

# Instrument Specifications

## OR34/35

2 to 8 Channels  
Multi-Analyzers

## SmartRouter Controller Unit



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## General description

The following specifications concern OR34 & OR35 multi-analyzers and the SmartRouter controller. OR34 and OR35 instruments consist of an OR3x hardware containing optional inputs and processing modules, a PC with an Ethernet interface, and NVGate® software with optional plug-in analyzers.

### Modules

The following tables detail the complete capacity of OR34, OR35 & SmartRouter hardware. Optional or standard modules may fill the described slots.

#### OR34

<b>Front-end</b>	Dynamic analog inputs	2 slots of 2 inputs (BNC)
	Dynamic analog outputs	1 output (BNC)
	Externals sync	2 trigger/tachometer inputs (BNC)
<b>Processors</b>	Trigger / tachometer / monitoring	1 DSP
	PC communication / recording	1 DSP
	Computation power	1 DSP
<b>Miscellaneous</b>	Remote control	1 with RS232 cable connection (RJ11)

#### OR35

<b>Front-end slots</b>	Dynamic analog inputs	4 slots of 2 inputs (BNC or BNC+LEMO)
	Dynamic analog outputs	2 outputs (BNC)
	Externals sync	2 trigger/tachometer inputs (BNC)
	Auxiliary	1 slot of 4 parametric (DC) inputs
<b>Processors</b>	Trigger / tachometer / monitoring	1 DSP
	PC communication / recording	1 DSP
	Computation power	2 slots of 1 DSP
<b>Miscellaneous</b>	Remote control (on/off/reset)	1 with RS232 cable connection (RJ11)

#### SmartRouter

<b>I/O ports</b>	Ethernet (analyzer connection)	100 Mb/s - RJ45 - CAT 5
	Ethernet (LAN/WAN connection)	1 Gb/s - RJ45 - CAT 5
	Digital I/O	8 in/out
	USB ports	4 external / 1 internal
<b>Controller</b>	CPU	Intel Celeron/M - 1 GHz – FSB 400 MHz
	RAM	480 MB
	Hard drive	50 GB
<b>Miscellaneous</b>	Analyzer remote (on/off/reset)	RS232 cable connection (RJ11)

### PC requirement

<b>Minimum</b>	Pentium 4/ 2 GHz / 256 <sup>1</sup> MB RAM with Windows XP or 512 <sup>1</sup> MB with Windows Vista/ Graphics video with at least 32 MB dedicated (not shared) memory / 100 MB free on HD + storage for measurements and signals, CD ROM drive, 1024 x 768 display (XGA), DirectX 8.0
<b>Recommended (for laptop)</b>	Intel <b>Core 2 Duo</b> / 2 GHz / 1 GB of RAM with XP, <b>2 GB of RAM with Vista</b> , / Graphics video with <b>256 MB dedicated</b> (not shared) memory / 100 MB free on HD + storage for measurements and signals, CD or DVD ROM drive, 1400 x 1024 display (SXGA+), DirectX 10
<b>Recommended (for desktop)</b>	Intel <b>Core 2 Duo</b> / <b>2.6 GHz</b> or <b>AMD Athlon 64 X2 Dual-Core 6000+</b> / <b>3 GB</b> of RAM / Graphics video with <b>512 MB dedicated</b> (not shared) memory / 100 MB free on HD + storage for measurements and signals, CD or DVD ROM drive, 1600 x 1200 display (UXGA), DirectX 10
<b>Connection</b>	Type: <b>Ethernet 100base TX</b> , 100 Mbit/s - Connector: <b>RJ45</b> For removable disk: <b>USB 2.0</b> - At least one <b>parallel port</b> or one <b>USB port</b> for dongle key.
<b>Operating systems</b>	Windows <b>XP Pro</b> Service Pack 3 (recommended), Windows <b>Vista Business</b> Service Pack 2

1) Waterfall depth depends on available memory. Minimum configuration does not allow waterfall storage.

## Case

### Mechanicals

#### OR34

<b>Weight</b>	<b>1.4 kg (3 lb)</b>	
<b>Dimensions</b>	Case (w.h.d)	<b>45 mm x 205 mm x 154 mm ( 1.8 in x 8.1 in x 8.8 in )</b>
	Overall (w.h.d)	<b>54 mm x 215 mm x 163 mm ( 2.1 in x 8.4 in. x 6.4 in )</b>

#### OR35/SmartRouter

<b>Weight</b>	<b>2.8 kg (6.2 lb)</b>	
<b>Dimensions</b>	Case (w.h.d)	<b>56 mm x 246 mm x 222 mm ( 2.2 in x 9.7 in x 8.8 in )</b>
	Overall (w.h.d)	<b>67 mm x 254 mm x 232 mm ( 2.6 in x 10 in. x 9.15 in )</b>

### Power supply

#### OR34

<b>Power</b>	<b>&lt; 15 VA</b>	
<b>External AC Power supply</b>	Voltage	<b>100 to 240 VAC</b>
	Frequency	<b>47 to 63 Hz</b>
<b>DC</b>	Range	<b>10 V to 28 V</b>
	Overload protection	<b>31 V (over this voltage DC poles are short-circuited)</b>
<b>UPS (Uninterrupt-ible Power Supply)</b>	Type	<b>Internal NiMh battery (No memory effect)</b>
	Protection against power supply loss or failure	<b>15 min.</b>

#### OR35

<b>Power</b>	<b>&lt; 20 VA</b>	
<b>External AC Power supply</b>	Voltage	<b>100 to 240 VAC</b>
	Frequency	<b>47 to 63 Hz</b>
<b>DC</b>	Range	<b>10 V to 28 V</b>
	Overload protection	<b>31 V (over this voltage DC poles are short-circuited)</b>
<b>Battery</b>	Type	<b>NiMh (no memory effect)</b>
	Autonomy	<b>2 h (typical)</b>
	Charge time	<b>3 h (typical)</b>
	Charge conditions	<b>DC power supply &gt; 18 V</b>

#### SmartRouter

<b>Power</b>	<b>&lt; 20 VA</b>	
<b>External AC Power supply</b>	Voltage	<b>100 to 240 VAC</b>
	Frequency	<b>47 to 63 Hz</b>
<b>DC</b>	Range	<b>10 V to 28 V</b>
	Overload protection	<b>31 V (over this voltage DC poles are short-circuited)</b>
<b>Battery</b>	Type	<b>NiMh (no memory effect)</b>
	Autonomy	<b>2 h (typical)</b>
	Charge time	<b>3 h (typical)</b>
	Charge conditions	<b>DC power supply &gt; 18 V</b>

## Environmental / Compliance with standards

<b>CE</b>	Indicates compliance with EMC Directive <b>89/336/EEC</b> and Low Voltage Directive <b>73/23/EEC</b>	
<b>Safety</b>	<b>EN 61010-1 June 2001</b>	Safety requirements for electrical equipment for measurement, control and laboratory use.
	Over-voltage Category	<b>II</b> (Local level mains, appliance, and portable equipment)
	Pollution Degree	<b>2</b> : Do not operate in environments where pollutants may be present.
<b>EMC Emission</b>	<b>EN 50081-1</b>	Generic emission standard: Residential, commercial and light industry.
	<b>EN 50081-2</b>	Generic emission standard: Industrial environment.
	<b>IEC 61326-A: 2002</b>	Electrical equipment for measurement control and laboratory use EMC requirements. Industrial locations
	<b>CISPR 22</b>	Radio disturbance characteristics of information technology equipment. Class B limits.
	<b>FCC Rules</b>	Complies with the limits for a Class B digital device.
<b>EMC Immunity</b>	<b>EN 50082-1</b>	Generic immunity standard: Residential, commercial and light industry.
	<b>IEC 61326-1</b>	Electrical equipment for measurement control and laboratory use EMC requirements.
	<b>EN 50082-2</b>	Generic immunity standard: Industrial environment.
	Linear input response range on interference	Max slew rate on input: <b>5 V/ <math>\mu</math>s</b>
<b>Materials</b>	<b>ROHS</b>	<b>2011/65/EU</b>
	<b>WEEE</b>	<b>2002/96/CE – 2003/108/CE</b> End user support recycling and concern fees
<b>Temperature</b>	OR34 Operating	<b>0°C to 50°C</b> (32°F to 122°F)
	OR35 Operating	<b>0°C to 50°C</b> (32°F to 122°F)
	Storage	<b>-20°C to 65°C</b> (-4°F to 149°F)
	Absolute maximum rating <sup>ii</sup>	<b>-35°C to 70°C</b> (-31°F to 158°F)
<b>Humidity</b>	Max	<b>93 % RH at 40°C</b> non condensing
<b>Shock</b>	Complies with <b>IEC 68-2-27</b>	
	Operating	<b>98.1 m/s<sup>2</sup></b> (11 ms, ½ sine) and <b>686 m/s<sup>2</sup></b> (3 ms, ½ sine)
	Storage	<b>196 m/s<sup>2</sup></b> (11 ms, ½ sine) and <b>981 m/s<sup>2</sup></b> (3 ms, ½ sine)
	Absolute maximum rating <sup>ii</sup>	<b>981 m/s<sup>2</sup></b> (3 ms, ½ sine)
<b>Vibration</b>	Complies with <b>IEC 68-2-6</b>	
	Operating	<b>19.6 m/s<sup>2</sup>, 5-500 Hz, 5mm</b>
	Storage	<b>24.5 m/s<sup>2</sup>, 5-500 Hz, 5mm</b>
	Absolute maximum rating <sup>ii</sup>	<b>29.4 m/s<sup>2</sup>, 5-500 Hz, 5mm</b>
<b>Bump</b>	Complies with <b>IEC 68-2-29</b>	
	Storage	<b>1000 bumps</b> in each direction (6) at <b>392 m/s<sup>2</sup>, 6 ms</b>
<b>Enclosure</b>	Type	<b>IP 40</b>

### Radio frequencies sensibility

	Input measured with 50 $\Omega$ terminator
<b>Radiated RF: 80-1000 MHz, 80% AM 1 kHz, 10 V/m</b>	< 20 $\mu$ V
<b>Conducted RF: 0.15-80 MHz, 80% AM 1 kHz, 10 V</b>	< 100 $\mu$ V
<b>Magnetic field: 30 A/m, 50 Hz</b>	< 2 $\mu$ V

## Front-end

### Dynamic inputs

<b>Sampling</b>	Frequencies (Additional decimators allow analysis bandwidth down to 0.8 Hz)	<b>102.4 kHz, 65.536 kHz, 51.2 kHz, 37.768 kHz, 25.6 kHz, 16.384 kHz, 12.8 kHz, 8.192 kHz, 6.4 kHz, 5.12 kHz, 4.096 kHz, 3.2 kHz, 2.048 kHz</b>
	Converters	One <b>24 bit sigma-delta ADC</b> for each input
	Frequency relative precision	$0.5 \cdot 10^{-4}$ (typical $1 \cdot 10^{-5}$ )
	Synchronization	All inputs synchronized on the same sampling clock
<b>Anti-aliasing filter</b>	Type	Over-sampled digital filters
	Slope	<b>&gt; 400 dB/octave</b>
	Pass band ripple	<b>&lt; 0.003 dB</b>
	Rejection of parasites bands	<b>&gt; 110 dB</b> (@ frequency > 0.57 x FS)
	Effective bandwidth	<b>0.43 x FS</b> (ex: 23.2 kHz @ 51.2 kS/s)
<b>Range (peak)</b>	With amplifier (included)	<b>±17.5 mV, ±31.6 mV, ±60 mV, ±100 mV, ±175 mV, ±316 mV, ±600 mV, ±1 V, ±1.75 V, ±3.16 V, ±6 V</b>
	Direct	<b>±10 V</b>
<b>Absolute accuracy</b>	Resolution	<b>24 bits</b> (144 dB)
	All input ranges at 1 kHz	<b>±0.05 dB</b> (typical ±0.015 dB)
	Temperature variability	<b>&lt; 0.1 dB / 10°C</b>
<b>DC offset</b>	For ranges from ±1 V to ±10 V	<b>&lt; ±0.15 %</b> of full scale
	For ranges below ±1 V	<b>&lt; ±1 mV</b>
<b>Frequency flatness and phase response</b>	Includes channel to channel match with different gains	
	10 V range, 0 to 20 kHz	<b>±0.02 dB / ±0.02 °</b>
	10 V range, 20 to 40 kHz	<b>±0.05 dB / ±0.05 °</b>
	175 mV to 6 V ranges, 0 to 20 kHz	<b>±0.02 dB / ±0.1 °</b>
	175 mV to 6 V ranges, 20 to 40 kHz	<b>±0.10 dB / ±0.5 °</b>
	17.5 mV to 100mV ranges, 0 to 10 kHz	<b>±0.05 dB / ±0.3 °</b>
	17.5 mV to 100mV ranges, 10 to 20 kHz	<b>±0.1 dB / ±1 °</b>
17.5 mV to 100mV ranges, 20 to 40 kHz	<b>±0.4 dB / ±3 °</b>	
<b>Cross-talk</b>	Between N (N is odd) and N+1 inputs: @ 1 kHz: <b>&lt; -112 dB</b> , @ 20 kHz: <b>&lt; -86 dB</b> , @ 40 kHz: <b>&lt; -80 dB</b>	
	Between any inputs excluding: N (N is odd) and N+1 inputs: @ 1 kHz: <b>&lt; -122 dB</b> , @ 20 kHz: <b>&lt; -96 dB</b> , @ 40 kHz: <b>&lt; -90 dB</b>	
<b>Signal to noise ratio</b>	With 50 Ω terminators:	
	10 V range, 40 kHz bandwidth: > <b>100 dB</b> , spurious lines < <b>-115 dB</b> of full scale 10 V range, 20 kHz bandwidth: > <b>104 dB</b> , spurious lines < <b>-125 dB</b> of full scale	
<b>Input noise</b>	With 50 Ω terminators	
	Thermal input noise	<b>20 nV/√Hz</b>
	17.5 mV range	20 kHz BW < <b>3 μV rms</b> , 40 kHz BW: < <b>4.2 μV rms</b>
	100 mV range	20 kHz BW < <b>3 μV rms</b> , 40 kHz BW: < <b>4.2 μV rms</b>
	1 V range	20 kHz BW < <b>5.4 μV rms</b> , 40 kHz BW: < <b>8.5 μV rms</b>
10V range	20 kHz BW < <b>44 μVrms</b> , 40 kHz BW: < <b>70 μV rms</b>	
<b>Impedance</b>	<b>1 MΩ ±1%, &lt; 100 pF</b>	
<b>Coupling</b>	<b>AC</b>	Cut-off frequency 0.35 Hz ±10% (analog filter)
	<b>DC</b>	
	<b>ICP</b>	<b>4 mA</b> power supply with AC coupling
	<b>ICP + TEDS</b>	ICP with reverse current for TEDS reading
	<b>AC and DC float</b>	Independent ground references for each input within the current input range
<b>GND</b>	Shortcuts input poles to the ground	
<b>Protection</b>	On any inputs <sup>ii</sup>	<b>±60 V</b> peak without damage
<b>TEDS</b>	Standards	<b>IEEE 1451.4 2001</b> revision 1
	Templates	Accelerometer/Force meter ( <b>25</b> ) Microphones ( <b>27, 28</b> and <b>29</b> )
<b>Dynamic</b>	Spectral domain	<b>&gt; 140 dB</b>

## Dynamic outputs

<b>Sampling</b>	Converters	One <b>24 bits DAC</b> for each output
	Synchronization	Same sampling clock as the dynamic inputs
<b>Range</b>	Direct	<b>±10 V peak</b>
	With attenuator (included)	<b>±1 V peak</b>
	Clipping	<b>User selectable</b> in the output range
	Digital gain	<b>From <math>10^{-5}</math> to <math>10^3</math></b>
<b>Absolute accuracy</b>	Resolution	<b>24 bits (144 dB)</b>
	All output ranges at 1 kHz	<b>±0.05 dB</b>
	Temperature drift	<b>&lt; 0.1 dB / 10°C</b>
<b>Frequency response</b>	Variation relative to 0 dB at 1 kHz	
	All ranges, at 10 kHz	<b>±0.05 dB</b>
	All ranges, at 20 kHz	<b>±0.15 dB</b>
	All ranges, at 40 kHz	<b>±0.8 dB</b>
<b>Noise floor level</b>	10 V range, 20 kHz bandwidth	<b>-110 dB</b> of full scale, spurious lines <b>&lt; -125 dB</b> of full scale
	10 V range, 40 kHz bandwidth	<b>-105 dB</b> of full scale, spurious lines <b>&lt; -125 dB</b> of full scale
	1 V range, 20 kHz bandwidth	<b>-99 dB</b> of full scale, spurious lines <b>&lt; -110 dB</b> of full scale
	1 V range, 40 kHz bandwidth	<b>-94 dB</b> of full scale, spurious lines <b>&lt; -110 dB</b> of full scale
<b>Impedance</b>	Impedance	<b>50 Ω</b>
<b>Current</b>	Max	<b>±10 mA</b>
<b>Protection</b>	Sum of injected + generated voltages	<b>±15 V peak</b> , On any output <sup>ii</sup> Permanent short circuit supported
<b>Total harmonic distortion</b>	THD @ 1 kHz	<b>&lt; 0.002%</b> or <b>-94 dB</b> at 20 kHz BW
	THD @ 5 kHz	<b>&lt; 0.005%</b> or <b>-86 dB</b> at 20 kHz BW
<b>Cross-talk</b>	Output 0 dBV to 50 Ω terminated input	<b>Lower than measurable noise</b>

## External sync

<b>Sampling</b>	Frequencies	<b>64 time over-sampling</b> of the current input sampling (up to <b>6.4 MHz</b> )
	Converters	High speed voltage comparator and time counter
<b>Range (peak)</b>	Direct	<b>±300 mV, ±1 V, ±3 V, ±10 V</b>
<b>Resolution</b>	Amplitude accuracy	<b>±1 % of range</b>
<b>Setting</b>	Hysteresis	<b>1%</b> (of input range) to input range
	Hold off	<b>0 s to 500 s</b>
	Slope	<b>Rise or fall</b>
	Hardwired pre-divider	<b>From 1 to 255</b>
<b>Time resolution</b>		<b>&gt; 160 ns</b> (0.06° at 1kHz and 1.2° at 20kHz)
<b>Pulse rate</b>	Max	<b>375k pulse/s</b>
<b>Coupling</b>	<b>AC</b>	Cut-off frequency 0.35 Hz ±10% (analog filter)
	<b>DC</b>	
<b>Impedance</b>		<b>1 MΩ, &lt; 100 pF</b>
<b>Protection</b>	on any external sync <sup>ii</sup>	<b>±60 V peak</b> without damage

## Optional parametric (DC) inputs

The following parametric inputs can be added to the OR35 hardware configuration 1 set of 4 parametric inputs with connector on the back plane.

These parametric inputs provide automatic calibration at each range modification including analyzer power-up.

<b>Sampling</b>	Frequencies	<b>12.5 samples/s</b> (50 Hz rejection) <b>15 samples/s</b> (60 Hz rejection) Independent from dynamic sampling clock
	Converters	One <b>16 bit sigma-delta ADC</b> for each input
<b>Range (peak)</b>	With amplifier (included)	<b>±150 mV, ±300 mV, ±625 mV, ±1.25 V, ±2.5 V, ±5 V</b>
	Direct	<b>±10 V</b>
<b>Frequencies rejection</b>	Selectable notch filters for	<b>50 Hz</b> (78 dB rejection) <b>60 Hz</b> (78 dB rejection)
<b>Amplitude</b>	Resolution	<b>16 bit</b>
	Linearity	<b>0.003 %</b> of input range peak
	Gain drift	<b>10 ppm</b> of input range peak/°C typ.
<b>Offset</b>	Offset	<b>&lt; ±1 mV</b> (after auto calibration)
	Offset drift	<b>6 µV/°C</b> typ.
<b>Impedance</b>		<b>1 MΩ, 5 nF</b> typ.
<b>Protection</b>	On any input <sup>ii</sup>	<b>±60 V</b> peak
<b>Input Noise</b>	With 50 Ω terminators	
	Input noise	<b>&lt; 1 mV</b> rms
	Max. deviation	<b>&lt; 1 mV</b> peak

## Satellite I/O

The following digital I/Os are included in the Satellite version of the SmartRouter with connector on the back plane.

<b>Type</b>	Inputs	<b>Open collector</b>
	Outputs	<b>Open collector</b>
<b>Voltages</b>	Standard	<b>±28 V</b>
	Absolute maximum rating	<b>±30 V</b>
<b>Current</b>	Peak	<b>&lt; 500 mA</b>



## Digital computation

The following table details the optional DSP modules that can be added to OR35 hardware to fit analysis mode calculation needs.

### SPUs

SPU (Signal Processing Units): the following table gives the characteristics of each analysis mode and the associated SPU consumption. For multi-analysis purpose, add the corresponding SPUs of each mode used simultaneously and increase the sum by 10%. "Real-time" means that the analysis speed is faster than the input rate and does not miss any sample.

<b>FFT</b>	Real-time FFT analysis with:
	<b>401 lines</b> (for 801, 1601,3201, 6401 lines multiply requested SPU respectively by 1.25,1.5, 2, 3)
	<b>20 kHz</b> bandwidth (Requested SPU are proportional to bandwidth)
	<b>0% overlap</b> 1 channel processing = <b>1 SPU</b>
<b>1/n Octave</b>	Real-time filter based 1/n octave analysis with:
	<b>1/3rd</b> octave resolution (for 1/12 <sup>th</sup> and 1/24 <sup>th</sup> octave multiply SPU respectively by 2 and 4)
	<b>20 kHz</b> bandwidth (Requested SPU are proportional to bandwidth)
	1 channel processing = <b>3 SPU</b>
<b>Order analysis</b>	Real-time order spectrum analysis (re-sampled time signal) with:
	Max order / order resolution = <b>800</b>
	Max RPM x Max order = <b>1 200 000</b> (requested SPU is proportional to max RPM)
	1 channel processing = <b>3 SPU</b>
<b>Recorder</b>	Gap free recording with:
	<b>51.2 kHz</b> sampling rate
	1 channel processing = <b>1 SPU</b>

### Computation DSPs modules

<b>Type</b>	Sample size	<b>32 bit floating</b>
	Computation words	<b>32/40 bits</b>
	Memory	<b>4 MSamples</b>
<b>Power</b>	Computation capability	<b>12 SPU / DSP module</b>

### Computation DSP module / OR34 & OR35 unit

<b>Minimum</b>	<b>1</b> Computation DSP module	<b>12 SPU</b>
<b>OR34 Max.</b>	<b>1</b> Computation DSP modules	<b>12 SPU</b>
<b>OR35 Max.</b>	<b>2</b> Computation DSP modules	<b>24 SPU</b>

## Notes

The above specifications describe all the guaranteed capacities and performances of the instrument and are applicable to an OR34-4 or OR35-8 hardware, powered for more than 15 minutes, at a stabilized room temperature of 23°C ±5°C and calibrated since less than one year.

The adapted control software NVGate<sup>®</sup> is described separately.

<sup>i</sup> Prepared for future use: the related specifications or options are in development.

<sup>ii</sup> Exceeding absolute maximum ratings damages the system and voids guarantee.

# OROS, Leadership through Innovation

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Now approaching 30-years in business, OROS' designs and manufacturing have been renowned for providing the best in noise and vibration analyzers as well as in specific application solutions.

## Our Philosophy

Reliability and efficiency are our ambition everyday. We know you require the same for your measurement instruments: comprehensive solutions providing performance and assurance, designed to fit the challenges of your demanding world.

## Our Emphasis

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