

Agilent Technologies
E4438C Option SP2

User's and Service Guide

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Agilent Technologies

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Safety Notes

The following safety notes are used throughout this document. Familiarize yourself with each of these notes and its meaning before performing any of the procedures in this document.

WARNING	Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.
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CAUTION	Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.
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Definitions

- *Specifications* describe the performance of parameters covered by the product warranty (temperature -0 to 55 °C, unless otherwise noted.)
- *Typical* describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- *Nominal* values indicate expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

E4438C Option SP2

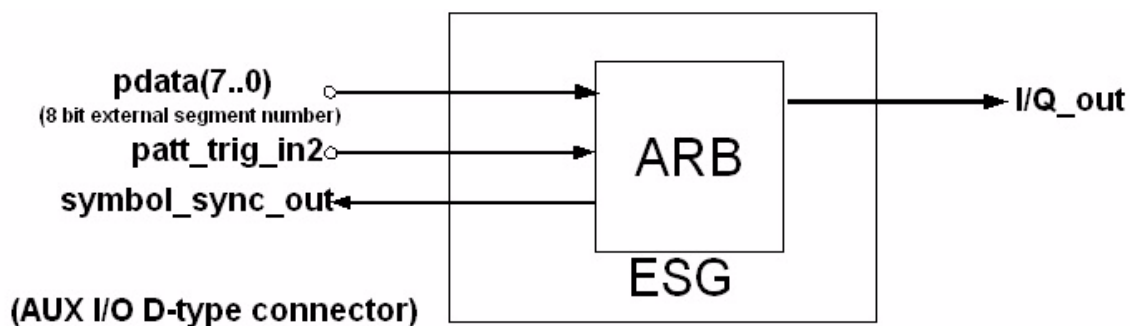
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E4438C Option SP2

Introduction

The Dynamic Sequencing Option SP2 enhances the “segment advance” ARB capability to allow jumping to any of the 256 different segments in ARB Waveform Memory. The next segment to be played is determined dynamically via an 8-bit value input on pdata(7..0) and is strobed in using the patt_trig_in2 signal.

NOTE Symbol_sync_out signal is used only as a timing marker to define the setup times for patt_trig_in2.



Linear Segment Switching

Linear Segment Switching is the term used to annotate the existing ARB-Waveform Sequence feature. In this original mode of operation, Waveform Segments are listed linearly within a Waveform Sequence Contents table on the Unit Interval (UI). The ARB player then plays (advances) these segments in a LINEAR, incremental order, subject to a set of qualifying Segment Advance triggers.

Dynamic Segment Switching

Dynamic Segment Switching will allow the arbitrary or dynamic selection of the next segment to be played. Segment ordering is achieved by applying and strobing a next segment index number to the Aux IO port on the rear of the instrument, using the rising edge of Pattern Trigger Input-2. The next segment will then play once the current segment has finished playing, subject to a further qualifying condition.

The strobe also controls the start of play of the next segment. Start of play can be selected immediately after the current segment has been completed or on the falling edge of the strobe signal. This is a notional Trigger Hold-Off control and provides a means of strobing in the next segment index and then waiting for the length (pulse-width) of the strobe signal before beginning to play the next segment.

User Interface

Typeface Key Conventions

The following key conventions are used throughout this document.

- **[HARDKEYS]** are labeled front panel keys
- **SOFTKEYS** are unlabeled key whose function is indicated on the instrument display

Keyboard and Display

From the ARB Trigger menu, Segment Advance will be selected as before. A further selection of Trigger Setup will lead to new selections as detailed below.

To set up Dynamic Segment Switching:

Select **ModeDual > ARB > Trigger > Segment Advance**

Select **ModeDual > ARB > Trigger > Setup > Segment Advance Mode > Continuous**

Graying control will be applied as follows:

1. Selecting **Segment Advance > Continuous** will ungray the new Segment Order selection.
2. Selecting **Segment Order > Dynamic** will ungray the new Trigger Hold-Off selection. It will also gray access to the **Trigger Setup > Trigger Source** menu which will default to: **Ext, Ext Source > Patt Trig In 2, Ext Polarity > Neg.**

Continuous			
Single			
Gated			
Segment Advance			
Trigger Setup →	Trigger Source	Trigger Key	
		Bus	
		Ext	
		Ext Source→	Patt Trig In 1
			Patt Trig In 2
		Ext Delay Off On	
			Ext Delay Time 10 ns to 40 s
	Continuous Mode →	Free Run	
		Trigger & Run	
		Reset & Run	
	Retrigger Mode →	Off	
		On	
		Immediate	
	Segment Advance Mode →	Single	
		Continuous	
		Segment Order Linear Dynamic	
		Trigger Hold - Off On Off	
	Gate Active Low High		

SCPI Commands

The intended operation is that a Pulsebuilder waveform is uploaded to the instrument, which is ultimately made up from of a number of segments. Segment numbering or indexing is therefore implicit to Pulsebuilder such that there is no attempt to enhance the UI with segment numbering information.

Segment Order

```
[ :SOURCE ] :RADio [ 1 ] :ARB:TRIGger:TYPE:SADVance:SORDder LINear | DYNamic  
[ :SOURCE ] :RADio [ 1 ] :ARB:TRIGger:TYPE:SADVance:SORDder?
```

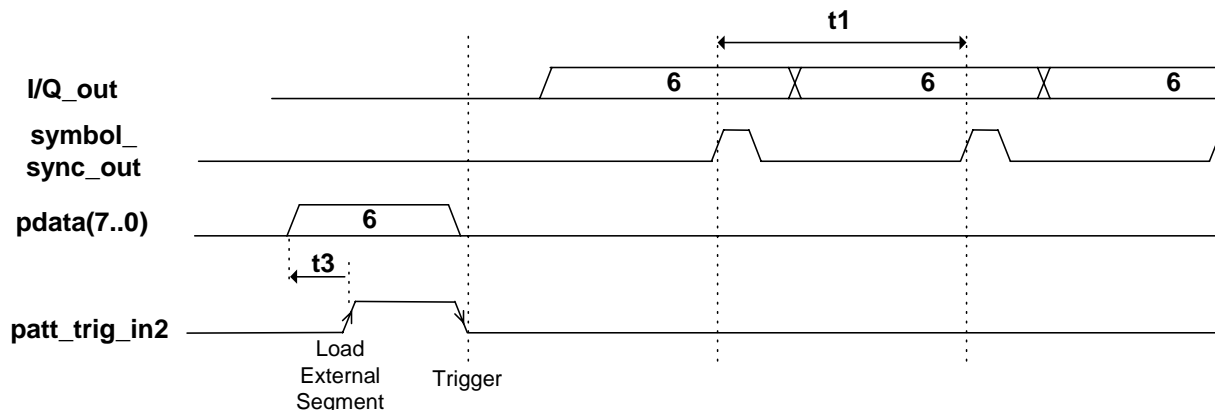
Trigger Hold-Off

```
[ :SOURCE ] :RADio [ 1 ] :ARB:TRIGger:TYPE:SADVance:THOFF ON | OFF | 1 | 0  
[ :SOURCE ] :RADio [ 1 ] :ARB:TRIGger:TYPE:SADVance:THOFF?
```

Technical Specification

Startup

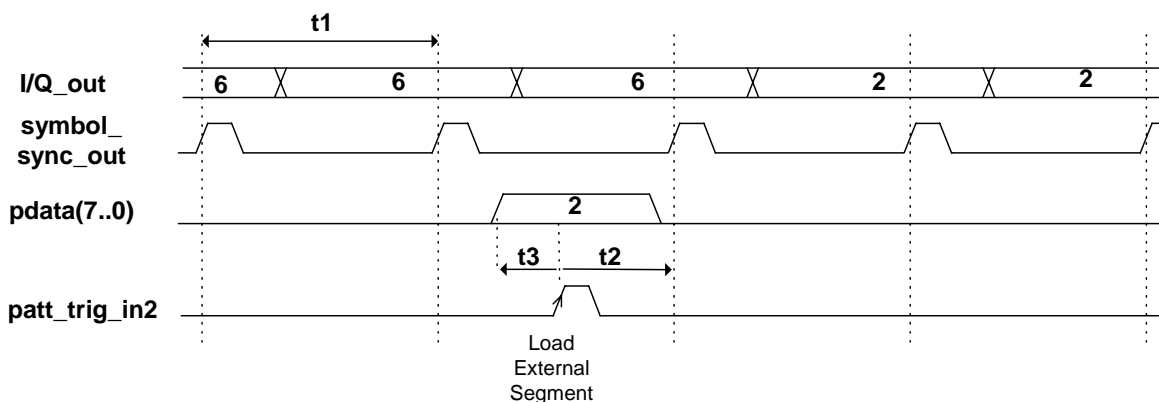
Once the ARB has been “armed”, it will wait until a trigger is received on patt_trig_in2. The rising edge of patt_trig_in2 will latch in the external 8 bit segment number input on pdata(7..0). The falling edge of patt_trig_in2 will “trigger” the externally defined waveform segment to be played continuously. Refer to timing diagram below.



		Minimum
t1	Segment period	150 samples
t2	Segment setup time	150 samples
t3	pdata setup time	50 ns

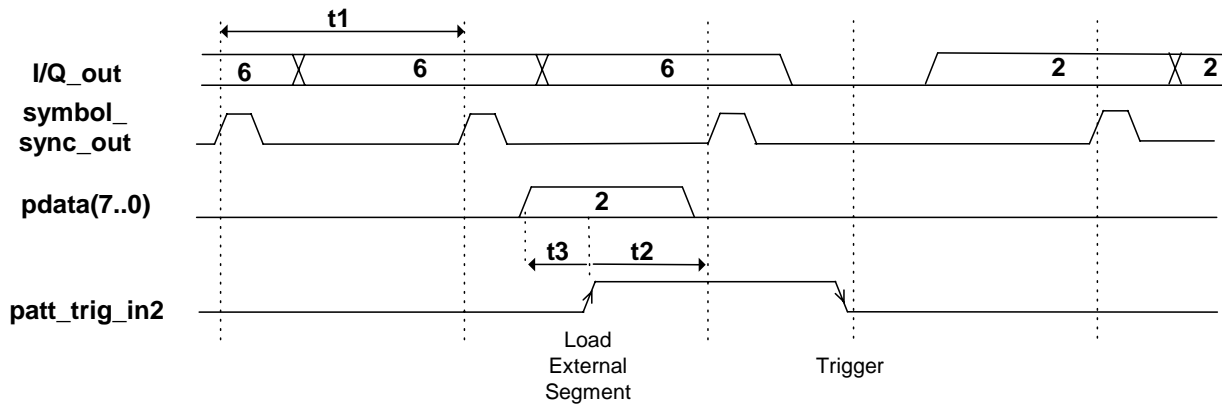
External Segment Switch Continuous

In this mode, the next segment is determined by the external 8 bit segment number pdata(7..0). The timing of the segment switch is controlled by the input strobe patt_trig_in2. The next segment number is strobed into the ARB on the rising edge of patt_trig_in2. The current segment will complete before switching to the next segment. This segment will play continuously until a new segment is strobed in by patt_trig_in2.



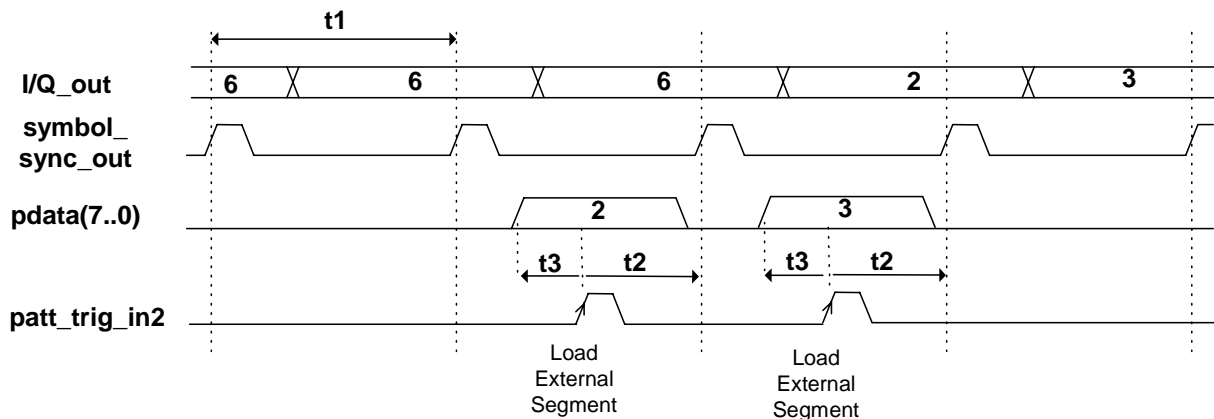
External Segment Switch Continuous with Delays

In this mode, once the next segment number is strobed into the ARB on the rising edge of `patt_trig_in2`, the current segment will stop playing when it reaches the end of the segment. There will be a delay before the next segment plays, triggered by the falling edge on `patt_trig_in2`. This segment will then play continuously until a new segment is strobed in by `patt_trig_in2`.



External Segment Switch Continuous (switched on consecutive segments)

The following diagram illustrates the segment being switched on consecutive segments.



AUX I/O Pinout

All signals are TTL compatible.

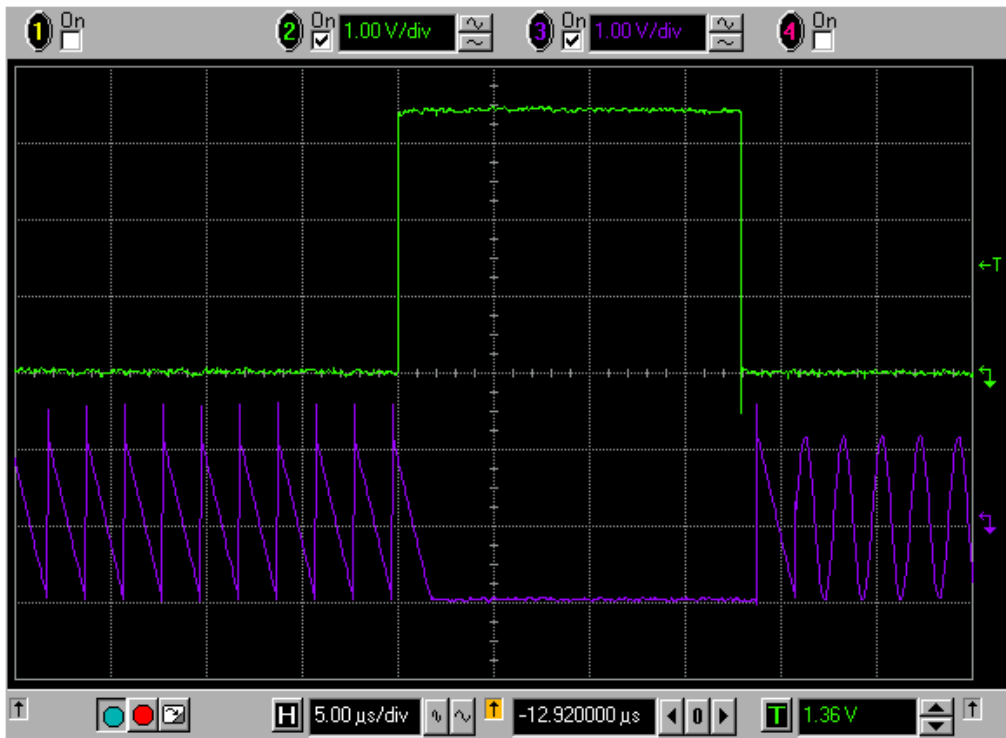
- PATT_TRIG_IN 2 should have a minimum pulse width of 10 ns.
- EVENT 1 is TTL compatible and is located on a BNC on the rear panel.

1 N/A
2 GND
3 GND
4 N/A
5 SYMBOL SYNC OUT
6 DATA CLOCK OUT
7 DATA OUT
8 PARALLEL DATA CLOCK
9 **PDATA 8**
10 GND
11 GND
12 GND
13 GND
14 GND
15 **PDATA 1**
16 ALT PWR IN
17 PATT_TRIG_IN 2
18 EVENT 4
19 EVENT 3
20 N/A
21 N/A
22 N/A
23 GND
24 GND
25 GND
26 GND
27 GND
28 **PDATA 7**
29 **PDATA 6**
30 **PDATA 5**
31 **PDATA 4**
32 **PDATA 3**
33 **PDATA 2**
34 GND
35 GND
36 GND
37 GND

Segment Size is too Small in Relation to the Trigger Signal

When using Trigger Hold-Off, the following can happen if the Segment sample size is too short in relation to the trigger pulse minimum specifications. Refer to “[Technical Specification](#)” on page 6 which states that the segment setup time should be 150 samples minimum. As shown in the graphic below, instead of a clean change over to the sinusoid, the sawtooth segment is seen to continue on the falling edge of the trigger signal.

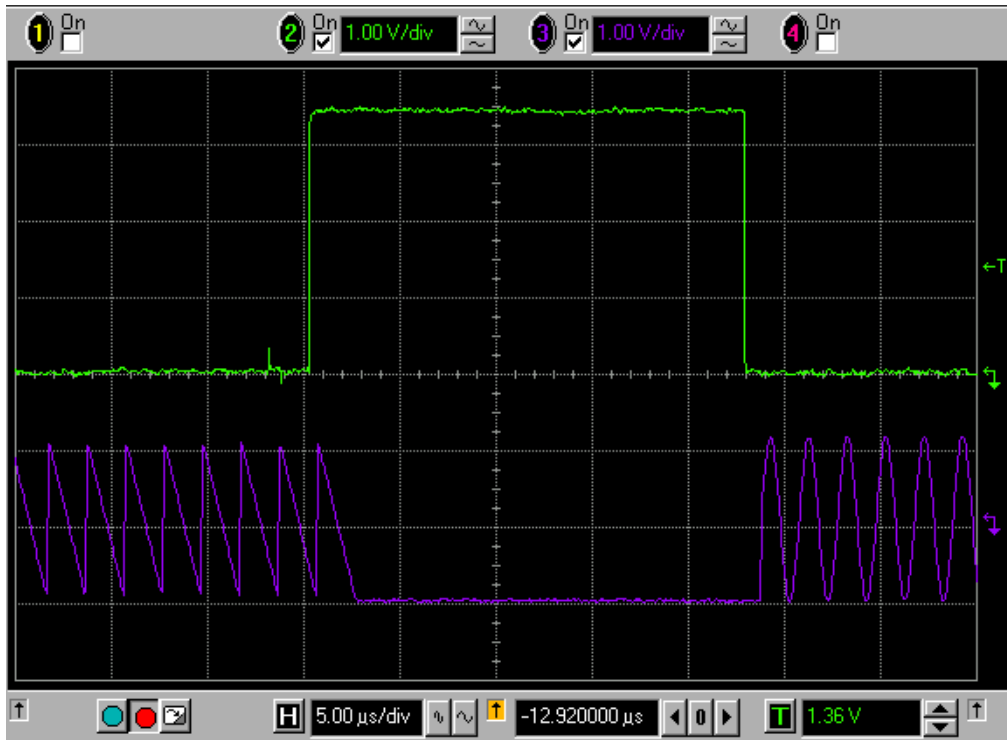
Trigger Pulse Period = $-17 \mu\text{s}$
Segment Sizes = 200 Sa ($2 \mu\text{s}$)



This is what should happen when the Trigger Pulse period is adjusted:

Trigger Pulse Period = $-22 \mu\text{s}$

Segment Sizes = 200 Sa ($2 \mu\text{s}$)



Safety and Regulatory Information

Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

Before Applying Power

Verify that the product is configured to match the available main power source. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Connector Care and Cleaning

If alcohol is used to clean the connectors, the power cord to the instrument must be removed. All cleaning should take place in a well ventilated area. Allow adequate time for the fumes to disperse and moist alcohol to evaporate prior to energizing the instrument.

WARNING **To prevent electrical shock, disconnect the Agilent Technologies model product from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

Statement of Compliance

This instrument has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the instrument in a safe condition.

Declaration of Conformity

For a copy of the manufacturer's Declaration of Conformity for this apparatus, contact your local Agilent Technologies office or sales representative on [Page 16](#).

Shipping Instructions

You must always call the Agilent Technologies Instrument Support Center to initiate service before retuning your instrument to a service office. See "[Contacting Agilent](#)" on [page 16](#). Always transport or ship the instrument using the original packaging if possible. If not, comparable packaging must be used. Attach a complete description of the failure symptoms.

Compliance with Canadian EMC Requirements

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme a la norme NMB du Canada.

Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrrordnung-3. GSGV Deutschland).

Acoustic Noise Emission/Geraeuschemission	
LpA<70 dB	Lpa<70 dB
Operator Position	am Arbeitsplatz
Normal Operation	normaler Betrieb
per ISO 7779	nach DIN 45635 t. 19

Warnings

WARNING	The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, which if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.
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Warnings applicable to this instrument are:

WARNING	If this instrument is not used as specified, the protection provided by the equipment could be impaired. This instrument must be used in a normal condition (in which all means for protection are intact) only.
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WARNING	For continued protection against fire hazard replace line fuse only with same type and rating: <ul style="list-style-type: none">• United States—F 3A/250V, Part Number 2110-0780• Europe—F 3.15A/250V, Part Number 2110-0655 The use of other fuses or material is prohibited.
----------------	--

WARNING	This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.
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WARNING	The power cord is connected to internal capacitors that may retain dangerous electrical charges for 5 seconds after disconnecting the plug from its power supply.
----------------	--

WARNING	These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.
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WARNING	The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.
----------------	---

WARNING	This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.
----------------	---

WARNING	No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.
----------------	--

WARNING	If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.
----------------	---

Cautions

CAUTION	The CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.
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Cautions applicable to this instrument are:

CAUTION	Always use the three-prong ac power cord supplied with this instrument. Failure to ensure adequate earth grounding (by not using this cord) can cause instrument damage.
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CAUTION	This instrument has autoranging line voltage input; be sure the supply voltage is within the specified range.
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CAUTION	Ventilation Requirements: When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, forced convection must be used.
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Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The CSA mark is a registered trademark of the Canadian Standards Association.
	This symbol indicates the product meets the Australian Standards.
	This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).
	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.
	Safety Earth Ground. This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Contacting Agilent

By internet, phone, or fax, get assistance with all your test and measurement needs.

This information supersedes all prior contact information.			
Online assistance: www.agilent.com/find/assist			
Americas			
Brazil <i>(tel)</i> (+55) 11 3351 7012 <i>(fax)</i> (+55) 11 3351 7024	Canada <i>(tel)</i> +1 877 894 4414 <i>(alt)</i> +1 303 662 3369 <i>(fax)</i> +1 800 746 4866	Mexico <i>(tel)</i> 1800 254 2440 Ext 2703 <i>(alt) from USA</i> 18008374039 <i>(fax)</i> 1 800 254 422	United States <i>(tel)</i> 800 829 4444 <i>(alt)</i> (+1) 303 662 3998 <i>(fax)</i> 800 829 4433
Asia Pacific and Japan			
Australia <i>(tel)</i> 1 800 225 574 <i>(fax)</i> 1 800 681 776 <i>(fax)</i> 1 800 225 539	China <i>(tel)</i> 800 810 0189 <i>(fax)</i> 800 820 2816	Hong Kong <i>(tel)</i> 800 933 229 <i>(fax)</i> 800 900 701	India <i>(tel)</i> 1600 112 626 <i>(alt)</i> +65 6275 0800 <i>(fax)</i> 1600 113 040
Japan (Bench) <i>(tel)</i> 0120 421 345 <i>(alt)</i> (+81) 426 56 7832 <i>(fax)</i> 0120 01 2144	Japan (On-Site) <i>(tel)</i> 0120 421 345 <i>(alt)</i> (+81) 426 56 7832 <i>(fax)</i> 0120 012 114	Malaysia <i>(tel)</i> 1800 880 399 <i>(fax)</i> 1800 801 054	New Zealand <i>(tel)</i> +64 4 939 0635 <i>(alt)</i> 0800 738 378 <i>(fax)</i> +64 4 972 5364
Singapore <i>(tel)</i> 1 800 275 0880 <i>(fax)</i> (+65) 6755 1214	South Korea <i>(tel)</i> 080 778 0011 <i>(fax)</i> 080 778 0013	Taiwan <i>(tel)</i> 0800 047 669 <i>(fax)</i> 0800 047 667 <i>(fax)</i> +886 3492 0779	Thailand <i>(tel)</i> +66 2 267 5913 <i>(tel)</i> 1 800 2758 5822 <i>(fax)</i> 1 800 653 336
Europe			
Austria <i>(tel)</i> 0820 87 44 11* <i>(fax)</i> 0820 87 44 22	Belgium <i>(tel)</i> (+32) (0)2 404 9340 <i>(fax)</i> (+32) (0)2 404 9395	Denmark <i>(tel)</i> (+45) 7013 1515 <i>(fax)</i> (+45) 7013 1555	Finland <i>(tel)</i> (+358) (0) 10 855 2100 <i>(fax)</i> (+358) (0) 10 855 2923
France <i>(tel)</i> 0825 010 700* <i>(fax)</i> 0825 010 701*	Germany <i>(tel)</i> 01805 24 6333* <i>(fax)</i> 01805 24 6336*	Ireland <i>(tel)</i> (+353) 1 890 924 204 <i>(fax)</i> 1 890 924 024	Israel <i>(tel)</i> (+972) 3 9288 504 <i>(alt)</i> (+972) 3 9288 544 <i>(fax)</i> (+972) 3 9288 520
Italy <i>(tel)</i> (+39) (0)2 9260 8484 <i>(fax)</i> (+39) (0)2 9544 1175	Luxemburg <i>(tel)</i> (+32) (0)2 404 9340 <i>(fax)</i> (+32) (0)2 404 9395	Netherlands <i>(tel)</i> (+31) (0)20 547 2111 <i>(fax)</i> (+31) (0)20 547 2190	Russia <i>(tel)</i> (+7) 095 797 3963 <i>(alt)</i> (+7) 095 797 3900 <i>(fax)</i> (+7) 095 797 3901
Spain <i>(tel)</i> (+34) 91 631 3300 <i>(fax)</i> (+34) 91 631 3301	Sweden <i>(tel)</i> 0200 88 22 55* <i>(alt)</i> (+46) (0)8 5064 8686 <i>(fax)</i> 020 120 2266*	Switzerland (French) <i>(tel)</i> 0800 80 5353 opt. 2* <i>(fax)</i> (0) 22 567 5313	Switzerland (German) <i>(tel)</i> 0800 80 5353 opt. 1* <i>(fax)</i> 0 44 272 7373
Switzerland (Italian) <i>(tel)</i> 0800 80 5353 opt. 3* <i>(fax)</i> (0) 22 567 5314	United Kingdom <i>(tel)</i> (+44) (0)7004 666666 <i>(fax)</i> (+44) (0)7004 444555		
<i>(tel)</i> = primary telephone number; <i>(alt)</i> = alternate telephone number; <i>(fax)</i> = FAX number; * = in country number 8/10/05			