TOFFset	681
: DLINK:DPCH:TPC:NSTeps	681
: DLINK:DPCH:TPC:PATTern	681
: DLINK:DPCH:TRPosition	682
: DLINK:DPCH[:STATe]	682
: DLINK:EAGCh:AGScope	683
: DLINK:EAGCh:AGValue	683
: DLINK:EAGCh:CCODe	684
: DLINK:EAGCh:ERNTI	685

:DLINK:EAGCh:Power	685
:DLINK:EAGCh[:STATe]	685
:DLINK:EHICh:CCODE	686
:DLINK:EHICh:INDicator	686
:DLINK:EHICh:POWer	687
:DLINK:EHICh:SSINdex	687
:DLINK:EHICh:TOFFset	687
:DLINK:EHICh[:STATe]	688
:DLINK:ERGCh:CCODE	688
:DLINK:ERGCh:POWER	688
:DLINK:ERGCh:RGValue	689
:DLINK:ERGCh:SSINdex	689
:DLINK:ERGCh:TOFFset	690
:DLINK:ERGCh[:STATe]	690
:DLINK:FILTter	690
:DLINK:FILTter:ALPHA	691
:DLINK:FILTter:BBT	692
:DLINK:FILTter:CHANnel	692
:DLINK:HSBurst	692
:DLINK:HSDPa:AMC:CQIMapping:UECategory	693
:DLINK:HSDPa:AMC:CPATtern	693
:DLINK:HSDPa:FCONtrol	694
:DLINK:HSDPa:HARQ:APATtern	695
:DLINK:HSDPa:HARQ:MNHTrans	696
:DLINK:HSDPa:HARQ:RVSequence[1] 2 3 4 5 6 7 8	696
:DLINK:HSDPa[1] 2 3 4:BSInfo	697
:DLINK:HSDPa[1] 2 3 4:HSPDsCh:COFFset	697
:DLINK:HSDPa[1] 2 3 4:HSPDsCh:DATA	698
:DLINK:HSDPa[1] 2 3 4:HSPDSch:DATA:FIX4	698
:DLINK:HSDPa:HSPDsCh:DSCH:DATA	699
:DLINK:HSDPa:HSPDSch:DSCH:DATA:FIX4	699
:DLINK:HSDPa:HSPDSch:DSCH:IRBSize	700
:DLINK:HSDPa:HSPDsCh:NCODE	700
:DLINK:HSDPa[1] 2 3 4:HSPDsCh:POWer	700
:DLINK:HSDPa[1] 2 3 4:HSPDsCh:SFORmat	701
:DLINK:HSDPa[1] 2 3 4:HSPDsCh[:STATe]	701
:DLINK:HSDPa[1] 2 3 4:HSSCch:CCODE	702
:DLINK:HSDPa[1] 2 3 4:HSSCch:DATA	702

Contents

:DLINK:HSDPa[1]2 3 4:HSSCch:DATA:FIX4	703
:DLINK:HSDPa[1]2 3 4:HSSCch:POWer	703
:DLINK:HSDPa[1]2 3 4:ITTI	704
:DLINK:HSDPa[1]2 3 4:ITTI:PATTern	704
:DLINK:HSDPa:NHPRocess	705
:DLINK:HSDPa[1]2 3 4:RVParameter	705
:DLINK:HSDPa[1]2 3 4:UEID	706
:DLINK:HSDPa[1]2 3 4[:STATe]	706
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:CCODe	707
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:DATA	707
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:MODulation	708
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:POWer	708
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:SF	708
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:SSCoffset	709
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:TOFFset	709
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16[:STATe]	710
:DLINK:PCCPch:BCH:DATA	710
:DLINK:PCCPch:BCH:DATA:FIX4	710
:DLINK:PCCPch:CCODe	711
:DLINK:PCCPch:POWer	711
:DLINK:PCCPch[:STATe]	712
:DLINK:PICH:CCODE	712
:DLINK:PICH:DATA	712
:DLINK:PICH:DATA:FIX4	713
:DLINK:PICH:POWer	713
:DLINK:PICH[:STATe]	714
:DLINK:POLarity	714
:DLINK:PSCH:POWer	714
:DLINK:PSCH[:STATe]	715
:DLINK:SCRamblecode	715
:DLINK:SSCH:POWer	715
:DLINK:SSCH[:STATe]	716
:DLINK:TXDiversity	716
:LINK	716
:ULINK:APPLy	717
:ULINK:AWGN:CN	717
:ULINK:AWGN[:STATe]	718
:ULINK:BBReference:EXTernal:MRATe	718

:ULINK:BBReference:EXTernal[:SOURce]	718
:ULINK:CRATe	719
:ULINK:DPCCh:CCODe	719
:ULINK:DPCCh:DATA	719
:ULINK:DPCCh:DATA:FIX4	720
:ULINK:DPCCh:FBI:PATTern	720
:ULINK:DPCCh:FBI:PATTern:FIX	720
:ULINK:DPCCh:POWER	721
:ULINK:DPCCh:SFORmat	721
:ULINK:DPCCh:TFCI	722
:ULINK:DPCCh:TPC:NSTeps	722
:ULINK:DPCCh:TPC:PATTern	722
:ULINK:DPCCh[:STATe]	723
:ULINK:DPDCh:DATA	724
:ULINK:DPDCh:DATA:FIX4	724
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:BSIZe	725
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:CRC	725
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:CTYPe	726
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:DATA	726
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:DATA:FIX4	727
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:NBLocks	727
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:RMATtribute	728
:ULINK:DPDCh:DCH[1 2 3 4 5 6]:TTI	728
:ULINK:DPDCh:DCH[2 3 4 5 6]:STATe]	728
:ULINK:DPDCh:POWER	729
:ULINK:DPDCh:SFORmat	729
:ULINK:DPDCh[:STATe]	730
:ULINK:FClock:INTerval	730
:ULINK:FClock:POLarity	730
:ULINK:FILTter	731
:ULINK:FILTter:ALPHa	731
:ULINK:FILTter:BBT	732
:ULINK:FILTter:CHANnel	732
:ULINK:FOFFset	733
:ULINK:HConfig	733
:ULINK:HSDPcch:APATtern	733
:ULINK:HSDPcch:APOWer	734

Contents

:ULINK:HSDPcch:CCODE	734
:ULINK:HSDPcch:CPATtern	735
:ULINK:HSDPcch:CPOWer	735
:ULINK:HSDPcch:NPOWer	736
:ULINK:HSDPcch:SFDelay	736
:ULINK:HSDPcch[:STATE]	736
:ULINK:HSUPa:EDPCch:DATA:FIX4	737
:ULINK:HSUPa:EDPCch:POWer	737
:ULINK:HSUPa:EDPCch[:STATE]	738
:ULINK:HSUPa:EDPDch:DATA	738
:ULINK:HSUPa:EDPDch:DATA:FIX4	738
:ULINK:HSUPa:EDPDch:EDCH:DATA	739
:ULINK:HSUPa:EDPDch:EDCH:DATA:FIX4	739
:ULINK:HSUPa:EDPDch:MCCodes	740
:ULINK:HSUPa:EDPDch:PLNMax	741
:ULINK:HSUPa:EDPDch:POWer	741
:ULINK:HSUPa:EDPDch:SNPHchs	741
:ULINK:HSUPa:EDPDch[:STATE]	742
:ULINK:HSUPa:ETABle	742
:ULINK:HSUPa:ETFCi	743
:ULINK:HSUPa:HARQ:APATtern	743
:ULINK:HSUPa:HARQ:APATtern[:EXTernal]:DELay	744
:ULINK:HSUPa:HARQ:APATtern[:EXTernal]:INPUT	744
:ULINK:HSUPa:HARQ:APATtern[:EXTernal]:POLarity	745
:ULINK:HSUPa:HARQ:MNRTtrans	745
:ULINK:HSUPa:HARQ[:MODE]	745
:ULINK:HSUPa:HARQ:HBIT	746
:ULINK:HSUPa:HPRocess	746
:ULINK:HSUPa:RSN	747
:ULINK:HSUPa:RVIndex	747
:ULINK:HSUPa:TFC:EPATtern[:EXTernal]:DELay	747
:ULINK:HSUPa:TFC:EPATtern[:EXTernal]:INPUT	748
:ULINK:HSUPa:TFC:EPATtern[:EXTernal]:POLarity	748
:ULINK:HSUPa:TFC:EPATtern	749
:ULINK:HSUPa:TFC[:ALT]:EDPCch:POWer	749
:ULINK:HSUPa:TFC[:ALT]:EDPDch:EDCH:DATA	750
:ULINK:HSUPa:TFC[:ALT]:EDPDch:EDCH:DATA:FIX4	750

:ULINK:HSUPa:TFC[:ALT]:EDPDch:POWer	751
:ULINK:HSUPa:TFC[:ALT]EDPDch:SNPHchs	751
:ULINK:HSUPa:TFC[:ALT]:ETABle	752
:ULINK:HSUPa:TFC[:ALT]:ETFCI	752
:ULINK:HSUPa:TTI	752
:ULINK:HSUPa[:STATe]	753
:ULINK:NMDPdch	753
:ULINK:POLarity	753
:ULINK:SCRamblecode	754
:ULINK:SDELay	754
:ULINK:SFNRst:POLarity	754
:ULINK:SYNC:MODE	755
:ULINK:SYNC[:SOURce]	755
:ULINK:TGAP:PSI[1]:CFN	756
:ULINK:TGAP:PSI[1]:D	756
:ULINK:TGAP:PSI[1]:L1	756
:ULINK:TGAP:PSI[1]:L2	757
:ULINK:TGAP:PSI[1]:PL1	757
:ULINK:TGAP:PSI[1]:PRC	757
:ULINK:TGAP:PSI[1]:PS	757
:ULINK:TGAP:PSI[1]:SN	758
:ULINK:TOFFset	758
:ULINK:TPControl:PATTern	759
:ULINK:TPControl:PATTern[:EXTernal]:INPut	759
:ULINK:TPControl:PATTern[:EXTernal]:POLarity	759
:ULINK:TPControl:POWer:INITial	760
:ULINK:TPControl:POWer:MAXimum	760
:ULINK:TPControl:POWer:MINimum	761
:ULINK:TPControl:POWer:STEP	761
:ULINK:TPControl[:STATe]	762
[:STATe]	762
Real Time GPS Subsystem–Option 409	
([:SOURce]:RADio[1] 2 3 4:GPS)	763
:DATA	763
:DMODe	763
:DSHift	764
:FILTter	764
:FILTter:ALPHA	765
:FILTter:BBT	766

Contents

:FILT _r :CHANnel	766
:IQPHase	767
:PCODE	767
:RCODE	767
:REFClk	768
:REFFreq	768
:SATid	769
[:STATe]	769
Real Time MSGPS Subsystem–Option 409	
([:SOURce]:RADiO[1 2 3 4]:MSGPs)	770
:IQPHase	770
:PMODE	770
:REFClk	771
:REFFreq	771
:REStart	771
:SCENario	772
:SCENario:SATellites	772
:SCENario:STATus	772
[:STATe]	772
GSM Subsystem–Option 402 ([:SOURce]:RADiO:GSM)	
:ALPha	773
:BBClock	773
:BBT	774
:BRATe	774
:BURSt:PN9	775
:BURSt:SHAPE:FALL:DELay	776
:BURSt:SHAPE:FALL:TIME	776
:BURSt:SHAPE:FDELay	777
:BURSt:SHAPE:FTIME	778
:BURSt:SHAPE:RDElay	778
:BURSt:SHAPE:RISE:DELay	779
:BURSt:SHAPE:RISE:TIME	780
:BURSt:SHAPE:RTIME	780
:BURSt:SHAPE[:TYPE]	781
:BURSt[:STATe]	781
:CHANnel	782
:DATA	782
:DATA:PRAM	783
:DATA:FIX4	783

:DEFault	783
:DENCode	784
EDATa:DELay	784
:EDClock	784
:EREference	785
:EREference:VALue	785
:FILTer	786
:IQ:SCALe	787
:MODulation:FSK[:DEViation]	787
:MODulation:MSK[:PHASE]	788
:MODulation:UFSK	788
:MODulation:UIQ	788
:MODulation[:TYPE]	789
:POLarity[:ALL]	789
:SECondary:RECall	790
:SECondary:SAVE	790
:SECondary:TRIGger[:SOURce]	790
:SECondary[:STATe]	791
:SLOT0 [1] 2 3 4 5 6 7:ACCess:ENCRyption	791
:SLOT0 [1] 2 3 4 5 6 7:ACCess:ENCRyption:FIX4	791
:SLOT0 [1] 2 3 4 5 6 7:ACCess:ETAIl	792
:SLOT0 [1] 2 3 4 5 6 7:ACCess:SSEQunce	792
:SLOT0 [1] 2 3 4 5 6 7:ACCess:CUSTom	792
:SLOT0 [1] 2 3 4 5 6 7:CUSTom:FIX4	793
:SLOT0 [1] 2 3 4 5 6 7:DUMMy:TSEQunce	793
:SLOT0 [1] 2 3 4 5 6 7:MULTislot	793
SLOT0 [1] 2 3 4 5 6 7:NORMal:ENCRyption	794
:SLOT0:NORMAL:ENCRyption:BCH1:BCC	796
:SLOT0:NORMAL:ENCRyption:BCH1:CELLid	796
:SLOT0:NORMAL:ENCRyption:BCH1:LAC	796
:SLOT0:NORMAL:ENCRyption:BCH1:MCC	797
:SLOT0:NORMAL:ENCRyption:BCH1:MNC	797
:SLOT0:NORMAL:ENCRyption:BCH1:PLMN	797
:SLOT0 [1] 2 3 4 5 6 7:NORMal:ENCRyption:CS1:DATA	798
:SLOT0 [1] 2 3 4 5 6 7:NORMal:ENCRyption:CS4:DATA	798
:SLOT0 [1] 2 3 4 5 6 7:NORMal:ENCRyption:DLINK:MCS1:DATA	798
:SLOT0 [1] 2 3 4 5 6 7:NORMal:ENCRyption:FIX4	799
:SLOT0 [1] 2 3 4 5 6 7:NORMal:ENCRyption:TCH:FS:DATA	799

Contents

:SLOT0 [1]2 3 4 5 6 7:NORMAl:ENCryption:ULINK:MCS1:DATA	799
:SLOT0 [1]2 3 4 5 6 7:NORMAl:STEal	800
:SLOT0 [1]2 3 4 5 6 7:NORMAl:TSEQUence	800
:SLOT0 [1]2 3 4 5 6 7:POWER	801
:SLOT0 [1]2 3 4 5 6 7:STATE	801
:SLOT0 [1]2 3 4 5 6 7:SYNC:ENCryption	801
:SLOT0 [1]2 3 4 5 6 7:SYNC:ENCryption:FIX4	802
:SLOT0 [1]2 3 4 5 6 7:SYNC:TSEQUence	802
:SLOT0 [1]2 3 4 5 6 7[:TYPE]	802
:SOUT	803
:SOUT:OFFSet	803
:SOUT:SLOT	804
:SRATE	804
:TRIGger:EXTernal:DELay	805
:TRIGger:TYPE	806
:TRIGger:TYPE:CONTinuous[:TYPE]	806
:TRIGger:TYPE:GATE:ACTive	807
:TRIGger[:SOURce]	807
:TRIGger[:SOURce]:EXTernal:DELay	808
:TRIGger[:SOURce]:EXTernal:DELay:FINE	809
:TRIGger[:SOURce]:EXTernal:DELay:STATE	809
:TRIGger[:SOURce]:EXTernal:SLOPe	809
:TRIGger[:SOURce]:EXTernal[:SOURce]	810
[:STATE]	811
HSDPA over W-CDMA Subsystem—Option 418 ([:SOURce]:RADio:WCDMa:HSDPa[:BBG]) .	812
File Overview	812
Managing ESG Setting Conflicts and Error Messages	814
:DLINK:APPLY	814
:DLINK:AWGN:CN	815
:DLINK:AWGN[:STATE]	815
:DLINK:BBClock[:SOURce]	815
:DLINK:CPICh:CCODE	816
:DLINK:CPICh:POWER	816
:DLINK:CPICh[:STATE]	816
:DLINK:DPCl:CCODE	816
:DLINK:DPCl:DATA	817
:DLINK:DPCl:DATA:FIX4	817
:DLINK:DPCl:DCH[1]2 3 4 5 6:BSIZE	818

:DLINK:DPCH:DCH[1]2 3 4 5 6:CTYPe	818
:DLINK:DPCH:DCH[1]2 3 4 5 6:CRC	819
:DLINK:DPCH:DCH[1]2 3 4 5 6:DATA	819
:DLINK:DPCH:DCH[1]2 3 4 5 6:DATA:FIX4	819
:DLINK:DPCH:DCH[1]2 3 4 5 6:NBLocks	820
:DLINK:DPCH:DCH[1]2 3 4 5 6:RMAPtribute	820
:DLINK:DPCH:DCH[1]2 3 4 5 6:TTI	821
:DLINK:DPCH:DCH2 3 4 5 6[:STATe]	821
:DLINK:DPCH:POWeR	821
:DLINK:DPCH:SFORmat	822
:DLINK:DPCH:SSCOFFset	822
:DLINK:DPCH:TFCI	823
:DLINK:DPCH:TOFFset	823
:DLINK:DPCH:TPC:NSTeps	824
:DLINK:DPCH:TPC:PATTERn	824
:DLINK:DPCH:TRPosition	825
:DLINK:DPCH[:STATe]	825
:DLINK:FILTter	825
:DLINK:FILTter:ALPHA	826
:DLINK:FILTter:BBT	826
:DLINK:FILTter:CHANnel	827
:DLINK:HSBurst	827
:DLINK:HSDPa:AMC:CQIMapping:UECategory	828
:DLINK:HSDPa:AMC:CPATtern	828
:DLINK:HSDPa:FCONtrol	829
:DLINK:HSDPa:HARQ:APATtern	830
:DLINK:HSDPa:HARQ:MNHTrans	830
:DLINK:HSDPa:HARQ:RVSequence[1]2 3 4 5 6 7 8	831
:DLINK:HSDPa[1]2 3 4:BSInfo	832
:DLINK:HSDPa[1]2 3 4:HSPDsch:COFFset	832
:DLINK:HSDPa[1]2 3 4:HSPDsch:DATA	832
:DLINK:HSDPa[1]2 3 4:HSPDSch:DATA:FIX4	833
:DLINK:HSDPa:HSPDsch:DSCH:DATA	833
:DLINK:HSDPa:HSPDSch:DSCH:DATA:FIX4	834
:DLINK:HSDPa:HSPDSch:DSCH:IRBSize	834
:DLINK:HSDPa:HSPDsch:NCODE	835
:DLINK:HSDPa[1]2 3 4:HSPDsch:POWeR	835
:DLINK:HSDPa[1]2 3 4:HSPDsch:SFORmat	836

Contents

:DLINK:HSDPa[1]2 3 4:HSPDsch[:STATE]	836
:DLINK:HSDPa[1]2 3 4:HSSCch:CCODE	837
:DLINK:HSDPa[1]2 3 4:HSSCch:DATA	837
:DLINK:HSDPa[1]2 3 4:HSSCch:DATA:FIX4	838
:DLINK:HSDPa[1]2 3 4:HSSCch:POWer	838
:DLINK:HSDPa[1]2 3 4:ITTI	839
:DLINK:HSDPa[1]2 3 4:ITTI:PATTern	839
:DLINK:HSDPa:NHPRocess	840
:DLINK:HSDPa[1]2 3 4:RVParameter	840
:DLINK:HSDPa[1]2 3 4:UEID	841
:DLINK:HSDPa[1]2 3 4[:STATE]	841
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:CCODE	842
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:DATA	842
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:POWer	843
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:SSCOffset	843
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:TOFFset	844
:DLINK:OCNS[1]2 3 4 5 6 7 8 9 10 11 12 13 14 15 16[:STATE]	844
:DLINK:PCCPch:BCH:DATA	844
:DLINK:PCCPch:BCH:DATA:FIX4	845
:DLINK:PCCPch:CCODE	845
:DLINK:PCCPch:POWer	846
:DLINK:PCCPch[:STATE]	846
:DLINK:PICH:CCODE	846
:DLINK:PICH:DATA	847
:DLINK:PICH:DATA:FIX4	847
:DLINK:PICH:POWer	848
:DLINK:PICH[:STATE]	848
:DLINK:POLarity	848
:DLINK:PSCH:POWer	849
:DLINK:PSCH[:STATE]	849
:DLINK:SCRamblecode	849
:DLINK:SSCH:POWer	850
:DLINK:SSCH[:STATE]	850
:DLINK:TXDiversity	850
:LINK	851
:ULINK:APPLY	851
:ULINK:AWGN:CN	851
:ULINK:AWGN[:STATE]	852

Contents

:ULINK:BBReference:EXTernal:MRATe	852
:ULINK:BBReference[:SOURce]	852
:ULINK:DPCCh:CCODE	853
:ULINK:DPCCh:DATA	853
:ULINK:DPCCh:DATA:FIX4	854
:ULINK:DPCCh:FBI:PATTern	854
:ULINK:DPCCh:FBI:PATTern:FIX	855
:ULINK:DPCCh:POWER	855
:ULINK:DPCCh:SFORmat	856
:ULINK:DPCCh[:STATe]	856
:ULINK:DPCCh:TFCI	856
:ULINK:DPCCh:TPC:NSTeps	857
:ULINK:DPCCh:TPC:PATTern	857
:ULINK:DPDCh:CCODE	858
:ULINK:DPDCh:DATA	858
:ULINK:DPDCh:DATA:FIX4	858
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:BSIZe	859
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:CRC	859
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:CTYPe	859
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:DATA	860
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:DATA:FIX4	860
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:NBLocks	861
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:RMAtribute	861
:ULINK:DPDCh:DCH[1] 2 3 4 5 6:TTI	862
:ULINK:DPDCh:DCH2 3 4 5 6[:STATe]	862
:ULINK:DPDCh:POWER	863
:ULINK:DPDCh:SFORmat	863
:ULINK:DPDCh[:STATe]	863
:ULINK:FClock:INTerval	864
:ULINK:FClock:POLarity	864
:ULINK:FILTter	865
:ULINK:FILTter:ALPHA	865
:ULINK:FILTter:BBT	866
:ULINK:FILTter:CHANnel	866
:ULINK:FOFFset	867
:ULINK:HSDPcch:APATtern	867
:ULINK:HSDPcch:APOWer	868
:ULINK:HSDPcch:CCODE	868

Contents

:ULINK:HSDPcch:CPATtern	868
:ULINK:HSDPcch:CPOWer	869
:ULINK:HSDPcch:NPOWer	869
:ULINK:HSDPcch:SFDelay	869
:ULINK:HSDPcch[:STATe]	870
:ULINK:POLarity	870
:ULINK:SCRamblecode	870
:ULINK:SDELay	871
:ULINK:SFNRst:POLarity	871
:ULINK:SYNC:MODE	872
:ULINK:SYNC[:SOURce]	872
:ULINK:TOFFset	872
[:STATe]	873
NADC Subsystem—Option 402 ([:SOURce]:RADio[:NADC])	874
:ALPha	874
:BBCLock	874
:BBT	875
:BRATe	875
:BURSt:PN9	876
:BURSt:SHAPE[:TYPE]	877
:BURSt:SHAPE:FALL:DELay	877
:BURSt:SHAPE:FALL:TIME	878
:BURSt:SHAPE:FDELay	878
:BURSt:SHAPE:FTIME	879
:BURSt:SHAPE:RDELay	880
:BURSt:SHAPE:RISE:DELay	880
:BURSt:SHAPE:RISE:TIME	881
:BURSt:SHAPE:RTIMe	882
:BURSt[:STATe]	882
:BURSt:SHAPE[:TYPE]	883
:CHANnel	883
:DATA	884
:DATA:PRAM	884
:DATA:FIX4	885
:DEFault	885
:EDATa:DELay	885
:EDClock	886
:EREference	886

:EREference:VALue	887
:FILTter	887
:FRATe	888
:IQ:SCALe	888
:MODulation:FSK[:DEViation]	889
:MODulation:MSK[:PHASe]	889
:MODulation:UFSK	889
:MODulation:UIQ	890
:MODulation[:TYPE]	890
:REPeat	891
:POLarity[:ALL]	891
:SECondary:RECall	891
:SECondary:SAVE	892
:SECondary:TRIGger[:SOURce]	892
:SECondary[:STATe]	892
:SLOT[1 2 3 4 5 6]:DCUStom	893
:SLOT[1 2 3 4 5 6]:DCUStom:FIX4	893
:SLOT[1 2 3 4 5 6]:DTCHannel:CDLocator	894
:SLOT[1 2 3 4 5 6]:DTCHannel:CDVCode	894
:SLOT[1 2 3 4 5 6]:DTCHannel:SACChannel	894
:SLOT[1 2 3 4 5 6]:DTCHannel:SWORd	895
:SLOT[1 2 3 4 5 6]:DTCHannel[:DATA]	895
:SLOT[1 2 3 4 5 6]:DTCHannel[:DATA]:FIX4	896
:SLOT[1 2 3 4 5 6]:POWER	896
:SLOT[1 2 3 4 5 6]:STATe	896
:SLOT[1 2 3 4 5 6]:UCUStom	897
:SLOT[1 2 3 4 5 6]:UCUStom:FIX4	897
:SLOT[1 2 3 4 5 6]:UTCHannel:CDVCode	897
:SLOT[1 2 3 4 5 6]:UTCHannel:SACChannel	898
:SLOT[1 2 3 4 5 6]:UTCHannel:SWORd	898
:SLOT[1 2 3 4 5 6]:UTCHannel[:DATA]	898
:SLOT[1 2 3 4 5 6]:UTCHannel[:DATA]:FIX4	899
:SLOT[1 2 3 4 5 6][:TYPE]	899
:SOUT	900
:SOUT:OFFSet	900
:SOUT:SLOT	901
:SRATe	901
:TRIGger:TYPE	902

Contents

:TRIGger:TYPE:CONTinuous[:TYPE]	903
:TRIGger:TYPE:GATE:ACTive	904
:TRIGger[:SOURce]	904
:TRIGger[:SOURce]:EXTernal:DELay	905
:TRIGger[:SOURce]:EXTernal:DELay:STATe	906
:TRIGger[:SOURce]:EXTernal:SLOPe	906
:TRIGger[:SOURce]:EXTernal[:SOURce]	906
PDC Subsystem—Option 402 ([:SOURce]:RADIO:PDC)	908
:ALPha	908
:BBClock	908
:BBT	909
:BRArTe	909
:BURSt:PN9	910
:BURSt:SHAPe:FALL:DELay	911
:BURSt:SHAPe:FALL:TIME	911
:BURSt:SHAPe:FDELay	912
:BURSt:SHAPe:FTIME	913
:BURSt:SHAPe:RDELay	913
:BURSt:SHAPe:RISE:DELay	914
:BURSt:SHAPe:RISE:TIME	915
:BURSt:SHAPe:RTIME	915
:BURSt:SHAPe[:TYPE]	916
:BURSt[:STATe]	916
:CHANnel	917
:DATA	917
:DATA:PRAM	918
:DATA:FIX4	918
:DEFault	918
:EDATA:DELay	919
:EDClock	919
:EREference	919
:EREference:VALue	920
:FILTer	920
:FRATe	921
:IQ:SCALE	921
:MODulation:FSK[:DEViation]	922
:MODulation:MSK[:PHASe]	922

:MODulation:UFSK	923
:MODulation:UIQ	923
:MODulation[:TYPE]	923
:POLarity[:ALL]	924
:SECondary:RECall	924
:SECondary:SAVE	924
:SECondary:TRIGger[:SOURce]	925
:SECondary[:STATe]	925
:SLOT0[1]2 3 4 5:DCUSTom	926
:SLOT0[1]2 3 4 5:DCUSTom:FIX4	926
:SLOT0[1]2 3 4 5:DTCHannel:CCODE	926
:SLOT0[1]2 3 4 5:DTCHannel:SACChannel	927
:SLOT0[1]2 3 4 5:DTCHannel:SWORD	927
:SLOT0[1]2 3 4 5:DTCHannel[:TCHannel]	927
:SLOT0[1]2 3 4 5:DTCHannel[:TCHannel]:FIX4	928
:SLOT0[1]2 3 4:POWER	928
:SLOT0[1]2 3 4 5:STATe	929
:SLOT0[1]2 3 4 5:UCUSTom	929
:SLOT0[1]2 3 4 5:UCUSTom:FIX4	929
:SLOT0[1]2 3 4 5:UTCHannel:CCODE	930
:SLOT0[1]2 3 4 5:UTCHannel:SACChannel	930
:SLOT0[1]2 3 4 5:UTCHannel:SWORD	930
:SLOT0[1]2 3 4 5:UTCHannel[:TCHannel]	931
:SLOT0[1]2 3 4 5:UTCHannel[:TCHannel]:FIX4	931
:SLOT0[1]2 3 4 5:UVOX:CCODE	932
:SLOT0[1]2 3 4 5:UVox:SACChannel	932
:SLOT0[1]2 3 4 5:UVox:SWORD	932
:SLOT0[1]2 3 4 5[:TYPE]	933
:SOUT	933
:SOUT:OFFSet	933
:SOUT:SLOT	934
:SRATe	934
:TRIGger:TYPE	936
:TRIGger:TYPE:CONTinuous[:TYPE]	936
:TRIGger:TYPE:GATE:ACTive	937
:TRIGger[:SOURce]	937
:TRIGger[:SOURce]:EXternal:DELay	938
:TRIGger[:SOURce]:EXternal:DELay:STATe	939

Contents

:TRIGger[:SOURce]:EXTernal:SLOPe	939
:TRIGger[:SOURce]:EXTernal[:SOURce]	940
[:STATe]	940
PHS Subsystem—Option 402 ([:SOURce]:RADio:PHS)	941
:ALPha	941
:BBClock	941
:BBT	942
:BRATe	942
:BURSt:PN9	943
:BURSt:SCRamble:SEED	944
:BURSt:SCRamble[:STATe]	944
:BURSt:SHAPe:FALL:DELay	945
:BURSt:SHAPe:FALL:TIME	945
:BURSt:SHAPe:FDELay	946
:BURSt:SHAPe:FTIMe	947
:BURSt:SHAPe:RDELay	947
:BURSt:SHAPe:RISE:DELay	948
:BURSt:SHAPe:RISE:TIME	949
:BURSt:SHAPe:RTIMe	949
:BURSt:SHAPe[:TYPE]	950
:BURSt[:STATe]	950
:CHANnel	951
:DATA	951
:DATA:PRAM	952
:DATA:FIX4	952
:DEFault	952
:DLINK:SLOT[1]2 3 4:CUSTom	953
:DLINK:SLOT[1]2 3 4:CUSTom:FIX4	953
:DLINK:SLOT[1]2 3 4:POWER	953
:DLINK:SLOT[1]2 3 4:SCHannel:CSID	954
:DLINK:SLOT[1]2 3 4:SCHannel:IDLE	954
:DLINK:SLOT[1]2 3 4:SCHannel:PSID	954
:DLINK:SLOT[1]2 3 4:SCHannel:UWORD	955
:DLINK:SLOT[1]2 3 4:STATe	955
:DLINK:SLOT[1]2 3 4:TChannel:SACChannel	955
:DLINK:SLOT[1]2 3 4:TChannel:UWORD	956
:DLINK:SLOT[1]2 3 4:TChannel[:TChannel]	956
:DLINK:SLOT[1]2 3 4:TChannel[:TChannel]:FIX4	956

:DLInk:SLOT[1]2 3 4[:TYPE]	957
:EDATA:DELay	957
:EDCLock	957
:EREFerence	958
:EREFerence:VALue	958
:FILTer	959
:IQ:SCALe	960
:MODulation:FSK[:DEViation]	960
:MODulation:MSK[:PHASE]	961
:MODulation:UFSK	961
:MODulation:UIQ	961
:MODulation[:TYPE]	962
:POLarity[:ALL]	962
:SECondary:RECall	962
:SECondary:SAVE	963
:SECondary:TRIGger[:SOURce]	963
:SECondary[:STATe]	963
:SOUT	964
:SOUT:OFFSet	964
:SOUT:SLOT	965
:SRATe	965
:TRIGger:TYPE	966
:TRIGger:TYPE:CONTinuous[:TYPE]	967
:TRIGger:TYPE:GATE:ACTive	968
:TRIGger[:SOURce]:EXTernal:DELay	968
:TRIGger[:SOURce]:EXTernal:DELay:STATe	969
:TRIGger[:SOURce]:EXTernal:SLOPe	969
:TRIGger[:SOURce]:EXTernal[:SOURce]	969
:TRIGger[:SOURce]	970
:ULINK:SLOT[1]2 3 4:CUSTom	971
:ULINK:SLOT[1]2 3 4:CUSTom:FIX4	972
:ULINK:SLOT[1]2 3 4:POWer	972
:ULINK:SLOT[1]2 3 4:SCHannel:CSID	972
:ULINK:SLOT[1]2 3 4:SCHannel:IDLE	973
:ULINK:SLOT[1]2 3 4:SCHannel:PSID	973
:ULINK:SLOT[1]2 3 4:SCHannel:UWORd	973
:ULINK:SLOT[1]2 3 4:STATe	974
:ULINK:SLOT[1]2 3 4:TCHannel:SACChannel	974

Contents

:ULINK:SLOT[1]2 3 4:TCHannel:UWORD	974
:ULINK:SLOT[1]2 3 4:TCHannel[:TCHannel]	975
:ULINK:SLOT[1]2 3 4:TCHannel[:TCHannel:FIX4]	975
:ULINK:SLOT[1]2 3 4[:TYPE]	975
[:STATe]	976
TETRA Subsystem—Option 402 ([:SOURce]:RADio:TETRa)	977
:ALPha	977
:BBClock	977
:BBT	978
:BRATe	978
:BURSt:PN9	979
:BURSt:SCRamble:SEED	980
:BURSt:SCRamble[:STATe]	980
:BURSt:SHAPe:FALL:DELay	980
:BURSt:SHAPe:FALL:TIME	981
:BURSt:SHAPe:FDELay	982
:BURSt:SHAPe:FTIME	982
:BURSt:SHAPe:RDELay	983
:BURSt:SHAPe:RISE:DELay	984
:BURSt:SHAPe:RISE:TIME	984
:BURSt:SHAPe:RTIME	985
:BURSt:SHAPe[:TYPE]	986
:BURSt[:STATe]	986
:CHANnel	987
:DATA	987
:DATA:PRAM	988
:DATA:FIX4	988
:DEFault	989
:EDATA:DELay	989
:EDClock	989
:EREference	990
:EREference:VALue	990
:FILTer	991
:IQ:SCALe	992
:MODulation:FSK[:DEViation]	992
:MODulation:MSK[:PHASe]	993
:MODulation:UFSK	993
:MODulation:UIQ	993

:MODulation[:TYPE]	994
:POLarity[:ALL]	994
:SECondary:RECall	995
:SECondary:SAVE	995
:SECondary:TRIGger[:SOURce]	995
:SECondary[:STATe]	996
:SLOT[1] 2 3 4:DCCustom	996
:SLOT[1] 2 3 4:DCCustom:FIX4	996
:DCNormal:B1	997
:DCNormal:B2	997
:SLOT[1] 2 3 4:DCNormal:TSEQunce	997
:SLOT[1] 2 3 4:DCNormal[:DATA]	998
:SLOT[1] 2 3 4:DCNormal[:DATA]:FIX4	998
:SLOT[1] 2 3 4:DCSync:B	999
:SLOT[1] 2 3 4:DCSync:FCOR	999
:SLOT[1] 2 3 4:DCSync:SSB	999
:SLOT[1] 2 3 4:DCSync:STS	1000
:SLOT[1] 2 3 4:DCSync[:DATA]	1000
:SLOT[1] 2 3 4:DCSync[:DATA]:FIX4	1000
:SLOT[1] 2 3 4:DDCustom	1001
:SLOT[1] 2 3 4:DDCustom:FIX4	1001
:SLOT[1] 2 3 4:DDNormal:B1	1002
:SLOT[1] 2 3 4:DDNormal:B2	1002
:SLOT[1] 2 3 4:DDNormal:TSEQunce	1002
:SLOT[1] 2 3 4:DDNormal[:DATA]	1003
:SLOT[1] 2 3 4:DDNormal[:DATA]:FIX4	1003
:SLOT[1] 2 3 4:DDSync:B	1004
:SLOT[1] 2 3 4:DDSync:FCOR	1004
:SLOT[1] 2 3 4:DDSync:SSB	1004
:SLOT[1] 2 3 4:DDSync:STS	1005
:SLOT[1] 2 3 4:DDSync[:DATA]	1005
:SLOT[1] 2 3 4:DDSync[:DATA]:FIX4	1005
:SLOT[1] 2 3 4:POWER	1006
:SLOT[1] 2 3 4:STATe	1006
:SLOT[1] 2 3 4:UC1:TSEQunce	1006
:SLOT[1] 2 3 4:UC1[:DATA]	1007
:SLOT[1] 2 3 4:UC1[:DATA]:FIX4	1007
:SLOT[1] 2 3 4:UC2:TSEQunce	1007

Contents

:SLOT[1]2 3 4:UC2[:DATA]	1008
:SLOT[1]2 3 4:UC2[:DATA]:FIX4	1008
:SLOT[1]2 3 4:UCUStom	1008
:SLOT[1]2 3 4:UCUStom:FIX4	1009
:SLOT[1]2 3 4:UNORMal:TSEQquence	1009
:SLOT[1]2 3 4:UNORMal[:DATA]	1009
:SLOT[1]2 3 4:UNORMal[:DATA]:FIX4	1010
:SLOT[1]2 3 4[:TYPE]	1010
:SOUT	1011
:SOUT:OFFSet	1011
:SOUT:SLOT	1012
:SRATe	1012
:TRIGger:TYPE	1014
:TRIGger:TYPE:CONTinuous[:TYPE]	1014
:TRIGger:TYPE:GATE:ACTive	1015
:TRIGger[:SOURce]	1016
:TRIGger[:SOURce]:EXTernal:DELay	1017
:TRIGger[:SOURce]:EXTernal:DELay:STATe	1017
:TRIGger[:SOURce]:EXTernal:SLOPe	1018
:TRIGger[:SOURce]:EXTernal[:SOURce]	1018
[:STATe]	1019
Wideband CDMA Base Band Generator Subsystem–Option 400	
([:SOURce]:RADio:WCDMa:TGPP[:BBG])	1020
:BBClock	1020
:BBClock:EXT:RATE	1020
:DLINK:APPLy	1021
:DLINK:AWGN:CN	1021
:DLINK:AWGN:CPOWer	1021
:DLINK:AWGN:ECNO	1022
:DLINK:AWGN:ECRPower	1022
:DLINK:AWGN:ECRef	1022
:DLINK:AWGN:FNBW	1023
:DLINK:AWGN:NPOWer	1023
:DLINK:AWGN:TICPower	1023
:DLINK:AWGN[:STATe]	1024
:DLINK:BBClock	1024
:DLINK:CARB:CMODe:CCODE	1024
:DLINK:CARB:CMODe:DATA	1025
:DLINK:CARB:CMODe:FOFFset	1025

:DLINK:CARB:CMODE:FSTRuct	1025
:DLINK:CARB:CMODE:POWer	1026
:DLINK:CARB:CMODE:PRATio	1026
:DLINK:CARB:CMODE:SCTYpe	1026
:DLINK:CARB:CMODE:SFORmat	1027
:DLINK:CARB:CMODE:SSCodeos	1027
:DLINK:CARB:CMODE:TFIRst	1028
:DLINK:CARB:CMODE:TGL	1028
:DLINK:CARB:CMODE[:STATe]	1028
:DLINK:CPICh:CCODE	1029
:DLINK:CPICh:POWer	1029
:DLINK:CPICh[:STATe]	1029
:DLINK:CRATe	1030
:DLINK:DPCH[1]:BALance	1030
:DLINK:DPCH[1]:BINitialize	1030
:DLINK:DPCH[1] 2:ALL[:STATe]	1031
:DLINK:DPCH[1] 2:CCODE	1031
:DLINK:DPCH[1] 2:DATA	1031
:DLINK:DPCH[1] 2:DATA:FIX4	1032
:DLINK:DPCH[1] 2:POWer	1032
:DLINK:DPCH[1] 2:RCSetup	1033
:DLINK:DPCH[1] 2:SLOTformat	1034
:DLINK:DPCH[1] 2:SRATE	1034
:DLINK:DPCH[1] 2:SSCodeos	1034
:DLINK:DPCH[1] 2:TFCI:PATTern	1035
:DLINK:DPCH[1] 2:TOFFset	1035
:DLINK:DPCH[1] 2:TPC:NUMSteps	1036
:DLINK:DPCH[1] 2:TPC:PATTern	1036
:DLINK:DPCH[1] 2[:STATe]	1037
:DLINK:FILTter	1037
:DLINK:FILTter:ALPHa	1038
:DLINK:FILTter:BBT	1038
:DLINK:FILTter:CHANnel	1039
:DLINK:MSYNC	1039
:DLINK:OCNS[1] 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:ALL[:STATe]	1039
:DLINK:OCNS[1] 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:CCODE	1040
:DLINK:OCNS[1] 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:DATA	1040
:DLINK:OCNS[1] 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:POWer	1040

Contents

:DLINK:OCNS[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:SRATe	1041
:DLINK:OCNS[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:SSCodeos	1041
:DLINK:OCNS[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16:TOFFset	1042
:DLINK:OCNS[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16[:STATe]	1042
:DLINK:OOSTest[:STATe]	1042
:DLINK:OOSTest:DTXGate:POLarity	1043
:DLINK:PADJust	1043
:DLINK:PCCPch:BCHData	1043
:DLINK:PCCPch:BCHData:FIX4	1044
:DLINK:PCCPch:CCODE	1044
:DLINK:PCCPch:POWER	1044
:DLINK:PCCPch[:STATe]	1045
:DLINK:PICH:CCODE	1045
:DLINK:PICH:DATA	1045
:DLINK:PICH:DATA:FIX4	1046
:DLINK:PICH:PIBits	1046
:DLINK:PICH:PINDicator	1046
:DLINK:PICH:POWER	1047
:DLINK:PICH[:STATe]	1047
:DLINK:POLarity	1047
:DLINK:PSCH:POWER	1048
:DLINK:PSCH[:STATe]	1048
:DLINK:RPANeL:INPut:ALTPower	1048
:DLINK:RPANeL:INPut:BBGRef	1049
:DLINK:RPANeL:INPut:BGATE	1049
:DLINK:RPANeL:INPut:PTRigger1	1049
:DLINK:RPANeL:INPut:PTRigger2	1050
:DLINK:RPANeL:OUTPut:DCLOCK	1050
:DLINK:RPANeL:OUTPut:DOUT	1052
:DLINK:RPANeL:OUTPut:EVENt1	1053
:DLINK:RPANeL:OUTPut:EVENt2	1053
:DLINK:RPANeL:OUTPut:EVENt3	1054
:DLINK:RPANeL:OUTPut:EVENt4	1054
:DLINK:RPANeL:OUTPut:SSYNC	1055
:DLINK:SCH[:STATe]	1055
:DLINK:SCRamblecode	1055
:DLINK:SDELay	1056
:DLINK:SSCH:POWER	1056

:DLINK:SSCH:SSGRoup	1056
:DLINK:SSCH[:STATe]	1057
:DLINK:TGAP:FSTRuct	1057
:DLINK:TGAP:POFFset	1057
:DLINK:TGAP:PSI[1]:CFN	1058
:DLINK:TGAP:PSI[1]:CMMETHOD	1058
:DLINK:TGAP:PSI[1]:D	1059
:DLINK:TGAP:PSI[1]:L1	1059
:DLINK:TGAP:PSI[1]:L2	1059
:DLINK:TGAP:PSI[1]:PL1	1060
:DLINK:TGAP:PSI[1]:PL2	1060
:DLINK:TGAP:PSI[1]:PRC	1060
:DLINK:TGAP:PSI[1]:PS	1061
:DLINK:TGAP:PSI[1]:SN	1061
:DLINK:TGAP:RPARameter	1061
:DLINK:TGAP:SCFN	1062
:DLINK:TGAP:STARt:TRIGger	1062
:DLINK:TGAP:STARt:TRIGger:POLarity	1062
:DLINK:TGAP:STOP:TRIGger	1063
:DLINK:TGAP:STOP:TRIGger:POLarity	1063
:DLINK[:STATe]	1063
:DLINK:TSETup	1064
:DLINK:TXDV	1065
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:BLKSize	1066
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:BPFRame	1067
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:BRATe	1067
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:BSSize	1067
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:CODE	1068
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:CRC	1069
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:DATA	1069
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:DATA:EINSert	1070
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:DATA:FIX4	1070
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:NBLocks	1071
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:POSITION	1072
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:PPERcentage	1072
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:RMATch	1073
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6]:TTI	1073
:DLINK[:TGROup [A] B]:DCH[1 2 3 4 5 6[:STATe]	1074

Contents

:LINK	1074
:POLarity[:ALL]	1074
:ULINK:APPLy	1075
:ULINK:AWGN:CN	1075
:ULINK:AWGN:CPOWer	1076
:ULINK:AWGN:DRArTe	1076
:ULINK:AWGN:EBNO	1076
:ULINK:AWGN:EBRef	1077
:ULINK:AWGN:FNBW	1077
:ULINK:AWGN:NPOWer	1078
:ULINK:AWGN:TICPower	1078
:ULINK:AWGN[:STATe]	1078
:ULINK:CRArTe	1079
:ULINK:DPCCh:BETA	1079
:ULINK:DPCCh:CCODe	1080
:ULINK:DPCCh:DATA	1080
:ULINK:DPCCh:DATA:FIX4	1081
:ULINK:DPCCh:FBI:PATTern	1081
:ULINK:DPCCh:FBI:PATTern:FIX	1082
:ULINK:DPCCh:FBI[:STATe]	1082
:ULINK:DPCCh:POWER	1083
:ULINK:DPCCh:RATE	1083
:ULINK:DPCCh:SLOTformat	1083
:ULINK:DPCCh:TFCI:PATTern	1084
:ULINK:DPCCh:TFCI:PATTern:FIX	1084
:ULINK:DPCCh:TFCI[:STATe]	1085
:ULINK:DPCCh:TPC:NSTeps	1085
:ULINK:DPCCh:TPC:PATTern	1086
:ULINK:DPCCh:TPC:PATTern:FIX4	1087
:ULINK:DPCCh:TPC:PATTern:TRIGger:POLarity	1087
:ULINK:DPCCh:TPC:PATTern:TRIGger[:STATe]	1088
:ULINK:DPCCh:TPoWer	1088
:ULINK:DPCCh[:STATe]	1089
:ULINK:DPDCh:BETA	1089
:ULINK:DPDCh:CCODe	1090
:ULINK:DPDCh:DATA	1091
:ULINK:DPDCh:DATA:FIX4	1091
:ULINK:DPDCh:POWER	1092

:ULINK:DPDCh:RATE	1092
:ULINK:DPDCh:RBER	1093
:ULINK:DPDCh:SLOTformat	1094
:ULINK:DPDCh:TBER[:CLENgth]	1095
:ULINK:DPDCh:TBER:ELENgth	1095
:ULINK:DPDCh:TPOWер	1096
:ULINK:DPDCh[:STATe]	1096
:ULINK:FClock:INTerval	1096
:ULINK:FClock:POLarity	1097
:ULINK:FILTер	1097
:ULINK:FILTер:ALPHа	1098
:ULINK:FILTер:BBT	1099
:ULINK:FILTер:CHANnel	1099
:ULINK:FOFFset	1100
:ULINK:PADJust	1100
:ULINK:PHYSical[1]:TYPE	1100
:ULINK:PMODE:TPControl:HOLD	1101
:ULINK:PMODE:TPControl:POWER:INITial	1101
:ULINK:PMODE:TPControl:POWER:MAXimum	1102
:ULINK:PMODE:TPControl:POWER:MINimum	1102
:ULINK:PMODE:TPControl:POWER:RESet	1103
:ULINK:PMODE:TPControl:POWER:STEP	1103
:ULINK:PMODE:TPControl:TRIGger:POLarity	1104
:ULINK:PMODE[:SElect]	1104
:ULINK:PRACH:AICH:NUMBER	1104
:ULINK:PRACH:AICH:POLarity	1105
:ULINK:PRACH:AWGN:CN	1105
:ULINK:PRACH:AWGN:CPOWer	1106
:ULINK:PRACH:AWGN:DRATe	1106
:ULINK:PRACH:AWGN:EBNO	1106
:ULINK:PRACH:AWGN:ECNO	1107
:ULINK:PRACH:AWGN:EREF	1107
:ULINK:PRACH:AWGN:NPOWER	1108
:ULINK:PRACH:AWGN:TICPower	1108
:ULINK:PRACH:AWGN[:STATe]	1108
:ULINK:PRACH:MESSAge:CPARt:BETA	1109
:ULINK:PRACH:MESSAge:CPARt:DATA	1109
:ULINK:PRACH:MESSAge:CPARt:DATA:FIX4	1110

Contents

:ULINK:PRACH:MESSAge:CPARt:POWer	1110
:ULINK:PRACH:MESSAge:CPARt:RATE	1111
:ULINK:PRACH:MESSAge:CPARt:SLOTformat.....	1111
:ULINK:PRACH:MESSAge:CPARt:TFCI:PATTern	1112
:ULINK:PRACH:MESSAge:CPARt:TFCI:PATTern:FIX	1112
:ULINK:PRACH:MESSAge:CPARt:TFCI[:STATe].....	1113
:ULINK:PRACH:MESSAge:DPARt:BETA	1113
:ULINK:PRACH:MESSAge:DPARt:DATA	1114
:ULINK:PRACH:MESSAge:DPARt:DATA:FIX4	1114
:ULINK:PRACH:MESSAge:DPARt:POWer	1115
:ULINK:PRACH:MESSAge:DPARt:RATE	1115
:ULINK:PRACH:MESSAge:DPARt:SLOTformat.....	1116
:ULINK:PRACH:MODE[:SElect]	1117
:ULINK:PRACH:MULTi:MESSAge:TPOWer	1118
:ULINK:PRACH:MULTi:MESSAge[:STATe]	1118
:ULINK:PRACH:MULTi:NUMBER	1118
:ULINK:PRACH:MULTi:PREamble:NUMBER.....	1119
:ULINK:PRACH:MULTi:PREamble:POWer:INITial	1119
:ULINK:PRACH:MULTi:PREamble:POWer:MAX	1120
:ULINK:PRACH:MULTi:PREamble:POWer:RSTep	1120
:ULINK:PRACH:MULTi:PREamble:PPM	1120
:ULINK:PRACH:MULTi:UE[1] 2 3 4 5 6 7 8:MESSAge:CPARt:CCODE	1121
:ULINK:PRACH:MULTi:UE[1] 2 3 4 5 6 7 8:MESSAge:DPARt:CCODE	1121
:ULINK:PRACH:MULTi:UE[1] 2 3 4 5 6 7 8:PREamble:SIGNature	1121
:ULINK:PRACH:MULTi:UE[1] 2 3 4 5 6 7 8:SPOSITION[1] 2 3 4 5 6 7 8[:ASLot]	1122
:ULINK:PRACH:MULTi:UE[1] 2 3 4 5 6 7 8[:STATe]	1123
:ULINK:PRACH:PREamble:POWer:AVERage	1123
:ULINK:PRACH:PREamble:POWer:MODE	1124
:ULINK:PRACH:RPARAMeter	1124
:ULINK:PRACH:SCRamblecode	1125
:ULINK:PRACH:SDELay	1125
:ULINK:PRACH:SUBChannel	1126
:ULINK:PRACH:TOFFset	1126
:ULINK:PRACH:TPA	1127
:ULINK:PRACH:TPM	1127
:ULINK:PRACH:TPOWer	1128
:ULINK:PRACH:TPP	1128
:ULINK:PRACH:TRIGger.....	1129

:ULINK:PRACH:TRIGger:POLarity	1129
:ULINK:PRACH:TRIGger:SOURce	1129
:ULINK:PRACH:TTI	1130
:ULINK:PRACH[:SINGle]:MESSAge[:STATe]	1130
:ULINK:PRACH[:SINGle]:NUMBER	1131
:ULINK:PRACH[:SINGle]:MESSAge:CPARt:CCODE	1131
:ULINK:PRACH[:SINGle]:MESSAge:DPARt:CCODE	1132
:ULINK:PRACH[:SINGle]:MESSAge:TPOWer	1133
:ULINK:PRACH[:SINGle]:NUMBER	1133
:ULINK:PRACH[:SINGle]:PREamble:NUMBER	1134
:ULINK:PRACH[:SINGle]:PREamble:POWER:INITial	1134
:ULINK:PRACH[:SINGle]:PREamble:POWER:MAX	1135
:ULINK:PRACH[:SINGle]:PREamble:POWER:RSTep	1135
:ULINK:PRACH[:SINGle]:PREamble:PPM	1136
:ULINK:PRACH[:SINGle]:PREamble:SIGNature	1136
:ULINK:RMCHannel	1137
:ULINK:RPANel:DPCH:INPut:ALTPower	1137
:ULINK:RPANel:DPCH:INPut:BBGRef	1138
:ULINK:RPANel:DPCH:INPut:BGATe	1138
:ULINK:RPANel:DPCH:INPut:PTRigger1	1138
:ULINK:RPANel:DPCH:INPut:PTRigger2	1139
:ULINK:RPANel:DPCH:OUTPut:DClock	1139
:ULINK:RPANel:DPCH:OUTPut:DOUT	1140
:ULINK:RPANel:DPCH:OUTPut:EVENT1	1141
:ULINK:RPANel:DPCH:OUTPut:EVENT2	1141
:ULINK:RPANel:DPCH:OUTPut:EVENT3	1142
:ULINK:RPANel:DPCH:OUTPut:EVENT4	1142
:ULINK:RPANel:DPCH:OUTPut:SSYNC	1143
:ULINK:RPANel:PRACH:INPut:ALTPower	1143
:ULINK:RPANel:PRACH:INPut:BBGRef	1144
:ULINK:RPANel:PRACH:INPut:BGATe	1144
:ULINK:RPANel:PRACH:INPut:PTRigger1	1144
:ULINK:RPANel:PRACH:INPut:PTRigger2	1145
:ULINK:RPANel:PRACH:OUTPut:DClock	1145
:ULINK:RPANel:PRACH:OUTPut:DOUT	1147
:ULINK:RPANel:PRACH:OUTPut:EVENT1	1147
:ULINK:RPANel:PRACH:OUTPut:EVENT2	1148
:ULINK:RPANel:PRACH:OUTPut:EVENT3	1149

Contents

:ULINK:RPANeL:PRACH:OUTPut:EVENT4	1149
:ULINK:RPANeL:PRACH:OUTPut:SSYNC	1150
:ULINK:SCRamblecode	1151
:ULINK:SDELay	1151
:ULINK:SFNRst:POLarity	1151
:ULINK:SYNC:MODE	1152
:ULINK:SYNC[:SOURce]	1152
:ULINK:TGAP:POFFset	1154
:ULINK:TGAP:PSI[1]:2 3 4 5 6:CFN	1154
:ULINK:TGAP:PSI[1]:CMMETHOD	1155
:ULINK:TGAP:PSI[1]:2 3 4 5 6:D	1155
:ULINK:TGAP:PSI[1]:2 3 4 5 6:L1	1156
:ULINK:TGAP:PSI[1]:2 3 4 5 6:L2	1156
:ULINK:TGAP:PSI[1]:2 3 4 5 6:PL1	1156
:ULINK:TGAP:PSI[1]:2 3 4 5 6:PL2	1157
:ULINK:TGAP:PSI[1]:2 3 4 5 6:POWER	1157
:ULINK:TGAP:PSI[1]:2 3 4 5 6:PRC	1157
:ULINK:TGAP:PSI[1]:2 3 4 5 6:PS	1158
:ULINK:TGAP:PSI[1]:2 3 4 5 6:SN	1158
:ULINK:TGAP:RPARameter	1158
:ULINK:TGAP:SCFN	1159
:ULINK:TGAP[:STATE]	1159
:ULINK:TGAP:START:TRIGger	1160
:ULINK:TGAP:START:TRIGger:POLarity	1160
:ULINK:TGAP:STOP:TRIGger	1160
:ULINK:TGAP:STOP:TRIGger:POLarity	1160
:ULINK:TOFFset	1161
:ULINK:TStatus:COMPRESSED	1161
:ULINK:TStatus:RACH	1161
:ULINK:TStatus:RECeive	1162
:ULINK:TStatus:SYNC	1162
:ULINK:[TGROup[1]]:DCH[1]:2 3 3 5 6:BLKSize	1162
:ULINK[:TGROup[1]]:DCH[1]:2 3 4 5 6:BPFRame	1163
:ULINK[:TGROup[1]]:DCH[1]:2 3 4 5 6:BRATe	1163
:ULINK[:TGROup[1]]:DCH[1]:2 3 3 5 6:CODE	1163
:ULINK[:TGROup[1]]:DCH[1]:2 3 3 5 6:CRC	1164
:ULINK[:TGROup[1]]:DCH[1]:2 3 3 5 6:DATA	1164
:ULINK[:TGROup[1]]:DCH[1]:2 3 4 5 6:DATA:BER:ACTual	1165

:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:DATA:BER:ERROr:BIT	1165
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:DATA:BER:TOTal:BIT	1165
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:DATA:BER[:VALue]	1166
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:DATA:BLER:ACTual	1166
:ULINK[:TGRoup[1]]:DCH[1 2:DCH[1 2 3 4 5 6]:DATA:BLER:ERROr:BLOCK	1166
:ULINK[:TGRoup[1]]:DCH[1 2:DCH[1 2 3 4 5 6]:DATA:BLER:TOTal:BLOCK	1167
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:DATA:BLER[:VALue]	1167
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:DATA:EINSert	1168
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:DATA:FIX4	1168
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:NBLock	1169
:ULINK[:TGRoup [1]]:DCH[1 2 3 4 5 6]:PPERcentage	1169
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:RMATch	1169
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6]:TTI	1170
:ULINK[:TGRoup[1]]:DCH[1 2 3 4 5 6[:STATe]]	1170
:ULINK[:TGRoup[1]]:RACH[1]:BLKSize	1170
:ULINK[:TGRoup [1]]:RACH[1]:BPFFrame	1171
:ULINK[:TGRoup [1]]:RACH[1]:BRATe	1171
:ULINK[:TGRoup[1]]:RACH[1]:CODE	1171
:ULINK[:TGRoup[1]]:RACH[1]:CRC	1171
:ULINK[:TGRoup[1]]:RACH[1]:DATA	1172
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BER:ACTual	1172
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BER:ERROr:BIT	1172
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BER:TOTal:BIT	1173
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BER[:VALue]	1173
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BLER:ACTual	1173
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BLER:ERROr:BLOCK	1174
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BLER:TOTal:BLOCK	1174
:ULINK[:TGRoup[1]]:RACH[1]:DATA:BLER[:VALue]	1174
:ULINK[:TGRoup[1]]:RACH[1]:DATA:EINSert	1175
:ULINK[:TGRoup[1]]:RACH[1]:DATA:FIX4	1175
:ULINK[:TGRoup[1]]:RACH[1]:NBLock	1176
:ULINK[:TGRoup [1]]:RACH[1]:PPERcentage	1176
:ULINK[:TGRoup[1]]:RACH[1]:RMATch	1176
:ULINK[:TGRoup[1]]:RACH[1]:TTI	1177
:ULINK[:TGRoup[1]]:RACH[1][:STATe]	1177
[:STATe]	1177

Contents

Documentation Overview

Installation Guide

- Safety Information
- Getting Started
- Operation Verification
- Regulatory Information

User's Guide

- E4428C Analog Signal Generator Overview
- E4423C Analog Signal Generator Overview
- Basic Operation
- Basic Digital Operation
- AWGN Waveform Generator
- Analog Modulation
- Digital Signal Interface Module
- Bluetooth Signals
- BERT
- CDMA Digital Modulation
- GPS Modulation
- Multitone Waveform Generator
- Custom Digital Modulation
- Real Time TDMA Formats
- W-CDMA Digital Modulation for Component Test
- W-CDMA Uplink Digital Modulation for Receiver Test
- W-CDMA Downlink Digital Modulation for Receiver Test
- Troubleshooting

Programming Guide

- Getting Started with Remote Operation
- Using IO Interfaces
- Programming Examples
- Programming the Status Register System
- Creating and Downloading Waveform Files
- Creating and Downloading User-Data Files

SCPI Reference	<p>Volume 1:</p> <ul style="list-style-type: none"> • SCPI Basics • Basic Function Commands • System Commands • Analog Commands • Component Test Digital Commands <p>Volume 2:</p> <ul style="list-style-type: none"> • Digital Signal Interface Module Commands • Bit Error Rate Test (BERT) Commands • Receiver Test Digital Commands <p>Volume 3:</p> <ul style="list-style-type: none"> • Receiver Test Digital Commands (continued)
Compatibility with E44xxB SCPI Commands	<ul style="list-style-type: none"> • Overview • E4428C/38C SCPI Commands • ESG E44xxB Commands • 8648A/B/C/D Commands • 8658B, 8657A/B/D/J Programming Codes
Service Guide	<ul style="list-style-type: none"> • Troubleshooting • Replaceable Parts • Assembly Replacement • Post-Repair Procedures • Safety and Regulatory
Key and Data Field Reference	<p>Volume 1:</p> <ul style="list-style-type: none"> • Symbols, Numerics, A-H <p>Volume 2:</p> <ul style="list-style-type: none"> • Volume 2: I-Z

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

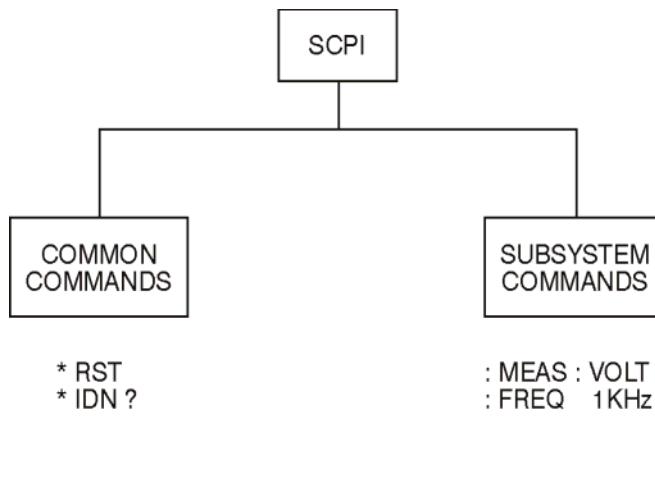
Command Types

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**

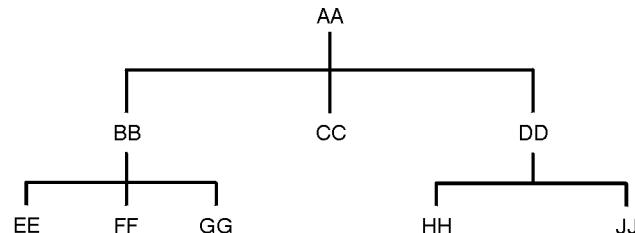


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Command Tree

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**



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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:

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

Extended numeric parameters also include the following special parameters:

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

Discrete Parameters

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

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

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

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

The following are examples of discrete parameters in commands:

```
TRIGger:SOURce BUS
TRIGger:SOURce IMMEDIATE
TRIGger:SOURce EXTernal
```

Boolean Parameters

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

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

String Parameters

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

The following are examples of string parameters:

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

Real Response Data

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

The following are examples of real response data:

```
+4.000000E+010, -9.990000E+002  
-9.990000E+002  
+4.00000000000000E+010  
+1  
0
```

Integer Response Data

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

The following are examples of integer response data:

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

Discrete Response Data

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

The following are examples of discrete response data:

IMM
EXT
INT
NEG

Numeric Boolean Response Data

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

String Response Data

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

The following are examples of string response data:

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

Program Messages

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

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

Example 1

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

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

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

Example 2

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

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

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

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

Example 3

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

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

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

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

Example 4

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

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

File Name Variables

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

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

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

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

NOTE

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

Example Using Format 1

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

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

Example Using Format 2

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

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

Example Using Format 3

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

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

Example Using Format 4

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

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

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

Command Syntax Format 3

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

Command Syntax Format 4

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

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

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

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

File Types and Directory Structure

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

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

Table 1-4 File Types and Directory Structures

File System	File Type	File Path	MSUS Path
BINARY ^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:

Table 1-4 File Types and Directory Structures

File System	File Type	File Path	MSUS Path
NVWFNM - non-volatile arbitrary waveform file ^a	NVWFNM	/USER/WAVEFORM	NVWFNM:
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 "[FileName Variables](#)" section on [page 13](#). The difference is the file type specifier (msus) occupies its own variable and is not part of the file name syntax.

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

Command Syntax with the msus variable

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

Command Syntax with the file system

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

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

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

Command Syntax with the file name and msus variables

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

Command Syntax with the file name and file system

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

The command from the above example cannot discern which file system LIST_1 belongs to without a file system specifier and will not work without it. When the command is properly executed, LIST_1 is deleted from the List file system.

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

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

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

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

Quote Usage with SCPI Commands

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

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

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

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

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

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

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

Binary, Decimal, Hexadecimal, and Octal Formats

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

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

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

#B101101 binary equivalent

#H2D hexadecimal equivalent

#Q55 octal equivalent

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

:POW #H000A

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

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

:RADio:BLUETOOTH:ARB:BDADDr #HFFBF7

2 Basic Function Commands

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

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

Basic Function Commands

Correction Subsystem ([**:SOURce**]:CORRection)

Correction Subsystem ([**:SOURce**]:CORRection)

:FLATness:LOAD

Supported All Models

[:SOURce] :CORRection :FLATness :LOAD "<file name>"

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

Key Entry **Load From Selected File**

:FLATness:PAIR

Supported All Models

[:SOURce] :CORRection :FLATness :PAIR <freq>[<unit>],<corr>[<unit>]

This command sets a frequency and amplitude correction pair.

<corr.> This variable is the power correction.

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

Key Entry **Configure Cal Array**

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

:FLATness:POINTs

Supported All Models

[:SOURce] :CORRection :FLATness :POINTs?

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

:FLATness:PRESet

Supported All Models

CAUTION The current correction data will be overwritten once this command is executed. Save the current data if needed. Refer to "[:FLATness:STORE](#)" on page 21 for storing user-flatness files.

[:SOURce] :CORRection:FLATness:PRESet

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

Key Entry **Preset List**

:FLATness:STORe

Supported All Models

[:SOURce] :CORRection:FLATness:STORe "<file name>"

This command stores the current user-flatness correction data to a file named 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**

Basic Function Commands

Digital Modulation Subsystem—E4438C ([:SOURce])

Digital Modulation Subsystem—E4438C ([:SOURce])

:BURSt:SOURce

Supported E4438C

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

[:SOURce] :BURSt:SOURce?

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

***RST** EXT

Key Entry Burst Envelope Int Ext Off

Remarks The external burst source is applied to the EXT 1 INPUT connector.

The INT[1] choice will not work unless an internal burst source is active.

:BURSt:STATE

Supported E4438C

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

[:SOURce] :BURSt:STATE?

This command enables or disables the burst envelope function.

***RST** 0

Key Entry Burst Envelope Int Ext Off

:DM:EXTernal:ALC:BANDwidth | BWIDth

Supported All Models

NOTE Refer to the *Programming Compatibility Guide* for information on this command.

This command was replaced by the “:ALC:BANDwidth|BWIDth” command shown on [page 58](#) and the “:ALC:BANDwidth” command on [page 59](#).

:DM:EXTernal:HCRest[:STATE]

Supported E4438C

[:SOURCE] :DM:EXTernal:HCRest [:STATE] ON|OFF|1|0
[:SOURCE] :DM:EXTernal:HCRest [:STATE] ?

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

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

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

***RST** 0

Key Entry **High Crest Mode Off On**

:DM:EXTernal:FILTer

Supported E4438C

[:SOURCE] :DM:EXTernal:FILTer 40e6|THRough
[:SOURCE] :DM:EXTernal:FILTer?

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

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

***RST** THR

Key Entry **40.000 MHz Through**

:DM:EXTernal:FILTer:AUTO

Supported E4438C

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

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

Basic Function Commands

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

ON(1)	This choice will automatically select a digital modulation filter optimized for the current signal generator settings.
OFF(0)	This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “ “:DM:EXTernal:FILTer” on page 23 for selecting a filter or through path.
*RST	1
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 001/601 or 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 36 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 35.

:DM:IQADjustment:BBG:QSKEw

Supported E4438C with Option 001/601 or 002/602

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

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

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

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

Example

:DM:IQAD:BBG:QSK 4.5DEG

The preceding example increases the phase angle by 4.5 degrees.

*RST +0.00000000E+000

Range -30 to 30DEG

Key Entry **Quadrature Angle Adjustment**

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

To change the quadrature skew on only the RF output path, see “[:DM:IQADjustment:QSKEw](#)” on page 30.

Basic Function Commands

Digital Modulation Subsystem—E4438C ([:SOURce])

: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** +0.0000000E+000

Range –3 to 3

Key Entry Common Mode I/Q Offset

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

:DM:IQADjustment:EXTernal:DIOFFset

Supported E4438C

```
[ :SOURce ] :DM: IQADjustment: EXTernal: DIOFFset <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** +0.0000000E+000

Range –3 to 3

Key Entry Diff. Mode I Offset

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

:DM:IQADjustment:EXTernal:DQOFFset

Supported E4438C

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

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

***RST** +0.00000000E+000

Range –4 to 4

Key Entry **Diff. Mode Q Offset**

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

:DM:IQADjustment:EXTernal:GAIN

Supported E4438C

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

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

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

***RST** +0.00000000E+000

Range –4 to 4

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

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

:DM:IQADjustment:EXTernal:IOFFset

Supported E4438C

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

Basic Function Commands

Digital Modulation Subsystem—E4438C ([:SOURce])

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

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

***RST** +0.00000000E+000

Key Entry Ext In 600 Ohm I Offset

Range –5 to 5

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

:DM:IQADjustment:EXTernal:IQATten

Supported E4438C

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

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

This command sets the I/Q output attenuation level.

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

***RST** +6.00000000E+000

Range 0–40

Key Entry I/Q Output Atten

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

:DM:IQADjustment:EXTernal:QOFFset

Supported E4438C

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

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

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

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

***RST** +0.00000000E+000

Range –5 to 5

Key Entry Ext In 600 Ohm Q Offset

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

:DM:IQADjustment:GAIN

Supported E4438C

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

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

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

***RST** +0.00000000E+000

Range -4 to 4

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

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

:DM:IQADjustment:IOFFset

Supported E4438C

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

This command adjusts the I channel offset value.

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

***RST** +0.00000000E+000

Range -50.000 to 50.000

Key Entry **I Offset**

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

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

Basic Function Commands

Digital Modulation Subsystem—E4438C ([:SOURce])

:DM:IQADjustment:QOFFset

Supported E4438C

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

This command adjusts the Q channel offset value.

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

***RST** +0.00000000E+000

Range -50.000 to 50.000

Key Entry **Q Offset**

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

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

:DM:IQADjustment:QSKEw

Supported E4438C

[:SOURce] :DM: IQADjustment: QSKEw <val>
[:SOURce] :DM: IQADjustment: QSKEw?

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

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

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

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

Example

:DM: IQAD: QSK 4.5

The preceding example increases the phase angle by 4.5 degrees.

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

:DM:IQADjustment:SKEW

Supported E4438C

[: SOURce] :DM: IQADjustment :SKEW[:DELy] <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**

Basic Function Commands

Digital Modulation Subsystem—E4438C ([:SOURce])

:DM:IQADjustment:SKEW:Path

Supported E4438C

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

[:SOURce] :DM:IQADjustment:SKEW?

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

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

Example

:DM:IQAD:SKEW:PATH RF

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

***RST** +0.00000000E+000

Key Entry I/Q Timing Skew Path

:DM:IQADjustment[:STATe]

Supported E4438C

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

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

This command enables or disables the I/Q adjustments.

Example

:DM:IQAD 1

The preceding example enables I/Q adjustments.

***RST** 0

Key Entry I/Q Adjustments Off On

:DM:MODulation:FILTer

Supported E4438C

[:SOURce] :DM:MODulation:FILTter 2.1e6|40e6|THrough

[:SOURce] :DM:MODulation:FILTter?

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

2.1E6	This choice applies a 2.1 MHz baseband filter to the I/Q signals.
40E6	This choice applies a 40 MHz baseband filter to the I/Q signals.
THRough	This choice bypasses filtering.
*RST	THR
Key Entry	2.100 MHz 40.000 MHz Through

:DM:MODulation:FILTer:AUTO

Supported E4438C

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

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

ON(1)	This choice will automatically select a digital modulation filter.
OFF(0)	This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “ :DM:MODulation:FILTer ” on page 32 for selecting a filter or through path.
*RST	1
Key Entry	I/Q Mod Filter Manual Auto

:DM:MODulation:ATTen

Supported E4438C

[:SOURce] :DM:MODulation:ATTen <val>
[:SOURce] :DM:MODulation:ATTen?

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

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

*RST +2.00000000E+000

Range 0–40

Key Entry **Modulator Atten Manual Auto**

Basic Function Commands

Digital Modulation Subsystem—E4438C ([:SOURce])

:DM:MODulation:ATTen:AUTO

Supported E4438C

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

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

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

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

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

***RST** 1

Key Entry **Modulator Atten Manual Auto**

:DM:POLarity[:ALL]

Supported E4438C

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

[:SOURce] :DM:POLarity?

This command sets the digital modulation phase polarity.

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

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

***RST** NORM

Key Entry **Int Phase Polarity Normal Invert**

:DM:SKEW:PATH

Supported E4438C

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

This command selects the skew path.

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

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

***RST** INT

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

:DM:SKEW[:STATe]

Supported E4438C

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

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

***RST** 1

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

:DM:SOURce

Supported E4438C

[:SOURce] :DM:SOURce[1]|2 EXTERNAL|INTERNAL|BBG1|EXT600|OFF
[:SOURce] :DM:SOURce?

This command selects the I/Q modulator source.

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

Basic Function Commands

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

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

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

***RST** +0.0000000E+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 33 and “:DM:MODulation:ATTen:AUTO” on page 34. For an Arb modulation format modulator attenuator setting, refer to the SCPI command subsystem for the Arb format being used and find the commands that contain the command mnemonics IQ:MODulation:ATTen.

:DM:STATE

Supported E4438C

[:SOURce] :DM:STATE ON|OFF|1|0
[:SOURce] :DM:STATE?

This command enables or disables the I/Q modulator.

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

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

***RST** 0

Key Entry **I/Q Off On**

Remarks The I/Q modulator is enabled whenever a digital format is turned on.

The I/Q annunciator will be shown on the signal generator display whenever the I/Q modulator is on.

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

:FREQuency:CHANnels:BAND

Supported All Models

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

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

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

M8	This choice selects 800MHz Mobile as the frequency band for PDC.			
B15	This choice selects 1500MHz Base as the frequency band for PDC.			
M15	This choice selects 1500MHz Mobile as the frequency band for PDC.			
B390	This choice selects Base 390-400 as the frequency band for TETRA.			
B420	This choice selects Base 420-430 as the frequency band for TETRA.			
B460	This choice selects Base 460-470 as the frequency band for TETRA.			
B915	This choice selects Base 915-921 as the frequency band for TETRA.			
M380	This choice selects Mobile 380-390 as the frequency band for TETRA.			
M410	This choice selects Mobile 410-420 as the frequency band for TETRA.			
M450	This choice selects Mobile 450-460 as the frequency band for TETRA.			
M870	This choice selects Mobile 870-876 as the frequency band for TETRA.			
PHS	This choice selects Standard PHS as the frequency band.			
DECT	This choice selects Standard DECT as the frequency band.			
*RST	BPGS			
Key Entry	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 41.			

Basic Function Commands

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

: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 41.

:FREQuency:CHANnels[:STATe]

Supported All Models

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

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

***RST** 0

Key Entry Freq Channels Off On

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

:FREQuency:FIXed

Supported All Models

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

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

<val> A frequency value.

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

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

***RST** Option 501: +10000000000000E+09

Option 502: +20000000000000E+09

Option 503: +30000000000000E+09

Option 504: +40000000000000E+09

Option 506: +60000000000000E+09

Range E4438C Option 501: 100kHZ–1GHZ

E4438C Option 502: 100kHZ–2GHZ

Option 503: 100kHZ–3GHZ

E4438C Option 504: 100kHZ–4GHZ

Basic Function Commands

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

Option 506: 100kHz–6GHz

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

:FREQuency:MODE

Supported All Models

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

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

CW and FIXed	These choices are synonymous with one another and stops a frequency sweep, allowing the ESG to operate at a set frequency. Refer to “ “:FREQuency[:CW]” on page 46 for setting the frequency in the CW mode and to “ “:FREQuency:FIXed” on page 41 for setting the frequency in the FIXed mode.
LIST	This choice selects the swept frequency mode. If sweep triggering is set to immediate along with continuous sweep mode, executing the command starts the LIST or STEP frequency sweep.

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

***RST** CW

Key Entry Frequency Freq Off

:FREQuency:MULTIplier

Supported All Models

[:SOURce] :FREQuency:MULTIplier <val>
[:SOURce] :FREQuency:MULTIplier?

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

***RST** +1.0000000E+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** +0.000000000000E+00

Range -200GHZ to 200GHZ

Key Entry Freq Offset

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

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

:FREQuency:OFFSet:STATE

Supported All Models

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

This command enables or disables the offset frequency.

***RST** 0

Key Entry Freq Offset

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

:FREQuency:REFerence

Supported All Models

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

This command sets the output reference frequency.

Basic Function Commands

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

*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: +100000000000000E+09 Option 502: +200000000000000E+09 Option 503: +300000000000000E+09 Option 504: +400000000000000E+09 Option 506: +600000000000000E+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: +100000000000000E+09

Option 502: +200000000000000E+09

Option 503: +300000000000000E+09

Option 504: +400000000000000E+09

Option 506: +600000000000000E+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:SYNTthesis

Supported E4438C except with Option UNJ

[:SOURce] :FREQuency:SYNTthesis 1 | 2

[:SOURce] :FREQuency:SYNTthesis?

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 optimizes phase noise at offsets below 10 kHz.

2 This choice will select mode 2 which optimizes phase noise at offsets above

Basic Function Commands

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

	10 kHz.	
*RST	+1	
Key Entry	Mode 1 Optimize <10kHz Offset	Mode 2 Optimize >10kHz Offset
:FREQuency[:CW]		
Supported	All Models	
[:SOURce] :FREQuency[:CW] <val><unit> UP DOWN		
[:SOURce] :FREQuency[:CW] ?		
This command sets the signal generator output frequency for the CW frequency mode, or increments or decrements the current RF frequency setting.		
<val>	A frequency value.	
UP	Increases the current frequency setting by the value set with the “: :FREQuency[:CW]:STEP[:INCREMENT] ” command found on page 47 . The front-panel up-arrow key performs the same function.	
DOWN	Decreases the current frequency setting by the value set with the “: :FREQuency[:CW]:STEP[:INCREMENT] ” command found on page 47 . The front-panel down-arrow key performs the same function.	
*RST	Option 501: +10000000000000E+09 Option 502: +20000000000000E+09 Option 503: +30000000000000E+09 Option 504: +40000000000000E+09 Option 506: +60000000000000E+09	
Range	E4438C Option 501: 100kHz–1GHz E4438C Option 502: 100kHz–2GHz Option 503: 100kHz–3GHz E4438C Option 504: 100kHz–4GHz Option 506: 100kHz–6GHz	
Key Entry	Frequency	
Remarks	To set the frequency mode to CW, refer to “: :FREQuency:MODE ” on page 42 . A frequency change may affect the current output power. Refer to “[:LEVel][:IMMEDIATE][:AMPLitude]” on page 69 for the correct specified frequency and amplitude settings.	

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

Supported All Models

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

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

Range .01 Hz–99 GHz

Key Entry **Incr Set**

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

:PHASe:REFerence

Supported All Models

[:SOURce] :PHASe:REFerence

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

Key Entry **Phase Ref Set**

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

:PHASe[:ADJust]

Supported All Models

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

This command adjusts the phase of the modulating signal.

The query will only return values in radians.

***RST** +0.00000000E+000

Range Radians: -3.14 to 3.14RAD Degrees: -180 to 179DEG

Key Entry **Adjust Phase**

:ROSCillator:SOURce

Supported All Models

[:SOURce] :ROSCillator:SOURce?

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

Basic Function Commands

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

:ROSCillator:SOURce:AUTO

Supported All Models except signal generators with Option UNJ

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

[:SOURce] :ROSCillator:SOURce:AUTO?

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

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

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

***RST** 1

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

List/Sweep Subsystem ([:SOURce])

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

Table 2-1 Location of Commands from the other Subsystems

Sweep Type	Function	Command Location	Key Entry under Sweep/List key
List and Step	Start/stop frequency sweep	“:FREQuency:MODE” on page 42	Freq Off
	Start/stop amplitude sweep	“:MODE” on page 66	Ampl Off
	Start/stop frequency and amplitude sweep ¹	“:MODE” on page 66 “:FREQuency:MODE” on page 42	Freq & Ampl Off
	Set up and control sweep triggering ²	“Trigger Subsystem” on page 166	See the “Trigger Subsystem”
List	Load a list sweep file	“:LOAD:LIST” on page 123 and page 127	Load From Selected File
	Store list sweep data to a file	“:STORe:LIST” on page 123 and page 127	Store To File
Step	Start frequency sweep	“:FREQuency:STARt” on page 44	Freq Start
	Store list sweep data to a file	“:STORe:LIST” on page 123 and page 127	Store To File
	Start amplitude sweep	“:START” on page 67	Ampl Start
	Stop amplitude sweep	“:STOP” on page 68	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 54.

Basic Function Commands

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

: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 54 for the trigger setting.

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

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

:LIST:DWEli: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:DWEli:TYPE

Supported All Models

[:SOURce] :LIST:DWEll:TYPE LIST|STEP

[:SOURce] :LIST:DWEll:TYPE?

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

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

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

***RST** LIST

Key Entry Dwell Type List Step

:LIST:FREQuency

Supported All Models

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

[:SOURce] :LIST:FREQuency?

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

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

Range Option 501: 100E3–1E9

Option 502: 100E3–2E9

Option 503: 100E3–3E9

Option 504: 100E3–4E9

Option 506: 100E3–6E9

Basic Function Commands

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

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

:LIST:FREQuency:POINts

Supported	All Models
------------------	------------

[:SOURce] :LIST:FREQuency:POINts?

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

:LIST:MANual

Supported	All Models
------------------	------------

[:SOURce] :LIST:MANual <val>

[:SOURce] :LIST:MANual?

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

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

Key Entry	Manual Point
------------------	---------------------

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

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

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

:LIST:MODE

Supported All Models

[:SOURce] :LIST:MODE AUTO|MANual

[:SOURce] :LIST:MODE?

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

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

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

***RST** AUTO

Key Entry **Manual Mode Off On**

:LIST:POWer

Supported All Models

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

[:SOURce] :LIST:POWer?

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

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

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

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

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

:LIST:POWer:POINts

Supported All Models

[:SOURce] :LIST:POWer:POINts?

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

Basic Function Commands

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

:LIST:RETRace

Supported All Models

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

[**:SOURce**] :LIST:RETRace?

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

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

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

***RST** 1

Key Entry **Sweep Retrace Off On**

:LIST:TRIGger:SOURce

Supported All Models

[**:SOURce**] :LIST:TRIGger:SOURce BUS|IMMEDIATE|EXTernal|KEY

[**:SOURce**] :LIST:TRIGger:SOURce?

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

To set the sweep trigger, see “[“:TRIGger\[:SEQUence\]:SOURce” on page 168](#).

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

IMMEDIATE This choice enables immediate triggering of the sweep event.

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

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

Example

:LIST:TRIG:SOUR BUS

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

***RST** IMM

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

:LIST:TYPE

Supported All Models

[:SOURce] :LIST:TYPE LIST|STEP

[:SOURce] :LIST:TYPE?

This command toggles between the two types of sweep.

LIST This type of sweep has arbitrary frequencies and amplitudes.

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

***RST** STEP

Key Entry Sweep Type List Step

:LIST:TYPE:LIST:INITialize:FSTep

Supported All Models

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

[:SOURce] :LIST:TYPE:LIST:INITialize:FSTep

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

Key Entry Load List From Step Sweep

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

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

Basic Function Commands

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

:LIST:TYPE:LIST:INITialize:PRESet

Supported All Models

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

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

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

Key Entry Preset List

:SWEep:DWELL

Supported All Models

[:SOURce] :SWEep:DWELL <val>

[:SOURce] :SWEep:DWELL?

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

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

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

***RST** +2.0000000E-003

Range 0.001–60

Key Entry Step Dwell

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

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

:SWEep:POINts

Supported All Models

[:SOURce] :SWEep:POINts <val>

[:SOURce] :SWEep:POINts?

This command defines the number of step sweep points.

***RST** 2

Range 2–65535

Key Entry # Points

Power Subsystem ([:\$OUREce]:POWer)

:ALC:BANDwidth | BWIDth

Supported All Models

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

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

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

Example

:POW:ALC:BWID 1KHZ

The preceding example sets the ALC bandwidth to 1 kHz.

***RST** 10000

Key Entry 100 Hz 1kHz 10 kHz

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

:ALC:BANDwidth

Supported All Models

[:**SOURCE**] :POWer :ALC:BANDwidth|BWIDth:AUTO ON|OFF|1|0
[:**SOURCE**] :POWer :ALC:BANDwidth|BWIDth:AUTO?

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

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

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

Modulation Type	Auto ALC Bandwidth Selection
Digital Modulation	100 Hz
Pulse Modulation	1 kHz
AM Modulation	10 kHz 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 58.

***RST** 1

Key Entry Auto

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

Basic Function Commands

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

:ALC:LEVel

Supported All Models

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

[:SOURce] :POWer :ALC:LEVel?

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

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

Example

:POW:ALC:LEV 10DB

The preceding example sets the ALC to 10 dB.

***RST** +1.00000000E+000

Range -20 to 20

Key Entry Set ALC Level

:ALC:SEARch

Supported All Models

[:SOURce] :POWer :ALC:SEARch ON|OFF|1|0|ONCE

[:SOURce] :POWer :ALC:SEARch?

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

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

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

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

***RST** 0

Key Entry Power Search Manual Auto Do Power Search

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

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

selection after the power search is completed.

:ALC:SEARch:REFerence

Supported All Models

[:SOURce] :POWER:ALC:SEARch:REFerence FIXed|MODulated
[:SOURce] :POWER:ALC:SEARch:REFerence?

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

FIXed This choice uses a 0.5 volt reference.

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

***RST** MOD

Key Entry **Power Search Reference Fixed Mod**

:ALC:SEARch:SPAN:START

Supported All Models

[:SOURce] :POWER:ALC:SEARch:SPAN:START
[:SOURce] :POWER:ALC:SEARch:SPAN:START?

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

Key Entry **Start Frequency**

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

:ALC:SEARch:SPAN:STOP:SPAN:STOP

Supported All Models

[:SOURce] :POWER:ALC:SEARch:SPAN:STOP
[:SOURce] :POWER:ALC:SEARch:SPAN:STOP?

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

Key Entry **Stop Frequency**

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

Basic Function Commands

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

: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.

:ALTerate:AMPLitude

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

[:SOURce] :POWER:ALTerate:AMPLitude <val>

[:SOURce] :POWER:ALTerate: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.

:ALTerate:MANual

Supported All Models

[:SOURce] :POWER:ALTerate:MANual MAIN|DELTa

[:SOURce] :POWER:ALTerate: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 “[“:ALTerate:TRIGger\[:SOURce\]” on page 64](#) for more information.

Basic Function Commands

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

:ALTerNate:STATe

Supported All Models

[:SOURce] :POWER :ALTerNate:STATe ON|OFF|1|0

[:SOURce] :POWER :ALTerNate:STATe?

This command enables or disables the alternate amplitude.

***RST** 0

Key Entry Alt Ampl Off On

:ALTerNate:TRIGger[:SOURce]

Supported All Models except with Option UNB or 506

[:SOURce] :POWER :ALTerNate:TRIGger[:SOURce] INTernal|EXTernal|MANual

[:SOURce] :POWER :ALTerNate:TRIGger[:SOURce]?

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

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

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

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

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

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

***RST** MAN

Key Entry Int Ext Manual

:ATTenuation

Supported All Models

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

This command sets the signal generator's attenuator level. Before setting the attenuator level, set the "[:ATTenuation:AUTO](#)" function to Off which will disable ALC control.

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

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

Example

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

The preceding example sets the attenuator to 10 dB.

***RST** +115

Range 0 to 115 dB

Key Entry Set Atten

:ATTenuation:AUTO

Supported All Models

```
[ :SOURce ] :POWer :ATTenuation:AUTO ON|OFF|1|0
[ :SOURce ] :POWer :ATTenuation:AUTO?
```

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

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

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

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

***RST** 1

Basic Function Commands

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

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 60 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 69 for setting the output power level.

LIST

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

NOTE

To perform a frequency and amplitude sweep, you must also select LIST as the frequency mode. See “[\[:FREQuency:MODE\]](#)” on page 42 for selecting the list mode for a frequency sweep.

*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 85 and “[:POWER](#)” on page 170 will be expressed in DB.

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

***RST** 0

Key Entry **Ampl Ref Off On**

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

Amplitude offsets can be used with the amplitude reference mode.

:STARt

Supported All Models

[:SOURce] :POWER:START <val><unit>
[:SOURce] :POWER:START?

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

***RST** -1.3500000E+002

Range Refer to “[[:LEVel](#)][[:IMMEDIATE](#)][[:AMPLitude](#)]” on page 69 for the output power ranges.

Key Entry **Ampl Start**

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

Basic Function Commands

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

: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 69 for the output power ranges.

Key Entry **Ampl Stop**

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

[:LEVel**][**:IMMEDIATE**]:OFFSet**

Supported All Models

[:SOURce] :POWer [:LEVel] [:IMMEDIATE] :OFFSet <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	<i>Frequency</i>	<i>Standard</i>	<i>Option UNB</i>	<i>Option 506</i>
	250kHz–250MHz	-136 to 11dBm	-136 to 15dBm	-136 to 12dBm
	>250MHz–1GHz	-136 to 13dBm	-136 to 17dBm	-136 to 14dBm
	> 1–3GHz	-136 to 10dBm	-136 to 16dBm	-136 to 13dBm
	> 3–4GHz	-136 to 7dBm	-136 to 13dBm	-136 to 10dBm
	> 4–6GHz	N/A	N/A	-136 to 10dBm

Key Entry **Amplitude**

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

[:LEVel][[:IMMEDIATE][[:AMPLitude]]]:STEP

Supported All Models

[:SOURCE] :POWER[:LEVel][:IMMEDIATE][:AMPLitude] :STEP[:INCREMENT]
<val><unit> | UP | DOWN
[:SOURCE] :POWER[:LEVel][:IMMEDIATE][:AMPLitude] :STEP[:INCREMENT]?

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

<val> The increment power value.

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

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

Range .02–100dB

Key Entry **Incr Set**

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

Basic Function Commands

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

3 System Commands

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

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

Calibration Subsystem (:CALibration)

:DCF M

Supported All

:CALibration:DCF M

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 **DCF M/DCF M 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.

:I Q

Supported E4438C

:CALibration:I Q

This command initiates an I/Q calibration.

Key Entry **Execute Cal**

:I Q:DC

Supported E4438C

:CALibration:I Q: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.

System Commands

Calibration Subsystem (:CALibration)

: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**

System Commands

Communication Subsystem (:SYSTem:COMMUnicatE)

: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.

System Commands

Communication Subsystem (:SYSTem:COMMUnicatE)

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

The power meter is controlled only through a GPIB cable.

:PMETer:IDN

Supported All

:SYSTem:COMMUnicatE:PMETer:IDN E4418B|E4419B|E4416A|E4417A

:SYSTem:COMMUnicatE:PMETer:IDN?

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

Key Entry **Power Meter**

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

The power meter is controlled only through a GPIB cable.

:PMETer:TIMEout

Supported All

:SYSTem:COMMUnicatE:PMETer:TIMEout <num>[<time suffix>]

:SYSTem:COMMUnicatE:PMETer:TIMEout?

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

The variable <num> has a resolution of 0.001.

Range 1mS–100S

Key Entry **Meter Timeout**

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

The power meter is controlled only through a GPIB cable.

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

:SERial:BAUD

Supported All

```
:SYSTem:COMMUnicatE:SERial:BAUD <number>
:SYSTem:COMMUnicatE:SERial:BAUD?
```

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

Key Entry **RS-232 Baud Rate**

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

:SERial:ECHO

Supported All

```
:SYSTem:COMMUnicatE:SERial:ECHO ON|OFF
:SYSTem:COMMUnicatE:SERial:ECHO?
```

This command enables or disables the RS-232 echo.

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

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

:SERial:RESet

Supported All

```
:SYSTem:COMMUnicatE:SERial:RESet
```

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

Key Entry **Reset RS-232**

System Commands

Communication Subsystem (:SYSTem:COMMUnicatE)

: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**

System Commands

Diagnostic Subsystem (:DIAGnostic[:CPU]:INFOrmation)

:DISPlay:OTIMe

Supported All Models

:DIAGnostic[:CPU]:INFOrmation:DISPlay:OTIMe?

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

Key Entry **Diagnostic Info**

:LICense:AUXiliary

Supported E4438C with Option 001/600 or 002.602

:DIAGnostic[:CPU]:INFOrmation:LICense:AUXiliary?

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

Key Entry **Auxiliary Software Options**

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

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

:LICense:WAVeform

Supported E4438C with Option 001/600 or 002/602

:DIAGnostic[:CPU]:INFOrmation:LICense:WAVeform?

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

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

Key Entry **Waveform Licenses**

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

refer to the command, “[:LICense:AUXiliary](#)” on page 82.

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

:OPTions

Supported All Models

`:DIAGnostic[:CPU]:INFormation:OPTions?`

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

Key Entry **Options Info**

:OPTions:DETail

Supported All Models

`:DIAGnostic[:CPU]:INFormation:OPTions:DETail?`

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

Key Entry **Options Info**

:OTIMe

Supported All Models

`:DIAGnostic[:CPU]:INFormation:OTIMe?`

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

Key Entry **Diagnostic Info**

:REVision

Supported All Models

`:DIAGnostic[:CPU]:INFormation:REVision?`

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

Key Entry **Diagnostic Info**

System Commands

Diagnostic Subsystem (:DIAGnostic[:CPU]:INFOrmation)

:SDATe

Supported All Models

`:DIAGnostic[:CPU] :INFOrmation:SDATe?`

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

Key Entry **Diagnostic Info**

:WLICence[:VALue]

Supported E4438C with Option 001/601 or 002/602

`:DIAGnostic[:CPU] :INFOrmation: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 82](#). 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 67 for more information.

***RST** DBM

:ANNotation:CLOCK:DATE:FORMAT

Supported All Models

```
:DISPLAY:ANNotation:CLOCK:DATE:FORMAT MDY|DMY  
:DISPLAY:ANNotation:CLOCK:DATE:FORMAT?
```

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

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

:ANNotation:CLOCK[:STATe]

Supported All Models

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

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

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

System Commands

Display Subsystem (:DISPlay)

:BRIghtness

Supported All Models

```
:DISPlay:BRIGHTness <val>
:DISPlay:BRIGHTness?
```

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

Range 0.02–1

Key Entry Brightness

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

:CAPTure

Supported All Models

```
:DISPlay:CAPTURE
```

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

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

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

:CONTrast

Supported All Models

```
:DISPlay:CONTRast <val>
:DISPlay:CONTRast?
```

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

Range 0–1

Key Entry Display contrast hardkeys are located below the display.

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

:INVerse

Supported All Models

:DISPLAY:INVerse ON|OFF|1|0

:DISPLAY:INVerse?

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

Key Entry Inverse Video Off On

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

:REMote

Supported All Models

:DISPLAY:REMote ON|OFF|1|0

:DISPLAY:REMote?

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

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

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

Key Entry Update in Remote Off On

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

[{:WINDOW}][{:STATE}]

Supported All Models

:DISPLAY[{:WINDOW}[{:STATE}] ON|OFF|1|0

:DISPLAY[{:WINDOW}[{:STATE}]?

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

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

IEEE 488.2 Common Commands

*CLS

Supported All Models

*CLS

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

*ESE

Supported All Models

*ESE <data>

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

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

Range 0–255

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

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

*ESE?

Supported All Models

*ESE?

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

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

*ESR?

Supported All Models

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

*ESR?

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

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

*IDN?

Supported All Models

*IDN?

The Identification (IDN) query outputs an identifying string. The response will show the following information:

<company name>, <model number>, <serial number>, <firmware revision>

Key Entry **Diagnostic Info**

Remarks The identification information can be modified. Refer to “[:IDN](#)” on page 156 for more information.

*OPC

Supported All Models

*OPC

The Operation Complete (OPC) command sets bit 0 in the Standard Event Status Register when all pending operations have finished.

System Commands

IEEE 488.2 Common Commands

*OPC?

Supported All Models

*OPC?

The Operation Complete (OPC) query returns the ASCII character 1 in the Standard Event Status Register when all pending operations have finished.

*OPT?

Supported All Models

*OPT?

The options (OPT) query returns a comma-separated list of all of the instrument options currently installed on the signal generator.

Key Entry **Instrument Options**

*PSC

Supported

*PSC ON|OFF|1|0

The Power-On Status Clear (PSC) command controls the automatic power-on clearing of the Service Request Enable Register, the Standard Event Status Enable Register, and device-specific event enable registers.

ON (1) This choice enables the power-on clearing of the listed registers.

OFF (0) This choice disables the clearing of the listed registers and they retain their status when a power-on condition occurs.

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

*PSC?

Supported All Models

*PSC?

The Power-On Status Clear (PSC) query returns the flag setting as enabled by the *PSC command.

*RCL

Supported All Models

*RCL <reg>, <seq>

The Recall (RCL) command recalls the state from the specified memory register <reg> of the specified sequence <seq>.

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 90 for information on recalling saved signal generator settings.

*SRE

Supported All Models

*SRE <data>

The Service Request Enable (SRE) command sets the value of the Service Request Enable Register.

The variable <data> is the decimal sum of the bits that will be enabled. Bit 6 (value 64) is ignored and cannot be set by this command.

Range 0–255

Remarks Refer to Chapter 3 of the *E4428C/38C ESG Signal Generators Programming*

Guide for more information.

Entering values from 64 to 127 is equivalent to entering values from 0 to 63.

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

***SRE?**

Supported All Models

*SRE?

The Service Request Enable (SRE) query returns the value of the Service Request Enable Register.

Range 0–63 or 128–191

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

***STB?**

Supported All Models

*STB?

The Read Status Bye (STB) query returns the value of the status byte including the master summary status (MSS) bit.

Range 0–255

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

***TRG**

Supported All Models

*TRG

The Trigger (TRG) command triggers the device if BUS is the selected trigger source, otherwise, *TRG is ignored.

***TST?**

Supported All Models

*TST?

The Self-Test (TST) query initiates the internal self-test and returns one of the following results:

- 0 This shows that all tests passed.
- 1 This shows that one or more tests failed.

Key Entry **Run Complete Self Test**

***WAI**

Supported All Models

***WAI**

The Wait-to-Continue (WAI) command causes the signal generator to wait until all pending commands are completed, before executing any other commands.

Memory Subsystem (:MEMory)

:CATalog:BINary

Supported E4438C with Option 001/601 or 002/602

:MEMory:CATalog:BINary?

This command outputs a list of the binary files. The return data will be in the following form:

`<mem used>, <mem free>{ , "<file listing>" }`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

`"<file name, file type, file size>"`

Key Entry **Binary**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:BIT

Supported E4438C with Option 001/601 or 002/602

:MEMory:CATalog:BIT?

This command outputs a list of the bit files. The return data will be in the following form:

`<mem used>, <mem free>{ , "<file listing>" }`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

`"<file name, file type, file size>"`

Key Entry **Bit**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:CDMa

NOTE Refer to the *E4428C/38C ESG Signal Generators Programming Compatibility Guide* for information on this command. This command is still valid for backward compatibility and was replaced by “[:CATalog:CDMA](#)”.

:CATalog:CDMA

Supported E4438C with Option 401

:MEMORY:CATalog:CDMA?

This command outputs a list of the arbitrary waveform CDMA files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry **CDMA**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:DMOD

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:DMOD?

This command outputs a list of the arbitrary waveform digital modulation files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry **DMOD**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

System Commands

Memory Subsystem (:MEMory)

:CATalog:DWCDma

Supported E4438C with Option 400

:MEMory:CATalog:DWCDma?

This command outputs a list of the arbitrary waveform downlink W-CDMA files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry DWCDMA

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:FCDMa

Supported E4438C with Option 401

:MEMory:CATalog:FCDMa?

This command outputs a list of the arbitrary waveform forward link cdma2000 files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry FCDMA

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:FIR

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:FIR?

This command outputs a list of the finite impulse response filter files. The return data will be in the following form:

```
<mem used>, <mem free>{ , "<file listing>" }
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name, file type, file size>"
```

Key Entry **FIR**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:FSK

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:FSK?

This command outputs a list of the FSK files. The return data will be in the following form:

```
<mem used>, <mem free>{ , "<file listing>" }
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name, file type, file size>"
```

Key Entry **FIR**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

System Commands

Memory Subsystem (:MEMORY)

:CATalog:IQ

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:IQ?

This command outputs a list of the IQ files. The return data will be in the following form:

<mem used>, <mem free>{ , <file listing>"}

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry I/Q

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:LIST

Supported All Models

:MEMORY:CATalog:LIST?

This command outputs a list of the list sweep files. The return data will be in the following form:

<mem used>, <mem free>{ , <file listing>"}

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry List

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:MCDMa

Supported E4438C with Option 401

:MEMORY:CATalog:MCDMa?

This command outputs a list of the arbitrary waveform multicarrier IS-95 CDMA files. The return data will be in the following form:

```
<mem used>, <mem free>{ , "<file listing>" }
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

Key Entry **MCDMA**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:MDMod

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:MDMod?

This command outputs a list of the arbitrary waveform multicarrier digital modulation files. The return data will be in the following form:

```
<mem used>, <mem free>{ , "<file listing>" }
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name,file type,file size>"
```

Key Entry **MDMOD**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

System Commands

Memory Subsystem (:MEMory)

:CATalog:MDWCdma

Supported E4438C with Option 400

:MEMory:CATalog:MDWCdma?

This command outputs a list of the arbitrary waveform multicarrier downlink W-CDMA files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry **MDWCDMA**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:MFCdma

Supported E4438C with Option 401

:MEMory:CATalog:MFCdma?

This command outputs a list of the arbitrary waveform multicarrier forward link cdma2000 files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry **MFCDMA**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:MTONe

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:MTONe?

This command outputs a list of the arbitrary waveform multitone files. The return data will be in the following form:

```
<mem used>, <mem free>{ , "<file listing>" }
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name, file type, file size>"
```

Key Entry **MTONE**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:RCDMA

Supported E4438C with Option 401

:MEMORY:CATalog:RCDMA?

This command outputs a list of the arbitrary waveform files for reverse link cdma2000. The return data will be in the following form:

```
<mem used>, <mem free>{ , "<file listing>" }
```

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

```
"<file name, file type, file size>"
```

Key Entry **RCDMA**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

System Commands

Memory Subsystem (:MEMORY)

:CATalog:SEQ

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:SEQ?

This command outputs a list of the arbitrary waveform sequence files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry **SEQ**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:SHAPe

Supported E4438C with Option 001/601 or 002/602

:MEMORY:CATalog:SHAPe?

This command outputs a list of the burst shape files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>" }

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry **SHAPE**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:STATE

Supported All Models

:MEMORY:CATalog:STATE?

This command outputs a list of the state files. The return data will be in the following form:

`<mem used>, <mem free>{,<file listing>}`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

`"<file name,file type,file size>"`

Key Entry **State**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog:UFLT

Supported All Models

:MEMORY:CATalog:UFLT?

This command outputs a list of the user-flatness correction files. The return data will be in the following form:

`<mem used>, <mem free>{,<file listing>}`

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

`"<file name,file type,file size>"`

Key Entry **User Flatness**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

System Commands

Memory Subsystem (:MEMORY)

:CATalog:UWCDma

Supported E4438C with Option 400

:MEMORY:CATalog:UWCDma?

This command outputs a list of the arbitrary waveform uplink W-CDMA files. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>"}

The signal generator will return the two memory usage parameters and as many file listings as there are files in the directory list. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry UWCDMA

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:CATalog[:ALL]

Supported All Models

:MEMORY:CATalog[:ALL]?

This command outputs a list of all the files in the memory subsystem. However it does not include files stored on the Option 001/601 or 002/602 baseband generator. The return data will be in the following form:

<mem used>, <mem free>{ , "<file listing>"}

The signal generator will return the two memory usage parameters and as many file listings as there are files in the memory subsystem. Each file listing parameter will be in the following form:

"<file name,file type,file size>"

Key Entry All

Remarks Refer to the [Table](#) on page 14 for a listing of the file types and “[File Name Variables](#)” on page 13 for information on the “<file name>” syntax.

:COPY[:NAME]

Supported All Models

`:MEMORY:COPY[:NAME] "<file name>" , "<file name>"`

This command makes a duplicate of the requested file.

Key Entry **Copy File**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

When copying a waveform file from volatile to non-volatile memory, the marker file and file header, associated with the waveform file, will automatically be copied at the same time.

:DATA

Supported E4438C with Option 001/601 or 002/602

`:MEMORY:DATA "<file_name>" ,<data_block>`

`:MEMORY:DATA? "<file_name>"`

This command loads waveform data into signal generator memory using the `<data_block>` parameter and saves the data to a file designated by the `"<file_name>"` variable. The query returns the file contents of the file as a datablock.

The waveform file must be located in volatile waveform memory (WFM1) before it can be played by the signal generator’s dual ARB player.

For downloads directly into volatile waveform memory use the path `"WFM1:<file_name>"`. For downloads to non-volatile waveform memory, use the path `"NVWFM:<file_name>"`.

`"<file_name>"` This variable names the destination file, including the directory path.

`<data_block>` This parameter represents the data and file length parameters. The data in the file is represented by the `<data_block>` variable.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on programming the status registers.

NOTE ARB waveform files created using the :DATA command cannot be retrieved or uploaded. Attempting to do so will cause the signal generator to display the message: ERROR:221, Access denied. To download ARB data to files for later retrieval, use the “[:DATA:UNPROTECTED](#)” command on [page 116](#).

System Commands

Memory Subsystem (:MEMORY)

Example

```
:MEM:DATA "NVWFM:IQ_Data",#210Qaz37pY9oL
```

The preceding example downloads 10 bytes of data to a file, IQ_Data., in the signal generator's non-volatile memory. The table shown below describes the command parameters.

- | | |
|-------------------|---|
| • "NVWFM:IQ_Data" | IQ_Data is the file name. The directory path is not needed.
The path "/USER/WAVEFORM/" is implied. |
| • #210Qaz37pY9oL | Data block |
| # | This character indicates the beginning of the data block |
| 2 | Number of digits in the byte count |
| 10 | Byte count |
| Qaz37pY9oL | 10 bytes of data |

NOTE The data, Qaz37pY9oL, in the above command are not valid and are shown for example purposes only. Typically, ascii characters representing data are unprintable.

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

:DATA:APPend

Supported E4438C with Option 001/601 or 002/602

```
:MEMORY:DATA:APPend "<file_name>",<data_block>
```

This command appends data to an existing file stored in signal generator memory.

"<file_name>" This variable names the destination file and directory path.

<data_block> This parameter represents the data and file length parameters. The data in the file is represented by the <data_block> variable. The file length parameters are used by the signal generator for allocating memory.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

Example

```
:MEM:DATA:APPend "NVWFM:IQ_Data",#14Y9oL
```

The preceding example downloads and appends the data, Y9oL, to an existing file named IQ_Data stored in the signal generator's non-volatile memory (NVWFM).

- "NVWFM:IQ_Data" IQ_Data the file name. The directory path is not needed.
The path "/USER/WAVEFORM/" is implied.
- #14Y9oL Data block
 - # This character indicates the beginning of the data block
 - 1 Number of digits in the byte count
 - 4 Byte count
 - Y9oL 4 bytes of data

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

:DATA:BIT

Supported E4438C with Option 001/601 or 002/602

```
:MEMORY:DATA:BIT "<file_name>",<bit_count>,<data_block>  
:MEMORY:DATA:BIT? "<file_name>"
```

This command loads bit data into signal generator memory using the <bit_count> and <data_block> parameters and saves the data to a file designated by the "<file_name>" variable. The query returns the bit count, file length information, and the data.

- "<file_name>" This variable names the destination file and the directory path.
- <bit_count> This number represents the number of bits in the data block.
- <data_block> This parameter represents the data and file length parameters. The data in the file is represented by the <data_block> variable. The file length parameters are used by the signal generator for allocating memory.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

Example

```
:MEM:DATA:BIT "Test_Data",16,#12Qz
```

The preceding example downloads bit data to the file, Test_Data. The table below describes the command parameters.

System Commands

Memory Subsystem (:MEMORY)

- "Test_Data" Test_Data is the file name. The directory path is not needed. The path "/USER/BIT/" is implied.
- 16 Number of bits in the data block
- #12Qz Data block
 - # This character indicates the beginning of the data block
 - 1 Number of digits in the byte count
 - 2 Byte count
 - Qz 16 bits of data (ascii representation of bit data)

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:DATA:FIR

Supported E4438C with Option 001/601 or 002/602

```
:MEMORY:DATA:FIR "<file_name>",osr,coefficient{,coefficient}  
:MEMORY:DATA:FIR? "<file_name>"
```

This command loads oversample ratio (OSR) and user-defined finite impulse response (FIR) coefficient data into a file in the signal generator’s non-volatile memory (NVWFM). The query returns the oversample ratio and coefficient data.

"<file_name>" This variable is the file name of the destination file. The directory path, /USER/FIR is not required as it is implied by the command.

osr The OSR is the number of filter taps per symbol.

coefficient This variable is the FIR coefficient. The maximum number of coefficients is 1024.

{,coefficient} This optional variable is used when you enter additional coefficients.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

Example

```
:MEM:DATA:FIR "FIR_1",4,0,0,0,0,0,0.000001,0.000012,0.000132,  
0.001101,0.006743,0.030588,0.103676,0.265790,0.523849,0.809508,1,1,  
0.809508,0.523849,0.265790,0.103676,0.030588,0.006743,0.001101,0.000132,  
0.000012,0.000001,0,0,0,0,0
```

The preceding example downloads FIR coefficient and oversampling ratio data to the signal generator’s non-volatile memory in a file named FIR_1. Notice that the signal generator directory

path, /USER/FIR, is not needed as it is implied by the command. Refer to “[File Name Variables](#)” on [page 13](#) for information on the file name syntax.

Range *osr*: 1–32
 coefficient: –1000 to 1000

Key Entry **Oversample Ratio**

:DATA:FSK

Supported E4438C with Option 001/601 or 002/602

```
:MEMORY:DATA:FSK "<file_name>",<num_states>,<f0>,<f1>,...<f(n)>
[,<diff_state>,<num_diff_states>,<diff1>,...<diff(n)>]
:MEMORY:DATA:FSK? "<file_name>"
```

This command loads custom frequency shift keying (FSK) data into a file in the signal generator’s non-volatile memory (NVWFM).

The query returns data in the following form:

```
<num_states>,<f0>,<f1>,...<f(n)>,<diff_state>,<num_diff_states>,<diff1>,
...<diff(n)>

"<file_name>" This variable string identifies the name of the FSK file. The filename must be enclosed with quotation marks.

<num_states> This variable identifies the number of frequency states.

<f0> This variable identifies the value of the first frequency state.

<f1>,...<f(n)> This variable identifies the value of the second and subsequent frequency states with a frequency resolution of 0.1Hz.

<diff_state> This variable enables or disables differential encoding.

<num_diff_states> This variable identifies the number of differential states.

<diff0> This variable identifies the value of the first differential state.

<diff1>,...<diff(n)> This variable identifies the value of the second and subsequent differential states.
```

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

System Commands

Memory Subsystem (:MEMORY)

Example

```
:MEM:DATA:FSK "4FSK",4,-2kHz,-1kHz,2kHz,1kHz,ON,2,1,0
```

The preceding example downloads a four-level FSK data to a file named 4FSK. There are four states (frequencies): -2kHz, -1kHz, 2kHz, 1kHz; differential encoding is toggled ON, and there are two differential states 1 and 0. The table shown below describes the command parameters.

- | | |
|----------|--|
| • "4FSK" | 4FSK is the FSK file name. The directory path is not needed.
The path "/USER/FSK" is implied. |
| • 4 | Number of states |
| • -2kHz | First frequency state |
| • -1kHz | Second frequency state |
| • 2kHz | Third frequency state |
| • 1kHz | Fourth frequency state |
| • ON | Differential encoding is on |
| • 2 | Number of differential states |
| • 1 | Value of the first differential state. |
| • 0 | Value of the second differential state. |

Range *num_diff_states*: 0–256

num_states: 2–16

f0-f(n): -20MHz to 20MHz

diff0-diff(n): -128 to 127

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

:DATA:IQ

Supported E4438C with Option 001/601 or 002/602

```
:MEMORY:DATA:IQ "<file_name>",<offsetQ>,<num_states>,<i0>,<q0>,<i1>,<q1>,...<i(n)>,<q(n)>[,<diff_state>,<num_diff_states>,<diff0>,<diff1>,...<diff(n)>]  
:MEMORY:DATA:IQ? "<file_name>"
```

This command loads custom I/Q data into a file in the signal generator’s non-volatile waveform memory (NVWFM).

The query returns data in the following form:

```
<offsetQ>,<num_states>,<i0>,<q0>,<i1>,<q1>,...<i(n)>,<q(n)>,<diff_state>
,<num_diff_states>,<diff0>,<diff1>,...<diff(n)>

"<file_name>" This variable string identifies the name of the I/Q file. The filename must be
enclosed with quotation marks.

<offsetQ> This variable enables (1) or disables (0) the Q output delay by 1/2 symbol from
the I output.

<num_states> This is the number of symbols.

<i0>...<i(n)> This is the I value of the first and subsequent I symbols.

<q0>...<q(n)> This is the Q value of the first and subsequent Q symbols.

<diff_state> This variable enables and disables differential encoding.

<num_diff_states> This variable identifies the number of differential states.

<diff0> This variable identifies the value of the first differential state.

<diff1,...diff(n)> This variable identifies the value of the second and subsequent differential
states.
```

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

Example

```
:MEM:DATA:IQ "Test_BPSK",1,2,1,0,0,0
```

The preceding example loads and stores a two-symbol I/Q file named Test_BPSK that has a Q offset. The table shown below describes the command parameters.

- | | |
|---------------|---|
| • "Test_BPSK" | Test_BPSK is the file name. The directory path is not needed. The path "/USER/IQ" is implied. |
| • 1 | Q Offset. The Q output delay is enabled. |
| • 2 | Number of symbols |
| • 1 | Value of the first I symbol |
| • 0 | Value of the first Q symbol. |
| • 0 | Value of the second I symbol |
| • 0 | Value of the second Q symbol |

System Commands

Memory Subsystem (:MEMORY)

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

:DATA:PRAM:FILE:BLOCK

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DATA:PRAM:FILE:BLOCK <file_name>, <data_block>

This command loads block-formatted data directly into pattern RAM volatile memory (WFM1). Pattern RAM memory describes how memory (WFM1) is used and is not a distinct piece of memory. A PRAM file is specified as an array of bytes.

“<file_name>” This variable names the destination file. No directory path name is needed.

<data_block> This parameter represents the data and file length parameters. The data in the file is represented by the <data_block> variable. The file length parameters are used by the signal generator for allocating memory.

Pattern Ram files are binary files downloaded directly into waveform memory as an array of bytes. Each byte specifies a data bit (LSB 0), a burst bit (BIT 2), and an Event 1 output bit (BIT 6). Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on pattern RAM downloading.

Example

:MEM:DATA:PRAM:FILE:BLOC "PRAM_Data",#14Yq8L

The preceding example downloads PRAM data to a file named PRAM_Data into the signal generator’s volatile memory (WFM1).

- "PRAM_Data" PRAM_Data is the file name. PRAM files are saved to the signal generator’s volatile memory (WFM1).
- #14Yq8L Data block
 - # This character indicates the beginning of the data block
 - 1 Number of digits in the byte count
 - 4 Byte count
 - Yq8L 4 bytes of data

NOTE The data, Yq8L, in the above command is not valid and is used for example purposes only. Typically, ASCII characters representing data are unprintable.

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:DATA:PRAM:FILE:LIST

Supported E4438C with Option 001/601 or 002/602

MEMORY:DATA:PRAM:FILE:LIST "<file_name>" ,<uint8>[,<uint8>,<...>]

This command loads list-formatted data directly into pattern RAM volatile memory (WFM1). Pattern RAM memory describes how memory (WFM1) is used and is not a distinct piece of memory. A PRAM file is specified as an array of bytes.

NOTE This command should be preceded by a *WAI (Wait-to-Continue) command to ensure that all pending operations are completed, before loading the list.

"<file_name>" This variable names the destination file.

<uint8> This variable is any of the valid 8-bit, unsigned integer values between 0 and 255.

[,<uint8>,<...>] This variable identifies the value of the second and subsequent 8-bit unsigned integer variables.

Pattern Ram files are binary files downloaded directly into waveform memory as an array of bytes. Each byte specifies a data bit (LSB 0), a burst bit (BIT 2), and an Event 1 output bit (BIT 6). Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on pattern RAM downloading.

Example

:MEM:DATA:PRAM:FILE: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.

System Commands

Memory Subsystem (:MEMORY)

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 <i>E4428C/38C ESG Signal Generators Programming Compatibility Guide</i> for information on this command. This command is still valid for backward compatibility with earlier signal generator models.
-------------	--

:DATA:PRAM:BLOCK

NOTE	Refer to the <i>E4428C/38C ESG Signal Generators Programming Compatibility Guide</i> for information on this command. This command was replaced by “:DATA:PRAM:FILE:BLOCK” on page 112.
-------------	---

:DATA:PRAM:LIST

NOTE	Refer to the <i>E4428C/38C ESG Signal Generators Programming Compatibility Guide</i> for information on this command. This command has been replaced by “:DATA:PRAM:FILE:LIST” on page 113.
-------------	---

:DATA:SHAPE

Supported E4438C with Option 001/601 or 002/602

```
:MEMORY:DATA:SHAPE "<filename>" ,<num_rise_points>,<rp0>,<rpl>,
...<num_fall_points>,<fp0>,<fp1>,...<fp(n)>
:MEMORY:DATA:SHAPE? "<filename>"
```

This command creates a new burst shape file and stores it in the signal generator non-volatile memory.

“<filename>” This variable string identifies the name of the burst shape file.

num_rise_points This variable specifies how many rise points used in the command.

rp0,...rp(n) This variable defines each successive rise point, where 0 is no power and 1 is full power.

num_fall_points This variable specifies how many fall points used in the command.

fp0,...fp(n)	This variable defines each successive fall point, where 0 is no power and 1 is full power.
Range	num_rise_points: 2–256 num_fall_points: 2–256 rp0–rp(n): 0.0–1.0 fp0–fp(n): 0.0–1.0

:DATA:SHAPE

Supported E4438C with Option 001/601 or 002/602

```
:MEMORY:DATA:SHAPE
"<file_name>",<rise_pnts>,<rp0>,<rpl>,...<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.

System Commands

Memory Subsystem (:MEMORY)

Range	<i>num_rise_points:</i> 2–256
	<i>num_fall_points:</i> 2–256
	<i>rp0–rp(n):</i> 0.0–1.0
	<i>fp0–fp(n):</i> 0.0–1.0

:DATA:UNPROTECTED

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DATA:UNPROTECTED "<file_name>" ,<data_block>

This command allows you to download data and store it in a file on the signal generator with the ability to retrieve it. This command is intended for downloading waveform data; however you can use it to download other types of data.

NOTE If you do not use the *UNPROTECTED* command when downloading a waveform file, you will not be able to retrieve or upload the file. Attempting to do so will cause the signal generator to display the message: **ERROR:221, Access denied.**

"<file_name>" This variable names the destination file and directory path. The file type determines how you must format the "<file_name>" variable as described in the following list.

- Binary file The "<file_name>" variable requires only a file name. A file name without a file path is automatically stored in the Binary memory catalog. Refer to ["File Name Variables" on page 13](#) for information on the file name syntax.
- Encrypted file The "<file_name>" variable requires a path that includes the SECUREWAVE directory. The securewave directory path is SNVWFM: for non-volatile waveform memory and SWFM1: for volatile waveform memory.
- All other file types The "<file_name>" variable requires a path that includes the destination directory for the file type. Refer to the [Table on page 14](#), and ["File Name Variables" on page 13](#) for more information.

<data_block> This parameter represents the data and file length parameters. The data in the file is represented by the <data_block> variable.

Refer to the *E4428C/38C ESG Signal Generators Programming Guide* for more information on downloading and using files.

Example

```
:MEM:DATA:UNPR "NVWFM:Data_File",#18Qz37pY9o
```

The preceding example downloads waveform data to a file named Data_File in the signal generator's non-volatile securewave directory. The table shown below describes the command parameters.

- | | |
|---------------------|--|
| • "NVWFM:Data_File" | Data_File is the filename. The directory path is not needed. The path "/USER/SECUREWAVE" is implied. |
| • #18Qz37pY9o | Data block |
| # | This character indicates the beginning of the data block |
| 1 | Number of digits in the byte count |
| 8 | Byte count |
| Qz37pY9o | 8 bytes of data |

NOTE	The data, Qz37pY9o, in the above command is not valid and is used for example purposes only. Typically, ascii characters representing data are unprintable.
-------------	---

:DElete:ALL

Supported All Models

CAUTION Using this command deletes all user files including binary, list, state, and flatness correction files, and any saved setups which use the front panel table editor. However, this does not include files stored on the Option 001/601 or 002/602 baseband generator. You cannot recover the files after executing this command.

```
:MEMORY:DElete:ALL
```

This command clears the file system of all user files.

Key Entry **Delete All Files**

System Commands

Memory Subsystem (:MEMORY)

:DELete:BINary

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DELete:BINary

This command deletes all binary files.

Key Entry **Delete All Binary Files**

:DELete:BIT

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DELete:BIT

This command deletes all bit files.

Key Entry **Delete All Bit Files**

:DELete:CDMa

NOTE Refer to the *E4428C/38C ESG Signal Generators Programming Compatibility Guide* for information on this command. This command is still valid for backward compatibility and was replaced by "[:DELete:CDMA](#)".

:DELete:CDMA

Supported E4438C with Option 401

:MEMORY:DELete:CDMA

This command deletes all arbitrary waveform IS-95 CDMA files.

Key Entry **Delete All ARB CDMA Files**

:DELete:DMOD

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DELete:DMOD

This command deletes all arbitrary waveform digital modulation files.

Key Entry **Delete All ARB DMOD Files**

:DElete:DWCDma

Supported E4438C with Option 400

:MEMORY:DElete:DWCDma

This command deletes all arbitrary waveform downlink W-CDMA files.

Key Entry **Delete All ARB DWCDMA Files**

:DElete:FCDMa

Supported E4438C with Option 401

:MEMORY:DElete:FCDMa

This command deletes all arbitrary waveform forward link W-CDMA files.

Key Entry **Delete All ARB FCDMA Files**

:DElete:FIR

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DElete:FIR

This command deletes all finite impulse response filter files.

Key Entry **Delete All FIR Files**

:DElete:FSK

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DElete:FSK

This command deletes all FSK files.

Key Entry **Delete All FSK Files**

:DElete:IQ

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DElete:IQ

This command deletes all I/Q files.

Key Entry **Delete All I/Q Files**

System Commands

Memory Subsystem (:MEMORY)

:DELetE:LIST

Supported All Models

:MEMORY:DELetE:LIST

This command deletes all List files.

Key Entry **Delete All List Files**

:DELetE:MCDMA

Supported E4438C with Option 401

:MEMORY:DELetE:MCDMA

This command deletes all arbitrary waveform multicarrier IS-95 CDMA files.

Key Entry **Delete All ARB MCDMA Files**

:DELetE:MDMod

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DELetE:MDMod

This command deletes all arbitrary waveform multicarrier digital modulation files.

Key Entry **Delete All ARB MDMOD Files**

:DELetE:MDWCdma

Supported E4438C with Option 400

:MEMORY:DELetE:MDWCdma

This command deletes all arbitrary waveform multicarrier downlink W-CDMA files.

Key Entry **Delete All ARB MDWCDMA Files**

:DELetE:MFCdma

Supported E4438C with Option 401

:MEMORY:DELetE:MFCdma

This command deletes all arbitrary waveform multicarrier forward link cdma2000 files.

Key Entry **Delete All ARB MFCDMA Files**

:DELete:MTONe

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DELete:MTONe

This command deletes all arbitrary waveform multitone files.

Key Entry **Delete All ARB MTONE Files**

:DELete:RCDMa

Supported E4438C with Option 401

:MEMORY:DELete:RCDMa

This command deletes all arbitrary waveform reverse link cdma2000 files.

Key Entry **Delete All ARB RCDMA Files**

:DELete:SEQ

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DELete:SEQ

This command deletes all sequence files.

Key Entry **Delete All Sequence Files**

:DELete:SHAPe

Supported E4438C with Option 001/601 or 002/602

:MEMORY:DELete:SHAPe

This command deletes all burst shape files.

Key Entry **Delete All Shape Files**

:DELete:STATe

Supported All Models

:MEMORY:DELete:STATE

This command deletes all state files.

Key Entry **Delete All Models State Files**

System Commands

Memory Subsystem (:MEMORY)

:DELETED:UFLT

Supported All Models

:MEMORY:DELETED:UFLT

This command deletes all user-flatness correction files.

Key Entry **Delete All UFLT Files**

:DELETED:UWCDma

Supported E4438C with Option 400

:MEMORY:DELETED:UWCDma

This command deletes all arbitrary waveform uplink W-CDMA files.

Key Entry **Delete All ARB UWCDMA Files**

:DELETED[:NAME]

Supported All Models

:MEMORY:DELETED[: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		NWWFM

Remarks Refer to [“MSUS \(Mass Storage Unit Specifier\) Variable” on page 16](#) for information on the use of the "<msus>" variable.

:COPY

Supported All Models

:MMEMory:COPY "<file name> , "<file name>"

This command makes a duplicate of the requested file.

Key Entry **Copy File**

Remarks Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

When copying a waveform file from volatile to non-volatile memory, the marker file and file header, associated with the waveform file, will automatically be copied at the same time.

:DATA

Supported E4438C with Option 001/601 or 002/602

:MMEMory:DATA "<file name>" ,<.datablock>
:MMEMory:DATA? "<file name>"

This command loads <datablock> into the memory location "<file name>".

The query returns the <datablock> associated with the "<file name>".

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:DElete:NWWFm

Supported E4438C with Option 001/601 or 002/602

:MMEMory:DElete:NWWFm

This command clears the user file system of all non-volatile arbitrary waveform files.

Key Entry **Delete All NWWFM Files**

:DElete:WFM

Supported E4438C with Option 001/601 or 002/602

:MMEMory:DElete:WFM

This command clears the user file system of all arbitrary waveform files, which is the same function as performed by the command shown in “[:DElete:WFM1](#)” .

Key Entry **Delete All WFM1 Files**

:DElete:WFM1

Supported E4438C with Option 001/601 or 002/602

:MMEMory:DElete:WFM1

This command clears the user file system of all arbitrary waveform files, which is the same function as performed by the command shown in “[:DElete:WFM](#)” .

Key Entry **Delete All WFM1 Files**

System Commands

Mass Memory Subsystem (:MMEMemory)

:DELetE[:NAME]

Supported All

`:MMEMemory:DELetE[:NAME] "<file name>[, <msus>]"`

This command clears the user file system of "<file name>" with the option of specifying the file system separately.

The variable "<msus>" (mass storage unit specifier) represents the file system. For a list of the file systems refer to the [Table on page 14](#).

Key Entry **Delete File**

Remarks If the optional variable "<msus>" is omitted, the file name needs to include the file system extension. Refer to [“File Name Variables” on page 13](#) and [“MSUS \(Mass Storage Unit Specifier\) Variable” on page 16](#) for information on the use of the file variables.

When deleting a waveform file from memory, the marker file and file header, associated with the waveform file, will also be deleted.

:HEADer:CLEar

Supported E4438C with Option 001/601 or 002/602

`:MMEMemory:HEADer:CLEar "<file name>"`

This command sets the file header field settings to unspecified for the "<file name>" variable.

Key Entry **Clear Header**

Remarks This command does not require a personality modulation to be on. Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

:HEADer:DESCription

Supported E4438C with Option 001/601 or 002/602

`:MMEMemory:HEADer:DESCription "<file name>,<description>"`

`:MMEMemory:HEADer:DESCription? "<file name>"`

This command inserts a description for the file header.

Key Entry **Edit Description**

Remarks The header description is limited to 32 characters. Refer to [“File Name Variables” on page 13](#) for information on the file name syntax.

:LOAD:LIST

Supported All

`:MMEMory:LOAD:LIST "<file name>"`

This command loads a List sweep file.

Key Entry **Load From Selected File**

:MOVE

Supported All

`:MMEMory:MOVE "<src_file>","<dest_file>"`

This command renames the requested file in the memory catalog.

Key Entry **Rename File**

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

:STORe:LIST

Supported All

`:MMEMory:STORe:LIST "<file name>"`

This command stores the current list sweep data to a file.

Key Entry **Store To File**

Output Subsystem (:OUTPut)

:BLANKing:AUTO

Supported All

:OUTPut:BLANKing:AUTO ON|OFF|1|0

:OUTPut:BLANKing:AUTO?

This command turns the RF output on or off during frequency band changes. Frequency band changes can cause the signal generator's RF output to fluctuate. The output blanking function, when active, turns off the RF output until the frequency settles.

ON(1) The RF output turns off when crossing a frequency band.

OFF(0) The RF output stays on when crossing a frequency band.

*RST 1

Key Entry Output Blanking Off On Auto

Remarks Refer to the signal generator's data sheet for information on frequency switching speeds, settling times, and frequency band information.

:BLANKing:STATE

Supported All

:OUTPut:BLANKing:STATE ON|OFF|1|0

:OUTPut:BLANKing:STATE?

This command enables or disables the RF output blanking state.

ON(1) The RF output turns off during frequency changes.

OFF(0) The RF output stays on during frequency changes.

*RST 1

Remarks Refer to the signal generator's data sheet for information on frequency switching speeds, settling times, and frequency band information.

:MODulation[:STATe]

Supported All

:OUTPut:MODulation[:STATe] ON|OFF|1|0
:OUTPut:MODulation[:STATe]?

This command enables or disables the modulation of the RF output with the currently active modulation type(s).

***RST** 1

Key Entry Mod On/Off

Remarks Some modulation types can be simultaneously enabled such as pulse and AM.

An annunciator on the signal generator is always displayed to indicate whether modulation is switched on or off.

[:STATe]

Supported All

:OUTPut[:STATe] ON|OFF|1|0
:OUTPut[:STATe]?

This command enables or disables the RF output.

***RST** 0

Key Entry RF On/Off

Remarks Although you can configure and engage various modulations, no signal is available at the RF OUTPUT connector until this command is executed.

An annunciator is always displayed on the signal generator to indicate whether the RF output is switched on or off.

Route Subsystem (:ROUTe:HARDware:DGENerator)

:INPut:BPOLarity

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:INPut:BPOLarity POSitive|NEGative

:ROUTe:HARDware:DGENerator:INPut:BPOLarity?

This command configures the polarity of the TTL input signal at the BURST GATE IN connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry **Burst Gate In Polarity Neg Pos**

Remarks This command performs the same function as “[:IPOLarity:BGATe](#)” on page 131.

:INPut:CPOLarity

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:INPut:CPOLarity POSitive|NEGative

:ROUTe:HARDware:DGENerator:INPut:CPOLarity?

This command configures the polarity of the TTL input signal at the DATA CLOCK connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry **Data Clock Polarity Neg Pos**

Remarks This command performs the same function as “[:IPOLarity:CLOCK](#)” on page 132.

:INPut:DPOLarity

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:INPut:DPOLarity POSitive|NEGative

:ROUTe:HARDware:DGENerator:INPut:DPOLarity?

This command configures the polarity of the TTL input signal at the DATA connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Data Polarity Neg Pos

Remarks This command performs the same function as “[:IPOLarity:DATA](#)” on page 132.

:INPut:SPOLarity

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:INPut:SPOLarity POSitive|NEGative

:ROUTe:HARDware:DGENerator:INPut:SPOLarity?

This command configures the polarity of the TTL input signal at the SYMBOL SYNC connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Symbol Sync Polarity Neg Pos

Remarks This command performs the same function as “[:IPOLarity:SSYNC](#)” on page 132.

:IPOLarity:BGATE

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:IPOLarity:BGATE POSitive|NEGative

:ROUTe:HARDware:DGENerator:IPOLarity:BGATE?

This command configures the polarity of the input signal at the BURST GATE IN connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Burst Gate In Polarity Neg Pos

Remarks This command performs the same function as “[:INPut:BPOLarity](#)” on page 130.

System Commands

Route Subsystem (:ROUTe:HARDware:DGEnerator)

:IPOLarity:CLOCK

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:IPOLarity:CLOCK POSitive|NEGative

:ROUTe:HARDware:DGENerator:IPOLarity:CLOCK?

This command configures the polarity of the TTL input signal at the DATA CLOCK connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Data Clock Polarity Neg Pos

Remarks This command performs the same function as “:INPut:CPOLarity” on page 130.

:IPOLarity:DATA

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:IPOLarity:DATA POSitive|NEGative

:ROUTe:HARDware:DGENerator:IPOLarity:DATA?

This command configures the polarity of the TTL input signal at the DATA connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Data Polarity Neg Pos

Remarks This command performs the same function as “:INPut:DPOLarity” on page 131.

:IPOLarity:SSYNC

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:IPOLarity:SSYNC POSitive|NEGative

:ROUTe:HARDware:DGENerator:IPOLarity:SSYNC?

This command configures the polarity of the TTL input signal at the SYMBOL SYNC connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Symbol Sync Polarity Neg Pos

Remarks This command performs the same function as “:INPut:SPOLarity” on page 131.

:OPOLarity:CLOCK

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:OPOLarity:CLOCK POSitive|NEGative

:ROUTe:HARDware:DGENerator:OPOLarity:CLOCK?

This command configures the polarity of the TTL output Data Clock Out signal at the DATA CLK OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while the NEGative refers to inverted logic.

***RST** POS

Key Entry Data Clock Out Neg Pos

Remarks This command performs the same function as “:OUTPut:CPOLarity” on [page 134](#).

:OPOLarity:DATA

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:OPOLarity:DATA POSitive|NEGative

:ROUTe:HARDware:DGENerator:OPOLarity:DATA?

This command configures the polarity of the TTL output DATA OUT signal at the DATA OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Data Out Polarity Neg Pos

Remarks This command performs the same function as “:OUTPut:DPOLarity” on [page 135](#).

System Commands

Route Subsystem (:ROUTe:HARDware:DGEnerator)

:OPOLarity:SSYNc

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:OPOLarity:SSYNC POSitive|NEGative

:ROUTe:HARDware:DGENerator:OPOLarity:SSYNC?

This command configures the polarity of the TTL output SYMBOL SYNC signal at the SYM SYNC OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry **Symbol Sync Out Polarity Neg Pos**

Remarks This command performs the same function as “[:OUTPut:SPOLarity](#)” on [page 135](#).

:OUTPut:CPOLarity

Supported E4438C with Option 001/601 or 002/602

:ROUTe:HARDware:DGENerator:OUTPut:CPOLarity POSitive|NEGative

:ROUTe:HARDware:DGENerator:OUTPut:CPOLarity?

This command configures the polarity of the TTL output DATA CLOCK OUT signal at the DATA CLK OUT pin on the rear panel AUX I/O connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry **Data Clock Polarity Neg Pos**

Remarks This command performs the same function as “[:OPOLarity:CLOCK](#)” on [page 133](#).

:OUTPut:DCS[:STATe]

Supported E4438C with Option 001/601 or 002/602

```
:ROUTe:HARDware:DGENerator:OUTPut:DCS[:STATe] ON|OFF|1|0
:ROUTe:HARDware:DGENerator:OUTPut:DCS[:STATe]?
```

This command is used to enable or disable the output DATA OUT, DATA CLK OUT, and SYM SYNC OUT signals from the rear panel AUX I/O connector. Normally, these output signals should be enabled (On). However, disabling these outputs will decrease the spurs that are sometimes present when operating at high symbol rates.

***RST** 1

Key Entry DATA/CLK/SYNC Rear Outputs Off On

:OUTPut:DPOLarity

Supported E4438C with Option 001/601 or 002/602

```
:ROUTe:HARDware:DGENerator:OUTPut:DPOLarity POSitive|NEGative
:ROUTe:HARDware:DGENerator:OUTPut:DPOLarity?
```

This command configures the polarity of the TTL output signal at the DATA OUT connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Data Out Polarity Neg Pos

Remarks This command performs the same function as “[:OPOLarity:DATA](#)” on page 133.

:OUTPut:SPOLarity

Supported E4438C with Option 001/601 or 002/602

```
:ROUTe:HARDware:DGENerator:OUTPut:SPOLarity POSitive|NEGative
:ROUTe:HARDware:DGENerator:OUTPut:SPOLarity?
```

This command configures the polarity of the TTL input signal at the SYMBOL SYNC connector. POSitive refers to normal logic, while NEGative refers to inverted logic.

***RST** POS

Key Entry Symbol Sync Out Polarity Neg Pos

Status Subsystem (:STATus)

:OPERation:BASEband:CONDition

Supported E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASEband:CONDition?

This query returns the decimal sum of the bits in the Baseband Operation Condition Register. For example, if the baseband is busy (bit 0), the value 1 is returned.

Range 0–32767

Remarks The data in this register is continuously updated and reflects the current conditions.

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

:OPERation:BASEband:ENABLE

Supported E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASEband:ENABLE <val>

:STATus:OPERation:BASEband:ENABLE?

This command determines which bits in the Baseband Operation Event Register will set the Baseband is Busy bit (bit 10) in the Standard Operation Condition Register.

The variable <num> is the sum of the decimal values of the bits you want to enable.

Range 0–32767

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

:OPERation:BASeband:NTRansition

Supported E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASeband:NTRansition <val>

:STATus:OPERation:BASeband:NTRansition?

This command determines which bits in the Baseband Operation Condition Register will set the corresponding bit in the Baseband Operation Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:OPERation:BASeband:PTRansition

Supported E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASeband:PTRansition <val>

:STATus:OPERation:BASeband:PTRansition?

This command determines which bits in the Baseband Operation Condition Register will set the corresponding bit in the Baseband Operation Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

System Commands

Status Subsystem (:STATus)

:OPERation:BASeband[:EVENT]

Supported E4438C with Option 001/601 or 002/602

:STATus:OPERation:BASeband[:EVENT]?

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

This query returns the decimal sum of the bits in the Standard Operation Baseband Event Register.

Range 0–32767

Remarks The equivalent PTR and NTR filters must be set before the condition register can set the corresponding bit in the event register.

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

:OPERation:CONDITION

Supported All

:STATus:OPERation:CONDITION?

This query returns the decimal sum of the bits for the registers that are set to one and are part of the Standard Operation Status Group. For example, if a sweep is in progress (bit 3), the value 8 is returned.

Range 0–32767

Remarks The data in this register is continuously updated and reflects current conditions.

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

:OPERation:ENABLE

Supported All

:STATus:OPERation:ENABLE <val>
:STATus:OPERation:ENABLE?

This command determines which bits in the Standard Operation Event Register will set the Standard Operation Status Summary bit (bit 7) in the Status Byte Register.

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:OPERation:NTRansition

Supported All

:STATus:OPERation:NTRansition <val>
:STATus:OPERation:NTRansition?

This command determines which bits in the Standard Operation Condition Register will set the corresponding bit in the Standard Operation Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

Status Subsystem (:STATus)

: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.

Status Subsystem (:STATus)

: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.

System Commands

Status Subsystem (:STATus)

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:QUESTIONable:CALibration:NTRansition

Supported All

`:STATus:QUESTIONable:CALibration:NTRansition <val>`

`:STATus:QUESTIONable:CALibration:NTRansition?`

This command determines which bits in the Data Questionable Calibration Condition Register will set the corresponding bit in the Data Questionable Calibration Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:QUESTIONable:CALibration:PTRansition

Supported All

`:STATus:QUESTIONable:CALibration:PTRansition <val>`

`:STATus:QUESTIONable:CALibration:PTRansition?`

This command determines which bits in the Data Questionable Calibration Condition Register will set the corresponding bit in the Data Questionable Calibration Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:QUEStionable:CALibration[:EVENT]

Supported All

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

:STATus:QUEStionable:CALibration[:EVENT]?

This command returns the decimal sum of the bits in the Data Questionable Calibration Event Register.

Range 0–32767

Remarks The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

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

:QUEStionable:CONDition

Supported All

:STATus:QUEStionable:CONDition?

This query returns the decimal sum of the bits in the Data Questionable Condition Register. For example, if the reference oscillator oven is cold (bit 4), a value of 16 is returned.

Range 0–32767

Remarks The data in this register is continuously updated and reflects current conditions.

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

System Commands

Status Subsystem (:STATus)

: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

System Commands

Status Subsystem (:STATus)

Remarks The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

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

:QUESTIONable:MODulation:CONDition

Supported All

`:STATus:QUESTIONable:MODulation:CONDition?`

This command returns the decimal sum of the bits in the Data Questionable Modulation Condition Register. For example, if the modulation is uncalibrated (bit 4), a value of 16 is returned.

Range 0–32767

Remarks The data in this register is continuously updated and reflects current conditions.

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

:QUESTIONable:MODulation:ENABLE

Supported All

`:STATus:QUESTIONable:MODulation:ENABLE <val>`

`:STATus:QUESTIONable:MODulation:ENABLE?`

This command determines which bits in the Data Questionable Modulation Event Register will set the modulation summary bit (bit 7) in the Data Questionable Condition Register.

The variable `<val>` is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:QUEStionable:MODulation:NTRansition

Supported All

```
:STATus:QUEStionable:MODulation:NTRansition <val>
:STATus:QUEStionable:MODulation:NTRansition?
```

This command determines which bits in the Data Questionable Modulation Condition Register will set the corresponding bit in the Data Questionable Modulation Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:QUEStionable:MODulation:PTRansition

Supported All

```
:STATus:QUEStionable:MODulation:PTRansition <val>
:STATus:QUEStionable:MODulation:PTRansition?
```

This command determines which bits in the Data Questionable Modulation Condition Register will set the corresponding bit in the Data Questionable Modulation Event Register when that bit has a positive transition (0 to 1).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:QUEStionable:MODulation[:EVENT]

Supported All

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

```
:STATus:QUEStionable:MODulation[:EVENT]?
```

This query returns the decimal sum of the bits in the Data Questionable Modulation Event Register.

Range 0–32767

System Commands

Status Subsystem (:STATus)

Remarks The equivalent PTR or NTR filters must be set before the condition register can set the corresponding bit in the event register.

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

:QUESTIONable:NTRansition

Supported All

```
:STATus:QUESTIONable:NTRansition <val>
:STATus:QUESTIONable:NTRansition?
```

This command determines which bits in the Data Questionable Condition Register will set the corresponding bit in the Data Questionable Event Register when that bit has a negative transition (1 to 0).

The variable <val> is the sum of the decimal values of the bits that you want to enable.

Range 0–32767

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

:QUESTIONable:POWer:CONDition

Supported All

```
:STATus:QUESTIONable:POWer:CONDition?
```

This query returns the decimal sum of the bits in the Data Questionable Power Condition Register. For example, if the RF output signal is 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

System Commands

Status Subsystem (:STATus)

Remarks	Refer to Chapter 3 of the <i>E4428C/38C ESG Signal Generators Programming Guide</i> 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 <i>E4428C/38C ESG Signal Generators Programming Guide</i> 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:

(RF SOURCE 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. The query returns only the numeric value of 1 or 0.

***RST** 0

Remarks The setting ON/1 is persistent through preset and *RST. This setting will not survive a power cycle.

:FILEsystem:SAFEmode

Supported All

:SYSTem:FILEsystem:SAFEmode ON|OFF|1|0

:SYSTem:FILEsystem:SAFEmode?

This command selects the safe mode for file handling. When safe mode is set to OFF, volatile waveform files can be edited and saved while the signal generator plays the file without signal interruption. However, it is possible with complex waveforms, for corruption of memory to occur which will be reported as an error on the front-panel display and require a reboot of the signal generator to resolve.

Example

:SYST:FILE:SAVE ON

The preceding example enables the safe mode setting and waveform files cannot be edited without

System Commands

System Subsystem (:SYSTem)

signal disruption while the signal generator plays them.

***RST** On

:HELP:MODE

Supported All

:SYSTem:HELP:MODE SINGLE|CONTinuous

:SYSTem:HELP:MODE?

This command sets the help function mode of the signal generator.

SINGle Help is provided only for the next key that you press.

CONTinuous Help is provided for each key you press. In addition, the function of the key is executed.

When the help dialog box is displayed, pressing the **Help** hardkey in either mode will turn help off.

Key Entry **Help Mode Single Cont**

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

:IDN

Supported All

:SYSTem:IDN "<string>"

This command modifies the identification string that the *IDN? query returns. Sending an empty string returns the query output of *IDN? to its factory shipped setting. The maximum string length is 72 characters.

Remarks Modification of the *IDN? query output enables the signal generator to identify itself as another signal generator when used as a replacement.

The display diagnostic information, shown by pressing the **Diagnostic Info** softkey, is not affected by this command.

:LANGuage

Supported All

:SYSTem:LANGuage "SCPI" | "COMP" | "NADC" | "PDC" | "PHS" | "8648"

:SYSTem:LANGuage?

This command sets the remote language for the signal generator.

SCPI	This choice provides compatibility for SCPI commands.				
COMP	This choice provides compatibility for the 8656B, 8657A/B signal generator which is supported by using the GPIB interface.				
NADC	This choice provides compatibility for the 8657D NADC personality which is supported only through a GPIB interface (E4438C only).				
PDC	This choice provides compatibility for the 8657D PDC personality which is supported only through a GPIB interface (E4438C only).				
PHS	This choice provides compatibility for the 8657J PHS personality which is supported only through a GPIB interface (E4438C only).				
8648	This choice provides compatibility for the 8648A/B/C/D signal generator which is supported only through a GPIB interface.				
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 <i>Programming Compatibility Guide</i> .				

:OPT

Supported All

:SYSTem:OPT "<string>"

This command modifies the option string that the *OPT? query returns. Sending an empty string sets the query output of *OPT? to the signal generator's factory shipped setting. The maximum string length is 72 characters.

Remarks Modification of the *OPT? query output enables the signal generator, with a set of options, to *identify* itself as another signal generator when used as a replacement

The display diagnostic information, shown by pressing the **Diagnostic Info** softkey, is not affected by this command.

:PON:TYPE

Supported All

:SYSTem:PON:TYPE PRESet | LAST

:SYSTem:PON:TYPE?

System Commands

System Subsystem (:SYSTem)

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

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 160 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 160 for selecting the type of defined conditions.

:PRESet:ALL

Supported All

:SYSTem:PRESet:ALL

This command sets all states of the signal generator back to their factory default settings, including states that are not normally affected by signal generator power-on, preset, or *RST.

:PRESet:LANGuage

Supported All

:SYSTem:PRESet:LANGuage "SCPI" | "COMP" | "NADC" | "PDC" | "PHS" | "8648"

:SYSTem:PRESet:LANGuage?

This command sets the remote language that is available when the signal generator is preset.

SCPI	This choice provides compatibility for SCPI commands.
COMP	This choice provides compatibility for the 8656B, 8657A/B signal generator which is supported by using the GPIB interface.
NADC	This choice provides compatibility for the 8657D NADC personality which is supported only through a GPIB interface (E4438C only).
PDC	This choice provides compatibility for the 8657D PDC personality which is supported only through a GPIB interface (E4438C only).
PHS	This choice provides compatibility for the 8657J PHS personality which is supported only through a GPIB interface (E4438C only).
8648	This choice provides compatibility for the 8648A/B/C/D signal generator which is supported only through a GPIB interface.
*RST	"SCPI"
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

System Commands

System Subsystem (:SYSTem)

Key Entry **PN9 Mode Preset**

:PRESet:TYPE

Supported All

:SYSTem: PRESet:TYPE NORMAl | USER
:SYSTem: PRESet:TYPE?

This command toggles the preset state between factory- and user-defined conditions.

Key Entry **Preset Normal User**

Remarks Refer to “[:PRESet\[:USER\]:SAVE](#)” for saving the USER choice preset settings.

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

:PRESet[:USER]:SAVE

Supported All

:SYSTem: PRESet[:USER] : SAVE

This command saves your user-defined preset conditions to a state file.

Key Entry **Save User Preset**

Remarks Only one user-defined preset file can be saved. Subsequent saved user-defined preset files will overwrite the previously saved file.

:SECurity:DISPLAY

Supported All Models

:SYSTem: SECurity:DISPLAY ON|OFF|1|0
:SYSTem: SECurity:DISPLAY?

This command enables or disables the secure display mode.

On(1) This selection turns the signal generator display back on, showing the current settings. Cycling the signal generator power also restores the display, however the current settings may change depending on the power-on configuration choice. See “[:PON:TYPE](#)” on page 157 for information on the power-on choices available.

OFF(0) This selection blanks the signal generator’s display, hiding the settings and disabling the front panel keys. While in this mode, the display shows *** SECURE DISPLAY ACTIVATED ***.

For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.

Example

:SYST:SEC:DISP OFF

The preceding example enables the secure display mode.

***RST**

1

Range

N/A

Key Entry

Activate Security Display

:SECurity:ERASall

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.

System Commands

System Subsystem (:SYSTem)

SANitize	This selection removes all user files, table editor files, flatness correction files, and baseband generator files using the same techniques as the OVERwrite selection for SRAM and flash memory. For the hard disk, the signal generator overwrites all addressable locations with a single character, its complement, and then with a random character.
----------	--

Once you select the security level, you must execute the command from “:SECurity:LEVel:STATe” to arm the security level.

NOTE

Once you select a security level and arm it, you cannot change the level.

For other cleaning and security operation descriptions, see “:SECurity:ERASeall” on page 161, “:SECurity:OVERwrite” on page 163, and “:SECurity:SAnitize” on page 163. For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.

Example

:SYST:SEC:LEV NONE

The preceding example sets the secure mode so it resets the signal generator to factory settings after completing the security operation.

Key Entry **None** **Erase** **Overwrite** **Sanitize**

:SECurity:LEVel:STATe

Supported All Models

CAUTION Ensure that you select the security level prior to executing this command with the ON (1) selection. Once you enable the state, you cannot reduce the security level.

:SYSTem:SECurity:LEVel:STATe ON|OFF|1|0

:SYSTem:SECurity:LEVel:STATe?

This command arms and executes the current security level parameter.

On (1) This selection arms and prevents any changes to the current security level. Refer to “:SECurity:LEVel” on page 161 for setting the security level.

OFF (0) This selection performs the actions required for the current security level setting. Cycling the signal generator power also performs the same function.

For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User’s Guide*.

Example

:SYST:SEC:LEV:STAT ON

The preceding example arms the secure mode selected with the SYSTem:SECurity:LEVel command.

Key Entry Enter Secure Mode

:SECurity:OVERwrite

Supported All Models

:SYSTem:SECurity:OVERwrite

This command removes all user files, table editor files values, flatness correction files, and baseband generator files. The memory is then overwritten with random data as described below. For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

SRAM All addressable locations will be overwritten with random characters.

HARD DISK All addressable locations will be overwritten with random characters.

FLASH MEMORY The flash blocks will be erased.

Key Entry Erase and Overwrite All

:SECurity:SANitize

Supported All Models

:SYSTem:SECurity:SANitize

This command removes all user files, table editor files values, flatness correction files, and baseband generator files. The memory is then overwritten with a sequence of data as described below. For more information about security functions, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

SRAM All addressable locations will be overwritten with random characters.

HARD DISK All addressable locations will be overwritten with a single character and then a random character.

FLASH MEMORY The flash blocks will be erased.

Key Entry Erase and Sanitize All

:SSAVer:DELay

Supported All

:SYSTem:SSAVer:DELay <val>

:SYSTem:SSAVer:DELay?

System Commands

System Subsystem (:SYSTem)

This command sets the amount of time before the display light or display light and text is switched off. This will occur if there is no input via the front panel during the delay period.

The variable <val> is a whole number measured in hours.

Range 1–12

Key Entry **Screen Saver Delay:**

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

Refer to “[:SSAVer:MODE](#)” on page 164 for selecting the screen saver mode.

:SSAVer:MODE

Supported All

`:SYSTem:SSAVer:MODE LIGHT|TEXT`

`:SYSTem:SSAVer:MODE?`

This command toggles the screen saver mode between light only or light and text.

LIGHT This choice enables only the light to turn off during the screen saver operation while leaving the text visible on the darkened screen.

TEXT This choice enables both the display light and text to turn off during the screen saver operation.

Key Entry **Screen Saver Mode**

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

:SSAVer:STATE

Supported All

`:SYSTem:SSAVer:STATE ON|OFF|1|0`

`:SYSTem:SSAVer:STATE?`

This command enables or disables the display screen saver.

Key Entry **Screen Saver Off On**

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

:TIME

Supported All

:SYSTem:TIME <hour>, <minute>, <second>

:SYSTem:TIME?

This command sets the time displayed in the lower right area of the signal generator's display.

Range <hour>: 0–23 <minute>: 0–59 <second>: 0–59

Key Entry **Time/Date**

:VERSion

Supported All

:SYSTem:VERSion?

This command returns the SCPI version number with which the signal generator complies.

Trigger Subsystem

:ABORt

Supported All

:ABORT

This command causes the List or Step sweep in progress to abort. If INIT:CONT[:ALL] is set to ON, the sweep will immediately re-initiate. The pending operation flag affecting *OPC, *OPC?, and *WAI will undergo a transition once the sweep has been reset.

:INITiate:CONTinuous[:ALL]

Supported All

:INITiate:CONTinuous[:ALL] ON|OFF|1|0

:INITiate:CONTinuous[:ALL]?

This command selects either a continuous or single list or step sweep. Execution of this command does not affect a sweep in progress.

ON (1) This choice selects continuous sweep where, after the completion of the previous sweep, the current sweep will restart automatically or wait until the appropriate trigger source is received.

OFF (0) This choice selects a single sweep. Refer to “[:INITiate\[:IMMediate\]\[:ALL\]](#)” on [page 167](#) for single sweep triggering information.

***RST** 0

Key Entry Sweep Repeat Single Cont

Remarks Execution of this command will not affect a sweep in progress.

:INITiate[:IMMEDIATE][:ALL]

Supported All

:INITiate[:IMMEDIATE][:ALL]

This command either sets or sets and starts a single List or Step sweep, depending on the trigger type. The command performs the following:

- arms a single sweep when BUS, EXternal, or KEY is the trigger source selection
- arms and starts a single sweep when IMMEDIATE is the trigger source selection

This command is ignored if a sweep is in progress. See “[:INITiate:CONTinuous\[:ALL\]](#)” on page 166 for setting continuous or single sweep. See “[:TRIGger\[:SEQUence\]:SOURce](#)” on page 168 to select the trigger source.

In some atypical cases, the :INIT command could be ignored if it immediately follows an *OPC? command. If the :INIT command is ignored, then use a 10ms sleep function before sending the command.

Key Entry Single Sweep

:TRIGger:OUTPut:POLarity

Supported All

:TRIGger:OUTPut:POLarity POSitive|NEGative

:TRIGger:OUTPut:POLarity?

Sets the TTL signal level present at the TRIGGER OUT connector to either high (5 vdc) or low (0 vdc). The trigger out is asserted after the frequency and/or power is set while the sweep is waiting for its step trigger. In addition, the swept-sine sends a pulse to the TRIGGER OUT at the beginning of each sweep.

Example

:TRIG:OUTP:POL NEG

The preceding example enables the 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 67 for more information.

***RST** DBM

Key Entry dBm dBuV dBuVemf mV uV mVemf uVemf DB

Remarks All power values in this chapter are shown with DBM as the unit of measure. If a different unit of measure is selected, replace DBM with the newly selected unit whenever it is indicated for the value.

4 Analog Commands

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

- “Amplitude Modulation Subsystem (`[:SOURce]`)” on page 172
- “Frequency Modulation Subsystem (`[:SOURce]`)” on page 179
- “Low Frequency Output Subsystem (`[:SOURce]:LFOOutput`)” on page 186
- “Phase Modulation Subsystem (`[:SOURce]`)” on page 191
- “Pulse Modulation Subsystem (`[:SOURce]:PULM`)” on page 199

Amplitude Modulation Subsystem ([**:SOURce**])

:AM[1]|2...

Supported All Models

[**:SOURce**] :AM[1] | 2 . . .

This prefix enables the selection of the AM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **AM Path 1 2** softkey.

AM[1] **AM Path 1 2** with 1 selected

AM2 **AM Path 1 2** with 2 selected

When just AM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses AM[1], only path one is affected. Consequently, when AM2 is selected, only path two is set up. However, the depth of the signals for the two paths can be coupled.

Depth coupling links the depth value of AM[1] to AM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPtSine is not the selection for the waveform type
- each path uses a different source (Internal 1, Ext1, or Ext2)

:AM:INTernal:FREQuency:STEP[:INCRement]

Supported All Models

[**:SOURce**] :AM: INTernal: FREQuency: STEP [**:INCRement**] <num>

[**:SOURce**] :AM: INTernal: FREQuency: STEP [**:INCRement**] ?

This command sets the step increment for the amplitude modulation internal frequency.

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

Range 0.5–1E6

Key Entry **Incr Set**

Remarks The value set by this command is used with the UP and DOWN choices for the AM frequency setting. Refer to “[:AM\[1\]2:INTERNAL\[1\]:FREQuency](#)” on page 174 for more information.

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

:AM:WIDeband:STATe

Supported All Models

[:SOURce] :AM:WIDeband:STATe ON|OFF|1|0
[:SOURce] :AM:WIDeband:STATe?

This command enables or disables the wideband amplitude modulation for the selected path.

***RST** 0

Key Entry **AM Off On**

Remarks The RF carrier is modulated when the modulation state of the signal generator is set to ON, see “[:MODulation\[:STATe\]](#)” on page 129 for more information.

Whenever amplitude modulation is enabled, the AM annunciator is turned on in the display

:AM[1]|2:EXTernal[1]|2:COUPLing

Supported All Models

[:SOURce] :AM[1]|2:EXTernal[1]|2:COUPLing AC|DC
[:SOURce] :AM[1]|2:EXTernal[1]|2:COUPLing?

This command sets the coupling for the amplitude modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

***RST** DC

Key Entry **Ext Coupling DC AC**

Remarks The command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

Analog Commands

Amplitude Modulation Subsystem ([**:SOURce**])

:AM[1]|2:INTernal[1]:FREQuency

Supported All Models

[:SOURce] :AM[1]|2:INTernal[1]:FREQuency <val><unit> |UP|DOWN
[:SOURce] :AM[1]|2:INTernal[1]:FREQuency?

This command sets the internal amplitude modulation rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

***RST** +4.0000000E+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** +4.0000000E+002

Range Dual-Sine: 0.1HZ–100kHz Swept-Sine: 0.1HZ–100kHz

Key Entry **AM Tone 2 Rate** **AM Stop Rate**

Remarks The alternate signal frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to “[“:AM\[1\]|2:INTernal\[1\]:FUNCTION:SHAPE” on page 175](#) for the waveform selection.

:AM[1] | 2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent

Supported All Models

```
[ :SOURce ] :AM[1] | 2:INTernal[1]:FREQuency:ALTernate:AMPLitude:  

PERCent <val><unit>  

[ :SOURce ] :AM[1] | 2:INTernal[1]:FREQuency:ALTernate:AMPLitude:PERCent?
```

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

***RST** +5.00000000E+001

Range 0–100PCT

Key Entry **AM Tone 2 Ampl Percent Of Peak**

Remarks Refer to “[“:AM\[1\]2:INTernal\[1\]:FUNCTION:SHAPE” on page 175](#) for the waveform selection.

:AM[1] | 2:INTernal[1]:FUNCTION:SHAPE

Supported All Models

```
[ :SOURce ] :AM[1] | 2:INTernal[1]:FUNCTION:SHAPE SINE|TRIangle|SQUare|RAMP|  

NOISE|DUALsine|SWEPtSine  

[ :SOURce ] :AM[1] | 2:INTernal[1]:FUNCTION:SHAPE?
```

This command sets the AM waveform type.

***RST** SINE

Key Entry	Sine	Triangle	Square	Ramp	Noise	Dual-Sine	Swept-Sine
------------------	------	----------	--------	------	-------	-----------	------------

:AM[1] | 2:INTernal[1]:SWEep:TIME

Supported All Models

```
[ :SOURce ] :AM[1] | 2:INTernal[1]:SWEep:TIME <val><unit>  

[ :SOURce ] :AM[1] | 2:INTernal[1]:SWEep:TIME?
```

This command sets the sweep rate for the amplitude-modulated, swept-sine waveform.

***RST** +1.00000000E–001

Range 1mS–65.535S

Key Entry **AM Sweep Time**

Analog Commands

Amplitude Modulation Subsystem ([**:SOURce**])

:AM[1]|2:INTernal[1]:SWEep:TRIGger

Supported All Models

[:SOURce] :AM[1] | 2 :INTernal[1] :SWEep:TRIGGER BUS|IMMEDIATE|EXTernal|KEY

[:SOURce] :AM[1] | 2 :INTernal[1] :SWEep:TRIGGER?

This command sets the trigger source for the amplitude modulated swept-sine waveform.

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

IMMEDIATE This choice enables immediate triggering of the sweep event.

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

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

***RST** IMM

Key Entry Bus Free Run Ext Trigger Key

Remarks Refer to “[:AM\[1\]|2:INTernal\[1\]:FUNCTION:SHAPE](#)” on page 175 for the waveform selection.

:AM[1]|2:SOURce

Supported All Models

[:SOURce] :AM[1] | 2 :SOURce INT[1] | EXT[1] | EXT2

[:SOURce] :AM[1] | 2 :SOURce?

This command sets the source to generate the amplitude modulation.

INT This choice selects the internal source to provide an ac-coupled signal.

EXT This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.

***RST** INT

Key Entry Internal Ext1 Ext2

Remarks A 1.0 V_p input is required for calibrated AM depth settings.

The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is >±3% of 1 V_p.

:AM[1] | 2:STATe

Supported All Models

[:SOURce] :AM[1] | 2:STATe ON|OFF|1|0

[:SOURce] :AM[1] | 2:STATe?

This command enables or disables the amplitude modulation for the selected path.

***RST** 0

Key Entry AM Off On

Remarks The RF carrier is modulated when you have set the signal generator's modulation state to ON, see “[:MODulation\[:STATe\]](#)” on page 129 for more information.

Whenever amplitude modulation is enabled, the AM annunciator is turned on in the display.

The two paths for amplitude modulation can be simultaneously enabled. Refer to “[:AM\[1\]2...](#)” on page 172 for more information.

:AM[1] | 2[:DEPTh]

Supported All Models

[:SOURce] :AM[1] | 2[:DEPTh] [:LINEar] <val><unit>|UP|DOWN

[:SOURce] :AM[1] | 2[:DEPTh] [:LINEar]?

This command sets the amplitude modulation depth in percent.

***RST** +1.00000000E-001

Range 0.00–100PCT

Key Entry AM Depth

Remarks The value of AM depth applies only to whichever AM path configuration (AM[1]|2) you have currently selected. AM Depth is fixed for wideband AM.

When the depth values are coupled, a change made to one path is applied to both. Refer to “[:AM\[1\]2\[:DEPTh\]:TRACk](#)” on page 178 for AM depth value coupling.

Refer to “[:AM\[:DEPTh\]:STEP\[:INCRelement\]](#)” on page 178 for setting the value associated with UP and DOWN choices.

Analog Commands

Amplitude Modulation Subsystem (:SOURce)

: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 177 for more information.

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

Frequency Modulation Subsystem ([:SOURce])

:FM[1]|2...

Supported All Models

[:SOURce] :FM[1] | 2 ...

This prefix enables the selection of the FM path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **FM Path 1 2** softkey.

FM[1] **FM Path 1 2** with 1 selected

FM2 **FM Path 1 2** with 2 selected

When just FM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses FM[1], only path one is affected. Consequently, when FM2 is selected, only path two is set up. However, the deviation of the signals for the two paths can be coupled.

Deviation coupling links the deviation value of FM[1] to FM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPt sine 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]

Analog Commands

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

: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** +5.0000000E+002

Range 0.5–1E6

Key Entry **Incr Set**

Remarks The value set by this command is used with the UP and DOWN choices for the FM frequency setting. Refer to “[“:FM\[1\]|2:INTernal\[1\]:FREQuency” on page 181](#) for more information.

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

:FM[1]|2:EXTernal[1]|2:COUPLing

Supported All Models

[:SOURce] :FM[1]|2:EXTernal[1]|2:COUPLing AC|DC

[:SOURce] :FM[1]|2:EXTernal[1]|2:COUPLing?

This command sets the coupling for the frequency modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

***RST** DC

Key Entry **Ext Coupling DC AC**

Remarks The command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

:FM[1]|2:INTernal[1]:FREQuency

Supported All Models

[:SOURce] :FM[1]|2:INTernal[1]:FREQuency <val><unit> |UP|DOWN
 [:SOURce] :FM[1]|2:INTernal[1]:FREQuency?

This command sets the internal frequency modulation rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

***RST** +4.00000000E+002

Range Dual-Sine: 0.1HZ–100KHZ Swept-Sine: 0.1HZ–100KHZ
 All Other Waveforms: 0.1HZ–20KHZ

Key Entry **FM Tone 1 Rate** **FM Start Rate** **FM Rate**

:FM[1]|2:INTernal[1]:FREQuency:ALTername

Supported All Models

[:SOURce] :FM[1]|2:INTernal[1]:FREQuency:ALTername <val><unit>
 [:SOURce] :FM[1]|2:INTernal[1]:FREQuency:ALTername?

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 182 for the waveform selection.

Analog Commands

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

: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** +1.0000000E+002

Range 0–100PCT

Key Entry FM Tone 2 Ampl Percent Of Peak

Remarks Refer to “[:FM\[1\]|2:INTERNAL\[1\]:FUNCTION:SHAPE](#)” for the waveform selection.

:FM[1] | 2:INTERNAL[1]:FUNCTION:SHAPE

Supported All Models

```
[ :SOURce ] :FM[1] | 2:INTERNAL[1] | :FUNCTION:SHAPE SINE|TRIangle|SQUARE|RAMP|  
NOISE|DUALsine|SWEPtsine  
[ :SOURce ] :FM[1] | 2:INTERNAL[1] | :FUNCTION:SHAPE?
```

This command sets the FM waveform type.

***RST** SINE

Key Entry Sine Triangle Square Ramp Noise Dual-Sine Swept-Sine

Remarks The waveform selection is only valid when INT[1] is the source selection. Refer to “[:FM\[1\]|2:SOURce](#)” on page 184 for type source selection.

:FM[1]|2:INTernal[1]:SWEep:TIME

Supported All Models

[:SOURce] :FM[1]|2:INTernal[1]:SWEep:TIME <val><unit>

[:SOURce] :FM[1]|2:INTernal[1]:SWEep:TIME?

This command sets the sweep time for the swept-sine waveform.

***RST** +1.00000000E-001

Range 1.0mS–65.535S

Key Entry FM Sweep Time

Remarks Refer to “[:FM\[1\]|2:INTernal\[1\]:FUNCTION:SHAPE](#)” on page 182 for the waveform selection.

:FM[1]|2:INTernal[1]:SWEep:TRIGger

Supported All Models

[:SOURce] :FM[1]|2:INTernal[1]:SWEep:TRIGger BUS|IMMEDIATE|EXTernal|KEY

[:SOURce] :FM[1]|2:INTernal[1]:SWEep:TRIGger?

This command sets the trigger source for the frequency modulated swept-sine waveform.

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

IMMEDIATE This choice enables immediate triggering of the sweep event.

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

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

***RST** IMM

Key Entry Bus Free Run Ext Trigger Key

Remarks Refer to “[:FM\[1\]|2:INTernal\[1\]:FUNCTION:SHAPE](#)” on page 182 for the waveform selection.

:FM[1]|2:SOURce**Supported** All Models**[:SOURce] :FM[1]|2:SOURce** INT[1]|EXT1|EXT2**[:SOURce] :FM[1]|2:SOURce?**

This command sets the source to generate the frequency modulation.

INT This choice selects the internal source to provide an ac-coupled signal.**EXT** This choice selects the EXT 1 INPUT or the EXT 2 INPUT connector to provide an externally applied signal that can be ac- or dc-coupled.***RST** INT**Key Entry** Internal Ext1 Ext2**Remarks** The externally applied, ac-coupled input signal is tested for a voltage level and a display annunciator will report a high or low condition if that voltage is $>\pm 3\%$ of 1 V_p.**:FM[1]|2:STATe****Supported** All Models**[:SOURce] :FM[1]|2:STATe** ON|OFF|1|0**[:SOURce] :FM[1]|2:STATe?**

This command enables or disables the frequency modulation for the selected path.

***RST** 0**Key Entry** FM Off On**Remarks** The RF carrier is modulated when you set the signal generator's modulation state to ON, see "[":MODulation\[:STATe\]](#)" on page 129 for more information.

Whenever frequency modulation is enabled, the FM annunciator is turned on in the display.

The two paths for frequency modulation can be simultaneously enabled. Refer to "[":FM\[1\]|2..."](#) on page 179 for more information.

:FM[1]|2[:DEViation]

Supported All Models

[:SOURce] :FM[1]|2[:DEViation] <val><unit>

[:SOURce] :FM[1]|2[:DEViation]?

This command sets the frequency modulation deviation.

***RST** +1.00000000E+003

Range	<i>Frequency</i>	<i>Deviation</i>	Deviation Option UNJ
250kHZ–249.999MHZ	0–8MHZ	0–1MHZ	
> 249.999–500MHZ	0–4MHZ	0–500kHZ	
> 500MHZ–1GHZ	0–8MHZ	0–1MHZ	
> 1–2GHZ	0–16MHZ	0–2MHZ	
> 2–4GHZ	0–32MHZ	0–4MHZ	
> 4–6GHZ	0–8MHZ	0–8MHZ	

Key Entry **FM DEV**

Remarks If deviation tracking is ON, a change to the deviation value on one path will apply to both. Refer to “[:FM\[1\]|2\[:DEViation\]:TRACK](#)” on page 185 for more information and setting the deviation tracking.

:FM[1]|2[:DEViation]:TRACK

Supported All Models

[:SOURce] :FM[1]|2[:DEViation]:TRACK ON|OFF|1|0

[:SOURce] :FM[1]|2[:DEViation]:TRACK?

This command enables or disables the deviation coupling between the paths (FM[1] and FM2).

ON (1) This choice will link the deviation value of FM[1] with FM2; FM2 will assume the FM[1] deviation value. For example, if FM[1] deviation is set to 500 Hz and FM2 is set to 2 kHz, enabling the deviation tracking will cause the FM2 deviation value to change to 500 Hz. This applies regardless of the path (FM[1] or FM2) selected in this command

OFF (0) This choice disables the coupling and both paths will have independent deviation values.

***RST** 0

Key Entry **FM Dev Couple Off On**

Remarks This command uses exact match tracking, not offset tracking.

Analog Commands

Low Frequency Output Subsystem ([**:SOURce**]:LFOOutput)

Low Frequency Output Subsystem ([**:SOURce**]:LFOOutput)

:AMPLitude

Supported All Models

[**:SOURce**] :LFOOutput :AMPLitude <val><unit>

[**:SOURce**] :LFOOutput :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**] :LFOOutput :FUNCTION[1] :FREQuency <val><unit>

[**:SOURce**] :LFOOutput :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** +4.0000000E+002

Range Sine: 0.1HZ–100KHZ Dual-Sine: 0.1HZ–100KHZ

Swept-Sine: 0.1HZ–100KHZ

All Other Waveforms: 0.1HZ–20KHZ

Key Entry **LF Out Tone 1 Freq** **LF Out Start Freq** **LF Out Freq**

Remarks Refer to “[:FUNCTION\[1\]:SHAPE](#)” on page 189 for selecting the waveform type.

:FUNCTION[1]:FREQuency:ALTerNate

Supported All Models

[:SOURce] :LFOOutput :FUNCTION[1] :FREQuency:ALTerNate <val><unit>

[:SOURce] :LFOOutput :FUNCTION[1] :FREQuency:ALTerNate?

This command sets the frequency for the alternate LF output signal.

***RST** +4.00000000E+002

Range Dual-Sine: 0.1HZ–100KHZ Swept-Sine: 0.1HZ–100KHZ

Key Entry **LF Out Tone 2 Freq** **LF Out Stop Freq**

Remarks The alternate frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to “[:FUNCTION\[1\]:SHAPE](#)” on page 189 for selecting the waveform type.

:FUNCTION[1]:FREQuency:ALTerNate:AMPLitude:PERCent

Supported All Models

[:SOURce] :LFOOutput :FUNCTION[1] :FREQuency:ALTerNate:AMPLitude:PERCent <val><unit>

[:SOURce] :LFOOutput :FUNCTION[1] :FREQuency:ALTerNate:AMPLitude:PERCent?

This command sets the amplitude of the second tone for a dual-sine waveform as a percentage of the total LF output amplitude. For example, if the second tone makes up 30% of the total amplitude, then the first tone is 70% of the total amplitude.

***RST** +5.00000000E+001

Range 0–100PCT

Key Entry **LF Out Tone 2 Ampl % of Peak**

Remarks Refer to “[:FUNCTION\[1\]:SHAPE](#)” on page 189 for selecting the waveform type.

Analog Commands

Low Frequency Output Subsystem (:SOURce):LFOOutput

:FUNCTION[1]:PERiod

Supported All Models

[:SOURce] :LFOOutput :FUNCTION[1] :PERiod <val><unit>

[:SOURce] :LFOOutput :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] :LFOOutput :FUNCTION[1] :PWIDth <val><unit>

[:SOURce] :LFOOutput :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 188.

:FUNCTION[1]:SHAPE

Supported All Models

[:SOURce] :LFOOutput :FUNCTION[1]:SHAPE SINE|DUALsine|SWEPtSine|TRIangle|
SQuare|RAMP|PULSe|NOISE|DC
[:SOURce] :LFOOutput :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 190.

:FUNCTION[1]:SWEep:TIME

Supported All Models

[:SOURce] :LFOOutput :FUNCTION[1]:SWEep:TIME <val><unit>
[:SOURce] :LFOOutput :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] :LFOOutput :FUNCTION[1]:SWEep:TRIGger BUS|IMMEDIATE|EXTernal|KEY
[:SOURce] :LFOOutput :FUNCTION[1]:SWEep:TRIGger?

This command sets the trigger source for the internally generated swept-sine waveform signal at the LF output.

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

IMMEDIATE This choice enables immediate triggering of the sweep event.

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

Analog Commands

Low Frequency Output Subsystem (**[:SOURce]:LFOOutput**)

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 189 for selecting the waveform type.

:SOURce

Supported	All Models
[:SOURce]:LFOOutput:SOURce INT[1] FUNCTION	
[:SOURce]:LFOOutput: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]:LFOOutput:STATE ON OFF 1 0	
[:SOURce]:LFOOutput: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 Φ M path and is part of most SCPI commands associated with this subsystem. The two paths are equivalent to the **Φ M Path 1 2** softkey.

PM[1] **Φ M Path 1 2** with 1 selected

PM2 **Φ M Path 1 2** with 2 selected

When just PM is shown in a command, this means the command applies globally to both paths.

Each path is set up separately. When a SCPI command uses PM[1], only path one is affected. Consequently, when PM2 is selected, only path two is set up. However, the deviation of the signals for the two paths can be coupled.

Deviation coupling links the deviation value of PM[1] to PM2. Changing the deviation value for one path will change it for the other path.

These two paths can be on at the same time provided the following conditions have been met:

- DUALsine or SWEPt sine 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]

Analog Commands

Phase Modulation Subsystem ([:SOURce])

: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 193 for more information.

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

:PM[1]|2:BANDwidth | BWIDth

Supported All Models

[:SOURce] :PM[1]|2:BANDwidth|BWIDth NORMAL|HIGH

[:SOURce] :PM[1]|2:BANDwidth|BWIDth?

This command toggles between normal phase modulation and high bandwidth phase modulation mode.

***RST** NORM

Key Entry **FM ΦM Normal High BW**

:PM[1]|2:EXTernal[1]:COUpling

Supported All Models

[:SOURce] :PM[1]|2:EXTernal[1]:COUpling AC|DC
[:SOURce] :PM[1]|2:EXTernal[1]:COUpling?

This command sets the coupling for the phase modulation source through the selected external input connector.

AC This choice will only pass ac signal components.

DC This choice will pass both ac and dc signal components.

***RST** DC

Key Entry **Ext Coupling DC AC**

Remarks This command does not change the currently active source or switch the current modulation on or off. The modulating signal may be the sum of several signals, either internal or external sources.

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

Supported All Models

[:SOURce] :PM[1]|2:INTernal[1]:FREQuency <val><unit>|UP|DOWN
[:SOURce] :PM[1]|2:INTernal[1]:FREQuency?

This command sets the internal modulation frequency rate for the following applications:

- the first tone of a dual-sine waveform
- the start frequency for a swept-sine waveform
- the frequency rate for all other waveforms

***RST** +4.0000000E+002

Range Dual-Sine: 0.1HZ–100KHZ Swept-Sine: 0.1HZ–100KHZ

All Other Waveforms: 0.1HZ–20KHZ

Key Entry **ΦMTone 1 Rate** **ΦM Start Rate** **ΦM Rate**

Remarks Refer to “[“:FUNCTION\[1\]:SHAPE” on page 189](#) for selecting the waveform type.

Analog Commands

Phase Modulation Subsystem (:SOURce)

: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** +4.0000000E+002

Range Dual-Sine: 0.1HZ–100KHZ Swept-Sine: 0.1HZ–100KHZ

Key Entry **ΦM Stop Rate** **ΦM Tone 2 Rate**

Remarks The alternate frequency is the second tone of a dual-sine or the stop frequency of a swept-sine waveform.

Refer to “[:PM\[1\]|2:INTernal\[1\]:FUNCTION:SHAPE](#)” on page 195 for the waveform selection.

:PM[1]|2:INTernal[1]:FREQuency:ALTerNate:AMPLitude:PERCent

Supported All Models

[:SOURce] :PM[1] | 2 :INTernal[1] :FREQuency:ALTerNate:AMPLitude:

PERCent <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** +5.0000000E+001

Range 0–100PCT

Key Entry **ΦM Tone 2 Ampl Percent of Peak**

Remarks Refer to “[:PM\[1\]|2:INTernal\[1\]:FUNCTION:SHAPE](#)” on page 195 for the waveform selection.

:PM[1]|2:INTernal[1]:FUNCTION:SHAPe

Supported All Models

[:SOURce] :PM[1]|2:INTernal[1]:FUNCTION:SHAPe SINE|TRIangle|SQUare|RAMP|
NOISE|DUALsine|SWEPtSine
[:SOURce] :PM[1]|2:INTernal[1]:FUNCTION:SHAPe?

This command sets the phase modulation waveform type.

***RST** SINE

Key Entry Sine Triangle Square Ramp Noise Dual-Sine Swept-Sine

Remarks The waveform selection is only valid when INT[1] is the source selection. Refer to “[:PM\[1\]|2:SOURce](#)” on page 196 for type source selection.

:PM[1]|2:INTernal[1]:SWEep:TIME

Supported All Models

[:SOURce] :PM[1]|2:INTernal[1]:SWEep:TIME <val><unit>
[:SOURce] :PM[1]|2:INTernal[1]:SWEep:TIME?

This command sets the sweep time for a phase-modulated, swept-sine waveform.

***RST** +1.00000000E-001

Range 1.0mS–65.535S

Key Entry **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.

Analog Commands

Phase Modulation Subsystem ([:SOURce])

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 195 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 $> \pm 3\%$ 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 129 for more information.
	Whenever phase modulation is enabled, the ΦM annunciator is turned on in the display

The two paths for phase modulation can be simultaneously enabled. Refer to “[\[:PM\[1\]2...\]](#)” on page 191 for more information.

:PM[1]|2[:DEViation]

Supported All Models

```
[ :SOURce ] :PM[1]|2[:DEViation] <val><unit>|UP|DOWN
[ :SOURce ] :PM[1]|2[:DEViation]?
```

This command sets the deviation of the phase modulation.

The variable <unit> will accept RAD (radians), PIRAD (pi-radians), and DEG (degrees); however, the query will only return values in radians.

***RST** +0.00000000E+000

Range	<i>Frequency</i>	<i>Normal Bandwidth</i>	<i>High Bandwidth</i>
250kHZ–249.999MHZ	0–10RAD	0–1RAD	
> 249.999–500MHZ	0–5RAD	0–0.5RAD	
> 500MHZ–1GHZ	0–10RAD	0–1RAD	
> 1–2GHZ	0–20RAD	0–2RAD	
> 2–4GHZ	0–40RAD	0–4RAD	
> 4–6GHZ	0–80RAD	0–8RAD	

Key Entry **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\[:INCReement\]\]](#)” on page 198 for setting the value associated with the UP and DOWN choices.

:PM[1]|2[:DEViation]:TRACk

Supported All Models

```
[ :SOURce ] :PM[1]|2[:DEViation]:TRACk ON|OFF|1|0
[ :SOURce ] :PM[1]|2[:DEViation]:TRACk?
```

This command enables or disables the deviation coupling between the paths (PM[1] and PM2).

ON (1) This choice will link the deviation value of PM[1] with PM2; PM2 will assume the PM[1] deviation value. For example, if PM[1] deviation is set to 500 Hz and

Analog Commands

Phase Modulation Subsystem (:SOURce)

PM2 is set to 2 kHz, enabling the deviation tracking will cause the PM2 deviation value to change to 500 Hz. This applies regardless of the path (PM[1] or PM2) selected in this command.

OFF (0) This choice disables the coupling and both paths will have independent deviation values.

***RST** 0

Key Entry **ΦM Dev Couple Off On**

Remarks This command uses exact match tracking, not offset tracking.

:PM[:DEViation]:STEP[:INCRement]

Supported All Models

[:SOURce] :PM[:DEViation] :STEP[:INCRement] <val><unit>
[:SOURce] :PM[:DEViation] :STEP[:INCRement]?

This command sets the phase modulation deviation step increment.

Range 0.001–1E3RAD

Key Entry **Incr Set**

Remarks The value set by this command is used with the UP and DOWN choices for the FM deviation command. Refer to “[:PM\[1|2\]\[:DEViation\]](#)” on page 197 for more information.

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

Pulse Modulation Subsystem (:SOURce):PULM)

:INTernal[1]:FREQuency

Supported All Models

[:SOURce] :PULM: INTernal[1]:FREQuency <val><unit> | UP | DOWN

[:SOURce] :PULM: INTernal[1]:FREQuency?

This command sets the rate of the internal square wave pulse modulation source.

***RST** +4.00000000E+002

Range 0.1HZ–20.0kHZ

Key Entry Pulse Rate

Remarks This command is used when SQUare is the current pulse modulation type. Refer to “:SOURce” on page 202 for the pulse modulation type selection.

:INTernal[1]:FREQuency:STEP

Supported All Models

[:SOURce] :PULM: INTernal[1]:FREQuency:STEP[:INCRement] <frequency>MIN | MAX

[:SOURce] :PULM: INTernal[1]:FREQuency:STEP[INCRement]?

This command sets the step value for the internally-generated square wave pulse rate.

This command is used when SQUare is the pulse modulation type. Refer to “:SOURce” on page 202 for the pulse modulation type selection. The step value, set with this command, is used with the UP and DOWN choices in the :INTernal[1]:FREQuency command.

The step value set with this command is not affected by a power-on, preset, or *RST command.

Example

:PULM: INT: FREQ: STEP MIN

The preceding example sets the step value for the square wave pulse rate to 0.1 Hz, the minimum rate.

Range 0.1HZ–20kHZ

Analog Commands

Pulse Modulation Subsystem ([**:SOURce**]:PULM)

: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** +8.0000000E-005

Range 8uS–30S

Key Entry Pulse Period

Remarks If the entered value for the pulse period is equal to or less than the value for the pulse width, the pulse width changes to a value that is equal to the pulse period.

Refer to “[“:INTernal\[1\]:PERiod:STEP\[:INCrement\]” on page 200](#) for setting the value associated with the UP and DOWN choices.

:INTernal[1]:PERiod:STEP[:INCrement]

Supported All Models

[:SOURce] :PULM: INTernal[1] :PERiod:STEP[:INCrement] <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** +1.0000000E-006

Range 4uS–30S

Key Entry Incr Set

Remarks	The value set by this command is used with the UP and DOWN choices for the pulse period command. Refer to “ :INTernal[1]:PERiod ” on page 200 for more information.
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:INTernal[1]:PWIDth

Supported	All Models
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[:SOURce] :PULM:INTernal[1]:PWIDth <val><unit> | UP | DOWN

[:SOURce] :PULM:INTernal[1]:PWIDth?

This command sets the pulse width for the internally generated pulse modulation source.

NOTE	A power search is recommended for signals with pulse widths less than one microsecond. Refer to “ :ALC:SEARCh ” on page 60.
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*RST	+4.00000000E-005
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Range	4uS–30S
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Key Entry	Pulse Width
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Remarks	If the entered value for the pulse width is equal to or greater than the value for the pulse period, the pulse width will change to a value that is equal to the pulse period.
----------------	--

Refer to “[:INTernal\[1\]:PWIDth:STEP](#)” on page 201 for setting the value associated with the UP and DOWN choices.

:INTernal[1]:PWIDth:STEP

Supported	All Models
------------------	------------

[:SOURce] :PULM:INTernal[1]:PWIDth:STEP <num>[<time suffix>]

[:SOURce] :PULM:INTernal[1]:PWIDth:STEP?

This command sets the step increment for the pulse width.

The optional variable [<time suffix>] accepts nS (nano-seconds) to S (seconds).

*RST	+1.00000000E-006
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Range	4uS–30S
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Remarks	The value set by this command is used by the UP and DOWN choices for the pulse width command. Refer to “ :INTernal[1]:PWIDth ” on page 201 for more information.
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Analog Commands

Pulse Modulation Subsystem (:SOURce):PULM)

:SOURce

Supported All Models

[:SOURce] :PULM:SOURce INT|EXT[1]|EXT2

[:SOURce] :PULM:SOURce?

This command sets the source that will generate the pulse modulation.

***RST** INT

Key Entry Internal Square Internal Pulse Ext1 DC-Coupled Ext2 DC-Coupled

:STATe

Supported All Models

[:SOURce] :PULM:STATE ON|OFF|1|0

[:SOURce] :PULM:STATE?

This command enables or disables the operating state of the pulse modulation source.

***RST** 0

Key Entry Pulse Off On

Remarks When pulse modulation is enabled, the PULSE annunciator is shown in the display

5 Component Test Digital Commands

This chapter provides SCPI descriptions for commands dedicated to digital component testing using the E4438C ESG Vector Signal Generator. This chapter contains the following major sections:

- “All Subsystem–Option 001/601 or 002/602 ([**:SOURce**])” on page 204
- “AWGN ARB Subsystem–Option 403 ([**:SOURce**]:RADio:AWGN:ARB)” on page 205
- “CDMA ARB Subsystem–Option 401 ([**:SOURce**]:RADio:CDMA:ARB)” on page 215
- “CDMA2000 ARB Subsystem–Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)” on page 240
- “Dmodulation Subsystem–Option 001/601 or 002/602 ([**:SOURce**]:RADio:DMODulation:ARB)” on page 270
- “Dual ARB Subsystem–Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)” on page 294
- “Multitone Subsystem–Option 001/601 or 002/602 ([**:SOURce**]:RADio:MTONe:ARB)” on page 326
- “Wideband CDMA ARB Subsystem–Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)” on page 340

All Subsystem—Option 001/601 or 002/602 (:SOURce)

:RADio:ALL:OFF

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:ALL:OFF

This command disables the digital modulation formats.

Remarks This command does not affect analog modulation.

AWGN ARB Subsystem—Option 403 ([:SOURce]:RADio:AWGN:ARB)

:BWIDth

Supported E4438C with Option 403

[:SOURce] :RADio :AWGN :ARB :BWIDth <val>

[:SOURce] :RADio :AWGN :ARB :BWIDth?

This command adjusts the bandwidth of the AWGN waveform.

The variable <val> is expressed in units of Hertz (Hz–MHz).

***RST** +1.00000000E+006

Range 5E4–1.5E7

Key Entry Bandwidth

:IQ:EXTernal:FILTer

Supported E4438C with Option 403

[:SOURce] :RADio :AWGN :ARB :IQ :EXTernal :FILTer 40e6 | THRough

[:SOURce] :RADio :AWGN :ARB :IQ :EXTernal :FILTer?

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter setting with this command will automatically set the “[:IQ:EXTernal:FILTer:AUTO](#)” on page 206 command to Off mode.

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

***RST** THR

Key Entry 40.000 MHz Through

Component Test Digital Commands

AWGN ARB Subsystem—Option 403 ([\[:SOURce\]:RADio:AWGN:ARB](#))

:IQ:EXTernal:FILTer:AUTO

Supported E4438C with Option 403

[:SOURce] :RADio:AWGN:ARB:IQ:EXTernal:FILTer:AUTO ON|OFF|1|0

[:SOURce] :RADio:AWGN:ARB:IQ:EXTernal:FILTer:AUTO?

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

ON(1) This choice will automatically select a digital modulation filter optimized for the current signal generator settings.

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “[:IQ:EXTernal:FILTer](#)” on page 205 for selecting a filter or through path.

***RST** ON

Key Entry [I/Q Output Filter Manual Auto](#)

:HEADer:CLEar

Supported E4438C with Option 403

[:SOURce] :RADio:AWGN:ARB:HEADer:CLEar

This command clears the header information from the file header used by this modulation format.

Key Entry [Clear Header](#)

Remarks The **AWGN Off On** softkey must be set to On for this command to function.

:HEADer:SAVE

Supported E4438C with Option 403

[:SOURce] :RADio:AWGN:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

Key Entry [Save Setup To Header](#)

Remarks The **AWGN Off On** softkey must be set to On for this command to function.

:IQ:MODulation:ATTen**Supported** E4438C with Option 403**[:SOURCE] :RADio:AWGN:ARB:IQ:MODulation:ATTen <val>****[:SOURCE] :RADio:AWGN:ARB:IQ:MODulation:ATTen?**

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

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

RST** +2.00000000E+000**Range** 0–40**Key Entry** **Modulator Atten Manual Auto*:IQ:MODulation:ATTen:AUTO****Supported** E4438C with Option 403**[:SOURCE] :RADio:AWGN:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0****[:SOURCE] :RADio:AWGN:ARB:IQ:MODulation:ATTen:AUTO?**

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

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

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” for setting the attenuation value.

***RST** 1**Key Entry** **Modulator Atten Manual Auto**

Component Test Digital Commands

AWGN ARB Subsystem—Option 403 ([\[:SOURce\]:RADio:AWGN:ARB](#))

:IQ:MODulation:FILTer

Supported E4438C with Option 403

[:SOURce] :RADio:AWGN:ARB:IQ:MODulation:FILT_{er} 2.1e6|40e6|THRough
[:SOURce] :RADio:AWGN:ARB:IQ:MODulation:FILT_{er}?

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter with this command will automatically set “[:IQ:MODulation:ATTen:AUTO](#)” on page 207 to Off(0) mode.

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

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

THRough This choice bypasses filtering.

***RST** THR

Key Entry **2.100 MHz** **40.000 MHz** **Through**

:IQ:MODulation:FILTer:**AUTO**

Supported E4438C with Option 403

[:SOURce] :RADio:AWGN:ARB:IQ:MODulation:FILT_{er}:AUTO ON|OFF|1|0
[:SOURce] :RADio:AWGN:ARB:IQ:MODulation:FILT_{er}: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:FILT_{er}](#)” on page 299 for selecting a filter or through path.

***RST** 1

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

:MDESTination:AAMPLitude

Supported E4438C with Option 403

[**:SOURce**]:RADio:AWGN:ARB:MDESTination:AAMPLitude NONE|M1|M2|M3|M4
[:SOURce]:RADio:AWGN:ARB:MDESTination:AAMPLitude?

This command routes the selected marker to the Alternate Amplitude function. The NONE parameter clears the marker for the Alternate Amplitude function.

***RST** NONE

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

:MDESTination:ALCHold

Supported E4438C with Option 403

CAUTION Incorrect automatic level control (ALC) sampling can create a sudden 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 302](#).

Use the ALC hold function when you have a waveform signal that has idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[“:MPOLarity:MARKer1|2|3|4” on page 370](#).

NOTE Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

Component Test Digital Commands

AWGN ARB Subsystem—Option 403 ([**:SOURce**]:RADio:AWGN:ARB)

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.
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For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “[“:**MARKer**:\[SET\]” on page 302](#).

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

***RST** **NONE**

Example

:RAD:AWGB:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Remarks N/A

:MDESTination:PULSe

Supported E4438C with Option 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.
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[:**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.
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The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker's polarity, see “[:MPOLarity:MARKer1|2|3|4](#)” on page 333.

NOTE	Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “ :MARKer:[SET] ” on page 302 for setting the marker points.
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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.
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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**

Component Test Digital Commands

AWGN ARB Subsystem—Option 403 ([**:SOURce**]:RADio:AWGN:ARB)

: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** +1.0000000E+007

Range 2.5E5–1E8

Key Entry Reference Freq

Remarks The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “[:REFerence\[:SOURce\]](#)” on page 281.

:REFerence[:SOURce]

Supported E4438C with Option 403

[:SOURce] :RADio:AWGN:ARB:REFerence[:SOURce] INTernal | EXTernal
[:SOURce] :RADio:AWGN:ARB:REFerence[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

***RST** INT

Key Entry ARB Reference Ext Int

Remarks If the EXTERNAL choice is selected, the external frequency *value must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.

Refer to “[:REFerence:EXTernal:FREQuency](#)” on page 280 to enter the external reference frequency.

:SClock:RATE

Supported E4438C with Option 403

[:SOURce] :RADio:AWGN:ARB:SClock:RATE <val>
[:SOURce] :RADio:AWGN:ARB:SClock:RATE?

This command sets the sample clock rate for the AWGN modulation format.

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

***RST** +1.00000000E+008

Range 1–1E8

Key Entry ARB Sample Clock

Remarks The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[[:STATE](#)]” on page 214 to activate the modulation format.

Component Test Digital Commands

AWGN ARB Subsystem—Option 403 ([:SOURce]:RADio:AWGN:ARB)

: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:

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

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

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** +1.0000000E+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:FILTter

Supported E4438C with Option 401

[: SOURce] : RADio : CDMA : ARB : IQ : EXTernal : FILTter 40e6 | THRough
[: SOURce] : RADio : CDMA : ARB : IQ : EXTernal : FILTter?

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:FILTter:AUTO](#)” on page 217 to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

***RST** THR

Key Entry **40.000 MHz Through**

:IQ:EXTernal:FILTter:AUTO

Supported E4438C with Option 401

[: SOURCE] : RADio : CDMA : ARB : IQ : EXTernal : FILTter : AUTO ON | OFF | 1 | 0
[: SOURce] : RADio : CDMA : ARB : IQ : EXTernal : FILTter : 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:FILTter](#)” on page 217 for selecting a filter or through path.

***RST** 1

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

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

: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 218.

:FILTer:BBT

Supported E4438C with Option 401

[:**SOURCE**]:RADio:CDMA:ARB:FILTer:BBT <val>

[:**SOURCE**]:RADio:CDMA:ARB:FILTer:BBT?

This command changes the bandwidth-multiplied-by-bit-time (BbT) filter parameter.

The filter BbT value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

***RST** +5.00000000E–001

Range 0.000–1.000

Key Entry Filter BbT

Remarks This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.

To change the current filter type, refer to “[:FILTer](#)” on page 218.

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

:FILTer:CHANnel

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA:ARB:FILT~~e~~rn:CHANnel EVM|ACP

[**:SOURce**]:RADio:CDMA:ARB:FILT~~e~~rn:CHANnel?

This command optimizes the Nyquist and root Nyquist filters to minimize error vector magnitude (EVM) or to minimize adjacent channel power (ACP).

EVM This choice provides the most ideal passband.

ACP This choice improves stopband rejection.

***RST** EVM

Key Entry **Optimize FIR For EVM ACP**

Remarks To change the current filter type, refer to “[“:FILTer” on page 218](#).

:HEADer:CLEAR

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA:ARB:HEADer:CLEar

This command clears the header information from the file header used by this modulation format.

Key Entry **Clear Header**

Remarks The **CDMA Off On** softkey must be set to On for this command to function.

:HEADer:SAVE

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

Key Entry **Save Setup To Header**

Remarks The **CDMA Off On** softkey must be set to On for this command to function.

:IQMap

Supported E4438C with Option 401

[:SOURce]:RADio:CDMA:ARB:IQMap NORMal | INVerted
[:SOURce]:RADio:CDMA:ARB:IQMap?

This command selects whether the Q output will be normal or inverted.

NORMal This choice selects normal polarity.

INVerted This choice inverts the internal Q signal.

***RST** NORM

Key Entry I/Q Mapping Normal Invert

Remarks Inverting the Q output inverts the RF spectrum after the modulation.

:IQ:MODulation:ATTen

Supported E4438C with Option 401

[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen <val>
[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen?

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

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

***RST** +2.00000000E+000

Range 0–40

Key Entry Modulator Atten Manual Auto

:IQ:MODulation:ATTen:AUTO

Supported E4438C with Option 401

[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0
[:SOURce]:RADio:CDMA:ARB:IQ:MODulation:ATTen:AUTO?

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

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

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” on page 221 for setting the attenuation value.

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

***RST** 1

Key Entry Modulator Atten Manual Auto

:IQ:MODulation:FILTter

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:IQ:MODulation:FILTter 2.1e6|40e6|THRough
[:SOURce] :RADio:CDMA:ARB:IQ:MODulation:FILTter?

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter using this command will automatically set “[:IQ:MODulation:ATTen:AUTO](#)” on page 221 to OFF(0) mode.

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

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

THRough This choice bypasses filtering.

***RST** THR

Key Entry 2.100 MHz 40.000 MHz Through

:IQ:MODulation:FILTter:AUTO

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:IQ:MODulation:FILTter:AUTO ON|OFF|1|0
[:SOURce] :RADio:CDMA:ARB:IQ:MODulation:FILTter: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:FILTter](#)” on page 299 for selecting a filter or through path.

***RST** 1

Key Entry I/Q Mod Filter Manual Auto

:MDESTination:AAMPplitude

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:MDESTination:AAMPplitude 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
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: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 302.

Use the ALC hold function when you have a waveform signal that has idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[:MPolarity:MARKer1|2|3|4](#)” on page 226.

NOTE Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

NOTE	A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings.
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For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “[“:**MARKer**:\[SET\]” on page 302](#).

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

***RST** **NONE**

Example

:RAD:AWGB:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Remarks N/A

:MDESTination:PULSe

Supported E4438C with Option 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.
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[: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.
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The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker's polarity, see “[:MPolarity:MARKer1|2|3|4](#)” on page 226.

NOTE Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “[:MARKer:\[SET\]](#)” on page 302 for setting the marker points.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

Example

`:RAD:ARB:MDES:PULS M2`

The preceding example routes marker 2 to Pulse/RF Blanking.

***RST** **NONE**

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

:MPOLarity:MARKer1|2|3|4

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:MPOLarity:MARKer1|2|3|4 NEGative|POSitive
[:SOURce] :RADio:CDMA:ARB:MPOLarity:MARKer1|2|3|4?

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

***RST** POS

Key Entry Marker 1 Polarity Neg Pos Marker 2 Polarity Neg Pos Marker 3 Polarity Neg Pos
Marker 4 Polarity Neg Pos

:OSAMple

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:OSAMple <val>
[:SOURce] :RADio:CDMA:ARB:OSAMple?

This command sets the oversampling ratio (number of filter taps per symbol) for CDMA modulation.

***RST** +5

Range 2–8

Key Entry Oversample Ratio

Remarks The upper limit of the oversample ratio is adjusted based on the waveform length and chip rate.

Using larger oversample ratios result in more completely filtered images, but this action also uses up more waveform memory.

The maximum oversample ratio is the smaller of 8, 40 Mcps/Chip Rate, or 32/Waveform Length (number of CDMA short codes).

:REFerence:EXTernal:FREQuency

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:REFerence:EXTernal:FREQuency <val>
[:SOURce] :RADio:CDMA:ARB:REFerence:EXTernal:FREQuency?

This command allows you to enter the frequency of the applied external reference.

The variable <val> is expressed in units of Hertz (Hz–MHz).

***RST** +1.00000000E+007

Range 2.5E5–1E8

Key Entry Reference Freq

Remarks The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “[:REFerence\[:SOURce\]](#)” on page 227.

:REFerence[:SOURce]

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:REFerence[:SOURce] INTernal|EXTernal
[:SOURce] :RADio:CDMA:ARB:REFerence[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

***RST** INT

Key Entry ARB Reference Ext Int

Remarks If the EXTernal choice is selected, the external frequency value *must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.

Refer to “[:REFerence:EXTernal:FREQuency](#)” on page 226 to enter the external reference frequency.

:RETRigger

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA:ARB:RETRigger ON|OFF|IMMEDIATE
[:SOURce] :RADio:CDMA:ARB:RETRigger?

This command enables or disables the ARB retrigging mode; the retrigger mode controls how the retrigging 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.

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

IMMEDIATE This choice specifies that if a trigger occurs while a waveform is playing, the waveform will reset and replay from the start immediately upon receiving a trigger.

***RST** ON

Key Entry On Off Immediate

:SCLock:RATE

Supported E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:SCLock:RATE <val>
[ :SOURce ] :RADio:CDMA:ARB:SCLock:RATE?
```

This command sets the sample clock rate for the CDMA modulation format.

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

***RST** +1.0000000E+008

Range 1–1E8

Key Entry ARB Sample Clock

Remarks The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[**:STATe**]” on page 239 to activate the modulation format.

:SETup

Supported E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:SETup FWD9 | FWD32 | FWD64 | PIlot | REVerse | MCARrier |
"<file name>"
[ :SOURce ] :RADio:CDMA:ARB:SETup?
```

This command selects a pre-defined CDMA channel setup or multicarrier, and turns multicarrier off or on (see the MCARrier choice description).

FWD9 This CDMA setup consists of 9 forward channels (pilot, paging, sync, and 6 traffic channels) at IS-97-defined power levels.

FWD32 This CDMA setup consists of 32 forward channels (pilot, paging, sync, and 29 traffic channels) at IS-97-defined power levels.

FWD64 This CDMA setup consists of 64 forward channels (pilot, 7 paging, sync, and 55 traffic channels) at IS-97-defined power levels.

PILOT This choice selects single pilot channel.

REVerse	A single reverse link traffic channel.								
MCA Rrier	This choice selects multicarrier and turns it on. Selecting any other setup such as FWD9 or FWD64 turns multicarrier off. To select the multicarrier setup, see “ :SETup:MCARrier ” on page 230.								
*RST	FWD9								
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.

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

The channel type, walsh code, power, PN offset, and data values are returned when a query is initiated. The output format is as follows:

<channel_type>, <walsh_value>, <power>, <pn_offset>, <data_value>

*RST	Channel #	Channel Type	Walsh Code	Power	PN Offset	Data
	1	PIL	+0	-7.00000000E+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.

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

*RST	carrier type: FWD9 <freq_offset>: +1.2500000E+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 231 The file name specified must be a single carrier CDMA file.

:SETup:STORe

Supported E4438C with Option 401

[:**SOURce**] :RADio:CDMA:ARB:SETup:STORe "<file name>"

This command stores the current custom CDMA state, using a designated file name, to the signal generator non-volatile memory.

Along with the contents of the CDMA channel table editor (channel types, Walsh code, power levels, PN offset, and data), this command stores the following information to the signal generator non-volatile memory:

- FIR filter
- FIR filter file name
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- chip rate
- waveform length
- oversample ratio
- ARB reference clock source (internal or external)
- ARB reference clock frequency

Key Entry **Store Custom CDMA State**

Remarks Recall the stored file by executing the following command:

[:**SOURce**] :RADio:CDMA:ARB:SETup: "<file name>"

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:TRIGger:TYPE

Supported E4438C with Option 401

[:SOURCE] :RADio:CDMA:ARB:TRIGGER:TYPE CONTinuous|SINGle|GATE
[:SOURCE] :RADio:CDMA:ARB:TRIGGER:TYPE?

This command sets the trigger mode (type) that controls the waveform's playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform's final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform's transmission.
 - CONTinuous, see “[:TRIGger:TYPE:CONTinuous\[:TYPE\]](#)” on page 234
 - SINGle, see “[:RETRigger](#)” on page 227
 - GATE, selecting the mode also sets the response
- Selecting the trigger source (see “[:TRIGger\[:SOURce\]](#)” on page 235), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
 - CONTinuous and SINGle see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 237
 - GATE, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 235

For more information on triggering, see the *E4428C/38C ESG Signal Generators User's Guide*.

The following list describes the trigger type command choices:

CONTinuous Upon triggering, the waveform repeats continuously.

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

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 235). 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 command selects the waveform's response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see "[":TRIGger:TYPE](#)" on page 233.

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

FREE	Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.
TRIGger	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.
RESet	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.

*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 233.

The following list describes the ESG’s gating behavior for the polarity selections:

LOW	The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state).
HIGH	The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state).

***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 233. 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:

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 (:SOURce):RADio:CDMA:ARB)

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “[:TRIGger\[:SOURce\]:EXTernal\[:SOURce\]](#)” on page 238.
For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.
- The trigger signal polarity:
 - gating mode, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 235
 - continuous and single modes, see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 237
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
 - setting the amount of delay, see “[:TRIGger\[:SOURce\]:EXTernal:DELay](#)” on page 236
 - turning the delay on, see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATe](#)” on page 237

BUS This choice enables triggering over the GPIB or LAN using the *TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the *TRG command.

***RST** KEY

Key Entry Trigger Key Ext Bus

:TRIGger[:SOURce]:EXTernal:DELay

Supported E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:TRIGger[ :SOURce ] :EXTernal:DELay <val>
[ :SOURce ] :RADio:CDMA:ARB:TRIGger[ :SOURce ] :EXTernal:DELay?
```

This command sets the amount of time to delay the ESG’s response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATe](#)” on page 237). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 235.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

***RST** +1.00000000E-003

Range 1E-8 to 4E1

Key Entry Ext Delay Time

:TRIGger[:SOURce]:EXTernal:DELay:STATE

Supported E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:TRIGger[ :SOURce ] :EXTernal:DELay:STATE ON|OFF |  
1|0  
[ :SOURce ] :RADio:CDMA:ARB:TRIGger[ :SOURce ] :EXTernal:DELay:STATE?
```

This command enables or disables the operating state of the external trigger delay function.

For setting the delay time, see “[:TRIGger\[:SOURce\]:EXTernal:DELay](#)” on page 236, and for more information on configuring an external source, see “[:TRIGger\[:SOURce\]](#)” on page 235.

***RST** 0

Key Entry Ext Delay Off On

:TRIGger[:SOURce]:EXTernal:SLOPe

Supported E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA:ARB:TRIGger[ :SOURce ] :EXTernal:SLOPe POSitive|  
NEGative  
[ :SOURce ] :RADio:CDMA:ARB:TRIGger[ :SOURce ] :EXTernal:SLOPe?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 235.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 235.

***RST** NEG

Key Entry Ext Polarity Neg Pos

Component Test Digital Commands

CDMA ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA:ARB)

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

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA:ARB:TRIGger[:SOURce]:EXTernal[:SOURce] EPT1|EPT2|EPTRIGGER1|EPTRIGGER2
[:SOURce]:RADio:CDMA:ARB:TRIGger[:SOURce]:EXTernal[:SOURce]?

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 235. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

EPT1	This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.
EPT2	This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
EPTRIGGER1	This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.
EPTRIGGER2	This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
*RST	EPT1
Key Entry	Patt Trig In 1 Patt Trig In 2

:WLENgth

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA:ARB:WLENgth <val>
[:SOURce]:RADio:CDMA:ARB:WLENgth?

This command specifies the waveform length (in short codes).

***RST** +1

Range 1–6

Key Entry **Waveform Length**

Remarks The upper limit is adjusted based on the oversample ratio to fit the signal within the available memory.

The maximum waveform length is 32/oversample ratio.

[:STATe]**Supported** E4438C with Option 401**[:SOURCE] :RADio:CDMA:ARB[:STATe]** ON|OFF|1|0
[:SOURCE] :RADio:CDMA:ARB[:STATe]?

This command enables or disables the CDMA modulation format.

Executing the command **[:SOURce] :RADio:CDMA:ARB[:STATe]** ON sets up the internal hardware to generate the currently selected CDMA signal selection. This also activates the I/Q state and sets the I/Q source to internal.

ON (1) This choice sets up the internal hardware to generate the currently selected CDMA signal selection. This also activates the I/Q state and sets the I/Q source to internal.

OFF (0) This choice disables the CDMA modulation format.

***RST** 0

Key Entry **CDMA Off On**

Remarks The enabled modulation is not present on RF carrier until you have activated the modulation by executing the command
:**OUTPut:MODulation[:STATe]** ON.

Overriding the I/Q state and I/Q source functions can be achieved by using the I/Q menu.

CDMA2000 ARB Subsystem–Option 401 ([:SOURce]:RADio:CDMA2000:ARB)

:CLIPping:I

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:CLIPping:I <val>

[:SOURce] :RADio:CDMA2000:ARB:CLIPping:I?

This command clips (limits) the modulation level of the waveform's I component to a percentage of full scale.

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

***RST** +1.0000000E+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** +1.0000000E+002

Range 10–100

Key Entry Clip |Q| To

:CLIPping:TYPE

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA2000:ARB:CLIPping:TYPE IJQ|IORQ

[**:SOURce**]:RADio:CDMA2000:ARB:CLIPping:TYPE?

This command selects either IJQ or IORQ as the clipping type.

IJQ This choice clips (circular clipping) the combined I and Q waveform.

IORQ This choice independently clips (rectangular clipping) I and Q components of the waveform. I and Q can be clipped to different levels using this mode.

***RST** IORQ

Key Entry Clipping Type |I+jQ| |I|,|Q|

:CLIPping[:IJQ]

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA2000:ARB:CLIPping[:IJQ] <val>

[**:SOURce**]:RADio:CDMA2000:ARB:CLIPping[:IJQ]?

This command clips (limits) the modulation level of the combined I and Q waveform to a percentage of full scale.

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

***RST** +1.00000000E+002

Range 10–100

Key Entry Clip |I+jQ| To

:IQ:EXTernal:FILTer

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA2000:ARB:IQ:EXTernal:FILTer 40e6|THRough

[**:SOURce**]:RADio:CDMA2000:ARB:IQ:EXTernal:FILTer?

This command selects the filter or through path for I/Q signals routed to the rear panel I and Q outputs. Selecting a filter using this command will automatically set “[:IQ:EXTernal:FILTer:AUTO](#)” on [page 242](#) to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

*RST THR
Key Entry **40.000 MHz Through**

:IQ:EXTernal:FILTter:AUTO

Supported E4438C with Option 401

[:SOURce] :RADio:ARB:IQ:EXTernal:FILTter:AUTO ON|OFF|1|0
[:SOURce] :RADio:ARB:IQ:EXTernal:FILTter: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:FILTter ” on page 241 for selecting a filter or through path. |

*RST 1

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

:FILTter

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:FILTter RNYQuist|NYQuist|GAUssian|RECTangle|IS95|IS95_EQ|IS95_MOD|IS95_MOD_EQ|AC4Fm|WCDMA|IS2000SR3DS|UGGaussian|<user FIR>
[:SOURce] :RADio:CDMA2000:ARB:FILTter?

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 242](#).

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

: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** +5.0000000E–001

Range 0.000–1.000

Key Entry **Filter BbT**

Remarks This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.

To change the current filter type, refer to “[“:FILTer” on page 242](#).

:FILTer:CHANnel

Supported E4438C with Option 401

[:**SOURce**] :RADio:CDMA2000:ARB:FILTer:CHANnel EVM|ACP

[:**SOURce**] :RADio:CDMA2000:ARB:FILTer:CHANnel?

This command optimizes the Nyquist and root Nyquist filters to minimize error vector magnitude (EVM) or to minimize adjacent channel power (ACP).

EVM This choice provides the most ideal passband.

ACP This choice improves stopband rejection.

***RST** EVM

Key Entry **Optimize FIR For EVM ACP**

Remarks To change the current filter type, refer to “[“:FILTer” on page 242](#).

:HEADer:CLEAR**Supported** E4438C with Option 401

[:SOURce]:RADio:CDMA2000:ARB:HEADer:CLEAR

This command clears the header information from the file header used by this modulation format.

Key Entry **Clear Header****Remarks** The **CDMA2000 Off On** softkey must be set to On for this command to function.**:HEADer:SAVE****Supported** E4438C with Option 401

[:SOURce]:RADio:CDMA2000:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

Key Entry **Save Setup To Header****Remarks** The **CDMA2000 Off On** softkey must be set to On for this command to function.**:IQ:MODulation:ATTen****Supported** E4438C with Option 401

[:SOURce]:RADio:CDMA2000:ARB:IQ:MODulation:ATTen <val>

[:SOURce]:RADio:CDMA2000:ARB:IQ:MODulation:ATTen?

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

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

***RST** +2.00000000E+000**Range** 0–40**Key Entry** **Modulator Atten Manual Auto**

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([SOURce]:RADio:CDMA2000:ARB)

:IQ:MODulation:ATTen:AUTO

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[:SOURce] :RADio:CDMA2000:ARB:IQ:MODulation:ATTen:AUTO?

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

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

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” on page 245 for setting the attenuation value.

***RST** 1

Key Entry **Modulator Atten Manual Auto**

:IQ:MODulation:FILTer

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:IQ:MODulation:FILTer 2.1e6|40e6|THRough

[:SOURce] :RADio:CDMA2000:ARB:IQ:MODulation:FILTer?

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. Selecting a filter using this command will automatically set “[:IQ:MODulation:FILTer:AUTO](#)” on page 246 to OFF(0) mode.

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

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

THRough This choice bypasses filtering.

***RST** THR

Key Entry **2.100 MHz 40.000 MHz Through**

:IQ:MODulation:FILTer:AUTO

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:IQ:MODulation:FILTer:AUTO ON|OFF|1|0

[:SOURce] :RADio:CDMA2000:ARB:IQ:MODulation:FILTer:AUTO?

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

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

OFF(0) This choice disables the auto feature which lets you select a digital modulation filter or through path. Refer to “[:IQ:MODulation:FILTer](#)” on page 246 for selecting a filter or through path.

***RST** 1

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

:IQMap

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:IQMap NORMAL | INVerted
[:SOURce] :RADio:CDMA2000:ARB:IQMap?

This command selects whether the Q output will be normal or inverted.

NORMAL This choice selects normal polarity.

INVerted This choice inverts the internal Q signal.

***RST** NORM

Key Entry **I/Q Mapping Normal Invert**

Remarks Inverting the Q output inverts the RF spectrum after the modulation.

:LINK

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:LINK FORWARD | REVerse
[:SOURce] :RADio:CDMA2000:ARB:LINK?

This command selects the CDMA2000 forward or reverse link channel setup.

FORW This choice selects a basestation to mobile configuration.

REV This choice selects a mobile to basestation configuration.

***RST** FORW

Key Entry **Link Forward Reverse**

:LINK:FORWard:SETup

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:LINK:FORward:SETup S1Pilot | S3DPilot |
S3MPilot | S19Chan | S3D9chan | S3M9chan | MCARrier | "<file name>"
[:SOURce] :RADio:CDMA2000:ARB:LINK:FORward:SETup?

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

This command selects a previously defined channel configuration for the CDMA2000 forward link or multicarrier, and turns multicarrier off or on (see the MCARrier choice description).

S1Pilot	This choice selects a spread rate 1, pilot-channel setup.				
S3DPilot	This choice selects a spread rate 3, direct spread, pilot-channel setup.				
S3MPilot	This choice selects a spread rate 3, multicarrier spread, pilot-channel setup.				
S19Chan	This choice selects a spread rate 1, 9-channel setup.				
S3D9Chan	This choice selects a spread rate 3, direct spread, 9-channel setup.				
S3M9Chan	This choice selects a spread rate 3, multicarrier spread, 9-channel setup.				
MCARrier	This choice selects multicarrier and turns it on. Selecting any other setup such as S1Pilot or S3D9Chan turns multicarrier off. To select the multicarrier setup, see “ :LINK:FORward:SETup:MCARrier ”.				
*RST	S19C				
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.

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

The variable <freq_offset> is expressed in units of Hertz (MHz).

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

Channel type, frequency offset, and power level are returned when a query is initiated. The output format is as follows:

<channel type>, <freq_offset>, <power>

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

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

: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.

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

: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.

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

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	<i>channel type</i> : PIL < <i>data_rate</i> >: +3.84000000E+004 < <i>power</i> >: -7.00000000E+000 < <i>pn_offset</i> >: +0 < <i>data_val</i> >: 0
Range	< <i>data_rate</i> >: 1500–9600 < <i>power</i> >: –40 to 0 < <i>data_val</i> >: 0000000–1111111
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 302](#).

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[“:MPOLarity:MARKer1|2|3|4” on page 260](#).

NOTE Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE	A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings.
-------------	---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “[“:**:MARKer:\[SET\]**” on page 302](#).

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

***RST** **NONE**

Example

:RAD:AWGB:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Remarks N/A

:MDESTination:PULSe

Supported E4438C with Option 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 260.

NOTE	Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “ :MARKer:[SET] ” on page 302 for setting the marker points.
-------------	---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE	A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.
-------------	---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

Example

`:RAD:ARB:MDES:PULS M2`

The preceding example routes marker 2 to Pulse/RF Blanking.

***RST** NONE

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

: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** +1.0000000E+007

Range 2.5E5–1E8

Key Entry Reference Freq

Remarks The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “[:REFerence\[:SOURce\]](#)” on page 260.

:REFerence[:SOURce]

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:REFerence[:SOURce] INTernal|EXTernal
[:SOURce] :RADio:CDMA2000:ARB:REFerence[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

***RST** INT

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 260 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 retrigerring mode; the retrigger mode controls how the retrigerring 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

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([SOURce]:RADio:CDMA2000:ARB)

: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** +1.0000000E+008

Range 1–1E8

Key Entry **ARB Sample Clock**

Remarks The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[STATe]” on page 269 to activate the modulation format.

:SPReading:RATE

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:SPReading:RATE 1|3

[:SOURce] :RADio:CDMA2000:ARB:SPReading:RATE?

This command opens a submenu that provides the available spread rate choices for the CDMA2000 waveform.

***RST** +1

Key Entry **Spread Rate 1** **Spread Rate 3**

Remarks The spread rate multiplied by 1.2288 MHz is equal to the chip rate. For example, spread rate 3 equals a 3.6864 Mcps chip rate.

Higher data rates can be achieved using spread rate 3, though offset by greater bandwidth/spectrum usage.

Changing the spread rate to either 1 or 3 will also change the initial setup menu, resulting in a configuration that is specific to the current spread rate.

:SPReading:TYPE

Supported E4438C with Option 401

[**:SOURCE**]:RADio:CDMA2000:ARB:SPReading:TYPE DIRect|MCArrier
[:SOURce]:RADio:CDMA2000:ARB:SPReading:TYPE?

This command selects the spreading type for a CDMA2000 waveform.

***RST** DIR

Key Entry Spreading Type Direct Mcarrier

Remarks Multicarrier is not available in the reverse link setup.

Note that changing the spreading type will result in the setup changing to a setup for the current spreading type.

:SPReading:TYPE:MCArrier:SPACing

Supported E4438C with Option 401

[**:SOURCE**]:RADio:CDMA2000:ARB:SPReading:TYPE:MCArrier:SPACing 1.23MHz|
1.25MHz
[:SOURce]:RADio:CDMA2000:ARB:SPReading:TYPE:MCArrier:SPACing?

This command selects the multicarrier frequency spacing.

***RST** +1.25000000E+006

Key Entry 1.23 MHz 1.25 MHz

Remarks Cellular band uses 1.23 MHz and PCS band uses 1.25 MHz.

:TRIGger:TYPE

Supported E4438C with Option 401

[**:SOURCE**]:RADio:CDMA2000:ARB:TRIGger:TYPE CONTinuous|SINGle|GATE
[:SOURce]:RADio:CDMA2000:ARB:TRIGger:TYPE?

:TRIGger:TYPE

Supported E4438C with Option 401

[**:SOURCE**]:RADio:CDMA:ARB:TRIGGER:TYPE CONTinuous|SINGle|GATE
[:SOURce]:RADio:CDMA:ARB:TRIGGER:TYPE?

This command sets the trigger mode (type) that controls the waveform's playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform's final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform's transmission.
- Setting the waveform's response to triggers:
 - CONTinuous, see “[:TRIGger:TYPE:CONTinuous\[:TYPE\]](#)” on page 265
 - SINGle, see “[:RETRigger](#)” on page 261
 - GATE, selecting the mode also sets the response
- Selecting the trigger source (see “[:TRIGger\[:SOURce\]](#)” on page 266), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
 - CONTinuous and SINGle see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 268
 - GATE, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 266

For more information on triggering, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the trigger type command choices:

CONTinuous Upon triggering, the waveform repeats continuously.

SINGle Upon triggering, the waveform segment or sequence plays once.

GATE An external trigger signal repeatedly starts and stops the waveform’s playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 266). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

NOTE The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.

*RST	CONT
Key Entry	Continuous Single Gated

:TRIGger:TYPE:CONTinuous[:TYPE]

Supported E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger:TYPE:CONTinuous[ :TYPE ] FREE |
TRIGger | RESet
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger:TYPE:CONTinuous[ :TYPE ] ?
```

This commands selects the waveform’s response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see “[:TRIGger:TYPE](#)” on page 263.

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

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

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

:TRIGger:TYPE:GATE:ACTive

Supported E4438C with Option 401

[**:SOURce**] :RADio:CDMA2000:ARB:TRIGGER:TYPE:GATE:ACTive LOW|HIGH

[**:SOURce**] :RADio:CDMA2000:ARB:TRIGGER:TYPE:GATE:ACTive?

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see “[:TRIGger:TYPE](#)” on page 263.

The following list describes the ESG’s gating behavior for the polarity selections:

LOW The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state).

HIGH The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state).

***RST** HIGH

Key Entry **Gate Active Low High**

:TRIGger[:SOURce]

Supported E4438C with Option 401

[**:SOURce**] :RADio:CDMA2000:ARB:TRIGGER[**:SOURce**] KEY|EXT|BUS

[**:SOURce**] :RADio:CDMA2000:ARB:TRIGGER[**:SOURce**]?

This command sets the trigger source.

For more information on triggering, see “[:TRIGger:TYPE](#)” on page 263. The following list describes the command choices:

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

EXT An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger:

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “[:TRIGger\[:SOURce\]:EXTernal\[:SOURce\]](#)” on page 269.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User's Guide*.

- The trigger signal polarity:
 - gating mode, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 266
 - continuous and single modes, see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 268
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
 - setting the amount of delay, see “[:TRIGger\[:SOURce\]:EXTernal:DELay](#)” on page 267
 - turning the delay on, see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATE](#)” on page 268

BUS	This choice enables triggering over the GPIB or LAN using the *TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the *TRG command.
*RST	EXT
Key Entry	Trigger Key Ext Bus

:TRIGger[:SOURce]:EXTernal:DELay

Supported E4438C with Option 401

```
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger[ :SOURce ] :EXTernal:DELay <val>
[ :SOURce ] :RADio:CDMA2000:ARB:TRIGger[ :SOURce ] :EXTernal:DELay?
```

This command sets the amount of time to delay the ESG’s response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATE](#)” on page 268). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 266.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

***RST** +1.00000000E–003

Component Test Digital Commands

CDMA2000 ARB Subsystem—Option 401 ([**:SOURce**]:RADio:CDMA2000:ARB)

Range 1E-8 to 4E1

Key Entry Ext Delay Time

:TRIGger[:SOURce]:EXTernal:DELay:STATe

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:TRIGger[:SOURce] :EXTernal:DELay:STATe ON | OFF | 1 | 0

[:SOURce] :RADio:CDMA2000:ARB:TRIGger[:SOURce] :EXTernal:DELay:STATe?

This command enables or disables the operating state of the external trigger delay function.

For setting the delay time, see “[:TRIGger\[:SOURce\]:EXTernal:DELay](#)” on page 267, and for more information on configuring an external source, see “[:TRIGger\[:SOURce\]](#)” on page 266.

***RST** 0

Key Entry Ext Delay Off On

:TRIGger[:SOURce]:EXTernal:SLOPe

Supported E4438C with Option 401

[:SOURce] :RADio:CDMA2000:ARB:TRIGger[:SOURce] :EXTernal:SLOPe POSitive | NEGative

[:SOURce] :RADio:CDMA2000:ARB:TRIGger[:SOURce] :EXTernal:SLOPe?

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 266.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 266.

***RST** NEG

Key Entry Ext Polarity Neg Pos

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

Supported E4438C with Option 401

[**:SOURce**]:RADio:CDMA2000:ARB:TRIGger[:SOURce]:EXTernal[:SOURce] EPT1 |
EPT2 | EPTRIGGER1 | EPTRIGGER2
[:SOURce]:RADio:CDMA2000:ARB:TRIGger[:SOURce]:EXTernal[:SOURce]?

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “[“:TRIGger\[:SOURce\]” on page 266](#). For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

EPT1	This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.
EPT2	This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
EPTRIGGER1	This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.
EPTRIGGER2	This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.
*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**

Component Test Digital Commands

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

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

:IQ:EXTernal:FILTer

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DMODulation:ARB:IQ:EXTernal:FILT_{er} 40e6 | THRough

[:SOURce] :RADio:DMODulation:ARB:IQ:EXTernal:FILT_{er}?

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:FILT](#)er:AUTO” on [page 270](#) to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

***RST** THR

Key Entry **40.000 MHz Through**

:IQ:EXTernal:FILTer:**AUTO**

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DMODulation:ARB:IQ:EXTernal:FILT_{er}:AUTO ON | OFF | 1 | 0

[:SOURce] :RADio:DMODulation:ARB:IQ:EXTernal:FILT_{er}: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:FILT](#)er” on [page 270](#) for selecting a filter or through path.

***RST** 1

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

:FILTer

Supported	E4438C with Option 001/601 or 002/602																		
[: SOURCE]:RADio:DMODulation:ARB:FILTer	RNYQuist NYQuist GAUSSian RECTangle IS95 IS95_EQ IS95_MOD IS95_MOD_EQ WCDMA AC4Fm IS2000SR3DS UGGaussian <user FIR>"																		
[: SOURce]:RADio:DMODulation:ARB:FILTer?																			
This command specifies the pre-modulation filter type.																			
IS95	This choice selects a filter that meets the criteria of the IS-95 standard.																		
IS95_EQ	This choice selects a filter which is a combination of the IS-95 filter (above) and the equalizer filter described in the IS-95 standard. This filter is only used for IS-95 baseband filtering.																		
IS95_MOD	This choice selects a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance) with lower passband rejection than the filter specified in the IS-95 standard.																		
IS95_MOD_EQ	This choice selects a filter which is a combination of the equalizer filter described in the IS-95 standard and a filter that meets the criteria of the IS-95 error function (for improved adjacent channel performance), with lower passband rejection.																		
WCDMA	This choice selects a 0.22 Nyquist filter optimized for ACP.																		
AC4Fm	This choice selects a predefined Association of Public Safety Communications Officials (APCO) specified compatible 4-level frequency modulation (C4FM) filter.																		
IS2000SR3DS	This choice selects an IS-2000 standard, spread rate 3 direct spread filter.																		
UGGaussian	This choice selects a backwards compatible GSM Gaussian filter (Gaussian filter with a fixed BbT value of 0.300) for the ESG E44xxB Option UN3 or UN4.																		
"<user FIR>"	This variable is any FIR filter file that you have stored in memory. The variable needs no directory path indicating the location of the file, such as FIR: or /USER/FIR. The command assumes the FIR directory. Refer to “ File Name Variables ” on page 13 for more information on file names.																		
*RST	RNYQ																		
Key Entry	<table border="0"> <tr> <td>Root Nyquist</td> <td>Nyquist</td> <td>Gaussian</td> <td>Rectangle</td> <td>IS-95</td> <td>IS-95 w/EQ</td> </tr> <tr> <td>IS-95 Mod</td> <td>IS-95 Mod w/EQ</td> <td>WCDMA</td> <td>IS-2000 SR3 DS</td> <td></td> <td>APCO 25 C4FM</td> </tr> <tr> <td colspan="2">UN3/4 GSM Gaussian</td> <td colspan="3">User FIR</td> <td></td> </tr> </table>	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			
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																	

Component Test Digital Commands

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

:FILTer:ALPHa

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DMODulation:ARB:FILTer:ALPHa <val>

[:SOURce] :RADio:DMODulation:ARB:FILTer:ALPHa?

This command changes the Nyquist or root Nyquist filter alpha value.

The filter alpha value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

***RST** +3.5000000E–001

Range 0.000–1.000

Key Entry Filter Alpha

Remarks To change the current filter type, refer to “[:FILTer](#)” on page 271.

:FILTer:BBT

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DMODulation:ARB:FILTer:BBT <val>

[:SOURce] :RADio:DMODulation:ARB:FILTer:BBT?

This command changes the bandwidth-multiplied-by-bit-time (BbT) filter parameter.

The filter BbT value can be set to the minimum level (0), the maximum level (1), or in between by using fractional numeric values (0.001–0.999).

***RST** +5.0000000E–001

Range 0.000–1.000

Key Entry Filter BbT

Remarks This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.

To change the current filter type, refer to “[:FILTer](#)” on page 271.

:FILTer:CHANnel

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DMODulation:ARB:FILTter:CHANnel EVM|ACP

[**:SOURce**]:RADio:DMODulation:ARB:FILTter:CHANnel?

This command optimizes the Nyquist and root Nyquist filters to minimize error vector magnitude (EVM) or to minimize adjacent channel power (ACP).

EVM This choice provides the most ideal passband.

ACP This choice improves stopband rejection.

*RST EVM

Key Entry Optimize FIR For EVM ACP

Remarks To change the current filter type, refer to “[:FILTer](#)” on page 271.

:HEADer:CLEar

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DMODulation:ARB:HEADer:CLEar

This command clears the header information from the file header used by this modulation format.

Key Entry Clear Header

Remarks The **Digital Modulation Off On** softkey must be set to On for this command to function.

:HEADer:SAVE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DMODulation:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

Key Entry Save Setup To Header

Remarks The **Digital Modulation Off On** softkey must be set to On for this command to function.

Component Test Digital Commands

Dmodulation Subsystem—Option 001/601 or 002/602 ([\[:SOURce\]:RADio:DModulation:ARB](#))

:IQ:MODulation:ATTen

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DModulation:ARB:IQ:MODulation:ATTen <val>

[:SOURce] :RADio:DModulation:ARB:IQ:MODulation:ATTen?

This command sets the attenuation level of the I/Q signals being modulated through the signal generator RF path.

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

***RST** +2.0000000E+000

Range 0–40

Key Entry Modulator Atten Manual Auto

:IQ:MODulation:ATTen:AUTO

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DModulation:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[:SOURce] :RADio:DModulation:ARB:IQ:MODulation:ATTen:AUTO?

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

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

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” on page 207 for setting the attenuation value.

***RST** 1

Key Entry Modulator Atten Manual Auto

:IQ:MODulation:FILT

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:DMODulation:ARB:IQ:MODulation:FILT 2.1e6|40e6|THrough
[:SOURce]:RADio:DMODulation:ARB:IQ:MODulation:FILT?

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:FILT](#)” on page 275 to OFF(0) mode.

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

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

THRough This choice bypasses filtering.

***RST** THR

Key Entry **2.100 MHz** **40.000 MHz** **Through**

:IQ:MODulation:FILT:**AUTO**

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:DMODulation:ARB:IQ:MODulation:FILT:AUTO ON|OFF|1|0
[:SOURce]:RADio:DMODulation:ARB:IQ:MODulation:FILT: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:FILT](#)” on page 275 for selecting a filter or through path.

***RST** 1

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

Component Test Digital Commands

Dmodulation Subsystem—Option 001/601 or 002/602 ([\[:SOURce\]:RADio:DModulation:ARB](#))

:MDESTination:AAMPplitude

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DModulation:ARB:MDESTination:AAMPplitude NONE|M1|M2|M3|M4
[:SOURce] :RADio:DModulation:ARB:MDESTination:AAMPplitude?

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 302.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[:MPOLarity:MARKer1|2|3|4](#)” on page 280.

NOTE Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE	A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings.
-------------	---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “[:MARKer:\[SET\]](#)” on page 302.

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

***RST** **NONE**

Example

:RAD:AWGB:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Remarks N/A

:MDEStination:PULSe

Supported E4438C with Option 001/601 or 002/602

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

Component Test Digital Commands

Dmodulation Subsystem—Option 001/601 or 002/602 ([\[:SOURce\]:RADio:DModulation:ARB](#))

NOTE

Do not use ALC hold for more than 100 ms, because it can affect the waveform's output amplitude.

The signal generator blanks the RF output when the marker signal goes low. The marker polarity determines when the marker signal is low. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker's polarity, see [“:MPolarity:MARKer1|2|3|4” on page 280](#).

NOTE

Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See [“:MARKer:\[SET\]” on page 302](#) for setting the marker points.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE

A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User's Guide*.

NONE

This terminates the marker RF blanking/pulse function.

M1–M4

These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

Example

`:RAD:ARB:MDES:PULS M2`

The preceding example routes marker 2 to Pulse/RF Blanking.

***RST**

NONE

Key Entry

None Marker 1 Marker 2 Marker 3 Marker 4

:MODulation:FSK[:DEViation]

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:DMDUlation:ARB:MODulation:FSK[:DEViation] <val>

[**:SOURCE**]:RADio:DMDUlation: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** +4.0000000E+002

Range 0–2E7

Key Entry **Freq Dev**

Remarks To change the modulation type, refer to “[:MODulation\[:TYPE\]](#)” on page 279.

Refer to “[:SRATE](#)” on page 286 for a list of the minimum and maximum symbol rate values.

To set an asymmetric FSK deviation value, refer to the *E4428C/38C ESG Signal Generators User’s Guide* for more information.

:MODulation[:TYPE]

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:DMDUlation: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:DMDUlation: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	$\pi/4$ 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			

Component Test Digital Commands

Dmodulation Subsystem—Option 001/601 or 002/602 ([\[:SOURce\]:RADio:DModulation:ARB](#))

:MPOLarity:MARKer1|2|3|4

Supported E4438C with Option 401

[:SOURce]:RADio:DModulation:ARB:MPOLarity:MARKer1|2|3|4 NEGative|
POSitive
[:SOURce]:RADio:DModulation:ARB:MPOLarity:MARKer1|2|3|4?

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

***RST** POS

Key Entry **Marker 1 Polarity Neg Pos** **Marker 2 Polarity Neg Pos** **Marker 3 Polarity Neg Pos**
Marker 4 Polarity Neg Pos

:REFerence:EXTernal:FREQuency

Supported E4438C with Option 001/601 or 002/602

[:SOURce]:RADio:DModulation:ARB:REFerence:EXTernal:FREQuency <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** +1.0000000E+007

Range 2.5E5–1E8

Key Entry **Reference Freq**

Remarks The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to
[“:REFerence\[:SOURce\]” on page 281](#).

:REFerence[:SOURce]

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DModulation:ARB:REFerence[:SOURce] INTernal|EXTernal
[:SOURce]:RADio:DModulation:ARB:REFerence[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

***RST** INT

Key Entry ARB Reference Ext Int

Remarks If the EXTernal choice is selected, the external frequency value *must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.

Refer to “[:REFerence:EXTernal:FREQuency](#)” on page 280 to enter the external reference frequency.

:RETRigger

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DModulation:ARB:RETRigger ON|OFF|IMMEDIATE
[:SOURce]:RADio:DModulation:ARB:RETRigger?

This command enables or disables the ARB retrigerring mode; the retrigger mode controls how the retrigerring 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

Component Test Digital Commands

Dmodulation Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:DModulation:ARB)

:SCLock:RATE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DModulation:ARB:SCLock:RATE <val>

[**:SOURce**]:RADio:DModulation:ARB:SCLock:RATE?

This command sets the sample clock rate.

The variable <val> is expressed in units of Hertz (Hz – MHz)

***RST** +1.0000000E+008

Range 1–1E8

Key Entry **ARB Sample Clock**

Remarks The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[**:STATe**]” on page 293 to activate the modulation format.

:SETup

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DModulation:ARB:SETup GSM|NADC|PDC|PHS|DECT|AC4Fm|ACQPSk|CDPD|PWT|EDGE|TETRA|MCArrier|"<file name>"

[**:SOURce**]:RADio:DModulation:ARB:SETup?

This command selects the digital modulation format type or multicarrier, and turns multicarrier off or on (see the MCArrier choice description).

The *MCArrier* choice selects multicarrier and turns it on. Selecting any other setup such as GSM or CDPD turns multicarrier off. To select the multicarrier setup, see “[\[:SETup:MCArrier\]](#)” .

***RST** NADC

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 001/601 or 002/602

```
[ :SOURce ] :RADio :DMODulation :ARB :SETup :MCARrier GSM | NADC | PDC | PHS | DECT |
AC4Fm | ACQPSk | CDPD | PWT | EDGE | TETRA , <num carriers> , <freq spacing> ) |
"<file name>"
```

```
[ :SOURce ] :RADio :DMODulation :ARB :SETup :MCARrier ?
```

This command builds a table with the specified number of carriers and frequency spacing or retrieves the setup stored in the specified user file.

The carrier type, number of carriers, and frequency spacing value are returned when a query is initiated. The output format is as follows:

```
<carrier type> , <num carriers> , <freq spacing>
```

If a specific file is loaded and then queried, only the file name is returned.

The variable <freq spacing> is expressed in units of Hertz (kHz–MHz).

*RST	<i>Carrier: NADC <num carriers>: 2</i>
-------------	---

	<i><freq spacing>: +1.0000000000000E+06</i>
--	---

Range	<i><num carriers>: 2–100</i>
--------------	------------------------------------

	<i><freq spacing>: 2 ÷ (<num carriers> – 1) × 80 MHz</i>
--	--

Key Entry	GSM	NADC	PDC	PHS	DECT	APCO 25 w/C4FM	APCO w/CQPSK
	CDPD	PWT	EDGE	TETRA	# of Carriers	Freq Spacing	

Custom Digital Mod State

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

To store a multicarrier setup refer to “[:SETup:MCARrier:STORe](#)” on page 284.

:SETup:MCARrier:PHASe

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio :DMODulation :ARB :SETup :MCARrier :PHASe FIXed | RANDOM
[ :SOURce ] :RADio :DMODulation :ARB :SETup :MCARrier :PHASe ?
```

This command toggles the phase settings for multicarrier digital modulation.

FIXed	This choice sets the phase of all carriers to 0.
--------------	--

RANDOM	This choice sets random phase values for all of the carriers.
---------------	---

Component Test Digital Commands

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

***RST** FIX

Key Entry Carrier Phases Fixed Random

:SETup:MCARrier:STORe

Supported E4438C with Option 001/601 or 002/602

[:**SOURce**] :RADio:DMDODulation:ARB:SETup:MCARrier:STORe "<file name>"

This command stores the current multicarrier setup information.

The stored file contains information that includes the digital modulation format, number of carriers, frequency spacing, and power settings for the multicarrier setup.

Key Entry Load/Store

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

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

:SETup:MCARrier:TABLE

Supported E4438C with Option 001/601 or 002/602

[:**SOURce**] :RADio:DMDODulation: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:DMDODulation: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:

*RST	<i>carrier type</i> : NADC < <i>freq_offset</i> >: -5.00000000E+004 < <i>power</i> >: +0.00000000E+000
Range	< <i>freq_offset</i> >: -1E5 to 1E6 < <i>power</i> >: -40 to 0
Key Entry	Initialize Table Insert Row GSM NADC PDC PHS DECT APCO 25 w/C4FM APCO w/CQPSK CDPD PWT EDGE TETRA Custom Digital Mod State
Remarks	Refer to “ File Name Variables ” on page 13 for information on the file name syntax.
	To store a multicarrier setup refer to “ :SETup:MCARrier:STORE ” on page 284.

:SETup:MCARrier:TABLE:NCARriers

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DMODulation:ARB:SETup:MCARrier:TABLE:NCARriers?

This query returns the number of carriers in the current multicarrier setup.

***RST** +2

Range 1–100

Key Entry **# of Carriers**

:SETup:STORE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:DMODulation:ARB:SETup:STORE "<file name>"

This command stores the current custom digital modulation state.

The saved file contains information that includes the modulation type, filter and symbol rate for the custom modulation setup.

Key Entry **Store Custom Dig Mod State**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

Component Test Digital Commands

Dmodulation Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:DModulation:ARB)

:SRATe

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**] :RADio:DModulation:ARB:SRATe <val>

[**:SOURce**] :RADio:DModulation:ARB:SRATe?

This command sets the transmission symbol rate.

The variable <val> is expressed in units of symbols per second (sps—Msps) and the maximum range value is dependent upon the modulation type, and filter.

***RST** +2.4300000E+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 271”, the upper bit rate will be restricted in line with the following symbol rate restriction:

- FIR filter length > 32 symbols: upper limit is 12.5 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 279.

:TRIGger:TYPE

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DModulation:ARB:TRIGger:TYPE CONTinuous | SINGle | GATE
[:SOURce] :RADio:DModulation:ARB:TRIGger:TYPE?

This command sets the trigger mode (type) that controls the waveform’s playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform’s final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform’s transmission.
- Setting the waveform’s response to triggers:
 - CONTinuous, see “[:TRIGger:TYPE:CONTinuous\[:TYPE\]](#)” on page 288
 - SINGle, see “[:RETRigger](#)” on page 281
 - GATE, selecting the mode also sets the response

Component Test Digital Commands

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

- Selecting the trigger source (see “[:TRIGger\[:SOURce\]](#)” on page 290), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
 - CONTinuous and SINGle see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 292
 - GATE, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 289

For more information on triggering, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the trigger type command choices:

CONTinuous	Upon triggering, the waveform repeats continuously.
SINGle	Upon triggering, the waveform segment or sequence plays once.
GATE	An external trigger signal repeatedly starts and stops the waveform’s playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see “ :TRIGger:TYPE:GATE:ACTive ” on page 289). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

NOTE	The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.
-------------	---

*RST	CONT
Key Entry	Continuous Single Gated

:TRIGger:TYPE:CONTinuous[:TYPE]

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DMODulation:ARB :TRIGger:TYPE:CONTinuous[:TYPE] FREE | TRIGger | RESet
[:SOURce] :RADio:DMODulation:ARB :TRIGger:TYPE:CONTinuous[:TYPE] ?

This commands selects the waveform’s response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see “[:TRIGger:TYPE](#)” on page 287.

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

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 001/601 or 002/602

[**:SOURce**]:RADio:DModulation:ARB:TRIGger:TYPE:GATE:ACTive LOW|HIGH
[:SOURce]:RADio:DModulation:ARB:TRIGger:TYPE:GATE:ACTive?

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see “[:TRIGger:TYPE](#)” on page 287.

The following list describes the ESG's gating behavior for the polarity selections:

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

Component Test Digital Commands

Dmodulation Subsystem—Option 001/601 or 002/602 ([\[:SOURce\]:RADio:DModulation:ARB](#))

:TRIGger[:SOURce]

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DModulation:ARB:TRIGger[:SOURce] KEY|EXT|BUS
[:SOURce] :RADio:DModulation:ARB:TRIGger[:SOURce]?

This command sets the trigger source.

For more information on triggering, see “[:TRIGger:TYPE](#)” on page 287. The following list describes the command choices:

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

EXT An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger:

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “[:TRIGger\[:SOURCE\]:EXTernal\[:SOURcel\]](#)” on page 292.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.

- The trigger signal polarity:
 - gating mode, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 289
 - continuous and single modes, see “[:TRIGger\[:SOURCE\]:EXTernal:SLOPe](#)” on page 292
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
 - setting the amount of delay, see “[:TRIGger\[:SOURCE\]:EXTernal:DElay](#)” on page 291
 - turning the delay on, see “[:TRIGger\[:SOURCE\]:EXTernal:DElay:STATE](#)” on page 291

BUS This choice enables triggering over the GPIB or LAN using the *TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the *TRG command.

***RST** EXT

Key Entry Trigger Key Ext Bus

:TRIGger[:SOURce]:EXTernal:DELay

Supported E4438C with Option 001/601 or 002/602

[:SOURCE] :RADio:DModulation:ARB:TRIGger [:SOURCE] :EXTernal:DELay <val>
[:SOURCE] :RADio:DModulation:ARB:TRIGger [:SOURCE] :EXTernal:DELay?

This command sets the amount of time to delay the ESG's response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATe](#)” on page 291). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 290.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

***RST** +1.00000000E–003

Range 1E–8 to 4E1

Key Entry Ext Delay Time

:TRIGger[:SOURce]:EXTernal:DELay:STATe

Supported E4438C with Option 001/601 or 002/602

[:SOURCE] :RADio:DModulation:ARB:TRIGger [:SOURCE] :EXTernal:DELay:
STATe ON|OFF|1|0
[:SOURCE] :RADio:DModulation:ARB:TRIGger [:SOURCE] :EXTernal:DELay:STATe?

This command enables or disables the external trigger delay function.

For setting the delay time, see “[:TRIGger\[:SOURce\]:EXTernal:DELay](#)” on page 291, and for more information on configuring an external source, see “[:TRIGger\[:SOURce\]](#)” on page 290.

***RST** 0

Key Entry Ext Delay Off On

Component Test Digital Commands

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

:TRIGger[:SOURce]:EXTernal:SLOPe

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:TRIGger[:SOURce] :EXTernal:  
SLOPe POSitive|NEGative  
[ :SOURce ] :RADio:DMODulation:ARB:TRIGger[:SOURce] :EXTernal:SLOPe?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 289.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 290.

***RST** NEG

Key Entry Ext Polarity Neg Pos

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

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:DMODulation:ARB:TRIGger[:SOURce] :  
EXTernal[:SOURce] EPT1|EPT2|EPTRIGGER1|EPTRIGGER2  
[ :SOURce ] :RADio:DMODulation:ARB:TRIGger[:SOURce] :EXTernal[:SOURce]?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 290. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

- | | |
|------------|---|
| EPT1 | This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector. |
| EPT2 | This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. |
| EPTRIGGER1 | This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector. |

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

EPTIGGER2 This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.

***RST** EPT1

Key Entry **Patt Trig In 1** **Patt Trig In 2**

[:STATe]

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:DMODulation:ARB[:STATe] ON|OFF|1|0
[:SOURce] :RADio:DMODulation:ARB[:STATe]?

This command enables or disables the digital modulation capability.

ON (1) This choice sets up the internal hardware to generate the currently selected digital modulation format signal selection.

OFF (0) This choice disables the digital modulation capability.

***RST** 0

Key Entry **Digital Modulation Off On**

Remarks When ON is selected, the I/Q state is activated and the I/Q source is set to internal.

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

:CLIPping

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:CLIPping "<file name>", IJQ | IORQ, <val>[, <val>]

This command sets the clipping level of the selected waveform segment to a percentage of its highest peak.

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

IJQ This choice clips the composite I/Q waveform.

IORQ This choice clips I and Q separately. When this choice is enabled, percentage values for both I and Q must be specified.

*RST IJQ <val>: +100

Range <val>: 10–100 (0.1% resolution)

Key Entry Clipping Type |I+jQ| |I|, |Q|

Remarks A value of 100 percent equates to no clipping.

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:GENerate:SINE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:GENerate:SINE [<file_name>][, <osr>], [<scale>], [I|Q|IQ]

This command creates a sine wave waveform file and saves it in the signal generator’s volatile waveform memory (WFM1).

"<file_name>" This variable names the file used to save the generated sine wave data.

<osr> This variable sets the oversample ratio, which must be an even number and ≥ 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 $60 \div <\text{osr}>$ (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 001/601 or 002/602

```
[ :SOURce ]:RADio:ARB:HEADer:CLEar
```

This command clears the header information from the file header used by this modulation format.

Key Entry **Clear Header**

Remarks The **ARB Off On** softkey must be set to On for this command to function.

:HEADer:RMS

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURce ]:RADio:ARB:HEADER:RMS "<file_name>",<val>|UNSpecified  
[ :SOURce ]:RADio:ARB:HEADER:RMS? "<file_name>"
```

This command sets the file header RMS value for the selected waveform file. The ESG uses the RMS value with the dual ARB's real-time noise function.

The signal generator reads the RMS value from the file header when real-time noise is enabled and the dual ARB turned on.

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

When the waveform file is saved from volatile waveform memory (WFM1) to non-volatile waveform memory (NVWFM), the RMS value, auto-calculated or user-defined, is also saved.

"<file_name>" This variable names the waveform file to which the RMS value will be applied. The file name variable can designate a file in the WFM1, NVWFM, or SEQ directories. For information on the file name syntax, refer to "["File Name Variables" on page 13](#).

<val> This variable is the user-measured RMS value for the specified waveform. The following figure shows the RMS calculation.

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

N = # of Samples

UNSPecified Using this variable in the command clears the RMS value and sets it to unspecified. An unspecified RMS value causes the signal generator to calculate the value when real-time noise is applied to the waveform during play back by the dual ARB player. The RMS calculation includes rise times and does not include consecutive zero level samples. DC offsets and noise are also included in the RMS measurement. Because the signal generator calculation uses so many parameters, you may achieve better results calculating your own RMS value.

Examples

```
[ :SOURce ] :RADio:ARB:HEADER:RMS "WFM1:Sine_Wave", .835
```

The first example shows a user-measured RMS value for the Sine_Wave waveform file in the waveform's file header.

```
:RAD:ARB:HEADER:RMS "WFM1:Sine_Wave", UNSP
```

In the second example, the signal generator calculates the RMS value.

The RMS value is expressed in volts.

Range 0 – 1.414213562373095

:HEADer:SAVE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:HEADer:SAVE

This command saves the header information to the file header used by this modulation format.

Key Entry **Save Setup To Header**

Remarks The **ARB Off On** softkey must be set to On for this command to function.

:HCRest[:STATE]

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:HCRest[:STATE] ON|OFF|1|0

[**:SOURce**]:RADio:ARB:HCRest[:STATE]?

This command enables or disables the operating state of the high crest mode.

ON(1) This choice turns high crest mode on for arbitrary I/Q waveforms with high crest factors (such as downloaded Signal Studio for 802.11 signals). High crest mode reduces the ALC vernier level by 7.5 dB, allowing the signal generator to process these signals with less distortion and improved EVM. For crest factors higher than 4 dB, I/Q drive levels should be reduced by 1 dB for each dB above that level. In high crest mode, the maximum output level is reduced and power level accuracy is degraded.

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

***RST** 0

Key Entry **High Crest Mode Off On**

Remarks The high crest mode is automatically turned on by some Signal Studio applications. You can manually override this automatic selection at any time.

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([\[:SOURce\]:RADio:ARB](#))

:IQ:EXTernal:FILTer

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:ARB:IQ:EXTernal:FILT_{er} 40e6 | THRough
[:SOURce] :RADio:ARB:IQ:EXTernal:FILT_{er}?

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:FILT](#)er:AUTO” on page 298 to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

*RST THR

Key Entry **40.000 MHz Through**

:IQ:EXTernal:FILTer:AUTO

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:ARB:IQ:EXTernal:FILT_{er}:AUTO ON | OFF | 1 | 0
[:SOURce] :RADio:ARB:IQ:EXTernal:FILT_{er}: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:FILT](#)er” on page 298 for selecting a filter or through path.

*RST 1

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

:IQ:MODulation:ATTen

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:ARB:IQ:MODulation:ATTen <val>
[:SOURce] :RADio:ARB:IQ:MODulation:ATTen?

This command sets the attenuation level of the I/Q signals being modulated through the signal generator RF path.

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

***RST** +2.00000000E+000

Range 0–40

Key Entry **Modulator Atten Manual Auto**

:IQ:MODulation:ATTen:AUTO

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[**:SOURce**]:RADio:ARB:IQ:MODulation:ATTen:AUTO?

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

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

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” on page 298 for setting the attenuation value.

***RST** 1

Key Entry **Modulator Atten Manual Auto**

:IQ:MODulation:FILTer

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:ARB:IQ:MODulation:FILTer 2.1e6|40e6|THrough

[**:SOURce**]:RADio:ARB:IQ:MODulation:FILTer?

This command enables you to select a filter or through path for I/Q signals modulated onto the RF carrier. This filter has no effect on the I/Q signal out the rear panel. Selecting a filter using this command will automatically set “[:IQ:MODulation:FILTer:AUTO](#)” on page 300 to OFF(0) mode.

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

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

THThrough This choice bypasses filtering.

***RST** THR

Key Entry **2.100 MHz 40.000 MHz Through**

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

:IQ:MODulation:FILTter:AUTO

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:IQ:MODulation:FILTter:AUTO ON|OFF|1|0

[**:SOURce**]:RADio:ARB:IQ:MODulation:FILTter: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:FILTter](#)” on page 299 for selecting a filter or through path.

***RST** 1

Key Entry I/Q Mod Filter Manual Auto

:MARKer:CLEar

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:MARKer:CLEar "<file_name>",<marker>,<first_point>,<last_point>

This command clears a single marker point or a range of marker points on a waveform segment for the selected marker (1–4). The dual ARB player and all of the ARB modulation formats use this command.

"<file_name>" This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN_WAVEFORM file when clearing marker points for an active ARB format. The ESG automatically creates a file, using current settings, and names it AUTOGEN_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the dual ARB player. For information on the file name syntax, see “[File Name Variables](#)” on page 13.

<marker> This variable selects the marker number; an integer value from one to four.

<first_point> This variable defines the first point in a range of points. The number must be greater than or equal to one, and less than or equal to the total number of waveform points.

If you enter a value for either the first marker point or the last marker point that would make the first marker point occur after the last, the last marker point automatically adjusts to match the first marker point.

<last_point> This variable defines the last point in a range of points. The number must be greater than or equal to the first point, and less than or equal to the total number of waveform points.

To clear a single marker point, use the same marker point for the first and last point variables. For more information on markers and ARB files, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

Example

```
:RAD:ARB:MARK:CLE "Test_Data",1,1,300
```

The preceding example clears marker 1 from the first point through the 300th point in the Test_Data file.

Range	<i><marker></i> : 1–4 <i><first_Point></i> : 1–number of waveform points <i><last_point></i> : <i><first_Point></i> –number of waveform points
Key Entry	Set Marker Off Range Of Points Marker 1 2 3 4 First Mkr Point Last Mkr Point

:MARKer:CLEar:ALL

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURce ]:RADio:ARB:MARKer:CLEar:ALL "<file_name>",<marker>"
```

This command clears all marker points on a waveform segment for the selected marker (1–4). The dual ARB player and all of the ARB formats use this command. With all marker points cleared, the event output signal level is set low.

"*<file_name>*" This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN_WAVEFORM file when clearing all marker points for the currently active ARB format. The ESG automatically creates a file, using current settings, and names it AUTOGEN_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the dual ARB player. For information on the file name syntax, see "["File Name Variables" on page 13](#)".

<marker> This variable selects the marker number; an integer value from one to four.

Example

```
:RAD:ARB:MARK:CLE:ALL "Test_Data",1
```

The preceding example clears marker 1 from all waveform points in the Test_Data file.

Range 1–4

Key Entry **Marker 1 2 3 4 Set Marker Off All Points**

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

:MARKer:ROtate

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:MARKer:ROtate "<file_name>",<rotate_count>

This command shifts the marker points for all markers in a waveform segment earlier or later by the value of the <rotate_count> variable. The dual ARB player and all of the ARB formats use this command.

You can use a positive or negative value. When a marker point is close to the end of the waveform and the <rotate_count> value is greater than the number of remaining marker points, but less than the total number of marker points, the marker points that would move beyond the end of the waveform wrap to the beginning of the waveform. For example, if a marker point resides at sample point 195 out of 200, and the <rotate_count> value is twenty-five, the marker point wraps to the beginning of the waveform and continues out to the twentieth waveform point.

To set the marker points in a waveform, refer to “[:MARKer:\[SET\]](#)” on page 302.

"<file_name>" This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN_WAVEFORM file when rotating marker points for the currently active ARB format and then save the file using a different file name. The ESG automatically creates a file, using current settings, and names it AUTOGEN_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the dual ARB player. For information on the file name syntax, see “[File Name Variables](#)” on page 13.

Example

:RAD:ARB:MARK:ROT "Test_Data",100

The preceding example shifts all markers set in the Test_Data file 100 points later. If the first set point in the file is at 50, then after sending this command, the first set point will be 150 (assuming the Test_Data file has at least 150 points) and no later set points wrapped around to the beginning of the file.

Range – (n – 1) to (n – 1)

n = number of points in the waveform

:MARKer:[SET]

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:MARKer:[SET] "<file_name>",<marker>,<first_point>,<last_point>,<skip_count>

This command sets a single marker point or a range of marker points on a waveform segment for the selected marker (1–4). The dual ARB player and all of the ARB formats use this command.

The ESG provides four independent markers. Each marker routes an output signal to the rear-panel event connector number (BNC—EVENT 1 and EVENT 2 or AUXILIARY I/O—EVENT 3 and EVENT 4) that corresponds to the marker number. A marker consists of marker points placed at defined sample points in a waveform segment. This means that a marker point cannot be less than one or greater than the last sample point in the waveform. Marker points are cumulative, so multiple command executions with different range values, without first clearing the existing points, places additional marker points on the waveform. Because of this cumulative behavior, it is a good practice to clear existing marker points prior to setting new points. This will eliminate unexpected marker pulses. Refer to “[:MARKer:CLEar](#)” on page 300 and “[:MARKer:CLEar:ALL](#)” on page 301 for information on clearing marker points.

For waveforms generated on the signal generator (baseband generator), the ESG automatically places a marker point at the first waveform sample for markers one and two.

NOTE	You can set markers for either positive or negative polarity. The following discussions for this command assume positive marker polarity. When using negative marker polarity, the marker pulses occur during the periods of no marker points.
-------------	--

There are three ways to place marker points using this command:

- consecutive marker points over a range that collectively create a single marker pulse that spans the range
- equally spaced marker points over a range, so that a marker pulse occurs at each sample point that coincides with a marker point (Using this method, you can configure a clock signal by setting the <skip_count> variable to one.)
- a single marker point placed at a specific sample point in the waveform, which outputs a single pulse relative to the marker point location (To configure a single marker point, set the first and last points to the same number.)

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

The following list describes the command variables:

"<file_name>"	This variable specifies the name of the waveform file in volatile waveform memory (WFM1). Use the AUTOGEN_WAVEFORM file when setting marker points for the currently active ARB format and then save the file using a different file name. The ESG automatically creates a file, using current settings, and names it AUTOGEN_WAVEFORM whenever an ARB format is turned on (except dual ARB); the same file name is used for all ARB formats. When all ARB formats are off, this file is still in waveform memory (WFM1) and available for use by the
---------------	---

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

dual ARB player. For information on the file name syntax, see “[File Name Variables](#)” on page 13.

- | | |
|---------------|--|
| <marker> | This variable selects the marker number; an integer value from one to four. |
| <first_point> | This variable defines the first point in the range over which the marker is placed. This number must be greater than or equal to one, and less than or equal to the total number of waveform points.

If you enter a value for either the first marker point or the last marker point that would make the first marker point occur after the last, the last marker point is automatically adjusted to match the first marker point. |
| <last_point> | This variable defines the last point in the range over which the marker will be placed. This value must be greater than or equal to the first point, and less than or equal to the total number of waveform points. |
| <skip_count> | This variable defines the marker point pattern across the range. A zero value means the marker points occur consecutively across the range. A value greater than zero creates a repeating marker point pattern across the range, where the gap between the marker points is equal to the <skip_count> value. The gaps begin after the first marker point. Each marker point in the pattern, which is only one point wide, produces a marker pulse. |

Example

```
:RAD:ARB:MARK "Test_Data",1,40,100,2
```

The preceding example sets marker 1 on the first point, 40, the last point, 100, and every third point (skip 2) between 40 and 100 (assuming the Test_Data file has at least 100 points).

Range	<marker>: 1–4 <first_Point>: 1–number of waveform points <last_point>: <first_Point>–number of waveform points <skip_count>: 0–number of points in the range
Key Entry	Set Marker on Range Of Points Marker 1 2 3 4 First Mkr Point Last Mkr Point # Skipped Points Apply to Waveform

:MDESTination:AAMPLitude

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:MDESTination:AAMPLitude NONE|M1|M2|M3|M4

[**:SOURce**]:RADio:ARB:MDESTination:AAMPLitude?

This command routes the selected marker to the Alternate Amplitude function. The NONE parameter clears the marker for the Alternate Amplitude function.

***RST** NONE

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

:MDESTination:ALCHold

Supported E4438C with Option 001/601 or 002/602

CAUTION Incorrect automatic level control (ALC) sampling can create a sudden 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 302](#)”.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[“:MPOLarity:MARKer1|2|3|4” on page 308](#)”.

NOTE Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE	A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings.
-------------	---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “[“:**MARKer**:\[SET\]” on page 302](#)”.

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

***RST** **NONE**

Example

:RAD:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Remarks N/A

:MDESTination:PULSe

Supported E4438C with Option 001/601 or 002/602

CAUTION	The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden 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 308.

NOTE

Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “[:MARKer:\[SET\]](#)” on page 302 for setting the marker points.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE

A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User's Guide*.

NONE

This terminates the marker RF blanking/pulse function.

M1–M4

These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

Example

:RAD:ARB:MDES:PULS M2

The preceding example routes marker 2 to Pulse/RF Blanking.

***RST**

NONE

Key Entry

None Marker 1 Marker 2 Marker 3 Marker 4

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

:MPOLarity:MARKer1|2|3|4

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:MPOLarity:MARKer1|2|3|4 NEGative|POSitive
[**:SOURce**]:RADio:ARB:MPOLarity:MARKer1|2|3|4?

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

Example

:RAD:ARB:MPOL:MARK3 NEG

The preceding example sets the polarity for marker 3 to negative.

***RST** POS

Key Entry Marker 1 Polarity Neg Pos Marker 2 Polarity Neg Pos Marker 3 Polarity Neg Pos
Marker 4 Polarity Neg Pos

:NOISe:BFACTOR

Supported E4438C with Option 403

[**:SOURce**]:RADio:ARB:NOISe:BFACTOR 1|2
[**:SOURce**]:RADio:ARB:NOISe:BFACTOR?

This command sets the flat noise bandwidth for the real-time noise applied to the waveform.

1 This sets the noise bandwidth to at least 0.8 times the sample rate.

2 This sets the noise bandwidth to at least 1.6 times the sample rate, with a maximum bandwidth of 80 MHz.

NOTE For the bandwidth factor of 2, 50 MHz is the maximum sample rate. If 2 is the current selection, you cannot set the sample rate above 50 MHz, and if the sample rate is above 50 MHz, you cannot select 2. See “[:SClock:RATE](#)” on page 313 for setting the sample rate.

The flat noise bandwidth increases with any oversampling by a factor equal to the oversampling amount.

Example

```
:RAD:ARB:NOIS:BFAC 2
```

The preceding example sets the bandwidth factor to 2 and increases the flat noise bandwidth by at least 1.6 times the ARB sample clock rate.

***RST** +1

Key Entry **Noise Bandwidth Factor**

: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 309.”

Example

```
:RAD:ARB:NOIS:CN 50DB
```

The preceding example sets the carrier to noise ratio to 50 dB.

***RST** +0.00000000E+000

Range –100 to 100DB

Key Entry **Carrier to Noise Ratio**

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

:NOISe[:STATe]

Supported E4438C with Option 403

[**:SOURce**] :RADio:ARB:NOISe[:STATe] ON|OFF|1|0
[**:SOURce**] :RADio:ARB:NOISe[:STATe]?

This command enables or disables adding real-time additive white gaussian noise (AWGN) to the carrier modulated by the waveform being played by the dual ARB waveform player. The noise bandwidth will be at least 0.8 times the sample rate, or 1.6 times the sample rate depending on the bandwidth factor. For information on the bandwidth factor, refer to “[:NOISe:BFACtor](#)”.

When the bandwidth factor is 2 and the sample rate is greater than 50 megasamples per/second, noise cannot be enabled. Maximum bandwidth cannot exceed 80 MHz. Any oversampling in the waveform increases the noise bandwidth by a factor equal to the oversampling.

Example

:RAD:ARB:NOIS ON

The preceding example applies real-time AWGN to the carrier.

***RST** 0

Key Entry **Real-time Noise Off On**

:REFerence:EXTernal:FREQuency

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**] :RADio:ARB:REFerence:EXTernal:FREQuency <value>
[**:SOURce**] :RADio:ARB:REFerence:EXTernal:FREQuency?

This command enters the frequency of the applied external reference.

The variable <val> is expressed in units of Hertz (Hz–MHz).

***RST** +1.0000000E+007

Range 2.5E5–1E8

Key Entry **Reference Freq**

Remarks The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to “[:REFerence\[:SOURce\]](#)” on page 311.

:REFerence[:SOURce]

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:REFerence[:SOURce] INTernal|EXTernal
[:SOURce]:RADio:ARB:REFerence[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

***RST** INT

Key Entry ARB Reference Ext Int

Remarks If the EXTernal choice is selected, the external frequency value *must* be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector.

Refer to “[:REFerence:EXTernal:FREQuency](#)” on page 310 to enter the external reference frequency.

:RETRigger

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:RETRigger ON|OFF|1|0|IMMEDIATE
[:SOURce]:RADio:ARB:RETRigger?

This command enables or disables the ARB retrigerring mode; the retrigger mode controls how the retrigerring 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

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

:RSCALing

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:RSCALing <val>

[**:SOURce**]:RADio:ARB:RSCALing?

This command adjusts the scaling value that is applied to a waveform while it is playing. The variable <val> is expressed as a percentage. Runtime scaling does not alter the waveform data file. For more information about runtime scaling, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

Example

:RAD:ARB:RSC 50

The preceding example applies a 50% scaling factor to the selected waveform.

***RST** +7.00000000E+001

Range 1–100

Key Entry **Waveform Runtime Scaling**

Remarks Runtime scaling does not alter the waveform data file.

:SCALing

Supported E84438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:SCALing "<file_name>",<val>

This command scales the designated "<file_name>" waveform file while it is being played by the dual ARB player. The variable <val> is expressed as a percentage, 1–100%. For information on file name syntax, see “[File Name Variables](#)” on page 13.

Scaling is additive and permanent. You cannot scale up. If you scale a waveform file by 60% and then scale it again to 80% you will scale down the 60% waveform file. For more information about waveform file scaling, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

Example

:RAD:ARB:SCAL "Test_Data", 50

The preceding example applies a 50% scaling factor to the Test_Data waveform file.

Range 1–100

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

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 001/601 or 002/602

[**:SOURce**]:RADio:ARB:SCLock:RATE <val>

[**:SOURce**]:RADio:ARB:SCLock:RATE?

This command sets the sample clock rate for the dual ARB format.

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

***RST** +1.00000000E+008

Range 1–1E8

Key Entry **ARB Sample Clock**

:SEQuence

Supported All with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:SEQuence

```
"<file_name>","<waveform1>",<reps>,NONE|M1|M2|M3|M4|M1M2|M1M3|M1M4|M2M3|M2M4|M3M4|M1M2M3|M1M2M4|M1M3M4|M2M3M4|ALL,{ "<waveform2>",<reps>,NONE|M1|M2|M3|M4|M1M2|M1M3|M1M4|M2M3|M2M4|M3M4|M1M2M3|M1M2M4|M1M3M4|M2M3M4|ALL}
[:SOURce]:RADio:ARB:SEQuence? "<file_name>"
```

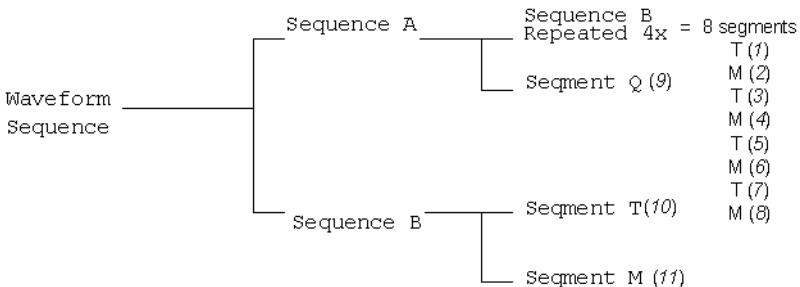
This command creates a waveform sequence. A waveform sequence is made up of segments and other sequences. Any number of segments, up to a segment count limit of 32768, can be used to create a sequence. The count limit is determined by the number of segments in the waveform sequence.

Repeated segments are included in the count limit.

For example, using the figure below, suppose a waveform is created using two sequences: Sequence_A and Sequence_B. Sequence_A consists of Sequence_B and Segment_Q with Sequence_B repeated four times. The total segment count for this waveform sequence would be eleven.

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)



The query returns the contents and segment settings of the waveform sequence file

The segments and sequences play in the same order as placed into the waveform sequence by the command. Once you create the file, you cannot edit the segment settings or add further waveform segments unless you use the signal generator's front panel. Using the same waveform sequence name overwrites the existing file with that name. To use a segment's marker settings, you must enable the segment's markers within the segment or within the waveform sequence. A sequence is stored in the catalog of SEQ files USER/SEQ or SEQ: directory.

When you create a waveform sequence, the ESG also creates a file header for the sequence. This file header takes priority over segment or nested sequence file headers. Refer to the *E4428C/38C ESG Signal Generators User's Guide* for more information on file headers. To save the file header, see “[:HEADer:SAVE](#)” on page 297.

- “<file_name>” This variable names the waveform *sequence* file. For information on the file name syntax, see “[File Name Variables](#)” on page 13.
- “<waveform1>” This variable specifies the name of an existing waveform *segment* or sequence file. A waveform segment or the waveform segments in a specified sequence must reside in volatile memory, WFM1, before it can be played by the dual ARB player. For information on the file name syntax, see “[File Name Variables](#)” on page 13, and for more information on waveform segments, see the *E4428C/38C ESG Signal Generators User's Guide*.
- “<waveform2>” This variable specifies the name of a second existing waveform *segment* or sequence file. The same conditions required for waveform1 apply for this segment or sequence. Additional segments and other sequences can be inserted into the file.
- <reps> This variable sets the number of times a segment or sequence plays (repeats) before the next segment or sequence plays.

NONE	This choice disables all four markers for the waveform. Disabling markers means that the waveform sequence ignores the segment's or sequence's marker settings.
M1, M2, M3, M4	These choices, either individually or a combination of them, enable the markers for the waveform segment or sequence. Markers not specified are ignored for that segment or sequence.
ALL	This choice enables all four markers in the waveform segment or sequence.

Example

```
:RAD:ARB:SEQ "SEQ:Test_Data","WFM1:ramp_test_wfm",25,M1M4,  
"WFM1:sine_test_wfm",100,ALL
```

NOTE	A carriage return or line feed is never included in a SCPI command. The example above contains a carriage return so that the text will fit on the page.
-------------	---

The preceding example creates a waveform sequence file named Test_Data. This file consists of the factory-supplied waveform segments, ramp_test_wfm and sine_test_wfm. The waveform is stored in the signal generator's SEQ: directory.

- The first segment, ramp_test_wfm, has 25 repetitions with markers 1 and 4 enabled.
- The second segment, sine_test_wfm, has 100 repetitions with all four markers enabled.

Range <reps>: 1–65535

Key Entry	Build New Waveform Sequence	Name and Store	Insert Waveform
	Edit Repetitions	Toggle Marker 1	Toggle Marker 2
		Toggle Marker 3	
	Toggle Marker 4		

:TRIGger:TYPE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:TRIGger:TYPE CONTinuous|SINGle|GATE|SADVance
[:SOURce]:RADio:ARB:TRIGger:TYPE?

This command sets the trigger mode (type) that controls the waveform's playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

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.
 - CONTinuous, see “[:TRIGger:TYPE:CONTinuous\[:TYPE\]](#)” on page 317
 - SINGle, see “[:RETRigger](#)” on page 311
 - GATE, selecting the mode also sets the response
- Selecting the trigger source (see “[:TRIGger\[:SOURce\]](#)” on page 320), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
 - CONTinuous and SINGle see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 322
 - GATE, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 317

For more information on triggering, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the trigger type command choices:

CONTinuous	Upon triggering, the waveform repeats continuously.
SINGle	Upon triggering, the waveform segment or sequence plays once.
GATE	An external trigger signal repeatedly starts and stops the waveform's playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see “ :TRIGger:TYPE:GATE:ACTive ” on page 317). 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 001/601 or 002/602

[**:SOURce**]:RADio:ARB:TRIGger:TYPE:CONTinuous[:TYPE] FREE|TRIGger|RESET
[**:SOURce**]:RADio:ARB:TRIGger:TYPE:CONTinuous[:TYPE]?

This command selects the waveform's response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see “[:TRIGger:TYPE on page 315](#)”.

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

FREE	Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.
TRIGger	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.
RESET	The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.

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

:TRIGger:TYPE:GATE:ACTive

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:TRIGger:TYPE:GATE:ACTive LOW|HIGH
[**:SOURce**]:RADio:ARB:TRIGger:TYPE:GATE:ACTive?

This command selects the active state (gate polarity) of the gate while using the gating trigger mode.

The LOW and HIGH selections correspond to the low and high states of an external trigger signal. For example, when you select HIGH, the active state occurs during the high of the trigger signal. When the active state occurs, the ESG stops the waveform playback at the last played sample point, then restarts the playback at the next sample point when the inactive state occurs. For more information on triggering and to select gating as the trigger mode, see “[:TRIGger:TYPE on page 315](#)”.

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

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 001/601 or 002/602

[**:SOURce**] :RADio:ARB:TRIGger:TYPE:SADVance[**:TYPE**] **SINGle** | **CONTinuous**
[**:SOURce**] :RADio:ARB:TRIGger:TYPE:SADVance[**:TYPE**] ?

This command customizes the segment advance trigger type setting.

SINGle This choice will play the next segment in the sequence only once.

CONTinuous This choice will instruct the sequencer to continually play the next segments in the waveform sequence in a continuous pattern.

***RST** **CONT**

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 315.

:TRIGger:TYPE:SADVance[:TYPE]

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**] :RADio:ARB:TRIGger:TYPE:SADVance[**:TYPE**] **SINGle** | **CONTinuous**
[**:SOURce**] :RADio:ARB:TRIGger:TYPE:SADVance[**:TYPE**] ?

This command selects the waveform’s response to a trigger signal while using the segment advance (SADVance) trigger mode.

When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest. For more information on triggering and to select segment advance as the trigger mode, see “[:TRIGger:TYPE](#)” on page 315.

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

- | | |
|------------|---|
| SINGle | Each segment in the sequence requires a trigger to play, and a segment plays only once, ignoring a segment's repetition value (see “ .SEQuence ” on page 313 for repetition information). The following list describes a sequence's playback behavior with this choice: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

:TRIGger[:SOURce]

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:TRIGger[:SOURCE] KEY|EXT|BUS
[**:SOURce**]:RADio:ARB:TRIGger[:SOURCE]?

This command sets the trigger source.

For more information on triggering, see “[:TRIGger:TYPE](#)” on page 315. The following list describes the command choices:

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

EXT An externally applied signal triggers the waveform. This is the only choice that works with gating. The following conditions affect an external trigger:

- The input connector selected for the trigger signal. You have a choice between the rear-panel PATTERN TRIG IN connector or the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector. To make the connector selection, see “[:TRIGger\[:SOURCE\]:EXTernal\[:SOURcel\]](#)” on page 323.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.

- The trigger signal polarity:
 - gating mode, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 317
 - continuous and single modes, see “[:TRIGger\[:SOURCE\]:EXTernal:SLOPe](#)” on page 322
- The delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
 - setting the amount of delay, see “[:TRIGger\[:SOURCE\]:EXTernal:DElay\[:TIME\]](#)” on page 322 or “[:TRIGger\[:SOURCE\]:EXTernal:DElay:SAMPles](#)” on page 321
 - turning the delay on, see “[:TRIGger\[:SOURCE\]:EXTernal:DElay:STATE](#)” on page 321

BUS This choice enables triggering over the GPIB or LAN using the *TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the *TRG command.

***RST** EXT

Key Entry Trigger Key Ext Bus

:TRIGger[:SOURce]:EXTernal:DELay:SAMPles

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:TRIGger[:SOURce]:EXTernal:DELay:SAMPles <val>

[**:SOURce**]:RADio:ARB:TRIGger[:SOURce]:EXTernal:DELay:SAMPles?

This command sets the number of samples to delay the ESG's response to an external trigger.

The delay is between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of 100 samples, causes the ESG to wait 100 samples after receipt of the external trigger before the ESG plays the waveform. The delay does not occur until you select SAMPles as the delay type. For more information, see

[“:TRIGger\[:SOURce\]:EXTernal:DELay:STATE” on page 321](#)). You can set the delay value either before or after selecting SAMPles.

For more information on configuring an external trigger source and to select external as the trigger source, see [“:TRIGger\[:SOURce\]” on page 320](#).

The unit of measurement for the variable <val> is in samples.

***RST** +0

Range 0–100E6

Key Entry Ext Delay Samples

:TRIGger[:SOURce]:EXTernal:DELay:STATE OFF|ON|1|0

Supported E4438C with Option 001/601 or 002/602

NOTE Refer to the *Programming Compatibility Guide* for information on this command. This command was replaced by the [“:TRIGger\[:SOURce\]:EXTernal:DELay:STATE”](#) command.

:TRIGger[:SOURce]:EXTernal:DELay:STATE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADio:ARB:TRIGger[:SOURce]:EXTernal:DELay:STATE OFF|TIME|

SAMPles

[**:SOURce**]:RADio:ARB:TRIGger[:SOURce]:EXTernal:DELay:STATE?

This command enables the delay feature by selecting the external trigger delay type or disables the external trigger delay function.

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

TIME Selects time as the delay value in units of nanoseconds to seconds. For setting the time delay value, see “[\[:TRIGger\[:SOURce\]:EXTernal:DELay\[:TIME\]\]](#)” on page 322.

SAMPles Selects samples as the delay value. For setting the sample delay value, see “[\[:TRIGger\[:SOURce\]:EXTernal:DELay:SAMPLEs\]](#)” on page 321.

For information on configuring an external source, see “[\[:TRIGger\[:SOURce\]\]](#)” on page 320.

***RST** OFF

Key Entry **Ext Delay Off Time Samples**

:TRIGger[:SOURce]:EXTernal:DELay[:TIME]

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:ARB:TRIGger[:SOURce] :EXTernal:DELay[:TIME] <val>
[:SOURce] :RADio:ARB:TRIGger[:SOURce] :EXTernal:DELay[:TIME]?

This command sets the amount of time to delay the ESG’s response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform. The delay does not occur until you select TIME as the delay type. For more information, see

“[\[:TRIGger\[:SOURce\]:EXTernal:DELay:STATE\]](#)” on page 321. You can set the delay value either before or after selecting TIME.

For more information on configuring an external trigger source and to select external as the trigger source, see “[\[:TRIGger\[:SOURce\]\]](#)” on page 320.

The unit of measurement for the variable <val> is in seconds (nsec–sec).

***RST** +1.0000000E-003

Range 1E-8 to 4E1

Key Entry **Ext Delay Time**

:TRIGger[:SOURce]:EXTernal:SLOPe

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADio:ARB:TRIGger[:SOURce] :EXTernal:SLOPe POSitive|NEGative
[:SOURce] :RADio:ARB:TRIGger[:SOURce] :EXTernal:SLOPe?

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “[\[:TRIGger:TYPE:GATE:ACTive\]](#)” on page 317.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 320.

***RST** NEG

Key Entry **Ext Polarity Neg Pos**

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

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:TRIGger[ :SOURce ] :EXTernal[ :SOURce ] EPT1 | EPT2 |
EPTRIGGER1 | EPTRIGGER2
[ :SOURce ] :RADio:ARB:TRIGger[ :SOURce ] :EXTernal[ :SOURce ] ?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on page 320. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the command choices:

EPT1 This choice is synonymous with EPTRIGGER1 and selects the PATTERN TRIG IN rear-panel connector.

EPT2 This choice is synonymous with EPTRIGGER2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.

EPTRIGGER1 This choice is synonymous with EPT1 and selects the PATTERN TRIG IN rear-panel connector.

EPTRIGGER2 This choice is synonymous with EPT2 and selects the PATT TRIG IN 2 pin on the rear-panel AUXILIARY I/O connector.

***RST** EPT1

Key Entry **Patt Trig In 1 Patt Trig In 2**

:WAVeform

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURCE ] :RADio:ARB:WAVeform "WFM1:file_name" | "SEQ:file_name"
```

Component Test Digital Commands

Dual ARB Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADio:ARB)

[**:SOURce**] :RADio:ARB:WAVeform?

This command selects a waveform file or sequence, for the dual ARB player to play. The file must be present in volatile memory, WFM1, or in the SEQ directory. If a file is in non-volatile memory (NVWFM), use the command “[“:COPY\[:NAME\]” on page 105](#) to copy the file to WFM1.

“WFM1:file_name” This variable names a waveform file residing in volatile memory (WFM1:). For information on the file name syntax, see “[File Name Variables](#)” on page 13.

“SEQ:file_name” This variable names a sequence file residing in the catalog of sequence files. For more information on the file name syntax, see “[File Name Variables](#)” on page 13.

Example

:RAD:ARB:WAV "WFM1:Test_Data"

The preceding example selects the file Test_Data from the list of files in volatile waveform memory, WFM1, and applies its file header settings.

Key Entry Select Waveform

:Waveform:NHEAders

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**] :RADio:ARB:WAVeform:NHEAders "WFM1:file_name" | "SEQ:filename"
[**:SOURce**] :RADio:ARB:WAVeform:NHEAders?

This command, for the dual ARB mode, allows for a fast selection of a segment or sequence waveform file. No header information or settings are applied to the segment or sequence waveform file when this command is used. This will improve the access or loading speed of the waveform file to approximately 100 mS for a single segment. The file must be in volatile waveform memory (WFM1), or in the SEQ directory. If a file is in non-volatile waveform memory (NVWFM), use the command “[“:COPY\[:NAME\]” on page 105](#) to copy files to WFM1.

“WFM1:file_name” This variable names a waveform file residing in volatile memory:WFM1. For information on the file name syntax, see “[File Name Variables](#)” on page 13.

“SEQ:filename” This variable names a sequence file residing in the catalog of sequence files. For more information on the file name syntax, see “[File Name Variables](#)” on page 13.

Example

:RAD:ARB:WAV:NHEA "Test_Data"

The preceding example selects the file Test_Data, without applying header settings.

[**:STATe**]

Supported E4438C with Option 001/601 or 002/602

```
[ :SOURce ] :RADio:ARB[ :STATe ] ON|OFF|1|0  
[ :SOURce ] :RADio:ARB[ :STATe ]?
```

This command enables or disables the arbitrary waveform generator function.

***RST** 0

Key Entry **ARB Off On**

Multitone Subsystem—Option 001/601 or 002/602 ([:SOURce**]:**RADio:MTONe:ARB**)**

Creating a Multitone Waveform

Use the following steps to create a multitone waveform:

1. Initialize the phase for the multitone waveform. Refer to “:[SETUp:TABLE:PHASe:INITialize](#)” on [page 338](#).
2. Assign the frequency spacing between the tones. Refer to “:[SETUp:TABLE:FSPacing](#)” on [page 337](#).
3. Define the number of tones within the waveform. Refer to “:[SETUp:TABLE:NTONes](#)” on [page 337](#).
4. Modify the power level, phase, and state of any individual tones. Refer to “:[ROW](#)” on [page 334](#).

:HEADer:CLEAR

Supported E4438C with Option 001/601 or 002/602

[:**SOURce**] :**RADio:MTONe:ARB:HEADer:CLEAR**

This command clears the header information from the file header used by this modulation format.

Key Entry **Clear Header**

Remarks The **Multitone Off On** softkey must be set to On for this command to function.

:HEADer:SAVE

Supported E4438C with Option 001/601 or 002/602

[:**SOURce**] :**RADio:MTONe:ARB:HEADer:SAVE**

This command saves the header information to the file header used by this modulation format.

Key Entry **Save Setup To Header**

Remarks The **Multitone Off On** softkey must be set to On for this command to function.

:IQ:EXTernal:FILTter

Supported E4438C with Option 001/601 or 002/602

[:**SOURCE**] :RADio:MTONe:ARB:IQ:EXTernal:FILTter 40e6 | THRough

[:**SOURCE**] :RADio:MTONe:ARB:IQ:EXTernal:FILTter?

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:FILTter:AUTO](#)” on [page 327](#) to OFF(0) mode.

40e6 This choice applies a 40 MHz baseband filter.

THRough This choice bypasses filtering.

***RST** THR

Key Entry **40.000 MHz Through**

:IQ:EXTernal:FILTter:AUTO

Supported E4438C with Option 001/601 or 002/602

[:**SOURCE**] :RADio:MTONe:ARB:IQ:EXTernal:FILTter:AUTO ON | OFF | 1 | 0

[:**SOURCE**] :RADio:MTONe:ARB:IQ:EXTernal:FILTter: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:FILTter](#)” on [page 327](#) for selecting a filter or through path.

***RST** 1

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

Component Test Digital Commands

Multitone Subsystem—Option 001/601 or 002/602 ([\[:SOURce\]:RADIO:MTONe:ARB](#))

:IQ:MODulation:ATTen

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADIO:MTONe:ARB:IQ:MODulation:ATTen <val>

[:SOURce] :RADIO:MTONe:ARB:IQ:MODulation:ATTen?

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

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

***RST** +2.0000000E+000

Range 0–40

Key Entry **Modulator Atten** **Manual** **Auto**

:IQ:MODulation:ATTen:AUTO

Supported E4438C with Option 001/601 or 002/602

[:SOURce] :RADIO:MTONe:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[:SOURce] :RADIO:MTONe:ARB:IQ:MODulation:ATTen:AUTO?

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

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

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “[:IQ:MODulation:ATTen](#)” on page 328 for setting the attenuation value.

***RST** 1

Key Entry **Modulator Atten** **Manual** **Auto**

:IQ:MODulation:FILT**er**

Supported E4438C with Option 001/601 or 002/602

[:**SOURCE**] :RADio:MTONe:ARB:IQ:MODulation:FILT**er** 2.1e6 | 40e6 | THRough
 [:**SOURCE**] :RADio:MTONe:ARB:IQ:MODulation:FILT**er**?

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:FILT**er**:AUTO](#)” on page 329 to OFF(0) mode.

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

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

THRough This choice bypasses filtering.

***RST** THR

Key Entry **2.100 MHz** **40.000 MHz** **Through**

:IQ:MODulation:FILT**er**:**AUTO**

Supported E4438C with Option 001/601 or 002/602

[:**SOURCE**] :RADio:MTONe:ARB:IQ:MODulation:FILT**er**:**AUTO** ON | OFF | 1 | 0
 [:**SOURCE**] :RADio:MTONe:ARB:IQ:MODulation:FILT**er**:**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:FILT](#)**er**” on page 329 for selecting a filter or through path.

***RST** 1

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

:MDESt**ination**:**AAMPlitude**

Supported E4438C with Option 001/601 or 002/602

[:**SOURCE**] :RADio:MTONe:ARB:MDESt**ination**:AAMPl**itude** NONE | M1 | M2 | M3 | M4
 [:**SOURCE**] :RADio:MTONe:ARB:MDESt**ination**:AAMPl**itude**?

This command routes the selected marker to the Alternate Amplitude function. The NONE parameter clears the marker for the Alternate Amplitude function.

Component Test Digital Commands

Multitone Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADIO:MTONe:ARB)

*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 302](#)”.

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[“:MPOLarity:MARKer1|2|3|4” on page 333](#)”.

NOTE Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings.

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “[\[:MARKer:\[SET\]\]](#)” on page 302.

NONE	This terminates the marker ALC hold function.
M1–M4	These are the marker choices. The ALC hold feature uses only one marker at a time.
*RST	NONE

Example

:RAD:AWGB:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Remarks N/A

:MDESTination:PULSe

Supported E4438C with Option 001/601 or 002/602

CAUTION	The pulse function incorporates ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden 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 333.

Component Test Digital Commands

Multitone Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:**RADio**:**MTONe**:**ARB**)

NOTE

Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “[:**MARKer**:\[SET\]](#)” on page 302 for setting the marker points.

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE

A waveform file that has unspecified settings in the file header uses the previous waveform’s routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

Example

:RAD:ARB:MDES:PULS M2

The preceding example routes marker 2 to Pulse/RF Blanking.

***RST** **NONE**

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

:MPOLarity:MARKer1|2|3|4

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:MTONe:ARB:MPOLarity:MARKer1|2|3|4 NEGative|POSitive
[**:SOURCE**]:RADio:MTONe:ARB:MPOLarity:MARKer1|2|3|4?

This command sets the polarity for the selected marker. For a positive marker polarity, the marker signal is high during the marker points. For a negative marker polarity, the marker signal is high during the period of no marker points.

***RST** POS

Key Entry	Marker 1 Polarity Neg Pos	Marker 2 Polarity Neg Pos	Marker 3 Polarity Neg Pos
	Marker 4 Polarity Neg Pos		

:REFerence:EXTernal:FREQuency

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:MTONe:ARB:REFERENCE:EXTernal:FREQuency <val>
[**:SOURCE**]:RADio:MTONe:ARB:REFERENCE:EXTernal:FREQuency?

This command allows you to enter the frequency of the applied external reference.

The variable <val> is expressed in units of Hertz (Hz–MHz).

***RST** +1.00000000E+007

Range 2.5E5–1E8

Key Entry Reference Freq

Remarks The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to
“[:REFerence\[:SOURce\]](#)” on page 333.

:REFerence[:SOURce]

Supported E4438C with Option 001/601 or 002/602

[**:SOURCE**]:RADio:MTONe:ARB:REFERENCE[:SOURce] INTernal|EXTernal
[**:SOURCE**]:RADio:MTONe:ARB:REFERENCE[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

Component Test Digital Commands

Multitone Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:**RADIO**:**MTONe**:**ARB**)

*RST	INT
Key Entry	ARB Reference Ext Int
Remarks	If the EXTernal choice is selected, the external frequency <i>value must</i> be entered and the signal must be applied to the BASEBAND GEN REF IN rear panel connector. Refer to “ :REFerence:EXTernal:FREQuency ” on page 333 to enter the external reference frequency.

:ROW

Supported E4438C with Option 001/601 or 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 336 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 326 for all four steps.

:RSCALing

Supported E4438C with Option 001/601 or 002/602

[:SOURce]:RADio:MTONe:ARB:RSCALing <val>
[:SOURce]:RADio:MTONe:ARB:RSCALing?

This command adjusts the scaling value that is applied to the Multitone waveform while it is playing. The variable <val> is expressed as a percentage. Runtime scaling does not alter the waveform data file. For more information about runtime scaling, refer to the *E4428C/38C ESG Signal Generators User's Guide*.

Example

:RAD:MTON:ARB:RSC 50

The preceding example applies a 50% scaling factor to the selected waveform.

***RST** +7.00000000E+001

Range 1–100

Key Entry **Waveform Runtime Scaling**

Remarks Runtime scaling does not alter the waveform data file.

:SCLock:RATE

Supported E4438C with Option 001/601 or 002/602

[:SOURce]:RADio:MTONe:ARB:SCLOCK:RATE <val>
[:SOURce]:RADio:MTONe:ARB:SCLOCK:RATE?

This command sets the sample clock rate for the Multitone modulation format.

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

***RST** +1.00000000E+008

Range 1–1E8

Key Entry **ARB Sample Clock**

Remarks The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[:STATE]” on page 339 to activate the modulation format.

Component Test Digital Commands

Multitone Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADIO:MTONe:ARB)

:SETup

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADIO:MTONe:ARB:SETup "<file name>"

[**:SOURce**]:RADIO:MTONe:ARB:SETup?

This command retrieves a multitone waveform file.

Key Entry Load From Selected File

Remarks The name of a multitone waveform file is stored in the signal generator file system of MTONE files. This information is held in memory until you send the command that turns the waveform on.

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:SETup:STORe

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADIO:MTONe:ARB:SETup:STORe "<file name>"

This command stores the current multitone waveform setup in the signal generator file system of MTONE files.

Key Entry **Store To File**

:SETup:TABLE

Supported E4438C with Option 001/601 or 002/602

[**:SOURce**]:RADIO:MTONe:ARB:SETup:TABLE <freq_spacing>, <num_tones>, {<phase>, <state>}

[**:SOURce**]:RADIO:MTONe:ARB:SETup:TABLE?

This command creates and configures a multitone waveform.

The frequency offset, power, phase, and state value are returned when a query is initiated. The output format is as follows:

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

The variable <freq_spacing> is expressed in units of Hertz (Hz–MHz).

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

* RST	Tone	<frequency offset>	<power>	<phase>	<state>
	Tone 1	-35000	+0.00000000E+000	+0	+1

*RST	Tone	<frequency offset>	<power>	<phase>	<state>
	Tone 2	-25000	+0.00000000E+000	+0	+1
	Tone 3	-15000	+0.00000000E+000	+0	+1
	Tone 4	-5000	+0.00000000E+000	+0	+1
	Tone 5	+5000	+0.00000000E+000	+0	+1
	Tone 6	+15000	+0.00000000E+000	+0	+1
	Tone 7	+25000	+0.00000000E+000	+0	+1
	Tone 8	+35000	+0.00000000E+000	+0	+1
Range		<i><freq_spacing></i> (2 tones): 1E4–8E7	<i><num_tones></i> : 2–64		
		<i><freq_spacing></i> (>2 tones): 1E4 to (80 MHz ÷ (num_tones – 1))			
		<i><phase></i> : 0–359			
Key Entry	Freq Spacing	Number Of Tones	Toggle State		
Remarks	To set the frequency spacing, refer to “ :SETup:TABLE:FSPacing ” on page 337.				

:SETup:TABLE:FSPacing

Supported E4438C with Option 001/601 or 002/602

[*:SOURce*]:RADio:MTONe:ARB:SETup:TABLE:FSPacing *<freq_spacing>*
[*:SOURce*]:RADio:MTONe:ARB:SETup:TABLE:FSPacing?

This command sets the frequency spacing between the tones.

The variable *<freq_spacing>* is expressed in units of Hertz (Hz–MHz).

***RST** +1.00000000E+004

Range *<freq_spacing>* (2 tones): 1E4–8E7

<freq_spacing> (>2 tones): 1E4 to (80 MHz ÷ (num_tones – 1))

Key Entry **Freq Spacing**

Remarks To set frequency spacing and additional parameters required to create or configure a multitone waveform, refer to “[:SETup:TABLE](#)” on page 336.

This command is the second step in creating a multitone waveform. Refer to “[Creating a Multitone Waveform](#)” on page 326 for all four steps.

:SETup:TABLE:NTONes

Supported E4438C with Option 001/601 or 002/602

[*:SOURce*]:RADio:MTONe:ARB:SETup:TABLE:NTONes *<num_tones>*
[*:SOURce*]:RADio:MTONe:ARB:SETup:TABLE:NTONes?

This command defines the number of tones in the multitone waveform.

Component Test Digital Commands

Multitone Subsystem—Option 001/601 or 002/602 ([**:SOURce**]:RADIO:MTONe:ARB)

*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 336. This command is the third step in creating a multitone waveform. Refer to “ Creating a Multitone Waveform ” on page 326 for all four steps.

:SETup:TABLE:PHASE:INITialize

Supported E4438C with Option 001/601 or 002/602

[:**SOURce**] :RADIO:MTONe:ARB:SETup:TABLE:PHASE:INITialize FIXed | RANDOM
[:**SOURce**] :RADIO:MTONe:ARB:SETup:TABLE:PHASE:INITialize?

This command initializes the phase in the multitone waveform table.

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 338.

This command is the first step in creating a multitone waveform. Refer to “[Creating a Multitone Waveform](#)” on page 326 for all four steps.

:SETup:TABLE:PHASE:INITialize:SEED

Supported E4438C with Option 001/601 or 002/602

[:**SOURce**] :RADIO:MTONe:ARB:SETup:TABLE:PHASE:INITialize:SEED FIXed | RANDOM
[:**SOURce**] :RADIO:MTONe:ARB:SETup:TABLE:PHASE:INITialize:SEED?

This command initializes the random number generator seed that is used to generate the random phase values for the multitone waveform.

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 001/601 or 002/602**[**:SOURce**]:RADio:MTONe:ARB[**:STATe**]** ON|OFF|1|0**[**:SOURce**]:RADio:MTONe:ARB[**:STATe**]?**

This command enables or disables the multitone waveform generator function.

***RST** 0**Key Entry** **Multitone Off On**

Wideband CDMA ARB Subsystem—Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)

:CLIPping:I

Supported E4438C with Option 400

[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:I <val>
[:SOURce]:RADio:WCDMa:TGPP:ARB:CLIPping:I?

This command limits the modulation level of the waveform's I component to a percentage of full scale.

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

***RST** +1.0000000E+002

Range 10–100

Key Entry Clip |I| To

:CLIPping:POStion

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** +1.0000000E+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**

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

: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:FILTera:ALPHA <val>

[:SOURce]:RADio:WCDMa:TGPP:ARB:FILTera: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** +2.2000000E–001**Range** 0.000–1.000**Key Entry** **Filt**er **A**lpha**Remarks** To change the current filter type, refer to “[:FILTer](#)” on page 342.**:FILTer:BBT*Supported** E4438C with Option 400

[:SOURce]:RADio:WCDMa:TGPP:ARB:FILTera:BBT <val>

[:SOURce]:RADio:WCDMa:TGPP:ARB:FILTera: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** +5.0000000E–001**Range** 0.000–1.000**Key Entry** **Filt**er **B**b**T*Remarks** This command is effective only after choosing a Gaussian filter. It does not have an effect on other types of filters.To change the current filter type, refer to “[:FILTer](#)” on page 342.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

:FILTer:**CHAN**nel

Supported E4438C with Option 400

[**:SOURce**]:RADio:WCDMa:TGPP:ARB:FILT**er**:CHAN**nel** EVM|ACP

[**:SOURce**]:RADio:WCDMa:TGPP:ARB:FILT**er**:CHAN**nel**?

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 “[“:FILT](#)er” on page 342.

:HEADer:**CLEAR**

Supported E4438C with Option 400

[**:SOURce**]:RADio:WCDMa:TGPP:ARB:HEAD**er**: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:HEAD**er**: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:**FILT**er

Supported E4438C with Option 400

[**:SOURce**]:RADio:WCDMa:TGPP:ARB:IQ:EXTernal:FILT**er** 40e6|THrough

[**:SOURce**]:RADio:WCDMa:TGPP:ARB:IQ:EXTernal:FILT**er**?

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:FILTter:AUTO](#)” on page 345 to OFF(0) mode.

40e6	This choice applies a 40 MHz baseband filter.
THRough	This choice bypasses filtering.
*RST	THR
Key Entry	40.000 MHz Through

:IQ:EXTernal:FILTter:AUTO

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB: IQ:EXTernal:FILTter:AUTO ON|OFF|1|0
[:SOURce] :RADio:WCDMa:TGPP:ARB: IQ:EXTernal:FILTter: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:FILTter ” on page 344 for selecting a filter or through path.
*RST	1
Key Entry	I/Q Output Filter Manual Auto

:IQMap

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB: IQMap NORMAl|INVert
[:SOURce] :RADio:WCDMa:TGPP:ARB: IQMap?

This command selects whether or not the I/Q outputs will be inverted.

NORMAl	This choice selects normal polarity.
INVerted	This choice inverts the internal Q signal.
*RST	NORM
Key Entry	I/Q Mapping Normal Invert

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

: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** +2.0000000E+00

Range 0–40

Key Entry Modulator Atten Manual Auto

:IQ:MODulation:ATTen:AUTO

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:ATTen:AUTO ON|OFF|1|0

[:SOURce] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:ATTen:AUTO?

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

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

OFF (0) This choice holds the attenuator at its current setting or at a selected value. Refer to “[“:IQ:MODulation:ATTen” on page 346](#) for setting the attenuation value.

***RST** 1

Key Entry Modulator Atten Manual Auto

:IQ:MODulation:FILTter

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTter 2.1e6|40e6|THRough

[:SOURce] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTter?

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:FILTter:AUTO” on page 347](#) to OFF(0) mode.

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

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

THRough This choice bypasses filtering.

***RST** THR
Key Entry 2.100 MHz 40.000 MHz Through

:IQ:MODulation:FILTter:AUTO

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTter:AUTO ON|OFF|1|0
[:SOURce] :RADio:WCDMa:TGPP:ARB:IQ:MODulation:FILTter: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:FILTter](#)” on page 346 for selecting a filter or through path.

***RST** 1
Key Entry I/Q Mod Filter Manual Auto

:LINK

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK DOWN|UP
[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK?

This command selects either a downlink or uplink channel configuration.

***RST** DOWN
Key Entry Link Down Up

:LINK:DOWN:OACP

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:OACP ADJ|ALT
[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:OACP?

This command selects the channel power optimization type for any downlink channel W-CDMA setup.

- ADJ This choice optimizes for adjacent channel power.
- ALT This choice optimizes for alternate channel power.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

*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 348.

:LINK:DOWN:SETup

Supported E4438C with Option 400

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup DPCH1 | DPCH3 | PPSCH |
PPDPCH1 | PPDPCH3 | TM1D16 | TM1D32 | TM1D64 | TM2 | TM3D16 | TM3D32 | TM4 | TM5H2 | TM5H4 |
TM5H8 | MCARrier | "<file name>"

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup?

This command selects a predefined channel setup or multicarrier, and turns multicarrier off or on (see the MCARrier choice description).

DPCH1	This choice selects 1 dedicated physical channel.
DPCH3	This choice selects 3 dedicated physical channels.
PPSCH	This choice selects a primary command control physical channel (PCCPCH) with a synchronization channel (SCH).
PPDPCH1	This choice selects a primary command control physical channel (PCCPCH) with a dedicated physical channel (DPCH).
PPDPCH3	This choice selects a primary command control physical channel (PCCPCH) with 3 dedicated physical channels.
TM1D16	This choice selects a Test Model 1 with 16 dedicated physical channels.
TM1D32	This choice selects a Test Model 1 with 32 dedicated physical channels.
TM1D64	This choice selects a Test Model 1 with 64 dedicated physical channels.
TM2	This choice selects a Test Model 2 downlink W-CDMA setup.
TM3D16	This choice selects a Test Model 3 with 16 dedicated physical channels.
TM3D32	This choice selects a Test Model 3 with 32 dedicated physical channels.
TM4	This choice selects a Test Model 4 downlink W-CDMA setup.
TM5H2	This choice selects a Test Model 5 with 6 DPCH and 2 HS-PDSCH (high speed physical shared channel) channels downlink W-CDMA setup.
TM5H4	This choice selects a Test Model 5 with 14 DPCH and 4 HS-PDSCH (high

	speed-physical downlink shared channel) channels downlink W-CDMA setup.
TM5H8	This choice selects a Test Model 5 with 30 DPCH and 8 HS-PDSCH (high speed physical shared channel) channels downlink WCDMA setup.
MCARrier	This choice selects multicarrier and turns it on. Selecting any other setup such as DPCH1 or TM1D16 turns multicarrier off. To select the multicarrier setup, see “ :LINK:DOWN:SETup:MCARrier ”.
"<file name>"	This choice selects a user-defined channel setup file. Refer to “ File Name Variables ” on page 13 for information on the file name syntax.
*RST	DPCH1
Key Entry	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

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:**RADIO**:**WCDMa**:**TGPP**:**ARB**)

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	+1.0000000E+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

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

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 circular clipping>[<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.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:**RADIO**:**WCDMA**:**TGPP**:**ARB**)

TM2	This choice selects a test model 2.
TM3D16	This choice selects a test model 3 with 16 dedicated physical channels.
TM3D32	This choice selects a test model 3 with 32 dedicated physical channels.
TM4	This choice selects a test model 4.
TM5H2	This choice selects a Test Model 5 with 6 DPCH and 2 HS-PDSCH (high speed physical shared channel) channels downlink W-CDMA setup.
TM5H4	This choice selects a Test Model 5 with 14 DPCH and 4 HS-PDSCH (high speed-physical downlink shared channel) channels downlink W-CDMA setup.
TM5H8	This choice selects a Test Model 5 with 30 DPCH and 8 HS-PDSCH (high speed physical shared channel) channels downlink W-CDMA setup.
<scramble code>	This variable sets the scramble code value.
<timing offset>	This variable sets the timing offset value.
<initial phase>	This variable sets the initial phase value. The units are not specified but the value represents degrees.
<clipping>	This variable sets the clipping value. If the units are not specified, the value will default to percent.
<carrier_num>	This variable specifies the number of multicarriers.
* RST	<i>carrier type</i> : PPSCH < <i>freq_offset</i> >: +7.50000000E+006 < <i>power</i> >: +0.00000000E+000
Range	< <i>freq_offset</i> >: -37.5E6 to 37.5E6 < <i>power</i> >: -40 to 0 <i>scramble code</i> : 0–511 <i>timing offset</i> : 0–149 <i>initial phase</i> : 0–359 <i>clipping(in units of percent)</i> : 0.0–100.0 or 0.0 to -20.0 (if units are dB)
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 356.](#)

:LINK:DOWN:SETup:MCARrier:TABLE:NCARriers

Supported E4438C with Option 400

[:**SOURCE**] :**RADio**:**WCDMa**:**TGPP**:**ARB**:**LINK:DOWN:SETup:MCARrier:TABLE:NCARriers?**

This command queries the number of carriers specified for the W-CDMA multicarrier waveform.

***RST** +2

:LINK:DOWN:SETup:MCARrier:TOFFset:AINCrement

Supported E4438C with Option 400

[:**SOURCE**] :**RADio**:**WCDMa**:**TGPP**:**ARB**:**LINK:DOWN:SETup:MCARrier:TOFFset:AINCrement**

This command will sort carriers by frequency offset and auto-increment timing offsets. The new values will start with the current timing offset for the lowest frequency carrier and increment by one for each subsequent carrier.

Key Entry **Increment Timing Offset**

:LINK:DOWN:SETup:STORe

Supported E4438C with Option 400

[:**SOURce**] :**RADio**:**WCDMa**:**TGPP**:**ARB**:**LINK:DOWN:SETup:STORe "<file name>"**

This command stores the current downlink setup information into the memory catalog with the entered file name.

Along with the contents of the W-CDMA channel table editor (channel types, Walsh code, power levels, PN offset, and data), this command stores the following information to the signal generator memory:

- FIR filter
- FIR filter file name
- FIR filter alpha
- FIR filter BbT
- FIR filter channel (EVM or ACP)
- I/Q mapping
- increment scramble code
- increment timing offset
- link
- spread type

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

spread rate
ARB reference clock source (internal or external)
ARB reference clock frequency
clipping
multicarrier spacing
radio configuration

Key Entry **Store Custom W-CDMA State**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:LINK:DOWN:SETup:TABLE:APPLy

Supported E4438C with Option 400

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:APPLy

This command generates a W-CDMA signal based on the current values in the W-CDMA channel setup table editor.

Key Entry **Apply Channel Setup**

:LINK:DOWN:SETup:TABLE:CHANnel

Supported E4438C with Option 400

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:CHANnel INIT | APPend | <chan_num>, <chan_type>, <symbol_rate>, <spread_code>, <power>, <timing_offset>, <TFCI>, <TPC>, <scramble_code>, STANDard|RALTernate| LALTernate, <scramble_offset>, RANDom|PN9|PINDicator | <data_val>, <TFCI_power>, <TPC_power>, <pilot_power>, <pilot_bits>
[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:CHANnel? <chan_num>

This command sets up the W-CDMA downlink channel type parameters.

Use INIT to clear the table editor and define the parameters for the first channel; use APPend to add new channels. To edit an existing channel, use its channel number <chan_num>.

The <power>, <TFCI_power>, <TPC_power>, and <pilot_power> variables are expressed in units of decibels (dB).

The channel type, symbol rate, spread code, power, timing offset, TFCI value, TPC value, scramble code, scramble type, scramble offset, data type, TFCI power, TPC power, pilot power, and the number of pilot bits are returned when a query is initiated. The output format is as follows:

<chan_type>, <symbol_rate>, <spread_code>, <power>, <tDPCH_offset>, <TFCI>, <TPC>, <scramble_code>, <scramble_type>, <scramble_code>, <scramble_offset>,

<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

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([:SOURce]:RADIO:WCDMa:TGPP:ARB)

Table 5-1 Variables and Channel Types

	SSCH	CPICH	PCCPCH	S CCPCH	PICH	DPCH	OCNS	PSCH
Power	X	X	X	X	X	X	X	X
Symbol offset	N/A	N/A	N/A	N/A	X	X	N/A	N/A
TFCI	N/A	N/A	N/A	X	N/A	X	N/A	N/A
TPC	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A
Scramble code	X	X	X	X	X	X	X	N/A
Standard	X	X	X	N/A	X	X	X	N/A
Right alternate	X	X	X	N/A	X	X	X	N/A
Left alternate	X	X	X	N/A	X	X	X	N/A
Scramble offset	X	X	X	X	X	X	X	N/A
Random	N/A	N/A	X	X	X	X	X	N/A
PN9	N/A	N/A	X	X	X	X	X	N/A
Paging Indicator	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A
Data value	N/A	N/A	X	N/A	X	X	X	N/A
TFCI power	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A
Pilot power offset	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A
Pilot bits	N/A	N/A	N/A	X	X	N/A	N/A	N/A

Table 5-2 Variables and Channel Types

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

Table 5-2 Variables and Channel Types

	HSPDSCH	HSSCCH
Power	X	X
Symbol offset	X	X
TFCI	N/A	N/A
TPC	N/A	N/A
Scramble code	X	X
Standard	X	X
Right alternate	X	X
Left alternate	X	X
Scramble offset	X	X
Random	X	X
PN9	X	X
Paging Indicator	N/A	N/A
Data value	X	X
TFCI power	N/A	N/A
Pilot power offset	N/A	N/A
Pilot bits	N/A	N/A

*RST <chan_type>: DPCH <symbol_rate>: +3.00000000E+004
 <spread_code>: +8 <scramble_offset>: +0.00000000E+000
 power: +0.00000000E+000 <tDPCH_offset>: +0 <TFCI>: +0
 <TPC>: #H5555 <scramble_code>: +0 scramble type: STAN
 <TFCI_power>: +0.00000000E+000
 <TPC_power>: +0.00000000E+000 <pilot_power>: +0.00000000E+000
 <pilot_bits>: +4

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([:SOURce]:RADio:WCDMa:TGPP:ARB)

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	TFCI		Scramble Code										
			Offset													
	TFCI	TPC		Pilot Power	Pilot Bits	Data										
	Power	Power														
	Scramble Type		Scramble Offset													

Remarks For additional information, refer to the 3GPP TS 25.211 (V 3.7) standard.

If the parameter set by this command is changed while the signal is active, the apply command must be executed for the change to occur. Refer to “[:LINK:DOWN:SETup:TABLE:APPLy](#)” on page 356.

:LINK:DOWN:SETup:TABLE:NCHannels?

Supported E4438C with Option 400

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:NCHannel?

This command queries the number of channels being used for the carrier.

***RST** 1

:LINK:DOWN:SETup:TABLE:PADJust

Supported E4438C with Option 400

[:**SOURCE**] :RADio:WCDMa:TGPP:ARB:LINK:DOWN:SETup:TABLE:PADJust 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 **TFCI Field Off On**

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

:LINK:UP:OACP

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:UP:OACP ADJ | ALT

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:UP:OACP?

This command selects the channel power optimization type for any uplink channel W-CDMA setup.

ADJ This choice optimizes for adjacent channel power.

ALT This choice optimizes for alternate channel power.

***RST** ADJ

Key Entry **Optimize ACP ADJ ALT**

Remarks This command is only operational for any uplink channel W-CDMA setup.

To change the current W-CDMA setup information, refer to “[“:LINK:UP:SETup” on page 363](#).

:LINK:UP:SCRAMBLE

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:UP:SCRAMBLE <val>

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:UP:SCRAMBLE?

This command sets the scramble code for the uplink.

***RST** #H000000

Range #H0–FFFFFF

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 364.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

:LINK:UP:SETup:STORe

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:STORe "<file name>"

This command stores the current state into a designated file name.

Key Entry **Store To File**

Remarks You can recall a saved state from signal generator memory (non-volatile) by executing the following commands (using a designated file name):

For downlink, refer to “[:LINK:DOWN:SETup](#)” on page 348.

For uplink, refer to “[:LINK:UP:SETup](#)” on page 363.

Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:LINK:UP:SETup:TABLE:APPLy

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:APPLy

This command applies the signal based on the current values in the W-CDMA channel setup table editor.

Key Entry **Apply Channel Setup**

Remarks Refer to “[File Name Variables](#)” on page 13 for information on the file name syntax.

:LINK:UP:SETup:TABLE:CHANnel

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:CHANnel
INIT|APPend|<chan_num>,<chan_type>,<symbol_rate>,<spread_code>,<power>,
<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 364.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

:LINK:UP:SETup:TABLE:GUNit

Supported E4438C with Option 400

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:GUNit DB|LINear|INDEX
[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:GUNit?

This command selects the uplink power measurement units.

DB The power is set in decibels-exponential.

LINear The power is set to increase linearly.

INDEX The power is set at an index level - steps.

***RST** DB

Key Entry Gain Unit dB Lin Index

Remarks If the parameter set by this command is changed while the signal is active, the apply command must be executed for the change to occur. Refer to “[“:LINK:UP:SETup:TABLE:APPLY” on page 364](#).”

:LINK:UP:SETup:TABLE:NCHannel

Supported E4438C with Option 400

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:UP:SETup:TABLE:NCHannels?

This command queries the setup table for the number of uplink channels.

***RST** 1

:LINK:UP:TFCI

Supported E4438C with Option 400

[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:UP:TFCI ON|OFF|1|0
[:**SOURce**] :RADio:WCDMa:TGPP:ARB:LINK:UP:TFCI?

This command enables or disables the transport format combination indicator (TFCI) field for all channels in the table.

***RST** 1

Key Entry 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 302](#).

Use the ALC hold function when you have a waveform signal that incorporates idle periods, or when the increased dynamic range encountered with RF blanking is not desired. The ALC leveling circuitry responds to the marker signal during the marker pulse (marker signal high), averaging the modulated signal level during this period.

The ALC hold function operates during the low periods of the marker signal. The marker polarity determines when the marker signal is high. For a positive polarity, this is during the marker points. For a negative polarity, this is when there are no marker points. For setting a marker’s polarity, see “[“:**MPOLarity:MARKer1|2|3|4**” on page 370](#).

NOTE Do not use the ALC hold for more than 100 ms, because it can affect the waveform’s output amplitude.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the ALC sampling to begin.

The ALC hold setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE	A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings.
-------------	---

For more information on the marker ALC hold function, see the *E4428C/38C ESG Signal Generators User's Guide*. For setting the marker points, see “[“:**MARKer**:\[SET\]” on page 302](#).

NONE This terminates the marker ALC hold function.

M1–M4 These are the marker choices. The ALC hold feature uses only one marker at a time.

***RST** **NONE**

Example

:RAD:AWGB:ARB:MDES:ALCH M1

The preceding example routes marker 1 to the ALC Hold function.

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Remarks N/A

:MDESTination:PULSe

Supported E4438C with Option 400

CAUTION	The pulse function uses the ALC hold. Incorrect automatic level control (ALC) sampling can create a sudden 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 370.

NOTE	Set marker points prior to using this function. Enabling this function without setting marker points may create a continuous low or high marker signal, depending on the marker polarity. This causes either no RF output or a continuous RF output. See “ :MARKer:[SET] ” on page 302 for setting the marker points.
-------------	---

The marker signal has a minimum of a two-sample delay in its response relative to the waveform signal response. To compensate for the marker signal delay, offset marker points from the waveform sample point at which you want the RF blanking to begin. The RF blanking setting is part of the file header information, so saving the setting to the file header saves the current marker routing for the waveform file.

NOTE	A waveform file that has unspecified settings in the file header uses the previous waveform's routing settings. This could create the situation where there is no RF output signal, because the previous waveform used RF blanking.
-------------	---

For more information on the marker RF blanking function, see the *E4428C/38C ESG Signal Generators User’s Guide*.

NONE This terminates the marker RF blanking/pulse function.

M1–M4 These are the marker choices. The RF blanking/pulse feature uses only one marker at a time.

Example

`:RAD:ARB:MDES:PULS M2`

The preceding example routes marker 2 to Pulse/RF Blanking.

***RST** NONE

Key Entry **None** **Marker 1** **Marker 2** **Marker 3** **Marker 4**

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

: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** +1.0000000E+007

Range 2.5E5–1E8

Remarks The value specified by this command is effective only when you are using an external ARB reference applied to the BASEBAND GEN REF IN rear panel connector.

To specify external as the ARB reference source type, refer to
[“:REFerence\[:SOURce\]” on page 370](#).

:REFerence[:SOURce]

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:REFerence[:SOURce] INTernal|EXTernal
[:SOURce] :RADio:WCDMa:TGPP:ARB:REFerence[:SOURce]?

This command selects either an internal or external reference for the waveform clock.

***RST** 0

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 370 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.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

: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** +1.0000000E+008

Range 1–1E8

Key Entry **ARB Sample Clock**

Remarks The modulation format should be active before executing this command. If this command is executed before the modulation format is active, the entered value will be overridden by a calculated factory default value. Refer to “[**:STATe**]” on page 378 to activate the modulation format.

:TRIGger:TYPE

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:TRIGger:TYPE CONTinuous|SINGLE|GATE

[:SOURce] :RADio:WCDMa:TGPP:ARB:TRIGger:TYPE?

This command sets the trigger mode (type) that controls the waveform’s playback.

Triggers control the playback by telling the ESG when to play the modulating signal (waveform). Depending on the trigger settings for the ESG, the waveform playback can occur once, continuously, or the ESG may start and stop playing the waveform repeatedly (GATE mode).

A trigger signal comprises both positive and negative signal transitions (states), which are also called high and low periods. You can configure the ESG to trigger on either state of the trigger signal. It is common to have multiple triggers, also referred to as trigger occurrences or events, occur when the signal generator requires only a single trigger. In this situation, the ESG recognizes the first trigger and ignores the rest.

When you select a trigger mode, you may lose the signal (carrier plus modulating) from the RF output until you trigger the waveform. This is because the ESG sets the I and Q signals to zero volts prior to the first trigger event, which suppresses the carrier. After the first trigger event, the waveform’s final I and Q levels determine whether you will see the carrier signal or not (zero = no carrier, other values = carrier visible). At the end of most files, the final I and Q points are set to a value other than zero.

There are four parts to configuring the trigger:

- Choosing the trigger type, which controls the waveform’s transmission.
- Setting the waveform’s response to triggers:
 - CONTinuous, see “[:TRIGger:TYPE:CONTinuous\[:TYPE\]](#)” on page 374
 - SINGle, see “[:RETRigger](#)” on page 371
 - GATE, selecting the mode also sets the response
- Selecting the trigger source (see “[:TRIGger\[:SOURce\]](#)” on page 375), which determines how the ESG receives its trigger signal, internally or externally. The GATE choice requires an external trigger.
- Setting the trigger polarity when using an external source:
 - CONTinuous and SINGle see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 377
 - GATE, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 374

For more information on triggering, see the *E4428C/38C ESG Signal Generators User’s Guide*.

The following list describes the trigger type command choices:

CONTinuous	Upon triggering, the waveform repeats continuously.
SINGle	Upon triggering, the waveform segment or sequence plays once.
GATE	An external trigger signal repeatedly starts and stops the waveform’s playback (transmission). The time duration for playback depends on the duty period of the trigger signal and the gate polarity selection (see “ :TRIGger:TYPE:GATE:ACTive ” on page 374). The waveform plays during the inactive state and stops during the active polarity selection state. The active state can be set high or low. The gate mode works only with an external trigger source.

NOTE The ARB gating behavior described above is opposite to the gating behavior for real-time custom mode.

*RST	CONT
Key Entry	Continuous Single Gated

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

:TRIGger:TYPE:CONTinuous[:TYPE]

Supported E4438C with Option 400

[**:SOURce**] :RADio:WCDMa:TGPP:ARB:TRIGger:CONTinuous[:TYPE] FREE |

TRIGger | RESet

[**:SOURce**] :RADio:WCDMa:TGPP:ARB:TRIGger:CONTinuous[:TYPE]?

This command selects the waveform’s response to a trigger signal while using the continuous trigger mode.

For more information on triggering and to select the continuous trigger mode, see “[“:TRIGger:TYPE” on page 372](#)”.

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

FREE Turning the ARB format on immediately triggers the waveform. The waveform repeats until you turn the format off, select another trigger, or choose another waveform file.

TRIGger The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously until you turn the format off, select another trigger, or choose another waveform file.

RESet The waveform waits for a trigger before play begins. When the waveform receives the trigger, it plays continuously. Subsequent triggers reset the waveform to the beginning. For a waveform sequence, this means to the beginning of the first segment in the sequence.

***RST** FREE

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 372](#)”.

The following list describes the ESG’s gating behavior for the polarity selections:

LOW	The waveform playback stops when the trigger signal goes low (active state) and restarts when the trigger signal goes high (inactive state).
HIGH	The waveform playback stops when the trigger signal goes high (active state) and restarts when the trigger signal goes low (inactive state).
*RST	HIGH
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 372. 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 377.

For more information on the connectors and on connecting the cables, see the *E4428C/38C ESG Signal Generators User’s Guide*.

- The trigger signal polarity:
 - gating mode, see “[:TRIGger:TYPE:GATE:ACTive](#)” on page 374
 - continuous and single modes, see “[:TRIGger\[:SOURce\]:EXTernal:SLOPe](#)” on page 377
- The time delay between when the ESG receives a trigger and when the waveform responds to the trigger. There are two parts to setting the delay:
 - setting the amount of delay, see “[:TRIGger\[:SOURce\]:EXTernal:DELay](#)” on page 376
 - turning the delay on, see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATe](#)” on page 376

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

BUS This choice enables triggering over the GPIB or LAN using the *TRG or GET commands or the AUXILIARY INTERFACE (RS-232) using the *TRG command.

Key Entry **Trigger Key** **Bus** **Ext**

:TRIGger[:SOURce]:EXTernal:DELay

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce] :EXTernal:DELay <val>

[:SOURce] :RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce] :EXTernal:DELay?

This command sets the amount of time to delay the ESG’s response to an external trigger.

The delay is a path (time) delay between when the ESG receives the trigger and when it responds to the trigger. For example, configuring a trigger delay of two seconds, causes the ESG to wait two seconds after receipt of the trigger before the ESG plays the waveform.

The delay does not occur until you turn it on (see “[:TRIGger\[:SOURce\]:EXTernal:DELay:STATe](#)” on [page 376](#)). You can set the delay value either before or after turning it on.

For more information on configuring an external trigger source and to select external as the trigger source, see “[:TRIGger\[:SOURce\]](#)” on [page 375](#).

The unit of measurement for the variable <val> is in seconds (nsec–sec).

***RST** +1.00000000E-003

Range 1E-8 to 4E1

Key Entry **Ext Delay Time**

Remarks This command is effective only if an external trigger is selected as the trigger source. Refer to “[:TRIGger\[:SOURce\]](#)” on [page 375](#).

:TRIGger[:SOURce]:EXTernal:DELay:STATe

Supported E4438C with Option 400

[:SOURce] :RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce] :EXTernal:DELay:

STATe ON|OFF|1|0

[:SOURce] :RADio:WCDMa:TGPP:ARB:TRIGger[:SOURce] :EXTernal:DELay:STATe?

This command enables or disables the arbitrary waveform generator’s external trigger delay.

For setting the delay time, see “[\[:TRIGger\[:SOURce\]:EXTernal:DELay\]](#)” on page 376, and for more information on configuring an external source, see “[\[:TRIGger\[:SOURce\]\]](#)” on page 375.

***RST** 0

Key Entry Ext Delay Off On

:TRIGger[:SOURce]:EXTernal:SLOPe

Supported E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:TRIGger[ :SOURce ] :EXTernal:  
SLOPe POSitive|NEGative  
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:TRIGger[ :SOURce ] :EXTernal:SLOPe?
```

This command sets the polarity for an external trigger signal while using the continuous, single triggering mode. To set the polarity for gating, see “[\[:TRIGger:TYPE:GATE:ACTive\]](#)” on page 374.

The POSitive and NEGative selections correspond to the high (positive) and low (negative) states of the external trigger signal. For example, when you select POSitive, the waveform responds (plays) during the high state of the trigger signal. When the ESG receives multiple trigger occurrences when only one is required, the signal generator uses the first trigger and ignores the rest.

For more information on configuring an external trigger source and to select external as the trigger source, see “[\[:TRIGger\[:SOURce\]\]](#)” on page 375.

***RST** NEG

Key Entry Ext Polarity Neg Pos

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

Supported E4438C with Option 400

```
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:TRIGger[ :SOURce ] :EXTernal  
[ :SOURce ] EPT1|EPT2|EPTRIGGER1|EPTRIGGER2  
[ :SOURce ] :RADio:WCDMa:TGPP:ARB:TRIGger[ :SOURce ] :EXTernal[ :SOURce ]?
```

This command selects which PATTERN TRIG IN connection the ESG uses to accept an externally applied trigger signal when external is the trigger source selection.

For more information on configuring an external trigger source and to select external as the trigger source, see “[\[:TRIGger\[:SOURce\]\]](#)” on page 375. For more information on the rear-panel connectors, see the *E4428C/38C ESG Signal Generators User’s Guide*.

Component Test Digital Commands

Wideband CDMA ARB Subsystem—Option 400 ([**:SOURce**]:RADio:WCDMa:TGPP:ARB)

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

of Blocks field, 1071
of Carriers softkey, 283, 285
Points softkey, 57
Skipped Points softkey, 302
ΦM Dev, 197
ΦM Dev Couple Off On, 197
FM ΦM Normal High BW, 192
ΦM Off On, 196
ΦM Path 1 2, 191
ΦM Stop Rate, 194
ΦM Sweep Time, 195
ΦM Tone 2 Amp1 Percent of Peak, 194

Numerics

0.7V,1.4V,1.65V,2.5V softkey, 421
1 DPCH softkey, 348, 353
1.23 MHz softkey, 263
1.25 MHz softkey, 263
1/2 Conv softkey, 1068, 1070, 1163
1/3 Conv softkey, 1068, 1070, 1163
10 msec softkey, 1096
1048576 softkey, 212
10ms Frame Pulse (DRPS11) softkey, 1050, 1052, 1053, 1054, 1055
10ms Frame Pulse (RPS6) softkey
 See wideband CDMA base band generator subsystem keys and fields
12.2 kbps (34.121) softkey, 1033
128QAM softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
131072 softkey, 212
144 kbps (34.121) softkey, 1033
16 1's & 16 0's softkey
 See custom subsystem keys
 See DECT subsystem keys
16 1's & 16 0's softkey (continued)
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
16384 softkey, 212
16-Lvl FSK softkey
 See DECT subsystem keys
 See PHS subsystem keys
16PSK softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
16QAM softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
2 Carriers softkey, 349
2 SR3 Carriers softkey, 248
2.100 MHz softkey, 32, 208, 222, 246, 275, 299, 329, 346, 473
20 msec softkey, 1096
2560 msec softkey, 1096
256QAM softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys

Index

- 256QAM softkey (*continued*)
 See PHS subsystem keys
 See TETRA subsystem keys
262144 softkey, [212](#)
2-Lvl FSK softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
2nd Scr Offset field, [1034](#), [1041](#)
3 Carriers softkey, [230](#), [248](#), [349](#)
3 DPCH softkey, [348](#), [353](#)
3.84MHz chip-clk (DRPS4) softkey, [1050](#), [1052](#),
 [1053](#), [1054](#), [1055](#)
32 1's & 32 0's softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
32 Ch Fwd softkey, [228](#), [231](#)
32768 softkey, [212](#)
32QAM softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
384 kbps (34.121) softkey, [1033](#)
3GPP W-CDMA HSPA SCPI commands, [668](#)
4 1's & 4 0's softkey
 See custom subsystem keys
 See DECT subsystem keys
4 1's & 4 0's softkey (*continued*)
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
4 Carriers softkey, [230](#), [248](#), [349](#)
40 msec softkey, [1096](#)
40.000 MHz softkey, [32](#), [205](#), [208](#), [217](#), [222](#), [241](#),
 [246](#), [270](#), [275](#), [298](#), [327](#), [329](#), [344](#), [346](#),
 [466](#), [473](#)
4-Lvl FSK softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
4QAM softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
5 Channel softkey, [254](#)
524288 softkeys, [212](#)
64 1's & 64 0's softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
64 Ch Fwd softkey, [228](#), [231](#)
64 kbps (34.121) softkey, [1033](#)

- 64QAM softkey
See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
65536 softkey, 212
8 1's & 8 0's softkey
See custom subsystem keys
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
8 Bit Pattern softkey, 465
8 Channel softkey, 254
80 msec softkey, 1096
80ms Frame Pulse (DRPS13) softkey, 1050, 1052, 1053, 1054, 1055
80ms Frame Pulse (RPS20) softkey
See wideband CDMA base band generator subsystem keys and fields
8648A/B/C/D softkey, 156, 158
8656B,8657A/B softkey, 156, 158
8657D NADC softkey, 156, 158
8657D PDC softkey, 156, 158
8657J PHS softkey, 156, 158
8-Lvl FSK softkey
See DECT subsystem keys
See PHS subsystem keys
8PSK softkey
See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
8PSK softkey (continued)
See TETRA subsystem keys
9 Ch Fwd softkey, 228, 231
9 Channel softkey, 247
- A**
- A field softkey
See DECT subsystem keys
A softkey, 1025
abort list/step sweep, 166
Access denied, 116
Access softkey, 802
ACS softkey, 1064
Activate Secure Display softkey, 160
Active softkey, 1061
Actual BER softkey, 1172
Actual BLER field, 1166, 1173
Add Comment To Seq[n] Reg[nn] softkey, 123
Adjust Gain softkey, 437
Adjust Phase softkey, 47
AICH softkey, 1130
AICH Trigger Polarity Pos Neg softkey, 1105
ALC
 BW
 100 Hz, 1 kHz, 10 kHz, 58
 Auto, 58, 59
 Off,On, 58, 59
 ALC BW Normal Narrow, 22
 ALC BW Setting
 Auto, 58, 59
 alc hold markers
 awgn subsystem, 209
 cdma subsystem, 223
 cdma2000 arb subsystem, 257
 dmodulation subsystem, 276
 dual arb subsystem, 305
 multitone subsystem, 330, 331
 wideband CDMA ARB subsystem, 367
 wideband CDMA ARB subsystem, 367
 ALC level, 60
 ALC Off On softkey, 62
 All Down softkey, 1036, 1086
 All softkey, 104, 122
 All Timeslots softkey
 See DECT subsystem keys

Index

- All Timeslots softkey (continued)*
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
- All Up softkey, 1036, 1086
- Alt Amp Delta softkey, 63
- Alt Ampl Off On softkey, 64
- Alt power in field, 1143
- alternate amplitude markers
- awgn arb subsystem, 209
 - cdma subsystem, 222
 - cdma2000 arb subsystem, 257
 - dmodulation subsystem, 276
 - dual arb subsystem, 305
 - multitone arb subsystem, 329
 - multitone subsystem, 329
 - wideband CDMA ARB subsystem, 367
- AM softkeys
- AM Depth, 177
 - AM Depth Couple Off On, 178
 - AM Off On, 177
 - AM Off On softkey, 173
 - AM Path 1 2, 172
 - AM Stop Rate, 174
 - AM Sweep Rate, 175
 - AM Tone 2 Ampl Percent Of Peak, 175
 - AM Tone 2 Rate, 174
- AM wideband, 173
- AM_ADDR softkey, 464
- Ampl softkeys
- Ampl, 49, 66
 - Ampl Offset, 68
 - Ampl Ref Off On, 67
 - Ampl Ref Set, 66
 - Ampl Start, 49, 67
 - Ampl Stop, 49, 68
- Amplitude hardkey, 66, 69
- amplitude modulation subsystem keys
- AM Depth, 177
 - AM Depth Couple Off On, 178
 - AM Off On, 173, 177
 - AM Path 1 2, 172
- amplitude modulation subsystem keys (continued)
- AM Stop Rate, 174
 - AM Sweep Rate, 175
 - AM Tone 2 Ampl Percent Of Peak, 175
 - AM Tone 2 Rate, 174
 - Bus, 176
 - Dual-Sine, 175
 - Ext, 176
 - Ext Coupling DC AC, 173
 - Ext1, 176
 - Ext2, 176
 - Free Run softkey, 176
 - Incr Set, 172, 178
 - Internal, 176
 - Noise, 175
 - Ramp, 175
 - Sine, 175
 - Square, 175
 - Swept-Sine, 175
 - Triangle, 175
 - Trigger Key, 176
- amplitude step, 69
- AMR 12.2 kbps softkey, 1033, 1137
- APCO 25 C4FM softkey
- See* CDMA ARB subsystem keys
 - See* CDMA2000 ARB subsystem keys
 - See* CDMA2000 BBG subsystem keys and fields
 - See* custom subsystem keys
 - See* DECT subsystem keys
 - See* Dmodulation subsystem keys
 - See* EDGE subsystem keys
 - See* GPS subsystem keys
 - See* GSM subsystem keys
 - See* NADC subsystem keys
 - See* PDC subsystem keys
 - See* PHS subsystem keys
 - See* TETRA subsystem keys
 - See* wideband CDMA ARB subsystem keys
 - See* wideband CDMA base band generator subsystem keys and fields
- APCO 25 w/C4FM softkey, 282, 283, 284
- APCO 25 w/C4QPSK softkey, 282, 283, 284
- APCO 25 w/CQPSK softkey, 567
- Apply Channel Setup softkey, 251, 255, 356, 364, 1021, 1075

-
- Apply to Waveform softkey, 300, 302
 Arb AWGN Off On softkey, 214
 ARB Off On softkey, 324
 ARB Reference Ext Int softkey
See AWGN subsystem keys
See bluetooth subsystem keys
See CDMA ARB subsystem keys
See CDMA2000 ARB subsystem keys
See Dmodulation subsystem keys
See dual ARB subsystem keys
See multitone subsystem keys
See wideband CDMA ARB subsystem keys
 ARB Sample Clock softkey, 213, 228, 262, 282, 313, 335, 372, 478
 arbitrary waveform
 runtime scaling, 312, 335
 scaling files, 312
 Atten Hold Off On softkey, 65
 Auto softkey, 58, 59
 automatic leveling control, 62
 Aux I/O Trigger Polarity Pos Neg softkey, 460
 Aux softkey
See sense subsystem keys
 Auxiliary Software Options softkey, 82
 AWGN Off On softkey, 468
 AWGN subsystem keys
 1048576, 212
 131072, 212
 16384, 212
 2.100 MHz, 208
 262144, 212
 32768, 212
 40.000 MHz, 205, 208
 524288, 212
 65536, 212
 Arb AWGN Off On, 214
 ARB Reference Ext Int, 213
 ARB Sample Clock, 213
 Bandwidth, 205
 Clear Header, 206
 I/Q Mod Filter Manual Auto, 208
 I/Q Output Filter Manual Auto, 206
 Marker 1, 209, 210
 Marker 1 Polarity Neg Pos, 212
 Marker 2, 209, 210
 AWGN subsystem keys (*continued*)
 Marker 2 Polarity Neg Pos, 212
 Marker 3, 209, 210
 Marker 3 Polarity Neg Pos, 212
 Marker 4, 209, 210
 Marker 4 Polarity Neg Pos, 212
 Modulator Atten Manual Auto, 207
 Noise Seed Fixed Random, 214
 None, 209, 210
 Reference Freq, 212
 Save Setup To Header, 206
 Through, 205, 208
 Waveform Length, 212
- B**
- B softkey, 999, 1004, 1025
 B1 softkey, 997, 1002
 B2 softkey, 997, 1002
 Bandwidth softkey, 205, 463
 Base Delay Tp-a softkey, 1127
 BBG Chip Clock Ext Int softkey
See wideband CDMA base band generator subsystem keys and fields
 BBG Data Clock Ext Int softkey
See custom subsystem keys
See DECT subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
 BBG Data Clock field, 480
 BBG Ref Ext Int softkey
See custom subsystem keys
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
 BBG1 softkey, 24, 35
 BD_ADDR softkey, 464
 Begin Data Format Pattern Framed softkey
See DECT subsystem keys
See EDGE subsystem keys

Index

- Begin Data Format Pattern Framed softkey
(continued)*
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
- Begin Frame softkey
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
- Begin Timeslot # softkey
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
- BER Display % Exp softkey, 407
- BER field, 1166, 1173
- BER Mode Off On softkey
See sense subsystem keys
- BER softkey, 1168, 1175
- BERT Off On softkey, 457
- BERT Resync Off On softkey, 457
- Beta field, 1079, 1089
- Binary softkey, 94, 124
- binary values, 18
- Bit Count softkey
See sense subsystem keys
- Bit Delay Off On softkey, 459
- Bit Order softkey, 384
- Bit Rate field
See CDMA2000 BBG subsystem keys and fields
- Bit softkey, 94
- BLER field, 1167, 1174
- BLER softkey, 1168, 1175
- Blk Set Size field, 1067
- Blk Size field, 1066, 1162, 1170
- Block Count softkey
See calculate subsystem keys
See sense subsystem keys
- Block Erasure softkey
See sense subsystem keys
- Blocking softkey, 1064
- Bluetooth Off On softkey, 478
- Bluetooth softkey, 567
- bluetooth subsystem keys
2.100 MHz, 473
40.000 MHz, 466, 473
8 Bit Pattern, 465
AM_ADDR, 464
ARB Reference Ext Int, 477
ARB Sample Clock, 478
AWGN Off On, 468
- BD_ADDR, 464
- Bluetooth Off On, 478
- Burst Off On, 464
- Burst Power Ramp, 478
- C/N[1 MHz], 468
- Clear Header, 467
- Clock/Gate Delay, 465
- Continuous PN9, 465
- Drift Deviation, 469
- Freq Drift Type Linear Sine, 470
- Freq Offset, 470
- I/Q Mod Filter Manual Auto, 474
- I/Q Output Filter Manual Auto, 466
- Impairments Off On, 467
- Marker 1, 474, 475
- Marker 1 Polarity Neg Pos, 475
- Marker 2, 474, 475
- Marker 2 Polarity Neg Pos, 476
- Marker 3, 474, 475
- Marker 3 Polarity Neg Pos, 476
- Marker 4, 474, 475
- Marker 4 Polarity Neg Pos, 476
- Mod Index, 471
- Modulator Atten Manual Auto, 472, 473
- Noise Seed, 469
- None, 474, 475
- Packet (DH1), 476
- Reference Freq, 477
- Save Setup To Header, 467

bluetooth subsystem keys (*continued*)
Symbol Timing Err, 472
Through, 466, 473
Truncated PN9, 465
boolean SCPI parameters, 10
boolean, numeric response data, 11
BPSK softkey
See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
Brightness softkey, 86
Build New Waveform Sequence softkey, 313
burst
shape, 115
Burst Envelope Int Ext Off softkey, 22
Burst gate in field, 1144
Burst Gate In Polarity Neg Pos softkey, 130, 131
Burst Off On softkey, 464
Burst Power Ramp softkey, 478
Bus softkey
list trigger source, 54
See amplitude modulation subsystem keys
See CDMA ARB subsystem keys
See CDMA2000 ARB subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See dual ARB subsystem keys
See EDGE subsystem keys
See frequency modulation subsystem keys
See GSM subsystem keys
See low frequency output subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See phase modulation subsystem keys
See PHS subsystem keys
See sense subsystem keys
See TETRA subsystem keys
See trigger subsystem keys
See wideband CDMA ARB subsystem keys

C

C Power field, 1076, 1106
C/N softkey, 505, 517
C/N value field, 1021, 1075, 1105
C/N[1 MHz] softkey, 468
C4FM softkey, 962
calculate subsystem keys
BER Display % Exp, 407
Block Count, 425
Class II RBER, 404, 405
Class Ib RBER, 404, 405
Cycle End, 405
Error Rate, 398, 399, 400, 401, 402, 403
Exceeds Any Limit, 405
Fail Hold, 405
Frame Erasure, 404, 405
No Limits, 399, 402, 403, 405
Pass/Fail Limits, 406
Pass/Fail Off On, 406
Update Display Cycle End Cont, 407
calibration subsystem keys
DCFM/DCFM Cal, 72
Execute Cal, 72, 73
I/Q Calibration, 72
Revert to Default Cal Settings, 73
Start Frequency, 74
Stop Frequency, 74
Carrier Bandwidth softkey, 309
Carrier Phases Fixed Random softkey, 283
Carrier to Noise Ratio softkey, 309
CC softkey, 926, 930, 932
CDL softkey, 894
CDMA ARB subsystem keys
2.100 MHz, 222
3 Carriers, 230
32 Ch Fwd, 228, 231
4 Carriers, 230
40.000 MHz, 217, 222
64 Ch Fwd, 228, 231
9 Ch Fwd, 228, 231
APCO 25 C4FM, 218
ARB Reference Ext Int, 227
ARB Sample Clock, 228
Bus, 235
CDMA Off On, 239

Index

CDMA ARB subsystem keys (*continued*)
 Chip Rate, 216
 Clear Header, 220
 Clip $|I+jQ|$ To, 216
 Clip $|I|$ To, 215
 Clip $|Q|$ To, 215
 Clip At PRE POST FIR Filter, 215
 Clipping Type $|I+jQ|$ $|I|, |Q|$, 216
 Continuous, 233, 263
 CPICH, 357
 Custom CDMA Multicarrier, 230
 Custom CDMA State, 228, 231
 Equal Powers, 229
 Ext, 235
 Ext Delay Off On, 237
 Ext Delay Time, 236
 Ext Polarity Neg Pos, 237
 Filter Alpha, 219
 Filter BbT, 219
 Free Run, 234
 Gate Active Low High, 235
 Gated, 233, 263
 Gaussian, 218
 I/Q Mapping Normal Invert, 221
 I/Q Mod Filter Manual Auto, 222
 I/Q Output Filter Manual Auto, 217
 Immediate, 227
 IS-2000 SR3 DS, 218
 IS-95, 218
 IS-95 Mod, 218
 IS-95 Mod w/EQ, 218
 IS-95 w/EQ, 218
 IS-97 Levels, 229
 Marker 1, 222, 223, 224
 Marker 1 Polarity Neg Pos, 226
 Marker 2, 222, 223, 224
 Marker 2 Polarity Neg Pos, 226
 Marker 3, 222, 223, 224
 Marker 3 Polarity Neg Pos, 226
 Marker 4, 222, 223, 224
 Marker 4 Polarity Neg Pos, 226
 Modulator Atten Manual Auto, 221
 Multicarrier Off On, 228
 None, 222, 223, 224
 Nyquist, 218

CDMA ARB subsystem keys (*continued*)
 Off, 227
 On, 227
 Optimize FIR For EVM ACP, 220
 Oversample Ratio, 226
 Paging, 229
 Patt Trig In 1, 238
 Patt Trig In 2, 238
 Pilot, 228, 229, 231
 Rectangle, 218
 Reference Freq, 226
 Reset & Run, 234
 Reverse, 228
 Root Nyquist, 218
 Save Setup To Header, 220
 Scale to 0dB, 229
 Single, 233, 263
 Store Custom CDMA State, 232
 Store Custom Multicarrier, 231
 Sync, 229
 Through, 217, 222
 Traffic, 229
 Trigger & Run, 234
 Trigger Key, 235
 UN3/4 GSM Gaussian, 218
 User FIR, 218
 Waveform Length, 238
 WCDMA, 218
 CDMA Freq field, 499
 CDMA Off On softkey, 239
 CDMA softkey, 95
CDMA2000 ARB subsystem keys
 1.23 MHz, 263
 1.25 MHz, 263
 2 SR3 Carriers, 248
 2.100 MHz, 246
 3 Carriers, 248
 4 Carriers, 248
 40.000 MHz, 241, 246
 5 Channel, 254
 8 Channel, 254
 9 Channel, 247
 APCO 25 C4FM, 242
 Apply Channel Setup, 251, 255
 ARB Reference Ext Int, 260

CDMA2000 ARB subsystem keys (*continued*)
 ARB Sample Clock, 262
 Bus, 266
 CDMA2000 Off On, 269
 Clear Header, 245
 Clip $|I+jQ|$ To, 241
 Clip $|I|$ To, 240
 Clip $|Q|$ To, 240
 Clip At PRE POST FIR Filter, 240
 Clipping Type $|I+jQ|$ $|I|, |Q|$, 241
 Config, 252, 255
 Continuous, 263
 Custom CDMA2000 Carrier, 247, 249
 Custom CDMA2000 Multicarrier, 248
 Custom CDMA2000 State, 254
 Edit Channel Setup, 252, 255
 Equal Powers, 253, 256
 Ext, 266
 Ext Delay Off On, 268
 Ext Delay Time, 267
 Ext Polarity Neg Pos, 268
 Filter Alpha, 243
 Filter BbT, 244
 Free Run, 265
 Gate Active Low High, 266
 Gated, 263
 Gaussian, 242
 I/Q Mapping Normal Invert, 247
 I/Q Mod Filter Manual Auto, 246
 I/Q Output Filter Manual Auto, 242
 Immediate, 261
 Insert Row, 252, 255
 IS-2000 SR3 DS, 242
 IS-95, 242
 IS-95 Mod, 242
 IS-95 Mod w/EQ, 242
 IS-95 w/EQ, 242
 Link Forward Reverse, 247
 Marker 1, 257, 258
 Marker 1 Polarity Neg Pos, 260
 Marker 2, 257, 258
 Marker 2 Polarity Neg Pos, 260
 Marker 3, 257, 258
 Marker 3 Polarity Neg Pos, 260
 Marker 4, 257, 258

CDMA2000 ARB subsystem keys (*continued*)
 Marker 4 Polarity Neg Pos, 260
 Modulator Atten Manual Auto, 245, 246
 Multicarrier Off On, 247
 None, 257, 258
 Nyquist, 242
 Off, 261
 On, 261
 Optimize FIR For EVM ACP, 244
 Patt Trig In 1, 269
 Patt Trig In 2, 269
 Pilot, 247, 254
 PN Offset, 252, 255
 Radio Config, 253
 Rate, 252, 255
 Rectangle, 242
 Reference Freq, 260
 Reset & Run, 265
 Root Nyquist, 242
 Save Setup To Header, 245
 Scale to 0dB, 253, 256
 Single, 263
 Spread Rate 1, 247, 254, 262
 Spread Rate 3, 247, 254, 262
 Spreading Type Direct Mcarrier, 247, 263
 SR1 9 Channel, 249
 SR1 Pilot, 249
 SR3 Direct 9 Channel, 249
 SR3 Direct Pilot, 249
 SR3 Mcarrier 9 Channel, 249
 SR3 MCcarrier Pilot, 249
 Store Custom CDMA State, 251, 254
 Store Custom Multicarrier, 249
 Through, 241, 246
 Trigger & Run, 265
 Trigger Key, 266
 UN3/4 GSM Gaussian, 242
 User FIR, 242
 Walsh Code, 252, 255
 WCDMA, 242
 CDMA2000 BBG subsystem keys and fields
 APCO 25 C4FM, 481, 514
 BBG Data Clock, 480
 Bit Rate, 488, 492, 497, 511, 521, 523, 527, 532,
 537, 541, 544

Index

- CDMA2000 BBG subsystem keys and fields
(continued)
C/N, 505, 517
CDMA Freq, 499
CDMA2000 Off On, 547
Change, 509
Chip Rate, 480, 513
DAYLT, 499
EbNo, 484, 489, 495, 500, 506, 509, 519, 525, 527, 531, 536, 539, 542
EcNo, 493, 528, 533
Equal Powers, 508, 517
Even Second Delay, 480, 513
Ext, 483, 494, 522
Ext CDMA Freq, 500
External, 512
Falling, 547
Field 1, 490
Field 2, 490
Field 3, 491
Filter Alpha, 482, 515
Filter BbT, 482, 485, 515
FIX4, 483, 484, 494, 518, 519, 522, 524, 525, 530, 535, 539, 542
Frame Length, 520, 522, 526, 536, 540, 543
Frame Offset, 495, 520, 523, 526, 531, 536, 540, 543
FSYNCH Type, 504
Full, 529, 534
Gaussian, 481, 514
Half, 529, 534
Header, 486, 496
Internal, 512
Inverted, 517
IS-95, 481, 514
IS-95 MOD, 514
IS-95 Mod, 481
IS-95 MOD w/EQ, 514
IS-95 Mod w/EQ, 481
IS-95 w/EQ, 481, 514
Leap Seconds, 501
Link Forward Reverse, 479
Long Code Mask, 516
Long Code State, 483, 516
LTM OFF, 501
- CDMA2000 BBG subsystem keys and fields
(continued)
Message Type, 502
Network ID, 502
Noise Off On, 506, 518
Normal, 517
Nyquist, 481, 514
Optimize FIR For EVM ACP, 482, 516
P Rev, 503
P Rev Min, 501
Paging Indicator, 510
Permuted ESN, 486, 496
Phase Polarity, 509
PN Offset, 512
PN15, 483, 494, 518, 522, 524, 530, 535, 538, 542
PN9, 483, 494, 518, 522, 524, 530, 535, 538, 542
Power, 486, 491, 493, 497, 502, 507, 510, 520, 523, 526, 529, 532, 534, 537, 540, 544
PRAT, 503
QOF, 487, 497
Quarter, 529, 534
Radio Config, 488, 498, 521, 524, 532, 537, 541, 544
RadioConfig 1/2 Access, 479
RadioConfig 1/2 Traffic, 479
RadioConfig 3/4 Common Control, 479
RadioConfig 3/4 Enhanced Access, 479
RadioConfig 3/4 Traffic, 479
Ramp, 487
Ramp Time, 487
Rectangle, 481, 514
Reserved, 503
Rising, 547
Root Nyquist, 481, 514
Scale to 0dB, 508, 517
Spread Rate, 511
State, 492, 494, 499, 505, 508, 511, 521, 524, 528, 530, 533, 535, 538, 541, 545
State field, 489
System ID, 504
Time, 504
Trigger Advance, 546
Turbo Coding, 498, 545
UN3/4 GSM Gaussian, 481, 514

- CDMA2000 BBG subsystem keys and fields
(continued)
- User File, 483, 489, 494, 518, 522, 524, 530, 535, 538, 542
- User FIR, 481, 514
- Walsh, 492, 498, 505, 508, 511, 527, 529, 533, 534, 538, 541, 545
- Walsh field, 488
- CDMA2000 Off On softkey, 269, 547
- CDPD softkey, 282, 283, 284, 567
- CDVCC softkey, 894, 897
- CFN #0 Frame Pulse (RPS10) softkey
- See* wideband CDMA base band generator subsystem keys and fields
- Chan Code field, 1031, 1040
- Chan Code softkey, 1030
- Change field, 509
- Channel Code field, 1090, 1131
- See* wideband CDMA base band generator subsystem keys and fields
- Channel Number softkey, 40
- Channel softkey, 356, 364
- Channel State field, 1089, 1096
- Channel State Off On softkey, 1108
- See* wideband CDMA base band generator subsystem keys and fields
- ChCode Ctl field, 1121
- ChCode Dat field, 1121
- Chip Clock (RPS1) softkey
- See* wideband CDMA base band generator subsystem keys and fields
- Chip Rate field, 480, 513, 1030, 1079
- Chip Rate softkey, 216, 342
- Class Ib Bit Error softkey, 451, 452
- Class II Bit Error softkey, 452
- Class II RBER softkey, 404, 405
- Class Ib RBER softkey, 404, 405
- Clear Header softkey, 206, 220, 245, 273, 295, 326, 344, 467
- clearing markers, 300
- Clip $|I+jQ|$ To softkey, 216, 241
- Clip $|I|$ To softkey, 215, 240, 340, 350
- Clip $|Q|$ To softkey, 215, 240, 340, 351
- Clip At PRE POST FIR Filter, 215
- Clip At PRE POST FIR Filter softkey, 240, 340
- Clip Type $|I+jQ|$ To softkey, 341, 351
- Clipping Type $|I+jQ|$ $|I|, |Q|$ softkey, 216, 241, 294, 341, 351
- Clock Delay Off On softkey, 419
- Clock Per Sample softkey, 380
- Clock Phase softkey, 380
- Clock Polarity Neg Pos softkey, 420
- Clock Polarity softkey, 381
- Clock Rate softkey, 382
- Clock Skew softkey, 383
- Clock Source softkey, 383
- Clock Time Delay softkey, 419
- Clock/Gate Delay softkey, 465
- command tree, SCPI, 6, 7
- Common Mode I/Q Offset softkey, 26
- communication subsystem keys
- Default Gateway, 76
- GPIB Address, 75
- Hostname, 76
- IP Address, 76
- LAN Config, 75
- Meter Address, 77
- Meter Channel A B, 77
- Meter Timeout, 78
- Power Meter, 78
- Reset RS-232, 79
- RS-232 Baud Rate, 79
- RS-232 ECHO Off On, 79
- RS-232 Timeout, 80
- Subnet Mask, 77
- Comp Mode Start Trigger Polarity Neg Pos softkey, 1160
- Comp Mode Start Trigger Polarity Pos Neg softkey, 1062, 1063
- Comp Mode Stop Trigger Polarity Neg Pos softkey, 1160
- Comp Mode Stop Trigger Polarity Pos Neg softkey, 1063
- Compressed Frame (RPS8) softkey
- See* wideband CDMA base band generator subsystem keys and fields
- Compressed Mode Off On softkey, 1159
- Compressed Mode Start Trigger softkey, 1039, 1062, 1160
- Compressed Mode Stop Trigger softkey, 1063, 1160

Index

- Config softkey, [252](#), [255](#)
Configure Cal Array softkey, [20](#)
continuous
 segment advance, [318](#)
Continuous PN9 softkey, [465](#)
Continuous softkey
 dual ARB subsystem keys, [318](#)
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
Copy File softkey, [105](#), [114](#), [124](#)
correction subsystem keys
 Configure Cal Array, [20](#)
 Flatness Off On, [21](#)
 Load From Selected File, [20](#)
 Preset List, [21](#)
 Store To File, [21](#)
CPICH softkey, [357](#)
CRC Size field, [1069](#), [1164](#), [1171](#)
creating a waveform
 sequence, dual ARB, [313](#)
creating a waveform, multitone, [326](#)
CS-1 softkey, [641](#), [642](#), [794](#)
CS-4 softkey, [641](#), [643](#), [798](#)
CSID softkey, [954](#), [972](#)
Ctrl Beta field, [1109](#)
Ctrl Pwr field, [1110](#)
Custom CDMA Multicarrier softkey, [230](#)
Custom CDMA State softkey, [228](#), [231](#)
Custom CDMA2000 Carrier softkey, [247](#), [249](#)
Custom CDMA2000 Multicarrier softkey, [248](#)
Custom CDMA2000 State softkey, [254](#)
Custom Digital Mod State softkey, [283](#), [284](#)
Custom Off On softkey, [572](#)
Custom softkey, [589](#), [600](#), [656](#), [802](#), [957](#)
custom subsystem keys
 128QAM, [564](#)
 16 1's & 16 0's, [557](#)
 16PSK, [564](#)
 16QAM, [564](#)
 256QAM, [564](#)
 2-Lvl FSK, [564](#)
 32 1's & 32 0's, [557](#)
 32QAM, [564](#)
 4 1's & 4 0's, [557](#)
 4-Lvl FSK, [564](#)
 4QAM, [564](#)
 64 1's & 64 0's, [557](#)
 64QAM, [564](#)
 8 1's & 8 0's, [557](#)
 8PSK, [564](#)
 APCO 25 C4FM, [561](#)
 APCO 25 w/CQPSK, [567](#)
 BBG Data Clock Ext Int, [549](#)
 BBG Ref Ext Int, [560](#)
 Bit Rate, [550](#)
 Bluetooth, [567](#)
 BPSK, [564](#)
 Bus, [569](#)
 CDPD, [567](#)
 Continuous, [567](#)
 Custom Off On, [572](#)
 D8PSK, [564](#)
 Diff Data Encode Off On, [559](#)
 Ext, [557](#), [569](#)
 Ext BBG Ref Freq, [560](#)
 Ext Data Clock Normal Symbol, [559](#)
 Ext Delay Bits, [570](#)
 Ext Delay Off On, [570](#)
 Ext Polarity Neg Pos, [571](#)
 Fall Delay, [552](#), [553](#)
 Fall Time, [552](#), [553](#)
 Filter Alpha, [548](#)
 Filter BbT, [549](#)
 FIX4, [557](#), [558](#)
 Free Run, [568](#)
 Freq Dev, [563](#)
 Gate Active Low High, [568](#)
 Gated, [567](#)
 Gaussian, [561](#)

custom subsystem keys (*continued*)
 Gray Coded QPSK, 564
 I/Q Scaling, 562
 IS-95, 561
 IS-95 Mod, 561
 IS-95 Mod w/EQ, 561
 IS-95 OQPSK, 564
 IS-95 QPSK, 564
 IS-95 w/EQ, 561
 MSK, 564
 None, 567
 Nyquist, 561
 Optimize FIR For EVM ACP, 557
 OQPSK, 564
 π/4 DQPSK, 564
 Patt Trig In 1, 571
 Patt Trig In 2, 571
 Phase Dev, 563
 Phase Polarity Normal Invert, 565
 PN11, 557
 PN15, 557
 PN20, 557
 PN23, 557
 PN9, 557
 PRAM Files, 558
 QPSK, 564
 Rectangle, 561
 Reset & Run, 568
 Rise Delay, 554
 Rise Time, 555, 556
 Root Nyquist, 561
 Single, 567
 Symbol Rate, 565
 Trigger & Run, 568
 Trigger Key, 569
 UN3/4 GSM Gaussian, 561
 User File, 557
 User FIR, 561
 User FSK, 564
 User I/Q, 564
 Custom TS softkey, 645, 655, 793, 800
 Custom WCDMA State softkey, 363
 Cycle Count softkey, 459
 Cycle End softkey, 405

D

D8PSK softkey
See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
 data
 memory subsystem, 105
 data append
 memory subsystem, 106
 Data Beta field, 1113
 data bit, 107
 data block, 114
 Data Clock Out Neg Pos softkey, 133
 Data Clock Polarity Neg Pos softkey, 130, 132, 134
 Data field, 1091, 1175
 data files, 105
 data FSK, 109
 data IQ, 110
 Data Mode Raw Enc TLM softkey, 763, 764
 Data Out Polarity Neg Pos softkey, 133, 135
 Data Polarity Neg Pos softkey, 131, 132, 420
 Data Pwr field, 1115
 Data Rate field, 1041
 data subsystem keys
 Error Out, 413
 PN9, 413
 Reference Out, 413
 Data Type softkey, 392
 DATA/CLK/SYNC Rear Outputs Off On softkey, 135
 DAYLT field, 499
 dBm softkey, 170
 dBuV softkey, 170
 dBuVemf softkey, 170
 DC softkey, 189
 DCFM/DCFM Cal softkey, 72
 DCH1 softkey, 1077
 DCH2 softkey, 1077
 DCH3 softkey, 1077

Index

- DCH4 softkey, 1077
DCH5 softkey, 1077
DCH6 softkey, 1077
decimal values, 18
Dect Off On softkey, 621
DECT softkey, 282, 283, 284
DECT subsystem keys
 128QAM, 588
 16 1's & 16 0's, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 16-Lvl FSK, 582
 16PSK, 588
 16QAM, 588
 256QAM, 588
 2-Lvl FSK, 588
 32 1's & 32 0's, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 32QAM, 588
 4 1's & 4 0's, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 4-Lvl FSK, 588
 4QAM, 588
 64 1's & 64 0's, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 64QAM, 588
 8 1's & 8 0's, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 8-Lvl FSK, 582
 8PSK, 588
A field, 590, 593, 596, 598, 601, 602, 603, 606, 608, 610
All Timeslots, 614
APCO 25 C4FM, 585
BBG Data Clock Ext Int, 573
BBG Ref Ext Int, 584
Begin Frame, 614
Begin Timeslot #, 614, 615
Bit Rate, 574
BPSK, 588
Bus, 613, 618
Continuous, 616
Custom, 589, 600
D8PSK, 588
Data Format Pattern Framed, 581
Dect Off On, 621
DECT subsystem keys (*continued*)
 DM0, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 DM1, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 Dummy Bearer 1, 600
 Dummy Bearer 2, 600
 Ext, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611, 613, 618
 Ext Data Clock Normal Symbol, 584
 Ext Delay Bits, 619
 Ext Delay Off On, 621
 Ext Polarity Neg Pos, 620
 FACC, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 Fall Delay, 576, 577
 Fall Time, 576, 577
 FDEV1_FS, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 FDEV1_HS, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 FDEV2_FS, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 Filter Alpha, 573
 Filter BbT, 574
 FIX4, 582, 589, 590, 592, 595, 597, 599, 600, 601, 604, 605, 607, 608, 609, 610, 611, 612
 Free Run, 617
 Freq Dev, 586
 Gate Active Low High, 618
 Gated, 616
 Gaussian, 585
 Gray Coded QPSK, 588
 I/Q Scaling, 586
 IS-95, 585
 IS-95 Mod, 585
 IS-95 Mod w/EQ, 585
 IS-95 OQPSK, 588
 IS-95 QPSK, 588
 IS-95 w/EQ, 585
 Low Capacity, 589, 600
 Low Capacity with Z field, 589, 600
 MSK, 588
 Nyquist, 585
 Optimize FIR For EVM ACP, 581

- DECT subsystem keys (*continued*)
 OQPSK, 588
 P, 591, 594, 596, 598, 602, 603, 604, 606, 608, 610
 $\pi/4$ DQPSK, 588
 Patt Trig In 1, 620
 Patt Trig In 2, 620
 Phase Dev, 587
 Phase Polarity Normal Invert, 588
 PN11, 582, 589, 592, 595, 597, 599, 600, 607, 609, 611
 PN15, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 PN20, 582, 589, 592, 595, 597, 599, 600, 607, 609, 611
 PN23, 582, 589, 592, 595, 597, 599, 600, 607, 609, 611
 PN9, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 PN9 Mode Normal Quick, 575
 QPSK, 588
 Recall Secondary Frame State, 612
 Rectangle, 585
 Reset & Run, 617
 Restore DECT Factory Default, 583
 Rise Delay, 578
 Rise Time, 579, 580
 Root Nyquist, 585
 S, 591, 594, 596, 598, 602, 603, 604, 607, 609, 611
 Save Secondary Frame State, 612
 Secondary Frame Off On, 613
 Sine, 556, 580
 Single, 616
 Sync Out Offset, 614
 Timeslot Ampl Main Delta, 593, 605
 Timeslot Off On, 593, 606
 Traffic Bearer, 589, 600
 Traffic Bearer with Z field, 589, 600
 Trigger & Run, 617
 Trigger Key, 613, 618
 UN3/4 GSM Gaussian, 585
 User File, 556, 580, 582, 589, 592, 595, 597, 599, 600, 604, 607, 609, 611
 User FIR, 585
 User FSK, 587, 588
 User I/Q, 588
 dect subsystem keys
 PRAM File, 583
 DECTsubsystem keys
 Symbol Rate, 615
 Default Gateway softkey, 76
 Delay Bits softkey, 459
 Delete All NVWFM Files softkey, 125
 Delete All WFM Files softkey, 125
 Delete All WFM1 Files softkey, 125
 Delete File softkey, 126
 Delete softkeys
 Delete All ARB CDMA Files, 118
 Delete All ARB DMOD Files, 118
 Delete All ARB DWCDMA Files, 119
 Delete All ARB FCDMA Files, 119
 Delete All ARB MCDMA Files, 120
 Delete All ARB MDMOD Files, 120
 Delete All ARB MDWCDMA Files, 120
 Delete All ARB MFCDMA Files, 120
 Delete All ARB MTONE Files, 121
 Delete All ARB RCDMA Files, 121
 Delete All ARB UWCDMA Files, 122
 Delete All Binary Files, 118
 Delete All Bit Files, 118
 Delete All Files, 117
 Delete All FIR Files, 119
 Delete All FSK Files, 119
 Delete All I/Q Files, 119
 Delete All List Files, 120
 Delete All SEQ Files, 121
 Delete All SHAPE Files, 121
 Delete All State Files, 121
 Delete All UFLT Files, 122
 Delete File, 122
 DHCP, 75
 Diagnostic Info softkey, 81, 82, 83, 84, 89
 diagnostic subsystem keys
 Auxiliary Software Options, 82
 Diagnostic Info, 81, 82, 83, 84
 Installed Board Info, 81
 Options Info, 83
 diagnostic subsystem softkeys
 Waveform Licenses, 82, 84
 Diff Data Encode Off On softkey, 559, 784
 Diff. Mode I Offset softkey, 26

Index

- Diff. Mode Q Offset softkey, 27
Digital Modulation Off On softkey, 293
digital modulation subsystem keys
 2.100 MHz, 32
 40.000 MHz, 32
 ALC BW Normal Narrow, 22
 BBG1, 24, 35
 Burst Envelope Int Ext Off, 22
 Common Mode I/Q Offset, 26
 Diff. Mode I Offset, 26
 Diff. Mode Q Offset, 27
 Ext 50 Ohm, 24, 35
 Ext 600 Ohm, 24, 35
 Ext In 600 Ohm I Offset, 27
 Ext In 600 Ohm Q Offset, 28
 High Crest Mode Off On, 23
 I Offset, 29
 I/Q Adjustments Off On, 32
 I/Q Gain Balance Source 1, 29
 I/Q Mod Filter Manual Auto, 33
 I/Q Off On, 37
 I/Q Out Gain Balance, 27
 I/Q Output Atten, 28
 I/Q Timing Skew, 31
 I/Q Timing Skew Path softkey, 32
 Int I/Q Skew Corrections RF BB Off, 35
 Int Phase Polarity Normal Invert, 24, 34
 Modulator Atten Manual Auto, 33, 34
 Off, 24, 35
 Q Offset, 30
 Quadrature Angle Adjustment, 25, 30
 Sum, 24
 Summing Ratio (SRC1/SRC2) x.xx dB, 36
 Through, 32
digital signal interface module, 380
digital subsystem softkeys, 387
 Bit Order, 384
 Clock Per Sample, 380
 Clock Phase, 380
 Clock Polarity, 381
 Clock Rate, 382
 Clock Skew, 383
 Clock Source, 383
 Data Type, 392
 Direction, 385
digital subsystem softkeys, 387 (*continued*)
 Frame Polarity, 387
 I Gain, 385
 I Offset, 386
 IQ Polarity, 388
 Logic Type, 393
 Loop Back Test Type, 393
 N5102A Off On, 395
 Negate I, 386
 Negate Q, 389
 Pass Through Preset, 395
 Port Config, 394
 Q Gain, 388
 Q Offset, 390
 Reference Frequency, 382
 Rotation, 390
 Scaling, 391
 Signal Type, 392
 Swap IQ, 387
 Word Alignment, 384
 Word Size, 391
Direction softkey, 385
discrete response data, 11
discrete SCPI parameters, 9
display
 secure mode, 160
display contrast hardkeys, 86
display subsystem keys
 Brightness, 86
 display contrast, 86
 Inverse Video Off On, 87
 Update in Remote Off On, 87
DL Reference 1.1 softkey, 1158
 wideband CDMA base band generator subsystem
 softkeys
 DL Reference 1.1, 1061
DL Reference 1.2 softkey, 1158
 wideband CDMA base band generator subsystem
 softkeys
 DL Reference 1.2, 1061
DL Reference 2.1 softkey, 1158
 wideband CDMA base band generator subsystem
 softkeys
 DL Reference 2.1, 1061

-
- DL Reference 2.2 softkey, 1158
 wideband CDMA base band generator subsystem
 softkeys
 DL Reference 2.2, 1061
 DM0 softkey
 See DECT subsystem keys
 DM1 softkey
 See DECT subsystem keys
 DMOD softkey, 95
 Dmodulation subsystem keys
 # of Carriers, 283, 285
 128QAM, 279
 16PSK, 279
 16QAM, 279
 2.100 MHz, 275
 256QAM, 279
 2-Lvl FSK, 279
 32QAM, 279
 40.000 MHz, 270, 275
 4-Lvl FSK, 279
 4QAM, 279
 64QAM, 279
 8PSK, 279
 APCO 25 C4FM, 271
 APCO 25 w/C4FM, 282, 283, 284
 APCO 25 w/C4QPSK, 282, 283, 284
 ARB Reference Ext Int, 281
 ARB Sample Clock, 282
 BPSK, 279
 Bus, 290
 Carrier Phases Fixed Random, 283
 CDPD, 282, 283, 284
 Clear Header, 273
 Continuous, 287
 Custom Digital Mod State, 283, 284
 D8PSK, 279
 DECT, 282, 283, 284
 Digital Modulation Off On, 293
 EDGE, 282, 283, 284
 Ext, 290
 Ext Delay Off On, 291
 Ext Delay Time, 291
 Ext Polarity Neg Pos, 292
 Filter Alpha, 272
 Filter BbT, 272
 Dmodulation subsystem keys (*continued*)
 Free Run, 288
 Freq Dev, 279
 Freq Spacing, 283
 Gate Active Low High, 289
 Gated, 287
 Gaussian, 271
 Gray Coded QPSK, 279
 GSM, 282, 283, 284
 I/Q Mod Filter Manual Auto, 275
 I/Q Output Filter Manual Auto, 270
 Immediate, 281
 Initialize Table, 284
 Insert Row, 249, 284
 IS-2000 SR3 DS, 271
 IS-95, 271
 IS-95 Mod, 271
 IS-95 Mod w/EQ, 271
 IS-95 OQPSK, 279
 IS-95 QPSK, 279
 IS-95 w/EQ, 271
 Load/Store, 284
 Marker 1, 276, 277
 Marker 1 Polarity Neg Pos, 280
 Marker 2, 276, 277
 Marker 2 Polarity Neg Pos, 280
 Marker 3, 276, 277
 Marker 3 Polarity Neg Pos, 280
 Marker 4, 276, 277
 Marker 4 Polarity Neg Pos, 280
 Modulator Atten Manual Auto, 274
 MSK, 279
 Multicarrier Off On, 282
 NADC, 282, 283, 284
 None, 276, 277
 Nyquist, 271
 Off, 281
 On, 281
 Optimize FIR For EVM ACP, 273
 OQPSK, 279
 π/4 DQPSK, 279
 Patt Trig In 1, 292
 Patt Trig In 2, 292
 PDC, 282, 283, 284
 PHS, 282, 283, 284

Index

- Dmodulation subsystem keys (*continued*)
PWT, 282, 283, 284
QPSK, 279
Rectangle, 271
Reference Freq, 212, 280
Reset & Run, 288
Root Nyquist, 271
Save Setup To Header, 273
Select File, 249, 282
Single, 287
Store Custom Dig Mod State, 285
Symbol Rate, 286
TETRA, 282, 283, 284
Through, 270, 275
Trigger & Run, 288
Trigger Key, 290
UN3/4 GSM Gaussian, 271
User FIR, 271
WCDMA, 271
Dn Custom Cont softkey, 1010
Dn Normal Cont softkey, 1010
Dn Normal Disc softkey, 1010
Dn Sync Cont softkey, 1010
Dn Sync Disc softkey, 1010
Do Power Search softkey, 60, 62
documentation, lxxiii
Doppler Shift softkey, 764
Down Custom softkey, 899, 933
Down TCH All softkey, 899, 933
Down TCH softkey, 899, 933
Down/Up softkey, 1036, 1086
Downlink MCS-1 softkey, 641, 643, 794
Downlink MCS-5 softkey, 646
Downlink MCS-9 softkey, 646
downloading files, 116
DPCCH + 1 DPDCH softkey, 363
DPCCH + 2 DPDCH softkey, 363
DPCCH + 3 DPCCH softkey, 363
DPCCH + 4 DPDCH softkey, 363
DPCCH + 5 DPDCH softkey, 363
DPCCH Pilot data-clk (DRPS23) softkey, 1050, 1052, 1053, 1054, 1055
DPCCH Power field, 1083
DPCCH Raw Data (RPS4) softkey
 See wideband CDMA base band generator subsystem keys and fields
DPCCH Raw Data Clock (RPS5) softkey
 See wideband CDMA base band generator subsystem keys and fields
DPCCH softkey, 363, 1077, 1100
DPCCH TFC I data-clk (DRPS22) softkey, 1050, 1052, 1053, 1054, 1055
DPCCH TPC indicator (DRPS21) softkey, 1050, 1052, 1053, 1054, 1055
DPCH + 1 softkey, 1022, 1023
DPCH + 2 softkey, 1022, 1023
DPCH Channel Balance softkey, 1030
DPCH Compressed Frame Indicator (DRPS32) softkey, 1050, 1052, 1053, 1054, 1055
DPCH data stream (DRPS24) softkey, 1050, 1052, 1053, 1054, 1055
DPCH data-clk (0) (DRPS28) softkey, 1050, 1052, 1053, 1054, 1055
DPCH Gap Indicator (DRPS33) softkey, 1050, 1052, 1053, 1054, 1055
DPCH softkey, 357
DPCH TimeSlot pulse (DRPS25) softkey, 1050, 1052, 1053, 1054, 1055
DPCH10ms Frame-Pulse (DRPS26) softkey, 1050, 1052, 1053, 1054, 1055
DPDCH data-clk withDTX (DRPS20) softkey, 1050, 1052, 1053, 1054, 1055
DPDCH data-clk WithOutDTX (DRPS30) softkey, 1050, 1052, 1053, 1054, 1055
DPDCH Power field, 1092
DPDCH Raw Data (RPS2) softkey
 See wideband CDMA base band generator subsystem keys and fields
DPDCH Raw DataClock (RPS3) softkey
 See wideband CDMA base band generator subsystem keys and fields
DPDCH softkey, 1077
Drift Deviation softkey, 469
dual ARB subsystem
 generate sine, 294
 markers, *See* markers
 runtime scaling, 312
 scaling waveform files, 312

dual ARB subsystem (*continued*)

Through, 298

dual ARB subsystem keys

Skipped Points, 302

2.100 MHz, 299

40.000 MHz, 298, 299

Apply to Waveform, 300, 302

ARB Off On, 324

ARB Reference Ext Int, 23, 311

ARB Sample Clock, 313

Build New Waveform Sequence, 313

Bus, 320

Carrier Bandwidth, 309

Carrier to Noise Ratio, 309

Clear Header, 295

Clipping Type $|I+jQ|$ $|I|,|Q|$, 294

Continuous, 318

Edit Repetitions, 313

Ext, 320

Ext Delay, 321

Ext Delay Samples, 321

Ext Delay Time, 322

Ext Polarity Neg Pos, 322

First Mkr Point, 300, 302

Free Run, 317

Gate Active Low High, 317

Gated, 315

Header RMS, 295

I/Q Mod Filter Manual Auto, 300

I/Q Output Filter Manual Auto, 297, 298

Immediate, 311

Insert Waveform, 313

Last Mkr Point, 300, 302

Marker 1, 305

Marker 1 2 3 4, 300

Marker 2, 305

Marker 3, 305

Marker 4, 305

Marker Polarity Neg Pos, 308, 333, 370, 475

Markers, 302, 306

Modulator Atten Manual Auto, 298, 299

Name and Store, 313

Noise Bandwidth Factor, 308

None, 305, 306

Off, 311, 321

dual ARB subsystem keys (*continued*)

On, 311

Patt Trig In 1, 323

Patt Trig In 2, 323

Real-time Noise Off On, 310

Reference Freq, 310

Reset & Run, 317

Samples, 321

Save Setup To Header, 297

Scale Waveform Data, 312

Scaling, 312

Segment Advance, 315

Select Waveform, 323, 324

Set Marker Off All Points, 301

Set Marker Off Range Of Points, 300

Set Marker On Range Of Points, 302

Single, 315, 318

Through, 298, 299

Time, 321

Toggle Marker 1 2 3 4, 313

Trigger & Run, 317

Trigger Key, 320

Waveform Runtime Scaling, 312

Dual-Sine softkey, 175, 182, 189, 195

Dummy Bearer 1 softkey, 600

Dummy Bearer 2 softkey, 600

Dummy softkey, 802

DWCDMA softkey, 96

Dwell Type List Step softkey, 51

E

Eb/No field, 1106

Eb/No value (dB) field, 1076

EbNo field, 506

See CDMA2000 BBG subsystem keys and fields

Ec/No value field, 1022, 1107

EcNo field, 493, 528, 533

EDGE BERT Off On softkey, 442

EDGE Off On softkey, 665

EDGE softkey, 282, 283, 284, 634

EDGE subsystem keys

128QAM, 637

16 1's & 16 0's, 630, 639, 641, 646

16PSK, 637

16QAM, 637

Index

- EDGE subsystem keys (*continued*)
 256QAM, 637
 2-Lvl FSK, 637
 32 1's & 32 0's, 630, 639, 641, 646
 32QAM, 637
 4 1's & 4 0's, 630, 639, 641, 646
 4-Lvl FSK, 637
 4QAM, 637
 64 1's & 64 0's, 630, 639, 641, 646
 64QAM, 637
 8 1's & 8 0's, 630, 639, 641, 646
 8PSK, 637
 All Timeslots, 657
 APCO 25 C4FM, 634
 BBG Ref Ext Int, 633
 Begin Frame, 657
 Begin Timeslot #, 657, 658
 BPSK, 637
 Bus, 638, 662
 Continuous, 660
 CS-1, 641, 642
 CS-4, 641, 643
 Custom, 656
 Custom TS, 645, 655
 D8PSK, 637
 Data Format Pattern Framed, 629
 Downlink MCS-1, 641, 643
 Downlink MCS-5, 646
 Downlink MCS-9, 646
 EDGE, 634
 EDGE Off On, 665
 E-TCH/F43.2, 646
 Ext, 630, 638, 639, 646, 662
 Ext BBG Ref Freq, 633
 Ext Data Clock Ext Int, 622
 Ext Data Clock Normal Symbol, 632
 Ext Delay Bits, 663
 Ext Delay Off On, 664
 Ext Polarity Neg Pos, 664
 Fall Delay, 623, 624
 Fall Time, 625
 Filter Alpha, 622
 Filter BbT, 623
 FIX4, 630, 631, 639, 640, 641, 643, 646, 652
 Free Run, 660
- EDGE subsystem keys (*continued*)
 Freq Dev, 635
 G, 640, 654
 Gate Active Low High, 661
 Gated, 660
 Gaussian, 634
 GMSK, 656
 Gray Coded QPSK, 637
 I/Q Scaling, 635
 IS-95, 634
 IS-95 Mod, 634
 IS-95 Mod w/EQ, 634
 IS-95 OQPSK, 637
 IS-95 QPSK, 637
 IS-95 w/EQ, 634
 MSK, 637
 Multislot Off On, 646
 Normal, 656
 Normal All, 656
 Nyquist, 634
 Optimize FIR For EVM ACP, 630
 OQPSK, 637
 π/4 DQPSK, 637
 Patt Trig In 1, 665
 Patt Trig In 2, 665
 Phase Dev, 636
 Phase Polarity Normal Invert, 637
 PN11, 630, 639, 646
 PN15, 630, 639, 641, 642, 643, 644, 646, 650, 651, 652, 653
 PN20, 630, 639, 646
 PN23, 630, 639, 646
 PN9, 630, 639, 641, 642, 643, 644, 646, 650, 651, 652, 653
 QPSK, 637
 Recall Secondary Frame State, 638
 Rectangle, 634
 Reset & Run, 660
 Restore EDGE Factory Default, 632
 Rise Delay, 626, 627
 Rise Time, 627, 628
 Root Nyquist, 634
 S, 645
 Save Secondary Frame State, 638
 Secondary Frame Off On, 639

EDGE subsystem keys (*continued*)

- Sine, [629](#)
- Single, [660](#)
- Symbol Rate, [658](#)
- Sync Out Offset, [657](#)
- T1, [654](#)
- T2, [655](#)
- TCH/FS, [641](#), [644](#)
- Timeslot Ampl Main Delta, [655](#)
- Timeslot Off On, [656](#)
- Trigger & Run, [660](#)
- Trigger Key, [638](#), [662](#)
- TSC0, [645](#), [655](#)
- TSC1, [645](#), [655](#)
- TSC2, [645](#), [655](#)
- TSC3, [645](#), [655](#)
- TSC4, [645](#), [655](#)
- TSC5, [645](#), [655](#)
- TSC6, [645](#), [655](#)
- TSC7, [645](#), [655](#)
- UN3/4 GSM Gaussian, [634](#)
- Uncoded, [646](#)
- Uplink MCS-1, [641](#), [644](#)
- Uplink MCS-5, [646](#)
- Uplink MCS-9, [646](#)
- User File, [629](#), [630](#), [639](#), [641](#), [646](#)
- User FIR, [634](#)
- User FSK, [636](#), [637](#)
- User I/Q, [636](#), [637](#)
- edge subsystem keys
 - PRAM File, [631](#)
 - Edit Channel Setup softkey, [252](#), [255](#)
 - Edit Repetitions softkey, [313](#)
 - Enter Secure Mode softkey, [162](#)
 - Equal Energy per Symbol softkey, [361](#)
 - Equal Powers softkey
 - See* CDMA ARB subsystem keys
 - See* CDMA2000 ARB subsystem keys
 - See* CDMA2000 BBG subsystem keys and fields
 - See* wideband CDMA base band generator subsystem keys and fields
 - Erase All softkey, [161](#)
 - Erase and Overwrite All softkey, [163](#)
 - Erase and Sanitize All softkey, [163](#)
 - Erase softkey, [161](#)
- ERROR
 - 221, [116](#)
 - Error BER softkey, [1172](#)
 - Error Bits softkey, [1165](#)
 - Error Blocks field, [1166](#)
 - Error Count softkey, [442](#)
 - See* sense subsystem keys
 - Error Info softkey, [155](#)
 - error messages, resolving, [670](#), [814](#)
 - Error Out softkey, [413](#)
 - Error Rate softkey
 - See* calculate subsystem keys
 - See* calculate subsystem keys
 - ESG file overview, [668](#), [812](#)
 - ET softkey, [792](#)
 - E-TCH/F43.2 softkey, [646](#)
 - Even Second Delay field, [480](#), [513](#)
 - Exceeds Any Limit softkey, [405](#)
 - Exceeds Any Thresholds softkey
 - See* sense subsystem keys
 - Execute Cal softkey, [72](#), [73](#)
 - Ext 50 Ohm softkey, [24](#), [35](#)
 - Ext 600 Ohm softkey, [24](#), [35](#)
 - Ext BBG Ref Freq softkey
 - See* custom subsystem keys
 - See* EDGE subsystem keys
 - See* GSM subsystem keys
 - See* NADC subsystem keys
 - See* PDC subsystem keys
 - See* PHS subsystem keys
 - See* TETRA subsystem keys
 - Ext CDMA Freq field, [500](#)
 - Ext Clock Rate x1 x2 x4 softkey, [1020](#)
 - Ext Data Clock Ext Int softkey
 - See* EDGE subsystem keys
 - See* PDC subsystem keys
 - Ext Data Clock Normal Symbol softkey
 - See* custom subsystem keys
 - See* DECT subsystem keys
 - See* EDGE subsystem keys
 - See* GSM subsystem keys
 - See* NADC subsystem keys
 - See* PDC subsystem keys
 - See* PHS subsystem keys
 - See* TETRA subsystem keys

Index

- Ext Delay Bits softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
- Ext Delay Off On softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
- Ext Delay Samples softkey, [321](#)
- Ext Delay softkey, [321](#)
- Ext Delay Time softkey, [236](#), [267](#), [291](#), [322](#), [376](#)
- Ext Frame Trigger Delay softkey, [427](#)
- Ext In 600 Ohm I Offset softkey, [27](#)
- Ext In 600 Ohm Q Offset softkey, [28](#)
- Ext Polarity Neg Pos softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
- Ext softkey
 List/Sweep subsystem, [54](#)
 See amplitude modulation subsystem keys
- Ext softkey (continued)*
- See* CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See frequency modulation subsystem keys
 See GSM subsystem keys
 See low frequency output subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See phase modulation subsystem keys
 See PHS subsystem keys
 See sense subsystem keys
 See TETRA subsystem keys
 See trigger subsystem keys
 See wideband CDMA ARB subsystem keys
 See wideband CDMA base band generator subsystem keys and fields
- Ext softkeys
 Ext Coupling DC AC, [173](#), [180](#), [193](#)
 Ext Detector, [63](#)
 Ext Pulse, [202](#)
 Ext1, [176](#), [184](#), [196](#)
 Ext2, [176](#), [184](#), [196](#)
- extended numeric SCPI parameter, [8](#)
- External Frame Trigger Polarity Neg Pos softkey, [427](#)
- External softkey, [512](#)
- F**
- FACC softkey
 See DECT subsystem keys
- Fail Hold softkey, [405](#)
- Fall Delay softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys

Fall Delay softkey (continued)

See TETRA subsystem keys

Fall Time softkey

See custom subsystem keys

See DECT subsystem keys

See EDGE subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

See TETRA subsystem keys

Falling softkey, 547

FBI State field, 1082

FCDMA softkey, 96

FCOR softkey, 999, 1004

FCorr softkey, 802

FDEV1_FS softkey

See DECT subsystem keys

FDEV1_HS softkey

See DECT subsystem keys

FDEV2_FS softkey

See DECT subsystem keys

Field 1 field, 490

Field 2 field, 490

Field 3 field, 491

file

names, 105

retrieval, 116

systems, 14

types, 14

file overview, HDSPA, 812

file overview, HSPA, 668

Filter Alpha softkey, 1098

See CDMA ARB subsystem keys

See CDMA2000 ARB subsystem keys

See CDMA2000 BBG subsystem keys and fields

See custom subsystem keys

See DECT subsystem keys

See Dmodulation subsystem keys

See EDGE subsystem keys

See GPS subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

Filter Alpha softkey, 1098 (continued)

See TETRA subsystem keys

See wideband CDMA ARB subsystem keys

See wideband CDMA base band generator subsystem keys and fields

Filter BbT softkey, 1099

See CDMA ARB subsystem keys

See CDMA2000 ARB subsystem keys

See CDMA2000 BBG subsystem keys and fields

See custom subsystem keys

See DECT subsystem keys

See Dmodulation subsystem keys

See EDGE subsystem keys

See GPS subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

See TETRA subsystem keys

See wideband CDMA ARB subsystem keys

See wideband CDMA base band generator subsystem keys and fields

FIR data, 108

FIR softkey, 97

First Mkr Point softkey, 300, 302

First Spread Code softkey, 356, 364

FIX softkey, 1082

FIX4 softkey, 643, 1081, 1110, 1114

See CDMA2000 BBG subsystem keys and fields

See custom subsystem keys

See DECT subsystem keys

See EDGE subsystem keys

See GPS subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

See TETRA subsystem keys

See wideband CDMA baseband generator subsystem keys and fields

Flat Noise BW field, 1077

Flatness Off On softkey, 21

FM softkeys

FM Dev, 185

FM Dev Couple Off On, 185

Index

- FM softkeys (*continued*)
 FM Off On, 184
 FM Path 1 2, 179
 FM Stop Rate, 181
 FM Sweep Rate, 183
 FM Tone 2 Amp Percent of Peak, 182
 FM Tone 2 Rate, 181
forgiving listening and precise talking, 7
Frame Clock Polarity Neg Pos softkey, 1097
Frame Count softkey
 See sense subsystem keys
Frame Erasure softkey, 452
 See calculate subsystem keys
Frame Length field
 See CDMA2000 BBG subsystem keys and fields
Frame Offset field
 See CDMA2000 BBG subsystem keys and fields
Frame offset field, 536
Frame Polarity softkey, 387
Frame Repeat Single Cont softkey, 891
Frame Struct field, 1057
Frame Sync Trigger Mode Single Cont softkey, 1152
Frame Trigger Source Int Ext softkey, 428
Free Run softkey
 list trigger source, 54
 See amplitude modulation subsystem keys
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See frequency modulation subsystem keys
 See GSM subsystem keys
 See low frequency output subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See phase modulation subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See trigger subsystem keys
 See wideband CDMA ARB subsystem keys
- Freq Dev softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See TETRA subsystem keys
- Freq softkeys
 Freq, 42, 49
 Freq & Ampl, 49
 Freq Channels Off On, 41
 Freq Drift Type Linear Sine, 470
 Freq Multiplier, 42
 Freq Offset, 43, 470
 Freq Ref Off On, 44
 Freq Ref Set, 43
 Freq Spacing, 283, 336, 337
 Freq Start, 44, 49
 Freq Stop, 45, 49
Frequency hardkey, 38, 41, 42, 45, 46
frequency modulation subsystem keys
 Bus, 183
 Dual-Sine, 182
 Ext, 183
 Ext Coupling DC AC, 180
 Ext1, 184
 Ext2, 184
 FM Dev, 185
 FM Dev Couple Off On, 185
 FM Off On, 184
 FM Path 1 2, 179
 FM Stop Rate, 181
 FM Sweep Rate, 183
 FM Tone 2 Amp Percent of Peak, 182
 FM Tone 2 Rate, 181
 Free Run, 183
 Incr Set, 180
 Internal 1, 184
 Internal 2, 184
 Noise, 182
 Ramp, 182
 Sine, 182
 Square, 182

- frequency modulation subsystem keys (*continued*)
 Swept-Sine, 182
 Triangle, 182
 Trigger Key, 183
- frequency subsystem keys
 Adjust Phase, 47
 Channel Number, 40
 Freq, 42, 49
 Freq Channels Off On, 41
 Freq Multiplier, 42
 Freq Offset, 43
 Freq Ref Off On, 44
 Freq Ref Set, 43
 Freq Start, 44, 49
 Freq Stop, 45, 49
 Frequency, 38, 41, 42, 45, 46
 Off, 42, 49
 Phase Ref Set, 47
 Ref Oscillator Source Auto Off On, 48
- FSK softkey, 97
- FSYNCH Type field, 504
- Full softkey, 529, 534
- Function Generator softkey, 190
- G**
- G softkey, 640, 654
- Gain Unit dB Lin Index softkey, 366
- Gate Active Low High softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
- Gate Clk Delay softkey, 416
- Gate Delay Off On softkey, 417
- Gate Mode Time Clk softkey, 416
- Gate Off On softkey, 418
- Gate Polarity Neg Pos softkey, 418
- Gate Time Delay softkey, 417
- Gated softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
- Gaussian softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GPS subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 See wideband CDMA base band generator subsystem keys and fields
- generate sine, 294
- GMSK softkey, 656
- Goto Row softkey, 334
- GPIB Address softkey, 75
- GPS Ref (f0) softkey, 768, 771
- GPS Ref Clk Ext Int softkey, 768, 771
- GPS subsystem
 Data Mode Raw Enc TLM, 764
- GPS subsystem keys
 APCO 25 C4FM, 764
- Data Mode Raw Enc TLM, 763
- Doppler Shift, 764

Index

- GPS subsystem keys (*continued*)
 Filter Alpha, 765
 Filter BbT, 766
 FIX4, 763
 Gaussian, 764
 GPS Ref (f0), 768
 GPS Ref Clk Ext Int, 768
 IQ Phase Normal Invert, 767
 IS-95, 764
 IS-95 Mod, 764
 IS-95 Mod w/EQ, 764
 IS-95 w/EQ, 764
 Nyquist, 764
 Optimize FIR For EVM ACP, 766
 P Code Pwr, 767
 PN15, 763
 PN9, 763
 Ranging Code C/A P C/A+P, 767
 Real-time GPS Off On, 769
 Rectangle, 764
 Root Nyquist, 764
 Satellite ID, 769
 UN3/4 GSM Gaussian, 764
 User File, 763
 User FIR, 764
Gray Coded QPSK softkey
 See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
 See TETRA subsystem keys
GSM BERT Off On softkey, 455
GSM Off On softkey, 811
GSM softkey, 282, 283, 284
GSM subsystem keys
 128QAM, 789
 16 1's & 16 0's, 782, 791, 792, 794, 801
 16PSK, 789
 16QAM, 789
 256QAM, 789
 2-Lvl FSK, 789
GSM subsystem keys (*continued*)
 32 1's & 32 0's, 782, 791, 792, 794, 801
 32QAM, 789
 4 1's & 4 0's, 782, 791, 792, 794, 801
 4-Lvl FSK, 789
 4QAM, 789
 64 1's & 64 0's, 782, 791, 792, 794, 801
 64QAM, 789
 8 1's & 8 0's, 782, 791, 792, 794, 801
 8PSK, 789
 Access, 802
 All Timeslots, 803
 APCO 25 C4FM, 786
 BBG Data Clock Ext Int, 773
 BBG Ref Ext Int, 785
 Begin Frame, 803
 Begin Timeslot #, 803, 804
 Bit Rate, 774
 BPSK, 789
 Bus, 790, 807
 Continuous, 806
 CS-1, 794
 CS-4, 798
 Custom, 802
 Custom TS, 793, 800
 D8PSK, 789
 Data Format Pattern Framed, 781
 Diff Data Encode Off On, 784
 Downlink MCS-1, 794
 Dummy, 802
 ET, 792
 Ext, 782, 790, 791, 792, 801, 807
 Ext BBG Ref Freq, 585, 785
 Ext Data Clock Normal Symbol, 784
 Ext Delay Bits, 808
 Ext Delay Off On, 809
 Ext Polarity Neg Pos, 809
 Fall Delay, 776, 777
 Fall Time, 776, 778
 FCorr, 802
 Filter Alpha, 773
 Filter BbT, 774
 FIX4, 782, 783, 791, 792, 793, 794, 799, 801, 802
 Free Run, 806
 Freq Dev, 787

GSM subsystem keys (*continued*)
Gate Active Low High, 807
Gated, 806
Gaussian, 786
Gray Coded QPSK, 789
GSM Off On, 811
I/Q Scaling, 787
IS-95, 786
IS-95 Mod, 786
IS-95 Mod w/EQ, 786
IS-95 OQPSK, 789
IS-95 QPSK, 789
IS-95 w/EQ, 786
MSK, 789
Multislot Off On, 793
Normal, 802
Normal All, 802
Nyquist, 786
Optimize FIR For EVM ACP, 782
OQPSK, 789
 $\pi/4$ DQPSK, 789
Patt Trig In 1, 810
Patt Trig In 2, 810
Phase Dev, 788
Phase Polarity Normal Invert, 789
PN11, 782, 801
PN15, 782, 791, 792, 794, 798, 799, 801
PN20, 782, 801
PN23, 782, 801
PN9, 782, 791, 792, 794, 798, 799, 801
PN9 Mode Normal Quick, 775
QPSK, 789
Recall Secondary Frame State, 790
Rectangle, 786
Reset & Run, 806
Restore Factory Default, 783
Rise Delay, 778, 779
Rise Time, 780
Root Nyquist, 786
S, 800
Save Secondary Frame State, 790
Secondary Frame Off On, 791
Sine, 781
Single, 806
SS, 792

GSM subsystem keys (*continued*)
Symbol Rate, 804
Sync, 802
Sync Out Offset, 803
TCH/FS, 794
Timeslot Ampl Main Delta, 801
Timeslot Off On, 801
Trigger & Run, 806
Trigger Key, 790, 807
TS, 802
TSC0, 793, 800
TSC1, 793, 800
TSC2, 793, 800
TSC3, 793, 800
TSC4, 793, 800
TSC5, 793, 800
TSC6, 793, 800
TSC7, 793, 800
UN3/4 GSM Gaussian, 786
Uplink MCS-1, 794
User File, 781, 782, 791, 792, 794, 801
User FIR, 786
User FSK, 788, 789
User I/Q, 788, 789
gsm subsystem keys
PRAM Files, 783
guides, lxxiii

H

Half softkey, 529, 534
Header field, 486, 496
Help Mode Single Cont softkey, 156
hexadecimal values, 18
High Amplitude softkey
 See sense subsystem keys
High Crest Mode Off On softkey, 23
Higher Layer softkey, 1155
Hostname softkey, 76
HSDPA file overview, 812
HSDPA over W-CDMA SCPI commands, 812
HSDPA user files, 812
HSPA file overview, 668
HSPA user files, 668

Index

I

- I Gain softkey, 385
I Offset softkey, 29, 386
I/Q Adjustments Off On softkey, 32
I/Q Calibration softkey, 72
I/Q Gain Balance Source 1 softkey, 29
I/Q Mapping Normal Invert softkey, 221, 247, 345
I/Q Mod Filter Manual Auto softkey, 33, 208, 222, 246, 275, 300, 329, 347, 474
I/Q Off On softkey, 37
I/Q Out Gain Balance softkey, 27
I/Q Output Atten softkey, 28
I/Q Output Filter Manual Auto softkey, 206, 217, 242, 270, 297, 298, 327, 345, 466
I/Q Scaling softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
I/Q softkey, 98
I/Q Timing Skew Path, 32
I/Q timing Skew softkey, 31
IDLE softkey, 954, 973
IEEE 488.2 common command keys
 Diagnostic Info, 89
 Instrument Options, 90
 RECALL Reg, 90
 Run Complete Self Test, 92
 Save Reg, 91
 Save Seq[n] Reg[nn], 91
 Select Seq, 90
Immediate softkey, 227, 261, 281, 311
 See sense subsystem keys
Impairments Off On softkey, 467
Impedance 75 Ohm High softkey, 420
Incr Set hardkey, 69
 See amplitude modulation subsystem keys
 See frequency modulation subsystem keys
 See phase modulation subsystem keys
Increment Scramble Code softkey, 352
Increment Timing Offset softkey, 355
Infinity softkey, 1060, 1157
Init Power field, 1101
Init Pwr field, 1119, 1134
Initial Bit Count softkey, 441
Initial Block Count softkey, 431, 434
Initial Frame Count softkey, 451
Initialize Phase Fixed Random softkey, 338
Initialize Table softkey, 284
input subsystem keys
 0.7V, 421
 1.4V, 421
 1.6V, 421
 2.5V, 421
Clock Delay Off On, 419
Clock Polarity Neg Pos, 420
Clock Time Delay, 419
Data Polarity Neg Pos, 420
Gate Clk Delay, 416
Gate Delay Off On, 417
Gate Mode Time Clk, 416
Gate Off On, 418
Gate Polarity Neg Pos, 418
Gate Time Delay, 417
Impedance 75 Ohm High, 420
Resolution, 418
Insert Row softkey, 249, 252, 255, 284
Insert Waveform softkey, 313
installation guide, lxxiii
Installed Board Info softkey, 81
Instrument Options softkey, 90
Int I/Q Skew Corrections RF BB Off softkey, 35
Int softkeys
 Int Doublet, 202
 Int Free-Run, 202
 Int Gated, 202
 Int Phase Polarity Normal Invert, 24, 34
 Int Triggered, 202
integer response data, 11
Intermod softkey, 1064
Internal softkeys
 Internal, 63, 176, 512
 Internal 1, 184, 196
 Internal 2, 184, 196
 Internal Monitor, 190
 Internal Square, 202

- Inverse Video Off On softkey, [87](#)
Inverted softkey, [517](#)
IP address, [75](#)
IP Address softkey, [76](#)
IQ Phase Normal Invert softkey, [767, 770](#)
IQ Polarity softkey, [388](#)
IS-2000 SR3 DS softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See Dmodulation subsystem keys
 See wideband CDMA ARB subsystem keys
IS-95 Mod softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GPS subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 See wideband CDMA base band subsystem keys and fields
IS-95 Mod w/EQ softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GPS subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 See wideband CDMA base band generator subsystem keys and fields
IS-95 OQPSK softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
IS-95 QPSK softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
IS-95 softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GPS subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 See wideband CDMA base band generator subsystem keys and fields
IS-95 w/EQ softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys

Index

IS-95 w/EQ softkey (*continued*)

 See GPS subsystem keys

 See GSM subsystem keys

 See NADC subsystem keys

 See PDC subsystem keys

 See PHS subsystem keys

 See TETRA subsystem keys

 See wideband CDMA ARB subsystem keys

IS-97 Levels softkey, 229

J

jy, 935

L

LAN Config softkey, 75

Last Mkr Point softkey, 300, 302

Leap Seconds field, 501

Left Alternate softkey, 356

Left softkey, 1026

LF Out softkeys

 LF Out Amplitude, 186

 LF Out Off On, 190

 LF Out Stop Freq, 186, 187, 193

 LF Out Sweep Rate, 188

 LF Out Sweep Time, 189

 LF Out Tone 2 Ampl % of Peak, 187

 LF Out Tone 2 Freq, 186, 187, 193

Link Down Up softkey, 347, 1074

Link Forward Reverse softkey, 247, 479

list data, 114

List softkey, 98, 124

list/sweep subsystem keys

 # Points, 57

 Ampl, 49, 66

 Ampl Start, 49, 67

 Ampl Stop, 49, 68

 Dwell Type List Step, 51

 Freq, 42, 49

 Freq & Ampl, 49

 Freq Start, 44, 49

 Freq Stop, 45, 49

 Load List From Step Sweep, 55

 Manual Mode Off On, 53

 Manual Point, 52

list/sweep subsystem keys (*continued*)

 Off, 42, 49, 66

 Preset List, 56

 Step Dwell, 56

 Sweep Direction Down Up, 50

 Sweep Retrace Off On, 54

 Sweep Type List Step, 55

Load From Selected File softkey, 20, 123, 127, 336

Load List From Step Sweep softkey, 55

Load/Store softkey, 284

Logic Type softkey, 393

Long Code Mask field, 516

Long Code State field, 483, 516

Loop Back Test Type softkey, 393

Low Amplitude softkey, 430, 433

 See sense subsystem keys

Low Capacity softkey, 589, 600

Low Capacity with Z field softkey, 589, 600

low frequency output subsystem keys

 Bus, 189

 DC, 189

 Dual-Sine, 189

 Ext, 189

 Free Run, 189

 Function Generator, 190

 Internal Monitor, 190

 LF Out Amplitude, 186

 LF Out Off On, 190

 LF Out Stop Freq, 186, 187, 193

 LF Out Sweep Rate, 188

 LF Out Sweep Time, 189

 LF Out Tone 2 Ampl % of Peak, 187

 LF Out Tone 2 Freq, 186, 187, 193

 Noise, 189

 Ramp, 189

 Sine, 189

 Square, 189

 Swept-Sine, 189

 Triangle, 189

 Trigger Key, 189

LTM OFF field, 501

M

Manual Mode Off On softkey, 53

Manual Point softkey, 52

- Marker 1 2 3 4 softkey, 302
Marker 1 Polarity Neg Pos softkey, 212, 226, 260, 280, 475
dual ARB subsystem, 308, 333, 475
wideband CDMA ARB subsystem, 370
Marker 1 softkey, 209, 210, 222, 223, 224, 257, 258, 276, 277, 305, 329, 330, 331, 367, 368, 474, 475
dual ARB subsystem, 306
Marker 2 Polarity Neg Pos softkey, 212, 226, 260, 280, 476
dual ARB subsystem, 308, 333, 370, 475
Marker 2 softkey, 209, 210, 222, 223, 224, 257, 258, 276, 277, 305, 329, 330, 331, 367, 368, 474, 475
dual ARB subsystem, 306
Marker 3 Polarity Neg Pos softkey, 212, 226, 260, 280, 476
dual ARB subsystem, 308, 333, 475
wideband CDMA ARB subsystem, 370
Marker 3 softkey, 209, 210, 222, 223, 224, 257, 258, 276, 277, 305, 329, 330, 331, 367, 368, 474, 475
dual ARB subsystem, 306
Marker 4 Polarity Neg Pos softkey, 212, 226, 260, 280, 476
dual ARB subsystem, 308, 333, 475
wideband CDMA ARB subsystem, 370
Marker 4 softkey, 209, 210, 222, 223, 224, 257, 258, 276, 277, 305, 329, 330, 331, 367, 368, 474, 475
dual ARB subsystem, 306
marker polarity, 212
Marker softkey, 300
Markers, 300
markers
alc hold
AWGN subsystem, 209
CDMA ARB subsystem, 223
CDMA2000 ARB subsystem, 257
Dmodulation subsystem, 276
dual ARB subsystem, 305
multitone subsystem, 330, 331
wideband CDMA ARB subsystem, 367
alternate amplitude
AWGN subsystem, 209
CDMA ARB subsystem, 222
CDMA2000 ARB subsystem, 257
Dmodulation subsystem, 276
dual ARB subsystem, 305
marker (continued)
alternate amplitude
dual ARB subsystem, 305
multitone subsystem, 329
wideband CDMA ARB subsystem, 367
clearing, 300
marker polarity
CDMA ARB subsystem, 226
CDMA2000 ARB subsystem, 260
Dmodulation subsystem, 280
dual ARB subsystem, 308, 475
multitone subsystem, 333
wideband CDMA ARB subsystem, 370
polarity
AWGN subsystem, 212
RF blanking/pulse
AWGN subsystem, 210
CDMA ARB subsystem, 224
CDMA2000 ARB subsystem, 258
Demodulation subsystem, 277
dual ARB subsystem, 306
wideband CDMA ARB subsystem, 368
setting, 302
shifting points, 302
mass memory subsystem keys
Binary, 124
Copy File, 124
Delete All NVWFM Files, 125
Delete All WFM Files, 125
Delete All WFM1 Files, 125
Delete File, 126
List, 124
Load From Selected File, 127
Rename File, 127
State, 124
Store To File, 127
User Flatness, 124
Max Input softkey, 1064
Max Power field, 1102
Max Pwr field, 1120, 1135
MCDMA softkey, 99
MDMOD softkey, 99
MDWCDMA softkey, 100
Measurement Mode BER% Search softkey, 450
Measurement Mode BLER% Search softkey, 436

Index

memory subsystem, 107, 109, 110
memory subsystem keys, 113, 115
 Add Comment To Seq[n] Reg[nn], 123
 All, 104, 122
 Binary, 94
 Bit, 94
 CDMA, 95
 Copy File, 105, 114
 Data PRAM, 112
 Delete All ARB CDMA Files, 118
 Delete All ARB DMOD Files, 118
 Delete All ARB DWCDMA Files, 119
 Delete All ARB FCDMA Files, 119
 Delete All ARB MCDMA Files, 120
 Delete All ARB MDWCDMA Files, 120
 Delete All ARB MTONE Files, 121
 Delete All ARB RCDMA Files, 121
 Delete All ARB UWCDMA Files, 122
 Delete All Binary Files, 118
 Delete All Bit Files, 118
 Delete All Files, 117
 Delete All FIR Files, 119
 Delete All FSK Files, 119
 Delete All I/Q Files, 119
 Delete All List Files, 120
 Delete All MDMOD Files, 120
 Delete All MFCDMA Files, 120
 Delete All SEQ Files, 121
 Delete All SHAPE Files, 121
 Delete All State Files, 121
 Delete All UFLT Files, 122
 Delete File, 122
 DMOD, 95
 DWCDMA, 96
 FCDMA, 96
 FIR, 97
 FSK, 97
 I/Q, 98
 List, 98
 Load From Selected File, 123
 MCDMA, 99
 MDMOD, 99
 MDWCDMA, 100
 MFCDMA, 100
 MTONE, 101
memory subsystem keys, 113, 115 (*continued*)
 Oversample Ratio, 108
 RCDMA, 101
 Rename File, 123
 SEQ, 102
 SHAPE, 102
 State, 103
 Store To File, 123
 User Flatness, 103
 UWCDMA, 104
Message Data Raw Data (RPS11) softkey
 See wideband CDMA base band generator
 subsystem keys and fields
Message Part field, 1118
Message Pulse (RPS22) softkey
 See wideband CDMA base band generator
 subsystem keys and fields
Message Type field, 502
Message-Control Raw Data Clock (RPS12) softkey
 See wideband CDMA base band generator
 subsystem keys and fields
Meter Address softkeys, 77
Meter Channel A B softkey, 77
Meter Timeout softkey, 78
MFCDMA softkey, 100
Min Power field, 1102
Mod Index softkey, 471
Mod On/Off hardkey, 129
Modulator Atten Manual Auto softkey, 33, 34, 207, 221, 245, 246, 274, 298, 299, 328, 346, 472, 473
Msg Ctrl softkey, 1107
Msg Data softkey, 1107
Msg Pwr field, 1118, 1133
MSGPS subsystem keys
 GPS Ref (f0), 771
 GPS Ref Clk Ext Int, 771
 IQ Phase Normal Invert, 770
 Number of Satellites, 772
 Pause/Resume, 770
 Real-time MSGPS Off On, 772
 Restart, 771
 Scenario, 772
 Select Scenario, 772
MSK softkey
 See custom subsystem keys

MSK softkey (continued)

See DECT subsystem keys
See Dmodulation subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
MTONE softkey, 101
 multicarrier, 348
 Multicarrier Off On softkey, 228, 247, 282
 Multicarrier softkey, 348
 Multislot Off On softkey, 646, 793
 Multitone Off On softkey, 339
 multitone subsystem keys
 2.100 MHz, 329
 40.000 MHz, 327, 329
 ARB Reference Ext Int, 333
 ARB Sample Clock, 335
 Clear Header, 326
 Freq Spacing, 336, 337
 Goto Row, 334
 I/Q Mod Filter Manual Auto, 329
 I/Q Output Filter Manual Auto, 327
 Initialize Phase Fixed Random, 338
 Load From Selected File, 336
 Marker 1, 329, 330, 331
 Marker 2, 329, 330, 331
 Marker 3, 329, 330, 331
 Marker 4, 329, 330, 331
 Modulator Atten Manual Auto, 328
 Multitone Off On, 339
 None, 329, 330, 331
 Number Of Tones, 336, 337
 Random Seed Fixed Random, 338
 Reference Freq, 333
 Save Setup To Header, 326
 Store To File, 336
 Through, 327, 329
 Toggle State, 334, 336
 Waveform Runtime Scaling, 335
mV softkey, 170
mVemf softkey, 170

N

N Power field, 1078, 1108
N5102A, 380
 See digital subsystem
N5102A Off On softkey, 395
NADC Off On softkey, 907
NADC softkey, 282, 283, 284
 NADC subsystem keys
 128QAM, 890
 16 1's & 16 0's, 884, 893, 895, 897, 898
 16PSK, 890
 16QAM, 890
 256QAM, 890
 2-Lvl FSK, 890
 32 1's & 32 0's, 884, 893, 895, 897, 898
 32QAM, 890
 4 1's & 4 0's, 884, 893, 895, 897, 898
 4-Lvl FSK, 890
 4QAM, 890
 64 1's & 64 0's, 884, 893, 895, 897, 898
 64QAM, 890
 8 1's & 8 0's, 884, 893, 895, 897, 898
 8PSK, 890
 All Timeslots, 900
 APCO 25 C4FM, 887
 BBG Data Clock Ext Int, 874
 BBG Ref Ext Int, 886
 Begin Frame, 900
 Begin Timeslot #, 900, 901
 Bit Rate, 875
 BPSK, 890
 Bus, 892, 904
 CDL, 894
 CDVCC, 894, 897
 Continuous, 902
 D8PSK, 890
 Data Format Pattern Framed, 882
 Down Custom, 899
 Down TCH, 899
 Down TCH All, 899
 Ext, 884, 892, 893, 895, 897, 898, 904
 Ext BBG Ref Freq, 887
 Ext Data Clock Normal Symbol, 886
 Ext Delay Bits, 905
 Ext Delay Off On, 906

Index

- NADC subsystem keys (*continued*)
Ext Polarity Neg Pos, 906
Fall Delay, 877, 878
Fall Time, 878, 879
Filter Alpha, 874
Filter BbT, 875
FIX4, 884, 885, 893, 895, 896, 897, 898, 899
Frame Repeat Single Cont, 891
Free Run, 903
Freq Dev, 889
Gate Active Low High, 904
Gated, 902
Gaussian, 887
Gray Coded QPSK, 890
I/Q Scaling, 888
IS-95, 887
IS-95 Mod, 887
IS-95 Mod w/EQ, 887
IS-95 OQPSK, 890
IS-95 QPSK, 890
IS-95 w/EQ, 887
MSK, 890
NADC Off On, 907
Nyquist, 887
Optimize FIR For EVM ACP, 883
OQPSK, 890
 $\pi/4$ DQPSK, 890
Patt Trig In 1, 906
Patt Trig In 2, 906
Phase Dev, 889
PN11, 884, 893, 895, 897, 898
PN15, 884, 893, 895, 897, 898
PN20, 884, 893, 895, 897, 898
PN23, 884, 893, 895, 897, 898
PN9, 884, 893, 895, 897, 898
PN9 Mode Normal Quick, 876
Polarity Normal Invert, 891
QPSK, 890
Rate Full Half, 888
Recall Secondary Frame State, 891
Rectangle, 887
Reset & Run, 903
Restore NADC Factory Default, 885
Rise Delay, 880
Rise Time, 881, 882
- NADC subsystem keys (*continued*)
Root Nyquist, 887
SACCH, 894, 898
Save Secondary Frame State, 892
Secondary Frame Off On, 892
Sine, 877, 883
Single, 902
Symbol Rate, 901
SYNC, 895, 898
Sync Out Offset, 900
Timeslot Ampl Main Delta, 896
Timeslot Off On, 896
Trigger & Run, 903
Trigger Key, 892, 904
UN3/4 GSM Gaussian, 887
Up Custom, 899
Up TCH, 899
Up TCH All, 899
User File, 877, 883, 884, 893, 895, 897, 898
User FIR, 887
User FSK, 889, 890
User I/Q, 890
- nadc subsystem keys
PRAM Files, 884
Name and Store softkey, 313
Negate I softkey, 386
Negate Q softkey, 389
Network ID field, 502
No Limits softkey
 See calculate subsystem keys
No Thresholds softkey
 See sense subsystem keys
Noise Bandwidth Factor softkey, 308
Noise Off On softkey, 506, 518
Noise Seed Fixed Random softkey, 214
Noise Seed softkey, 469
Noise softkey, 175, 182, 189, 195
NONE (RPSO) softkey
 See wideband CDMA base band generator
 subsystem keys and fields
NONE softkey, 1163
None softkey, 161, 209, 210, 222, 223, 224, 257,
 258, 276, 277, 305, 306, 329, 330, 331, 367,
 368, 474, 475, 567, 1068, 1070, 1168, 1175
Normal All softkey, 656, 802

- Normal softkey, 517, 656, 802, 1026
Num of Blk field, 1169, 1176
Num of Pre field, 1119, 1134
Number of AICH field, 1104
Number of PRACH 80ms field, 1118
Number of PRACH field, 1131, 1133
Number of Preamble field, 1134
Number of Satellites softkey, 772
Number Of Tones softkey, 336, 337
numeric boolean response data, 11
Numeric Format, 387
Numeric Format softkey, 387
numeric SCPI parameter, 8
numeric, extended SCPI parameter, 8
Nyquist softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GPS subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 See wideband CDMA base band generator subsystem keys and fields
- 0**
- OCNS softkey, 357
octal values, 18
Off softkey, 24, 35, 42, 49, 66, 227, 261, 281, 311, 1130
 Off softkey, dual ARB trigger delay, 321
 Omitted softkey, 1060, 1157
 On softkey, 227, 261, 281, 311, 1130
 On/Off field, 1042, 1123
 OpenLoop Ant1 SCH TSTD OFF softkey, 1065
 OpenLoop Ant1 softkey, 1065
 OpenLoop Ant2 SCH TSTD OFF softkey, 1065
 OpenLoop Ant2 softkey, 1065
- Optimize ACP ADJ ALT softkey, 347, 362
Optimize FIR For EVM ACP softkey, 1099
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GPS subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 See wideband CDMA base band generator subsystem keys and fields
- options
 001/002
 all subsystem, 204, 462
 custom subsystem, 548
 Dmodulation subsystem, 270
 dual ARB subsystem, 294
 multitone subsystem, 326
 400
 wideband CDMA ARB subsystem, 340
 wideband CDMA base band generator subsystem, 1020
 401
 CDMA ARB subsystem, 215
 CDMA2000 ARB subsystem, 240
 CDMA2000 BBG subsystem, 479
 402
 DECT subsystem, 573
 EDGE subsystem, 622
 GSM subsystem, 773
 NADC subsystem, 874
 PDC subsystem, 908
 PHS subsystem, 941
 TETRA subsystem, 977
 403
 AWGN real-time subsystem, 463
 AWGN subsystem, 205

Index

- options (*continued*)
406
 bluetooth subsystem, 464
409
 GPS subsystem, 763
424
 GPS subsystem, 763
 MSGPS subsystem, 770
UN7/300
 calculate subsystem, 398
 data subsystem, 408
 input subsystem, 416, 422
 sense subsystem, 425
Options Info softkey, 83
OQPSK softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
Output Blanking Off On Auto softkey, 128
output subsystem keys
 Mod On/Off, 129
 Output Blanking Off On Auto, 128
 RF On/Off, 129
Oversample Ratio softkey, 108, 226
Overwrite softkey, 161
- P**
- P Code Pwr softkey, 767
P Rev field, 503
P Rev Min field, 501
P softkey, 591
π/4 DQPSK softkey
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
p/4 DQPSK softkey (*continued*)
 See PHS subsystem keys
 See TETRA subsystem keys
Packet (DH1) softkey, 476
Paging Indicator field, 510, 1046
Paging softkey, 229
parameter types. *See* SCPI commands parameter types
Pass Amplitude softkey, 430, 434
 See sense subsystem keys
Pass Through Preset softkey, 395
Pass/Fail Limits softkey, 406
Pass/Fail Off On softkey, 406
paths, SCPI command tree, 7
Patt Trig In 1 softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 subsystem keys
Patt Trig In 2 softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 subsystem keys
Pattern trigger in 1 field, 1144

- Pattern trigger in 2 field, 1145
Pause/Resume softkey, 770
PCCPCH + SCH + 3 DPCH softkey, 348, 353
PCCPCH + SCH +1 DPCH softkey, 348, 353
PCCPCH + SCH softkey, 348, 353
P-CCPCH data (DRPS39) softkey, 1050, 1052, 1053, 1054, 1055
P-CCPCH data-clk (DRPS38) softkey, 1050, 1052, 1053, 1054, 1055
PCCPCH softkey, 1022, 1023
PDC Off On softkey, 940
PDC softkey, 282, 283, 284
PDC subsystem keys
 128QAM, 923
 16 1's & 16 0's, 917, 926, 927, 929, 931
 16PSK, 923
 16QAM, 923
 256QAM, 923
 2-Lvl FSK, 923
 32 1's & 32 0's, 917, 926, 927, 929, 931
 32QAM, 923
 4 1's & 4 0's, 917, 926, 927, 929, 931
 4-Lvl FSK, 923
 4QAM, 923
 64 1's & 64 0's, 917, 926, 927, 929, 931
 64QAM, 923
 8 1's & 8 0's, 917, 926, 927, 929, 931
 8PSK, 923
 All Timeslots, 933
 APCO 25 C4FM, 920
 BBG Ref Ext Int, 919
 Begin Frame, 933
 Begin Timeslot #, 933, 934
 Bit Rate, 909
 BPSK, 923
 Bus, 925, 937
 CC, 926, 930, 932
 Continuous, 936
 D8PSK, 923
 Data Format Pattern Framed, 916
 Down Custom, 933
 Down TCH, 933
 Down TCH All, 933
 Ext, 917, 925, 926, 927, 929, 931, 937
 Ext BBG Ref Freq, 920
- PDC subsystem keys (*continued*)
 Ext Data Clock Ext Int, 908
 Ext Data Clock Normal Symbol, 919
 Ext Delay Bits, 938
 Ext Delay Off On, 939
 Ext Polarity Neg Pos, 939
 Fall Delay, 911, 912
 Fall Time, 911, 913
 Filter Alpha, 908
 Filter BbT, 909
 FIX4, 917, 918, 926, 927, 928, 929, 931
 Free Run, 936
 Freq Dev, 922
 Gate Active Low High, 937
 Gated, 936
 Gaussian, 920
 Gray Coded QPSK, 923
 I/Q Scaling, 921
 IS-95, 920
 IS-95 Mod, 920
 IS-95 Mod w/EQ, 920
 IS-95 OQPSK, 923
 IS-95 QPSK, 923
 IS-95 w/EQ, 920
 MSK, 923
 Nyquist, 920
 Optimize FIR For EVM ACP, 917
 OQPSK, 923
 π/4 DQPSK, 923
 Patt Trig In 1, 940
 Patt Trig In 2, 940
 PDC Off On, 940
 Phase Dev, 922
 Phase Polarity Normal Invert, 924
 PN11, 917, 927, 929, 931
 PN15, 917, 926, 927, 929, 931
 PN20, 917, 927, 929, 931
 PN23, 917, 927, 929, 931
 PN9, 917, 926, 927, 929, 931
 PN9 Mode Normal Quick, 910
 QPSK, 923
 Rate Full Half, 921
 Recall Secondary Frame State, 924
 Rectangle, 920
 Reset & Run, 936

Index

- PDC subsystem keys (*continued*)
 Restore PDC Factory Default, 918
 Rise Delay, 913, 914
 Rise Time, 915
 Root Nyquist, 920
 SACCH, 927, 930, 932
 Save Secondary Frame State, 924
 Secondary Frame Off On, 925
 Sine, 916
 Single, 936
 SW, 927, 930, 932
 Symbol Rate, 934
 Sync Out Offset, 933
 Timeslot Ampl Main Delta, 928
 Timeslot Off On, 929
 Trigger & Run, 936
 Trigger Key, 925, 937
 UN3/4 GSM Gaussian, 920
 Up Custom, 933
 Up TCH, 933
 Up TCH All, 933
 Up VOX, 933
 User File, 916, 917, 926, 927, 929, 931
 User FIR, 920
 User FSK, 923
 User I/Q, 923
- pdc subsystem keys
 PRAM Files, 918
Performance Req softkey, 1064
Permuted ESN field, 486, 496
Phase Dev softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
phase modulation subsystem keys
 ΦM Sweep Time softkey, 195
 FM ΦM Normal High BW softkey, 192
 ΦM Dev Couple Off On, 197
 ΦM Dev softkey, 197
 ΦM Off On softkey, 196
- πηασε μοδυλατιον συβσψτεμ κεψσ
 (*continued*)
 ΦM Path 1 2, 191
 ΦM Tone 2 Ampl Percent of Peak, 194
 ΦM Tone 2 Rate, 194
 Bus, 195
 Dual-Sine, 195
 Ext, 195
 Ext Coupling DC AC, 193
 Ext1, 196
 Ext2, 196
 Free Run, 195
 Incr Set, 192, 198
 Internal 1, 196
 Internal 2, 196
 Noise, 195
 Ramp, 195
 Sine, 195
 Square, 195
 Swept-Sine, 195
 Triangle, 195
 Trigger Key, 195
- Phase Polarity field, 509
Phase Polarity Normal Invert softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA base band generator
 subsystem keys and fields
- Phase Polarity Normal Inverted softkey, 1074
Phase Ref Set softkey, 47
PHS Off On softkey, 976
PHS softkey, 282, 283, 284
PHS subsystem keys
 128QAM, 962
 16 1's & 16 0's, 951, 953, 956, 971, 975
 16-Lvl FSK, 962
 16PSK, 962
 16QAM, 962
 256QAM, 962
 2-Lvl FSK, 962

PHS subsystem keys (*continued*)
32 1's & 32 0's, [951](#), [953](#), [956](#), [971](#), [975](#)
32QAM, [962](#)
4 1's & 4 0's, [951](#), [953](#), [956](#), [971](#), [975](#)
4-Lvl FSK, [962](#)
4QAM, [962](#)
64 1's & 64 0's, [951](#), [953](#), [956](#), [971](#), [975](#)
64QAM, [962](#)
8 1's & 8 0's, [951](#), [953](#), [956](#), [971](#), [975](#)
8-Lvl FSK, [962](#)
8PSK, [962](#)
All Timeslots, [964](#)
APCO 25 C4FM, [959](#)
BBG Data Clock Ext Int, [941](#)
BBG Ref Ext Int, [958](#)
Begin Frame, [964](#)
Begin Timeslot #, [964](#), [965](#)
Bit Rate, [942](#)
BPSK, [962](#)
Bus, [963](#), [970](#)
C4FM, [962](#)
Continuous, [966](#)
CSID, [954](#), [972](#)
Custom, [957](#)
D8PSK, [962](#)
Data Format Pattern Framed, [950](#)
Ext, [951](#), [953](#), [956](#), [963](#), [970](#), [971](#), [975](#)
Ext BBG Ref Freq, [958](#)
Ext Data Clock Normal Symbol, [957](#)
Ext Delay Bits, [968](#)
Ext Delay Off On, [969](#)
Ext Polarity Neg Pos, [969](#)
Fall Delay, [945](#), [946](#)
Fall Time, [945](#), [947](#)
Filter Alpha, [941](#)
Filter BbT, [942](#)
FIX4, [951](#), [952](#), [953](#), [956](#), [971](#), [972](#), [975](#)
Free Run, [967](#)
Gate Active Low High, [968](#)
Gated, [966](#)
Gaussian, [959](#)
Gray Coded QPSK, [962](#)
I/Q Scaling, [960](#)
IDLE, [954](#), [973](#)
IS-95, [959](#)

PHS subsystem keys (*continued*)
IS-95 Mod, [959](#)
IS-95 Mod w/EQ, [959](#)
IS-95 OQPSK, [962](#)
IS-95 QPSK, [962](#)
IS-95 w/EQ, [959](#)
MSK, [962](#)
Nyquist, [959](#)
Optimize FIR For EVM ACP, [951](#)
OQPSK, [962](#)
 $\pi/4$ DQPSK, [962](#)
Patt Trig In 1, [969](#)
Patt Trig In 2, [969](#)
Phase Dev, [960](#), [961](#)
Phase Polarity Normal Invert, [962](#)
PHS Off On, [976](#)
PN11, [951](#), [953](#), [956](#), [971](#), [975](#)
PN15, [951](#), [953](#), [956](#), [971](#), [975](#)
PN20, [951](#), [953](#), [956](#), [971](#), [975](#)
PN23, [951](#), [953](#), [956](#), [971](#), [975](#)
PN9, [951](#), [953](#), [956](#), [971](#), [975](#)
PN9 Mode Normal Quick, [943](#)
PSID, [954](#), [973](#)
QPSK, [962](#)
Recall Secondary Frame State, [962](#)
Rectangle, [959](#)
Reset & Run, [967](#)
Restore PHS Factory Default, [952](#)
Rise Delay, [947](#), [948](#)
Rise Time, [949](#)
Root Nyquist, [959](#)
SA, [955](#), [974](#)
Save Secondary Frame State, [963](#)
Scramble Off On, [944](#)
Scramble Seed, [944](#)
Secondary Frame Off On, [963](#)
Sine, [950](#)
Single, [966](#)
Symbol Rate, [965](#)
SYNC, [957](#)
Sync Out Offset, [964](#)
TCH, [957](#)
TCH All, [957](#)
Timeslot Ampl Main Delta, [953](#), [972](#)
Timeslot Off On, [955](#), [974](#)

Index

- PHS subsystem keys (*continued*)
Timeslot Type, 975
Trigger & Run, 967
Trigger Key, 963, 970
UN3/4 GSM Gaussian, 959
User File, 950, 951, 953, 956, 971, 975
User FIR, 959
User FSK, 961, 962
User I/Q, 961, 962
UW, 955, 956, 973, 974
- phs subsystem keys
PRAM Files, 952
- PI Bits field, 1046
- PICH 10ms FramePulse (DRPS37) softkey, 1050, 1052, 1053, 1054, 1055
- PICH data (DRPS35) softkey, 1050, 1052, 1053, 1054, 1055
- PICH data-clk (DRPS34) softkey, 1050, 1052, 1053, 1054, 1055
- PICH softkey, 357, 1022, 1023
- PICH TimeSlot Pulse (DRPS36) softkey, 1050, 1052, 1053, 1054, 1055
- Pilot softkey, 228, 229, 231, 247, 254
- Playback Ratio field, 1026
- PN Offset field, 512
- PN Offset softkey, 252, 255
- PN11 softkey
See custom subsystem keys
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See sense subsystem keys
See TETRA subsystem keys
- PN15 softkey
See CDMA2000 BBG subsystem keys and fields
See custom subsystem keys
See DECT subsystem keys
See EDGE subsystem keys
See GPS subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
- PN15 softkey (*continued*)
See PHS subsystem keys
See sense subsystem keys
See TETRA subsystem keys
See wideband CDMA base band generator subsystem keys and fields
- PN20 softkey
See custom subsystem keys
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See sense subsystem keys
See TETRA subsystem keys
- PN23 softkey
See custom subsystem keys
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See sense subsystem keys
See TETRA subsystem keys
- PN9 Mode Normal Quick softkey
See DECT subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
- PN9 Mode Preset softkey, 159
- PN9 softkey
See CDMA2000 BBG subsystem keys and fields
See custom subsystem keys
See data subsystem keys
See DECT subsystem keys
See EDGE subsystem keys
See GPS subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys

PN9 softkey (continued)
See sense subsystem keys
See TETRA subsystem keys
See wideband CDMA base band generator subsystem keys and fields

polarity
awgn subsystem, 212

markers
cdma arb subsystem, 226
cdma2000 arb subsystem, 260
dmodulation subsystem, 280
dual ARB subsystem, 308, 475
multitone subsystem, 333
wideband CDMA ARB subsystem, 370

polarity markers
awgn subsystem, 212

Polarity Normal Invert softkey, 891

Port Config softkey, 394

Power Control Signal Polarity Neg Pos softkey, 1104

Power field
See CDMA2000 BBG subsystem keys and fields
See wideband CDMA baseband generator subsystem keys and fields

Power Hold Off On softkey, 1101

Power Meter softkey, 78

Power Mode Norm TPC softkey, 1104

Power On Last Preset softkey, 157

Power Search Manual Auto softkey, 60, 62

Power Search Reference Fixed Mod softkey, 61

Power softkey, 364

power subsystem keys
ALC Off On, 62
Alt Amp Delta, 63
Alt Ampl Off On, 64
Ampl, 49, 66
Ampl Offset, 68
Ampl Ref Off On, 67
Ampl Ref Set, 66
Ampl Start, 49, 67
Ampl Stop, 49, 68
Amplitude, 66, 69
Atten Hold Off On, 65
Auto, 58, 59
Do Power Search, 60, 62

power subsystem keys (*continued*)
Ext Detector, 63
Internal, 63
Off, 49, 66
Power Search Manual Auto, 60, 62
Power Search Reference Fixed Mod, 61
Set ALC Level, 60
Set Atten, 65
Source Module, 63
Span Type User Full softkey, 62
Start Frequency, 61
step, 69
Stop Frequency, 61
PPCCPCH softkey, 357, 358
Pp-m field, 1120, 1136
PRACH Mode Single Multi softkey, 1117
PRACH Power Setup Mode Pp-m Total softkey, 1124

PRACH Processing (RPS19) softkey
See wideband CDMA base band generator subsystem keys and fields

PRACH Scrambling Code field, 1125

PRACH softkey, 1100

PRACH Trigger Polarity Neg Pos softkey, 1129

PRACH Trigger softkey, 1129

PRACH Trigger Source Immedi Trigger softkey, 1129

PRAM
downloads, 112
list, 113

PRAM DATA BLOCK, 114

pram files
CUSTOM subsystem keys, 558
DECTsubsystem keys, 583
EDGE subsystem keys, 631
GSM subsystem keys, 783
NADC subsystem keys, 884
PDC subsystem keys, 918
PHS subsystem keys, 952
TETRA subsystem keys, 988

PRAM LIST, 114

PRAM?, 114

PRAT field, 503

Pre Sig field, 1121

Preamble power average field, 1123

Index

- Preamble Pulse (RPS21) softkey
 See wideband CDMA base band generator subsystem keys and fields
- Preamble Raw Data (RPS15) softkey
 See wideband CDMA base band generator subsystem keys and fields
- Preamble Raw Data Clock (RPS16) softkey
 See wideband CDMA base band generator subsystem keys and fields
- Preamble softkey, 1107
- precise talking and forgiving listening, 7
- Preset hardkey, 158
- Preset List softkey, 21, 56
- Preset Normal User softkey, 160
- programming guide, lxxiii
- PSCH softkey, 357
- PSCH State field, 1048
- PSID softkey, 954, 973
- pulse modulation subsystem keys
- Ext Pulse, 202
 - Int Doublet, 202
 - Int Free-Run, 202
 - Int Gated, 202
 - Int Triggered, 202
 - Internal Square, 202
 - Pulse Off On, 202
 - Pulse Period, 200
 - Pulse Rate, 199
 - Pulse Width, 201
- Pulse softkeys
- Pulse Off On, 202
 - Pulse Period, 200
 - Pulse Rate, 199
 - Pulse Width, 201
- Pulse/RF blanking, 306
- pulse/RF blanking markers
- awgn subsystem, 210
 - cdma arb subsystem, 224
 - cdma2000 arb, 258
 - dmodulation, 277
 - dual ARB subsystem, 306
 - wideband cdma arb, 368
- Puncture fields, 1169, 1176
- Puncture softkey, 1058
- PwrOffs field, 1057, 1154
- PWT softkey, 282, 283, 284
- Q**
- Q Gain softkey, 388
- Q Offset softkey, 30, 390
- QOF field, 487, 497
- QPSK softkey
- See* custom subsystem keys
 - See* DECT subsystem keys
 - See* Dmodulation subsystem keys
 - See* EDGE subsystem keys
 - See* GSM subsystem keys
 - See* NADC subsystem keys
 - See* PDC subsystem keys
 - See* PHS subsystem keys
 - See* TETRA subsystem keys
- Quadrature Angle Adjustment softkey, 25, 30
- Quarter softkey, 529, 534
- quotes, SCPI command use of, 17
- R**
- RACH TrCH softkey, 1107
- Radio Config field
- See* CDMA2000 BBG subsystem keys and fields
- Radio Config softkey, 253
- RadioConfig 1/2 Access softkey, 479
- RadioConfig 1/2 Traffic softkey, 479
- RadioConfig 3/4 Common Control softkey, 479
- RadioConfig 3/4 Enhanced Access softkey, 479
- RadioConfig 3/4 Traffic softkey, 479
- Ramp field, 487
- Ramp softkey, 175, 182, 189, 195
- Ramp Step field, 1120, 1135
- Ramp Time field, 487
- Random Seed Fixed Random softkey, 338
- Random softkey, 356, 364
- Ranging Code C/A P C/A+P softkey, 767
- Rate Full Half softkey, 888, 921
- Rate Match Attr field, 1073, 1169, 1176
- Rate softkey, 252, 255
- RCDMA softkey, 101
- real response data, 10
- Real-time AWGN Off On softkey, 463

-
- real-time AWGN subsystem keys
Bandwidth, [463](#)
Real-time AWGN Off On, [463](#)
Real-time GPS Off On softkey, [769](#)
Real-time MSGPS Off On softkey, [772](#)
Real-time Noise softkey, [310](#)
RECALL Reg softkey, [90](#)
Recall Secondary Frame State softkey
See DECT subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
Rectangle softkey
See CDMA ARB subsystem keys
See CDMA2000 ARB subsystem keys
See CDMA2000 BBG subsystem keys and fields
See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See EDGE subsystem keys
See GPS subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
See wideband CDMA ARB subsystem keys
See wideband CDMA base band generator subsystem keys and fields
Ref Data Rate field, [1076, 1106](#)
Ref Oscillator Source Auto Off On softkey, [48](#)
Ref Sensitivity softkey, [1064](#)
Reference Freq softkey, [477](#)
See AWGN subsystem keys
See bluetooth subsystem keys
See CDMA ARB subsystem keys
See CDMA2000 ARB subsystem keys
See Dmodulation subsystem keys
See dual ARB subsystem keys
See multitone subsystem keys
See wideband CDMA ARB subsystem keys
Reference Frequency softkey, [382](#)
Reference Out softkey, [413](#)
references, [lxviii](#)
Rename File, [123](#)
Rename File softkey, [127](#)
Reserved field, [503](#)
Reset & Run softkey
See CDMA ARB subsystem keys
See CDMA2000 ARB subsystem keys
See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See dual ARB subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
See wideband CDMA ARB subsystem keys
Reset RS-232 softkey, [79](#)
Reset to Initial Power softkey, [1103](#)
Resolution softkey, [418](#)
resolving error messages/setting conflicts, [670, 814](#)
response data types. *See SCPI commands response types*
Restart softkey, [771](#)
Restore DECT Factory Default softkey, [583](#)
Restore EDGE Factory Default softkey, [632](#)
Restore Factory Default softkey, [783](#)
Restore NADC Factory Default softkey, [885](#)
Restore PDC Factory Default softkey, [918](#)
Restore PHS Factory Default softkey, [952](#)
Restore Sys Defaults softkey, [159](#)
Restore TETRA Factory Default softkey, [989](#)
Resync Limits softkey, [456](#)
Retrigger Mode Off On softkey, [371](#)
Reverse softkey, [228](#)
Revert to Default Cal Settings softkey, [73](#)
rf blanking, [306](#)
RF blanking/pulse markers
awgn subsystem, [210](#)
cdma arb subsystem, [224](#)
cdma2000 arb subsystem, [258](#)
dmodulation subsystem, [277](#)
dual ARB subsystem, [306](#)

Index

- RF blanking/pulse markers (*continued*)
 wideband cdma arb subsystem, 368
- RF On/Off hardkey, 129
- Right Alternate softkey, 356
- Right softkey, 1026
- Rise Delay softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
- Rise Time softkey
 See custom subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
- Rising softkey, 547
- RMC 144 kbps (25.141) softkey, 1137
- RMC 384 kbps (25.141) softkey, 1137
- RMC 64 kbps (25.141) softkey, 1137
- RMC122 kbps (25.141) softkey, 1137
- RMS header info, 295
- Root Nyquist softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See EDGE subsystem keys
 See GPS subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
- Root Nyquist softkey (*continued*)
 See wideband CDMA base band generator subsystem keys and fields
rotate markers, 302
- Rotation softkey, 390
- route subsystem keys
 Burst Gate In Polarity Neg Pos, 130, 131
 Data Clock Out Neg Pos, 133
 Data Clock Polarity Neg Pos, 130, 132, 134
 Data Out Polarity Neg Pos, 133, 135
 Data Polarity Neg Pos, 131, 132
 DATA/CLK/SYNC Rear Outputs Off On, 135
 Symbol Sync Out Polarity Neg Pos, 134, 135
 Symbol Sync Polarity Neg Pos, 131, 132
- RS-232 Baud Rate softkey, 79
- RS-232 ECHO 0ff On softkeys, 79
- RS-232 Timeout softkeys, 80
- Run Complete Self Test softkey, 92
- runtime scaling, 312, 335
- S**
- S softkey, 645, 800
 See DECT subsystem keys
- SA softkey, 955, 974
- SACCH softkey, 894, 898, 927, 930, 932
- Samples softkey, dual ARB trigger delay, 321
- Sanitize softkey, 161
- Satellite ID softkey, 769
- Save Reg softkey, 91
- Save Secondary Frame State softkey
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
- Save Seq[n] Reg[nn] softkey, 91
- Save Setup To Header softkey, 206, 220, 245, 273, 297, 326, 344, 467
- Save User Preset softkey, 160
- Scale to 0dB softkey
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See CDMA2000 BBG subsystem keys and fields

Scale to 0dB softkey (continued)

- See* wideband CDMA ARB subsystem keys
- See* wideband CDMA base band generator subsystem keys and fields
- Scale Waveform Data softkey, 312
- scaling
 - during playback, 312, 335
 - waveform files, 312
- Scaling softkey, 312, 391
- SCCPCH softkey, 357, 358
- Scenario softkey, 772
- SCFN field, 1062, 1159
- SCH slot-pulse (DRPS10) softkey, 1050, 1052, 1053, 1054, 1055
- SCPI
 - errors, 155
- SCPI command subsystems
 - 3GPP W-CDMA HSPA, 668
 - all, 462
 - amplitude modulation, 172
 - AWGN, 205
 - AWGN real-time, 463
 - bluetooth, 464
 - calculate, 398
 - calibration, 72
 - CDMA ARB, 215
 - CDMA2000 ARB, 240
 - CDMA2000 BBG, 479
 - communication, 75
 - correction, 20
 - custom, 548
 - data, 408
 - DECT, 573
 - diagnostic, 81
 - digital, 380
 - digital modulation, 22
 - display, 85
 - Dmodulation, 270
 - Dual ARB, 294
 - E4438C, 204
 - EDGE, 622
 - frequency, 38
 - frequency modulation, 179
 - GPS subsystem, 763
 - GSM, 773

SCPI command subsystems (*continued*)

- HSDPA over W-CDMA, 812
- IEEE 488.2 common commands, 88
- input, 416, 422
- list/sweep, 49
- low frequency output, 186
- mass memory, 124
- memory, 94
- MSGPS subsystem, 770
- multitone, 326
- N5102A, 380
- NADC, 874
- output, 128
- PDC, 908
- phase modulation, 191
- PHS, 941
- power, 58
- pulse modulation, 199
- route, 130
- sense, 425
- status, 136
- system, 154
- TETRA, 977
- trigger, 166
- unit, 170
- wideband CDMA ARB, 340
- wideband CDMA base band generator, 1020
- SCPI commands
 - command tree paths, 7
 - parameter and response types, 7
 - parameter types
 - boolean, 10
 - discrete, 9
 - extended numeric, 8
 - numeric, 8
 - string, 10
 - response data types
 - discrete, 11
 - integer, 11
 - numeric boolean, 11
 - real, 10
 - string, 11
 - root command, 6
- SCPI reference, lxxiii
- SCPI softkey, 156, 158

Index

- Scramble Code softkey, 356, 362, 364
Scramble Off On softkey, 944, 980
Scramble Offset softkey, 356, 364
Scramble Seed softkey, 944, 980
Scrambling Code field, 1055, 1056, 1151
Screen Saver Delay
 1 hr softkey, 163
Screen Saver Mode softkeys, 164
Screen Saver Off On softkeys, 164
Second DPDCH I Q softkey, 362
Secondary Frame Off On softkey
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
secure wave directory, 116
security functions
 erase, 161
 none, 161
 overwrite, 161, 163
 sanitize, 161, 163
 secure display, 160
 secure mode, 162
segment advance
 trigger response, 318
Segment Advance softkey, 315
Select File softkey, 249, 282
Select Scenario softkey, 772
Select Seq softkey, 90
Select Waveform softkey, 323, 324
sense subsystem keys
 Adjust Gain, 437
 Aux, 438, 454, 460
 Aux I/O Trigger Polarity Pos Neg, 460
 BER Mode Off On, 425, 429, 448
 BERT Off On, 457
 BERT Resync Off On, 457
 Bit Count, 439, 441
 Bit Delay Off On, 459
 Block Count, 428, 430, 432, 444, 448
 Block Erasure, 426, 431, 444, 445, 446, 448, 449
 Bus, 438, 454, 460
sense subsystem keys (*continued*)
 Class Ib Bit Error, 451, 452
 Class II Bit Error, 452
 Cycle Count, 459
 Delay Bits, 459
 EDGE BERT Off On, 442
 Error Count, 442, 457
 Exceeds Any Thresholds, 452
 Ext, 438, 454, 460
 Ext Frame Trigger Delay, 427
 External Frame Polarity Net Pos, 427
 Frame Count, 447, 450
 Frame Erasure, 452
 Frame Trigger Source Int Ext, 428
 GSM BERT Off On, 455
 High Amplitude, 429, 433, 440
 Immediate, 438, 454, 460
 Initial Bit Count, 441
 Initial Block Count, 431, 434
 Initial Frame Count, 451
 Low Amplitude, 430, 433, 440, 447
 Measurement Mode BER% Search, 450
 Measurement Mode BLER% Search, 436
 No Thresholds, 426, 431, 446, 449, 452, 458
 Pass Amplitude, 430, 434, 441
 PN11, 456
 PN15, 456
 PN20, 456
 PN23, 456
 PN9, 456
 Resync Limits, 456
 Spcl Pattern 0's 1's, 455
 Spcl Pattern Ignore Off On, 456
 Spectrum Invert Off On, 437, 451
 Stop Measurement, 435, 449
 Sync Source BCH PDCH, 438
 Sync Source BCH TCH, 454
 Synchronize to BCH/PDCH, 437
 Synchronize to BCH/TCH, 453
 Target BER %, 429, 432
 Timeslot, 436, 449
 Total Bits, 458
 Trigger Key, 438, 454, 460
 Uplink Timing Advance, 439, 455
SEQ softkey, 102

-
- sequence, creating, 313
 service
 guide, lxxiii
 Set ALC Level softkey, 60
 Set Atten softkey, 65
 Set Marker Off All Points softkey, 301
 Set Marker Off Range Of Points softkey, 300
 Set Marker On Range Of Points softkey, 302
 setting conflicts, resolving, 670, 814
 setting markers, 302
 setup sweep, 49
 SF/2 softkey, 1155
 SF2 softkey, 1058
 SFN reset-signal (DRPS5) softkey, 1050, 1052, 1053, 1054, 1055
 SFN RST Polarity softkey, 1151
 SFN-CFN Frame Offset softkey, 1100
 SHAPE softkey, 102
 shift markers, 302
 Signal Type softkey, 392
 Signature field, 1136
 Sine softkey
 See amplitude modulation subsystem keys
 See DECT subsystem keys
 See EDGE subsystem keys
 See frequency modulation subsystem keys
 See GSM subsystem keys
 See low frequency output subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See phase modulation subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 single
 segment advance, 318
 Single softkey
 dual ARB subsystem keys, 318
 See CDMA ARB subsystem keys
 See CDMA2000 ARB subsystem keys
 See custom subsystem keys
 See DECT subsystem keys
 See Dmodulation subsystem keys
 See dual ARB subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 Single softkey (continued)
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
 See wideband CDMA ARB subsystem keys
 Single Sweep softkey, 167
 skew, 31, 32
 skew, quadrature (angle) adjustment
 BBG, 25
 RF path, 30
 Slot Format field, 1027, 1034, 1083, 1094, 1111, 1116
 softkey, 123
 software options, 82
 Source Module softkey, 63
 Span Type User Full softkey, 62
 Spcl Pattern 0's 1's softkey, 455
 Spcl Pattern Ignore Off On softkey, 456
 Spectrum Invert Off On softkey
 See sense subsystem keys
 Spread Rate 1 softkey, 247, 254, 262
 Spread Rate 3, 254
 Spread Rate 3 softkey, 247, 262
 Spread Rate field, 511
 Spreading Type Direct Mcarrier, 247
 Spreading Type Direct Mcarrier softkey, 263
 Spurious Response softkey, 1064
 Square softkey, 175, 182, 189, 195
 square wave pulse rate
 internally generated, 199
 SR1 9 Channel softkey, 249
 SR1 Pilot softkey, 249
 SR3 Direct 9 Channel softkey, 249
 SR3 Direct Pilot softkey, 249
 SR3 Mcarrier 9 Channel softkey, 249
 SR3 MCarrier Pilot softkey, 249
 SS softkey, 792
 SSB softkey, 999, 1004
 SSCH 2nd Scramble Group field, 1056
 SSCH Power field, 1056
 SSCH softkey, 357
 SSCH State field, 1057
 Standard softkey, 356
 Start Access Slot Position in 80ms Period field, 1122

Index

- Start Frequency softkey, 61, 74
Start Sub-Channel# field, 1126
State field
 See CDMA2000 BBG subsystem keys and fields
State softkey, 103, 124
STD softkey, 1080
Step Dwell softkey, 56
Step Power field, 1103
Stop Frequency softkey, 61, 74
Stop Measurement softkey
 See sense subsystem keys
Store Custom CDMA State softkey, 232, 251, 254
Store Custom Dig Mod State softkey, 285
Store Custom Multicarrier softkey, 231, 249
Store Custom W-CDMA State softkey, 352, 355
Store To File softkey, 21, 123, 127, 336, 364
string response data, 11
string SCPI parameter, 10
strings, quote usage, 17
STS softkey, 1000, 1005
Sub Channel Timing (RPS17) softkey
 See wideband CDMA base band generator
 subsystem keys and fields
Subnet Mask softkey, 77
subsystems, SCPI commands
 See SCPI command subsystems
Sum softkey, 24
Summing Ratio (SRC1/SRC2) x.xx dB softkey, 36
SW softkey, 927, 930, 932
Swap IQ softkey, 387
Sweep Direction Down Up softkey, 50
Sweep Repeat Single Cont softkey, 166
Sweep Retrace Off On softkey, 54
sweep setup, 49
Sweep Type List Step softkey, 55
sweep/list subsystem keys
 Load From Selected File
 Store to File, 49
Swept-Sine softkey, 175, 182, 189, 195
Symbol Out Polarity Neg Pos softkey, 134
Symbol Rate field, 1083, 1092, 1115
Symbol Rate softkey, 286, 356, 364, 658, 1111
Symbol Sync Out Polarity Neg Pos softkey, 135
Symbol Sync Polarity Neg Pos softkey, 131, 132
Symbol Timing Err softkey, 472
Sync Out Offset softkey, 614, 657, 803, 900, 933, 964, 1011
SYNC softkey, 895, 898, 957
Sync softkey, 229, 802
Sync Source BCH PDCH softkey, 438
Sync Source BCH TCH softkey, 454
Sync Source SFN FC1k ESG softkey, 1152
Synchronize to BCH/PDCH softkey, 437
Synchronize to BCH/TCH softkey, 453
System ID field, 504
system subsystem keys
 8648A/B/C/D, 156, 158
 8656B, 8657A/B, 156, 158
 8657D NADC, 156, 158
 8657D PDC, 156, 158
 8657J PHS, 156, 158
 Activate Secure Display, 160
 Enter Secure Mode, 162
 erase, 161
 Erase All, 161
 Erase and Overwrite All, 163
 Erase and Sanitize All, 163
 Error Info, 155
 Help Mode Single Cont, 156
 none, 161
 overwrite, 161
 PN9 Mode Preset, 159
 Power On Last Preset, 157
 Preset, 158
 Preset Normal User, 160
 Restore Sys Defaults, 159
 sanitize, 161
 Save User Preset, 160
 SCPI, 156, 158
 Screen Saver Delay
 1 hr, 163
 Screen Saver Mode, 164
 Screen Saver Off On, 164
 Time/Date, 154, 165
 View Next Error Message, 155

T

- T1 softkey, 654
T2 softkey, 655

-
- Target BER % softkey
See sense subsystem keys
- TCH All softkey, 957
- TCH softkey, 957
- TCH/FS softkey, 641, 644, 794
- tDPCH Offset field, 1035
- Test Model 1 w/16 DPCH softkey, 348, 353
- Test Model 1 w/32 DPCH softkey, 348, 353
- Test Model 1 w/64 DPCH softkey, 348, 353
- Test Model 2 softkey, 348, 353
- Test Model 3 w/16 DPCH softkey, 348, 353
- Test Model 3 w/32 DPCH softkey, 348, 353
- Test Model 4 softkey, 348, 353
- Test Model 5 w/2HSPDSCH softkey, 348, 353
- Test Model 5 w/4HSPDSCH softkey, 348, 353
- Test Model 5 w/8HSPDSCH softkey, 348, 353
- TETRA Off On softkey, 1019
- TETRA softkey, 282, 283, 284
- TETRA subsystem keys
- 128QAM, 994
 - 16 1's & 16 0's, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 - 16PSK, 994
 - 16QAM, 994
 - 256QAM, 994
 - 2-Lvl FSK, 994
 - 32 1's & 32 0's, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 - 32QAM, 994
 - 4 1's & 4 0's, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 - 4-Lvl FSK, 994
 - 4QAM, 994
 - 64 1's & 64 0's, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 - 64QAM, 994
 - 8 1's & 8 0's, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 - 8PSK, 994
 - All Timeslots, 1011
 - APCO 25 C4FM, 991
 - B, 999, 1004
 - B1, 997, 1002
 - B2, 997, 1002
 - BBG Data Clock Ext Int, 977
- TETRA subsystem keys (*continued*)
- BBG Ref Ext Int, 990
 - Begin Frame, 1011
 - Begin Timeslot #, 1011, 1012
 - Bit Rate, 978
 - BPSK, 994
 - Bus, 995, 1016
 - Continuous, 1014
 - D8PSK, 994
 - Data Format Pattern Framed, 986
 - Dn Custom Cont, 1010
 - Dn Normal Cont, 1010
 - Dn Normal Disc, 1010
 - Dn Sync Cont, 1010
 - Dn Sync Disc, 1010
 - Ext, 987, 995, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009, 1016
 - Ext BBG Ref Freq, 990
 - Ext Data Clock Normal Symbol, 989
 - Ext Delay Bits, 1017
 - Ext Delay Off On, 1017
 - Ext Polarity Neg Pos, 1018
 - Fall Delay, 980, 982
 - Fall Time, 981, 982
 - FCOR, 999, 1004
 - Filter Alpha, 977
 - Filter BbT, 978
 - FIX4, 987, 988, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009, 1010
 - Free Run, 1014
 - Freq Dev, 992
 - Gate Active Low High, 1015
 - Gated, 1014
 - Gaussian, 991
 - Gray Coded QPSK, 994
 - I/Q Scaling, 992
 - IS-95, 991
 - IS-95 Mod, 991
 - IS-95 Mod w/EQ, 991
 - IS-95 OQPSK, 994
 - IS-95 QPSK, 994
 - IS-95 w/EQ, 991
 - MSK, 994
 - Nyquist, 991
 - Optimize FIR For EVM ACP, 987

Index

- TETRA subsystem keys (*continued*)
 QPSK, 994
 π/4 DQPSK, 994
 Patt Trig In 1, 1018
 Patt Trig In 2, 1018
 Phase Dev, 993
 Phase Polarity Normal Invert, 994
 PN11, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 PN15, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 PN20, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 PN23, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 PN9, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 PN9 Mode Normal Quick, 979
 QPSK, 994
 Recall Secondary Frame State, 995
 Rectangle, 991
 Reset & Run, 1014
 Restore TETRA Factory Default, 989
 Rise Delay, 983, 984
 Rise Time, 984, 985
 Root Nyquist, 991
 Save Secondary Frame State, 995
 Scramble Off On, 980
 Scramble Seed, 980
 Secondary Frame Off On, 996
 Sine, 986
 Single, 1014
 SSB, 999, 1004
 STS, 1000, 1005
 Symbol Rate, 1012
 Sync Out Offset, 1011
 TETRA Off On, 1019
 Timeslot Ampl Main Delta, 1006
 Timeslot Off On, 1006
 Trigger & Run, 1014
 Trigger Key, 995, 1016
 TS, 997, 1002, 1006, 1007, 1009
 UN3/4 GSM Gaussian, 991
 Up Control 1, 1010
 Up Control 2, 1010
- TETRA subsystem keys (*continued*)
 Up Custom, 1010
 Up Normal, 1010
 User File, 986, 987, 996, 998, 1000, 1001, 1003, 1005, 1007, 1008, 1009
 User FIR, 991
 User FSK, 993, 994
 User I/Q, 993, 994
tetra subsystem keys
 PRAM Files, 988
TFCI Field Off On softkey, 356, 361, 364, 366
TFCI Pat field, 1035
TFCI Pattern field, 1084, 1112
TFCI State field, 1085, 1113
Tfirst field, 1028
TGCFN field, 1058, 1154
TGD field, 1059, 1155
Tgl field, 1028
TGL1 field, 1059, 1156
TGL2 field, 1059, 1156, 1157
TGPL1 field, 1060, 1156
TGPRC field, 1157
TGPS Inactive Active softkey, 1158
TGSN field, 1061, 1158
Through softkey, 32, 205, 208, 217, 222, 241, 246, 270, 275, 298, 299, 327, 329, 344, 346, 466, 473
Time field, 504
Time softkey, dual ARB trigger delay, 321
Time/Date softkey, 154, 165
Timeslot Ampl Main Delta softkey
 See DECT subsystem keys
 See EDGE subsystem keys
 See NADC subsystem keys
 See PDC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
Timeslot Off On softkey
 See DECT subsystem keys
 See EDGE subsystem keys
 See GSM subsystem keys
 See NADC subsystem keys
 See PHS subsystem keys
 See TETRA subsystem keys
Timeslot Offset softkey, 1125

- Timeslot softkey
See sense subsystem keys
- Timeslot Type softkey, [975](#)
- Timing Offset softkey, [1126](#), [1151](#), [1161](#)
- tOCNS Offset field, [1042](#)
- Toggle Marker 1 2 3 4 softkey, [313](#)
- Toggle State softkey, [334](#), [336](#)
- Total Bits field, [1165](#)
- Total Bits softkey, [458](#)
- Total Block field, [1167](#)
- TotalPwr field, [1078](#), [1108](#)
- TPC Pat Steps field, [1085](#)
- TPC Pat Trig Polarity Neg Pos softkey, [1087](#)
- TPC Pattern field, [1087](#)
- TPC Steps field, [1036](#)
- TPC UserFile Trig field, [1088](#)
- Tp-m field, [1127](#)
- Tp-p field, [1128](#)
- Traffic Bearer softkey, [589](#), [600](#)
- Traffic Bearer with Z field softkey, [589](#), [600](#)
- Traffic softkey, [229](#)
- Transp Chan A softkey, [1031](#)
- Transp Chan B softkey, [1031](#)
- Transp Position Flexible Fixed softkey, [1072](#)
- Transport CH softkey, [1043](#)
- TrCH BER field, [1093](#)
- TrCh BlkSize 168 softkey, [1124](#)
- TrCh BlkSize 360 softkey, [1124](#)
- TrCH State Off On softkey, [1177](#)
- TrCHl State Off On softkey, [1074](#)
- Triangle softkey, [175](#), [182](#), [189](#), [195](#)
- Trigger & Run softkey
See CDMA ARB subsystem keys
See CDMA2000 ARB subsystem keys
See custom subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See dual ARB subsystem keys
See EDGE subsystem keys
See GSM subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See PHS subsystem keys
See TETRA subsystem keys
See wideband CDMA ARB subsystem keys
- Trigger Advance field, [546](#)
- Trigger In Polarity Neg Pos softkey, [168](#)
- Trigger Key softkey
list/sweep subsystem, [54](#)
See amplitude modulation subsystem keys
See CDMA ARB subsystem keys
See CDMA2000 ARB subsystem keys
See DECT subsystem keys
See Dmodulation subsystem keys
See dual ARB subsystem keys
See EDGE subsystem keys
See frequency modulation subsystem keys
See GSM subsystem keys
See low frequency output subsystem keys
See NADC subsystem keys
See PDC subsystem keys
See phase modulation subsystem keys
See PHS subsystem keys
See sense subsystem keys
See TETRA subsystem keys
See trigger subsystem keys
See wideband CDMA ARB subsystem keys
- Trigger Out Polarity Neg Pos softkey, [167](#)
- trigger source, list sweep, [54](#)
- trigger subsystem keys
Bus, [168](#), [546](#)
Ext, [168](#), [546](#)
Free Run, [168](#), [546](#)
Single Sweep, [167](#)
Sweep Repeat Single Cont, [166](#)
Trigger In Polarity Neg Pos, [168](#)
Trigger Key, [168](#), [546](#)
Trigger Out Polarity Neg Pos, [167](#)
- Trigger Sync Reply (RPS7) softkey
See wideband CDMA base band generator subsystem keys and fields
- triggers
response selection
segment advance mode, dual ARB, [318](#)
- Truncated PN9 softkey, [465](#)
- TS softkey, [802](#), [997](#), [1002](#), [1006](#), [1007](#), [1009](#)
- TSC0 softkey, [645](#), [655](#), [793](#), [800](#)
- TSC1 softkey, [645](#), [655](#), [793](#), [800](#)
- TSC2 softkey, [645](#), [655](#), [793](#), [800](#)
- TSC3 softkey, [645](#), [655](#), [793](#), [800](#)

Index

TSC4 softkey, [645](#), [655](#), [793](#), [800](#)

TSC5 softkey, [645](#), [655](#), [793](#), [800](#)

TSC6 softkey, [645](#), [655](#), [793](#), [800](#)

TSC7, [645](#), [793](#), [800](#)

TSC7 softkey, [645](#), [655](#), [793](#), [800](#)

TTI field, [1073](#), [1130](#), [1170](#), [1177](#)

TTI Frame Clock (RPS9) softkey

See wideband CDMA base band generator

 subsystem keys and fields

Turbo Coding field, [498](#), [545](#)

Turbo softkey, [1068](#), [1070](#), [1163](#)

Type softkey, [356](#), [364](#)

U

UDI 64 kbps softkey, [1137](#)

UDI ISDN (25.101) softkey, [1033](#)

UN3/4 GSM Gaussian softkey

See CDMA ARB subsystem keys

See CDMA2000 ARB subsystem keys

See CDMA2000 BBG subsystem keys and fields

See custom subsystem keys

See DECT subsystem keys

See Dmodulation subsystem keys

See EDGE subsystem keys

See GPS subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

See TETRA subsystem keys

See wideband CDMA ARB subsystem keys

See wideband CDMA base band generator

 subsystem keys and fields

Uncoded softkey, [646](#)

unit subsystem keys

 dBm, [170](#)

 dBuV, [170](#)

 dBuVemf, [170](#)

 mV, [170](#)

 mVemf, [170](#)

 uV, [170](#)

 uVemf, [170](#)

unprotected

 memory subsystem, [116](#)

unspecified RMS, [295](#)

Up Control 1 softkey, [1010](#)

Up Control 2 softkey, [1010](#)

Up Custom softkey, [899](#), [933](#), [1010](#)

Up Normal softkey, [1010](#)

Up TCH All softkey, [899](#), [933](#)

Up TCH softkey, [899](#), [933](#)

Up VOX softkey, [933](#)

Up/Down softkey, [1036](#), [1086](#)

Update Display Cycle End Cont softkey, [407](#)

Update in Remote Off On softkey, [87](#)

Uplink MCS-1 softkey, [641](#), [644](#), [794](#)

Uplink MCS-5 softkey, [646](#)

Uplink MCS-9 softkey, [646](#)

Uplink Timing Advance softkey

See sense subsystem keys

uploading files, [116](#)

user

 documentation, [lxviii](#)

User File softkey

See CDMA2000 BBG subsystem keys and fields

See custom subsystem keys

See DECT subsystem keys

See EDGE subsystem keys

See GPS subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

See TETRA subsystem keys

See wideband CDMA base band generator

 subsystem keys and fields

user files, HSDPA, [812](#)

user files, HSPA, [668](#)

User FIR softkey

See CDMA ARB subsystem keys

See CDMA2000 ARB subsystem keys

See CDMA2000 BBG subsystem keys and fields

See custom subsystem keys

See DECT subsystem keys

See Dmodulation subsystem keys

See EDGE subsystem keys

See GPS subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

User FIR softkey (continued)

See PHS subsystem keys

See TETRA subsystem keys

See wideband CDMA ARB subsystem keys

See wideband CDMA base band generator subsystem keys and fields

User Flatness softkey, 103, 124**User FSK softkey**

See custom subsystem keys

See DECT subsystem keys

See EDGE subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

See TETRA subsystem keys

User I/Q softkey

See custom subsystem keys

See DECT subsystem keys

See EDGE subsystem keys

See GSM subsystem keys

See NADC subsystem keys

See PDC subsystem keys

See PHS subsystem keys

See TETRA subsystem keys

uV softkey, 170**uVemf softkey, 170****UW softkey, 955, 956, 973, 974****UWCDMA softkey, 104****V****View Next Error Message softkey, 155****W****Walsh Code softkey, 252, 255****Walsh field**

See CDMA2000 BBG subsystem keys and fields

waveform

sequence, dual ARB, 313

Waveform Length softkey, 212, 238**waveform license time remaining, 84****Waveform Licenses softkey, 82, 84****Waveform Runtime Scaling softkey, 312, 335****waveform scaling**

during playback, 312, 335

files, 312

waveform, creating a multitone, 326**W-CDMA Off On softkey, 378, 1177****WCDMA softkey**

See CDMA ARB subsystem keys

See CDMA2000 ARB subsystem keys

See Dmodulation subsystem keys

See wideband CDMA ARB subsystem keys

wideband AM, 173**wideband CDMA ARB subsystem keys**

1 DPCH, 348, 353

2 Carriers, 349

2.100 MHz, 346

3 Carriers, 349

3 DPCH, 348, 353

4 Carriers, 349

40.000 MHz, 344, 346

APCO 25 C4FM, 342

Apply Channel Setup, 356, 364

ARB Reference Ext Int, 370

ARB Sample Clock, 372

Bus, 375

Channel, 356, 364

Chip Rate, 342

Clear Header, 344

Clip |I| To, 340, 350

Clip |Q| To, 340, 351

Clip At PRE POST FIR Filter, 340

Clip Type |I+jQ| To, 341, 351

Clipping Type |I+jQ| |I|,|Q|, 341, 351

Continuous, 372

Custom WCDMA State, 363

DPCCH, 363

DPCCH + 1 DPDCH, 363

DPCCH + 2 DPDCH, 363

DPCCH + 3 DPDCH, 363

DPCCH + 4 DPDCH, 363

DPCCH + 5 DPDCH, 363

DPCH, 357

Equal Energy per Symbol, 361

Ext Delay Off On, 376

Ext Delay Time, 376

Ext Key, 375

Index

wideband CDMA ARB subsystem keys (*continued*)
Ext Polarity Neg Pos, 377
Filter Alpha, 343
Filter BbT, 343
First Spread Code, 356, 364
Free Run, 374
Gain Unit dB Lin Index, 366
Gate Active Low High, 374
Gated, 372
Gaussian, 342
I/Q Mapping Norma Invert, 345
I/Q Mod Filter Manual Auto, 347
I/Q Output Filter Manual Auto, 345
Increment Scramble Code, 352
Increment Timing Offset, 355
IS-2000 SR3 DS, 342
IS-95, 342
IS-95 Mod, 342
IS-95 Mod w/EQ, 342
IS-95 w/EQ, 342
Left Alternate, 356
Link Down Up, 347
Marker 1, 367, 368
Marker 2, 367, 368
Marker 3, 367, 368
Marker 4, 367, 368
Marker Polarity Neg Pos, 370
Modulator Atten Manual Auto, 346
None, 367, 368
Nyquist, 342
OCNS, 357
Optimize ACP ADJ ALT, 347, 362
Optimize FIR For EVM ACP, 344
Patt Trig In 1, 377
Patt Trig In 2, 377
PCCPCH + SCH, 348, 353
PCCPCH + SCH + 1 DPCH, 348, 353
PCCPCH + SCH + 3 DPCH, 348, 353
PICH, 357
Power, 364
PPCCPCH, 357, 358
PSCH, 357
Random, 356, 364
Rectangle, 342
Reference Freq, 370

wideband CDMA ARB subsystem keys (*continued*)
Reset & Run, 374
Retrigger Mode Off On, 371
Right Alternate, 356
Root Nyquist, 342
Save Setup To Header, 344
Scale to 0dB, 361
SCCPCH, 357, 358
Scramble Code, 356, 362, 364
Scramble Offset, 356, 364
Second DPDCH I Q, 362
Single, 372
SSCH, 357
Standard, 356
Store Custom W-CDMA State, 352, 355
Store To File, 364
Symbol Rate, 356, 364
Test Model 1 w/16 DPCH, 348, 353
Test Model 1 w/32 DPPCH, 348, 353
Test Model 1 w/64 DPCH, 348, 353
Test Model 2, 348, 353
Test Model 3 w/16 DPCH, 348, 353
Test Model 3 w/32 DPCH, 348, 353
Test Model 4, 348, 353
Test Model 5 w/2HSPDSCH, 348, 353
Test Model 5 w/4HSPDSCH, 348, 353
Test Model 5 w/8HSPDSCH, 348, 353
TFCI Field Off On, 356, 361, 364, 366
Through, 344, 346
Trigger & Run, 374
Trigger Key, 375
Type, 356, 364
UN3/4 GSM Gaussian, 342
User FIR, 342
WCDMA, 342
W-CDMA Off On, 378
wideband CDMA base band generator subsystem
 keys and fields
 # of Blocks, 1071
 1/2 Conv, 1068, 1070, 1163
 1/3 Conv, 1068, 1070, 1163
 10 msec, 1096
 10ms Frame Pulse (DRPS11), 1050, 1052, 1053,
 1054, 1055

- wideband CDMA base band generator subsystem
 keys and fields (*continued*)
 10ms Frame Pulse (RPS6), 1145, 1147, 1148, 1149, 1150
 12.2 kbps (34.121), 1033
 144 kbps (34.121), 1033
 20 msec, 1096
 2560 msec, 1096
 2nd Scr Offset, 1034, 1041
 3.84MHz chip-clk (DRPS4), 1050, 1052, 1053, 1054, 1055
 384 kbps (34.121), 1033
 40 msec, 1096
 64 kbps (34.121), 1033
 80 msec, 1096
 80ms Frame Pulse (DRPS13), 1050, 1052, 1053, 1054, 1055
 80ms Frame Pulse (RPS20), 1145, 1147, 1148, 1149, 1150
A, 1025
ACS, 1064
Active, 1061
Actual BER, 1172
Actual BLER, 1166, 1173
AICH, 1130
AICH Trigger Polarity Pos Neg, 1105
All Down, 1036, 1086
All Up, 1036, 1086
Alt power in, 1143
AMR 12.2 kbps, 1033, 1137
APCO 25 C4FM, 1037, 1097
Apply Channel Setup, 1021, 1075
B, 1025
Base Delay Tp-a, 1127
BBG Chip Clock Ext Int, 1020
BBG Data Clock Ext In, 1024
BER, 1166, 1168, 1173, 1175
Beta, 1079, 1089
BLER, 1167, 1168, 1174, 1175
Blk Set Size, 1067
Blk Size, 1066, 1162, 1170
Blocking, 1064
Burst gate in, 1144
C Power, 1076
C Power value, 1106
- wideband CDMA base band generator subsystem
 keys and fields (*continued*)
 C/N value, 1021, 1075, 1105
 CFN #0 Frame Pulse (RPS10), 1139
 Chan Code, 1030, 1031, 1040
 Channel Code, 1045, 1080, 1090, 1131, 1132
 Channel Code field, 1044
 Channel State, 1089, 1096
 Channel State Off On, 1024, 1028, 1029, 1031, 1037, 1039, 1042, 1043, 1045, 1047, 1055, 1078, 1108, 1163, 1170, 1171
 ChCode Ctl, 1121
 ChCode Dat, 1121
 Chip Clock (RPS1), 1139, 1145, 1147, 1148, 1149, 1150
 Chip Rate, 1030, 1079
 Comp Mode Start Trigger Polarity Neg Pos, 1160
 Comp Mode Start Trigger Polarity Pos Neg, 1062, 1063
 Comp Mode Stop Trigger Polarity Neg Pos, 1160
 Comp Mode Stop Trigger Polarity Pos Neg, 1063
 Compressed Mode Off On, 1159
 Compressed Mode Start Trigger, 1039, 1062, 1160
 Compressed Mode Stop Trigger, 1063, 1160
 CRC Size, 1069, 1164, 1171
 Ctrl Beta, 1109
 Ctrl Pwr, 1110
 Data, 1091
 Data Beta, 1113
 Data field, 1175
 Data Pwr, 1115
 Data Rate, 1041
 DCH1, 1077
 DCH2, 1077
 DCH3, 1077
 DCH4, 1077
 DCH5, 1077
 DCH6, 1077
 DL Reference 1.1, 1158
 DL Reference 1.2, 1158
 DL Reference 2.1, 1158
 DL Reference 2.2, 1158
 Down/Up, 1036, 1086
 DPCCH, 1077, 1100

Index

- wideband CDMA base band generator subsystem
 keys and fields (*continued*)
 DPCCH Pilot data-clk (DRPS23), 1050, 1052,
 1053, 1054, 1055
 DPCCH Power, 1083
 DPCCH Raw Data (RPS4), 1139
 DPCCH Raw Data Clock (RPS5), 1139
 DPCCH TFCI data-clk (DRPS22), 1050, 1052,
 1053, 1054, 1055
 DPCCH TPC indicator (DRPS21), 1050, 1052,
 1053, 1054, 1055
 DPCH + 1, 1022, 1023
 DPCH + 2, 1022, 1023
 DPCH 10ms Frame-Pulse (DRPS26), 1050, 1052,
 1053, 1054, 1055
 DPCH Channel Balance, 1030
 DPCH Compressed Frame Indicator (DRPS32),
 1050, 1052, 1053, 1054, 1055
 DPCH data stream (DRPS24), 1050, 1052, 1053,
 1054, 1055
 DPCH data-clk (0) (DRPS28), 1050, 1052, 1053,
 1054, 1055
 DPCH Gap Indicator (DRPS33), 1050, 1052,
 1053, 1054, 1055
 DPCH TimeSlot pulse (DRPS25), 1050, 1052,
 1053, 1054, 1055
 DPDCH, 1077
 DPDCH data-clk withDTX (DRPS20), 1050,
 1052, 1053, 1054, 1055
 DPDCH data-clk WithOutDTX (DRPS30), 1050,
 1052, 1053, 1054, 1055
 DPDCH Power, 1092
 DPDCH Raw Data (RPS2), 1139
 DPDCH Raw Data Clock (RPS3), 1139
 Eb/No, 1106
 Eb/No value (dB), 1076
 Ec/No value, 1022, 1107
 Equal Powers, 1043, 1100
 Error BER, 1172
 Error Bits, 1165
 Error Blocks, 1166
 Ext, 1036
 Ext Clock Rate x1 x2 x4, 1020
 FBI State, 1082
 Filter Alpha, 1038, 1098
- wideband CDMA base band generator subsystem
 keys and fields (*continued*)
 Filter BbT, 1038, 1099
 FIX, 1082
 FIX4, 1032, 1043, 1044, 1045, 1046, 1069, 1070,
 1081, 1091, 1109, 1110, 1112, 1114, 1168,
 1172
 Flat Noise BW, 1077
 Frame Clock Polarity Neg Pos, 1097
 Frame Struct, 1057
 Frame Sync Trigger Mode Single Cont, 1152
 Gaussian, 1037, 1097
 Higher Layer, 1155
 Infinity, 1060, 1157
 Init Power, 1101
 Init Pwr, 1119, 1134
 Intermod, 1064
 IS-95, 1037, 1097
 IS-95 Mod, 1037, 1097
 IS-95 Mod w/EQ, 1037, 1097
 IS-95 w/EQ, 1097
 Left, 1026
 Link Down Up, 1074
 Max Input, 1064
 Max Power, 1102
 Max Pwr, 1120, 1135
 Message Data Raw Data (RPS11), 1145, 1147,
 1148, 1149, 1150
 Message Part, 1118
 Message Pulse (RPS22), 1145, 1147, 1148, 1149,
 1150
 Message-Control Raw Data (RPS13), 1147, 1148,
 1149, 1150
 Message-Control Raw Data Clock (RPS12), 1145,
 1147, 1148, 1149, 1150
 Min Power, 1102
 Msg Ctrl, 1107
 Msg Data, 1107
 Msg Pwr, 1118, 1133
 N Power, 1078, 1108
 NONE, 1163
 None, 1068, 1070, 1168, 1175
 NONE (RPS0), 1139, 1145, 1147, 1148, 1149,
 1150
 Normal, 1026

-
- wideband CDMA base band generator subsystem
keys and fields (*continued*)
 Num of Blk, 1169, 1176
 Num of Pre, 1119, 1134
 Number of AICH, 1104
 Number of PRACH, 1131, 1133
 Number of PRACH 80ms, 1118
 Number of Preamble, 1134
 Nyquist, 1037, 1097
 Off, 1130
 Omitted, 1060, 1157
 On, 1130
 On/Off, 1042, 1123
 OpenLoop Ant1, 1065
 OpenLoop Ant1 SCH TSTD OFF, 1065
 OpenLoop Ant2, 1065
 OpenLoop Ant2 SCH TSTD OFF, 1065
 Optimize FIR For EVM ACP, 1039, 1099
 Paging Indicator, 1046
 Pattern trigger in 1, 1144
 Pattern trigger in 2, 1145
 PCCPCH, 1022, 1023
 P-CCPCH data (DRPS39), 1050, 1052, 1053,
 1054, 1055
 P-CCPCH data-clk (DRPS38), 1050, 1052, 1053,
 1054, 1055
 Performance Req, 1064
 Phase Polarity Normal Invert, 1047
 Phase Polarity Normal Inverted, 1074
 PI Bits, 1046
 PICH, 1022, 1023
 PICH 10ms FramePulse (DRPS37), 1050, 1052,
 1053, 1054, 1055
 PICH data (DRPS35), 1050, 1052, 1053, 1054,
 1055
 PICH data-clk (DRPS34), 1050, 1052, 1053,
 1054, 1055
 PICH TimeSlot Pulse (DRPS36), 1050, 1052,
 1053, 1054, 1055
 Playback Ratio, 1026
 PN15, 1025, 1031, 1040, 1043, 1045, 1080, 1081,
 1084, 1086, 1091, 1109, 1112, 1114
 PN9, 1025, 1031, 1040, 1043, 1045, 1069, 1080,
 1081, 1084, 1086, 1091, 1109, 1112, 1114,
 1164, 1172
- wideband CDMA base band generator subsystem
keys and fields (*continued*)
 Power, 1026, 1029, 1032, 1040, 1044, 1047, 1048
 Power Control Signal Polarity Neg Pos, 1104
 Power Hold Off On, 1101
 Power Mode Norm TPC, 1104
 Pp-m, 1120, 1136
 PRACH, 1100
 PRACH Mode Single Multi, 1117
 PRACH Power Setup Mode Pp-m Total, 1124
 PRACH Processing (RPS19), 1145, 1147, 1148,
 1149, 1150
 PRACH Scrambling Code, 1125
 PRACH Trigger, 1129
 PRACH Trigger Polarity Neg Pos, 1129
 PRACH Trigger Source Immedi Trigger, 1129
 Pre Sig, 1121
 Preamble, 1107
 Preamble power average, 1123
 Preamble Pulse (RPS21), 1145, 1147, 1148, 1149,
 1150
 Preamble Raw Data (RPS15), 1145, 1147, 1148,
 1149, 1150
 Preamble Raw Data Clock (RPS16), 1145, 1147,
 1148, 1149, 1150
 PSCH State, 1048
 Puncture, 1058, 1169, 1176
 PwrOffs, 1057, 1154
 RACH TrCH, 1107
 Ramp Step, 1120, 1135
 Rate Match Attr, 1073, 1169, 1176
 Rectangle, 1037, 1097
 Ref Data Rate, 1076, 1106
 Ref Sensitivity, 1064
 Reset to Initial Power, 1103
 Right, 1026
 RMC 144 kbps (25.141), 1137
 RMC 384 kbps (25.141), 1137
 RMC 64 kbps (25.141), 1137
 RMC122 kbps (25.141), 1137
 Root Nyquist, 1037, 1097
 Scale to 0dB, 1043, 1100
 SCFN, 1062, 1159
 SCH slot-pulse (DRPS10), 1050, 1052, 1053,
 1054, 1055

Index

- wideband CDMA base band generator subsystem
 keys and fields (*continued*)
 Scrambling Code, 1055, 1056, 1151
 SF/2, 1155
 SF2, 1058
 SFN reset-signal (DRPS5), 1050, 1052, 1053, 1054, 1055
 SFN RST Polarity, 1151
 SFN-CFN Frame Offset, 1100
 Signature, 1136
 Slot Format, 1027, 1034, 1083, 1094, 1111, 1116
 Spurious Response, 1064
 SSCH 2nd Scramble Group, 1056
 SSCH Power, 1056
 SSCH State, 1057
 Start Access Slot Position in 80ms Period, 1122
 Start Sub-Channel#, 1126
 STD, 1080
 Step Power, 1103
 Sub Channel Timing (RPS17), 1145, 1147, 1148, 1149, 1150
 Symbol Rate, 1083, 1092, 1111, 1115
 Sync Source SFN FClk ESG, 1152
 tDPCH Offset, 1035
 TFCI Pat, 1035
 TFCI Pattern, 1084, 1112
 TFCI State, 1085, 1113
 Tfirst, 1028
 TGCFN, 1058, 1154
 TGD, 1059, 1155
 Tgl, 1028
 TGL1, 1059, 1156
 TGL2, 1059, 1156
 GPL1, 1060, 1156
 GPL2, 1157
 TGPRC, 1157
 TGPS Inactive Active, 1158
 TGSN, 1061, 1158
 Timeslot Offset, 1125
 Timing Offset, 1126, 1151, 1161
 tOCNS Offset, 1042
 Total Bits, 1165
 Total Blocks, 1167
 TotalPwr, 1078, 1108
 TPC Pat Steps, 1085
wideband CDMA base band generator subsystem
 keys and fields (*continued*)
 TPC Pat Trig Polarity Neg Pos, 1087
 TPC Pattern, 1087
 TPC Steps, 1036
 TPC UserFile Trig, 1088
 Tp-m, 1127
 Tp-p, 1128
 Transp Chan A, 1031
 Transp Chan B, 1031
 Transp Position Flexible Fixed, 1072
 Transport CH, 1043
 TrCH BER, 1093
 TrCh BlkSize 168, 1124
 TrCh BlkSize 360, 1124
 TrCH State Off On, 1074, 1177
 Trigger Sync Reply (RPS7), 1145, 1147, 1148, 1149, 1150
 TTI, 1073, 1130, 1170, 1177
 TTI Frame Clock (RPS9), 1139
 Turbo, 1068, 1070, 1163
 UDI 64 kbps, 1137
 UDI ISDN (25.101), 1033
 UN3/4 GSM Gaussian, 1037
 Up/Down, 1036, 1086
 User File, 1031, 1036, 1043, 1045, 1069, 1080, 1081, 1084, 1091, 1109, 1112, 1114, 1164, 1172
 User FIR, 1037, 1097
 W-CDMA Off On, 1177
Word Alignment softkey, 384
Word Size softkey, 391