2.3GS/s Single-Channel Arbitrary Waveform Generator

TABOR'S NEW

WAVEXCITER SERIES

PRELIMINARY



MODEL WX2181B

- Single Channel 2.3GS/s,14 bit waveform generator
- 1GHz sine and 500MHz square waves
- 16M waveform memory, 32M memory optional
- 3 selectable output paths:
  - 2Vp-p into 50Ω with 700MHz bandwidth, Differential DC output
  - 4Vp-p into 50Ω with 350MHz bandwidth, Differential DC output
  - -20 to +10 dBm into 50Ω with >1 GHz bandwidth, RF AC output
- AM, FM, FSK, PSK, ASK, Amplitude Hop, Frequency Hop, Sweep and Chirp modulations
- Powerful pulse/pattern composer for analog, digital and mixed signals, device tests
- Smart trigger allows: trigger hold-off, detect <=> pulse width, as well as wait-for-waveform-end or abort waveform and restart
- Advanced sequencing scenarios define stepping, looping, and conditional jumps of waveforms or waveform sequences, including fast dynamic segments and sequences hop connector control
- Two differential markers with programmable positions, width &levels
- User friendly 4" color LCD display
- Remote control through LAN, USB and GPIB
- Store/recall capability on disk-on-key or 4GB internal memory
- LXI Class C compliant

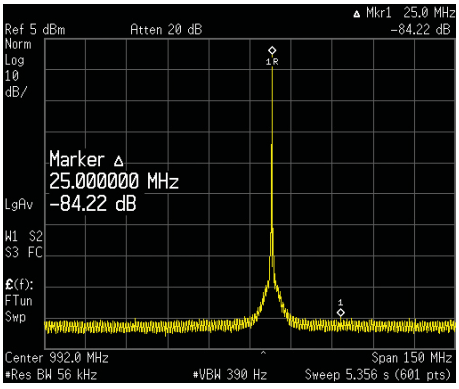
The WX2181B, 2.3GS/s Single Channel Arbitrary Waveform Generator, offers unrivaled performance, even when compared to instruments designed to generate fewer types of signals or higher sampling rates. Its affordable footprint saves space and cost without compromising bandwidth and signal integrity.

Universal Waveform Source

Aside from its natural ability to generate arbitrary shapes with waveform granularity of 1 point, the WX2181B can also be used as a full-featured standard, modulation or pulse generator to solve various applications. Equipped with 2.3GS/s 14-bit clock and 16M points (32M optional) memory, the WX2181B can generate literally any waveform, short or long, at frequencies up to 1GHz with 8 digits of resolution, resulting in the highest precision signal creation and regeneration without compromising signal fidelity or system integrity.

Signal Integrity and Purity

One of the most important requirement in today's testing and measurement applications is high signal quality. With a typical SSB phase noise of <-115dBc at 100MHz, and <-95dBc at 1GHz, at 10 kHz carrier offset and with exceptionally good SFDR of <-70dBc at 1GHz carrier, Tabor's WX1282B unique platform delivers one of the best quality signals available on the market today, answering the ever-growing demand for clear and precise signals.



DC or AC Coupled Outputs

Have a requirement for different output paths in your lab? Great! The WX2181B offers two single or differential ended DC coupled and one single ended AC coupled output amplifiers: 2Vp-p into 50 ohms with 700MHz bandwidth, for applications demanding optimized transitions and aberrations; 4Vp-p into 50 ohms with 350MHz bandwidth, for applications demanding high voltage or -20 to +10 dBm path for applications requiring bandwidth and flatness for frequencies as high as 1GHz.

Powerful Segmentation and Sequencing

Solving almost every complex application, powerful segmentation and sequencing produces a nearly endless variety of complex waveforms. The waveform memory can be divided into multiple waveform segments and sequenced in user-selectable fashion to create complex waveforms that have repeatable segments, jump and nest, saving you precious memory space. The WX2181B also allows you to generate up to 1000 sequence scenarios and sequence between them to generate an even higher level of flexibility in waveform creation.

Dynamic Segment / Sequence Control

Working in the real-time world and need fast waveform switching? The WX2181B has a rear panel control designed specifically for that. Having the dynamic control feature, in effect, can serve as replacement of the sequence table where the real-time application can decide when and for how long a waveform will be generated. For much more complex applications, this same input may serve as a dynamic switch for complete

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sequences, creating real-life scenarios for real-time applications.

Smart Trigger

Until now, you've been forced to trigger on a specific event. Tabor's all-new SmarTrigger feature was designed to enhance the trigger capability and facilitate wider flexibility of a specific pulse event. It allows triggering on either a pulse having a larger pulse width than a programmed time value (<time), a pulse having a smaller pulse width than a programmed time value (>time), or even on a pulse having a pulse width between two limits (<>time). In addition, the SmarTrigger has a hold-off function, in which the output is held idle after the first trigger and starts a waveform cycle only with the first valid trigger after a hold-off interval has lapsed, allowing you to solve endless "negotiation" scenarios.

Pulse / Pattern Creation

Generating complex pulse trains has never been easier. The Pulse Composer is a powerful built-in tool that converts the WX2181B to a very sophisticated Pulse/Pattern Generator, allowing to create literally any complex pulse train / pattern, whether it's a single pulse, multi-level, linear-points, initialization or preamble pattern definition, arbitrary bit design, user-defined or even standard random patterns with programmable resolution, so it doesn't matter if your application is radar communications, nanotechnology or serial bus testing, the pulse/pattern composer is the right tool for your application. Moreover, all the WX2181B advanced trigger modes are applicable, hence one can choose to use the "step" mode to advance every bit independently or the "once" mode to advance a complete data block in one trigger event, enabling even more applications, such as trigger, clock and data protocols.

Multi-Level and PAM(n) Signals

The WX2181B's pulse composer enables up to 2Gbit/s data rate generation, utilizing either NRZ and RZ modes (minimum transition times) which is ideal especially for multi level and PAM(n) applications such as, LED (light-emitting diodes), CAN, QPHY, FlexRay or simulating and testing Ethernet environment, whether it's 100Mbit/s (100BASE-T), the later gigabit Ethernet (1000BASE-T) or even the latest 802.3an standard (10GBASE-T), which utilizes PAM-16.

Programmable Deferential Markers

The WX2181B is equipped with two programmable deferential markers . Differential simply means outstanding signal integrity for high frequencies, whereas the programmability allows you to set position, width, delay and amplitude for any required peripheral triggering need. While bench usage enables setting only one marker position, you can set multiple markers and program different marker properties for each transition instance remotely, allowing various triggering profiles.

Automated External Calibration

Usually, calibration cycles in the industry range from one to three years, where instruments are sent to a service center, opened to allow access to trimmers, calibrated and certified for repeated usage. In contrast, the innovative advanced technology implemented in the WX2181B allows calibration from ANY interface, USB, GPIB or LAN. Calibration factors are stored in a flash memory eliminating the need to open instrument covers.

Easy to Use

Large and user-friendly 4" backlit color LCD display facilitates browsing though menus, updating parameters and displaying detailed and critical information for your waveform output. Combined with numeric keypad, ten quick-link function & run mode buttons, cursor position control and a dial, the front panel controls simplify the often complex operation of an arbitrary waveform generator.

High Speed Access

Access speed is an increasingly important requirement for test systems. Included with the instrument is a variety of interfaces including: Ethernet 10/100/1000, USB 2.0 and GPIB so one may select the interface most compatible to individual requirements. Using any of the external interfaces, controlling instrument functions and features as well as downloading waveforms and sequences is fast, time saving and easily tailored to every system, from simple benchtop instrumentation to fully-featured ATE system. IVI drivers and factory support speed-up system integration, minimizing time-to-market and significantly reducing system development costs.

Multiple Environments to Write Your Code

Model WX2181B comes with a complete set of drivers, allowing you to write your application in various environments such as: Labview, CVI, C++, VB, and MATLAB. You may also link the supplied dll to other Windows based API's or, use low-level SCPI commands (Standard Commands for Programmable Instruments) to program the instrument, regardless if your application is written for Windows, Linux or Macintosh operating systems.

ArbConnection

The ArbConnection software provides you with full control of instrument functions, modes and features. ArbConnection is a powerful editorial tool that allows you to easily design any type of waveform. Whether it is the built in wave, pulse or Serial data composers, or the built in equation editor with which you can create your own exotic functions, ArbConnection makes virtually any application possible.

Specification
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Service and Support
Beyond providing precision Test & Measurement instruments, Tabor Electronics provides unparalleled service and support, and is continuously finding new ways to bring added value to its customers.

Our after-sales services are comprehensive. They include all types of repair and calibration, and a single point of contact that you can turn to whenever you need assistance. As part of our extensive support, we offer individualized, personal attention Help Desk, both online and offline, via e-mail, phone or fax.

Tabor Electronics maintains a complete repair and calibration lab as well as a standards laboratory in Israel and USA. Service is also available at regional authorized repair/calibration facilities.

Contact Tabor Electronics for the address of service facilities nearest you.

Applications
For expert technical assistance with your specific needs and objectives, contact your local sales representative or our in-house applications engineers.

Manuals, Drivers, and Software Support
Every instrument comes equipped with a dedicated manual, developer libraries, IVI drivers, and software. However, if your specific manual is lost or outdated, Tabor Electronics makes it possible to log-on to its Download Center and get the latest data “in a click”.

Product Demonstrations
If your application requires that you evaluate an instrument before you purchase it, a hands-on demonstration can be arranged by contacting your local Tabor Electronics representative or the Sales Department at our Corporate Headquarters.

Five-year Warranty
Every instrument from the WaveXciter series comes with a five-year warranty. Each one has full test results, calibration certificate, and CD containing product's manual and complete software package. Our obligation under this warranty is to repair or replace any instrument or part thereof which, within five years after shipment, proves defective upon examination. To exercise this warranty, write or call your local Tabor representative, or contact Tabor Headquarters and you will be given prompt assistance and shipping instructions.

Specification
2.3GS/s Single-Channel Arbitrary Waveform Generator

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STANDARD WAVEFORMS

Type: Sine, triangle, square, ramp, pulse, sinc, exponential rise, exponential decay, gaussian, noise and dc.

Frequency Range:

Sine	10kHz to 1GHz
Square, Pulse	10kHz to 500MHz
All others	10kHz to 250MHz

Waveform Control: All the waveform parameters can be adjusted to specific requirements. The waveform is re-computed with each parameter change.

SINE

Start Phase Range: 0 to 360°

Harmonics Distortion (typ.):

	1Vp-p^{DC}	3Vp-p^{HV}	0dBm^{AC}
5MHz to 100MHz	<-44dBc	<-40dBc	<-40dBc
100MHz to 375MHz	<-40dBc	<-40dBc	<-40dBc
375MHz to 500MHz	<-35dBc[1]	<-35dBc[1]	<-20dBc
500MHz to 675MHz	<-32dBc[1]	<-32dBc[1]	<-55dBc
675MHz to 1GHz	<-70dBc[1]	<-70dBc[1]	<-70dBc

[1] Measured with 1GHz lowpass fiter

Non-Harmonics Distortion (typ.):

1MHz to 100MHz	<-80dBc
100MHz to 250MHz	<-75dBc
250MHz to 500MHz	<-70dBc
500MHz to 1GHz	<-65dBc

SSB Phase Noise (10kHz offset):

1MHz Carrier	<-120dBc/Hz
10MHz Carrier	<-118dBc/Hz
100MHz Carrier	<-115dBc/Hz
250MHz Carrier	<-108dBc/Hz
500MHz Carrier	<-100dBc/Hz
1GHz Carrier	<-95dBc/Hz

PULSE

Pulse State: On/Off
Pulse Mode: Single or double, programmable
Polarity: Normal, inverted or complemented
Period: 2ns to 1.6Sec
Resolution: 500 ps
Pulse Width: 1ns to 1.6Sec
Rise/Fall Time:
Fast
DC Path 700ps (typical < 600ps)
HV Path 1ns (typical < 900ps)
Linear 1ns to 1.6Sec
Delay: 1ns to 1.6Sec
Double Pulse Delay: 1ns to 1.6Sec

Amplitude:
Range

DC Path	50mVp-p to 2Vp-p into 50Ω
HV Path	100mVp-p to 4Vp-p into 50Ω

Levels

Low Level	-2V to +1.95V
High Level	-1.95V to +2V

NOTES:

1. All pulse parameters, except rise and fall times, may be freely programmed within the selected pulse period provided that the ratio between the period and the smallest incremental unit does not exceed the ratio of 16,000,000 to 1.
2. Rise and fall times, may be freely programmed provided that the ratio between the rise/fall time and the smallest incremental unit does not exceed the ratio of 1,000,000 to 1.
3. The sum of all pulse parameters must not exceed the pulse period setting.

PULSE / PATTERN COMPOSER

Modes: Multi-level, linear-points, arbitrary bit design, PAM

MULTI-LEVEL

Number of Levels: 1 to 1000
Dwell Time: 500ps to 10Sec
Amplitude Resolution: 4 digits
Time Resolution: 500ps

LINEAR-POINTS

Number of Points: 1 to 1000
Memory: 100k
Amplitude Resolution: 4 digits
Time Resolution: 500ps

ARBITRARY BIT DESIGN

Data Rate: TBD
Pattern Memory: 16 Mbit
Resolution: TBD
Pattern Source: PRBS or user-defined
Trigger Mode: Auto, step, once
Modulation: TBD

PAM (PULSE AMPLITUDE MODULATION)

Data Rate: 10Mbit/s to 2Gbit/s
PAM Range: 2 to 1000
Pattern Memory: 16 Mbit
Resolution: 1 bit (TBD)

ARBITRARY WAVEFORMS

Sample Rate: 10MS/s to 2.3GS/s
Vertical Resolution: 14 bits
Waveform Memory: 16M points standard, 32M points optional
Min. Segment Size: 384 points
Resolution: 32 points size increments
No. of Segments: 1 to 16k
Waveform Granularity: 1 point
Dynamic control: Software command or rear panel segment control port
Jump Timing: Coherent or asynchronous

SEQUENCED WAVEFORMS

Operation: Segments are grouped in a sequence table that links, loops and jumps to next in user-defined scenarios. Sequence steps are advanced on trigger events or remote commands.
Multi Sequence: 1 to 1,000 unique scenarios
Sequencer Steps: 1 to 16k steps.
Segment Duration: 32 ns minimum step duration
Segment Loops: 1 to 1M cycles, each segment
Sequence Loops: 1 to 1M ("Once" mode only)
Step Advance Modes: Continuous, once (x "N") and stepped

SEQUENCED SEQUENCES

Operation: Enables the grouping of sequences into scenarios in a way that is similar to how segments are grouped in a sequence table.
Sequence Scenarios: 1 Scenario
Dynamic Control: Software command or rear panel sequence control port
Table Length: 1 to 1k steps
Advance Control: Continuous, once and stepped
Sequence Loops: 1 to 1,000,000 cycles

MODULATION

COMMON CHARACTERISTICS

Carrier Waveform: Sine
Carrier Frequency: 10kHz to 1GHz
Modulation Source: Internal

FM

Modulation Shape: Sine, square, triangle and ramp
Modulation Freq.: (CW/6) > (M.F) > ($30e^{-6}$xCW)
Deviation Range: CW/2

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FSK / FREQUENCY HOPPING

Hop Table Size:	2 to 10,000 (<CWx10.24e^{-3})
Hop Type:	Fast or Linear
Dwell Time Mode:	Fixed or programmable per step
Dwell Time:	2ns to 10Sec
Dwell Time Resolution:	2ns

SWEEP / CHIRP

Sweep Type:	Linear or log
Sweep Direction:	Up or down
Sweep Time:	(9/High Freq.) > (S.T) > (50e^{3}/High Freq.)
Modulation Shape:	Pulse
Pulse Repetition:	
Range	100ns to 2Sec
Resolution	3 digits
Accuracy	100 ppm

AM

Modulation Shape:	Sine, square, triangle and ramp
Modulation Freq.:	(CW/9) > (M.F) > (CW/50e^{3})
Modulation Depth:	0.1 to 100%

ASK / AMPLITUDE HOPPING

Hop Table Size:	2 to 10,000 (<CWx10.24e^{-3})
Hop Type:	Fast or Linear
Dwell Time Mode:	Fixed or programmable per step
Dwell Time:	2ns to 10Sec
Dwell Time Resolution:	2ns
Resolution:	Maximum amplitude/4096

COMMON CHARACTERISTICS

FREQUENCY

Resolution:	8 digits
Accuracy and Stability:	Same as reference
Reference Clock:	
Internal	1 ppm from 19°C to 29°C; 1ppm/°C below 19°C or above 29°C; 1 ppm/year aging rate
External	Same as accuracy and stability of the external reference.

OUTPUTS

MAIN OUTPUT

Coupling:	DC-coupled, or AC-coupled
Connectors:	Front panel SMAs
Impedance:	50Ω nominal, each output
Protection:	Protected against temporary short to case ground

DC-COUPLED

Type:	Single-ended or differential
Resolution:	4 digits
Accuracy:	±(3% +5 mV), offset = 0 V
Overshoot:	5%, typical

DC PATH

Rise/Fall Time:	700ps (typical < 600ps)
Amplitude Range:	
Single-ended	50 mVp-p to 2Vp-p*
Differential	100 mVp-p to 4Vp-p*

* Double into high impedance

HV PATH

Rise/Fall Time:	1ns (typical < 900ps)
Amplitude Range:	
Single-ended	50 mVp-p to 4Vp-p*
Differential	100 mVp-p to 8Vp-p*

* Double into high impedance

OFFSET

Offset Control:	Common mode, specified into 50Ω , levels double into high Z
Offset Range:	-1.5 V to + 1.5 V
Offset Resolution:	4 digits
Offset Accuracy:	±(5% +5 mV)

RF, AC-COUPLED

Type:	Single-ended
Amplitude Range:	-20 dBm to +10 dBm into 50Ω, double into high impedance
Resolution:	4 digits
Accuracy:	(3% +0.5dBm)
Bandwidth:	1 GHz

MARKER OUTPUTS

Number of Markers:	Two markers
Type:	Differential (+) and (-) outputs
Connectors:	SMB
Skew Between Markers:	100 ps, typical
Impedance:	50Ω
Amplitude Voltage:	
Window	0V to 1.25V, single-ended; 0V to 2.5V, differential
Low level	0 V to 0.8V, single-ended; 0 V to 1.6V, differential
High level	0.5 V to 1.25V, single-ended; 0 V to 2.5V, differential
Resolution:	10 mV
Accuracy:	10% of setting
Width control:	4 SCLK to segment length
Position control:	0 to segment length in 4 points increments
Initial delay:	3.5 ns, typical (Output to marker)
Variable delay:	
Control	Separate for each channel
Range	0 to 3 ns
Resolution	10 ps
Accuracy	±(10% of setting +20 ps)
Rise/Fall Time:	1.0 ns, typical

SYNC OUTPUT

Connector:	Front panel SMA
Type:	Single ended
Waveform Type:	Pulse (32 points width), WCOM
Impedance:	50Ω
Amplitude:	1 V; doubles into high impedance
Variable Position Control:	
Range	0 to segment length
Resolution	32 points
Rise/Fall Time	2 ns, typical
Variable Width control:	
Range	32 points to segment length
Resolution	32 points

INPUTS

TRIGGER INPUT

Connector:	Rear panel SMA
Input Impedance:	10kΩ
Polarity:	Positive, negative, or both
Damage Level:	±20 Vdc
Frequency Range:	0 to 15 MHz
Trigger Level Control:	
Range	-5V to 5V
Resolution	12 bit (2.5 mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2 Vp-p
Pulse Width:	10 ns, minimum

EVENT INPUT

Connector:	Rear panel BNC
Input Impedance:	10kΩ
Polarity:	Positive, negative or either
Damage Level:	±20Vdc
Frequency Range:	0 to 15MHz
Trigger Level Control:	
Range	-5V to 5V
Resolution	12 bit (2.5mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2 Vp-p minimum
Pulse Width:	10 ns, minimum

SEQUENCE / SEGMENT CONTROL INPUT

Connectors:	Rear panel D-sub, 8 bit lines
Input Impedance:	10 kΩ
Input Level:	TTL

EXTERNAL REFERENCE INPUT

Connector:	Rear panel BNC
Input Frequency:	10MHz to 100MHz
Input Impedance:	50Ω
Input Voltage Swing:	-5dBm to 5dBm
Damage Level:	10dBm

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EXTERNAL SAMPLE CLOCK INPUT

Connector:	Rear panel SMA
Input Impedance:	50Ω
Input Voltage Swing:	0dBm to 10dBm
Input Frequency:	2.0GHz
Clock Divider:	1/1, 1/2, 1/4, … 1/256, separate for each channel
Damage Level:	15dBm

RUN MODES

Continuous	A selected output function shape is output continuously.
Self armed	No start commands are required to generate waveforms.
Armed	The output dwells on a dc level and waits for an enable command and then the output waveform is output continuously; An abort command turns off the waveform.
Triggered	A trigger signal activates a single-shot or counted burst of output waveforms and then the instrument waits for the next trigger signal.
Normal mode	The first trigger signal activates the output; consecutive triggers are ignored for the duration of the output waveform.
Override mode	The first trigger signal activates the output; consecutive triggers restart the output waveform regardless if the current waveform has been completed or not.
Gated	A waveform is output when a gate signal is asserted. The waveform is repeated until the gate signal is de-asserted. Last period is always completed.

TRIGGER CHARACTERISTICS

EXTERNAL

Connector:	SMA
Input Impedance:	10kΩ
Polarity:	Positive, negative, or both
Damage Level:	±20Vdc
Frequency Range:	0 to 15 MHz
Trigger Level Control:	
Range	-5V to 5V
Resolution	12 bit (2.5 mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2 Vp-p
Pulse Width:	10 ns, minimum
System Delay:	200 sample clock periods + 50ns, typical (Trigger to Output)
Trigger Delay:	Separate for each channel
Range	0 to 8,000,000 sclk periods
Resolution	8 points
Accuracy	Same as sample clock accuracy
Smart Trigger:	Detects a unique pulse width range
Conditioned trigger	< pulse width, > pulse width or <>pulse width
Pulse Width Range	50ns to 2Sec
Resolution	2ns
Accuracy	±(5% of setting +20ns)
Trigger Holdoff:	Ignores triggers for a holdoff duration
Holdoff range	100ns to 2Sec
Resolution	2ns
Accuracy	±(5% of setting +20ns)
Trigger jitter:	8 sampling periods

INTERNAL

Source:	Common or separate
Modes:	
Timer	Waveform start to waveform start
Delayed	Waveform stop to waveform start
Timer:	
Range	100ns to 2Sec
Resolution	3 digits
Accuracy	100 ppm
Delay	
Range	152 to 8,000,000 sclk periods
Resolution	Even numbers, divisible by 8

MANUAL

Source:	Soft trigger command through the front panel or external interface

TWO INSTRUMENTS SYNCHRONIZATION

Initial Skew:	20ns + 0 to 16 SCLK
Offset Control:	0 to Waveform length
Offset Resolutiuon:	8 SCLK increments
Skew Control:	-5ns to 5ns
Skew Resolutiuon:	10ps
Clock Source:	Master sample clock generator
Trigger Source:	Master trigger input

GENERAL

Voltage Range:	100 VAC to 240 VAC
Frequency Range:	50 Hz to 60 Hz
Power Consumption:	150 VA
Display Type:	TFT LCD, back-lit
Size	4 “
Resolution	320 x 240 pixels
Interfaces:	
USB 2.0	1 x front, USB host, (A type); 1 x rear, USB device, (B type)
LAN	1000/100/10 BASE-T
GPIB	IEEE 488.2 standard interface
Segment control	2 x D-sub, 9 pin
Dimensions:	
With feet	315 x 102 x 395 mm (WxHxD)
Without feet	315 x 88 x 395 mm (WxHxD)
Weight:	
Without package	4.5 kg
Shipping weight	6 kg
Operating temperature:	0°C to 40°C
Storage temperature:	-40°C to 70°C
Humidity:	85% RH, non condensing
Safety:	CE Marked, IEC61010-1
EMC:	IEC 61326-1:2006
Calibration:	2 years
Warranty:	5 years standard

ORDERING INFORMATION

MODEL	WX2181B
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OPTIONS

Option 1:	32M Memory

ACCESSORIES

S-Rack mount:	19" Single Rack Mounting Kit
Case Kit:	Professional Carrying Bag

Note: Options and Accessories must be specified at the time of your purchase.