Spellman High Voltage... Your Global Resource for High Voltage Power Conversion

MEETING CUSTOMER NEEDS
For over 70 years, Spellman has been helping technology companies grow by providing standard and custom high voltage power converters, X-Ray generators and Monoblock® X-Ray sources of exceptional value and performance and by aligning our procedures, processes and infrastructure to support our customers’ goals – a process we call homologation. At Spellman, homologation is in everything we do. From initial product concept through final delivery, we dedicate a team of experts to work with each customer.

YOUR VISION IS OUR MISSION
Spellman advances medical care, industrial processes, quality control, scientific research, security and telecommunications by providing innovative high voltage power conversion solutions that enable equipment manufacturers to improve their systems' performance, reliability, cost and bottom line.

- **Innovation & Quality:**
  With over 70 years of high voltage innovation, world-class ISO certified production facilities and global support network, Spellman can meet the needs of discriminating global OEM's system manufacturers

- **Compliance and Safety:**
  Safety and Regulatory Agency approvals such as: UL, CSA, and IEC can be provided. In addition, Spellman is authorized to conduct UL sanctioned testing

- **Risk Management:**
  Consistent processes across multiple facilities ensures a secure supply chain. Products can be manufactured at multiple Spellman sites. With standardized manufacturing, training and equipment, you can be assured of quality products and service for years to come

- **Support and Service:**
  Our globally situated technical support centers are strategically located to provide rapid local response to customer needs Support Centers are linked through a common ERP system and real-time data reporting so information is always available about your product and delivery status
Spellman has set the standard in development of integrated X-Ray sources with its Monoblock® series.

Our custom OEM designs are used in baggage screening, explosive detection, medical imaging, food inspection, non-destructive testing and many other applications. A Monoblock® is typically a single assembly containing both high voltage generation components and an X-Ray tube. The physical compactness and inherent elimination of cabling reduces cost and the risk of breakdown making these products extremely reliable. Monoblocks® can be designed in a wide variety of geometries, with beam shape, focal spot size and other critical parameters customized for the application. Digital control via RS-232, Ethernet or USB is available.

- Internal X-Ray tube eliminates maintenance issues with external HV cables/connecters
- Power Factor Correction minimizes input power requirements
- Universal Input circuitry accepts a wide variety of worldwide input voltages
- Sealed, leak-free tank can be mounted in any physical orientation
- Unique radiation shielding minimizes weight while ensuring very low X-Ray leakage
- Standard digital interface simplifies communication and system integration

<table>
<thead>
<tr>
<th>CURRENT/POWER</th>
<th>MODEL</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>80kV @ 20/50W</td>
<td>XRB011</td>
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<tr>
<td>80kV @ 100W</td>
<td>XRB80N100</td>
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<td>XRB160PN192</td>
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<td>XRB200PN400</td>
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<td>160kV @ 480W</td>
<td>XRB160PN480/1</td>
<td>36-38</td>
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<tr>
<td>160kV @ 480W</td>
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</tr>
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<td>90kV @ 900W</td>
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<tr>
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<td>MMB125PN3.5</td>
<td>54-56</td>
</tr>
</tbody>
</table>
Spellman’s XRB011 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 80kV at 20W and 80kV at 50W. Features like 24Vdc input voltage, small package size, standard analog interface and RS-232/Ethernet digital interface simplify integrating the XRB011 into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability and performance.

TYPICAL APPLICATIONS

SPECIFICATIONS
X-Ray Characteristics:
- Tube Type: Micro focus tube
- Focal Spot: 33μm Nominal, 50μm max. (IEC 336)
- Beam Filter: Ultem 0.060˝ (1.5mm) Oil 0.175˝ (4.4mm)
- Beam Geometry: Symmetrical 40° cone

Input Voltage:
- 20W: 24Vdc ±1V @ 2.5A
- 50W: 24Vdc ±1V @ 4A

X-Ray Tube Voltage:
- Nominal X-Ray tube voltage is adjustable between 35kV to 80kV

X-Ray Tube Current:
- 20W: 0-250μA over specified tube voltage range
- 50W: 0-700μA over specified tube voltage range

X-Ray Tube Power:
- 20/50W maximum continuous

Voltage Regulation:
- Line: ±0.5% for a ±1V change of nominal input line voltage
- Load: ±0.1% for a load change of 25μA to maximum rated current

Voltage Accuracy:
- Voltage measured across the X-Ray tube is within ±1% of the programmed value

Voltage Risetime:
- Ramp time shall be ≤250ms from 10% to 90% of maximum rated output voltage

Voltage Temperature Coefficient:
- ≤100ppm/°C

Temperature Stability:
- ≤.01% per 8 hours after a 1/2 hour warmup

Over Temperature Fault:
- Indicates that the internal oil temperature has exceeded 65° C. The high voltage output will be disabled. Toggling the X-Ray ON Command OFF and ON will reset the fault.

Over Voltage Fault:
- An overvoltage (OV) fault is detected when the output voltage exceeds 82kV. The high voltage output will be disabled. Toggling the X-Ray ON Command OFF and ON will reset the fault.

Voltage Ripple:
- 1% peak to peak

Current Regulation:
- Line: ±0.5% for a ±1V change of nominal input line voltage
- Load: ±0.5% for a voltage change of 35kV to 80kV

Current Accuracy:
- Current measured through the X-Ray tube is within ±2.5% of the programmed value

Over Current Fault:
- An overcurrent (OC) fault is detected when the emission current exceeds 275μA (20W model) and 710μA (50W model). Toggling the X-Ray ON Command OFF and ON will reset the fault.

Arc Intervention:
- One arc fault. The high voltage output will be disabled. Toggling the X-Ray ON command OFF and ON will reset the fault.

Filament Configuration:
- Internal high frequency AC filament drive with closed loop filament emission control

Analog Interface:
- Ground referenced 10kV/V, 25μA/V (20W model) and 70μA/V (50W model) for programming and monitoring analog interface signals. Open collector, active low digital signal interface. Internal jumper is needed to be configured for analog interface.
**ANALOG INTERFACE—**

J1 25 PIN MALE D CONNECTOR

**PIN** | **SIGNAL** | **PARAMETERS**
--- | --- | ---
1 | +24V | +24V dc ± 1V dc @ 4A
2 | +24V | +24V dc ± 1V dc @ 4A
3 | +24V | +24V dc ± 1V dc @ 4A
4 | NC | No Connection
5 | +24V RETURN | +24V Return
6 | +24V RETURN | +24V Return
7 | +24V RETURN | +24V Return
8 | Signal Ground | Signal Ground
9 | Interlock Input | Input, Active low, Interlock is low safe to enable high voltage. Connect to +24V Return
10 | kV Monitor | Output, 0 to 8V = 0 to rated output voltage.
11 | μA Monitor | Output, 0 to 10V = 0 to rated output current.
12 | X-Ray Ready status | Output, Active Low, Open Collector, 24Vdc @ 10mA max
13 | X-Ray ON status | Output, Active Low, Open Collector, 24Vdc @ 10mA max
14 | Filament Standby status | Output, Active Low, Open Collector, 24Vdc @ 10mA max
15 | Over Voltage Fault | Output, Active Low, Open Collector, 24Vdc @ 10mA max
16 | Over Current Fault | Output, Active Low, Open Collector, 24Vdc @ 10mA max
17 | ARC Fault | Output, Active Low, Open Collector, 24Vdc @ 10mA max
18 | Filament Current Limit Fault | Output, Active Low, Open Collector, 24Vdc @ 10mA max
19 | Signal Ground | Signal Ground
20 | Interlock Output | Output, Active Low, Open Collector, 24Vdc @ 10mA max
21 | μA Program | Input, 0 to 10V = 0 to rated output current.
22 | kV Program | Input, 0 to 8V = 0 to rated output voltage.
23 | X-Ray ON Command | Input, Active low Low (short) = X-Ray ON
High (open) = X-Ray OFF
Internal pull up resistor to +15V
24 | Signal Ground | Signal Ground
25 | Over Temperature | Output, Active Low, Open Collector, 24Vdc @ 10mA max

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**Control Software:**
A demo GUI is available for engineering evaluations

**Interlock/Signals:**
A hardware interlock functions in both analog and digital programming modes.

**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-20°C to +70°C

**Humidity:**
10% to 95% relative humidity, non-condensing

**Cooling:**
50W option: Customer provided, external cooling fan, 50cfm, minimum

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**Digital Interface: RS-232:** standard

**Digital Interface Connector:**
RS-232: 9 pin D connector, female
Ethernet: RJ45 connector

**Grounding Point:**
6-32 ground stud provided on chassis

**Dimensions:**
20W: 5.81"W x 5.0"H x 10.81"D
(147.57mm x 127mm x 274.57mm)
50W: 6.00"W x 5.0"H x 10.81"D
(152.4mm x 127mm x 274.57mm)

**Weight:**
20W: 18lbs (8.165kg)
50W: 20lbs (9.072kg)

**Orientation:**
Can be mounted in any orientation.

**X-Ray Leakage:**
Less than 1mR/hr at 1 meter

**Regulatory Approvals:**
Compliant to EMC 60601-1-2, UL/CUL recognized file E242584. CE to EN 61010-1 for Non-Medical Applications.
20W Model

ORDERING INFORMATION

- XRB011-80PN20 80kV, 250uA, 20W, Analog Interface, RS-232
- XRB011-80PN20E 80kV, 250uA, 20W, Analog Interface, RS-232, Ethernet
- XRB011-80PN20A 80kV, 250uA, 20W, Analog Interface
- XRB011-80PN20/CE 80kV, 250uA, 20W, Analog Interface, RS232, CE
- XRB011-80PN20E/CE 80kV, 250uA, 20W, Analog Interface, RS232, Ethernet, CE
- XRB011-80PN20A/CE 80kV, 250uA, 20W, Analog Interface, CE

DIMENSIONS: in.[mm]

XRB011 20W Model

SIDE VIEW

F.S. 40°

4X 0.236 [6.04]

4X 6-32 TAP

7.81 [198.37]

4.91 [124.71]

1.50 [38.1]

2.66 [67.56]

5.31 [134.87]

4.96 [126.74]

0.37 [9.39]

0.79 [20.06]

9.25 [234.95]

10.81 [274.57]

5.01 [127.71]

4.17 [105.91]

2.08 [52.83]

4.37 [110.99]

2.25 [57.15]

4.23 [107.44]

GROUNDING POINT

1.25 [31.75]

XRB011
50W Model
ORDERING INFORMATION

- **XRB011-80PN50**: 80kV, 700μA, 50W, Analog Interface, RS-232
- **XRB011-80PN50E**: 80kV, 700μA, 50W, Analog Interface, RS-232, Ethernet
- **XRB011-80PN50A**: 80kV, 700μA, 50W, Analog Interface
- **XRB011-80PN50/CE**: 80kV, 700μA, 50W, Analog Interface, RS-232, CE
- **XRB011-80PN50E/CE**: 80kV, 700μA, 50W, Analog Interface, RS-232, Ethernet, CE
- **XRB011-80PN50A/CE**: 80kV, 700μA, 50W, Analog Interface, CE
Spellman’s XRB80N100 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 80kV at 100W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this unit into your X-Ray system. The XRB80N100 is available either with fan shaped (standard) or (optional) cone shaped beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**
X-Ray Scanning; Bone Densitometry, Thickness Measurement, Food Inspection, Fill Level Confirmation, Parcel Inspection

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Focal Spot: 0.5mm (IEC 336)
- Beam Filter:
  - Ultem: 3.30mm ±0.15mm
  - Oil: 8mm ±0.1mm
  - Glass: 1.8mm ±0.25mm
  - BE: 0.8mm
- Beam Geometry:
  - Fan: Standard. The beam angular coverage will be 75° with the beam plane perpendicular to the X-Ray tube axis and 13° wide.
  - Cone: Optional. 25° cone beam

**Input Voltage:**
- Power factor corrected input 0.98, 100-240Vac ±10% 50/60Hz, 2A, maximum

**X-Ray Tube Voltage:**
- Nominal X-Ray tube voltage is adjustable up to 80kV

**X-Ray Tube Current:**
- 150uA to 1.25mA over specified tube voltage range

**X-Ray Tube Power:**
- 100W maximum continuous

**Voltage Regulation:**
- Line: ±0.05% of maximum output voltage over a ±10% change of nominal input line voltage
- Load: ±0.1% of maximum rated voltage for 150uA to 1.25mA load change

**Voltage Accuracy:**
- Voltage measured across the X-Ray tube is within ±2% of the programmed value

**Voltage Risetime:**
- Standard: Ramp time shall be 500ms from 10% to 90% of maximum rated output voltage
- Optional: 5 seconds. Specify at time of order

**Voltage Overshoot:**
- 5% of maximum voltage, to return within 2.5% of maximum voltage in less than 100ms

**Voltage Ripple:**
- 1% peak to peak of maximum voltage for frequencies ≤1kHz

**Emission Current Parameters**

**Current Regulation:**
- Line: ±0.05% of rated output current over a ±10% change of nominal input line voltage
- Load: ±0.1% of rated output current for a change from 50% to 100% of rated output voltage

**Current Accuracy:**
- Current measured through the X-Ray tube is within ±2% of the programmed value

**Current Risetime:**
- Standard: Ramp time shall be 500ms from 10% to 90% of maximum rated current
- Optional: 5 seconds. Specify at time of order

**Arc Intervention:**
- 3 arcs in 10 seconds with a 200ms quench = Shutdown

**Filament Configuration:**
- Internal high frequency AC filament drive with closed loop filament emission control

www.spellmanhv.com/manuals/XRB80
Analog Interface:
Ground referenced 0 to 9Vdc for all programming and monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

Digital Interface:
Jumpers are needed to be configured and the digital interface cable installed to enable the RS-232 interface.

Control Software:
A demo GUI is available for engineering evaluations

Interlock/Signals:
A hardware interlock functions in both analog and digital programming modes. The hardware X-Ray Enable signal only functions in analog programming mode.

Operating Temperature:
0°C to +40°C

Storage Temperature:
-40°C to +70°C

Humidity:
10% to 95% relative humidity, non-condensing

Cooling:
Customer provided 150cfm external cooling fan as required to maintain oil temperature below 55°C. (External cooling is not required if fan option is selected)

Input Line Connector:
3 pin, Phoenix Contact 1829167, SHV part number 105725-219. Mating connector Phoenix Contact #1805990, SHV part number 105808-475 provided with unit.

Analog Interface Connector:
15 pin D connector, male

Digital Interface Connector:
9 pin D connector, female

Grounding Point:
8-32 ground stud provided on chassis

Dimensions:
See line drawings

Weight:
32lbs (14.5kg)

Orientation:
Can be mounted in any orientation.

X-Ray Leakage:
Not to be greater than 0.5mR/hr at 5cm outside the external surface

Regulatory Approvals:

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**LED INDICATORS**

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SIGNAL NAME</th>
<th>CONDITION</th>
<th>Illuminated When...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 1</td>
<td>OV</td>
<td>High kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 2</td>
<td>UV</td>
<td>Low kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 3</td>
<td>UC</td>
<td>Low mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 4</td>
<td>OC</td>
<td>High mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 5</td>
<td>ARC FLT</td>
<td>Arc fault occurs</td>
<td></td>
</tr>
<tr>
<td>LED 6</td>
<td>OT</td>
<td>Over temperature occurs</td>
<td></td>
</tr>
<tr>
<td>LED 7</td>
<td>X-RAY ON</td>
<td>X-Rays are enabled</td>
<td></td>
</tr>
<tr>
<td>LED 8</td>
<td>PWR</td>
<td>Power is ON</td>
<td></td>
</tr>
</tbody>
</table>

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**AC LINE POWER CONNECTOR—J1 THREE POSITION PHOENIX CONTACT**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Earth Ground</td>
</tr>
<tr>
<td>2</td>
<td>Line</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

Mating connector provided with unit

---

**RS-232 DIGITAL INTERFACE—J3 9 PIN FEMALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TD</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RD</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

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**XRB ANALOG INTERFACE—J2 15 PIN MALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Supply Fault Output</td>
<td>Open collector, 35V @ 10mA max. high = no fault</td>
</tr>
<tr>
<td>2</td>
<td>mA Program Input</td>
<td>0 to 9.00Vdc = 0 to 100% rated output, Zin =10MΩ</td>
</tr>
<tr>
<td>3</td>
<td>kV Program Input</td>
<td>0 to 9.00Vdc = 0 to 100% rated output, Zin =10MΩ</td>
</tr>
<tr>
<td>4</td>
<td>X-Ray On Lamp Relay Output</td>
<td>Common, dry contacts, 30Vdc @ 1A, max</td>
</tr>
<tr>
<td>5</td>
<td>X-Ray On Lamp Relay Output</td>
<td>Normally open, X-Ray ON = closed</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor Output</td>
<td>0 to 9Vdc = 0 to 100% rated output, Zout =10kΩ</td>
</tr>
<tr>
<td>7</td>
<td>X-Ray On Lamp Relay Output</td>
<td>Normally closed, X-Ray ON = open</td>
</tr>
<tr>
<td>8</td>
<td>kV Monitor Output</td>
<td>0 to 9.00Vdc = 0 to 100% rated output, Zout =10kΩ</td>
</tr>
<tr>
<td>9</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>10</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>11</td>
<td>HV Interlock Return Input</td>
<td>Connect to pin 12 to close HV interlock</td>
</tr>
<tr>
<td>12</td>
<td>HV Interlock Output</td>
<td>+15Vdc @ open, 5mA when connected to pin 11</td>
</tr>
<tr>
<td>13</td>
<td>X-Ray Enable Output</td>
<td>+15Vdc @ open, 5mA when connected to pin 15</td>
</tr>
<tr>
<td>14</td>
<td>X-Ray Status Output</td>
<td>Open collector, 35V @ 10mA max. high = X-Ray OFF</td>
</tr>
<tr>
<td>15</td>
<td>X-Ray Enable Return Input</td>
<td>Connect to pin 13 to enable X-Ray generation</td>
</tr>
</tbody>
</table>
**OPTIONS**

- **RT** 5 second Risetime for both voltage and current
- **CB** Cone Beam
- **FN** Integrated Cooling Fan
- **M** Elapsed Time Meter (measures X-Ray ON elapsed time)

**How to Order:**

**Standard:** PART NO.: XRB80N100

Risetime, Cone Beam, Fan and Elapsed Time Meter Options

PART NO.: XRB80N100/RT/CB/FN/M

**DIMENSIONS:** in.[mm]

**Standard Unit**

**WARNING**

- DO NOT CONNECT AC INPUT POWER TO UNIT WITH COVER REMOVED. DIREGARDING THIS MAY CAUSE FATAL ELECTRICAL SHOCK

**NOTE:** Shown with Elapsed Time Meter option

**FRONT VIEW**

**SIDE VIEW**

**BACK VIEW**

**BOTTOM VIEW**

**SIDE VIEW**

- 7.60 [193]
- 1.92 ±0.06 [48.6±1.5]
- 25° Cone Beam Option
- 13° Fan Beam Option
- 8.95 [227]
- 8.40 [213]
- 4.25 [108] TYP.
- 3.07 ±0.06 [78.0 ±1.5]
- 3.13 [79] TYP.
- 6.25 [159] TYP.
- 281 [7.1] DIA.
- 4 MOUNTING HOLES

**BOTTOM VIEW**

- 10.03 [262]
- 64 [16] TYP.
- 9.13 [232]
- 7.00 [178]
- 7.60 [193]
- 9.13 [232]
DIMENSIONS: in.[mm]

Cooling Fan Option

TOP VIEW

SIDE VIEW

BACK VIEW
Spellman’s XRB80PN100HR (high reliability) Monoblock® X-Ray source is designed for OEM applications powering its internal Bipolar X-Ray tube up to 80kV at 100W. Features like universal input, small package size and a standard RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. The XRB80PN100HR is available either with fan shaped (standard) or (optional) cone shaped beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance. The XRB80PN100HR is designed for long field life.

**TYPICAL APPLICATIONS**
X-Ray Scanning, Thickness Measurement, Food Inspection, Fill Level Confirmation, Parcel Inspection

**SPECIFICATIONS**

**X-Ray Characteristics:**
- **Focal Spot:** 0.8mm (IEC 336) standard
  0.5mm (IEC 336) optional
- **Beam Filter:**
  - Ultem: 3.00mm ±0.15mm
  - Oil: 7.5mm ±0.25mm
  - Glass: 1.7mm ±0.2mm
  - Be: 0.8mm
- **Beam Geometry:**
  - Fan: The standard beam angular coverage will be 80° with the beam plane perpendicular to the X-Ray tube axis and 20° wide (with a 2° tolerance)
  - An optional 80° x 10° (with a 2° tolerance) is also available
  - Cone: Optional. 20° cone beam (with a 2° tolerance)

**Input Voltage:**
Power factor corrected input 0.98, 100-240Vac ±10% 50/60Hz, 2A maximum

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable 40kV (±20kV) to 80kV (±40kV)

**X-Ray Tube Current:**
150μA to 2.00mA over specified tube voltage range (100W max.)

**X-Ray Tube Power:**
100W maximum continuous

**Voltage Regulation:**
- **Line:** ±0.05% of maximum output voltage over a ±10% change of nominal input line voltage
- **Load:** ±0.1% of maximum rated voltage for 150μA to 2.00mA load change

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within ±2% of the programmed value

**Voltage Risetime:**
Standard: Ramp time shall be <500ms from 10% to 90% of maximum rated output voltage

**Voltage Ripple:**
0.5% peak to peak of maximum voltage for frequencies ≤1kHz

**Emission Current Parameters**

**Current Regulation:**
- **Line:** ±0.05% of rated output current over a ±10% change of nominal input line voltage
- **Load:** ±0.1% of rated output current for a change from 50% to 100% of rated output voltage

**Current Accuracy:**
Current measured through the X-Ray tube is within ±2% of the programmed value

**Current Risetime:**
Standard: Ramp time shall be <500ms from 10% to 90% of maximum rated current

**Arc Intervention:**
4 arcs in 10 seconds with a 100ms quench/100ms re-ramp = Shutdown

**Filament Configuration:**
Internal AC filament drive with closed loop filament emission control
Analog Monitoring Interface:
Ground referenced 0 to 9Vdc for all monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

Digital Programming and Monitoring Interface:
The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature. Tolerance 3%, (with an additional 5μA offset at ±10% mA programming).

Control Software:
A demo GUI is available for engineering evaluations

Operating Temperature:
0°C to +40°C

Storage Temperature:
-40°C to +70°C

Humidity:
10% to 95% relative humidity, non-condensing

Cooling:
X-Ray Tank: Customer provided 250 cfm external cooling fan as required to maintain oil temperature below 55°C.
Controller: Forced air via internal fan.

Input Line Connector:
3-pin Phoenix Contact 1829167. Mating connector provided with unit

Analog Interface Connector:
15 pin male D connector provided with unit

Digital Interface Connector:
9 pin female D connector provided with unit

Grounding Point:
8-32 ground stud provided on chassis

Dimensions:
X-Ray Tank: 11.3" L x 9.625" W x 4.93" H
(287.02mm x 244.4mm x 125.2mm)
Controller: 8.5" L x 6.70" W x 2.21" H
(215.9mm x 170.2mm x 56.1mm)

Weight:
X-Ray Tank: 36lbs (16.32kg)
Controller: 3.7lbs (1.68kg)

Orientation:
Can be mounted in any orientation.

X-Ray Leakage:
Not to be greater than 0.5mR/hr at 5cm outside the external surface.

Regulatory Approvals:
Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530
How to Order:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard:</td>
<td>XRB80PN100HR</td>
</tr>
<tr>
<td>Cone Beam Option</td>
<td>XRB80PN100HR/CB</td>
</tr>
<tr>
<td>0.5mm Focal Spot Option</td>
<td>XRB80PN100HR/.5mm</td>
</tr>
<tr>
<td>80° X 10° Narrow Fan Beam Option</td>
<td>XRB80PN100HR/NF</td>
</tr>
<tr>
<td>Cable Option:</td>
<td>XRB80PN100HR/RA</td>
</tr>
</tbody>
</table>

DIMENSIONS: in.[mm]

**Control Unit**

**Top View**

**Side View**

**Bottom View**

**Options**

- **CB** Cone Beam
- **.5mm** .5mm focal spot X-Ray tube
- **NF** 80° x 10° Narrow Fan beam
- **RA** Right Angle cable

**WARNING**

- Refer service to qualified personnel.
- Internal parts may present a risk of electrical shock during servicing.

**How to Order:**

- Standard: PART NO.: XRB80PN100HR
- Cone Beam Option PART NO.: XRB80PN100HR/CB
- 0.5mm Focal Spot Option PART NO.: XRB80PN100HR/.5mm
- 80° X 10° Narrow Fan Beam Option PART NO.: XRB80PN100HR/NF
- Cable Option PART NO.: XRB80PN100HR/RA

**XRB80PN100HR**

**80KV @ 100W MONOBLOCK®**

**Spellman High Voltage Electronics Corporation**

How to Order:

- Standard: PART NO.: XRB80PN100HR
- Cone Beam Option PART NO.: XRB80PN100HR/CB
- 0.5mm Focal Spot Option PART NO.: XRB80PN100HR/.5mm
- 80° X 10° Narrow Fan Beam Option PART NO.: XRB80PN100HR/NF
- Cable Option PART NO.: XRB80PN100HR/RA

**OPTIONS**

- **CB** Cone Beam
- **.5mm** .5mm focal spot X-Ray tube
- **NF** 80° x 10° Narrow Fan beam
- **RA** Right Angle cable

**DIMENSIONS: in.[mm]**

**CONTROL UNIT**

**TOP VIEW**

**SIDE VIEW**

**BOTTOM VIEW**

**WARNING**

- Do not connect AC input power to unit with cover removed. Disregarding this may cause fatal electrical shock.

**J1**

**AC INPUT**

- 2.56 [65]* Right Angle Cable (RA) Option
- Standard cable
- *Total height of RA connector from tank surface 2.84 [72]
Spellman’s XRB100N100 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 100kV at 100W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

Typical Applications
X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

Specifications
X-Ray Characteristics:
- Tube Type: Stationary anode, tungsten target
- Focal Spot: 0.5mm (IEC 336)
- Beam Filter:
  - Lexan: 3.2mm
  - Oil: 10mm ±0.1mm
  - Glass: 1.8mm max
- Beam Geometry: Symmetrical fan
  - 74° x 10° ±1°
- Input Voltage: Power factor corrected input 0.98, 100-240Vac ±10% 50/60Hz, 2A, maximum

X-Ray Tube Voltage:
- Nominal X-Ray tube voltage is adjustable between 40kV to 100kV

X-Ray Tube Current:
- 100µA to 1mA over specified tube voltage range

X-Ray Tube Power:
- 100W maximum continuous

Voltage Regulation:
- Line: ±0.1% of maximum output voltage over a ±10% change of nominal input line voltage
- Load: ±0.1% of maximum rated voltage for 100µA to 1mA load change

Emission Current Parameters
Current Regulation:
- Line: ±0.5% of rated output current over a ±10% change of nominal input line voltage
- Load: ±0.5% of rated output current for a change from 50% to 100% of rated output voltage

Current Accuracy:
- Current measured through the X-Ray tube is within ±1% of the programmed value

Current Risetime:
- Ramp time shall be 1 second from 10% to 90% of maximum rated current

Arc Intervention:
- 3 arcs in 10 seconds with a 200ms quench = Shutdown

Filament Configuration:
- Internal high frequency AC filament drive with closed loop filament emission control
Analog Interface:
Ground referenced 0 to 9Vdc for all programming and monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

Digital Interface:
Jumpers are needed to be configured and the digital interface cable installed to enable the RS-232 interface.

Control Software:
A demo GUI is available for engineering evaluations.

Interlock/Signals:
A hardware interlock functions in both analog and digital programming modes. The hardware X-Ray Enable signal only functions in analog programming mode.

Operating Temperature:
0°C to +40°C

Storage Temperature:
-40°C to +70°C

Humidity:
10% to 95% relative humidity, non-condensing

Cooling:
Forced air and natural convection augmented by customer provided external cooling fan to maintain oil temperature below 55°C.

Input Line Connector:
3 pin, Phoenix Contact 1829167, SHV part number 105725-219. Mating connector Phoenix Contact #1805990, SHV part number 105808-475 provided with unit.

Analog Interface Connector:
15 pin D connector, male

Digital Interface Connector:
9 pin D connector, female

Grounding Point:
8-32 ground stud provided on chassis

Dimensions:
See page 3 of 3

Weight:
55lbs (25kg)

Orientation:
Can be mounted in any orientation.

X-Ray Leakage:
Not to be greater than 0.5mR/hr at 5cm outside the external surface.
Spellman’s XRBHR (high reliability) Series of Monoblock® X-Ray sources are designed for OEM applications powering their internal Bipolar X-Ray tube at 80kV and 100kV at power levels of 100W, 210W, 350W and 500W. Features such as universal input, compact package size and a standard RS-232 digital interface simplify integration of any XRBHR model into your X-Ray system. Each XRBHR model is available with fan shaped (standard) or cone shaped (optional) beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance. The XRBHR Series is designed for long field life and available with a warranty of up to 3 years.

**TYPICAL APPLICATIONS**

**OPTIONS**
- CB: Cone Beam
- .5mm: 0.5mm focal spot X-Ray tube
- RA: Controller to tank right angle connector
- TE: Controller to tank top exit cable

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Focal Spot: 0.8mm (IEC 336) standard
- 0.5mm (IEC 336) optional
- Beam Filter:
  - Ultem: 1.50mm ±0.15mm
  - Oil: 9.0mm ±0.25mm
  - Glass: 1.7mm ±0.2mm
  - Be: 0.8mm
- Beam Geometry:
  - Fan: Standard. The beam angular coverage will be 90° with the beam plane perpendicular to the X-Ray tube axis and 12° wide (with a 2° tolerance)
  - Cone: Optional. 40° cone beam (with a 2° tolerance)

**Input Voltage:**
100-240 Vac, ±10%, 50/60 Hertz, 98 power factor

**Input Current:**
- 100W @ 1.4A
- 210W @ 2.8A
- 350W @ 4.6A
- 500W @ 6.6A

**X-Ray Tube Voltage:**
See table

**X-Ray Tube Current:**
See table

**X-Ray Tube Power:**
See table

**Voltage Regulation:**
- Line: ±0.05% of maximum output voltage over a ±10% change of nominal input line voltage
- Load: ±0.1% of maximum rated voltage for 150μA to full rated load change

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within ±2% of the programmed value

**Voltage Risetime:**
Standard ramp time shall be <500ms from 10% to 90% of maximum rated output voltage

**Voltage Ripple:**
0.5% peak to peak of maximum voltage for frequencies ≤1kHz

**Emission Current Parameters**

**Current Regulation:**
- Line: ±0.05% of rated output current over a ±10% change of nominal input line voltage
- Load: ±0.1% of rated output current for a change from 50% to 100% of rated output voltage

**Current Accuracy:**
Current measured through the X-Ray tube is within ±2% of the programmed value

**Current Risetime:**
Standard ramp time shall be <500ms from 10% to 90% of maximum rated current

**Arc Intervention:**
4 arcs in 10 seconds with a 100ms quench/100ms re-ramp = Shutdown

**Filament Configuration:**
Internal floating AC filament drive with closed loop filament emission control circuitry

**Analog Interface:**
Ground referenced 0 to 9Vdc for all monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pin out table.

**Digital Interface:**
The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature.
**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-40°C to +70°C

**Humidity:**
10% to 95% relative humidity, non-condensing

**Cooling:**
- **X-Ray Tank:**
  - 100W: Convection/customer supplied forced air so tank is <55˚C
  - 210W: Externally powered forced air cooling, 24Vdc @ 2A
  - 350W: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A
  - 500W: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A

Controller: Forced air via internal fan.

**Grounding Point:**
M5 ground female thread on tank
M5 ground stud on control chassis provided

**Dimensions:**
- **X-Ray Tank:** see drawings
- **100W/210W Controller:** see drawings
- **350W/500W Controller:** see drawings

**Weight:**
- **X-Ray Tank:**
  - 100W @ 75 lbs. (34kg)
  - 210W @ 75lbs. (34kg)
  - 350W @ 81.5lbs. (37kg)
  - 500W @ 81.5lbs. (37kgs)

Controller:
- 100W/210W: 4 pounds (1.18kg)
- 350W/500W: 7 pounds (3.18kg)

**Orientation:**
Can be mounted in any orientation.

**X-Ray Leakage:**
Not to be greater than 0.5mR/hr at 5cm outside the external surface.

**Regulatory Approvals:**
Designed to meet UL/EN61010-1
Designed to meet EN61326-1
(may require an external line filter)
### Power and Interface Connections for 100W and 210W Units

#### AC Input—6 PIN MOLEX

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC Input (high)</td>
<td>100-240Vac (high)</td>
</tr>
<tr>
<td>2</td>
<td>Pin Removed</td>
<td>N/C</td>
</tr>
<tr>
<td>3</td>
<td>AC Input (neutral)</td>
<td>100-240Vac (neutral)</td>
</tr>
<tr>
<td>4</td>
<td>Pin Removed</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>N/C</td>
</tr>
</tbody>
</table>

#### Analog Interface—7 PIN MOLEX

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray Interlock Enable</td>
<td>Apply +24Vdc to enable interlock. Open/Removal of +24Vdc will cause X-Ray generation to stop.</td>
</tr>
<tr>
<td>2</td>
<td>X-Ray Interlock Enable Return</td>
<td>Ground reference for X-Ray Interlock</td>
</tr>
<tr>
<td>3</td>
<td>Pin removed</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>kV Monitor</td>
<td>0-10Vdc = 0-100% rated output voltage. Zout = 10kΩ</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor</td>
<td>0-10Vdc = 0-100% rated output current. Zout = 10kΩ</td>
</tr>
<tr>
<td>7</td>
<td>X-Ray On</td>
<td>Open collector, High (Open) = No Fault, 35Vdc @ 10mA maximum</td>
</tr>
</tbody>
</table>

#### RS-232 Digital Interface—9 PIN MALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>2</td>
<td>Transmitted Data</td>
<td>Conforms to EIA RS-232-C</td>
</tr>
<tr>
<td>3</td>
<td>Received Data</td>
<td>Conforms to EIA RS-232-C</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>N/C</td>
</tr>
</tbody>
</table>

#### Ethernet Digital Interface—RJ45 8 PIN FEMALE CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX +</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX -</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX +</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>RX -</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

#### HV Lamp On Relay—3 PIN MOLEX

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normally Closed dry contact</td>
<td>50V max. Rated for 1 amp or less, 50mA nominal load</td>
</tr>
<tr>
<td>2</td>
<td>Common</td>
<td>50V max. Rated for 1 amp or less, 50mA nominal load</td>
</tr>
<tr>
<td>3</td>
<td>Normally Open dry contact</td>
<td>50V max. Rated for 1 amp or less, 50mA nominal load</td>
</tr>
</tbody>
</table>

### Power and Interface Connections for 350W and 500W Units

#### AC Input—3 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC Input (high)</td>
<td>100-240Vac (high)</td>
</tr>
<tr>
<td>2</td>
<td>Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>AC Input (neutral)</td>
<td>100-240Vac (neutral)</td>
</tr>
</tbody>
</table>

#### DC Input for Heat Dissipation Unit—4 PIN AMP (210/350/500W)

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>24Vdc</td>
<td>24Vdc @ 5 amps</td>
</tr>
<tr>
<td>2</td>
<td>24Vdc Return</td>
<td>24Vdc Return</td>
</tr>
<tr>
<td>3</td>
<td>24Vdc</td>
<td>24Vdc @ 5 amps</td>
</tr>
<tr>
<td>4</td>
<td>24Vdc Return</td>
<td>24Vdc Return</td>
</tr>
</tbody>
</table>

#### Analog Interface—10 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray Interlock Enable</td>
<td>Apply +24Vdc to enable interlock. Open/removal of +24Vdc will cause X-Ray generation to stop.</td>
</tr>
<tr>
<td>3</td>
<td>Pin removed</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>kV Monitor</td>
<td>0-10Vdc = 0-100% rated output voltage. Zout = 10kΩ</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor</td>
<td>0-10Vdc = 0-100% rated output current. Zout = 10kΩ</td>
</tr>
<tr>
<td>7</td>
<td>Fault Signal</td>
<td>Open collector, High (Open) = No Fault, 35Vdc @ 10mA maximum</td>
</tr>
<tr>
<td>8</td>
<td>HV On Lamp Relay N/O</td>
<td>N/C dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load</td>
</tr>
<tr>
<td>9</td>
<td>HV On Lamp Relay C</td>
<td>Common dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load</td>
</tr>
<tr>
<td>10</td>
<td>HV On Lamp Relay N/C</td>
<td>N/C dry contacts. 50 volts maximum. Rated for 1 amp or less, 50mA nominal load</td>
</tr>
</tbody>
</table>

#### RS-232 Digital Interface—9 PIN MALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>2</td>
<td>Transmitted Data</td>
<td>Conforms to EIA RS-232-C</td>
</tr>
<tr>
<td>3</td>
<td>Received Data</td>
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<td>4</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>8</td>
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<td>N/C</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>N/C</td>
</tr>
</tbody>
</table>

#### Ethernet Digital Interface—RJ45 8 PIN FEMALE CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
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<tbody>
<tr>
<td>1</td>
<td>TX +</td>
<td>Transmit Data +</td>
</tr>
<tr>
<td>2</td>
<td>TX -</td>
<td>Transmit Data -</td>
</tr>
<tr>
<td>3</td>
<td>RX +</td>
<td>Receive Data +</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>6</td>
<td>RX -</td>
<td>Receive Data -</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

#### Ethernet Digital Interface—RJ45 8 PIN FEMALE CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
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</tr>
<tr>
<td>3</td>
<td>RX +</td>
<td>Receive Data +</td>
</tr>
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</tr>
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</tr>
<tr>
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<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
DIMENSIONS: in.[mm]

350/500W CONTROL UNIT

FRONT VIEW

RA Right Angle Connector Option

TE Top Exit Cable Option

M5 GROUND STUD

350/500W CONTROL UNIT

BOTTOM VIEW

AIR FLOW

M5 x 10mm Dp 4PL

SIDE VIEW

SIDE VIEW

M5 x 10mm Dp 4PL

M5 GROUND STUD

80-100KV/100-500W MONOBLOCK®
DIMENSIONS: in.[mm]

**350/500W TANK**

**TOP VIEW**

**SIDE VIEW**

**BACK VIEW**

**FRONT VIEW**

AIR FLOW

12°
Spellman’s XRB160PN192 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 192W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**

X-Ray Scanning: Plating Measurement, Food Inspection, Fill Level Confirmation and Security Applications

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 0.8mm x 0.8mm
- Beam Filter: 0.016” thick 6061 Al
- Beam Geometry: Asymmetrical fan 80° x 10° ±2°

**Input Voltage:**
- 100-240Vac ±10%, 50/60Hz, 5A maximum

**X-Ray Tube Voltage:**
- Nominal X-Ray tube voltage is adjustable between 80kV to 160kV
- 0.1mA to 1.2mA, 192W maximum over specified tube voltage range

**X-Ray Tube Power:**
- 192W maximum continuous

**Voltage Regulation:**
- Line: ±0.1% for a ±10% input line change of nominal input line voltage
- Load: ±0.1% for a 0.1mA to 1.2mA load change

**Voltage Accuracy:**
- Voltage measured across the X-Ray tube is within ±2% of the programmed value

**Voltage Risetime:**
- Ramp time shall be <200ms from 10% to 90% of rated output

**Voltage Overshoot:**
- Within 5% of rated voltage in <10ms

**Voltage Ripple:**
- 1% pp of rated voltage @ ≤1kHz

**Current Regulation:**
- Line: ±0.1% for a ±10% input line change of nominal input line voltage
- Load: 0.5% @ 80-160kV, 0.1mA to 1.2mA

**Current Accuracy:**
- Current measured through the X-Ray tube is within ±2% of the programmed value

**Current Risetime:**
- <200ms from 10% to 90% of rated output

**Arc Intervention:**
- 4 arcs in 10 seconds with a 200ms quench = Shutdown

**Filament Configuration:**
- Internal high frequency AC filament drive with closed loop filament emission control

**Analog Interface:**
- 0 to 10Vdc ground referenced signals

**Digital Interface:**
- RS-232 interface.

**Control Software:**
- A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock Signals:**
- A hardware interlock function is provided

**Operating Temperature:**
- 0°C to +40°C

**Storage Temperature:**
- -40°C to +70°C

**Humidity:**
- 10% to 95% relative humidity, non-condensing

**Cooling:**
- Natural convection augmented by customer provided 250cfm cooling fans for 200W operation
Input Line Connector:
6 pin Molex 26-60-4060

Analog Interface Connector:
7 pin Molex 26-60-5070

Digital Interface Connector:
9 pin D connector, female

Grounding Point:
8-32 ground stud provided on chassis

Dimensions:
18” x 13.5” x 7.63” (458mm x 343mm x 193.80mm)

Weight:
90lbs (40.5kg)

Orientation:
Can be mounted in any orientation.

X-Ray Leakage:
Not to be greater than 0.5mR/hr at 5cm outside the external surface

Regulatory Approvals:

### AC INPUT POWER

**J1 6 PIN CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>Removed</td>
<td>NC</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>4</td>
<td>Removed</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>Spare</td>
<td>NC</td>
</tr>
<tr>
<td>6</td>
<td>Spare</td>
<td>NC</td>
</tr>
</tbody>
</table>

### RS-232 DIGITAL INTERFACE—

**JB16 9 PIN FEMALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TD</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RD</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

### ANALOG INTERFACE—

**J7 7 PIN MOLEX CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ex Gate</td>
<td>Low = X-Ray OFF, +12Vdc = X-Ray ON</td>
</tr>
<tr>
<td>2</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>4</td>
<td>kV Monitor</td>
<td>0-9 Vdc = 0 to 100% rated output</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor</td>
<td>0 to 9Vdc = 0 to 100% rated output</td>
</tr>
<tr>
<td>7</td>
<td>Fault</td>
<td>Open collector, 35V @ 10mA max, High = No Fault</td>
</tr>
</tbody>
</table>

### LED INDICATORS

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SIGNAL NAME</th>
<th>CONDITION</th>
<th>ILLUMINATED WHEN...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 1</td>
<td>OV</td>
<td>High kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 2</td>
<td>UV</td>
<td>Low kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 3</td>
<td>UC</td>
<td>Low mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 4</td>
<td>QC</td>
<td>High mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 5</td>
<td>ARC FLT</td>
<td>Arc fault occurs</td>
<td></td>
</tr>
<tr>
<td>LED 6</td>
<td>OT</td>
<td>Over temperature occurs</td>
<td></td>
</tr>
<tr>
<td>LED 7</td>
<td>X-RAY ON</td>
<td>X-Rays are enabled</td>
<td></td>
</tr>
<tr>
<td>LED 8</td>
<td>PWR</td>
<td>Power is ON</td>
<td></td>
</tr>
</tbody>
</table>
Spellman’s XRB80PN320 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 80kV at 320W. Features like small package size and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**
X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 0.8mm x 0.8mm (IEC 336)
- Beam Filter: 5052 Al, 0.040” (±0.01”)
- Beam Geometry: Asymmetrical fan 80° x 10° ±2°

**Input Voltage:**
200-240Vac ±10%, 50/60Hz, 6.5A max

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable between 40kV to 80kV

**X-Ray Tube Current:**
0.5mA to 4mA over specified tube voltage range

**X-Ray Tube Power:**
320W maximum continuous

**Voltage Regulation:**
- Line: ±0.05% for a ±10% input line change
- Load: ±0.05% for a 0.5mA to 4mA load change

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within ±2% of the programmed value

- Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics
- Compact & Lightweight
- Can be Mounted in Any Physical Orientation
- Standard RS-232 Digital Interface

**Voltage Risetime:**
Ramp time shall be <500ms from 10% to 90% of rated output

**Voltage Overshoot:**
Within 5% of rated voltage in <10ms

**Voltage Ripple:**
≤1% p-p of rated voltage @ 1kHz

**Current Regulation:**
- Line: ±0.5% @ 50-100% V nominal over specified Line range
- Load: ±0.5% @ 50-100% V nominal over specified Load range

**Current Accuracy:**
Current measured through the X-Ray tube is within ±2% of the programmed value

**Current Risetime:**
<500ms from 10% to 90% of rated output

**Arc Intervention:**
4 arcs in 10 seconds = shutdown

**Filament Configuration:**
Internal high frequency AC filament drive with closed loop filament emission control

**Analog Interface:**
0 to 10Vdc ground referenced monitoring signals

**Digital Interface:**
RS-232

**Control Software:**
A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock Signals:**
A hardware interlock functions in digital programming modes.

**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-40°C to +70°C

**Humidity:**
10% to 90% relative humidity, non-condensing

**Cooling:**
Heat exchanger w/fan and oil pump
Input Line Connector:  
Terminal block, Schurter, Inc. part no. 6100-33

Digital Interface Connector:  
9 pin D, female

Analog Monitoring Connector:  
10 pin Phoenix Contact 1755503

Grounding Point:  
8-32 ground stud provided on chassis

Dimensions:  
See line drawing

Weight:  
120lbs (54.4kg) maximum

Orientation:  
Can be mounted in any orientation.

X-Ray Leakage:  
Not to be greater than 0.5mR/hr at 5cm outside the external surface

Regulatory Approvals:  
Designed to be compliant to EEC EMC Directive and EEC Low Voltage Directive with an external filter.

### AC INPUT POWER TERMINAL BLOCK

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>3</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>4</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>5</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>6</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

### RS-232 DIGITAL INTERFACE  
JB16 9 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX</td>
<td>RS-232 Transmit</td>
</tr>
<tr>
<td>3</td>
<td>RX</td>
<td>RS-232 Receive</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

### ANALOG MONITORING—  
JB11 10 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
</table>
| 1   | X-Ray Enable | +24Vdc = Enable X-Ray  
                    0Vdc/0 = Disable X-Rays |
| 2   | RTN    | Signal Return |
| 3   | N/C    | No Connection |
| 4   | kV Monitor | 0 to 10Vdc = 0 to 100kV, Zout = 10kΩ |
| 5   | SGND   | Signal Return |
| 6   | mA Monitor | 0 to 10Vdc = 0 to 5mA, Zout = 10kΩ |
| 7   | Fault  | Open Collector, High (Open) = No Fault, 35Vdc @10mA max. |
| 8   | HV On Lamp, Relay N/O | Relay Normally Open, 50Vdc @ 1A maximum |
| 9   | HV On Lamp, Relay Common | Relay Common, 50Vdc @ 1A maximum |
| 10  | HV On Lamp, Relay N/C | Relay Normally Closed, 50Vdc @ 1A maximum |
Spellman’s XRB200PN400 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 200kV at 400W. Features like universal input, small package size, standard analog monitoring and RS-232 digital interface simplify integrating this unit into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**
X-Ray Scanning: Food Inspection, Fill Level Confirmation, Security Applications

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 0.8mm x 0.5mm (IEC336)
- Beam Filter: Glass 1.8mm, Oil 10mm, Al 1mm
- Beam Geometry: Symmetrical fan 85° x 10° ±1°

**Input Voltage:**
100Vac-240Vac ±10%, 50/60Hz, 6A maximum

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable between 100kV to 200kV

**X-Ray Tube Current:**
0.5mA to 2mA over specified tube voltage range

**X-Ray Tube Power:**
400W maximum continuous (350W average without external forced air)

**Voltage Regulation:**
- Line: ±0.1% for a ±10% input line change
- Load: ±0.1% for a 0.5mA to 2mA load change

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within ±1% of the programmed value

**Voltage Risetime:**
<1 second from 10% to 90% of rated output

**Voltage Overshoot:**
5% in less than 100ms

**Voltage Ripple:**
≤0.2% pp of rated maximum voltage

**Current Regulation:**
- Line: ±0.1% @ 100-200kV, 0.25mA to 2mA
- Load: ±0.5% @ 100-200kV, 0.25mA to 2mA

**Current Accuracy:**
Current measured through the X-Ray tube is within ±1% of the programmed value

**Current Risetime:**
<1 second from 10% to 90% of rated output

**Arc Intervention:**
4 arcs in 10 seconds = shutdown

**Filament Configuration:**
Internal high frequency AC filament drive with closed loop filament emission control

**Digital Interface:**
RS-232 interface.

**Control Software:**
A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock Signals:**
A hardware interlock function is provided

**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-40°C to +70°C

**Humidity:**
5% to 95% relative humidity, non-condensing

**Cooling:**
Heat exchanger w/fan and oil pump, powered from 24Vdc, 2A power supply (customer provided). External forced air cooling if needed to keep oil temperature below 55°C

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Input Line Connector:
3 pin Phoenix Contact 1829167

Analog Interface Connector:
10 pin Phoenix Contact 1755503

Digital Interface Connector:
9 pin D connector, female

Grounding Point:
M5 ground stud provided on chassis

Dimensions:
See drawing

Weight:
148.0lbs (67.0kg)

Orientation:
Can be mounted in any orientation.

X-Ray Leakage:
Not to be greater than 5uSv/hr at 5cm outside the external surface

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24</td>
<td>+24Vdc</td>
</tr>
<tr>
<td>2</td>
<td>RTN</td>
<td>Return</td>
</tr>
<tr>
<td>3</td>
<td>+24</td>
<td>+24Vdc</td>
</tr>
<tr>
<td>4</td>
<td>RTN</td>
<td>Return</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray</td>
<td>+24Vdc = enable X-Ray</td>
</tr>
<tr>
<td>2</td>
<td>X-Ray Return</td>
<td>X-Ray Return</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>KV Monitor Output</td>
<td>0 to 9Vdc = 0 to 100% Rated Voltage</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor Output</td>
<td>0 to 9Vdc = 0 to 100% Rated Current</td>
</tr>
<tr>
<td>7</td>
<td>Fault</td>
<td>Open Collector, Open = No Fault</td>
</tr>
<tr>
<td>8</td>
<td>Relay N/O</td>
<td>HV On, 50V @ 1A maximum</td>
</tr>
<tr>
<td>9</td>
<td>Relay Common</td>
<td>HV On, 50V @ 1A maximum</td>
</tr>
<tr>
<td>10</td>
<td>Relay N/C</td>
<td>HV On, 50V @ 1A maximum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>Transmit Data</td>
<td>Conforms to E/A RS-232-C</td>
</tr>
<tr>
<td>3</td>
<td>Receive Data</td>
<td>Conforms to E/A RS-232-C</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
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<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
Spellman’s XRB160PN480/1 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 480W. Features like power factor correction, small package size, standard analog monitoring and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**
X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 0.8mm x 0.8mm (IEC336)
- Beam Filter: Curved 1mm Al
- Beam Geometry: Asymmetrical fan 80° x 10° ±2°

**Input Voltage:**
220Vac, ±10%, 50/60Hz, 6.5A max

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

**X-Ray Tube Current:**
0.25mA to 3mA over specified tube voltage range

**X-Ray Tube Power:**
480W maximum continuous

**Voltage Regulation:**
- Line: ±0.1% for a ±10% input line change of nominal input line voltage
- Load: ±0.1% for a 0.25mA to 3mA load change

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within ±2% plus 1.785kV of the programmed value

**Voltage Risetime:**
Ramp time shall be ≤2 seconds from 10% to 90% of rated output

**Voltage Overshoot:**
±1% switching between 90kV to 160kV @ 0.25mA

**Voltage Ripple:**
≤0.1% of rated voltage from 10Hz to 1kHz

**Current Regulation:**
- Line: ±0.5% @ 80-160kV, 0.25mA to 3mA
- Load: ±0.5%, 0.25mA to 3mA

**Current Accuracy:**
Current measured through the X-Ray tube is within 2% of the programmed value

**Current Risetime:**
≤2 seconds from 10% to 90% of rated output

**Arc Intervention:**
4 arcs in 10 seconds = shutdown

**Filament Configuration:**
Internal high frequency AC filament drive with closed loop filament emission control

**Analog Interface:**
0 to 10Vdc ground referenced signals

**Digital Interface:**
RS-232 interface

**Control Software:**
A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock Signals:**
A hardware interlock function is provided

**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-20°C to +70°C

**Humidity:**
5% to 95% relative humidity, non-condensing
Cooling:
Heat exchanger w/fan and oil pump, powered from AC

Input Line Connector:
6 position terminal block

Analog Interface Connector:
7 pin Molex 26-60-5070

Digital Interface Connector:
9 pin D connector, female

Grounding Point:
8-32 ground stud provided on chassis

Dimensions:
20” x 22.5” x 10.75” (508mm x 572mm x 273mm)

Weight:
125lbs (56.7kg)

Orientation:
Can be mounted in any orientation.

X-Ray Leakage:
Not to be greater than 0.5mR/hr at 5cm outside the external surface

---

### AC INPUT POWER
#### J1 6 POSITION TERMINAL BLOCK

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>Removed</td>
<td>N/C</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>4</td>
<td>Removed</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>6</td>
<td>Spare</td>
<td>N/C</td>
</tr>
</tbody>
</table>

---

### ANALOG INTERFACE CONNECTOR—7 PIN MOLEX, 0.156 CENTER

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray</td>
<td>+12Vdc @16mA = enable X-Ray</td>
</tr>
<tr>
<td>2</td>
<td>X-Ray Return</td>
<td>X-Ray Return</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>kV Monitor Output</td>
<td>0 to 1.6Vdc = 0 to 160kV</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor Output</td>
<td>0 to 3Vdc = 0 to 3mA</td>
</tr>
<tr>
<td>7</td>
<td>Fault</td>
<td>Open Collector, Open = No Fault</td>
</tr>
</tbody>
</table>

---

### RS-232 DIGITAL INTERFACE—9 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>X-Ray Enable</td>
<td>+12Vdc @ 16mA = Enable</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
DIMENSIONS: in.[mm]

TOP VIEW

SIDE VIEW
Spellman’s XRB160PN480/2 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 480W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**
X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 0.8mm x 0.8mm (IEC336)
- Beam Filter: 1mm curved window
- Beam Geometry: Asymmetrical fan 80° x 10° ±2°

**Input Voltage:**
100-240Vac ±10%, 50/60Hz, 6.5A max; 12Vdc @ 5A

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

**X-Ray Tube Current:**
0.25mA to 3mA over specified tube voltage range

**X-Ray Tube Power:**
480W maximum

**Voltage Regulation:**
- Line: ±0.1% for a ±10% input line change of nominal input line voltage
- Load: ±0.1% for a 0.3mA to 3mA load change

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within ±1% of the programmed value

**Voltage Risetime:**
Ramp time shall be <1 second from 10% to 90% of rated output

**Voltage Overshoot:**
Within 5% of rated voltage in <10ms

**Voltage Ripple:**
0.1% pp of rated voltage @ ≤1kHz

**Current Regulation:**
- Line: ±0.1% for a ±10% input line change of nominal input line voltage
- Load: ±0.5% @ 80-160kV, 0.3mA to 3mA

**Current Accuracy:**
Current measured through the X-Ray tube is within ±1% of the programmed value

**Current Risetime:**
<1 second from 10% to 90% of rated output

**Arc Intervention:**
4 arcs in 10 seconds with a 200ms quench = Shutdown

**Filament Configuration:**
Internal high frequency AC filament drive with closed loop filament emission control

**Analog Interface:**
0 to 10Vdc ground referenced signals

**Digital Interface:**
RS-232 interface.

**Control Software:**
A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock Signals:**
A hardware interlock functions in both analog and digital programming modes.

**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-40°C to +70°C

**Humidity:**
95% relative humidity, non-condensing

**Cooling:**
Heat exchanger w/fan and oil pump, powered from DC input
Input Line Connector:
3 pin, Phoenix Contact 1829167

Analog Interface Connector:
10 pin, Phoenix Contact 1755503

Digital Interface Connector:
9 pin D connector, female

Heat Exchanger Power Connector:
4 pin AMP part no. 206061-1

Grounding Point:
8-32 ground stud provided on chassis

Dimensions:
See outline drawing

Weight:
125lbs (56.7kg)

Orientation:
Can be mounted in any orientation.

X-Ray Leakage:
Not to be greater than 0.5mR/hr at 5cm outside the external surface

---

**AC INPUT POWER**

**3 PIN PHOENIX CONTACT**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

**DC POWER FOR HEAT DISSIPATION UNIT**

**4 PIN AMP 206061-1 CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+12</td>
<td>+12Vdc</td>
</tr>
<tr>
<td>2</td>
<td>RTN</td>
<td>Return</td>
</tr>
<tr>
<td>3</td>
<td>+12</td>
<td>+12Vdc</td>
</tr>
<tr>
<td>4</td>
<td>RTN</td>
<td>Return</td>
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</table>

**ANALOG INTERFACE—**

**JB15 10 PIN PHOENIX CONTACT**

<table>
<thead>
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<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray Signal</td>
<td>+24Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=2.2kΩ</td>
</tr>
<tr>
<td>2</td>
<td>X-Ray Signal Return</td>
<td>Signal Return</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>kV Monitor</td>
<td>0-10Vdc = 0 to 178kV, Zout = 10kΩ</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor</td>
<td>0-10Vdc = 0 to 3.4mA, Zout = 10kΩ</td>
</tr>
<tr>
<td>7</td>
<td>Fault Signal</td>
<td>Open collector, High (Open) = No Fault, 35Vdc @10mA maximum</td>
</tr>
<tr>
<td>8</td>
<td>HV ON Lamp Relay n/c</td>
<td>Relay Normally Open, 50Vdc @ 1A maximum</td>
</tr>
<tr>
<td>9</td>
<td>HV ON Lamp Relay common</td>
<td>Relay Common, 50Vdc @ 1A maximum</td>
</tr>
<tr>
<td>10</td>
<td>HV ON Lamp Relay n/c</td>
<td>Relay Normally Closed, 50Vdc @ 1A maximum</td>
</tr>
</tbody>
</table>

**LED INDICATORS**

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SIGNAL NAME</th>
<th>CONDITION</th>
<th>Illuminated When...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 1</td>
<td>OT</td>
<td>Over temperature occurs</td>
<td></td>
</tr>
<tr>
<td>LED 2</td>
<td>ARC FLT</td>
<td>Arc fault occurs</td>
<td></td>
</tr>
<tr>
<td>LED 3</td>
<td>UV</td>
<td>Low kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 4</td>
<td>OV</td>
<td>High kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 5</td>
<td>UC</td>
<td>Low mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 6</td>
<td>OK</td>
<td>High mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 7</td>
<td>X-RAY ON</td>
<td>X-Rays are enabled</td>
<td></td>
</tr>
<tr>
<td>LED 8</td>
<td>PWR</td>
<td>Power is ON</td>
<td></td>
</tr>
</tbody>
</table>

**RS-232 DIGITAL INTERFACE—**

**9 PIN FEMALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>Transmit Data</td>
<td>Conforms to EIA RS-232-C</td>
</tr>
<tr>
<td>3</td>
<td>Receive Data</td>
<td>Conforms to EIA RS-232-C</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
Spellman’s XRB160PN480/CT Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 480W. Features like small package size and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**

X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 0.8mm x 0.8mm (IEC336)
- Beam Filter: 1.7mm of glass, 1mm of Al, and 10mm of oil
- Beam Geometry: Symmetrical fan 105° ±3° x 4° ±1°

**Input Voltage:**
- Monoblock®: 100-240Vac ±10%, 50/60Hz, 6.5A max
- Heat Dissipation Unit: 24Vdc, 3A

**X-Ray Tube Voltage:**
- Nominal X-Ray tube voltage is adjustable between 20kV to 160kV

**X-Ray Tube Current:**
- 0.3mA to 6mA over specified tube voltage range

**X-Ray Tube Power:**
- 320W continuous, 480W peak

**Voltage Regulation:**
- Line: ±0.1% for a ±10% input line change of nominal input line voltage
- Load: ±0.1% for a 0.3mA to 6mA load change

**Voltage Accuracy:**
- Voltage measured across the X-Ray tube is within ±1% of the programmed value

**Voltage Risetime:**
- Ramp time shall be <1 second from 1% to 90% of rated output

**Voltage Overshoot:**
- Within 5% of rated voltage

**Voltage Ripple:**
- 0.1% pp of rated voltage @ ≤1kHz

**Current Regulation:**
- Line: ±0.5%
- Load: ±0.5%

**Current Accuracy:**
- Current measured through the X-Ray tube is within ±1% of the programmed value

**Current Risetime:**
- <1 second from 1% to 90% of rated output

**Arc Intervention:**
- 4 arcs in 10 seconds = Shutdown

**Filament Configuration:**
- Internal high frequency AC filament drive with closed loop filament emission control

**Digital Interface:**
- RS-232

**Control Software:**
- A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock Signals:**
- A hardware interlock functions in digital programming modes.

**Operating Temperature:**
- 0°C to +40°C

**Storage Temperature:**
- -40°C to +70°C

**Humidity:**
- 5% to 90% relative humidity, non-condensing

**Cooling:**
- Heat exchanger w/fan and oil pump, powered from customer provided 24Vdc @ 3A
Input Line Connector: 3 pin Phoenix Contact part no. 1829167

Digital Interface Connector: 9 pin D, female

Analog Signal Connector: 10 pin Phoenix Contact part no. 1755503

Cooler Power Connector: 4 pin AMP part no. 206061-1

Grounding Point: 8-32 ground stud provided on chassis

Dimensions: 24.00” x 16.00” x 6.50” (609.60mm x 406.40mm x 165.10mm)

Weight: 125lbs (49.5kg) ±10lbs (±4.5kg)

Orientation: Can be mounted in any orientation.

X-Ray Leakage: Not to be greater than 0.5mR/hr at 5cm outside the external surface

Special Features: Stationary or rotating CT application up to 90rpm at a max. radius of 24.75” (629mm)

---

**AC INPUT POWER**

### 3 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

**ANALOG INTERFACE—10 PIN PHOENIX CONTACT**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray</td>
<td>+24Vdc = enable X-Ray</td>
</tr>
<tr>
<td>2</td>
<td>X-Ray Return</td>
<td>X-Ray Return</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>4</td>
<td>kV Monitor Output</td>
<td>0 to 9Vdc = 0 to 100% Rated Voltage</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor Output</td>
<td>0 to 9Vdc = 0 to 100% Rated Current</td>
</tr>
<tr>
<td>7</td>
<td>Fault</td>
<td>Open Collector, Open = No Fault</td>
</tr>
<tr>
<td>8</td>
<td>Relay N/C</td>
<td>HV On, 50V @ 1A maximum</td>
</tr>
<tr>
<td>9</td>
<td>Relay Common</td>
<td>HV On, 50V @ 1A maximum</td>
</tr>
<tr>
<td>10</td>
<td>Relay N/O</td>
<td>HV On, 50V @ 1A maximum</td>
</tr>
</tbody>
</table>

**RS-232 DIGITAL INTERFACE—9 PIN FEMALE D CONNECTOR**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>Transmit Data</td>
<td>Conforms to E/A RS-232-C</td>
</tr>
<tr>
<td>3</td>
<td>Receive Data</td>
<td>Conforms to E/A RS-232-C</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
Spellman’s XRB150PN600 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 150kV at 600W. Features like power factor correction, small package size and a standard analog and RS-232 digital interface simplify integrating this unit into your X-Ray system. Standard models are available with cone shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**

X-Ray Scanning: Bone Densitometry, Food Inspection, Security

**SPECIFICATIONS**

X-Ray Characteristics:
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 0.5mm x 0.5mm (IEC 336)
- Beam Filter: 0.06” Ultem
- Beam Geometry: Cone, 18° ±1°

**Input Voltage:**
200-240Vac ±10%, 50/60Hz, 6.5A maximum

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable between 70kV to 150kV

**X-Ray Tube Current:**
1.0mA to 4.0mA over specified tube voltage range

**X-Ray Tube Power:**
160W continuous, 600W peak
- Duty Cycle: 30 seconds on, 300 seconds off
- @ 600W peak

**Voltage Regulation:**
- Line: ±0.1% for a ±10% input line change of 180 to 264Vac
- Load: ±0.1% for a 1.0mA to 4.0mA load change.
- 600W maximum

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within ±2% of the programmed value

**Voltage Risetime:**
±1% in less than 300ms

**Voltage Overshoot:**
±10% during 300ms risetime

**Voltage Ripple:**
1% rms of rated voltage @ 10Hz to 1MHz

**Current Regulation:**
- Line: ±0.1% from 180-264Vac
- Load: ±0.5% @ 70kV-150kV, 1.0mA to 4.0mA

**Current Accuracy:**
Current measured through the X-Ray tube is within ±2% of the programmed value

**Current Risetime:**
±1% in less than 300ms

**Arc Intervention:**
4 arcs in 10 seconds with a 200ms quench = Shutdown

**Filament Configuration:**
Internal high frequency AC filament drive with closed loop filament emission control

**Analog Interface:**
0 to 5Vdc ground referenced signals

**Digital Interface:**
- RS-232 interface.
- Control Software:
  - A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock/Signals:**
A hardware interlock function is provided

**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-40°C to +70°C

**Humidity:**
10% to 95% relative humidity, non-condensing

**Cooling:**
External fan required. 250cfm minimum to maintain an oil temperature of 55° C
Input Line Connector: 3 pin Phoenix Contact P/N 1829167

Analog Interface Connector: 10 pin Phoenix Contact P/N 1755503

Digital Interface Connector: 9 pin D connector, female

Grounding Point: 8-32 ground stud provided on chassis

Dimensions: 13.46" x 13.38" x 6.24" (341.89mm x 339.85mm x 158.50mm)

Weight: 66lbs (30kg)

Orientation: Can be mounted in any orientation.

X-Ray Leakage: Less than 100mR/hr at 1m distance, measured at 140kV, 3mA

---

### AC INPUT POWER

**JB1 3 PIN PHOENIX CONTACT**

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>Line</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Chassis Ground</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

### RS-232 DIGITAL INTERFACE—JB16 9 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>2</td>
<td>Transmit</td>
<td>RS-232</td>
</tr>
<tr>
<td>3</td>
<td>Receive</td>
<td>RS-232</td>
</tr>
<tr>
<td>4</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>8</td>
<td>Spare</td>
<td>N/C</td>
</tr>
<tr>
<td>9</td>
<td>Spare</td>
<td>N/C</td>
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</table>

### ANALOG INTERFACE—JB15 10 PIN PHOENIX CONTACT

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray Signal</td>
<td>+12Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=1kΩ</td>
</tr>
<tr>
<td>2</td>
<td>X-Ray Signal Return</td>
<td>Signal Return</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>N/C</td>
</tr>
<tr>
<td>4</td>
<td>kV Monitor</td>
<td>0 to 5Vdc = 0 to 175kV, Zout= 10kΩ</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>mA Monitor</td>
<td>0 to 5Vdc = 0 to 4.5mA, Zout= 10kΩ</td>
</tr>
<tr>
<td>7</td>
<td>Fault Signal</td>
<td>Open collector, High (Open) = No Fault, 35Vdc @10mA maximum</td>
</tr>
<tr>
<td>8</td>
<td>HV ON Lamp Relay n/o</td>
<td>Relay Normally Open, 50Vdc @ 1A maximum</td>
</tr>
<tr>
<td>9</td>
<td>HV ON Lamp Relay common</td>
<td>Relay Common, 50Vdc @ 1A maximum</td>
</tr>
<tr>
<td>10</td>
<td>HV ON Lamp Relay n/c</td>
<td>Relay Normally Closed, 50Vdc @ 1A maximum</td>
</tr>
</tbody>
</table>

### LED INDICATORS

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SIGNAL NAME</th>
<th>CONDITION</th>
<th>Illuminated When...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 1</td>
<td>OT</td>
<td>Over temperature occurs</td>
<td></td>
</tr>
<tr>
<td>LED 2</td>
<td>ARC FLT</td>
<td>Arc fault occurs</td>
<td></td>
</tr>
<tr>
<td>LED 3</td>
<td>UV</td>
<td>Low kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 4</td>
<td>OV</td>
<td>High kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 5</td>
<td>UC</td>
<td>Low mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 6</td>
<td>OC</td>
<td>High mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 7</td>
<td>X-RAY ON</td>
<td>X-Rays are enabled</td>
<td></td>
</tr>
<tr>
<td>LED 8</td>
<td>PWR</td>
<td>Power is ON</td>
<td></td>
</tr>
</tbody>
</table>
Spellman’s XRB160PN688/CT Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 688W. Features like small package size and RS-232 digital interface simplify integrating this unit into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

**TYPICAL APPLICATIONS**
X-Ray Scanning: Food Inspection, Fill Level Confirmation and Security Applications

**SPECIFICATIONS**

**X-Ray Characteristics:**
- Tube Type: Glass tube, Tungsten target, Be filter
- Focal Spot: 2.5mm x 2.5mm (IEC 60336)
- Beam Filter: 1.5mm glass, 9-26mm oil, 0.4mm Al
- Beam Geometry: Asymmetrical fan 93° x 15° ±2°

**Input Voltage:**
230Vac, ±15%, 50/60Hz, 5A max

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable between 50kV to 160kV

**X-Ray Tube Current:**
0.25mA to 4.3mA over specified tube voltage range

**X-Ray Tube Power:**
688W maximum continuous

**Voltage Regulation:**
- Line: ±0.1% ±10%
- Load: ±0.1% 0.25 to 4.3mA

**Voltage Accuracy:**
Voltage measured across the X-Ray tube is within 1% of the programmed value

**Voltage Risetime:**
Ramp time shall be 500ms nominal, 1 second maximum from 10% to 90% of rated output

**Voltage Overshoot:**
Within 5% of rated voltage

**Voltage Ripple:**
1% p-p of rated voltage

**Current Regulation:**
- Line: ±0.5% ±10%
- Load: ±0.5% 0.25 to 4.3mA

**Current Accuracy:**
Current measured through the X-Ray tube is within 5% of the programmed value

**Current Risetime:**
500ms nominal, 1 second maximum

**Arc Intervention:**
4 arcs in 10 seconds = shutdown

**Filament Configuration:**
Internal high frequency AC filament drive with closed loop filament emission control

**Digital Interface:**
RS-232 interface.

**Control Software:**
A demo GUI for engineering evaluations will be provided for the RS-232 digital interface upon request.

**Interlock Signals:**
A hardware interlock function is provided

**Operating Temperature:**
5°C to +40°C

**Storage Temperature:**
-25°C to +65°C

**Humidity:**
10% to 90% relative humidity, non-condensing

**Cooling:**
Heat exchanger w/fan and oil pump, powered from AC
AC INPUT POWER
J1 5 PIN MOLEX 26-60-4050 CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>230Vac Input</td>
</tr>
<tr>
<td>2</td>
<td>Line</td>
<td>230Vac Input</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>4</td>
<td>Neutral</td>
<td>230Vac Neutral</td>
</tr>
<tr>
<td>5</td>
<td>Neutral</td>
<td>230Vac Neutral</td>
</tr>
</tbody>
</table>

AC POWER FOR HEAT DISSIPATION UNIT
4 PIN AMP 206061-1 CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>230Vac Input</td>
</tr>
<tr>
<td>2</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>230Vac Neutral</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Chassis Ground</td>
</tr>
</tbody>
</table>

RS-232 DIGITAL INTERFACE—
J5 9 PIN FEMALE D CONNECTOR

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>
160KV @ 688W MONOBLOCK®

XRB160PN688/CT

SPELLMAN HIGH VOLTAGE ELECTRONICS CORPORATION

DIMENSIONS: in.[mm]

TOP VIEW

SIDE VIEW

BOTTOM VIEW

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Spellman High Voltage is an ISO 9001 and ISO 14001 registered company
Copyright © 2010 Spellman High Voltage Electronics Corp.
Spellman’s new Panoramic Dental Monoblock® consists of an integrated X-Ray tube, dual-output high voltage power supply, and filament supply with control circuitry. The PDM90PN900 is designed for extra oral dental X-Ray applications including CT and Panoramic X-Ray. Features like small package size, standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability and performance.

### TYPICAL APPLICATIONS
Dental X-Ray: Panoramic and CT Imaging

### SPECIFICATIONS

**X-Ray Tube Characteristics:**
- **Target Angle:** 5 degrees
- **Focal Spot:** 0.5mm nominal
- **Beam Filtration:** 3.0mm of Al equivalent
- **Beam Geometry:** see page 3

**X-Ray Tube Voltage:**
Nominal X-Ray tube voltage is adjustable between 50kV to 90kV

**Voltage Regulation:**
- **Line:** ±0.5% for a ±1V change of nominal input line voltage
- **Load:** ±0.1% for a load change of 25μA to maximum rated current

**X-Ray Tube Current:**
1mA to 10mA over specified tube voltage range

**Current Regulation:**
- **Line:** ±0.5% for a ±1V change of nominal input line voltage
- **Load:** ±0.5% for a voltage change of 35kV to 80kV

**X-Ray Tube Power:**
900W peak power

**Duty Cycle:**
- **CT (Pulsed):** ≤45 seconds scan time cycle at up to 40 pulses per second available
- **Panoramic (Continuous):** Maximum scan time = 30s, with 60s off-time. Five consecutive scans

**Input Voltage:**
100-240Vac ±10% 50/60 Hz, 10 amps RMS maximum

**Interface:**
The RS-232 serial communications interface will be used to program and monitor output voltage and current, control various functions and report status and faults.

**Digital Interface Connector:**
- **RS-232:** 9 pin D connector, male

**Operating Temperature:**
0°C to +40°C

**Storage Temperature:**
-20°C to +70°C

**Humidity:**
5% to 95% relative humidity, non-condensing

**Cooling:**
- **Tank:** Convection
- **Controller:** Forced air via provided fan

**Dimensions:**
- **X-Ray Tank:** 9.7”W x 7.7”H x 4.7”D
  (247mm x 195mm x 119mm)
- **Inverter/Controller:** 7.10”W x 9.80”H x 3.60”D
  (180mm x 250mm x 92mm)

**Weight:**
- **X-Ray Tank:** 17lbs (7.7kg)
- **Inverter/Controller:** 6.5lbs (3kg)

**X-Ray Leakage:**
Less than 100mR/hour (or <1mGy/hr) @ 1 meter from the Monoblock® surface.

**Regulatory Approvals:**
Compliant to EMC 60601-1-2 (external EMC filter and shielding required). UL/CUL recognized file E242584.
### Analog Interface—
#### J2 10 Pin Phoenix Contact

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X-Ray Ready/Sync</td>
<td>+5 V Logic</td>
</tr>
<tr>
<td>2</td>
<td>X-Ray Enable</td>
<td>+5 V Logic</td>
</tr>
<tr>
<td>3</td>
<td>X-ray Signal (Exgate)</td>
<td>+5VDC = Enable X-Ray, Low (or Open) = Disable X-Ray</td>
</tr>
<tr>
<td>4</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>5</td>
<td>VMTR Signal (KV monitor)</td>
<td>Voltage: 0 to +5.00 V max, Scale Factor: 0 – 5.00 Vdc = 0 to 100 kV</td>
</tr>
<tr>
<td>6</td>
<td>Signal Ground</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>7</td>
<td>IMTR Signal (mA monitor)</td>
<td>Voltage: 0 to +5.00 V max, Scale Factor: 0 – 5.00 Vdc = 0 – 12.1mA</td>
</tr>
<tr>
<td>8</td>
<td>Fault Signal</td>
<td>Output signal: Open Collector, High (Open) = No Fault</td>
</tr>
<tr>
<td>9</td>
<td>HV ON Lamp, Relay N/O</td>
<td>Relay Normally Open, Dry contacts rated 1A or less will handle a nominal 50mA DC load.</td>
</tr>
<tr>
<td>10</td>
<td>HV ON Lamp, Common</td>
<td>Common</td>
</tr>
</tbody>
</table>

### RS-232 Digital Interface—
#### J5 9 Pin Male D Connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>2</td>
<td>TX</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RX In</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>5</td>
<td>SGND</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>8</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
<tr>
<td>9</td>
<td>N/C</td>
<td>No Connection</td>
</tr>
</tbody>
</table>

### LED Indicators

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SIGNAL NAME</th>
<th>CONDITION</th>
<th>ILLUMINATED WHEN...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 1</td>
<td>OV</td>
<td>High kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 2</td>
<td>UV</td>
<td>Low kV occurs</td>
<td></td>
</tr>
<tr>
<td>LED 3</td>
<td>UC</td>
<td>Low mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 4</td>
<td>OC</td>
<td>High mA occurs</td>
<td></td>
</tr>
<tr>
<td>LED 5</td>
<td>ARC FLT</td>
<td>Arc fault occurs</td>
<td></td>
</tr>
<tr>
<td>LED 6</td>
<td>OT</td>
<td>Over temperature occurs</td>
<td></td>
</tr>
<tr>
<td>LED 7</td>
<td>PW (Pulse mode)</td>
<td>Pulse mode selected</td>
<td></td>
</tr>
<tr>
<td>LED 8</td>
<td>CW (CW mode)</td>
<td>CW mode selected</td>
<td></td>
</tr>
<tr>
<td>LED 9</td>
<td>CW (CW mode)</td>
<td>X-Ray is ON</td>
<td></td>
</tr>
</tbody>
</table>
Spellman’s MMB125PN3.5 Medical Monoblock® with <1ms rise time is ideal for extremeties, specialized applications and vascular imaging. Benefit from Spellman’s 70 plus years of high voltage innovation with this MMB125PN3.5 Monoblock® X-Ray source specifically designed for the C-Arm OEM. Our advanced technology and design expertise in conjunction with our depth of manufacturing capabilities position Spellman as the wise choice for your Monoblock® requirements.

Spellman’s Ultra-Fast MMB Series utilizes our unique technologies that increases the quality of the X-Ray beam and significantly reduces patient dose. Pulsed Fluoroscopy enhances imaging of dense and complex anatomy to further support dose management. With a rise time of <1ms, Spellman’s MMB Series is among the fastest in the industry.

**TYPICAL APPLICATIONS**
C-Arm OEM

**SPECIFICATIONS**

X-Ray Characteristics:
- **Focal Spot**: 0.5mm for small focus 1.6mm for large focus
- **Target Angle**: 16°
- **Target Material**: Tungsten
- **Beam Filter**: 0.8mm Al
- **Beam Geometry**: Refer to line drawing
- **X-Ray Leakage**: Less than <1mGy/hour @ 1meter from tank surface.

**Maximum Filament Current**: 4.3A

**Filament Inverter Switching Frequency**: 20kHz

**Anode Heat Content**: 35.5kJ

**Maximum Anode Heat Dissipation**: 600W

**Distance Between Focal Spot to X-Ray Output Window**: 45mm

**Focal Spot Position**: Refer to outline drawing, additionally it is marked on tank cover.

**Input Power**:
- **Input Voltage**: 190-264Vac, single phase, 50/60 Hz
- **Continuous Current**: ≤9A @ 600W, 220V
- **Peak Current**: ≤34A @ 3500W, 220V

**X-Ray Tube Voltage**:
- **Operational Range**: 40 to 125kV
- **kV Rise Time**: <1ms (from 10% to 90%)
- **Reproducibility**: ≤0.05 per IEC60601-2-54
- **kV Ripple**: ≤1%
- **kV Accuracy**: Fluoroscopy: ±5%
- **kV Overshoot**: ≤5%

**X-Ray Tube Current**:
- **Fluoro**: 0.2mA to 6 mA (small focal spot)
- **Pulsed Fluoro**: 0.5mA to 10 mA (small focal spot)
- **Radiography**: 10mA to 40mA (large focal spot)
- **mA Accuracy**: ±10%

**Maximum Operating Conditions**:
- **Continuous Low Level Fluoro**: 6 mA for 5 minutes
- **Continuous High Level Fluoro**: 10 mA for 2 minutes
- **Pulsed Fluoro**: 0.5fps, 1fps, 2fps, 4fps, 8fps, 15fps, 25fps, 30fps for 2 minutes
- **Pulse on time**: the lower value of 40ms or 50% duty cycle
- **Radiographic**: Single shot large focal spot, 0.1 seconds @ 3500 watts
- **Maximum Anode Heat Dissipation**: 600W
- **Average Power**: 600W for 5 minutes
- **Tank Heat Content**: No less than 675kHU
- **Max. Cooling Rate**: 150W

**X-Ray Tube Current Protection**:
- **Over Current (High mA)**: Trip point is set at 15% over maximum rated current, or at 15% over programmed output current value for longer than 50ms.
- **Under Current (High mA)**: Trip point is set at 15% under programmed output current value for longer than 50ms.
- **Over Current (Low mA)**: Trip point is set at 20% over maximum rated current, or at 20% over programmed output current value for longer than 50ms.
- **Under Current (Low mA)**: Trip point is set at 20% under programmed output current value for longer than 50ms.
**X-Ray Tube Voltage Protection:**
Over Voltage (High kV): Trip point is when the kV output exceeds 137.5kV for more than 10ms or it set is at 10% over programmed output voltage value for longer than 30ms.
Under Voltage (Low kV): Trip point is set at 10% under the programmed output voltage value for longer than 30ms.

**X-Ray Tube Arc Protection:**
Arc Intervention: Unit will detect an Arc but HV will not be shut down, but if multiple arcs occur (4 arcs in 10 seconds) the unit will shut down.

**Over Temperature Protection:**
Over Temperature: Over temperature of tank cover trip point shall be within 60°C ±5°C. Over temperature of tank oil trip point shall be set 65°C.

**Operating Temperature:** 0 to +40 ºC.

**Storage Temperature:** -20 to +70 ºC

**Altitude:** 0 to 8000 feet (0 to 2438 meters)

**Humidity:** 5 to 95%, non-condensing.

**Dimensions:**
X-Ray Tank: 12.2” x 6.2” x 5.7” (310mm x 158mm x 145mm) Refer to outline drawing.
Controller: 14.9” x 10.6” x 3.2” (380mm x 270mm x 83mm) Refer to outline drawing.

**Weight:**
X-Ray Tank: 27.5 pounds (13kg)
Controller: 9.9 pounds (4.5kg)

**Regulatory Approvals:**
Designed to be compliant to:
- IEC 60601-1:2005+A
  Medical electrical equipment Part 1: General requirements for basic safety and essential performance.
- IEC 60601-1-2
  2007 Medical electrical equipment Part 1-2: General requirements for basic safety and essential performance- Collateral standard: Electromagnetic compatibility—Requirements and tests.
- IEC 60601-1-3
- IEC 60601-2-54
  2009 Medical electrical equipment Part 2: Particular requirements for the basic safety and essential performance of X-Ray equipment for radiography and radioscopy.

**EMC**
Designed to meet IEC requirements for medical components. (Note: External EMI filter may be required)

**RoHS**
Controller and Tank Assembly are RoHS compliant.
DIMENSIONS: in.[mm]

**GENERATOR TANK**

**FRONT VIEW**

- 0.47 [12]
- 0.689 [17.5]
- 1.77 [45]
- 6.22 [158]

**SIDE VIEW**

**TOP VIEW**

- 4xM6X1.25
- 4xM8X1.25 4xM4X0.7-6H
- 3.27 [83.0]
- 9.85 [250.0]
- 10.24 [260.0]
- 6.69 [170.0]
- 14.97 [380.0]
- 1.18 [30.0]

**CONTROL UNIT**

**FRONT VIEW**

**TOP VIEW**

**WARNING**

REFER SERVICE TO QUALIFIED PERSONNEL.
INTERNAL PARTS MAY PRESENT A RISK OF ELECTRICAL SHOCK DURING SERVICING.

**Technical Specifications**

- **Voltage**: 40-125KV @ 3.5KW
- **Model**: MMB125PN3.5
- **Manufacturer**: Spellman High Voltage Electronics Corporation
- **Dimensions**: See diagram
- **Contact Information**: Spellman High Voltage is an ISO 9001 and ISO 14001 registered company.

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*www.spellmanhv.com*

*Spellman High Voltage is an ISO 9001 and ISO 14001 registered company.*

*e-mail: sales@spellmanhv.com*
Monoblock® FAQs

Do I need to ensure my Monoblock® stays cool?
In order to obtain maximum performance and reliability from your Monoblock®, it is important that the operating temperature of the Monoblock® is kept within the recommended operating parameters.

Is there a minimum current and voltage I can set my Monoblock® to? Why?
The current and voltage programming for the Monoblock® should not be set lower than the specified operation range stated in the unit specification. Setting the current and voltage programming below these levels may cause erroneous faults to occur.

Are there any special considerations for the mechanical mounting of the Monoblock®?
The Monoblock® is designed to be used in any orientation. However, when mounting the Monoblock® in the system, special consideration may be required depending on how the Monoblock® will be supported in the system. Improper mounting of the Monoblock® or improper mounting of system components to the Monoblock® such as X-Ray beam collimators may cause damage.

How does X-ray dose stability relate to voltage/current stability?
When trying to understand the relationship between voltage/current stability and X-Ray dose stability, there are a couple of factors to consider. X-Ray dose is not directly proportional to the high voltage across the X-Ray tube, it is an exponential function (X²). If the high voltage across the X-Ray tube is doubled, the X-Ray dose increases by a factor of four. With regards to X-Ray tube current, it is directly proportional to X-Ray dose.

Will the X-ray tube last forever?
No, X-Ray tubes are a consumable device and will not last forever. The amount of time it will last is due to several factors including, but not limited to: proper seasoning, cooling, X-Ray hours, and X-Ray tube quality. If you have an application that requires many hours of X-Ray operation (X-Ray ON) over the course of a year (>3000 hours), it’s beneficial to let Spellman know so that your Monoblock® design can take this into consideration and expectations are understood.

Is it ok to keep a Monoblock® in storage, unused for long periods of time?
The concern with Monoblock® storage is with the idle time of the X-Ray tube. X-Ray tubes require seasoning after extended periods of off-time. It’s recommended to season Monoblocks® in storage every 3 months. If that’s not possible, longer seasoning profiles may be required and Spellman should be contacted for guidance. Generally speaking, an idle time of longer than about 6 months can be problematic and should be avoided to the extent possible. If enough idle time passes (>6 months), even the longest seasoning profiles may be inadequate for some X-Ray tubes.

How often do I need to season my Monoblock®? Why?
X-Ray tube seasoning should be done per the recommended seasoning schedule provided with your Monoblock®. A general seasoning guide can be found on the Spellman High Voltage website. Typically seasoning is done after initial installation and after periods of idle time (idle time is defined as X-Ray output being disabled). This would include a profile for daily seasoning and longer profiles for increased idle time. The seasoning procedure carefully raises the tube current and voltage to reduce any residual gas in the X-Ray tube before the tube is operated at full output. Seasoning also minimizes uneven distribution of potential/electric field on the tube glass. Following the recommended seasoning schedule will help prolong the life of the X-Ray tube and prevent tube arcing that can potentially cause irreversible damage to the X-Ray tube.
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