Series 3000 - The New Generation of B-RAX™ Vacuum Gauge Controllers

- 3 Channel Controller for one ionization and two convection gauges or one ionization, one convection and one alternate capacitance diaphragm gauge
- Various pressure measurement ranges from $4 \times 10^{-10}$ to 1,000 Torr
- 3 analog outputs, 6 setpoint relays, RS232/RS485 serial communications, remote Digital I/O
- Compact space saving half rack design, bench top or panel/rack mount instrument
- Outstanding product warranty of 5 years

Description

The B-RAX is a highly versatile vacuum gauge controller capable of operating one ionization gauge (IG) and up to two CVG101 convection vacuum gauge sensors (CG), or one IG, one CG and one alternate gauge such as a capacitance diaphragm gauge (CDG).

The ionization gauge on/off, degas functions and emission current selection can be controlled via front panel soft-keys, remote input signals (Digital I/O), or serial communications. IG sensor can also be automatically turned on/off using the measurements from one of the user selectable convection or alternate gauges. When using hot cathode IGs, the B-RAX can be set to automatically switch (auto-ranging) between various emission currents. This results in optimal and stable pressure readings over the entire measurement range from low to high vacuum. High efficiency power supply design and effective thermal management techniques are used to enable operation of the B-RAX without the need for air movement devices such as troublesome fans.

The state of all setpoint relays, emission current, filament in use and error messages for all fault conditions are displayed on the easy to read OLED set-up screen. Filament operation including filament current, emission current and ion current can be monitored in real time in the research screen mode.

<table>
<thead>
<tr>
<th>B-RAX Controller</th>
<th>Ionization Gauge Compatibility</th>
<th>Convection Gauge Compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model B-RAX 3300</td>
<td>One BA602 Nude l^R Hot Cathode</td>
<td>Up to two CVG101 Convection Gauges</td>
</tr>
<tr>
<td></td>
<td>(4 x 10^{-10} to 1 x 10^{-3} Torr)</td>
<td>(1 x 10^{-4} to 1,000 Torr)</td>
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<tr>
<td></td>
<td>One BA603 Glass l^R Hot Cathode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4 x 10^{-10} to 1 x 10^{-3} Torr)</td>
<td></td>
</tr>
<tr>
<td>Model B-RAX 3200</td>
<td>One IGM400 Hot Cathode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 x 10^{-9} to 5 x 10^{-7} Torr)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One CCM500 Cold Cathode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 x 10^{-9} to 1 x 10^{-7} Torr)</td>
<td></td>
</tr>
</tbody>
</table>
### Specifications

| measurement range: | **B-RAX 3300**: $4 \times 10^{-10}$ to 1,000 Torr when used with the BA602/603 hot cathode IG and CVG101 CG  
**B-RAX 3200**: $1 \times 10^{-6}$ to 1,000 Torr when used with the IGM400 hot cathode IG and CVG101 CG  
**B-RAX 3200**: $1 \times 10^{-5}$ to 1,000 Torr when used with the CCM500 cold cathode IG and CVG101 CG |
| display pressure indication programming & set-up screen | LED - 3 independent pressure display channels - 3 digit plus 2 digit exponent per channel  
OLED - displays state of all setpoint relays, IG emission current, error messages for fault conditions |
| units of measure | Torr, mbar, Pa - user selectable |
| functionality | IG: Powers & operates one InstruTech BA602, BA603, IGM400 or CCM500 ionization vacuum gauge  
**B-RAX 3300**: is also capable of operating other equivalent brands of glass or nude IFR B-A hot cathode IG  
CG: powers & operates up to 2 InstruTech CG101 convection or Granville-Phillips® (GP) Convection® gauges  
alternate gauge: displays pressure from an alternate gauge such as a CDG or other InstruTech modules using the analog input (external power source for these alternate auxiliary devices will be required) |
| IG sensor control | IG Sensor on/off, degas on/off and emission current can all be controlled via front panel soft-keys, remote input signals (digital I/O) or serial communications. IG sensor can also be automatically turned on/off using the measurements from one of the user selectable convection or alternate gauges. |
| IG remote input signals (digital I/O) | IG sensor on/off, degas on/off and emission current can also be set by applying momentary continuity to ground. Also the 9-pin D-sub remote input DIGITAL I/O connector provides pin-pin compatible signals with the GP 358 controller as well as compatible signals with the GP 307. |
| setpoint relays | six single-pole, double-throw (SPDT), 1 A at 30 Vdc resistive, or 1 A at 30 Vac non-inductive, user assignable to any of the gauges |
| analog output | three analog outputs, user assignable to any of the gauges; |
| IG analog output | log linear 0 to 10 Vdc, 1 V/decade, various scaling selections also provide analog output compatibility with Granville-Phillips® controller models 307, 350 and 358 controllers, or  
log Linear 1.7 V to 9.3 Vdc (nominal 1.8 to 8.7 Vdc) 0.8 V/decade, or  
linear 0 to 10 Vdc (useable over 3 decades, also compatible with GP 307 controller) |
| combination IG + CG analog output | log linear 0.5 to 7 Vdc, 0.5 V/decade |
| CG analog output | log linear 1 to 8 Vdc, 1 V/decade, or 0 to 7 Vdc, 1 V/decade (also compatible with GP 307, 350, 358), or  
non-linear analog S-curve 0.375 to 5.659 Vdc, or linear 0 to 10 Vdc (useable over 3 decades) |
| analog input | one 0-10 Vdc analog input signal from a CDG when used as an alternate gauge to CG2, or  
analog input signal from one of the following InstruTech modules: CVM201, CVM211, IGM401, CCM501 |
| serial communications | RS485 / RS232 - ASCII protocol  
(command protocol compatibility with GP 307 and 358 controller is also provided) |
| status output | IG Sensor on/off status message is displayed on the front panel, by serial communications and by SPDT relay (DIGITAL I/O Connector) rated at 1 A at 30 Vdc resistive, or 1 A at 30 Vac non-inductive.  
IG degas on/off status or IG error conditions are displayed on the front panel, by serial communications and by an open collector transistor output (ground emitter) rated at 40 V max. VCE, 50 mA IC max. |
| IG hot cathode filament switching | user selectable between filament 1 or 2 using the front panel soft-keys |
| IG hot cathode emission current | **B-RAX 3300**: 100 μA, 4 mA, 10 mA or automatic switching (auto ranging) between 100 μA, 4 mA, 10 mA  
**B-RAX 3200**: 100 μA, 4 mA, or automatic switching (auto ranging) between 100 μA and 4 mA |
| IG degas | **B-RAX 3300**: 40 W, resistive  
**B-RAX 3200**: 3 W, electron bombardment |
| IG overpressure protection | **B-RAX 3300**: turns BA602 or BA603 ion gauge filament off at the following factory default settings:  
$1 \times 10^{-5}$ Torr at 100 μA emission current,  $5 \times 10^{-6}$ Torr at 4 mA emission current,  $1 \times 10^{-5}$ Torr at 10 mA emission current  
**B-RAX 3200**: turns off IGM400 ion gauge filament or CCM500 sensor at the following factory default setting:  
$5 \times 10^{-5}$ Torr at 100 μA and $1 \times 10^{-3}$ Torr at 4 mA emission current for IGM400 hot cathode  
$1 \times 10^{-5}$ Torr for CCM500 cold cathode |
| temperature | operating: 0 to + 40 °C  
storage: -40 to + 70 °C |
| humidity | 0 to 95% relative humidity, non-condensing |
| weight | 1.7 lb. (0.7 kg) |
| housing | aluminum extrusion - black powder paint finish |
input power

**B-RAX 3300**: 20 - 28 Vdc, 200 W protected against power reversal and transient over-voltages

**B-RAX 3200**: 20 - 28 Vdc, 36 W protected against power reversal and transient over-voltages

connectors
- IG & CG digital I/O
- serial communications analog I/O, setpoint relays, power
- gauge cable assemblies provided by InstruTech
- 9-pin D-sub male
- RS232; 9-pin D-sub female, RS485; 9-pin D-sub male
- pluggable terminal block (mating connectors included)

CE compliance
- EMC Directive 2004/108/EC, EN 61326-1, EN 55011
- Low Voltage Directive 2006/95/EC, EN 61010-1

environmental
- RoHS compliant

**Front Panel Operation**

- pressure measurement
- ionization gauge
- ionization gauge on/off
- ionization gauge degas on
- state of relays
- engineering units
- pressure measurement
- convection gauge 2 or alternate gauge
- programming & set-up screen
- programming keys

**Electrical Connections**

**B-RAX 3300**
- 3 Analog Outputs
- 1 Alternate Gauge
- Analog Input
- Digital I/O (remote input/output)
- 6 Setpoint Relays
- Glass/Nude B-A IG

**B-RAX 3200**
- All connections are the same as the B-RAX 3300 except IG
- (Note IG Collector is removed below)
- IGM400 Hot Cathode IG, or
- CCM500 Cold Cathode IG

**Outline Drawing**

**Front View**
- IG
- CG1
- CG2
- I/O Power
- MENU
- 183 mm (7.2 in.)

**Side View**
- IG
- CG1
- CG2
- I/O Power
- MENU
- 78 mm (3.08 in.)
### Ordering Information

<table>
<thead>
<tr>
<th>Part Numbers</th>
<th>B-RAX Vacuum Gauge Controller</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 channel pressure display vacuum gauge controller. Operates one ionization gauge (IG) plus up to two convection gauges (CG), or one IG, one CG and one alternate gauge. Includes 6 setpoint relays, 3 analog outputs, Digital I/O, RS232/RS485 serial communications, one analog input from an alternate gauge.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Optional 24 Vdc Power Supply for B-RAX</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Input: 100 - 240 Vac, 50-60 Hz</td>
<td>Power Output: 24 Vdc @ 9.16 A (220 W); For B-RAX 3300 24 Vdc @ 2.5 A (60 W); For B-RAX 3200</td>
</tr>
<tr>
<td>Connector: 2-pin pluggable terminal block to mate with the B-RAX</td>
<td>Compliance: CE, RoHS, UL (US/Canada), CCC (China) For B-RAX 3300; Power cord with North American 115 Vac plug included For B-RAX 3300; No power cord included* PS330-UA PS330-UX For B-RAX 3200; Power cord with North American 115 Vac plug included For B-RAX 3200; No power cord included* PS301-UA PS301-UX</td>
</tr>
</tbody>
</table>

* The conventional IEC60320 AC receptacle allows use with any user supplied AC mains power cord set available worldwide.

### Gauge Cable Length

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>IG to B-RAX 3300 Bakeable Cable 200 °C*</th>
<th>IG to B-RAX 3300</th>
<th>Glass IG to B-RAX 3300</th>
<th>IGM400/CCM500 to B-RAX 3200</th>
<th>CVG101 to B-RAX 3300/3200</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 ft. (3 m)</td>
<td>IRNBD441-1-10F</td>
<td>IRN441-1-10F</td>
<td>IRG441-1-10F</td>
<td>BXC400-1-10F</td>
<td>CB421-1-10F</td>
</tr>
<tr>
<td>25 ft. (8 m)</td>
<td>IRNBD441-1-25F</td>
<td>IRN441-1-25F</td>
<td>IRG441-1-25F</td>
<td>BXC400-1-25F</td>
<td>CB421-1-25F</td>
</tr>
<tr>
<td>50 ft. (15 m)</td>
<td>IRNBD441-1-50F</td>
<td>IRN441-1-50F</td>
<td>IRG441-1-50F</td>
<td>BXC400-1-50F</td>
<td>CB421-1-50F</td>
</tr>
<tr>
<td>&gt;50 ft.</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
<td>consult factory</td>
</tr>
</tbody>
</table>

* The IRNBD441 bakeable Nude IG cable is provided with push-on sockets for connection to the Nude gauge pins (BA602 pins) and is bakeable to 200 °C. All other cables listed above are rated for 50 °C ambient temperature. All IG cables listed above can be used with either single or dual filament ion gauges and filament switching is controlled from the B-RAX controller.

### Optional Rack Mount Adapter

| 2U Rack Mount adapter panel for installation of one B-RAX as a left-mount or right-mount in a 2U, 19 inch wide rack. | 000849 |
| Rack Mount adapter panel for installation of two B-RAX side-by-side in a 2U, 19 inch wide rack. | 001007 |

**BA602, BA603, IGM400, CCM500 ionization gauges** See BA602, BA603, IGM400 or CCM500 Hornet™ ionization gauge data sheets

**CVG101 convection gauge** See CVG101 Worker Bee™ convection gauge data sheets

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