



Agilent E4428C and E4438C ESG Signal Generators

Configuration Guide

UP
GRADE

You Can Upgrade!
Options can be added
after initial purchase.



Migrate to the new Agilent MXG X-Series Signal generator and generate true performance

The new MXG exceeds the ESG's performance in every category - output power, phase noise, spurious, and low frequency coverage to 9 kHz. Enjoy frequency and amplitude switching speeds that are 10 to 20 times faster, all in a compact 3.5 inch (89 mm) tall unit. For more information, visit www.agilent.com/find/X_Series_SG



E4428C ESG Analog Signal Generator

Configuring your E4428C analog signal generator

The following steps will guide you through configuring your Agilent Technologies E4428C analog signal generator with the performance you need.

Step 1 Choose a frequency range (Required)

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
				Note: These 5 options are recommended to achieve full functional equivalence to the ESG. Additionally, one of the frequency options below must be selected.	N5181B-UNT (analog modulation) N5181B-UNW (narrow pulse modulation) N5181B-006 (instrument security) N5181B-1EQ (specified low power) N5181B-303 (multifunction generator)
E4428C-503	250 kHz to 3 GHz frequency range		506		N5181B-503 (9 kHz to 3 GHz)
E4428C-506	250 kHz to 6 GHz frequency range *(Mechanical attenuator only—Option UNB performance is included with Option 506)		503		N5181B-506 (9 kHz to 6 GHz)

Step 2 Choose an attenuator

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
E4428C-UNB	High output power with mechanical attenuator: Increase the output power up to 6 dB for higher power applications. (Option UNB performance is included with Option 506)	503	506	Data Sheet: 5989-1992EN	The MXG's standard output power is higher than E4428C-UNB performance. For even more power, order N5181B-1EA high output power.

Step 3 Choose accessories or instrument connector configuration

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
E4428C-1EM	Moves all front panel connectors to rear panel				N5181B-1EM
E4428C-1CM	Rack mount without handle		1CP, 1CN		1CM010A
E4428C-1CP	Rack mount kit with front handles		1CM, 1CN	Catalog: 5980-0450E	1CP004A
E4428C-1CN	Front handle kit		1CP, 1CM	Catalog: 5980-0450E	1CN006A

E4428C ESG Analog Signal Generator (Continued)

Step 4 Choose a warranty and calibration plan

Ordering #	Description	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
Included	3-year warranty (return-to-Agilent), standard		
R-51B-001-5C	Warranty Assurance Plan, Return to Agilent, 5 years		R-51B-001-5C
R-51B-001-1CU	Onsite warranty - 1 year (no charge)		R-51B-001-1CU
R-51B-001-3CU	Onsite warranty - 3 years		R-51B-001-3CU
UK6	Commercial calibration certificate with test data		UK6
R-50C-011-3	Calibration Assurance Plan, Return to Agilent, 3 years		R-50C-011-3
R-50C-011-5	Calibration Assurance Plan, Return to Agilent, 5 years		R-50C-011-5
AMG	Agilent Calibration + Uncertainties + Guardbanding (accredited cal)		AMG
R-50C-016-3	Agilent Calibration + Uncertainties + Guardbanding, 3 years		R-50C-016-3
R-50C-016-5	Agilent Calibration + Uncertainties + Guardbanding, 5 years		R-50C-016-5
A6J	ANSI Z540-1-1994 Calibration		A6J
R-50C-021-3	ANSI Z540-1-1994 Calibration, 3 years		R-50C-021-3
R-50C-021-5	ANSI Z540-1-1994 Calibration, 5 years		R-50C-021-5

Step 5 Choose start up assistance options

Ordering #	Description	Not Requires compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
PS-S10	Remote scheduled assistance 1 to 999 hours			PS-S10
PS-S10	Daily productivity assistance			PS-S20
PS-T10-ASG	Signal generator and source basics; half day, Max. 8 students on site			PS-T10-ASG
PS-X10	Custom services to be qualified by Agilent			PS-X10

Step 6 Choose documentation

Ordering #	Description	Not Requires compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
E4428C-CD1	CD-ROM - English Documentation Set (standard)			N5181B-CD1
E4428C-0BW	Service documentation, assembly level (hardcopy)			
E4428C-UK6	Commercial calibration certificate with test data (hardcopy)		N5181B-UK6	N5181B-UK6
E4428C-ABA	United States - English documentation set (hardcopy)			

List of available options

Ordering #	Description	Matching MXG options For more information go to www.agilent.com/find/mxg
E4428C-UNB	High output power with mechanical attenuator	N5181B-1EA
E4428C-1CM	Rackmount flange kit	1CM010A
E4428C-1CN	Front handle kit	1CN006A
E4428C-1CP	Rackmount kit with front handles	1CP004A
E4428C-1EM	Moves all front panel connectors to the rear panel	N5181B-1EM
E4428C-503	Frequency range from 250 kHz to 3 GHz	N5181B-503
E4428C-506	Frequency range from 250 kHz to 6 GHz	N5181B-506
E4428C-UK6	Hardcopy of the commercial calibration certificate and calibration test data	N5181B-UK6
E4428C-0BW	Service documentation, assembly level	
E4428C-ABA	Hardcopy of the English documentation set	
E4428C-CD1	CD-ROM containing the English documentation set	N5181B-CD1

E4438C ESG Vector Signal Generator

Configuring your E4438C vector signal generator

The following steps will guide you through configuring your Agilent Technologies E4438C vector signal generator with the performance you need.

Step 1 Choose a frequency range (Required)

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
				Note: These 5 options are recommended to achieve full functional equivalence to the ESG. Additionally, one of the frequency options below must be selected.	N5182B-UNT (analog modulation) N5182B-UNW (narrow pulse modulation) N5182B-006 (instrument security) N5182B-1EQ (specified low power) N5182B-303 (multifunction generator)
E4438C-501	250 kHz to 1 GHz frequency range		502, 503, 504, 506		N5182B-503 (9 kHz to 3 GHz)
E4438C-502	250 kHz to 2 GHz frequency range		501, 503, 504, 506		N5182B-503 (9 kHz to 3 GHz)
E4438C-503	250 kHz to 3 GHz frequency range		501, 502, 504, 506		N5182B-503 (9 kHz to 3 GHz)
E4438C-504	250 kHz to 4 GHz frequency range		501, 502, 503, 506		N5182B-506 (9 kHz to 6 GHz)
E4438C-506	250 kHz to 6 GHz frequency range (Mechanical attenuator only—Option UNB performance is included with Option 506)	UNJ	UNB*, 300, 501, 502, 503, 504		N5182B-506 (9 kHz to 6 GHz)

Step 2 Choose phase noise performance

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
<i>Standard</i>	Standard phase noise performance			Data Sheet: 5988-4039EN	Data Sheet: 5991-0038EN
E4438C-UNJ	Enhanced phase noise performance: Up to 20 dB single sideband (SSB) improvement over standard performance. (Option 1E5 performance is included)		300, 1E5	Data Sheet: 5988-4039EN	N5182B standard phase noise is better than or equal to E4438C-UNJ. For even better performance, order N5182B-UNX or -UNY

E4438C ESG Vector Signal Generator (Continued)

Step 3 Choose an attenuator

Ordering #	Description	Not Requires compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
<i>Standard with Options 501, 502, 503, 504</i>	State-of-the-art <u>electronic attenuator</u> : Includes excellent adjacent channel performance (ACP) for CDMA application (previously Option H99). Also provides alternate timeslot power control ideal for GSM receiver and transmitter designs (previously Option UNA)	506	Data Sheet: 5988-4039EN	Standard
E4438C-UNB	High output power with <u>mechanical attenuator</u> : Increase the output power up to 6 dB for higher power applications. (Option UNB performance is included with Option 506)	300, 506	Data Sheet: 5988-4039EN	The MXG's standard output power is higher than E4438C-UNB performance. For even more power, order N5182B-1EA high output power.

Step 4 Choose baseband generator with memory

Ordering #	Description	Not Requires compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
<i>Standard</i>	External I/Q inputs only. No built-in digital modulation.		Data Sheet: 5988-4039EN	External I/Q inputs only. No built-in digital modulation.
E4438C-601	Internal baseband generator, 8 MSa memory with digital bus capability; used to produce arbitrary and real-time I/Q waveforms. A variety of standard compliant firmware and software is available.	602	Data Sheet: 5988-4039EN	N5182B-656 (80 MHz RF BW, 32 MSa) N5182B-660 (Upgrade BBG with real-time capability) N5182B-430 (multi-tone and 2-tone) N5182B-431 (custom digital modulation) ¹ N5182B-1EL (differential I/Q outputs)
E4438C-602	Internal baseband generator, 64 MSa memory with digital bus capability; extra memory for when longer waveform playback is desired. Used to produce arbitrary and real-time I/Q waveforms. A variety of standard-compliant firmware and software is available.	601	Data Sheet: 5988-4039EN	N5182B-656 (80 MHz RF BW, 32 MSa) N5182B-022 (Upgrade BBG memory from 32 to 512 MSa) N5182B-660 (Upgrade BBG with real-time capability) N5182B-430 (multi-tone and 2-tone) N5182B-431 (Custom digital modulation) ¹ N5182B-1EL (Differential I/Q outputs)
E4438C-005	6 GB hard drive for non-volatile waveform storage		Data Sheet: 5988-4039EN	N5182B-009 (30 GB internal solid state memory)

1. N5182B-431 includes real-time custom modulation and does not require Option 660 hardware.

E4438C ESG Vector Signal Generator (Continued)

Standard with Options 601 & 602

- Generates arbitrary waveforms and real-time I/Q symbols.
- Includes custom modulation, multitone, and the PSG/ESG download assistant for MATLAB.

Step 5 Choose signal creation software for your internal baseband generator

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg www.agilent.com/find/signalstudio	Matching MXG options For more information go to www.agilent.com/find/mxg
E4438C-221-229	Waveform license 5-packs 1 to 9	601 or 602		View online documentation (purchase up to 9 packs for 45 Signal Studio waveforms)	N5182B-221 to -229
E4438C-250-259	Waveform license 50-packs 1 to 10	601 or 602		View online documentation (purchase up to 10 packs for 500 Signal Studio waveforms)	N5182B-250 to -259
E4438C-400	3GPP W-CDMA FDD personality	601 or 602		Technical Overview: 5988-4449EN	N7600B Signal Studio for W-CDMA/HSPA+
E4438C-401	cdma2000 [®] and IS-95-A personality	601 or 602		Technical Overview: 5988-4430EN	N7601B Signal Studio for cdma2000/1xEV-DO
E4438C-402	TDMA personality (GSM, EDGE, GPRS, EGPRS, NADC, PDC, PHS, DECT, TETRA)	601 or 602		Technical Overview: 5988-4431EN	N7602B Signal Studio for GSM/EDGE/Evo
E4438C-403	Calibrated Noise (AWGN) personality	601 or 602			N5182B-403 Calibrated AWGN
E4438C-407	Signal Studio for S-DMB	601 or 602		Technical Overview: 5989-0861EN	
E4438C-409	Multi-satellite GPS personality	601 or 602		Technical Overview: 5988-6256EN	N7609B Signal Studio for Global Navigation Satellite Systems (GNSS)
E4438C-419	Signal Studio for 3GPP WCDMA HSPA	601 or 602			N7600B Signal Studio for W-CDMA/HSPA+
E4438C-422	Scenario generator for GPS personality	409 and 601 or 602		Technical Overview: 5990-5780EN	N7609B Signal Studio for Global Navigation Satellite Systems (GNSS)
E4438C-SP1	Signal Studio for jitter injection	601 or 602			
N7600B*	N7600B Signal Studio for W-CDMA/HSPA+	601 or 602		View online documentation	N7600B Signal Studio for W-CDMA/HSPA+
N7601B*	N7601B Signal Studio for cdma2000/1xEV-DO	601 or 602		View online documentation	N7601B Signal Studio for cdma2000/1xEV-DO
N7602B*	N7602B Signal Studio for GSM/EDGE/Evo	601 or 602		View online documentation	N7602B Signal Studio for GSM/EDGE/Evo
N7606B*	N7606B Signal Studio for Bluetooth	601 or 602		View online documentation	N7606B Signal Studio for Bluetooth
N7611B*	N7611B Signal Studio for broadcast radio	601 or 602		View online documentation	N7611B Signal Studio for Broadcast Radio
N7612B*	N7612B Signal Studio for TD-SCDMA/HSDPA	601 or 602		View online documentation	N7612B Signal Studio for TD-SCDMA/HSDPA
N7613A*	N7613A Signal Studio for Fixed WiMAX	601 or 602		View online documentation	N7613A Signal Studio for Fixed WiMAX
N7615B*	N7615B Signal Studio for Mobile WiMAX	601 or 602		View online documentation	N7615B Signal Studio for Mobile WiMAX
N7616B*	Signal Studio for T-DMB (Discontinued)	601 or 602		View online documentation	
N7617B*	N7617B Signal Studio for 802.11a/b/g/n/ac WLAN	601 or 602		View online documentation	N7617B Signal Studio for 802.11a/b/g/n/ac WLAN
N7620B	Signal Studio for pulse building	601 or 602		View online documentation	N7620B Signal Studio for pulse building
N7621B*	Signal Studio for multitone distortion	601 or 602		View online documentation	
N7622A	N7622B Signal Studio toolkit (Free download)	601 or 602		Technical Overview: 5989-1606EN	N7622B Signal Studio Toolkit
N7623B*	N7623B Signal Studio for digital video	601 or 602		View online documentation	N7623B Signal Studio for Digital Video
N7624B*	N7624B Signal Studio for LTE/LTE-Advanced FDD	601 or 602		View online documentation	N7624B Signal Studio for LTE/LTE-Advanced FDD
N7625B*	N7625B Signal Studio for LTE/LTE-Advanced TDD	601 or 602		View online documentation	N7625B Signal Studio for LTE/LTE-Advanced TDD

*For factory installation of Signal Studio fixed perpetual licenses, Signal Studio model-number software must be ordered under the E4438C configuration.

E4438C ESG Vector Signal Generator (Continued)

Step 6 Choose a bit-error-rate (BER) analyzer

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
E4438C-UN7	Internal bit-error-rate analyzer				
E4438C-300	GSM/EDGE basestation loopback BER test capability	601 or 602, 402, UN7	UNJ, UNB, 506		

Step 7 Choose accessories or instrument connector configuration

Ordering #	Description	Requires	Not compatible	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
E4438C-003	Enables ESG digital <u>output</u> connectivity with N5102A	601 or 602		Technical Overview: 5988-9495EN	
E4438C-004	Enables ESG digital <u>input</u> connectivity N5102A Baseband Studio digital signal with interface module	601 or 602		Technical Overview: 5988-9495EN	
E4438C-1EM	Moves all front panel connectors to rear panel				N5182B-1EM
E4438C-1CM	Rack mount without handles		1CN, 1CP		1CM010A
E4438C-1CP	Rack mount kit with handles		1CM, 1CN	Catalog: 5980-0450E	1CP004A
E4438C-1CN	Handle kit		1CM, 1CP	Catalog: 5980-0450E	1CN006A

Step 8 Choose a warranty and calibration plan

Ordering #	Description	Matching MXG options For more information go to www.agilent.com/find/mxg
Included	3-year warranty (return-to-Agilent), standard	
R-51B-001-5C	Warranty Assurance Plan, Return to Agilent, 5 years	R-51B-001-5C
R-51B-001-1CU	Onsite warranty - 1 year (no charge)	R-51B-001-1CU
R-51B-001-3CU	Onsite warranty - 3 years	R-51B-001-3CU
UK6	Commercial calibration certificate with test data	UK6
R-50C-011-3	Calibration Assurance Plan, Return to Agilent, 3 years	R-50C-011-3
R-50C-011-5	Calibration Assurance Plan, Return to Agilent, 5 years	R-50C-011-5
AMG	Agilent Calibration + Uncertainties + Guardbanding (accredited cal)	AMG
R-50C-016-3	Agilent Calibration + Uncertainties + Guardbanding, 3 years	R-50C-016-3
R-50C-016-5	Agilent Calibration + Uncertainties + Guardbanding, 5 years	R-50C-016-5
A6J	ANSI Z540-1-1994 Calibration	A6J
R-50C-021-3	ANSI Z540-1-1994 Calibration, 3 years	R-50C-021-3
R-50C-021-5	ANSI Z540-1-1994 Calibration, 5 years	R-50C-021-5

Step 9 Choose start up assistance options

Ordering #	Description	Matching MXG options For more information go to www.agilent.com/find/mxg
PS-S10	Remote scheduled assistance 1 to 999 hours	PS-S10
PS-S20	Daily productivity assistance	PS-S20
PS-X10	Custom services to be qualified by Agilent	PS-X10

E4438C ESG Vector Signal Generator (Continued)

Step 6 Choose a bit-error-rate (BER) analyzer

Ordering #	Description	For more information go to: www.agilent.com/find/esg	Matching MXG options For more information go to www.agilent.com/find/mxg
E4438C-CD1 <i>(standard)</i>	CD-ROM - English documentation set		N5182B-CD1
E4438C-0BW	Service documentation, assembly level (hardcopy)		
E4438C-0BV	Service documentation, component level (hardcopy)		
E4438C-UK6	Commercial calibration certificate with test data (hardcopy)		N5182B-UK6
E4438C-ABA	United States - English documentation set (hardcopy)		
E4438C-AB0	Taiwan - Chinese localization (hardcopy)		
E4438C-AB1	Korean - Korean localization (hardcopy)		
E4438C-AB2	China - Chinese localization (hardcopy)		
E4438C-ABF	French - French localization (hardcopy)		
E4438C-ABJ	Japanese - Japanese localization (hardcopy)		

Related products

Ordering #	Description	For more information go to: www.agilent.com/find/basebandstudio
N5102A	Baseband Studio digital signal interface module. Enables digital outputs from, and digital inputs to, the E4438C ESG and E8267D PSG vector signal generators. Also works with N5110B Baseband Studio for waveform capture and playback.	

E4438C ESG Vector Signal Generator (Continued)

http://www.agilent.com/find/E4438C_upgrades

Upgradeable Options

Products	Order number	Description	Upgrade contents	Additional requirements	Incompatible with
003	E4438CK-003	Enables ESG digital outputs with N5102A	License key	601 or 602	001, 002
004	E4438CK-004	Enables ESG digital inputs with N5102A	License key	601 or 602	001, 002
005	E4438CK-005	6GB internal hard drive	Customer installable - hardware, License key	601 or 602	None
1E5	E4438CK-1E5	High stability time base	Customer installable - hardware, License key	None	506, UNJ or serial prefix > 4426
1EM	Not Upgradeable	Moves all front panel connectors to the rear panel	n/a	n/a	n/a
221-229	E4438CK-221	Waveform License 5-pack	License key	601 or 602	None
250-259	E4438CK-250	Waveform License 50-Pack	License key	601 or 602	None
400	E4438CK-400	3GPP W-CDMA FDD personality	License key	601 or 602	None
401	E4438CK-401	cdma2000@ and IS-95-A personality	License key	601 or 602	None
402	E4438CK-402	TDMA personality (GSM, EDGE, GPRS, EGPRS, NADC, PDC, PHS, DECT, TETRA)	License key	601 or 602	None
403	E4438CK-403	Calibrated Noise (AWGN) personality	License key	601 or 602	None
407	E4438CK-407	Signal Studio for S-DMB	License key	601 or 602	None
409	E4438CK-409	Global positioning system (GPS) personality	License key	005, 601 or 602	None
419	E4438CK-419	Signal Studio for 3GPP W-CDMA HSPA	License key	601 or 602	None
422	E4438CK-422	Scenario generator for GPS personality	License key	409, 601 or 602	None
501	Not Upgradeable	Frequency range from 250 kHz to 1 GHz	n/a	n/a	n/a
502	Not Upgradeable	Frequency range from 250 kHz to 2 GHz	n/a	n/a	n/a
503	Not Upgradeable	Frequency range from 250 kHz to 3 GHz	n/a	n/a	n/a
504	Not Upgradeable	Frequency range from 250 kHz to 4 GHz	n/a	n/a	n/a
506	Not Upgradeable	Frequency range from 250 kHz to 6 GHz	n/a	n/a	n/a
601	E4438CK-601	Internal baseband generator, 8 MSa memory with digital bus capability	Customer installable - hardware, License key	None	602, 1EM
602	E4438CK-602	Internal baseband generator, 64 MSa memory with digital bus capability	Customer installable - hardware, License key	None	601, 1EM
SP1	E4438CK-SP1	Signal Studio for jitter injection	License key	601 or 602	None
UN7	E4438CK-UN7	Internal bit error rate (BER) analyzer	Customer installable - hardware, License key	None	None
UNB	Not Upgradeable	High output power with mechanical attenuator	n/a	n/a	n/a
UNJ	Not Upgradeable	Enhanced phase noise performance	n/a	n/a	n/a
1CM	E4438C-1CM	Rackmount flange kit	Customer installable - hardware, License key	None	1CN, 1CP
1CN	E4438C-1CN	Front handle kit	Customer installable - hardware, License key	None	1CM, 1CP
1CP	E4438C-1CP	Rackmount flange and front handle kit	Customer installable - hardware, License key	None	1CM, 1CN
UK6	Not Upgradeable	Commercial calibration certificate with test data (hardcopy)	n/a	n/a	None
CD1	E4438C-CD1	CD-ROM - English documentation set	CD-ROM with complete documentation in PDF format	None	None
ABA	E4438C-ABA	United States - English documentation set (hardcopy)	Printed copy of user's guide - English	None	None
AB0	E4438C-AB0	Taiwan - Chinese localization (hardcopy)	Printed copy of user's guide - Chinese localization	None	None
AB1	E4438C-AB1	Korean - Korean localization (hardcopy)	Printed copy of user's guide - Korean localization	None	None
AB2	E4438C-AB2	China - Chinese localization (hardcopy)	Printed copy of user's guide - Chinese localization	None	None
ABF	E4438C-ABF	French - French localization (hardcopy)	Printed copy of user's guide - French localization	None	None
ABJ	E4438C-ABJ	Japanese - Japanese localization (hardcopy)	Printed copy of user's guide - Japanese localization	None	None
OBW	E4438C-OBW	Service documentation, assembly level (hardcopy)	Printed copy of service documentation	None	None
OBV	E4438C-OBV	Service documentation, component level (hardcopy)	Printed copy of service documentation	None	None

ESG Signal Generators

Agilent ESG signal generators provide metric grade continuous-wave, analog modulated, and digital modulated reference signals up to 6 GHz for baseband and RF test applications in the cellular communications, wireless connectivity, audio/video broadcasting, and aerospace/defense industries. They feature low phase noise, high output power, excellent level accuracy, and advanced baseband capability to generate functional and parametric test signals for RF transceiver systems and the components that comprise them. With options for frequency range, high output power, low phase noise, internal baseband generator, digital I/O, and more, you can configure the ESG to fit your specific needs.

More information about the ESG signal generators is available at <http://www.agilent.com/find/esg>

Signal Studio software: <http://www.agilent.com/find/signalstudio>

Baseband Studio: <http://www.agilent.com/find/basebandstudio>

E4428C ESG data sheet, 5989-1992EN

E4438C ESG brochure, 5988-3935EN

E4438C ESG data sheet, 5988-4039EN



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