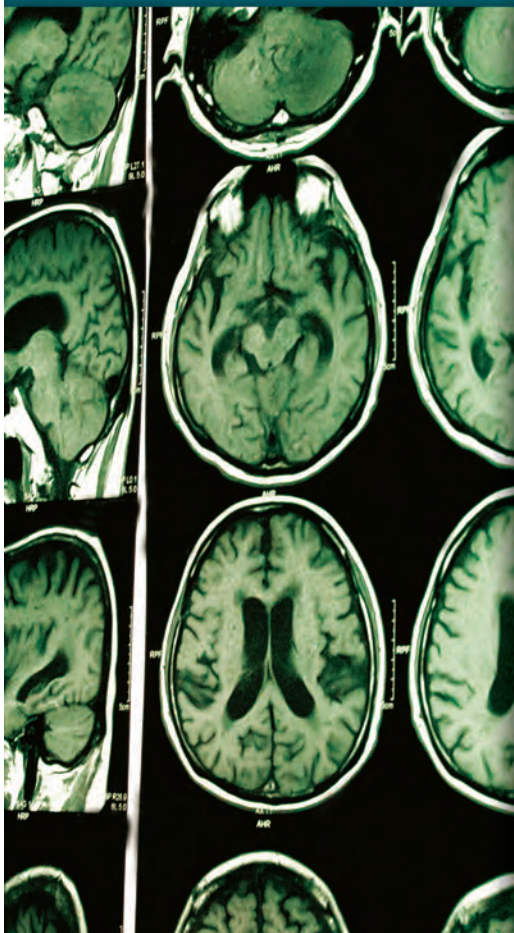


MONOBLOCK[®]
The Integrated X-Ray Source

2017

Release Version: 1.10.17



spellmanhv.com



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

MEETING CUSTOMER NEEDS

For 70 years, Spellman has been helping technology companies grow by providing standard and custom high voltage power converters and X-Ray generators 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 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

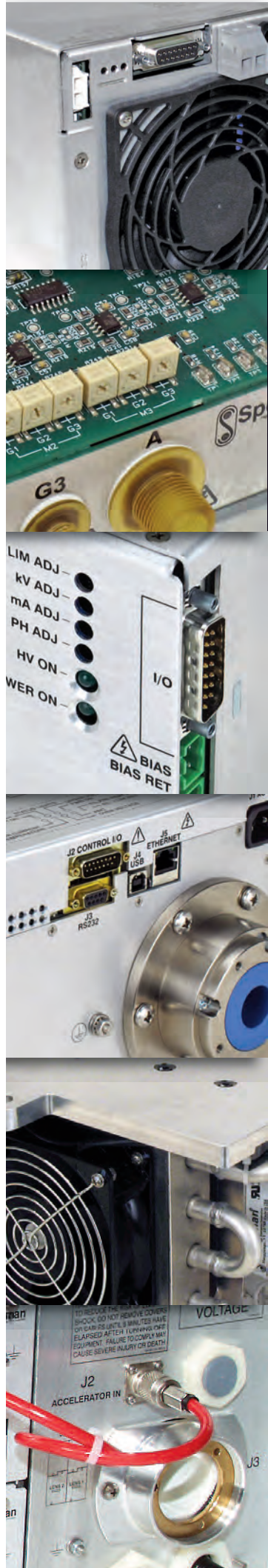
■ Support and Service:

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



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INNOVATIVE X-RAY SOLUTIONS...

MONOBLOCK®

THE INTEGRATED X-RAY SOURCE

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/connectors**
- ✓ **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**

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- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Analog or Digital Control Interface**

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 PDM 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 the PDM 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: $\pm 0.5\%$ for a $\pm 1V$ change of nominal input line voltage
Load: $\pm 0.1\%$ for a load change of 25 μA to maximum rated current

X-Ray Tube Current:

1mA to 10mA over specified tube voltage range

Current Regulation:

Line: $\pm 0.5\%$ for a $\pm 1V$ change of nominal input line voltage
Load: $\pm 0.5\%$ for a voltage change of 35kV to 80kV

X-Ray Tube Power:

900 watts 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 $\pm 10\%$ 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:

Convection

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 $< 1mGy/hr$) @ 1meter from the Monoblock® surface.

Regulatory Approvals:

Designed to meet CE, UL (60601-1).
(required external line filter P/N: CORCOM 20 EP1)

**ANALOG INTERFACE—
J2 10 PIN PHOENIX CONTACT**

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

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX In	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

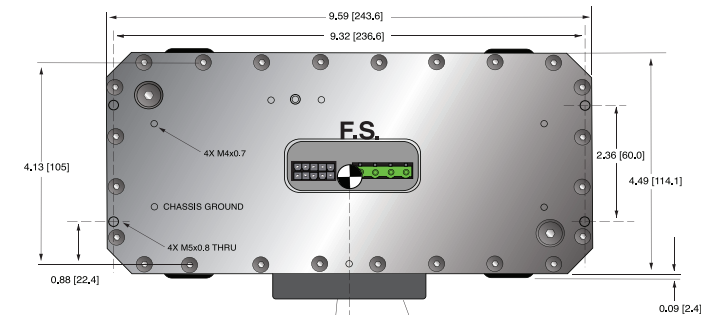
LED INDICATORS

INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	PW (Pulse mode)	Pulse mode selected
LED 8	CW (CW mode)	CW mode selected
LED 9	CW (CW mode)	X-Ray is ON

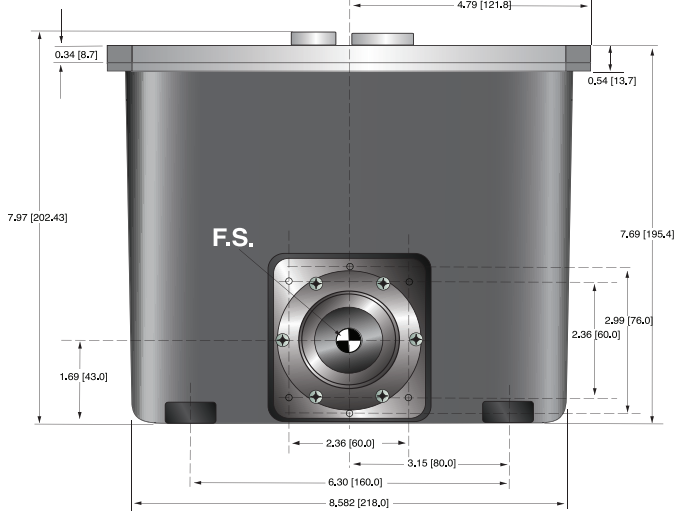
PDM Generator Tank

DIMENSIONS: in.[mm]

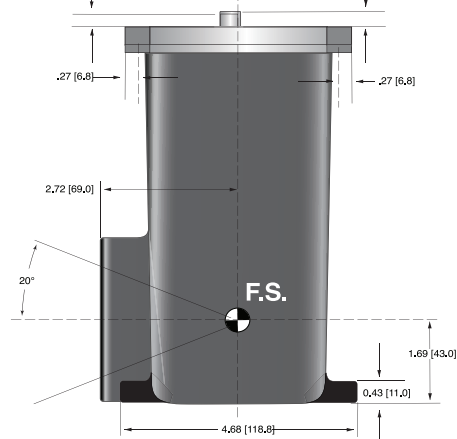
TOP VIEW



FRONT VIEW



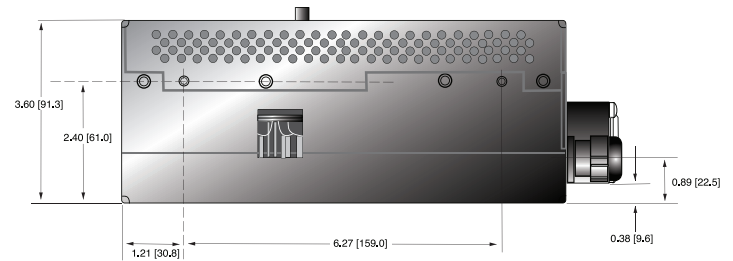
SIDE VIEW



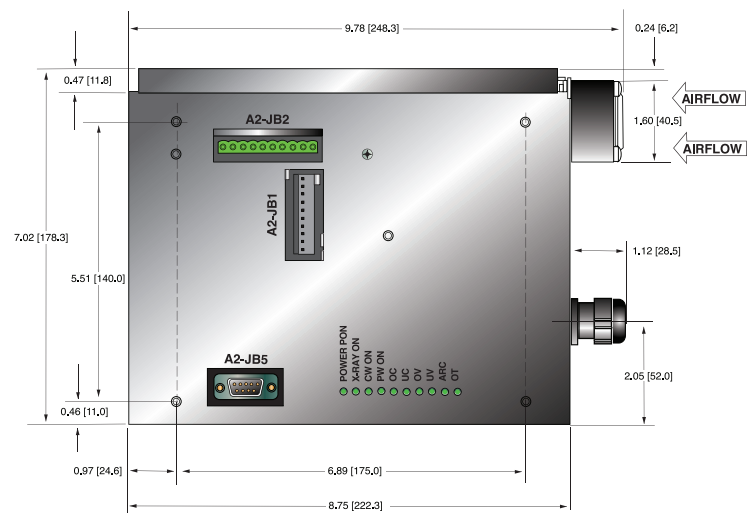
PDM Inverter/Controller

DIMENSIONS: in.[mm]

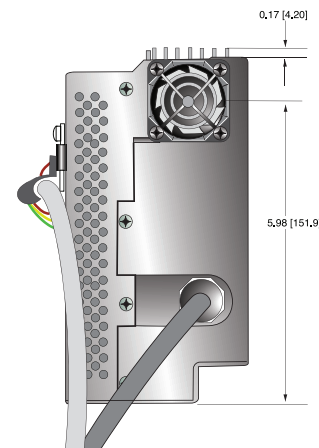
TOP VIEW

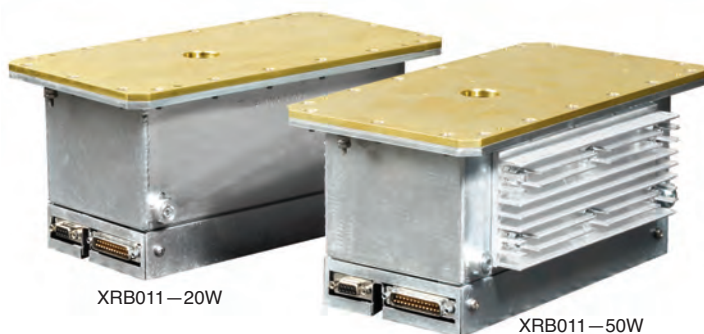


FRONT VIEW



SIDE VIEW





XRB011—20W

XRB011—50W

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

Medical X-Ray: Fluoroscopy and Radiography for Extremities, Specimen Radiography.
Pulsed Fluoroscopy (contact Spellman sales)
Industrial X-Ray: Component inspection and Non-Destructive Testing

SPECIFICATIONS

X-Ray Characteristics:

Tube Type: Micro focus tube
Focal Spot: 33 μ m Nominal, 50 μ m max. (IEC 336)
Beam Filter: Ultem 0.060" (1.5mm)
Oil 0.175" (4.4mm)
Beam Geometry: Symmetrical 40° cone

Input Voltage:

20W: 24Vdc @ 2.5A
50W: 24Vdc @ 4A

X-Ray Tube Voltage:

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

X-Ray Tube Current:

20W: 0-250 μ A over specified tube voltage range
50W: 0-700 μ A over specified tube voltage range

X-Ray Tube Power:

20/50W, maximum continuous

Voltage Regulation:

Line: $\pm 0.5\%$ for a $\pm 1V$ change of nominal input line voltage
Load: $\pm 0.1\%$ for a load change of 25 μ A to maximum rated current

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 1\%$ 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**
- **Analog or Digital Control Interface**

Voltage Risetime:

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

Voltage Temperature Coefficient:

≤ 100 ppm/°C

Temperature Stability:

$\leq 0.01\%$ 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: $\pm 0.5\%$ for a $\pm 1V$ change of nominal input line voltage
Load: $\pm 0.5\%$ for a voltage change of 35kV to 80kV

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 2.5\%$ of the programmed value

Over Current Fault:

An overcurrent (OC) fault is detected when the emission current exceeds 275 μ A (20W model) and 710 μ A (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, 25 μ A/V (20W model) and 70 μ A/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.

Digital Interface:

RS-232: standard
Ethernet: optional

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

Analog Interface and Input Line Connector:

25 pin D connector, male

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 50mR/hr at 1 meter

Regulatory Approvals:

ANSI/AAMI ES60601-1:2005, CAN/CSA-C22.2 No. 60601-1:2008, Designed to meet EN 60601-1:2006, file E242584.

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

PIN	SIGNAL	PARAMETERS
1	NC	No Connection
2	TX Out	Transmit Data
3	RX In	Receive Data
4	NC	No Connection
5	SGND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

ETHERNET DIGITAL INTERFACE—
RJ45 8 PIN CONNECTOR

PIN	SIGNAL	PARAMETERS
1	TX +	Transmit Data +
2	TX -t	Transmit Data -
3	RX +	Receive Data +
4	NC	No Connection
5	NC	No Connection
6	RX -	Receive Data -
7	NC	No Connection
8	NC	No Connection

ANALOG INTERFACE—
J1 25 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	+24V	+24Vdc±1Vdc @ 4A
2	+24V	+24Vdc±1Vdc @ 4A
3	+24V	+24Vdc±1Vdc @ 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. Zout=100Ω
11	µA Monitor	Output, 0 to 10V = 0 to rated output current. Zout=100Ω
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. Zin=10kΩ
22	kV Program	Input, 0 to 8V = 0 to rated output voltage. Zin=10kΩ
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

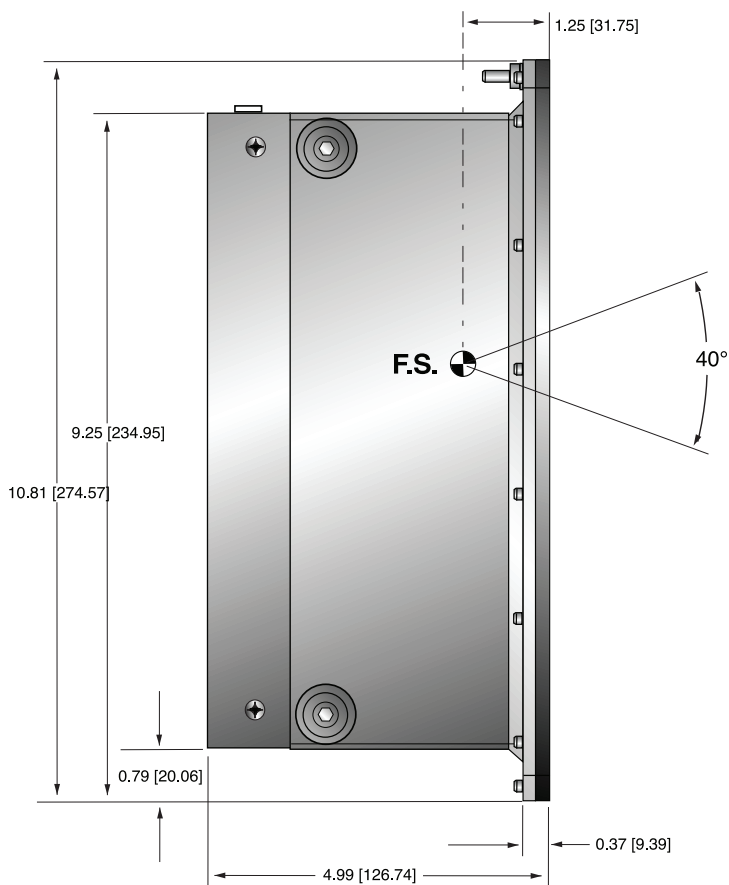
20W Model ORDERING INFORMATION

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

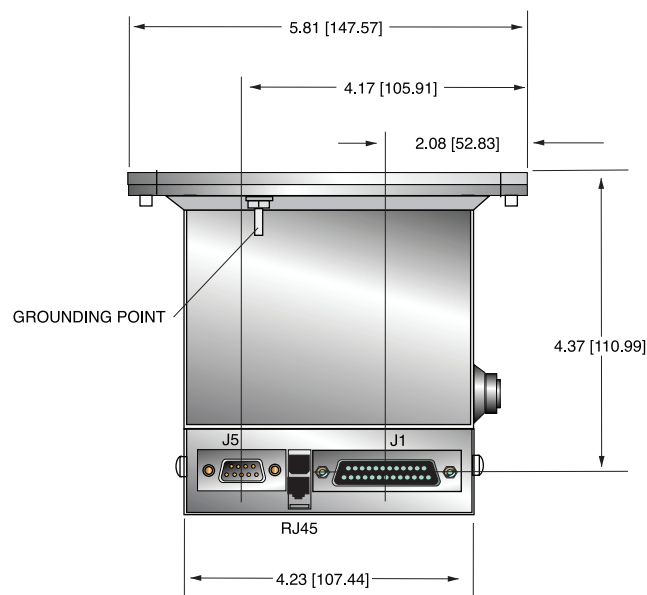
XRB011 20W Model

DIMENSIONS: in.[mm]

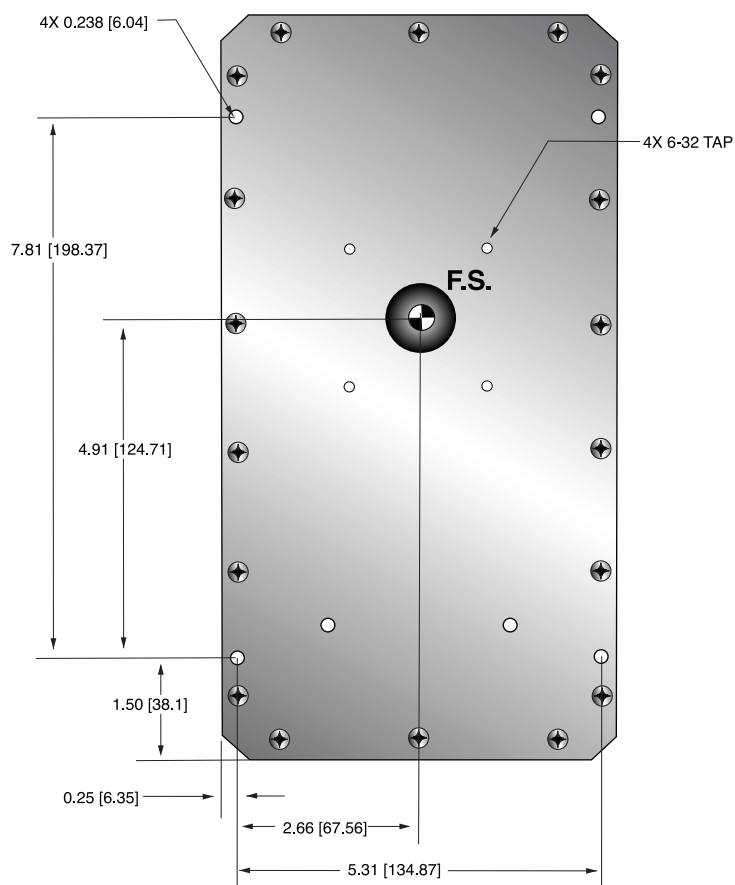
SIDE VIEW



FRONT VIEW



TOP VIEW



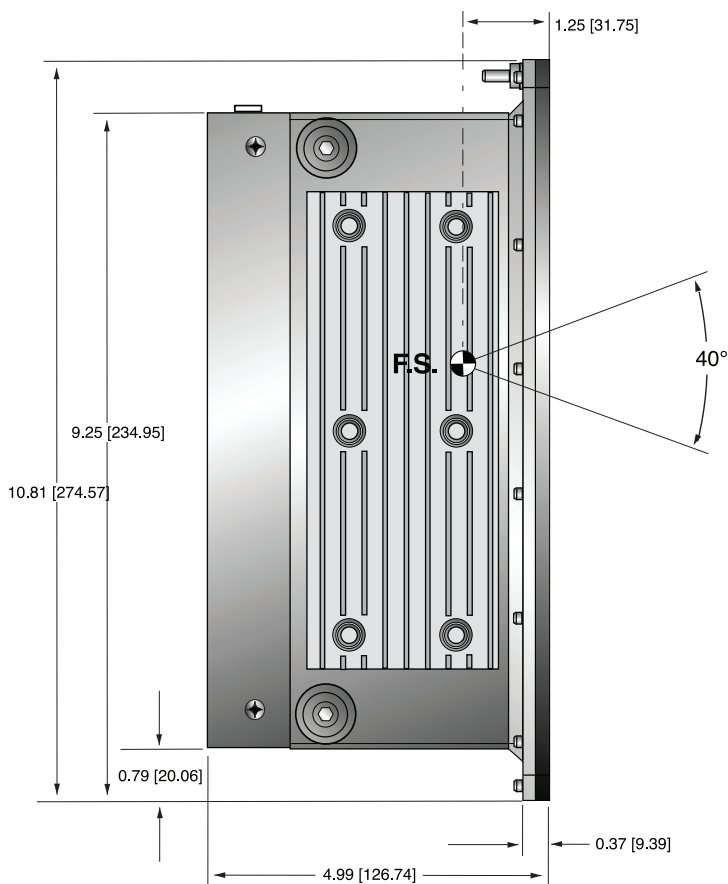
50W Model ORDERING INFORMATION

XRB011-80PN50	80kV, 700uA, 50W, Analog Interface, RS-232
XRB011-80PN50E	80kV, 700uA, 50W, Analog Interface, RS-232, Ethernet
XRB011-80PN50A	80kV, 700uA, 50W, Analog Interface

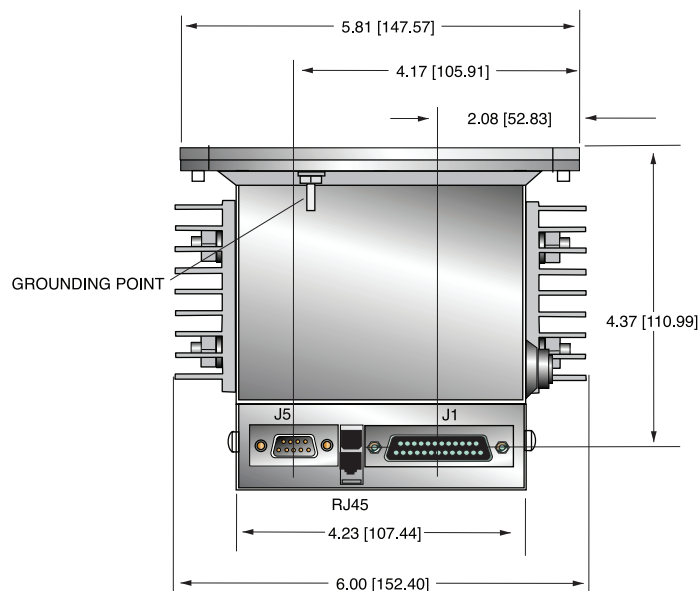
XRB011 50W Model

DIMENSIONS: in.[mm]

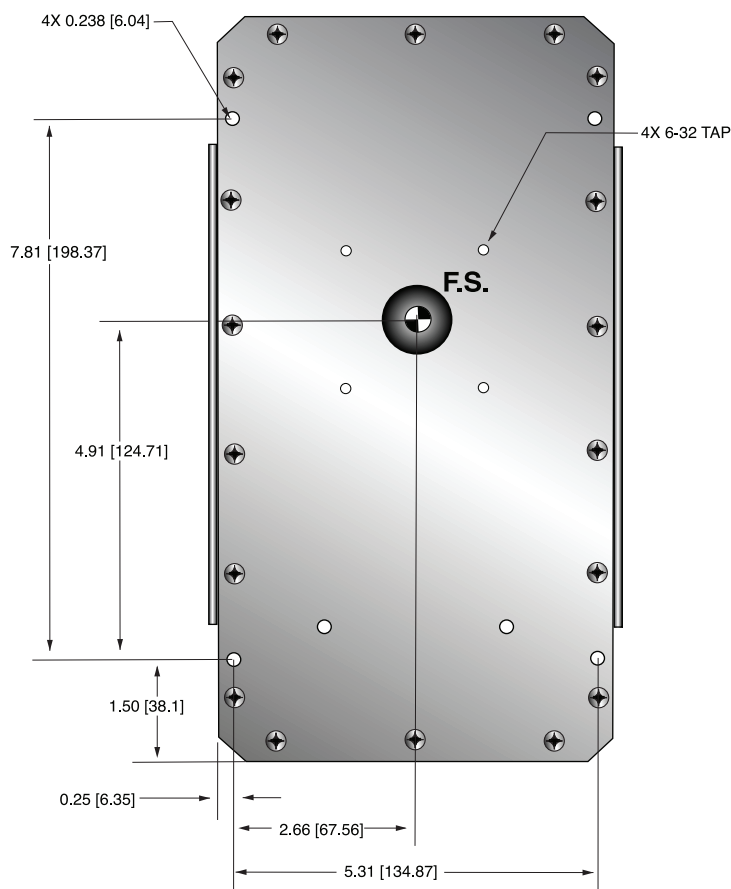
SIDE VIEW



FRONT VIEW



TOP VIEW





Spellman's XRB80 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 the XRB80 into your X-Ray system. The XRB80 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 \pm 0.15mm

Oil: 8mm \pm 0.1mm

Glass: 1.8mm \pm 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, 90-264Vac,
47-63Hz, 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

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Control Interface and Standard RS-232 Digital Interface**

www.spellmanhv.com/manuals/XRB80

Voltage Regulation:

Line: \pm 0.05% of maximum output voltage over a \pm 10% change of nominal input line voltage

Load: \pm 0.1% of maximum rated voltage for 150uA to 1.25mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within \pm 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 \leq 1kHz

Emission Current Parameters

Current Regulation:

Line: \pm 0.05% of rated output current over a \pm 10% change of nominal input line voltage

Load: \pm 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 \pm 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

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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and 2006/95/EC, The Low Voltage Directive, UL/CUL recognized file E235530.

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

PIN	SIGNAL
1	Earth Ground
2	Line
3	Neutral

Mating connector provided with unit

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

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

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

LED INDICATORS

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

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

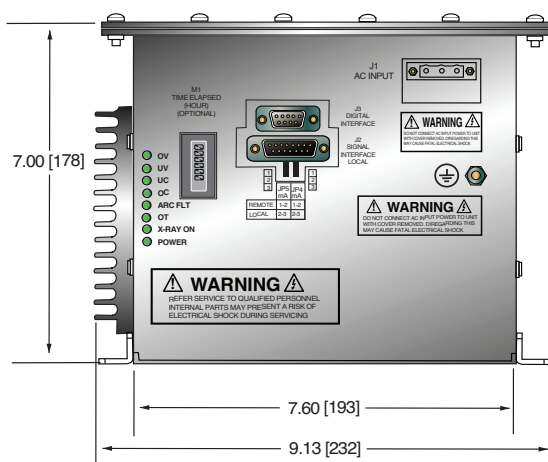
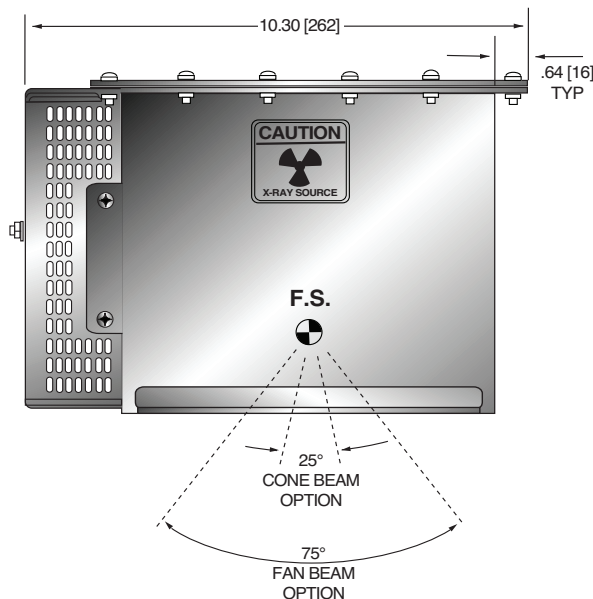
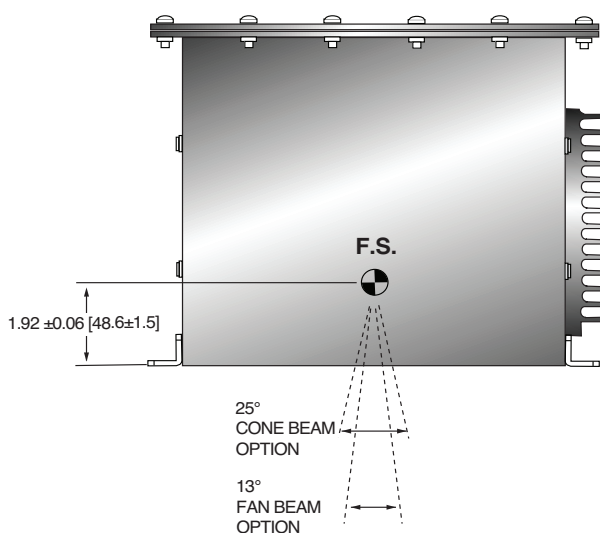
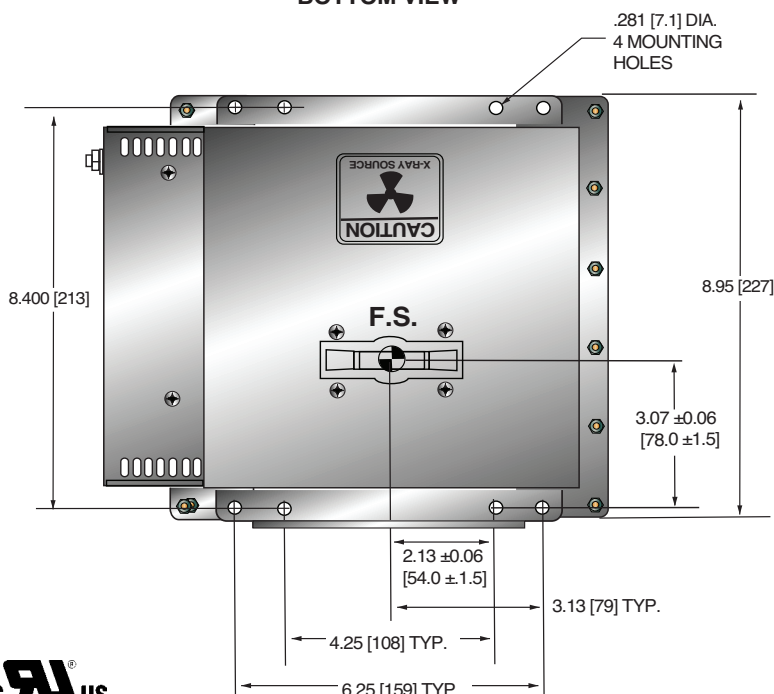
 Risetime, Cone Beam, Fan and
 Elapsed Time Meter Options

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

DIMENSIONS: in.[mm]

Standard Unit
FRONT VIEW

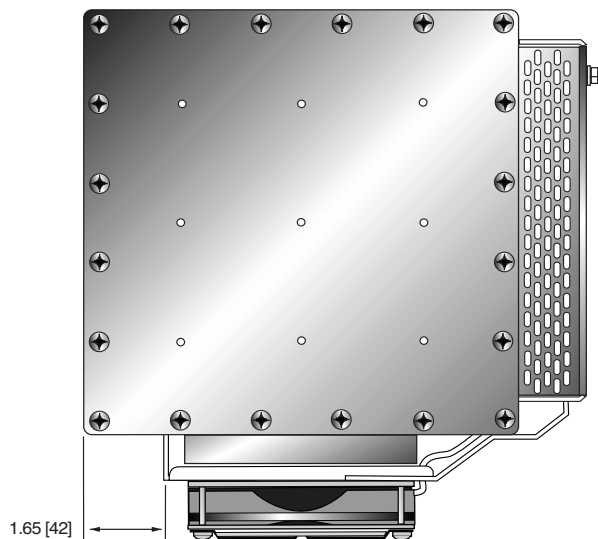
NOTE: Shown with Elapsed Time Meter option


SIDE VIEW

BACK VIEW

BOTTOM VIEW


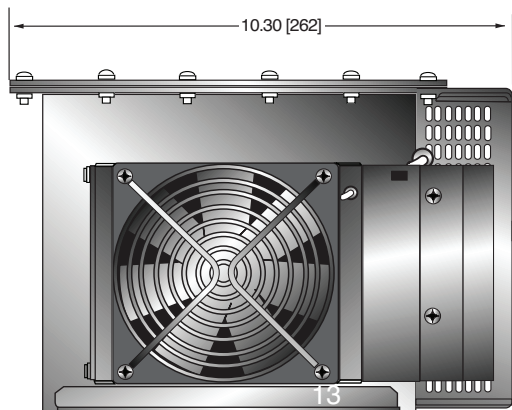
DIMENSIONS: in.[mm]

Cooling Fan Option

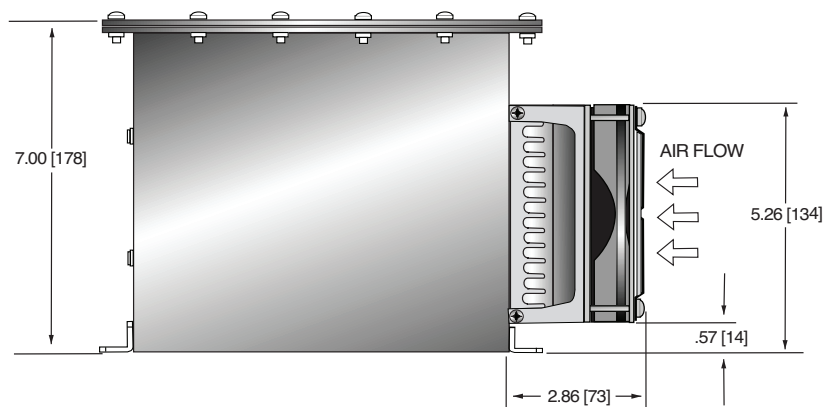
TOP VIEW



SIDE VIEW



BACK VIEW





Spellman's XRB80HR (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 the XRB80HR into your X-Ray system. The XRB80HR 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 XRB80HR 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)

Beam Filter:

Utem: 3.00mm \pm 0.15mm

Oil: 7.5mm \pm 0.25mm

Glass: 1.7mm \pm 0.2mm

Be: 0.8mm

Beam Geometry:

Fan: Standard. The beam angular coverage will be 80° with the beam plane perpendicular to the X-Ray tube axis and 20° wide (with a 2° tolerance)

Cone: Optional. 20° cone beam (with a 2° tolerance)

Input Voltage:

Power factor corrected input 0.98, 90-264Vac,
47-63Hz, 2A maximum

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable 40kV (\pm 20kV)
to 80kV (\pm 40kV)

X-Ray Tube Current:

150uA to 2.00mA over specified tube voltage range
(100W max.)

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface and Standard RS-232 Digital Interface**
- **Elapsed Time Meter Provided on Controller to Monitor X-Ray Tube Usage**

X-Ray Tube Power:

100W, maximum continuous

Voltage Regulation:

Line: \pm 0.05% of maximum output voltage over a \pm 10% change of nominal input line voltage

Load: \pm 0.1% of maximum rated voltage for 150uA to 2.00mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within \pm 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 \leq 1kHz

Emission Current Parameters

Current Regulation:

Line: \pm 0.05% of rated output current over a \pm 10% change of nominal input line voltage

Load: \pm 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 \pm 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 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.

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 D connector, male

Digital Interface Connector:

9 pin D connector, female

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:

Pending

AC LINE POWER CONNECTOR— J1 THREE POSITION PHOENIX CONTACT

PIN	SIGNAL
1	Earth Ground
2	Line
3	Neutral

Mating connector provided with unit

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

XRB80HR ANALOG INTERFACE— J2 15 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	Power Supply Fault Output	Open collector, 35V @ 10mA max. high = no fault
2	N/C	No Connection
3	N/C	No Connection
4	X-Ray On Lamp Relay Output	Common, dry contacts, 30Vdc @ 1A, max
5	X-Ray On Lamp Relay Output	Normally open, X-Ray ON = closed
6	mA Monitor Output	0 to 9Vdc = 0 to 100% rated output, Zout =10kΩ
7	X-Ray On Lamp Relay Output	Normally closed, X-Ray ON = open
8	kV Monitor Output	0 to 9.00Vdc = 0 to 100% rated output, Zout =10kΩ
9	Signal Ground	Ground
10	Signal Ground	Ground
11	HV Interlock Return Input	Connect to Pin 12 to close HV interlock
12	HV Interlock Output	+15Vdc @ open, 5mA when connected to pin 11
13	X-Ray Enable Output	+15Vdc @ open, 5mA when connected to pin 15
14	X-Ray Status Output	Open collector, 35V @ 10mA max high = X-Ray OFF
15	N/C	No Connection

LED INDICATORS

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

OPTIONS

CB Cone Beam

How to Order:

Standard: PART NO.: XRB80PN100HR

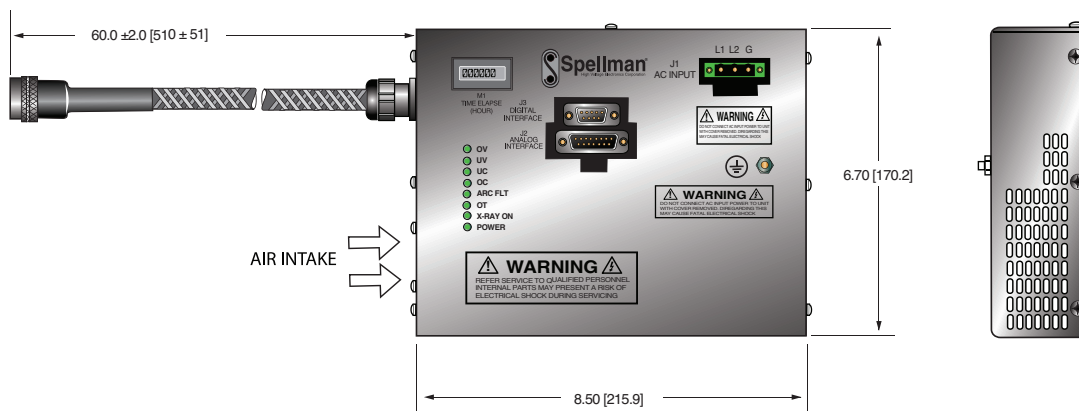
Cone Beam Option

PART NO.: XRB80PN100HR/CB

DIMENSIONS: in.[mm]

CONTROL UNIT

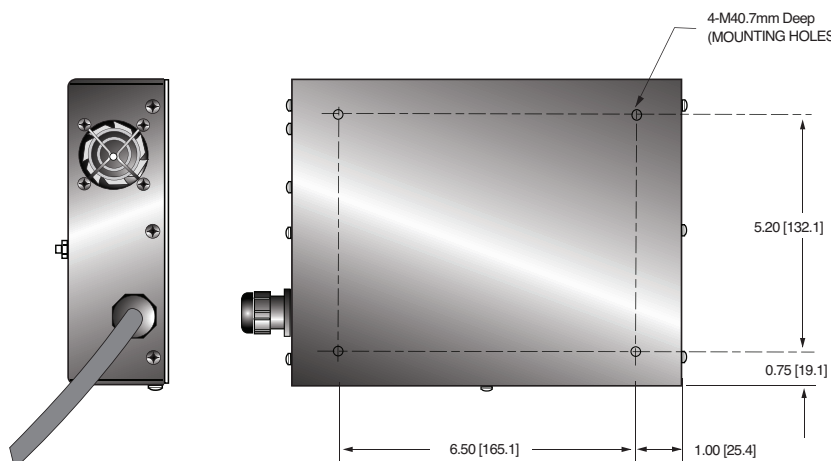
TOP VIEW



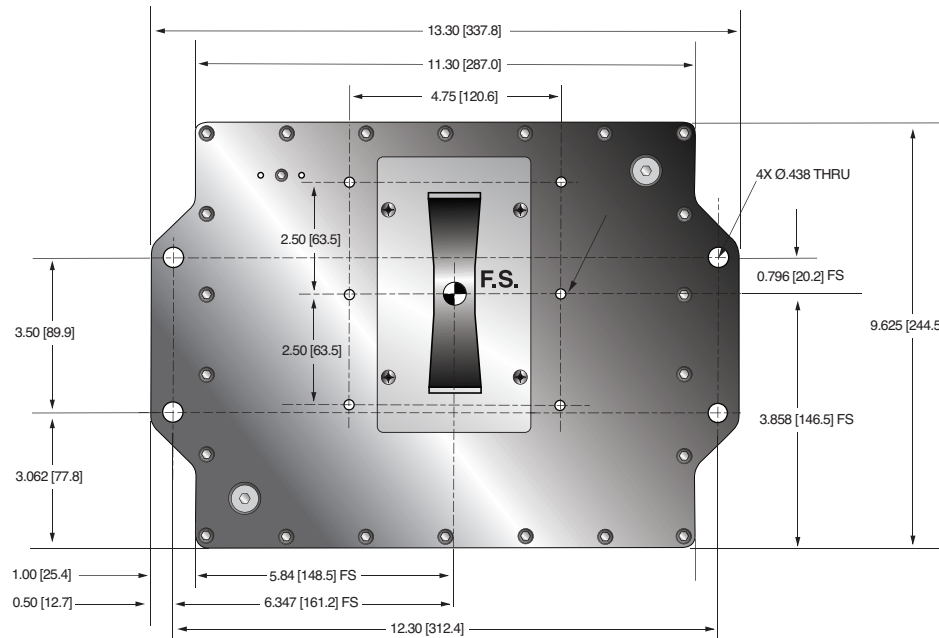
SIDE VIEW



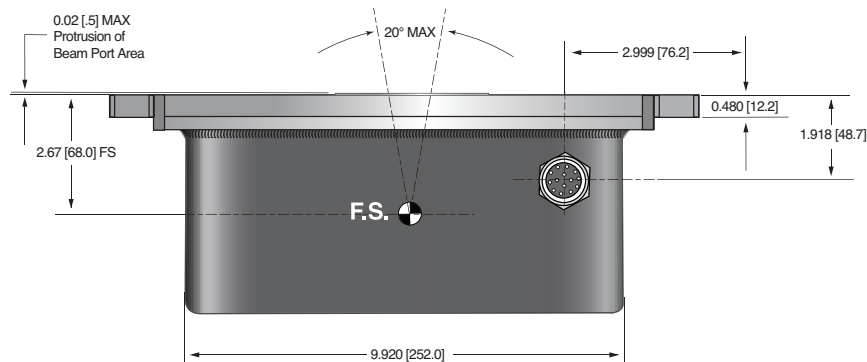
BOTTOM VIEW



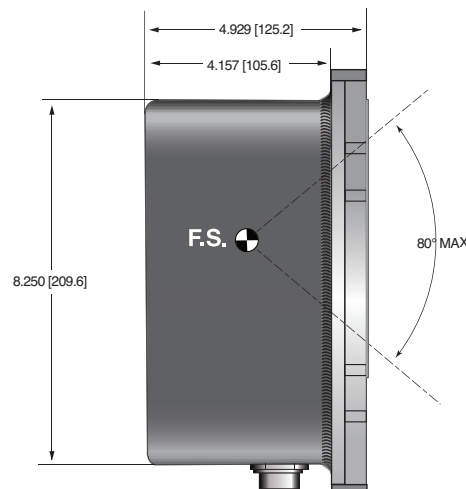
DIMENSIONS: in.[mm]
GENERATOR TANK
TOP VIEW



FRONT VIEW



SIDE VIEW





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal input, Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Control Interface and Standard RS-232 Digital Interface**

www.spellmanhv.com/manuals/XRB100

Spellman's XRB100 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 the XRB100 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 ± 0.1 mm Glass: 1.8mm max
Beam Geometry:	Symmetrical fan 74° x 10° $\pm 1\%$.

Input Voltage:

Power factor corrected input 0.98, 90-264Vac, 47-63Hz, 2A, maximum

X-Ray Tube Voltage:

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

X-Ray Tube Current:

100uA to 1mA over specified tube voltage range

X-Ray Tube Power:

100W, maximum continuous

Voltage Regulation:

Line:	$\pm 0.1\%$ of maximum output voltage over a $\pm 10\%$ change of nominal input line voltage
Load:	$\pm 0.1\%$ of maximum rated voltage for 100uA to 1mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 2\%$ of the programmed value

Voltage Risetime:

Ramp time shall be 1 second from 10% to 90% of maximum rated output voltage

Voltage Overshoot:

5% of maximum voltage, to return within 2.5% of maximum voltage in less than 50ms

Voltage Ripple:

0.5% peak to peak of maximum voltage for frequencies ≤ 1 kHz

Emission Current Parameters

Current Regulation:

Line:	$\pm 0.5\%$ of rated output current over a $\pm 10\%$ change of nominal input line voltage
Load:	$\pm 0.5\%$ 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 $\pm 1\%$ 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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

AC LINE POWER CONNECTOR— J1 THREE POSITION PHOENIX CONTACT

PIN	SIGNAL
1	Earth Ground
2	Line
3	Neutral

Mating connector provided with unit

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

XRB ANALOG INTERFACE— J2 15 PIN MALE D CONNECTOR

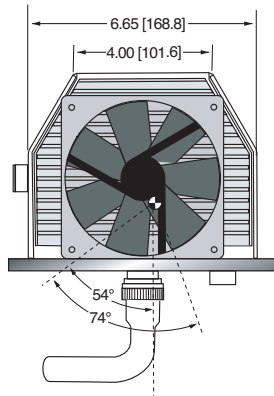
PIN	SIGNAL	PARAMETERS
1	Power Supply Fault Output	Open collector, 35V @ 10mA max. high = no fault
2	mA Program Input	0 to 9.00Vdc = 0 to 100% rated output, Zin =10MΩ
3	kV Program Input	0 to 9.00Vdc = 0 to 100% rated output, Zin =10MΩ
4	X-Ray On Lamp Relay Output	Common, dry contacts, 30Vdc @ 1A, max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

LED INDICATORS

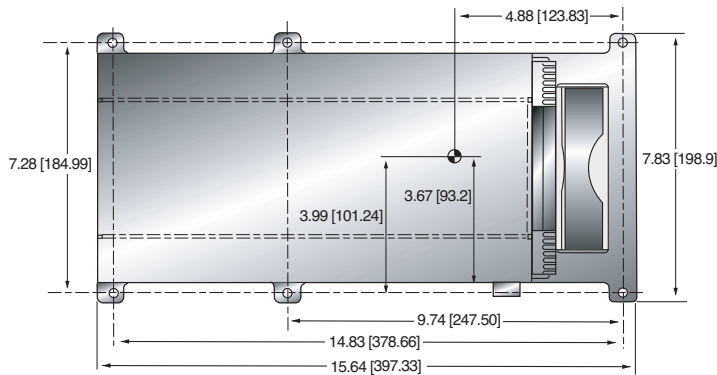
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

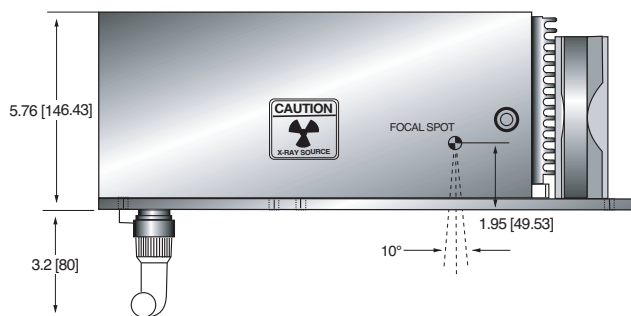
**X-RAY GENERATOR
FRONT VIEW**



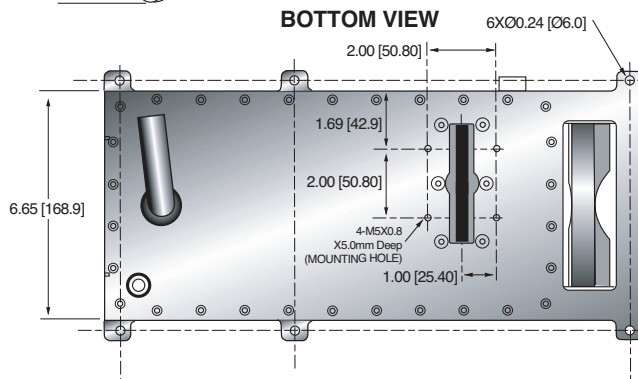
TOP VIEW



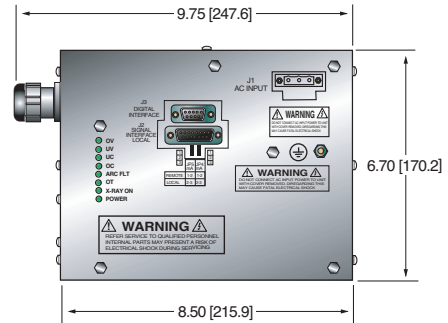
SIDE VIEW



BOTTOM VIEW



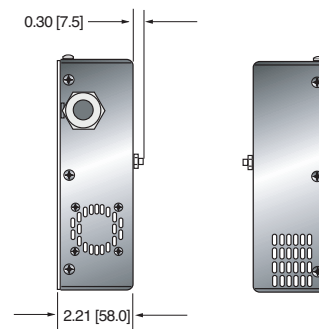
**CONTROL UNIT
FRONT VIEW**



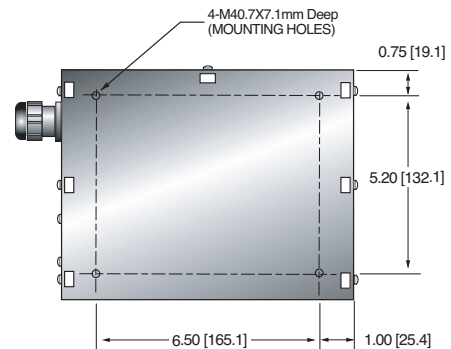
TOP VIEW



SIDE VIEW



BOTTOM VIEW





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

Spellman's XRB101 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 150kV at 160W. Features like power factor correction, small package size and a standard analog and RS-232 digital interface simplify integrating the XRB101 into your X-Ray system. Standard models are available either with fan shaped or 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,
Food Inspection, Security

SPECIFICATIONS

X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter
Focal Spot: 0.8mm x 0.8mm, 0.5mm x 0.5mm (IEC 336)
Beam Filter: 0.06" Ultem, 0.016-0.08" Al
Beam Geometry: Asymmetrical fan up to 40° x 10°, cone up to 18°

Input Voltage:

180-264Vac, 50/60Hz, 6.5A maximum

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 40kV 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: $\pm 0.1\%$ for a $\pm 10\%$ input line change of 180 to 264Vac
Load: $\pm 0.1\%$ for a 1.0mA to 4.0mA load change. 600W maximum

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 2\%$ of the programmed value

Voltage Risetime:

$\pm 1\%$ in less than 300ms

Voltage Overshoot:

$\pm 10\%$ during 300ms risetime

Voltage Ripple:

1% rms of rated voltage @ 10Hz to 1MHz

Current Regulation:

Line: $\pm 0.1\%$ from 180-264Vac
Load: $\pm 0.5\%$ @ 40-150kV, 1.0mA to 4.0mA

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 2\%$ of the programmed value

Current Risetime:

$\pm 1\%$ 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

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, with a 100 sq. cm probe or equivalent, per FDA 21 CFR 1020.30

**AC INPUT POWER
JB1 3 PIN PHOENIX CONTACT**

PIN	SIGNAL	PARAMETERS
1	Line	180-264Vac
2	GND	Chassis Ground
3	Neutral	Neutral

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

PIN	SIGNAL	PARAMETERS
1	Spare	N/C
2	Transmit	RS-232
3	Receive	RS-232
4	Spare	N/C
5	Signal Ground	Ground
6	Spare	N/C
7	Spare	N/C
8	Spare	N/C
9	Spare	N/C

**ANALOG INTERFACE—
JB15 10 PIN PHOENIX CONTACT**

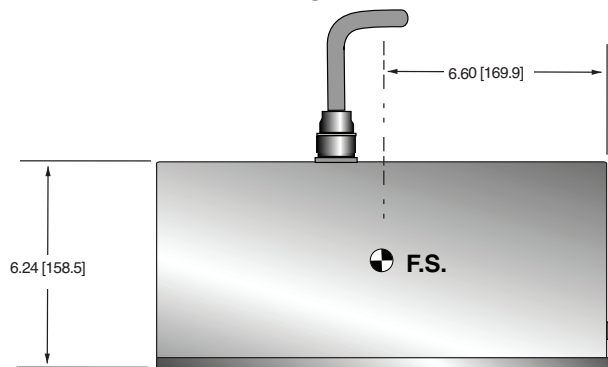
PIN	SIGNAL	PARAMETERS
1	X-Ray Signal	+12Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=1kΩ
2	X-Ray Signal Return	Signal Return
3	N/C	N/C
4	kV Monitor	0 to 5Vdc = 0 to 175kV, Zout= 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0 to 5Vdc = 0 to 4.5mA, Zout= 10kΩ
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @10mA maximum
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

LED INDICATORS

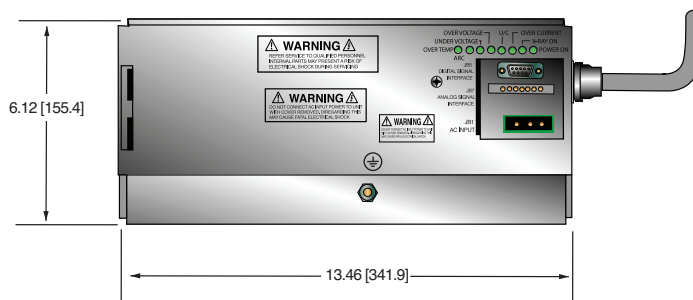
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OT	Over temperature occurs
LED 2	ARC FLT	Arc fault occurs
LED 3	UV	Low kV occurs
LED 4	OV	High kV occurs
LED 5	UC	Low mA occurs
LED 6	OC	High mA occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

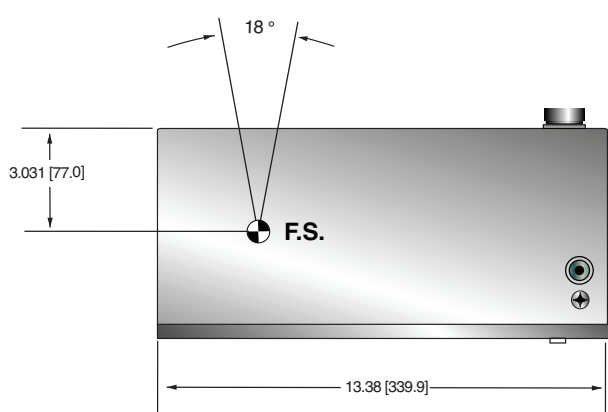
FRONT VIEW TANK



FRONT VIEW
CONTROL ASSEMBLY

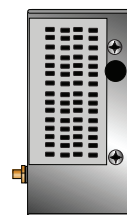


SIDE VIEW TANK

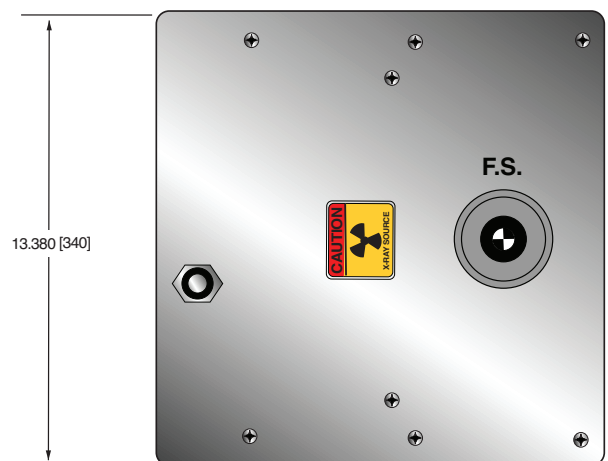


SIDE VIEW
CONTROL ASSEMBLY

AIR EXHAUST

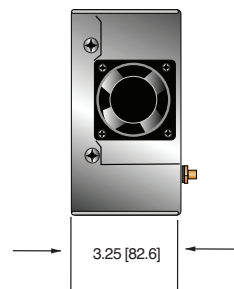


TOP VIEW TANK



SIDE VIEW
CONTROL ASSEMBLY

AIR INTAKE





Spellman's XRB201 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 200W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating the XRB201 into your X-Ray system. Standard models are available either with fan shaped or 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: 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, 0.5mm x 0.5mm (IEC 336)
Beam Filter: 0.016 - 0.08" Al, 0.125" Ultem
Beam Geometry: Asymmetrical fan up to 80° x 30°, cone up to 40°

Input Voltage:

90-264Vac, 50/60Hz, 5A maximum

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

X-Ray Tube Current:

0.1mA to 1.2mA over specified tube voltage range

X-Ray Tube Power:

200W, maximum continuous

Voltage Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ input line change of nominal input line voltage
Load: $\pm 0.1\%$ for a 0.1mA to 1.2mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 1\%$ of the programmed value

Voltage Risettime:

Ramp time shall be 1 second from 10% to 90% of rated output

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring and Standard RS-232 Digital Interface**

Voltage Overshoot:

Within 5% of rated voltage in 10ms

Voltage Ripple:

0.2% pp of rated voltage @ 1kHz

Current Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ change in nominal line
Load: $\pm 0.5\%$ @ 80-160kV, 0.1mA to 1.2mA

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 1\%$ of the programmed value

Current Risettime:

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 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:

Convection/external forced air so tank is $< 55^{\circ}\text{C}$

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:

See drawing

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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and 2006/95/EC, The Low Voltage Directive.

Special Features/Requirements:

High stability X-Ray output: Dose rate variations <2%

AC INPUT POWER JB1 3 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	Line	90-264Vac
2	GND	Chassis Ground
3	Neutral	Neutral

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

ANALOG INTERFACE— JB15 10 PIN PHOENIX CONTACT

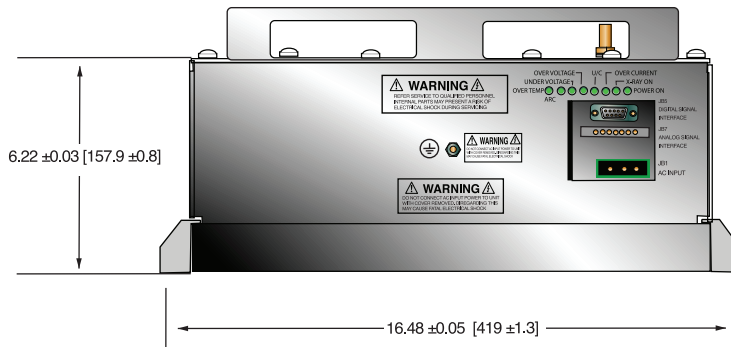
PIN	SIGNAL	PARAMETERS
1	X-Ray Signal	+24Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=2.2kΩ
2	X-Ray Signal Return	Signal Return
3	N/C	N/C
4	kV Monitor	0-10Vdc = 0 to 178kV, Zout = 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0-10Vdc = 0 to 1.5mA, Zout = 10kΩ
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @10mA maximum
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

LED INDICATORS

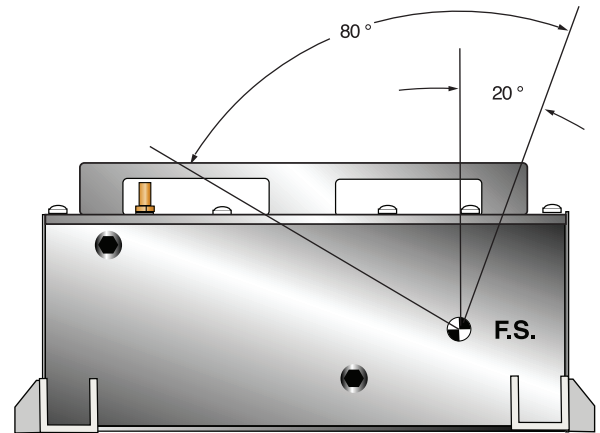
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OT	Over temperature occurs
LED 2	ARC FLT	Arc fault occurs
LED 3	UV	Low kV occurs
LED 4	OV	High kV occurs
LED 5	UC	Low mA occurs
LED 6	OC	High mA occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

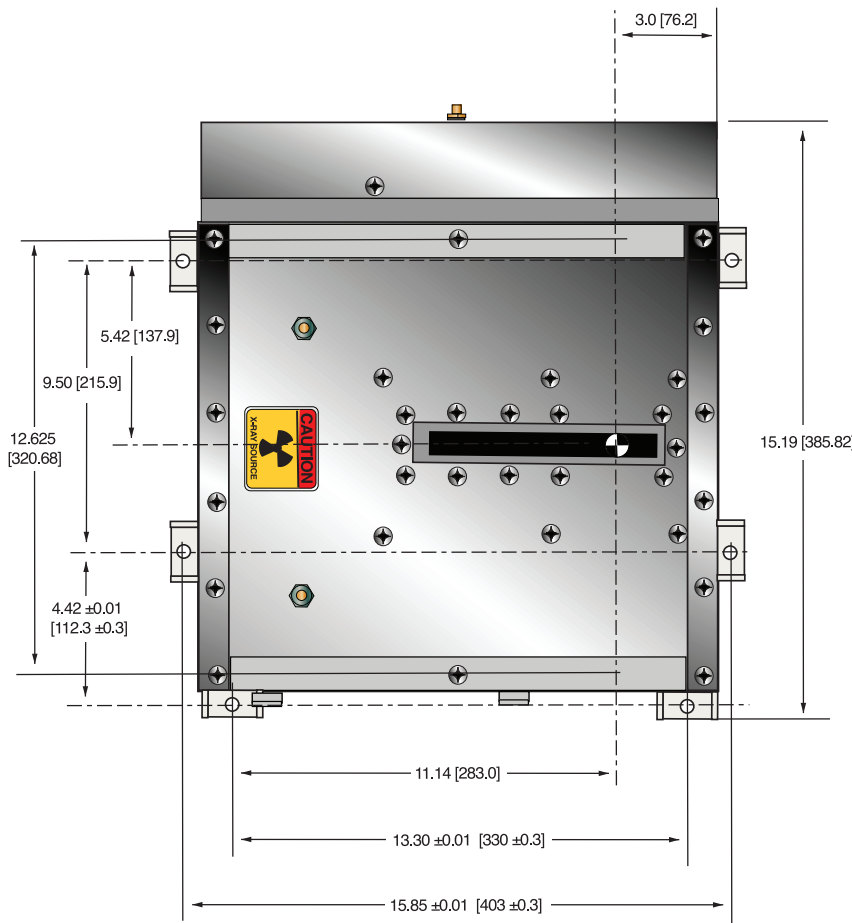
FRONT VIEW



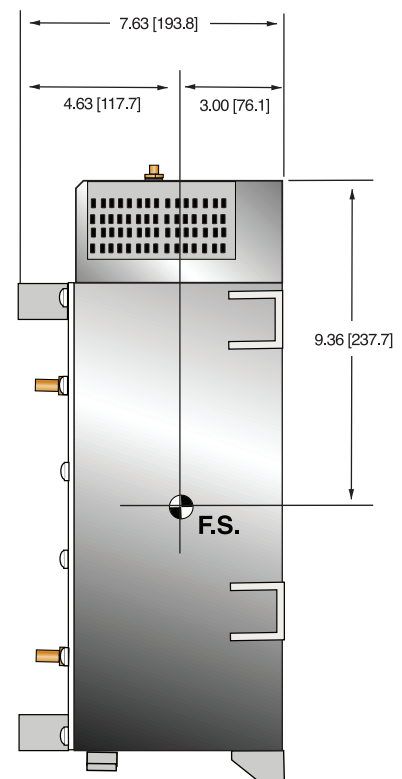
BACK VIEW



TOP VIEW



SIDE VIEW





Spellman's XRB202 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 200W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating the XRB202 into your X-Ray system. Standard models are available either with fan shaped or 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: 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, 0.5mm x 0.5mm
Beam Filter: 0.016" thick 6061 Al, ± 0.0045 "
Beam Geometry: Asymmetrical fan up to 80° x 30°, cone up to 40°

Input Voltage:

90-264Vac, 50/60Hz, 5A maximum

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

X-Ray Tube Current:

0.25mA to 3mA, 200W maximum over specified tube voltage range

X-Ray Tube Power:

200W, maximum continuous

Voltage Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ input line change of nominal input line voltage
Load: $\pm 0.1\%$ for a 0.1mA to 1.2mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 2\%$ of the programmed value

Voltage Risettime:

Ramp time shall be <200ms from 10% to 90% of rated output

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring and Standard RS-232 Digital Interface**

Voltage Overshoot:

Within 5% of rated voltage in <10ms

Voltage Ripple:

1% pp of rated voltage @ ≤ 1 kHz

Current Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ 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 $\pm 2\%$ of the programmed value

Current Risettime:

<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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and 2006/95/EC, The Low Voltage Directive

**AC INPUT POWER
J1 6 PIN CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	Line	90-264Vac
2	Removed	N/C
3	Neutral	Neutral
4	Removed	N/C
5	Spare	N/C
6	Spare	N/C

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TD	Transmit Data
3	RD	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

**ANALOG INTERFACE—
J7 7 PIN MOLEX CONNECTOR**

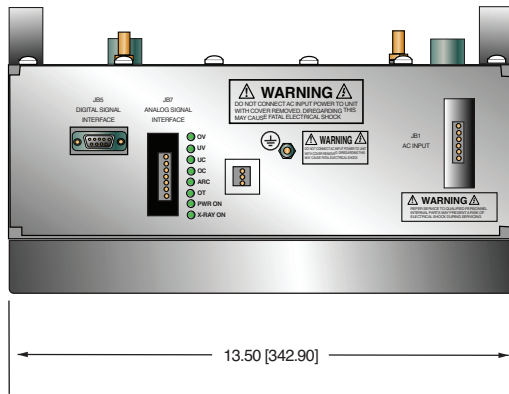
PIN	SIGNAL	PARAMETERS
1	Ex Gate	Low = X-Ray OFF, +12Vdc = X-Ray ON
2	Signal Ground	Ground
3	N/C	No Connection
4	kV Monitor	0-9 Vdc = 0 to 100% rated output
5	Signal Ground	Ground
6	mA Monitor	0 to 9Vdc = 0 to 100% rated output
7	Fault	Open collector, 35V @ 10mA max, High = No Fault

LED INDICATORS

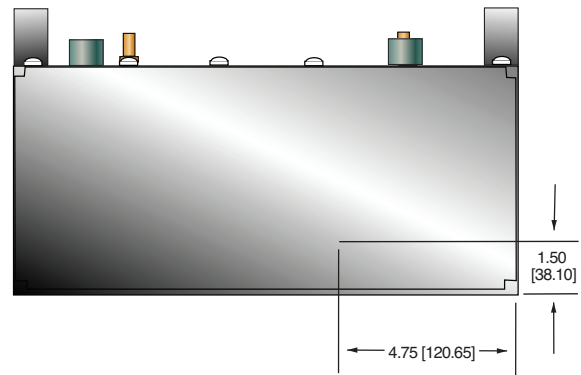
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

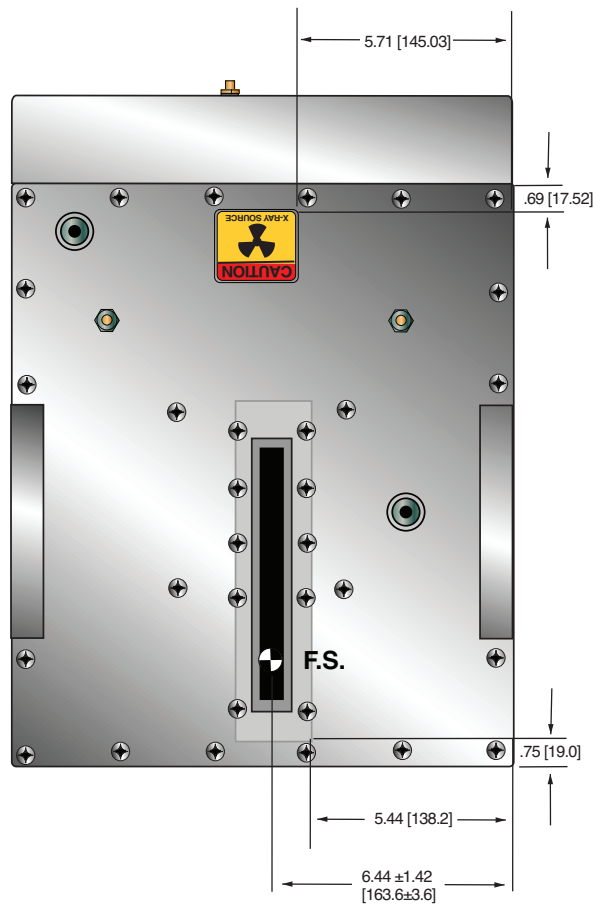
FRONT VIEW



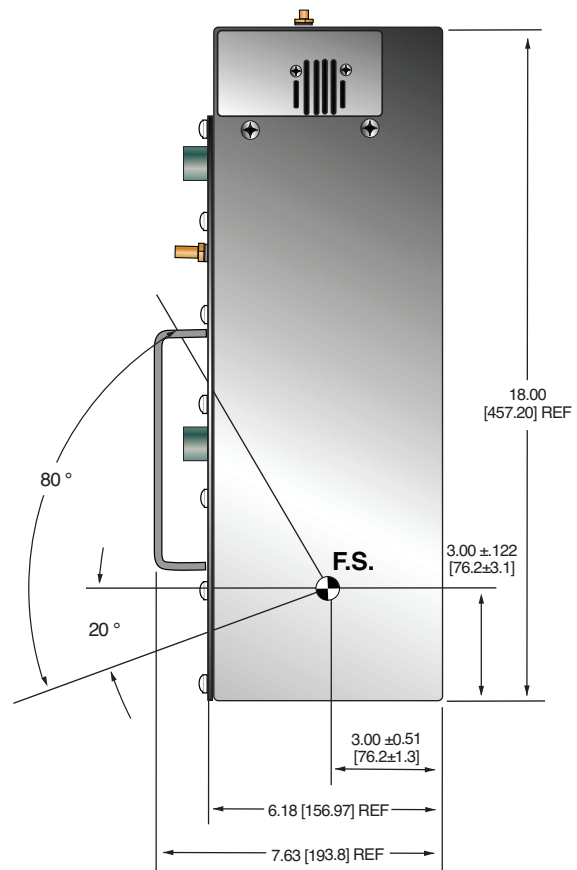
BACK VIEW



TOP VIEW



SIDE VIEW





Spellman's XRB301 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 320W. Features like small package size and RS-422 (RS-232 optional) digital interface simplify integrating the XRB301 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:	1.1mm x 0.5mm
Beam Filter:	1.5mm of glass, 1mm of Al, and 10mm of oil
Beam Geometry:	Symmetrical fan 105° x 4°, 80° x 10°, cone up to 40°

Input Voltage:

230Vac, $\pm 15\%$ 50/60Hz, 2.2A max or 350Vdc $\pm 10\%$

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

X-Ray Tube Current:

0.5mA to 3mA over specified tube voltage range

X-Ray Tube Power:

320W continuous, 480W peak

Voltage Regulation:

Line:	$\pm 0.1\%$ for a $\pm 10\%$ input line change of nominal input line voltage
Load:	$\pm 0.1\%$ for a 0.5mA to 3mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 0.5\%$ of the programmed value

Voltage Risettime:

Ramp time shall be <500ms from 1% to 99% of rated output

- **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 Overshoot:

Within 5% of rated voltage

Voltage Ripple:

0.5% pp of rated voltage @ $\leq 1\text{kHz}$

Current Regulation:

Line:	$\pm 0.5\%$
Load:	$\pm 0.5\%$

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 0.5\%$ of the programmed value

Current Risettime:

<500ms from 1% to 99% 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-422 interface, RS-232 optional

Control Software:

A demo GUI for engineering evaluations will be provided for the RS-422 (RS-232 optional) digital interface upon request.

Interlock Signals:

A hardware interlock functions in digital programming modes.

Operating Temperature:

5°C to +40°C

Storage Temperature:

-25°C to +65°C

Humidity:

5% to 90% relative humidity, non-condensing

Cooling:

Heat exchanger w/fan and oil pump, powered from AC

Input Line Connector:

10 pin Molex 39-29-9103

Digital Interface Connector:

9 pin D, female

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

22.12" X 14.30" X 6.50"

(561.85mm X 363.22mm X 165.10mm)

Weight:

110lbs (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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and 2006/95/EC, The Low Voltage Directive.

Special Features:

Stationary or rotating CT application up to 100rpm

AC INPUT POWER J1 10 PIN MOLEX CONNECTOR

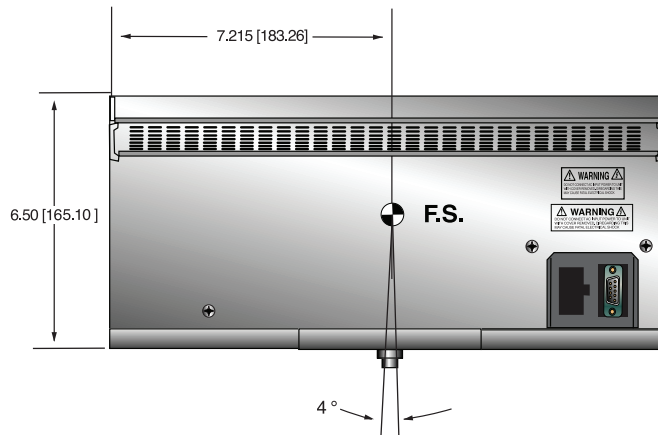
PIN	SIGNAL	PARAMETERS
1	Neutral	350Vdc RTN/230Vac Neutral
2	N/C	No Connection
3	GND	Chassis Ground
4	GND	Chassis Ground
5	Line	+350Vdc/230Vac Line
6	Neutral	350Vdc RTN/230Vac Neutral
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection
10	Line	+350Vdc/230Vac Line

RS-422 DIGITAL INTERFACE J2 9 PIN FEMALE D CONNECTOR

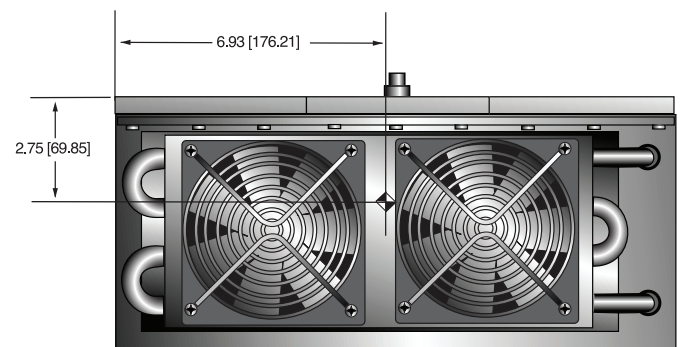
PIN	SIGNAL	PARAMETERS
1	TX+	RS422 Transmit +
2	TX-	RS422 Transmit -
3	RX+	RS422 Receive +
4	RX-	RS422 Receive -
5	GND	Chassis Ground
6	X-Ray On Ind	L = X-Ray OFF, H= X-Ray ON
7	Intlck Out	Connect to Pin 9
8	N/C	No Connection
9	Intlck In	Connect to Pin 7

DIMENSIONS: in.[mm]

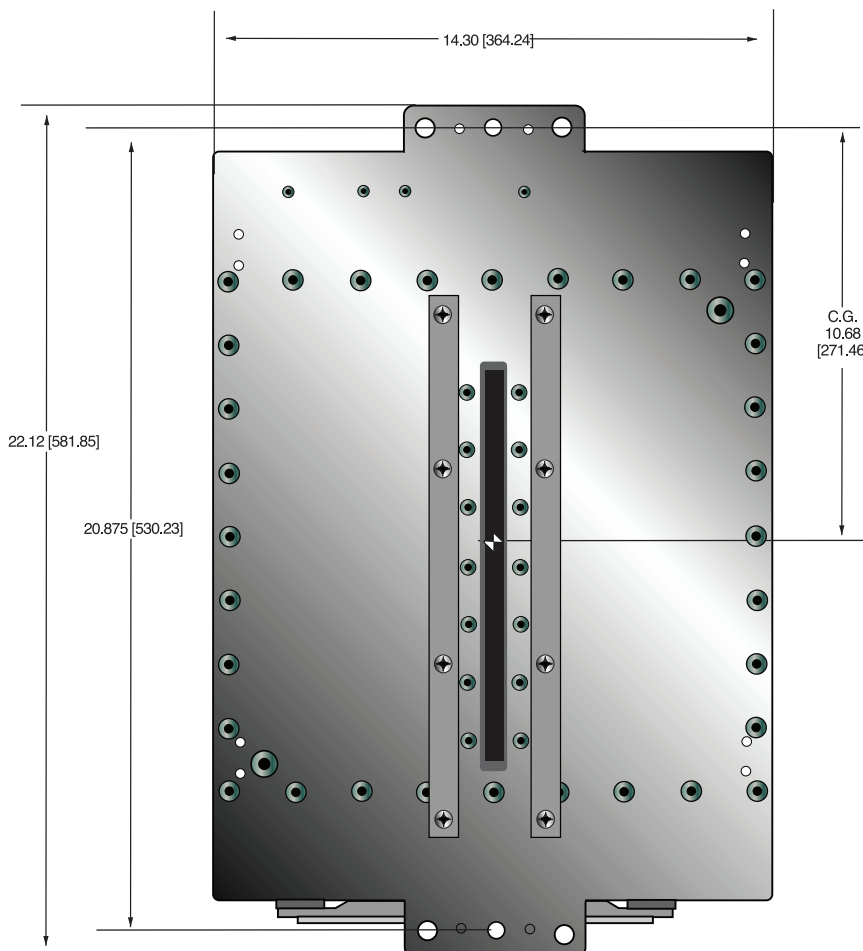
FRONT VIEW



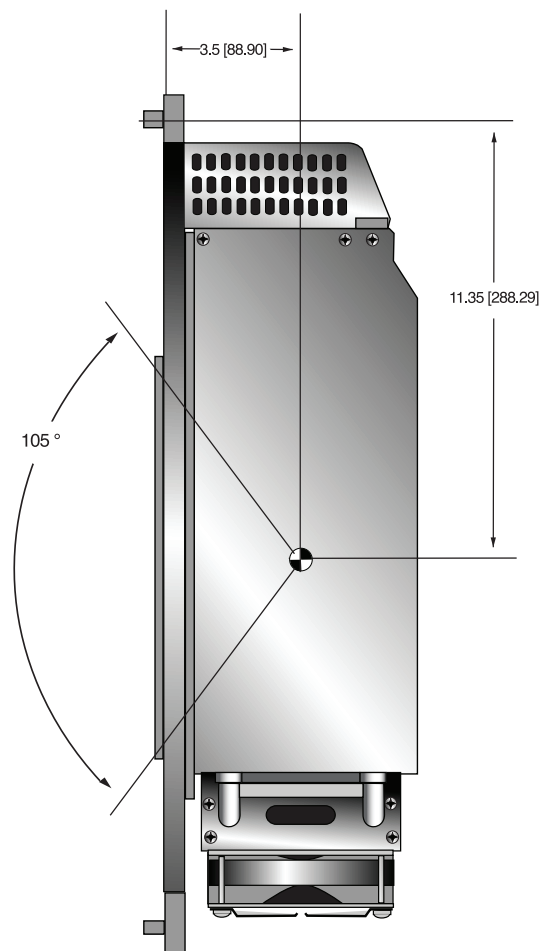
BACK VIEW



TOP VIEW



SIDE VIEW





Spellman's XRB302 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 320W. Features like small package size and RS-232 digital interface simplify integrating the XRB302 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 Options: 0.8mm x 0.8mm, 0.5mm x 0.5mm (IEC 336)
Beam Filter Options: 5052 Al, 0.040" (± 0.01 "); two pieces of 6061 Al, 0.16" (± 0.005 ")
Beam Geometry: Asymmetrical fan 105° x 4°, 80°x10°, cone up to 40°

Input Voltage:

200-264Vac, 50/60Hz, 4.0A max

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

X-Ray Tube Current:

0.5mA to 4mA over specified tube voltage range

X-Ray Tube Power:

320A maximum continuous

Voltage Regulation:

Line: $\pm 0.05\%$ for a $\pm 10\%$ input line change
Load: $\pm 0.05\%$ for a 0.5mA to 4mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 2\%$ 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 Risettime:

Ramp time shall be <500ms from 10% to 90% of rated output

Voltage Overshoot:

Within 5% of rated voltage in <10ms

Voltage Ripple:

$\leq 1\%$ p-p of rated voltage @ 1kHz

Current Regulation:

Line: $\pm 0.5\%$ @ 50-100% V nominal over specified Line range
Load: $\pm 0.5\%$ @ 50-100% V nominal over specified Load range

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 2\%$ of the programmed value

Current Risettime:

<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:

3 pin, Phoenix Contact 1829167

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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and 2006/95/EC, The Low Voltage Directive.

AC INPUT POWER
JB11 3 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	Line	200-264Vac Input
2	GND	200-264Vac Input
3	Neutral	Neutral

RS-232 DIGITAL INTERFACE
JB16 9 PIN FEMALE D CONNECTOR

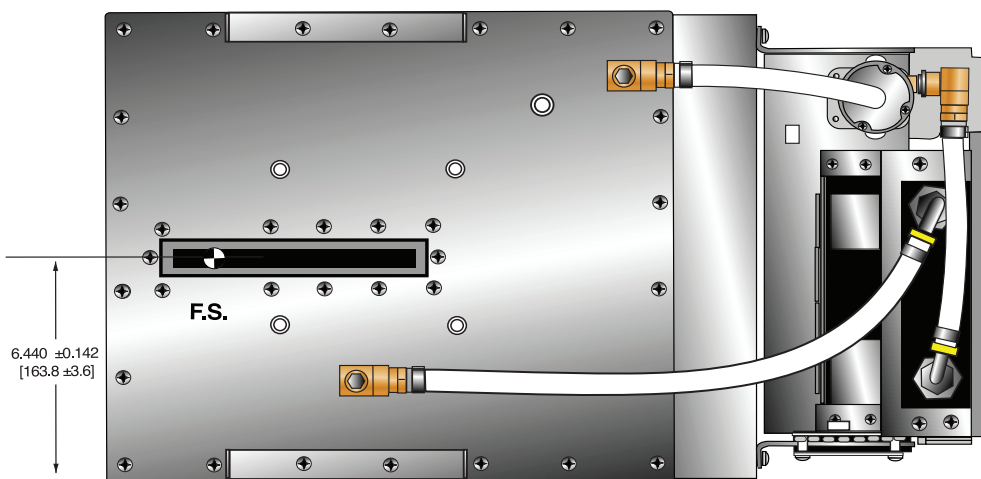
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	RS-232 Transmit
3	RX	RS-232 Receive
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

ANALOG MONITORING —
JB11 10 PIN PHOENIX CONTACT

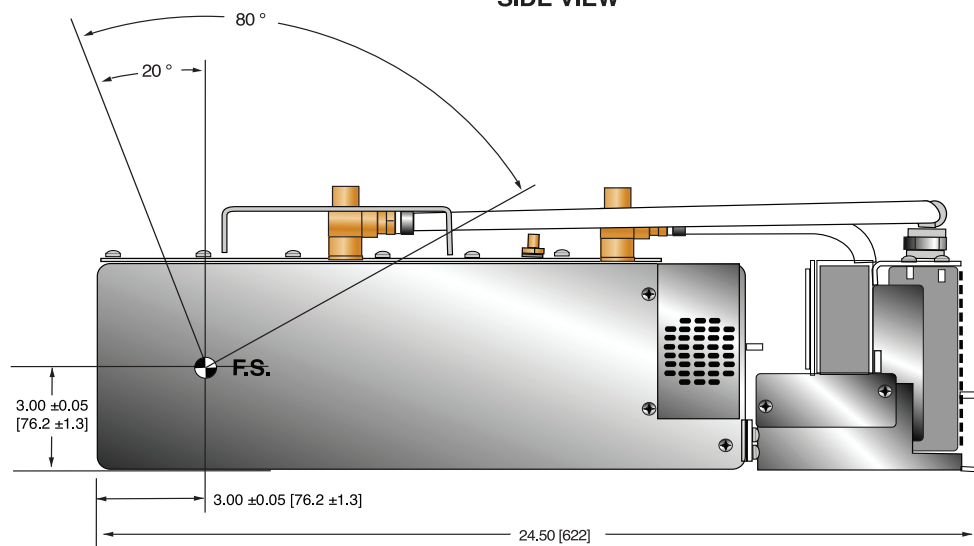
PIN	SIGNAL	PARAMETERS
1	X-Ray Enable	+24Vdc = Enable X-Ray 0Vdc/Open = Disable X-Rays
2	RTN	Signal Return
3	N/C	No Connection
4	kV Monitor	0 to 10Vdc = 0 to 100kV, Zout = 10kΩ
5	SGND	Signal Return
6	mA Monitor	0 to 10Vdc = 0 to 5mA, Zout = 10kΩ
7	Fault	Open Collector, High (Open) = No Fault, 35Vdc @10mA 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

DIMENSIONS: in.[mm]

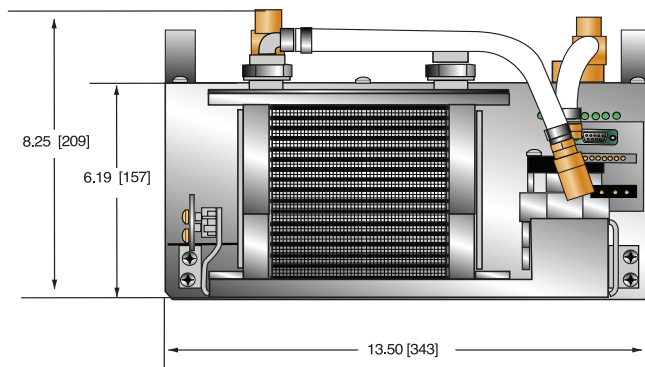
TOP VIEW



SIDE VIEW



BACK VIEW





Spellman's XRB401 Series of Monoblock® X-Ray sources are 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 the XRB401 into your X-Ray system. Standard models are available with fan 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: Food Inspection, Fill Level Confirmation, Security Applications, Industrial CT

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 105° x 4°

Input Voltage:

90Vac-264Vac, 50/60Hz, 6A maximum

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 100kV to 200kV

X-Ray Tube Current:

0.2mA to 2mA over specified tube voltage range

X-Ray Tube Power:

400W maximum continuous

Voltage Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ input line change
Load: $\pm 0.1\%$ for a 0.5mA to 2mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 1\%$ of the programmed value

Voltage Risettime:

<1 second from 10% to 90% of rated output

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring and Standard RS-232 Digital Interface**

Voltage Overshoot:

5% in less than 100ms

Voltage Ripple:

$\leq 0.2\%$ pp of rated maximum voltage

Current Regulation:

Line: $\pm 0.1\%$ @ 100-200kV, 0.25mA to 2mA
Load: $\pm 0.5\%$ @ 100-200kV, 0.25mA to 2mA

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 1\%$ of the programmed value

Current Risettime:

<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

Input Line Connector:

3 pin Phoenix Contact 1829167

Analog Interface Connector:

10 pin Phoenix Contact 1755503

Digital Interface Connector:

9 pin D connector, male

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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

Special Features:

Stationary or rotating CT application up to 120rpm

**AC INPUT POWER
3 PIN PHOENIX CONTACT**

PIN	SIGNAL	PARAMETERS
1	Line	90-264Vac
2	GND	Ground
3	Neutral	Neutral

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

PIN	SIGNAL	PARAMETERS
1	+24	+24Vdc
2	RTN	Return
3	+24	+24Vdc
4	RTN	Return

**ANALOG INTERFACE—
10 PIN PHOENIX CONTACT**

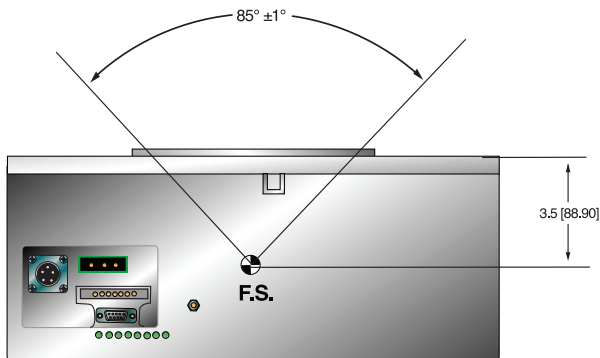
PIN	SIGNAL	PARAMETERS
1	X-Ray	+24Vdc = enable X-Ray
2	X-Ray Return	X-Ray Return
3	N/C	N/C
4	kV Monitor Output	0 to 9Vdc = 0 to 100% Rated Voltage
5	SGND	Signal Ground
6	mA Monitor Output	0 to 9Vdc = 0 to 100% Rated Current
7	Fault	Open Collector, Open = No Fault
8	Relay N/C	HV On, 50V @ 1A maximum
9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

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to E/A RS-232-C
3	Receive Data	Conforms to E/A RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

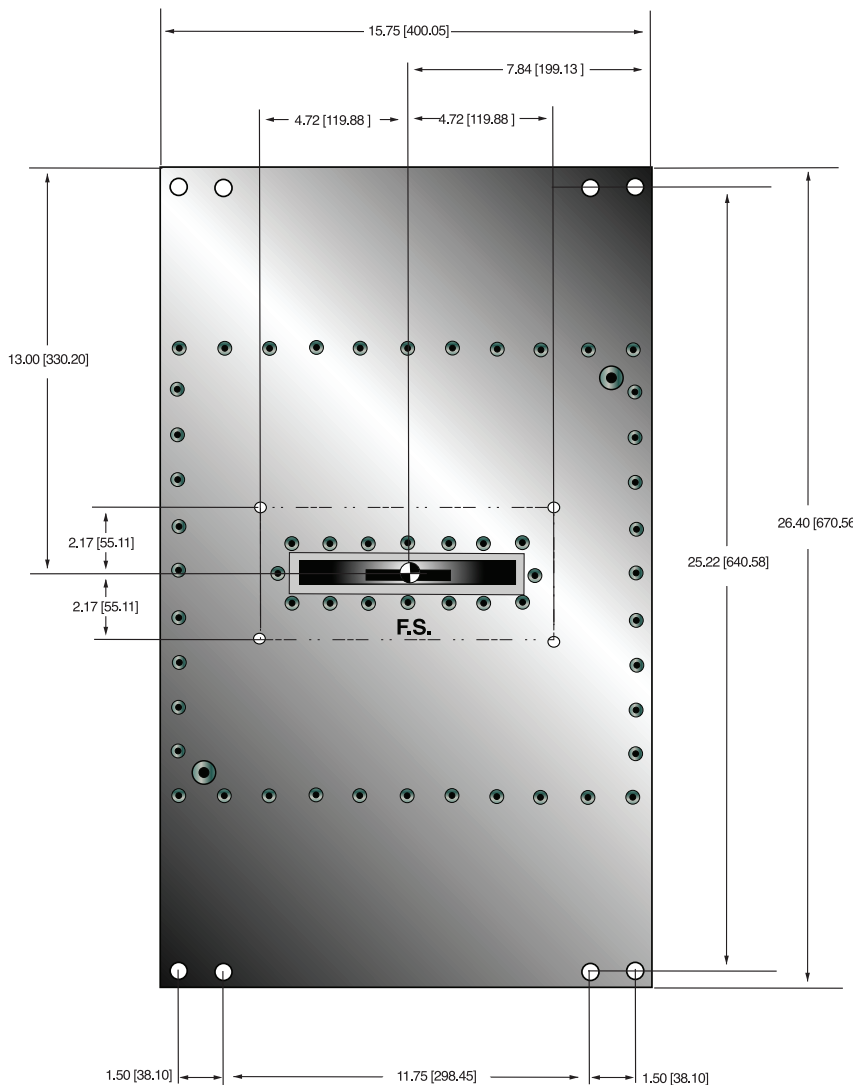
FRONT VIEW



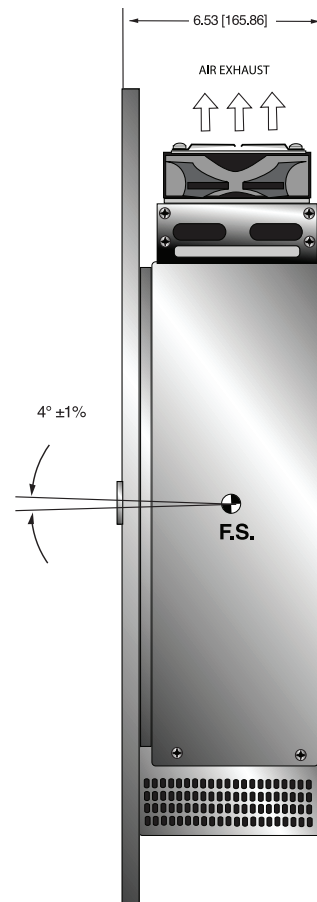
BACK VIEW

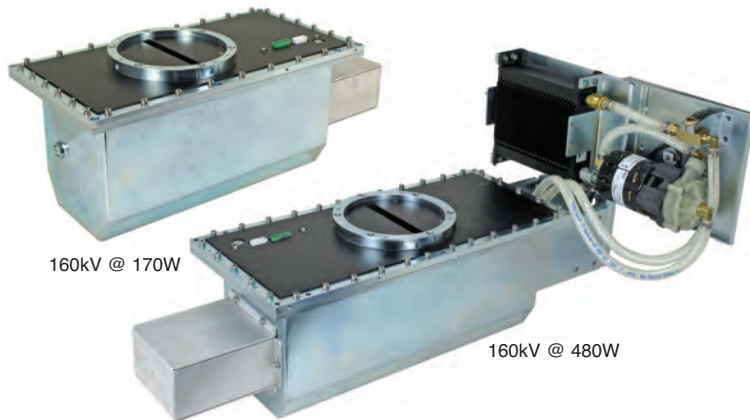


TOP VIEW



SIDE VIEW





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in any Physical Orientation**
- **Ethernet and Standard RS-232 Digital Interface**

Spellman's XRBC Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 170W, or 160kV at 480W with an oil cooler. Features like universal input, small package size with Ethernet and RS-232 digital interface simplify integrating the XRBC into your X-Ray system. Standard models are available either with fan shaped or cone shaped beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

Scanning, Security Applications

SPECIFICATIONS

X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter
Focal Spot: 0.8mm x 0.8mm
Beam Filter: 1.7mm Glass, typical
+ 12mm oil + 3mm PEEK, 0.8 Be
Beam Geometry: Fan up to 80° x 10° nominal or
cone beam up to 40°

Input Voltage:

480W Single phase - 90-264Vac, 50/60Hz, 8 amps, maximum. IEC320 input connector with EMI filter
170W Single phase - 90-264Vac, 50/60Hz, 3.15 amps,

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

X-Ray Tube Current:

0.5mA to 1.2mA over specified tube voltage range (up to 3mA available upon request with oil cooler)

X-Ray Tube Power:

170W, maximum continuous, or 480W with oil cooler

Voltage Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ input line change of nominal input line voltage
Load: $\pm 0.1\%$ for a 10% to full load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 2\%$ of the programmed value

Voltage Risetime:

Ramp time shall be <350 msec from 10% to 90% of rated output

Voltage Overshoot:

Within 2% of rated voltage

Voltage Ripple:

0.1% pp of rated voltage from 10 Hz to 10kHz across X-Ray tube

Current Regulation:

Line: 0.1% over a range of line voltage from 90 to 264Vac
Load: <0.5% @ 80-160kV, 0.1mA to 3mA

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 2\%$ of the programmed value

Current Risetime:

<350 msec from 10% to 90% of rated output

Arc Intervention:

200mS quench with a 4 arcs in 10 seconds shutdown

Filament Configuration:

High frequency AC filament drive; referenced to cathode potential of the X-Ray tube. Closed loop filamentary emission control circuit regulates filament current to provide desired X-Ray tube emission current.

Digital Interface:

Ethernet and RS-232

Operating Temperature:

0°C to +40°C

Storage Temperature:

-30°C to +70°C

Humidity:

5% to 95% relative humidity, non-condensing

Cooling:

170W unit: Customer provided convection/external forced air to keep oil temperature <55°C
480W unit: Heat exchanger w/fan and oil pump, powered from customer provided 115Vac

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

See line drawings

Weight:

170W unit: <150 lbs (68.0 kg)

480W unit: <180 lbs (81.64 kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm from surface of the Monoblock® when operating at maximum rated kV and maximum rated X-Ray tube power.

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

**ETHERNET DIGITAL INTERFACE—
RJ45 8 PIN FEMALE CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	TX +	Transmit Data +
2	TX -	Transmit Data -
3	RX +	Receive Data +
4	N/C	No Connection
5	N/C	No Connection
6	RX -	Receive Data -
7	N/C	No Connection
8	N/C	No Connection

**ANALOG INTERFACE—
J4 15 PIN FEMALE D CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	N/C	No Connection
3	Enable	+24Vdc (>20Vdc) = HV ON
4	Signal Ground	Ground
5	kV Monitor	0-4.5Vdc = 0 to 100% rated output, Zin = 10kΩ
6	N/C	No Connection
7	mA Monitor	0-4.5Vdc = 0 to 100% rated output, Zin = 10kΩ
8	Interlock	Dry contact to ground (10mA) = interlock closed
9	Signal Ground	Ground
10	N/C	No Connection
11	Signal Ground	Ground
12	HV ON Lamp Relay	Normally open, X-Ray ON = closed, 30Vdc @ 1A maximum
13	HV ON Lamp Relay	Common dry contact, 30Vdc @ 1A maximum
14	HV ON Lamp Relay	Normally closed, X-Ray ON = open, 30Vdc @ 1A maximum
15	Power Supply Fault	Open collector, 35Vdc @ 10mA maximum, High = no fault, series Zin = 1kΩ

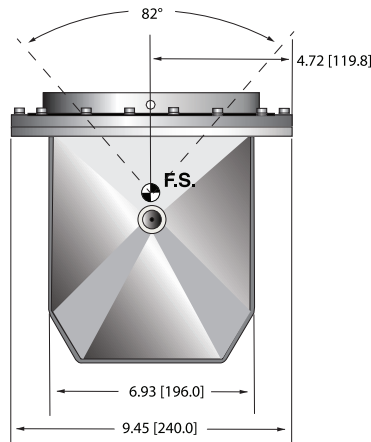
LED INDICATORS

INDICATOR	COLOR	CONDITION Illuminated When...
POWER	GREEN	Power is ON
X-RAY ON	YELLOW	X-Rays are enabled
FAULT	RED	Fault
INTERLOCK	WHITE	Interlock closed
ARC FAULT	RED	Momentarily illuminated for 1 ARC, Continuous for arc shutdown after multiple arcs
OVER VOLTAGE	RED	Over Voltage fault occurs
UNDER VOLTAGE	RED	Under Voltage fault occurs
OVER CURRENT	RED	Over Current fault occurs
UNDER CURRENT	RED	Under Current fault occurs
OVER TEMP	RED	Over Temperature fault occurs

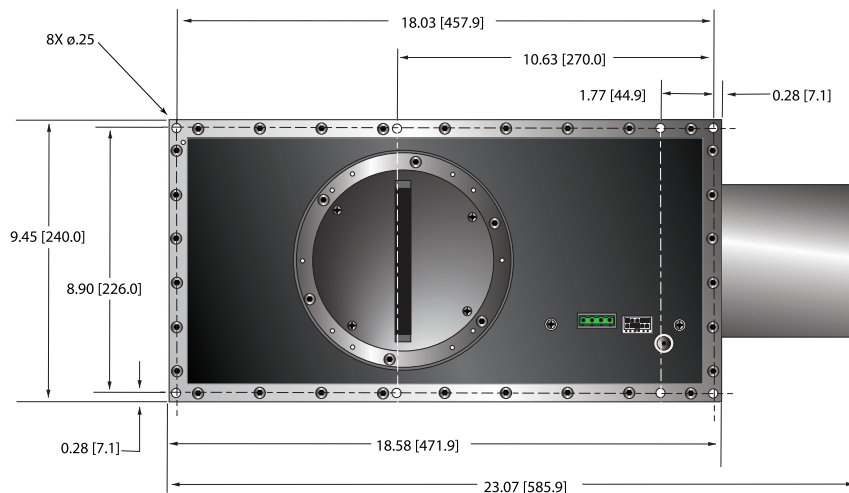
DIMENSIONS: in.[mm]

XRBC 170W UNIT

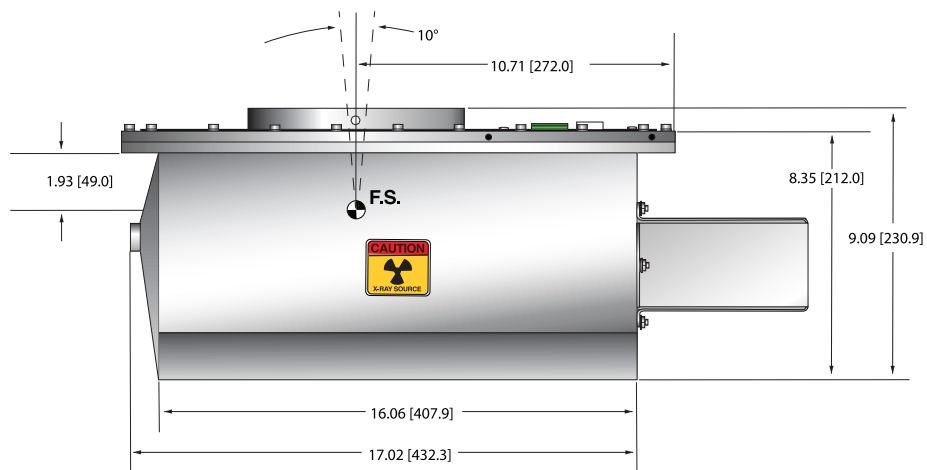
FRONT VIEW



TOP VIEW



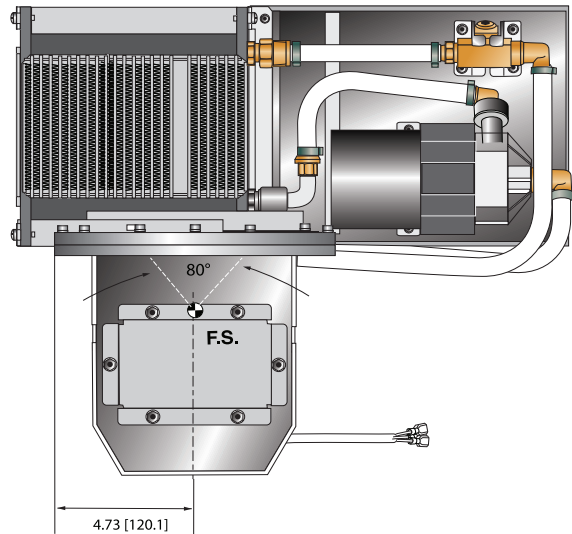
SIDE VIEW



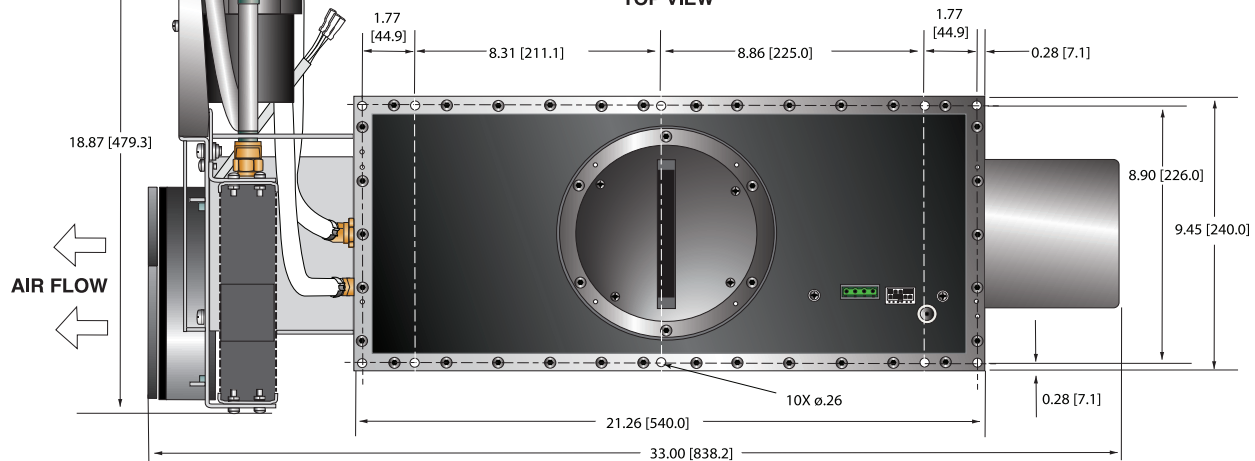
DIMENSIONS: in.[mm]

XRBC 480W UNIT

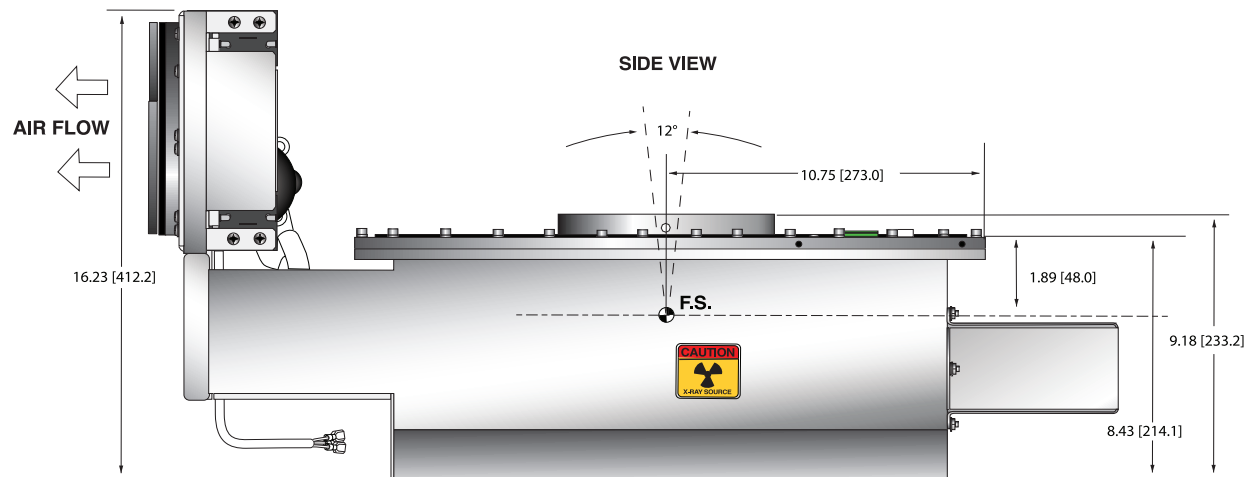
FRONT VIEW



TOP VIEW

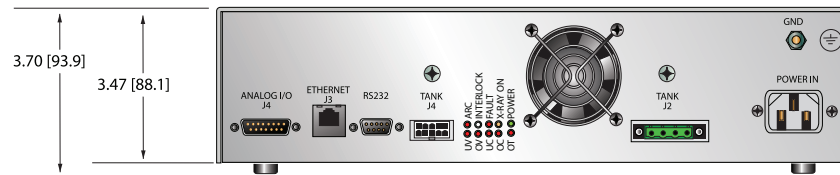


SIDE VIEW

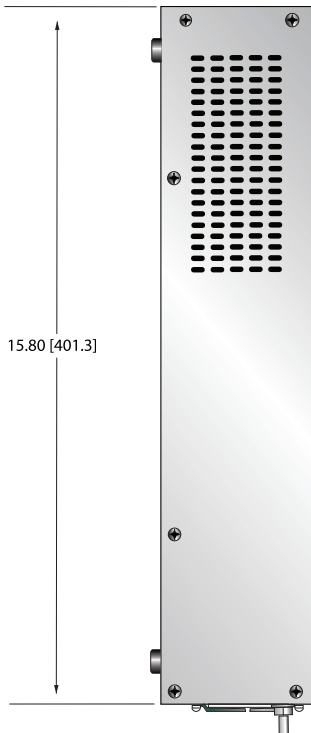


DIMENSIONS: in.[mm]
CONTROLLER

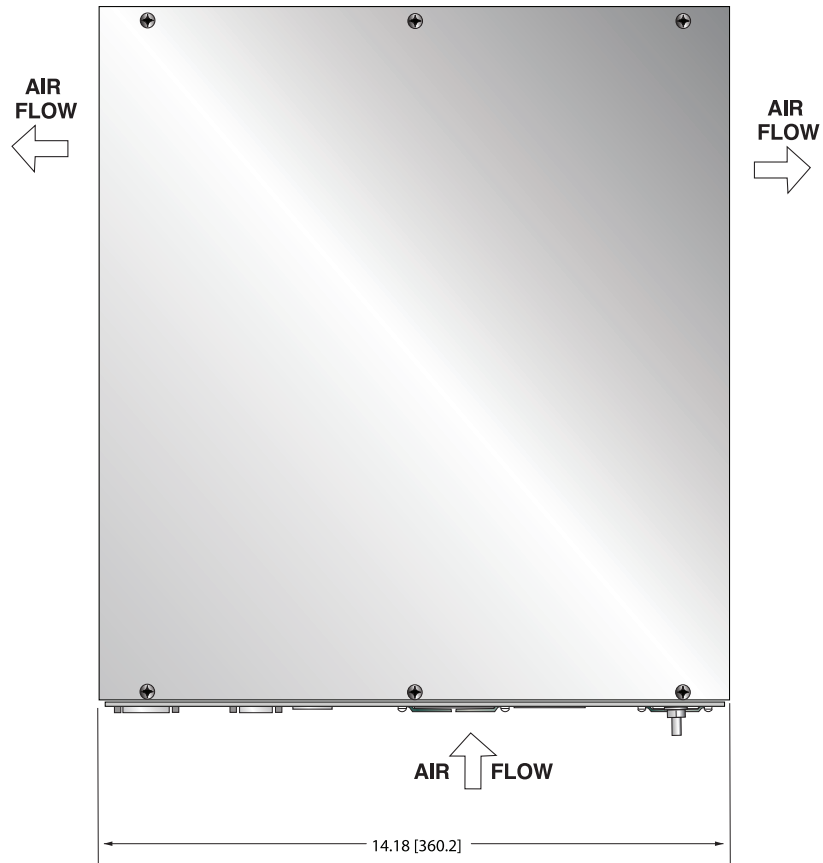
FRONT VIEW

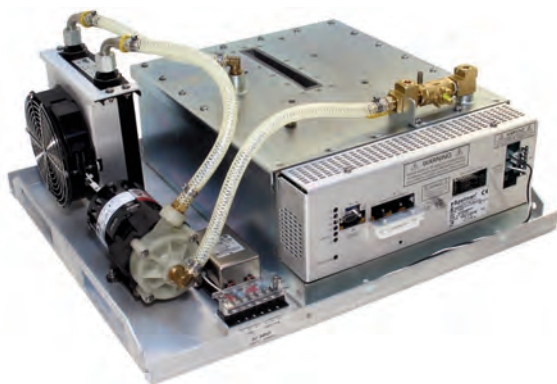


SIDE VIEW



TOP VIEW





Spellman's XRB501 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 500W. Features like power factor correction, small package size, standard analog monitoring and RS-232 digital interface simplify integrating the XRB501 into your X-Ray system. Standard models are available either with fan shaped or 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: 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, 0.5mm x 0.5mm (320W max)
Beam Filter:	0.016-0.08" thick 6061 Al 0.125" Ultem
Beam Geometry:	Asymmetrical fan up to 80° x 30°, cone up to 40°

Input Voltage:

120Vac, $\pm 10\%$, 50/60Hz, 6.5A max (230Vac optional)

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:

500W, maximum continuous

Voltage Regulation:

Line:	$\pm 0.1\%$ for a $\pm 10\%$ input line change of nominal input line voltage
Load:	$\pm 0.1\%$ for a 0.25mA to 3mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 2\%$ plus 1.785kV of the programmed value

- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **Power Factor Corrected with Internal EMI Filter**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring and Standard RS-232 Digital Interface**

Voltage Risetime:

Ramp time shall be ≤ 2 seconds from 10% to 90% of rated output

Voltage Overshoot:

$\pm 1\%$ switching between 90kV to 160kV @ 0.25mA

Voltage Ripple:

$\leq 0.1\%$ of rated voltage from 10Hz to 1kHz

Current Regulation:

Line:	$\pm 0.5\%$ @ 80-160kV, 0.25mA to 3mA
Load:	$\pm 0.5\%$, 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 with Eberline E-120 survey meter
with Eberline HP-270 energy compensated probe

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and
2006/95/EC, The Low Voltage Directive.

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

PIN	SIGNAL	PARAMETERS
1	Line	120Vac
2	Removed	N/C
3	Neutral	Neutral
4	Removed	N/C
5	Spare	N/C
6	Spare	N/C

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

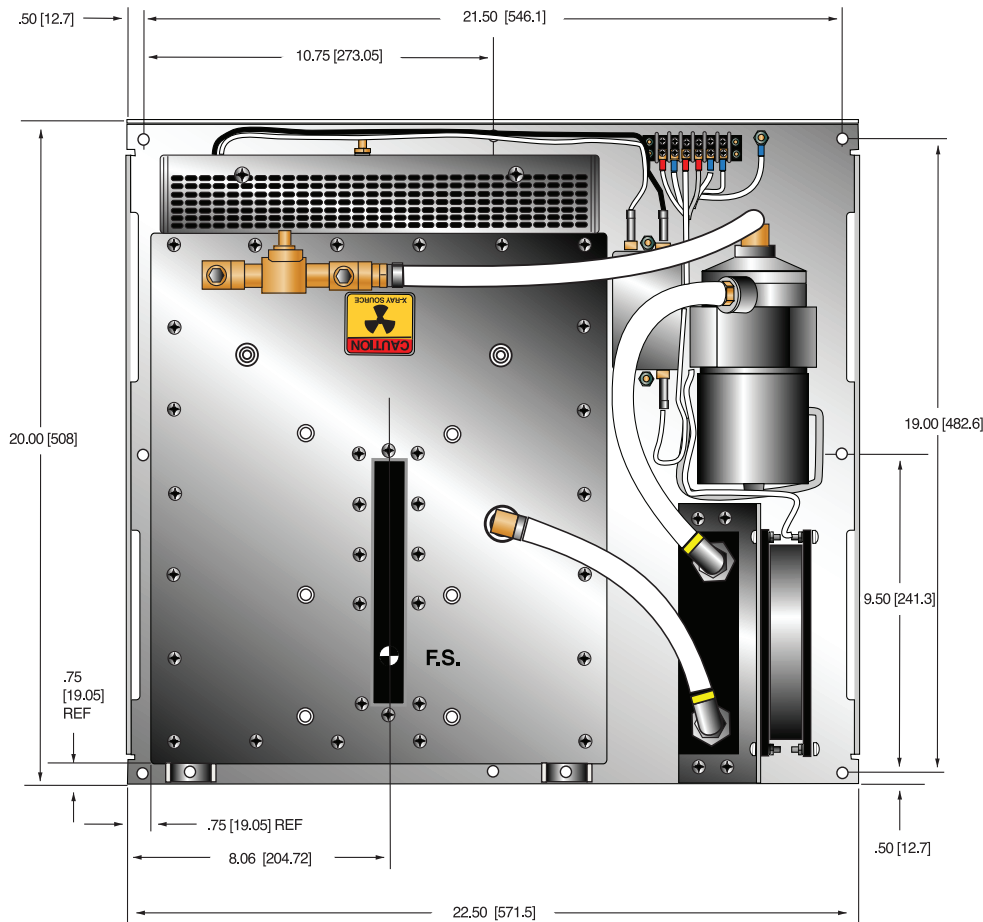
PIN	SIGNAL	PARAMETERS
1	X-Ray	+12Vdc @16mA = enable X-Ray
2	X-Ray Return	X-Ray Return
3	N/C	N/C
4	kV Monitor Output	0 to 1.6Vdc = 0 to 160kV
5	SGND	Signal Ground
6	mA Monitor Output	0 to 3Vdc = 0 to 3mA
7	Fault	Open Collector, Open = No Fault

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

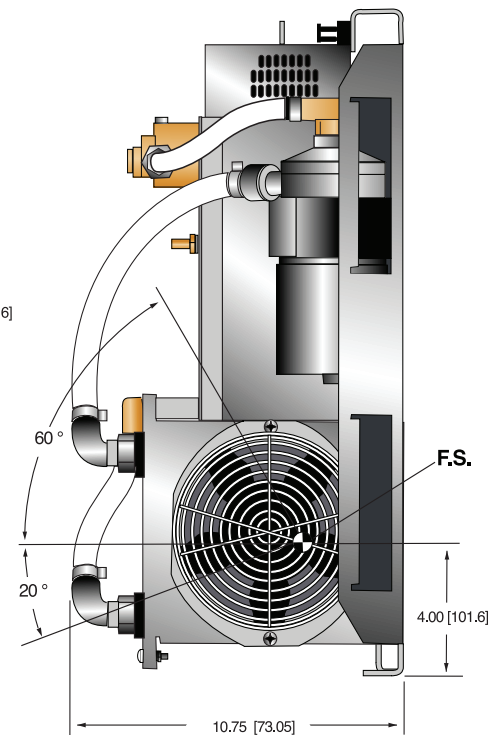
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	X-Ray Enable	+12Vdc @ 16mA = Enable
9	N/C	No Connection

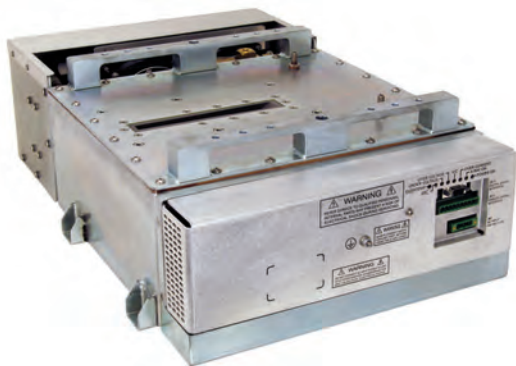
DIMENSIONS: in.[mm]

TOP VIEW



SIDE VIEW

 $\subset \in$



Spellman's XRB502 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 500W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating the XRB502 into your X-Ray system. Standard models are available either with fan shaped or 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: 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, 0.5mm x 0.5mm
Beam Filter: 0.016" thick 6061 Al, ± 0.0045 "
0.125" Ultem
Beam Geometry: Asymmetrical fan up to 80° x 30°,
cone up to 40°

Input Voltage:

90-264Vac, 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 6mA over specified tube voltage range

X-Ray Tube Power:

500W, maximum

Voltage Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ input line change of nominal input line voltage
Load: $\pm 0.1\%$ for a 0.3mA to 6mA load change

Voltage Accuracy:

Voltage measured across the X-Ray tube is within $\pm 1\%$ of the programmed value

Voltage Risetime:

Ramp time shall be <1 second from 10% to 90% of rated output

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

Voltage Overshoot:

Within 5% of rated voltage in <10ms

Voltage Ripple:

0.1% pp of rated voltage @ $\leq 1\text{kHz}$

Current Regulation:

Line: $\pm 0.1\%$ for a $\pm 10\%$ input line change of nominal input line voltage
Load: $\pm 0.5\%$ @ 75-160kV, 0.3mA to 6mA

Current Accuracy:

Current measured through the X-Ray tube is within $\pm 2\%$ 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:

10% to 95% relative humidity, non-condensing

Cooling:

Heat exchanger w/fan and oil pump, powered from DC

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:

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 per FDA 21 CFR 1020.40 and OSHA 29 CFR 1020.96

Special Features/Requirements:

55dB SPL @ 1m with fans stopped on heat exchanger High stability X-ray output: Dose rate variations <1%

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and 2006/95/EC, The Low Voltage Directive.

**AC INPUT POWER
J1 3 PIN CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	Line	100-264Vac
2	Removed	N/C
3	Neutral	Neutral

**ANALOG INTERFACE—
JB15 10 PIN PHOENIX CONTACT**

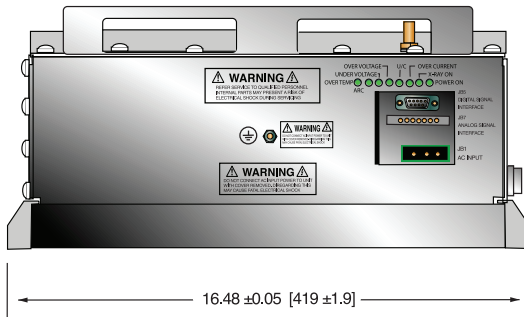
PIN	SIGNAL	PARAMETERS
1	X-Ray Signal	+24Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=2.2k Ω
2	X-Ray Signal Return	Signal Return
3	N/C	N/C
4	kV Monitor	0-10Vdc = 0 to 178kV, Zout = 10k Ω
5	Signal Ground	Signal Ground
6	mA Monitor	0-10Vdc = 0 to 3.4mA, Zout = 10k Ω
7	Fault Signal	Open collector, High (Open) = No Fault, 35Vdc @10mA maximum
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

LED INDICATORS

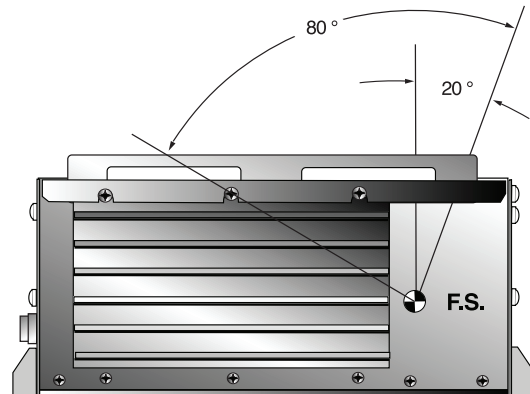
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OT	Over temperature occurs
LED 2	ARC FLT	Arc fault occurs
LED 3	UV	Low kV occurs
LED 4	OV	High kV occurs
LED 5	UC	Low mA occurs
LED 6	OC	High mA occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

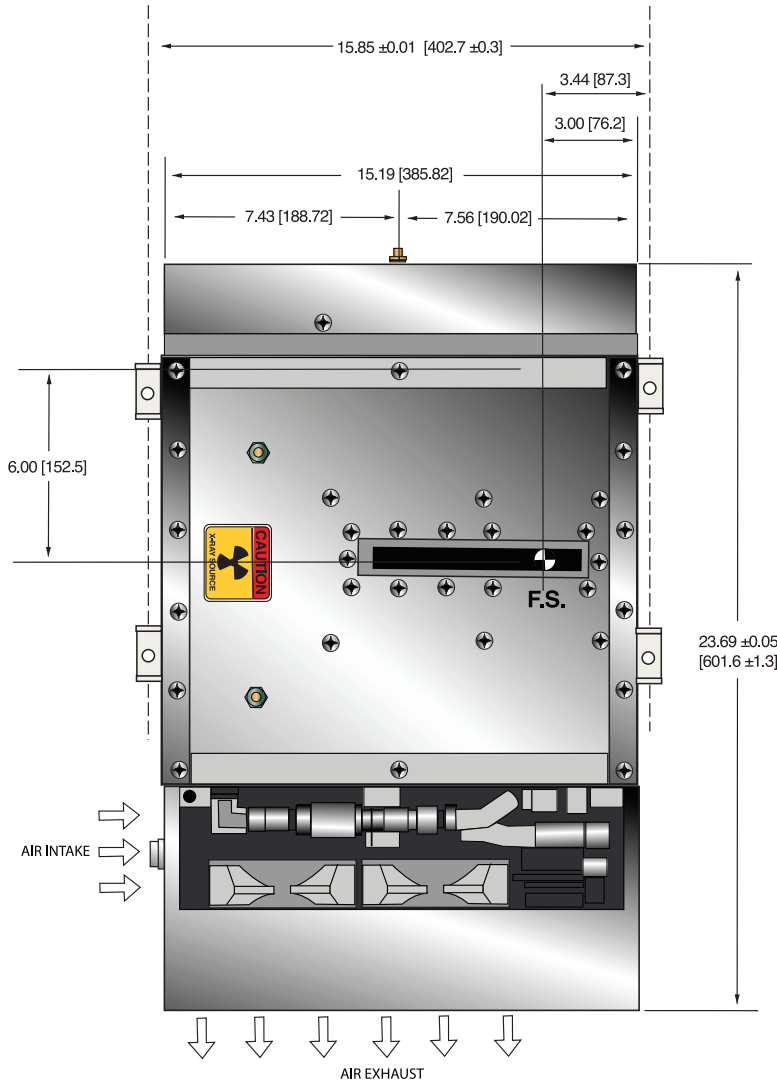
FRONT VIEW



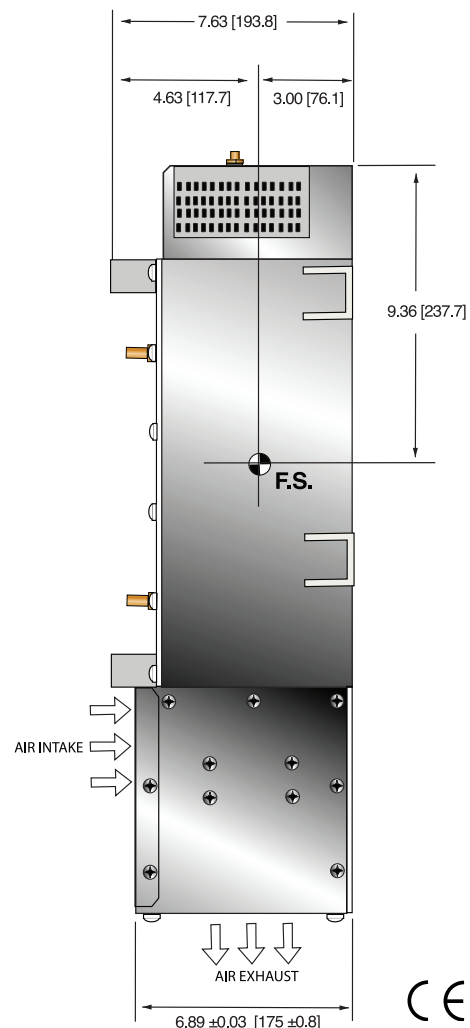
BACK VIEW



TOP VIEW



SIDE VIEW





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

Spellman's XRB701 Series of Monoblock® X-Ray sources are designed for OEM applications powering its internal X-Ray tube up to 160kV at 700W. Features like small package size and RS-232 digital interface simplify integrating the XRB701 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°

Input Voltage:

230Vac, $\pm 15\%$, 50/60Hz, 5A max

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 80kV to 160kV

X-Ray Tube Current:

0.25mA to 6mA over specified tube voltage range

X-Ray Tube Power:

700W, maximum continuous

Voltage Regulation:

Line: $\pm 0.1\% \pm 10\%$
Load: $\pm 0.1\% 0.25$ to 6mA

Voltage Accuracy:

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

Voltage Risettime:

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: $\pm 0.5\% \pm 10\%$
Load: $\pm 0.5\% 0.25$ to 6mA

Current Accuracy:

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

Current Risettime:

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

Input Line Connector:

5 pin Molex 26-60-4050

Cooling Power Connector:

4 pin Tyco 206061-1

Digital Interface Connector:

9 pin D connector, female

Grounding Point:

M5 ground stud provided on chassis

Dimensions:

See drawing

Weight:

140lbs ±10lbs (64kg ±4.5kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Less than 300uR/hr at a distance of 10cm from all surfaces while operating at 160kV @ 4.3mA

Special Features:

Stationary or rotating CT application up to 100rpm

AC INPUT POWER

J1 5 PIN CONNECTOR (MOLEX 26-60-4050)

PIN	SIGNAL	PARAMETERS
1	Line	230Vac Input
2	Line	230Vac Input
3	N/C	No Connection
4	Neutral	230Vac Neutral
5	Neutral	230Vac Neutral

COOLING POWER

J2 4 PIN CONNECTOR (TYCO 206061-1)

PIN	SIGNAL	PARAMETERS
1	Line	230Vac Input
2	N/C	No Connection
3	Neutral	230Vac Neutral
4	GND	Chassis Ground

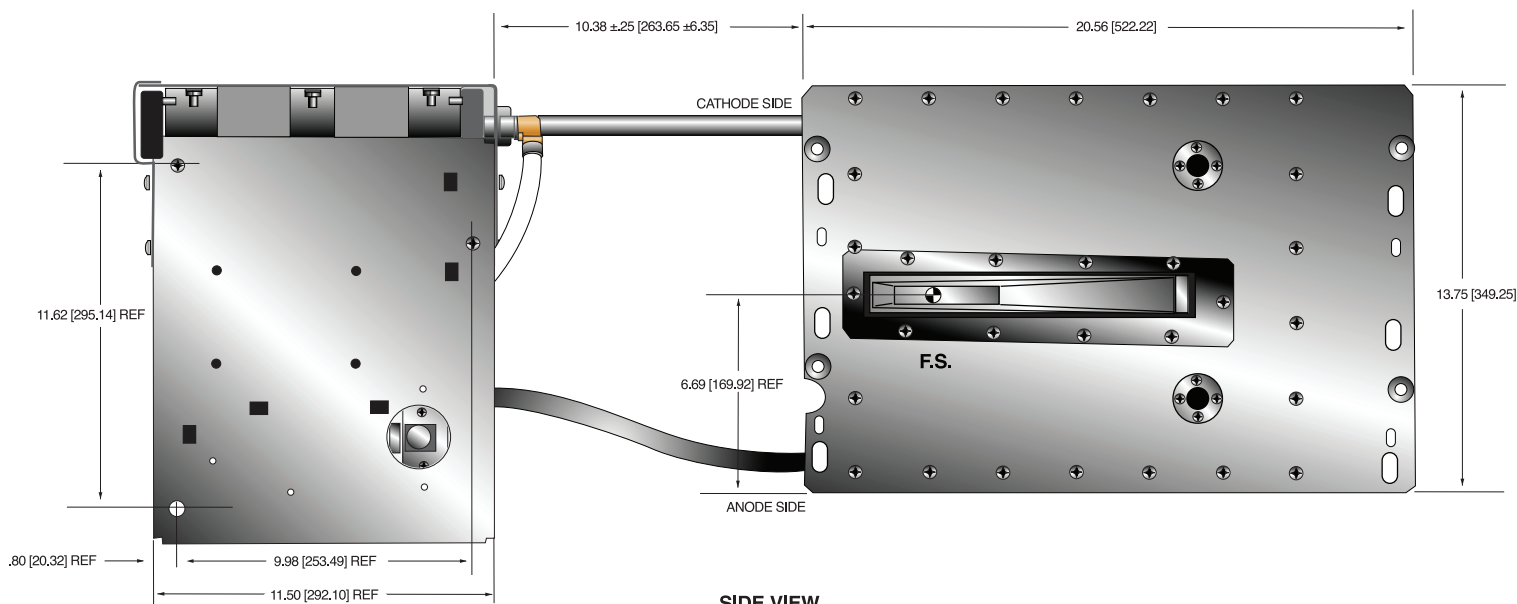
RS-232 DIGITAL INTERFACE—

J5 9 PIN FEMALE D CONNECTOR

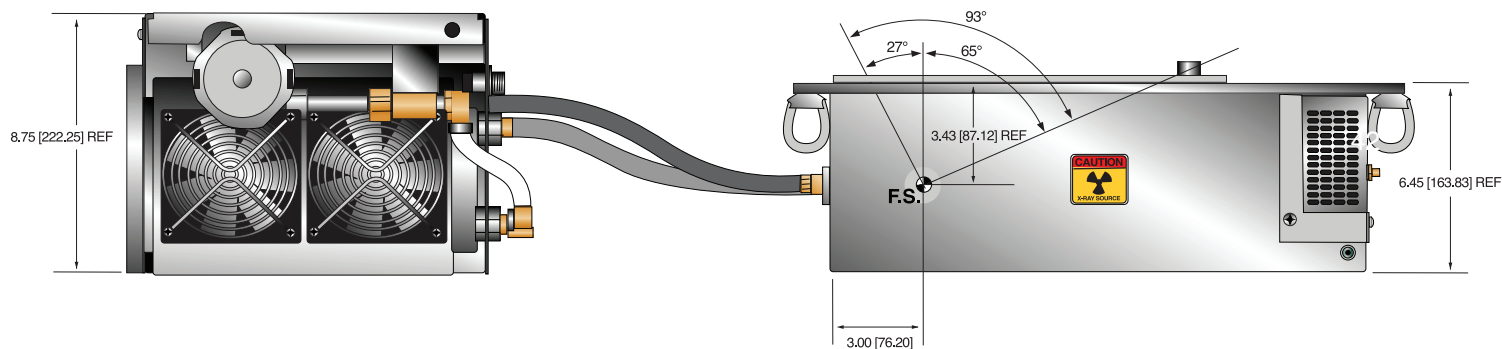
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

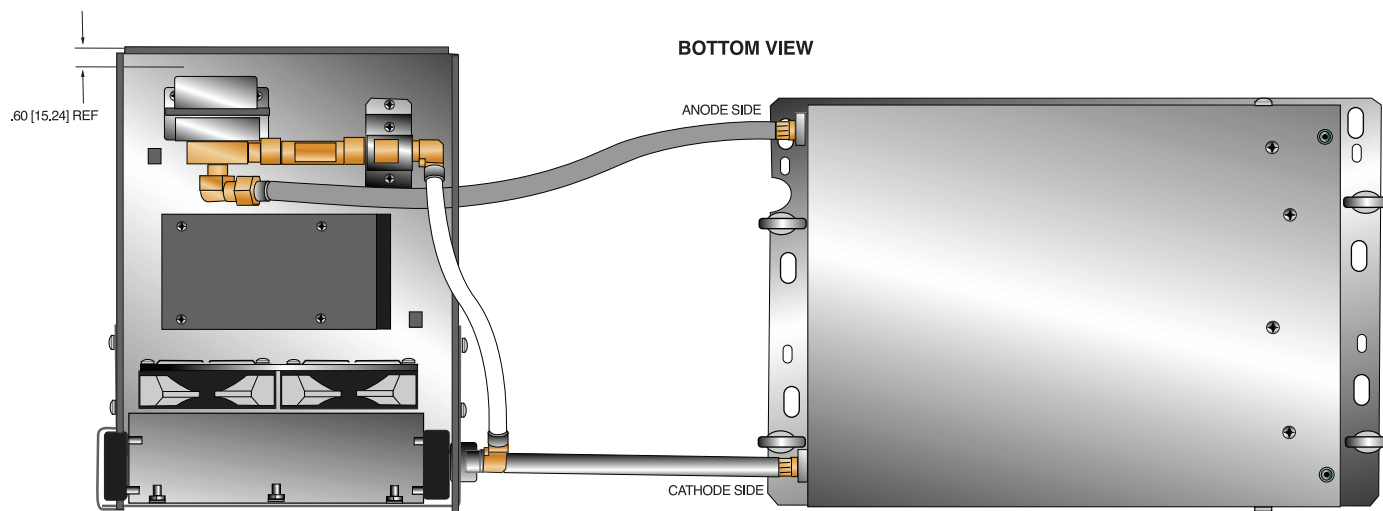
TOP VIEW



SIDE VIEW



BOTTOM VIEW



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