

2024



MONOBLOCK[®]

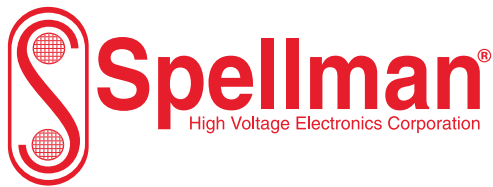
THE INTEGRATED X-RAY SOURCE



Powering the Future of Advanced Technologies

spellmanhv.com

01.08.2024



Plastics Sorting

Mineral Analysis

Crystal Inspection

X-Ray Fluorescence

Plating Measurement

X-Ray Diffraction

Thickness Gauging

Cargo Screening

Food Inspection

NDT Analysis

Undersea Telecom

Security Applications

Radiography

Fluoroscopy

Extraoral Dental X-Ray

Bone Densitometry

Mammography

Mass Spectrometry

Capillary Electrophoresis

Electrostatic Printing

Ion Beam Implantation

Semiconductor Processing

Electron Beam Welding

Capacitor Charging

High Power RF Transmitters

Spellman High Voltage. Powering the Future of Advanced Technologies



For over 75 years, Spellman has been helping technology companies grow by providing standard and custom high voltage power converters, X-Ray generators and Monoblock® X-Ray sources of exceptional value and

performance and by aligning our procedures, processes and infrastructure to support our customers' goals – a process we call homologation. At Spellman, homologation is in everything we do. From initial product concept through final delivery, we dedicate a team of experts to work with each customer.

Your Vision is Our Mission

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

Innovation & Quality

With over 75 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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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**

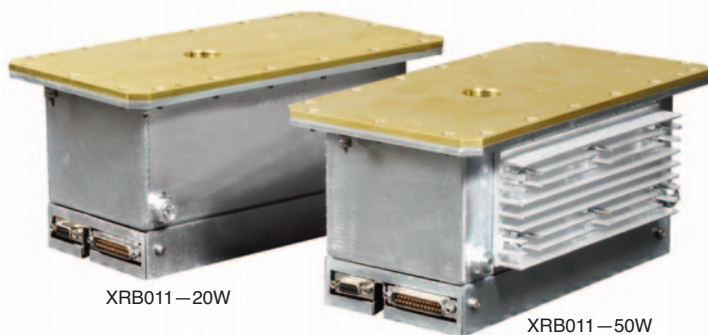
MODEL	MAX. VOLTAGE	MAX. POWER	PAGE
XRBO11	80kV	20W, 50W	4-7
uXRb130P65	130kV	65W	8-12
XRb80N100	80kV	100W	13-16
XRb80PN100HR	80kV	100W	17-22
XRb100N100	100kV	100W	18-25
XRbHR	80kV–100kV	100W–500W	26-33
XRBD	160kV	100W–500W	34-41
XRb180PN200	180kV	200W	42-44
XRBe80PN300	80kV	300W	45-49
XRb80PN320	80kV	320W	50-52
XRb200PN400/CT	200kV	400W	53-55
XRb160PN480/1	160kV	480W	56-58
XRb160PN480/2	160kV	480W	59-61
XRb160PN480/CT	160kV	480W	62-64
XRb200PN500	200kV	500W	65-67
XRb150PN600	150kV	600W	68-70
XRb160PN688/CT	160kV	688W	71-73
PDM90PN900	90kV	900W	74-76
MMB125PN3.5	125kV	3.5kW	77-79



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- **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**

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: 33µm Nominal, 50µm max. (IEC 336)
Beam Filter: Ultem 0.060" (1.5mm)
Oil 0.175" (4.4mm)
Beam Geometry: Symmetrical 40° cone

Input Voltage:

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

X-Ray Tube Voltage:

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

X-Ray Tube Current:

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

X-Ray Tube Power:

20/50W maximum continuous

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage Risettime:

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

Voltage Temperature Coefficient:

≤100ppm/°C

Over Temperature Fault:

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

Over Voltage Fault:

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

Voltage Ripple:

1% peak to peak

Current Regulation:

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

Current Accuracy:

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

Over Current Fault:

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

Arc Intervention:

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

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Analog Interface:

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

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:

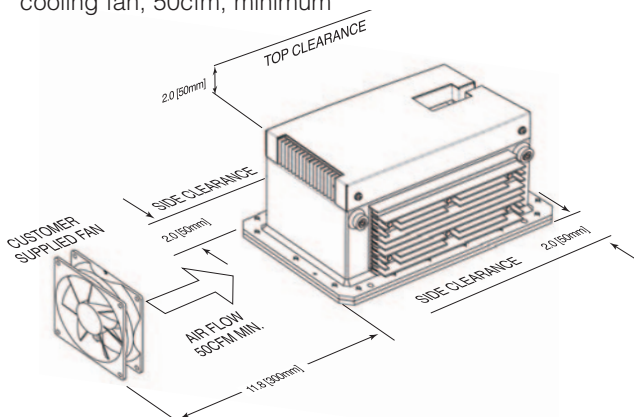
-20°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

20W and 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 1mR/hr at 1 meter

Regulatory Approvals:

Compliant to UL/CUL recognized file E242584.
CE to EN 61010-1 for non-medical applications.

**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 -	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

Medical Applications:

- 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

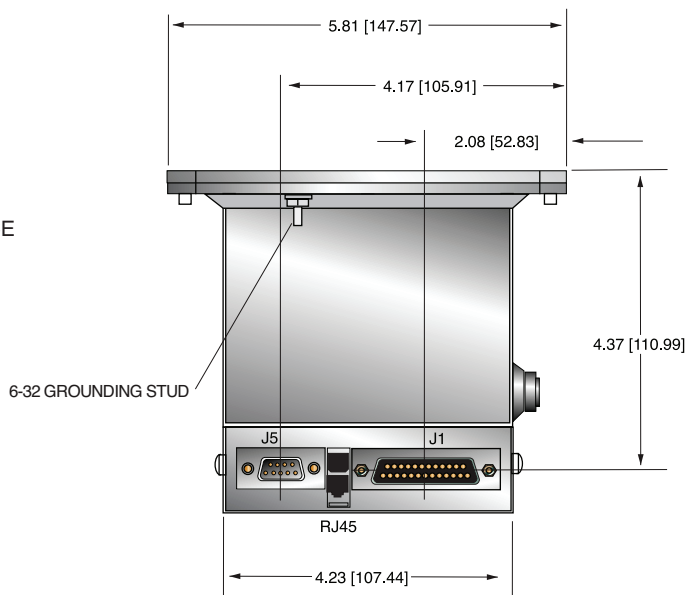
Non-Medical Applications:

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

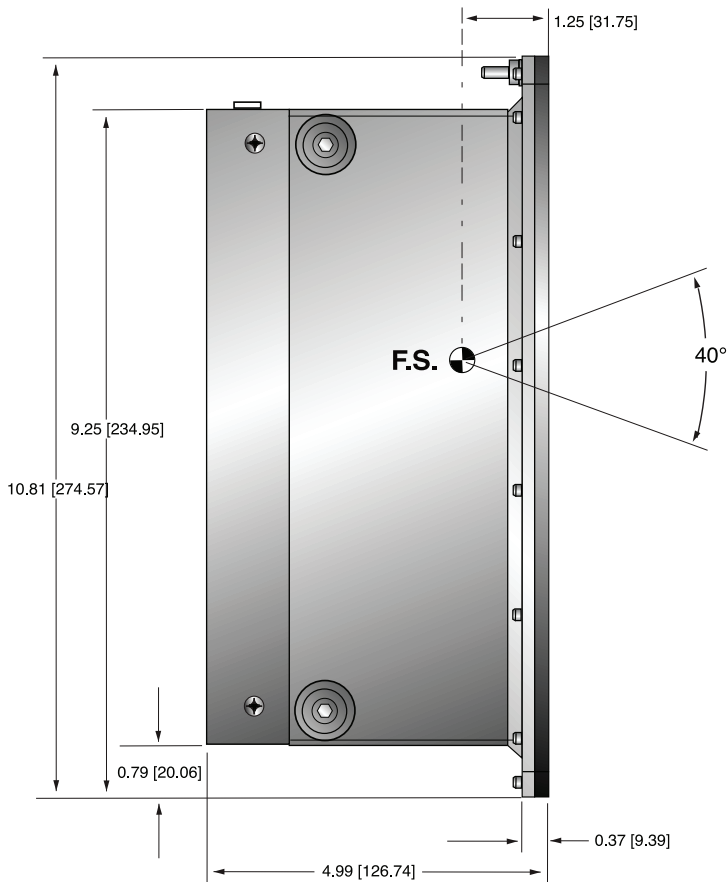
XRB011
20W Model

DIMENSIONS: in.[mm]

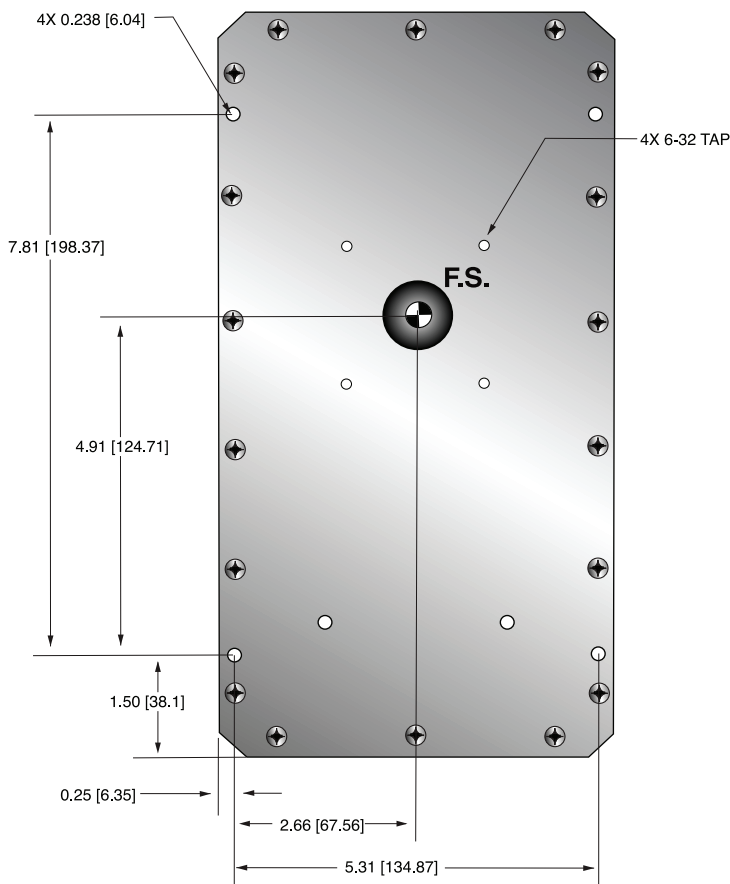
FRONT VIEW



SIDE VIEW



TOP VIEW



50W Model ORDERING INFORMATION

Medical Applications:

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

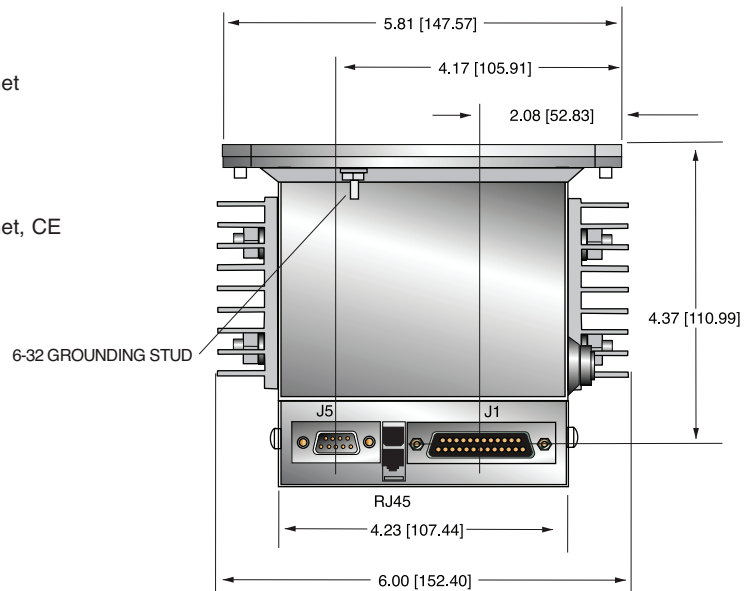
Non-Medical Applications:

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

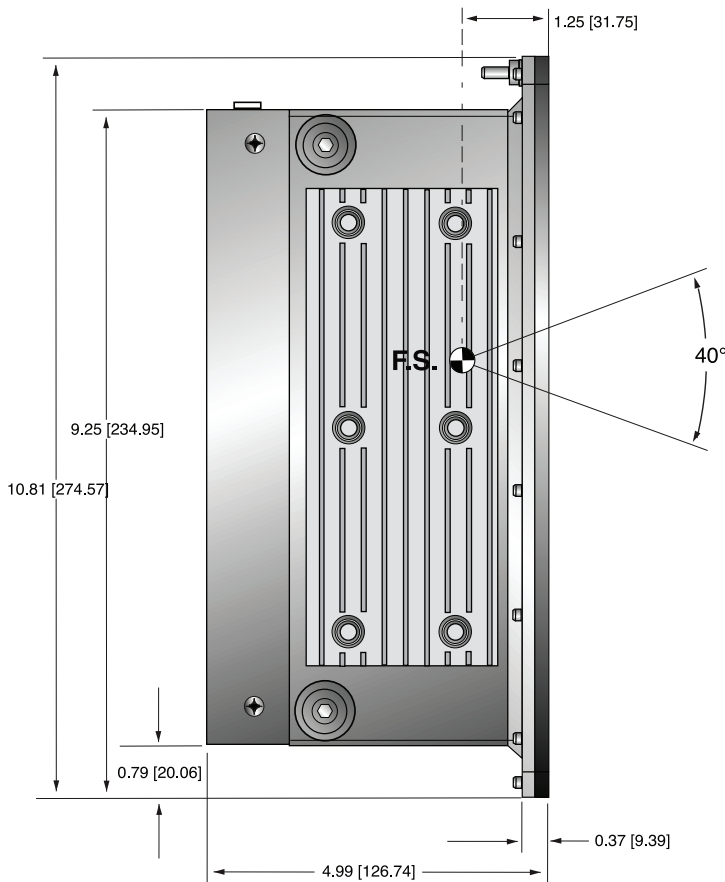
XRB011 50W Model

DIMENSIONS: in.[mm]

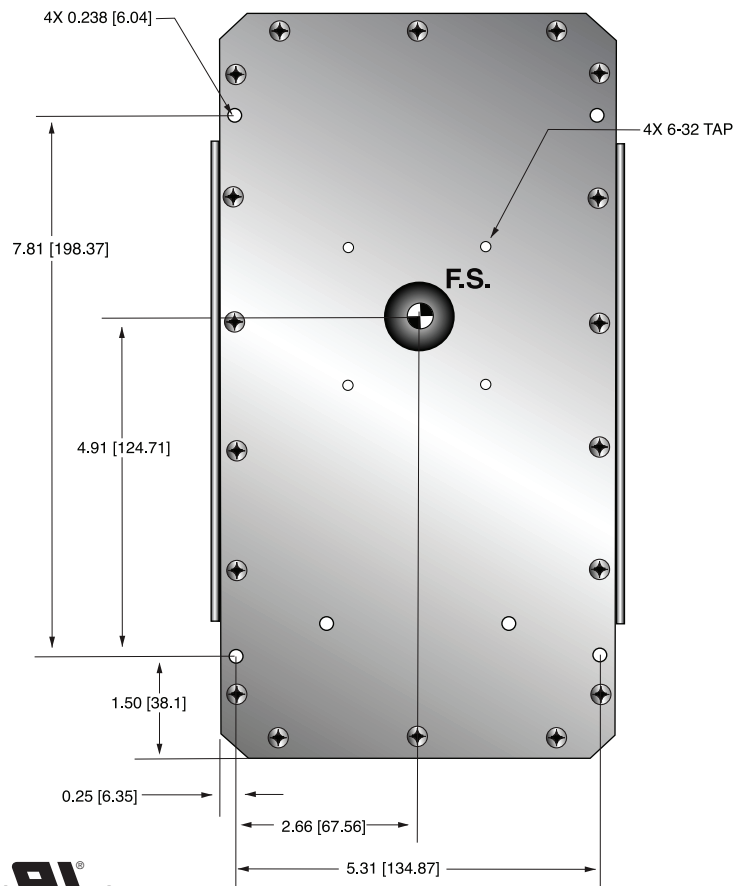
FRONT VIEW



SIDE VIEW



TOP VIEW





- **Integrated X-Ray Tube and Control Electronics in One Compact Assembly**
- **Standard RS-232 Digital Interface Offers Access to Diagnostics and Operating Logs**
- **Standard Windows Test GUI**
- **7 Micron Focal Spot for Narrow Beam**
- **8 Micron Focal Spot for Wide Beam**
- **10mm/14mm Spot to Window Spacing Provides High Geometric Magnification**

Spellman's μ XRB130P65 microfocus Monoblock® X-Ray sources are designed for high resolution imaging applications powering its internal microfocus X-Ray tube up to 130kV @ 65W. Features like 24Vdc input voltage, small package size and standard RS-232 digital interface simplify integrating the μ XRB130P65 into your X-Ray system. The small, round focal spot size, optimized over the range of operating voltage, and high magnification, combined with stable high intensity output provides distortion free, superior quality 2D and 3D images.

TYPICAL APPLICATIONS

Industrial X-Ray:

- Circuit board and electronic component inspection
- High resolution Non Destructive Testing of metal and plastic parts
- Micro CT for Industrial applications
- Battery inspection

Medical X-Ray:

- Micro CT for life sciences applications

OPTIONS

- WB** Wide Beam
- ET** Extended Tube (wide beam only)
- LW** Light Weight

SPECIFICATIONS

Narrow Beam Benefits (Standard):

The small round spot is optimized over the range of kV and power to provide distortion free images. Operated at 4 watts yields a 6 micron spot for high resolution imaging. The 14mm spot to window spacing offers high geometric magnification.

Narrow Beam X-Ray Characteristics (Standard):

- Spot Ellipticity: $\pm 20\%$ @ 16 watts, 130kV (either axis referred to average)
- Beam Geometry: $\geq 53^\circ$, round beam, uniform beam profile in any direction
- Spot to Window Spacing: 14mm ± 0.5 mm
- Window Diameter (uncollimated): ≈ 19 mm
- Window Material and Thickness: Beryllium, 0.25mm
- Target Material: Tungsten

Wide Beam Benefits (WB Option):

The 115 degree round beam is well suited for automated inspection where a large field of view is required for maximum throughput or off angled views. The 10mm spot to window spacing provides superior high geometric magnification.

Wide Beam X-Ray Characteristics (WB Option):

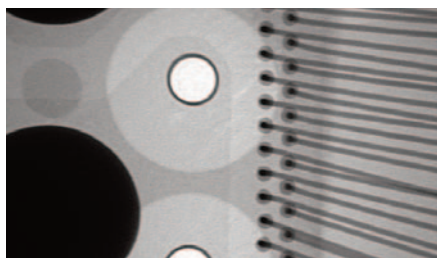
- Spot Ellipticity: $\pm 20\%$ @ 16 watts, 130kV (either axis referred to average)
- Cone of Illumination: 115° , round beam, uniform beam profile in any direction
- Spot to Window Spacing: 10mm ± 0.5 mm
- Window Diameter (uncollimated): ≈ 38 mm
- Window Material and Thickness: Beryllium, 0.51mm
- Target Material: Tungsten
- X-Ray Leakage: Behind X-Ray tube is ≤ 0.5 mR/hr at 2.55cm

Input Voltage:
+24-27Vdc

Input Current:
<6 amps



The uXRB130P65 is ideal for applications such as printed circuit board inspection, battery inspection and industrial/medical micro CT.



Photos provided by ThermoFisher Scientific

Anode Supply:

Output Voltage:
20kV to 130kV (referenced to Cathode Gun Supply)

Output Current:
up to 0.5mA, from 20kV to 130kV

Environmental:

Operating Temperature:
0°C to +32°C

Storage Temperature:
-20°C to +70°C

Humidity:
0 to 95%, non-condensing

Altitude:
Up to 5,000 feet (1524 meters)

Cooling:

Internal fan is incorporated. Adequate air circulation around unit must be provided.

Digital Interface:

RS-232

Mechanical:

See drawings

Weight: Standard: 30lbs. (13.60kg)

Standard/Extended Tube: 34lbs. (15.40kg)
Light Weight (LW option): 23lbs. (10.43kg)
Light Weight/Extended Tube: 27lbs. (12.24kg)

Regulatory Approvals:

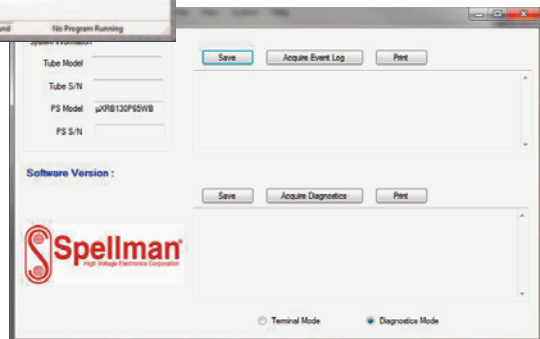
Compliant to EEC EMC Directive.
Compliant to EEC Low Voltage Directive.

Graphical User Interface



Spellman provides an example of a Graphical User Interface (GUI) for the convenience of the user but most customers implement their own software.

<Main System Screen



Diagnostics Screen

**J1 INPUT/OUTPUT—
16 PIN AMP #206036-1 CONNECTOR**

PIN	SIGNAL	PARAMETERS
1	Chamber Interlock Out	To close Chamber Interlock connect pin 1 to pin 2, R<2Ω
2	Chamber Interlock In	To close Chamber Interlock connect pin 2 to pin 1, R<2Ω
3	X-Ray ON Lamp Out	120Vac @ 3A/250Vac @ 1.5A rated contacts. Close at X-Ray ON
4	X-Ray ON Lamp In	120Vac @ 3A/250Vac @ 1.5A rated contacts. Close at X-Ray ON
5	N/C	N/C
6	Prime Power Interlock Out	To close Power Interlock connect pin 6, 7 to pin 8, 10, R<2Ω
7	Prime Power Interlock Out	To close Power Interlock connect pin 6, 7 to pin , R<2Ω
8	Prime Power Interlock In	To close Power Interlock connect pin 8, 10 to pin 6, 7, R<2Ω
9	N/C	N/C
10	Prime Power Interlock In	To close Power Interlock connect pin 8, 10 to pin 6, 7, R<2Ω
11	+24Vdc Input (+)	+24Vdc Input (+)
12	+24Vdc Input (+)	+24Vdc Input (+)
13	+24Vdc Return (-)	+24Vdc Return (-)
14	+24Vdc Return (-)	+24Vdc Return (-)
15	X-Ray On Indicator Out	24Vdc @ 3A rated contacts. Close at X-Ray On
16	X-Ray On Indicator In	24Vdc @ 3A rated contacts. Close at X-Ray On

**J2 RS-232 DIGITAL INTERFACE—
9 PIN AMP #788903-1 CONNECTOR**

PIN	SIGNAL	NAME
1	DCD	Data Carrier Detect
2	RD	Received Data
3	TD	Transmitted Data
4	DTR	Data Terminal Ready
5	SGNO	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to send
8	CTS	Clear to Send
9	RI	Ring Indicator

SPOT TABLE

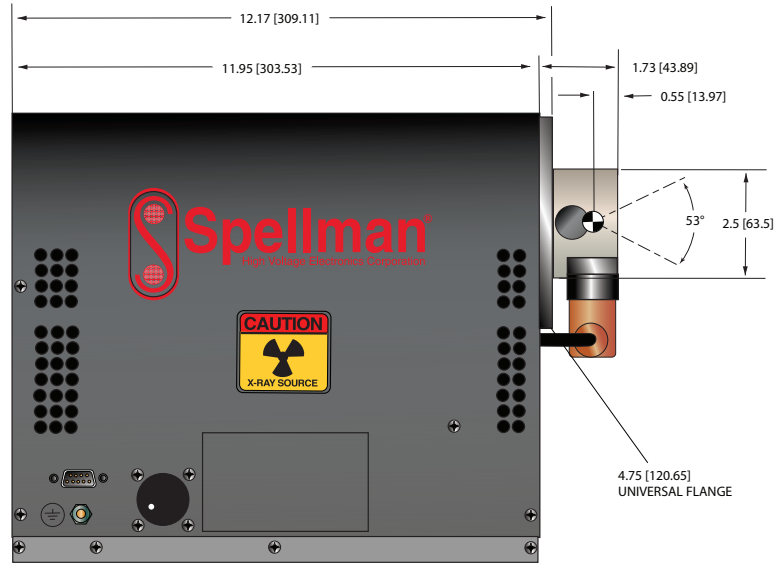
PARAMETER	NARROW BEAM	WIDE BEAM
Operating Voltage Range	45-130kV	50-130kV
Maximum Power	65W, 130kV	65W, 130kV
Maximum Beam Current	0.500mA	0.500mA
Spot Size	4 Watt	≤ 7μ, 45-130kV
	8 Watt	≤ 10μ, 45-130kV
	16 Watt	≤ 22μ, 45-130kV
	32 Watt	≤ 48μ, 70-130kV
	40 Watt	≤ 60μ, 80-130kV
	65 Watt	≤ 100μ, 130kV

How to Order:

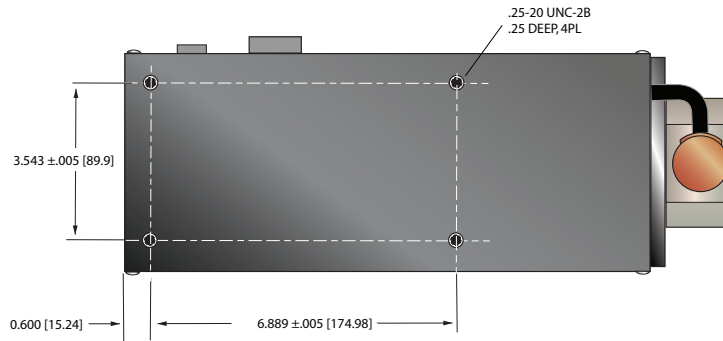
Standard (Narrow Beam)	PART NO.: μXRB130P65NB
Wide Beam Option	PART NO.: μXRB130P65WB
Wide Beam Option and Extension Tube	PART NO.: μXRB130P65WBET

DIMENSIONS: in.[mm]

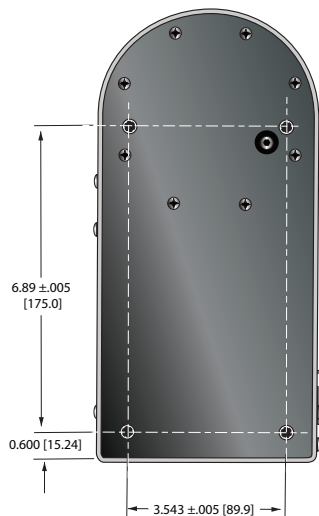
**NARROW BEAM (Standard)
SIDE VIEW**



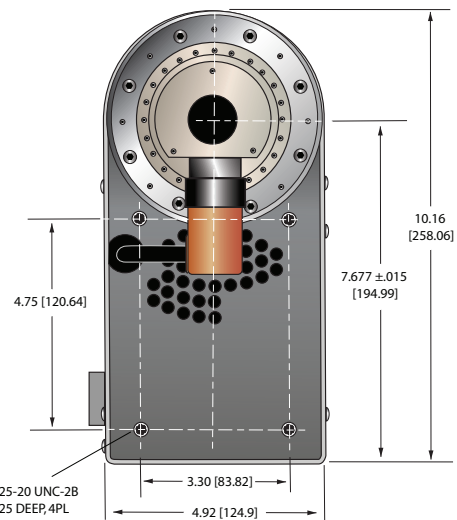
BOTTOM VIEW



REAR VIEW

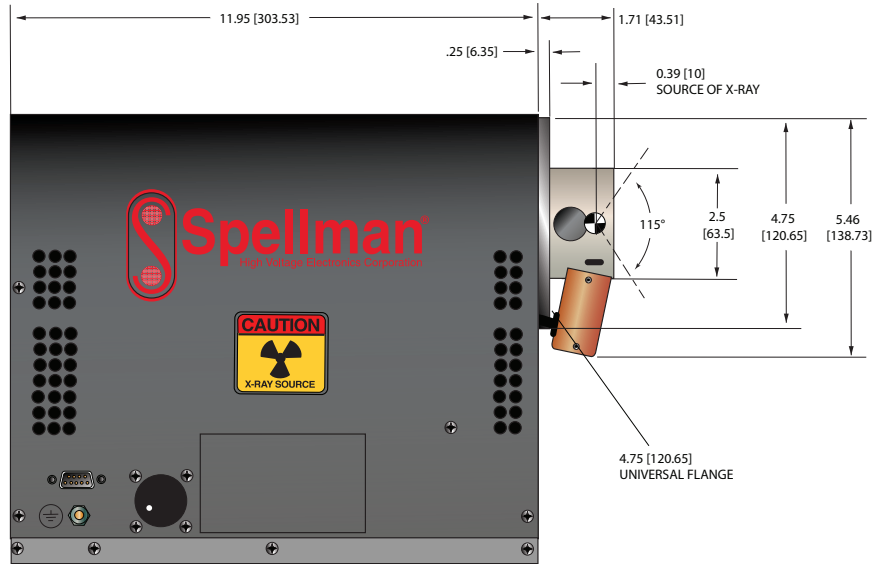


FRONT VIEW

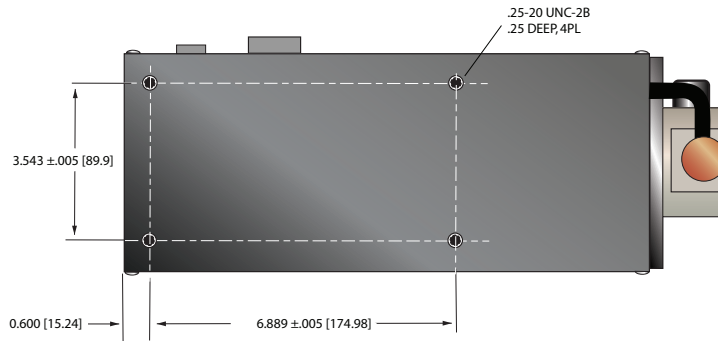


DIMENSIONS: in.[mm]

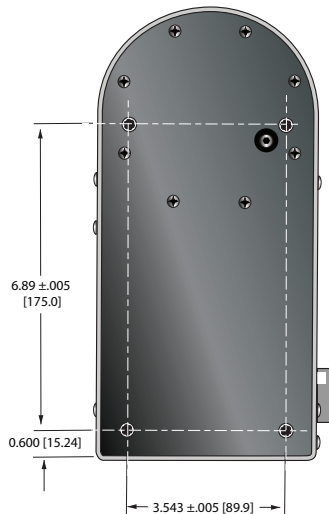
**WIDE BEAM (WB Option)
SIDE VIEW**



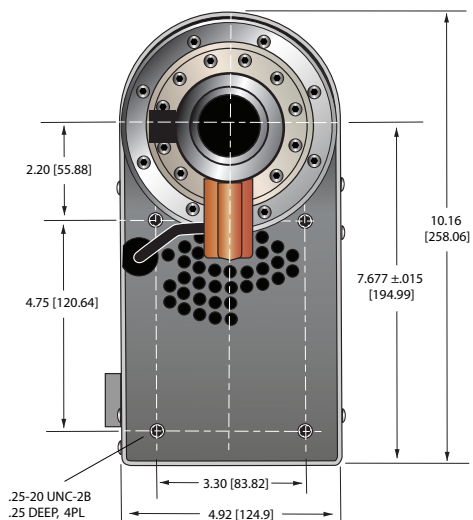
BOTTOM VIEW



REAR VIEW

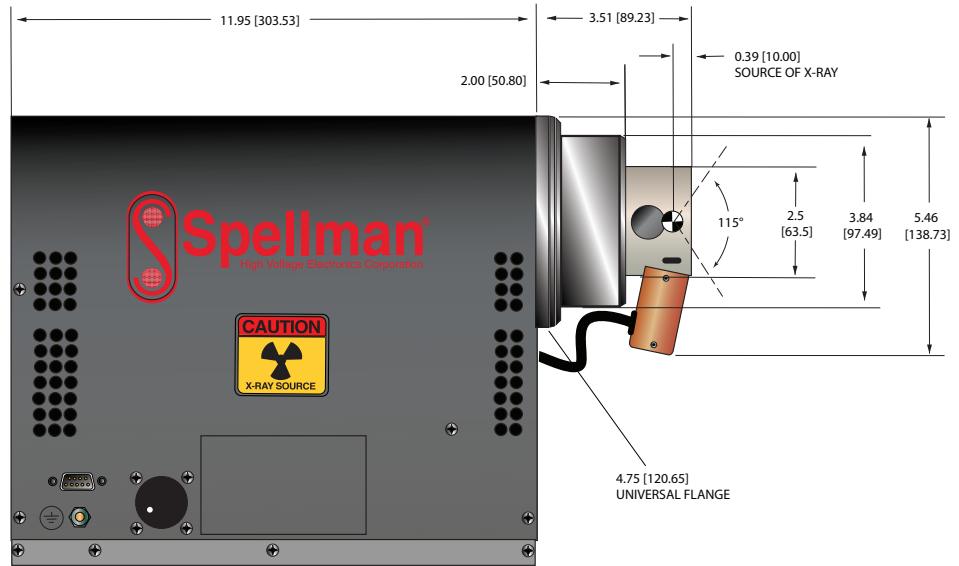


FRONT VIEW

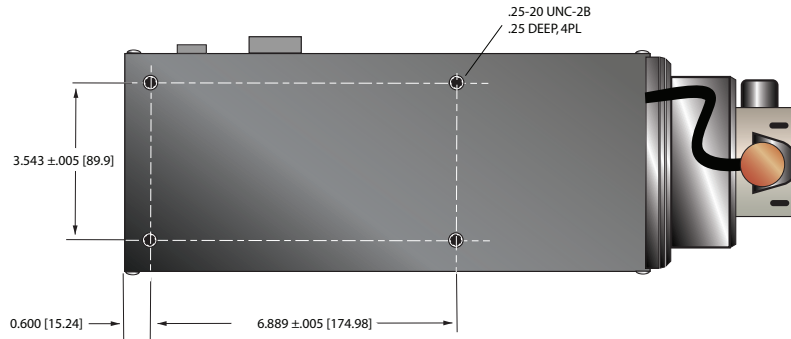


DIMENSIONS: in.[mm]

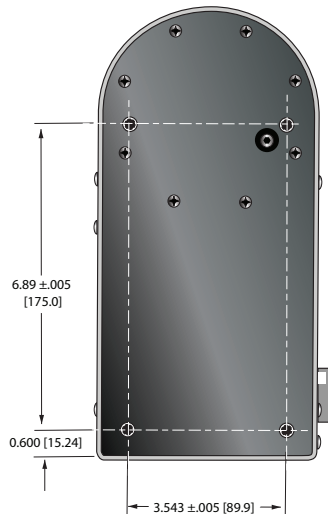
**WIDE BEAM (WB Option) and
EXTENSION TUBE (ET Option)
SIDE VIEW**



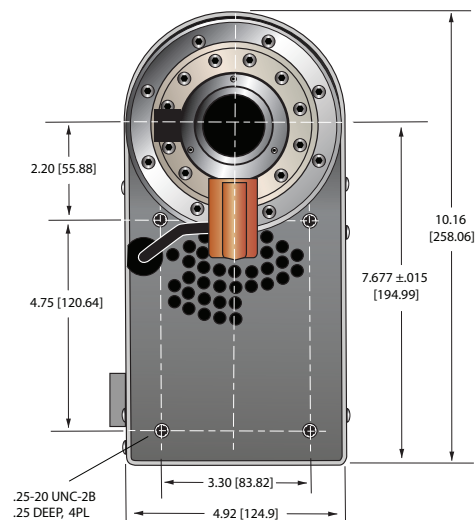
BOTTOM VIEW



REAR VIEW



FRONT VIEW





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

TYPICAL APPLICATIONS

X-Ray Scanning: Bone Densitometry, Thickness Measurement, Food Inspection, Fill Level Confirmation, Parcel Inspection

SPECIFICATIONS

X-Ray Characteristics:

Focal Spot: 0.5mm (IEC 336)

Beam Filter:

Ultem: 3.30mm ±0.15mm

Oil: 8mm ±0.1mm

Glass: 1.8mm ±0.25mm

BE: 0.8mm

Beam Geometry:

Fan: Standard. The beam angular coverage will be 75° with the beam plane perpendicular to the X-Ray tube axis and 13° wide.

Cone: Optional. 25° cone beam

Input Voltage:

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

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable up to 80kV

X-Ray Tube Current:

150uA to 1.25mA over specified tube voltage range

X-Ray Tube Power:

100W maximum continuous

- **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**

Voltage Regulation:

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

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

Voltage Accuracy:

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

Voltage Risetime:

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

Optional: 5 seconds. Specify at time of order

Voltage Overshoot:

5% of maximum voltage, to return within 2.5% of maximum voltage in less than 100ms

Voltage Ripple:

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

Emission Current Parameters

Current Regulation:

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

Load: ±0.1% of rated output current for a change from 50% to 100% of rated output voltage

Current Accuracy:

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

Current Risetime:

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

Optional: 5 seconds. Specify at time of order

Arc Intervention:

3 arcs in 10 seconds with a 200ms quench = Shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Analog Interface:

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

Digital Interface:

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

Control Software:

A demo GUI is available for engineering evaluations

Interlock/Signals:

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

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

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

Input Line Connector:

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

Analog Interface Connector:

15 pin D connector, male

Digital Interface Connector:

9 pin D connector, female

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

See line drawings

Weight:

32lbs (14.5kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC 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)

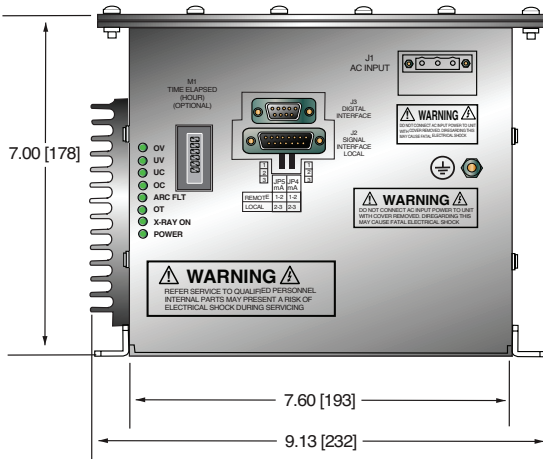
How to Order:

Standard: PART NO.: XRB80N100
 Risetime, Cone Beam, Fan and Elapsed Time Meter Options
 PART NO.: XRB80N100/RT/CB/FN/M

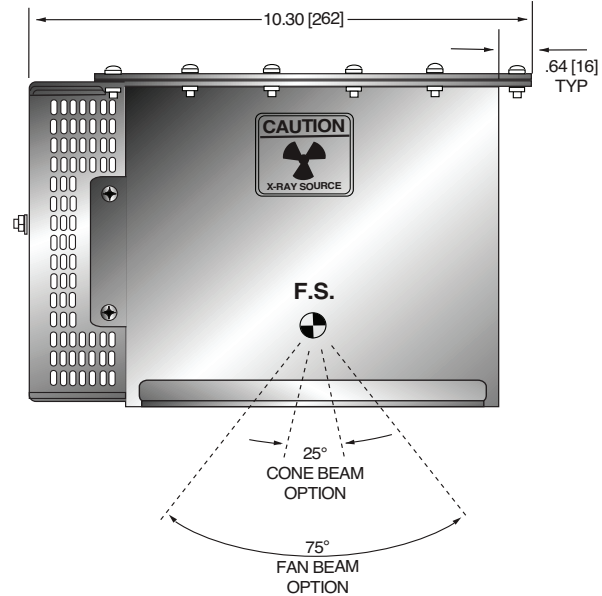
DIMENSIONS: in.[mm]
Standard Unit

FRONT VIEW

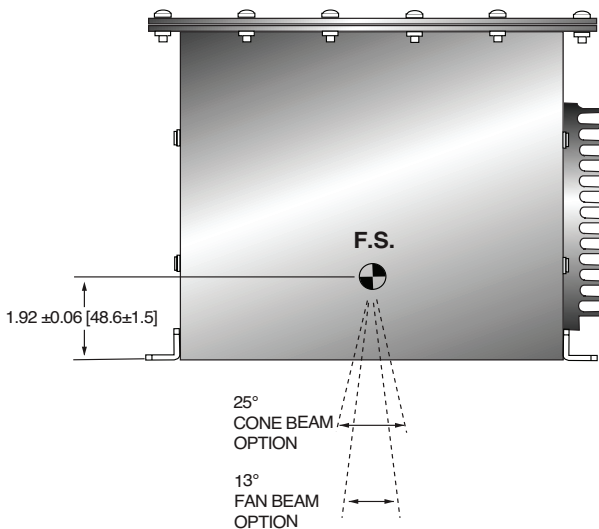
NOTE: Shown with Elapsed Time Meter option



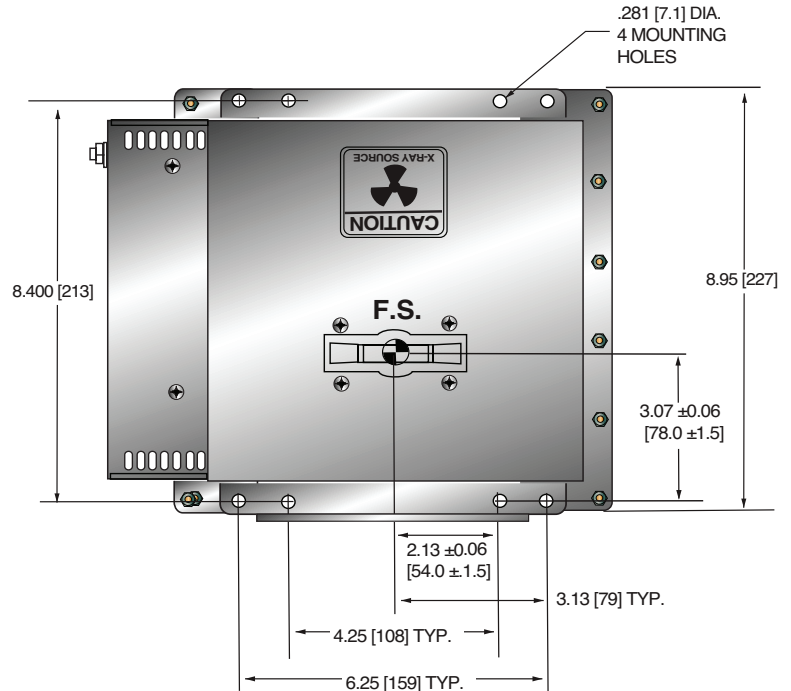
SIDE VIEW



BACK VIEW



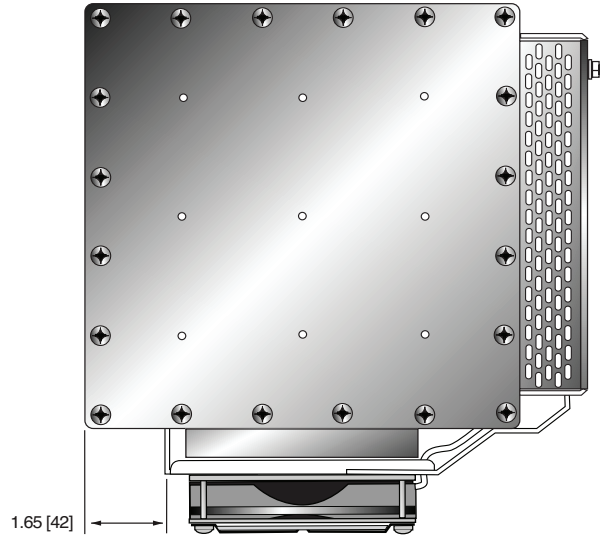
BOTTOM VIEW



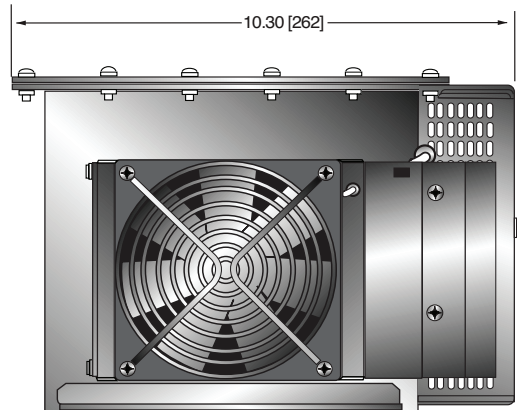
DIMENSIONS: in.[mm]

Cooling Fan Option

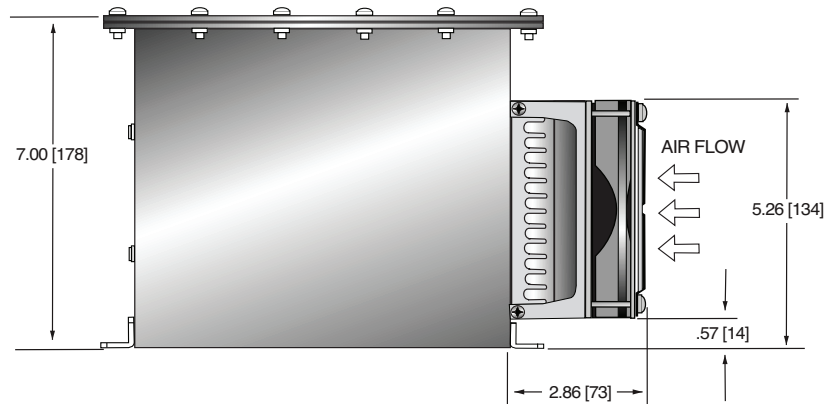
TOP VIEW

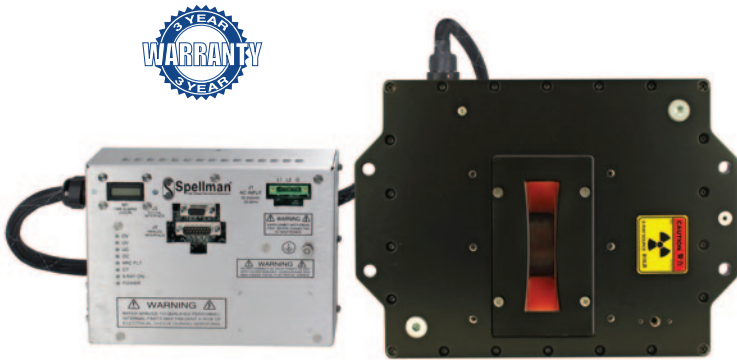


SIDE VIEW



BACK VIEW





- **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 Program and Monitor Interface**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning (Smart Controller Option Only)**

Spellman's XRB80PN100HR (high reliability) Monoblock® X-Ray source is designed for OEM applications powering its internal Bipolar X-Ray tube up to 80kV at 100W.

Features like universal input, small package size and a standard RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. The XRB80PN100HR is available either with fan shaped (standard) or (optional) cone shaped beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance. The XRB80PN100HR is designed for long field life and comes with a 3 year warranty.

TYPICAL APPLICATIONS

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

OPTIONS

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

SPECIFICATIONS

X-Ray Characteristics:

Focal Spot: 0.8mm (IEC 336) standard
0.5mm (IEC 336) optional

Beam Filter:

Ultem: 3.00mm ±0.15mm
Oil: 7.5mm ±0.25mm
Glass: 1.7mm ±0.2mm
Be: 0.8mm

Beam Geometry:

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

An optional 80° x 10° (with a 2° tolerance) is also available

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

Input Voltage:

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

X-Ray Tube Voltage:

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

X-Ray Tube Current:

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

X-Ray Tube Power:

100W maximum continuous

Voltage Regulation:

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

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

Voltage Accuracy:

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

Voltage Risettime:

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

Voltage Ripple:

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

Emission Current Parameters

Current Regulation:

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

Load: ±0.1% of rated output current for a change
from 50% to 100% of rated output voltage

Current Accuracy:

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

Current Risettime:

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

Arc Intervention:

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

Filament Configuration:

Internal AC filament drive with closed loop filament emission control

Analog Monitoring Interface:

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

Digital Programming and Monitoring Interface:

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

Control Software:

A demo GUI is available for engineering evaluations

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

X-Ray Tank: Customer provided 250 cfm external cooling fan as required to maintain oil temperature below 55°C.

Controller: Forced air via internal fan.

Input Line Connector:

3-pin Phoenix Contact 1829167. Mating connector provided with unit

Analog Interface Connector:

15 pin male D connector provided with unit

Digital Interface Connector:

9 pin female D connector provided with unit

Grounding Point:

M4 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)

Standard Controller: 8.5"L x 6.70"W x 2.21"H
(215.9mm x 170.2mm x 56.1mm)

Smart Controller: 8.5"L x 7.14"W x 2.40"H
(215.9mm x 181.4mm x 61.0mm)

Weight:

X-Ray Tank: 36lbs (16.32kg)

Standard Controller: 3.7lbs (1.68kg)

Smart Controller: 3.9lbs (1.77kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530

SMART XRB (only available with Smart Controller option)

The XRB80PN100HR with the Smart Controller (SC option) has two new digital features available: data logging and firmware controlled seasoning.

Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRB80PN100HR stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Pre Heat Set point

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown alarm if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRB80PN100HR knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

How to Order:

Standard	PART NO.: XRB80PN100HR
Cone Beam Option	PART NO.: XRB80PN100HR/CB
0.5mm Focal Spot Option	PART NO.: XRB80PN100HR/.5mm
Narrow Fan Beam Option	PART NO.: XRB80PN100HR/NF
Cable Option	PART NO.: XRB80PN100HR/RA
Smart Controller Option	PART NO.: XRB80PN100HR/SC

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

XRB80PN100HR 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	X-Ray Enable Return Input	Connect to pin 13 to enable X-Ray generation (for local enable)

ETHERNET DIGITAL INTERFACE* – J4 8 PIN RJ45 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

*Ethernet interface for Smart Controller option only

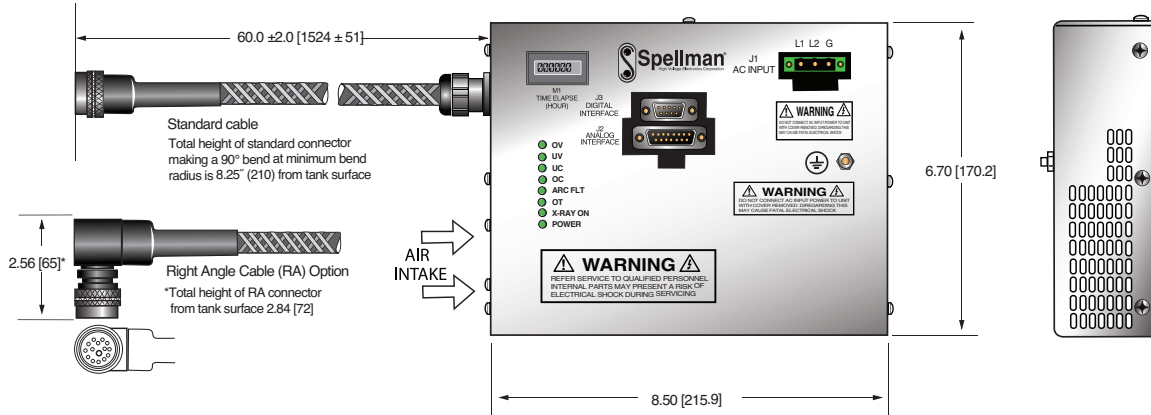
LED INDICATORS

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]

STANDARD CONTROL UNIT

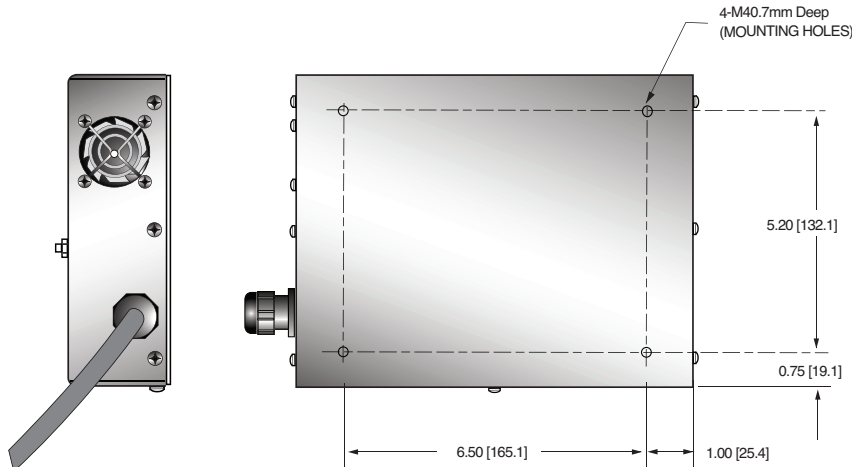
TOP VIEW



SIDE VIEW

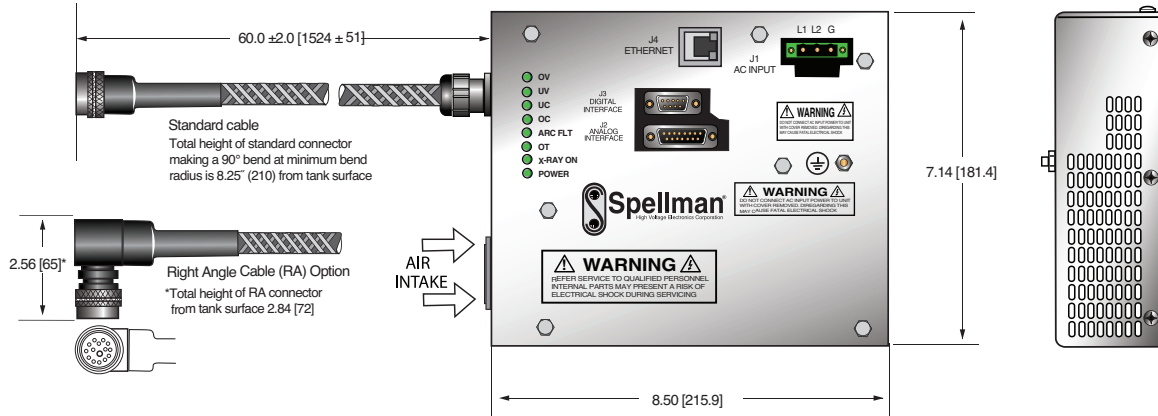


BOTTOM VIEW



DIMENSIONS: in.[mm]

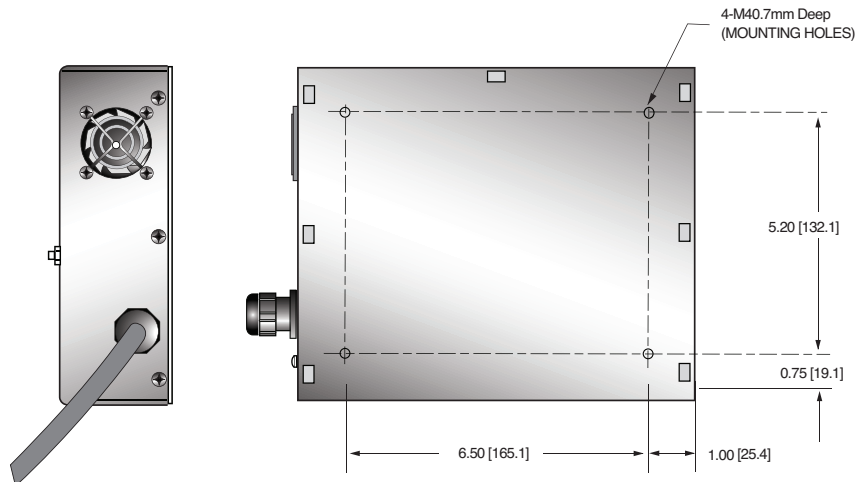
SMART CONTROL UNIT TOP VIEW



SIDE VIEW

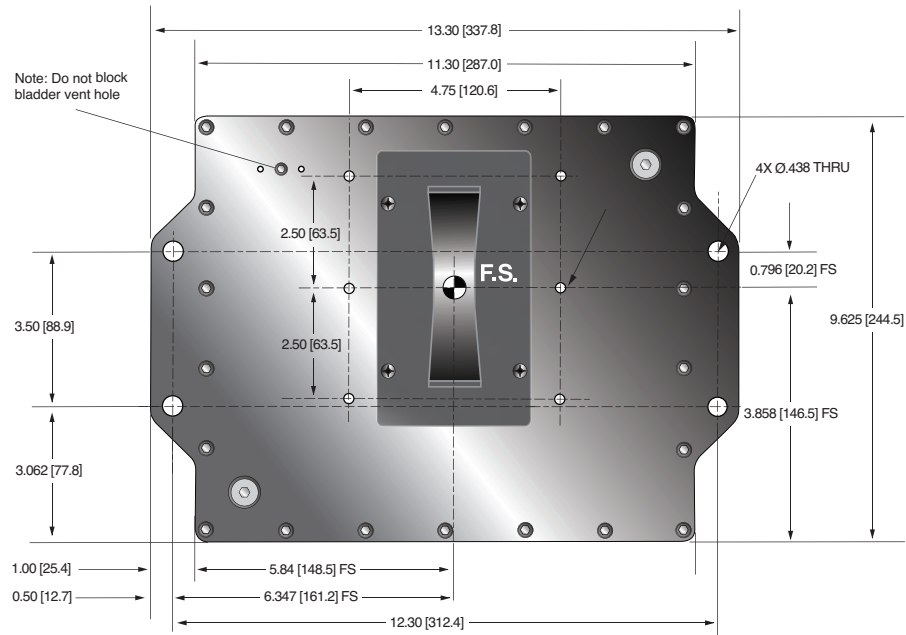


BOTTOM VIEW

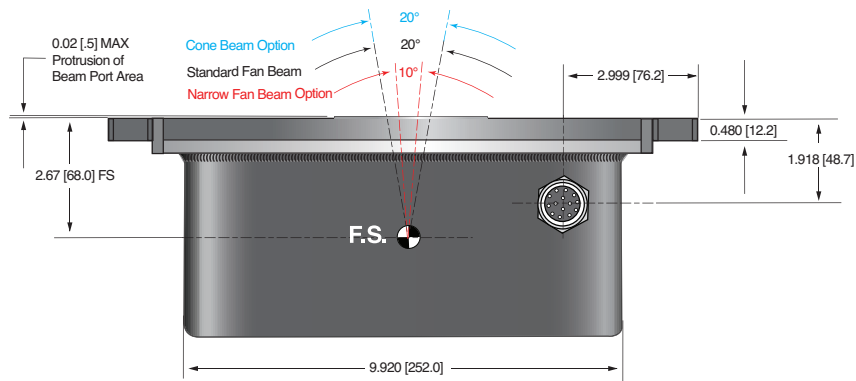


DIMENSIONS: in.[mm]

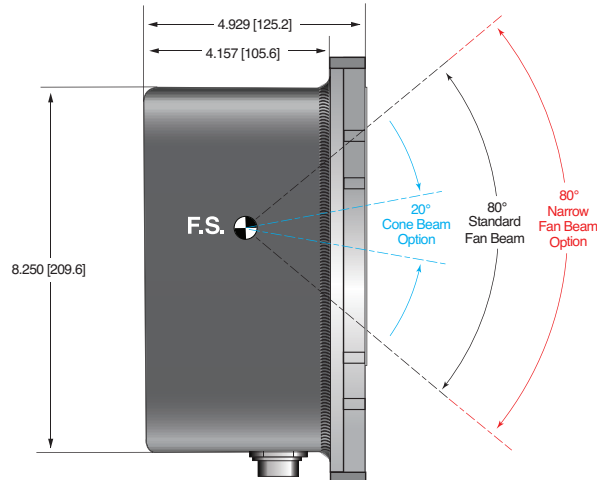
GENERATOR TANK TOP VIEW



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**

Spellman's XRB100N100 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 100kV at 100W. Features like universal input, small package size and a standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

Tube Type:	Stationary anode, tungsten target
Focal Spot:	0.5mm (IEC 336)
Beam Filter:	Lexan: 3.2mm Oil: 10mm ±0.1mm Glass: 1.8mm max
Beam Geometry:	Symmetrical fan 74° x 10° ±1°

Input Voltage:

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

X-Ray Tube Voltage:

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

X-Ray Tube Current:

100uA to 1mA over specified tube voltage range

X-Ray Tube Power:

100W maximum continuous

Voltage Regulation:

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

Voltage Accuracy:

Voltage measured across the X-Ray tube is within ±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 ≤1kHz

Emission Current Parameters

Current Regulation:

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

Current Accuracy:

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

Current Risetime:

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

Arc Intervention:

3 arcs in 10 seconds with a 200ms quench = Shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Analog Interface:

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

Digital Interface:

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

Control Software:

A demo GUI is available for engineering evaluations.

Interlock/Signals:

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

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

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

Input Line Connector:

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

Analog Interface Connector:

15 pin D connector, male

Digital Interface Connector:

9 pin D connector, female

Grounding Point:

M4 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.

**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**

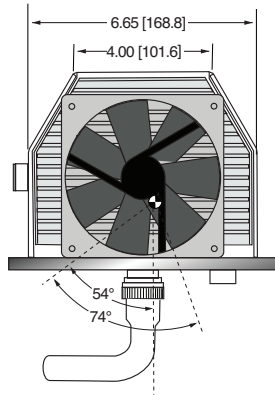
PIN	SIGNAL	PARAMETERS
1	Power Supply Fault Output	Open collector, 35V @ 10mA max. high = no fault
2	mA Program Input	0 to 9.00Vdc = 0 to 100% rated output, Zin = 10MΩ
3	kV Program Input	0 to 9.00Vdc = 0 to 100% rated output, Zin = 10MΩ
4	X-Ray On Lamp Relay Output	Common, dry contacts, 30Vdc @ 1A, max
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

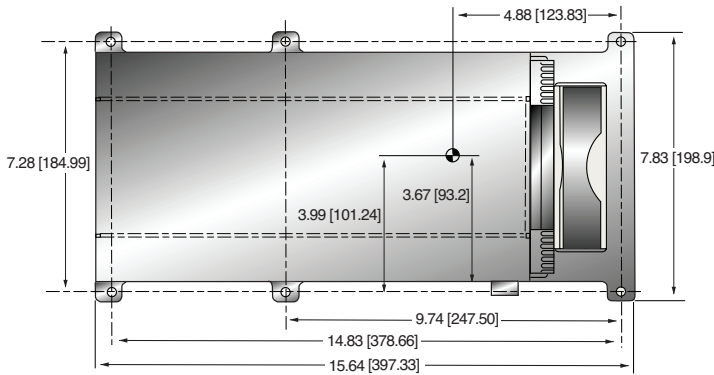
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OV	High kV occurs
LED 2	UV	Low kV occurs
LED 3	UC	Low mA occurs
LED 4	OC	High mA occurs
LED 5	ARC FLT	Arc fault occurs
LED 6	OT	Over temperature occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

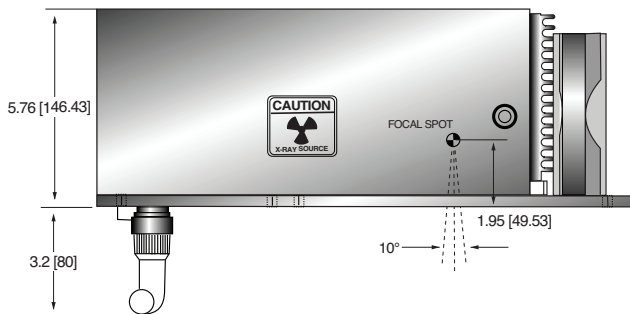
**X-RAY GENERATOR
FRONT VIEW**



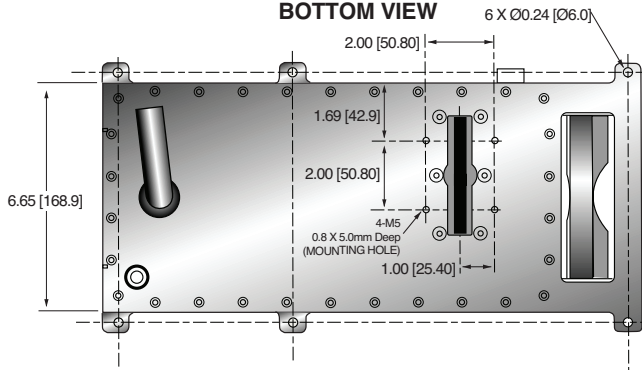
TOP VIEW



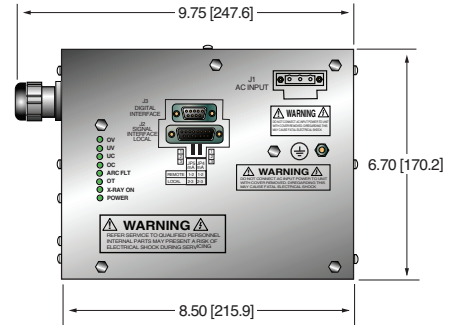
SIDE VIEW



BOTTOM VIEW



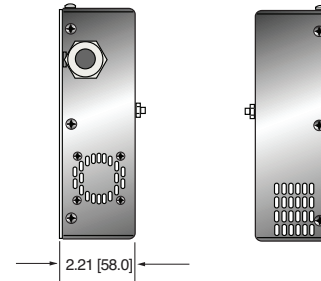
**CONTROL UNIT
FRONT VIEW**



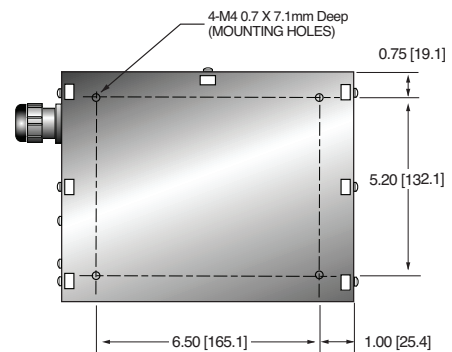
TOP VIEW



SIDE VIEW



BOTTOM VIEW





- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface, Standard RS-232 Digital Interface and Ethernet**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning**

Spellman's XR BHR (high reliability) Series of Monoblock® X-Ray sources are designed for OEM applications powering their internal Bipolar X-Ray tube at 80kV and 100kV at power levels of 100W, 210W, 350W and 500W. Features such as universal input, compact package size and a standard RS-232 digital interface simplify integration of any XR BHR model into your X-Ray system. Each XR BHR model is available with fan shaped (standard) or cone shaped (optional) beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance. The XR BHR Series is designed for long field life and comes with a 3 year warranty.

TYPICAL APPLICATIONS

Food Inspection Systems, Fill Level Confirmation Systems, Security Scanning Systems, Industrial NDT Systems, Thickness/Plating Measurement Systems

OPTIONS

- CB** Cone Beam
- .5mm** .5mm focal spot X-Ray tube
- ST-TE**
- RA-SE** See page 4 for Cable Options
- RA-TE**

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

100- 240Vac, ±10%, 50/60 Hertz, .98 power factor

Input Current:

- 100W @ 2A
- 210W @ 4A
- 350W @ 6A
- 500W @ 8A

X-Ray Tube Voltage:

See table. Minimum kV for emission current 35kV

X-Ray Tube Current:

See table. Minimum emission current 150uA

X-Ray Tube Power:

See table

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage Risetime:

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

Voltage Ripple:

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

Emission Current Parameters

Current Regulation:

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

Current Accuracy:

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

Current Risetime:

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

Arc Intervention:

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

Filament Configuration:

Internal floating AC filament drive with closed loop filament emission control circuitry

Analog Interface:

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

Digital Interface:

The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature.

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

X-Ray Tank:

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

Controller: Forced air via internal fan.

Grounding Point:

- M5 ground female thread on tank
- M5 ground stud on control chassis provided

Dimensions:

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

Weight:

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

Controller:

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

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530

MODEL SELECTION TABLE

MODEL	MAX. VOLTAGE	MAX. CURRENT	MAX. POWER
XRB80PN210HR	80kV	5.25mA	210 watts
XRB80PN350HR	80kV	8mA	350 watts
XRB80PN500HR	80kV	8mA	500 watts
XRB100PN100HR	100kV	2mA	100 watts
XRB100PN210HR	100kV	4.2mA	210 watts
XRB100PN350HR	100kV	7mA	350 watts
XRB100PN500HR	100kV	8mA	500 watts

LED INDICATORS

INDICATOR	SIGNAL	CONDITION Illuminated When...	LED COLOR
1	OV Error 6	High kV occurs	Red
2	UV Error 5	Low kV occurs	Red
3	UC Error 4	Low mA occurs	Red
4	OC Error 3	High mA occurs	Red
5	ARC Error 2	Arc fault occurs	Red
6	OT Error 1	Over temperature occurs	Red
7	X-Ray On	X-Rays are being generated	Green
8	Power On	AC input power is present	Green

SMART XRB

The XRBHR has two new digital features: **data logging and firmware controlled seasoning.**

Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRBHR stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Filament Limit Set point
Pre Heat Set point	Line Dip

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRBHR knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

Power and Interface Connections

AC INPUT—3 PIN PHOENIX CONTACT 1858772

PIN	SIGNAL	PARAMETERS
1	AC Input (high)	100-240Vac (high)
2	Ground	Ground
3	AC Input (neutral)	100-240Vac (neutral)

DC INPUT FOR HEAT DISSIPATION UNIT—4 PIN AMP (210/350/500W) 206060-1

PIN	SIGNAL	DESCRIPTION	PARAMETERS
1	24Vdc	Fan/Pump Power	24Vdc @ 5 amps
2	24Vdc Return		
3	N/C	No Connection	N/C
4	N/C	No Connection	N/C

It is critical to ensure that 24Vdc is supplied to pins 1 and 2

ANALOG INTERFACE—10 PIN PHOENIX CONTACT 1792605

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

RS-232 DIGITAL INTERFACE—9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	N/C
2	Transmitted Data	Conforms to EIA RS-232-C
3	Received Data	Conforms to EIA RS-232-C
4	N/C	N/C
5	Signal Ground	Signal Ground
6	N/C	N/C
7	N/C	N/C
8	N/C	N/C
9	N/C	N/C

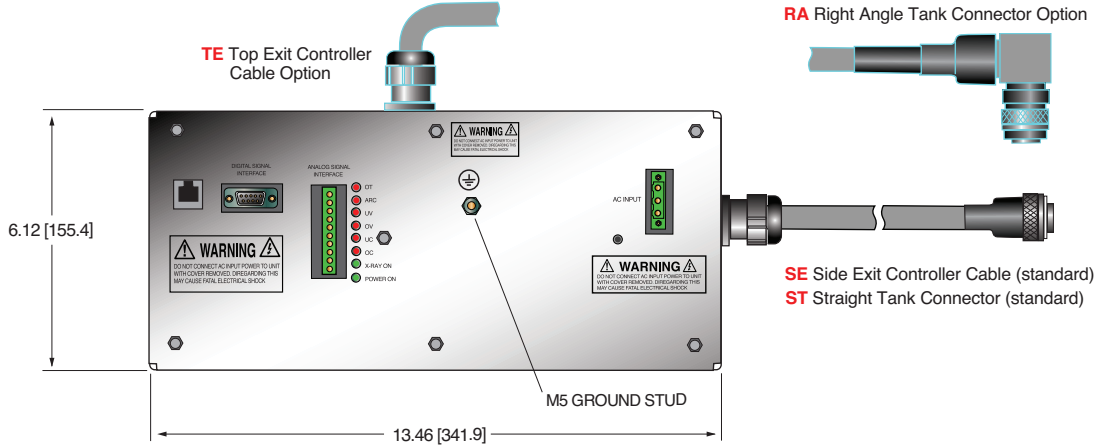
ETHERNET DIGITAL INTERFACE—RJ45 8 PIN FEMALE CONNECTOR

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

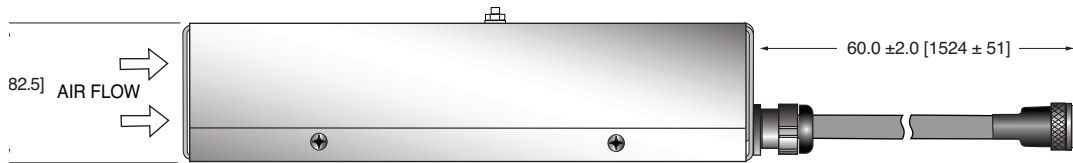
DIMENSIONS: in.[mm]

100/210W CONTROL UNIT

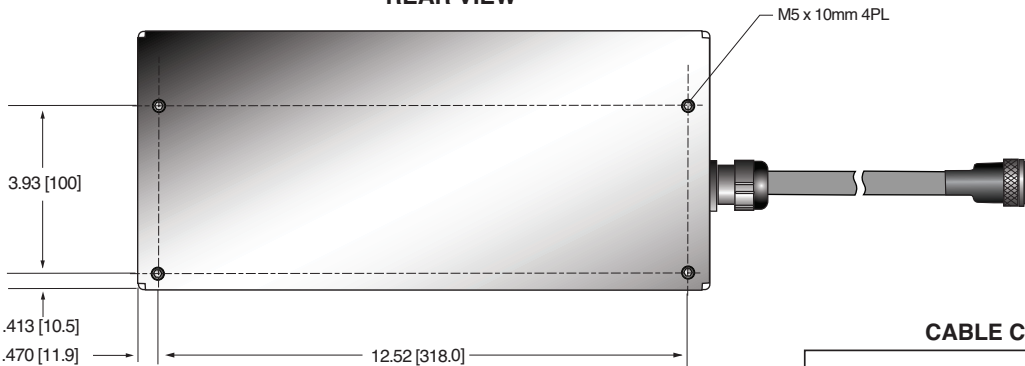
FRONT VIEW



BOTTOM VIEW



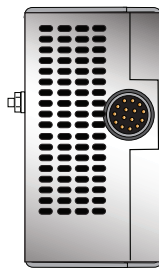
REAR VIEW



SIDE VIEW

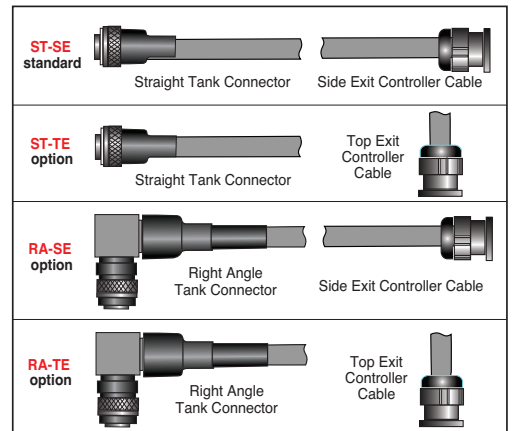


SIDE VIEW



Standard SE Side Exit shown

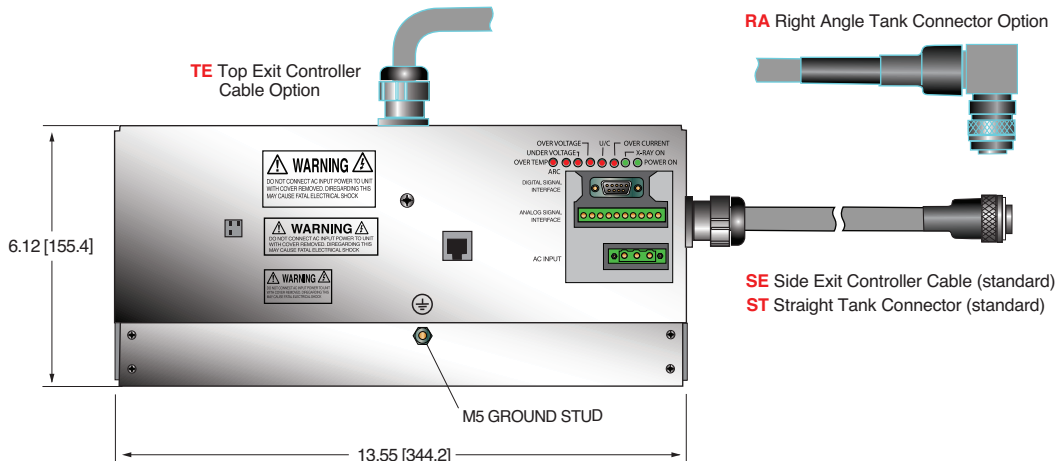
CABLE CONFIGURATIONS



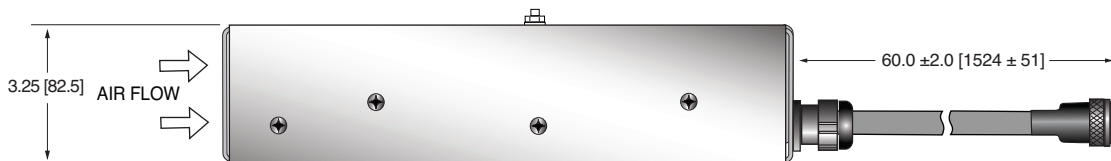
DIMENSIONS: in. [mm]

350/500W CONTROL UNIT

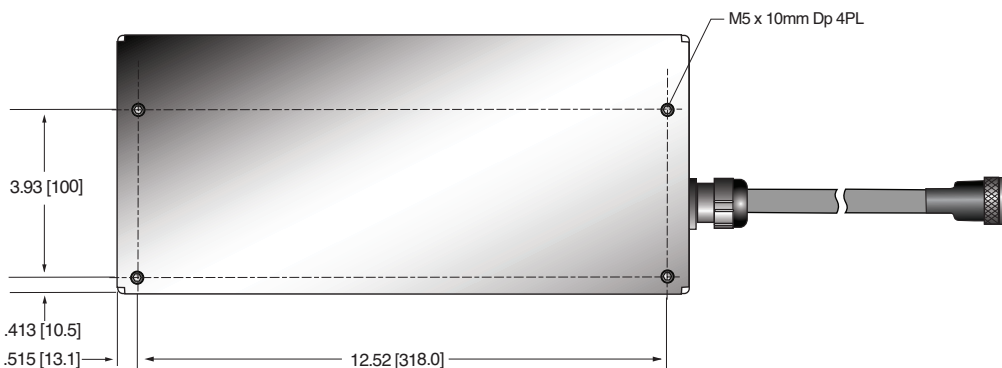
FRONT VIEW



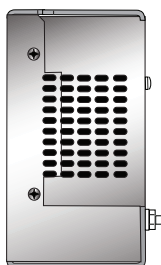
BOTTOM VIEW



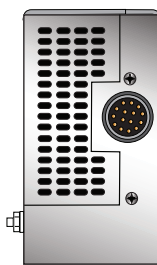
REAR VIEW



SIDE VIEW



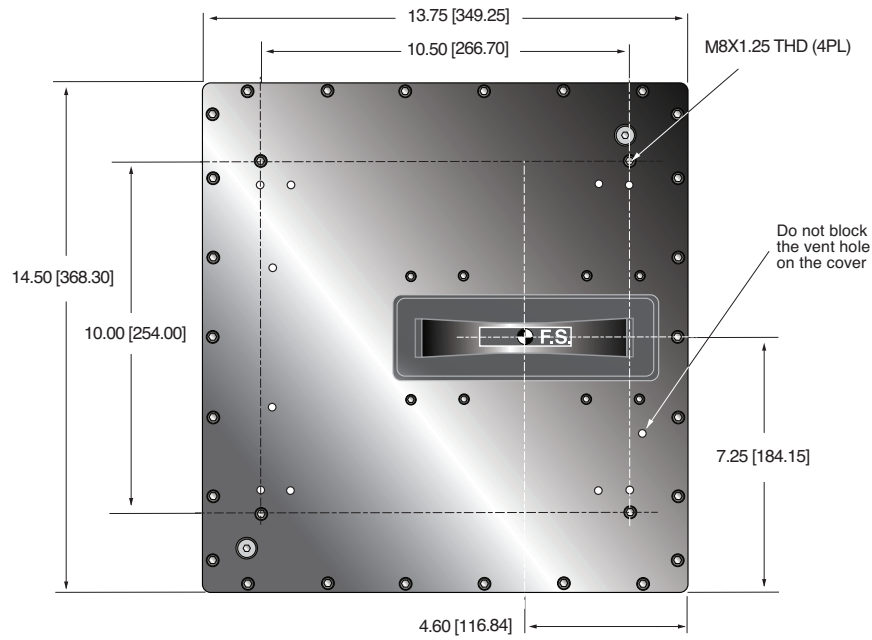
SIDE VIEW



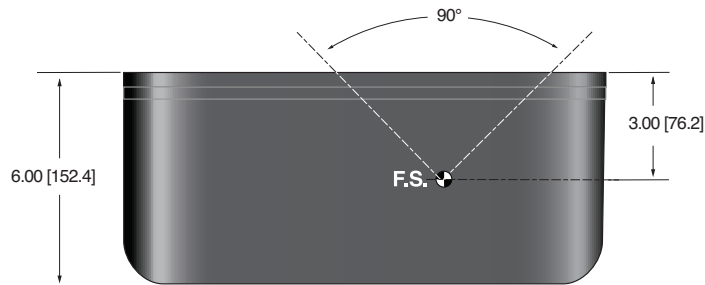
Standard
SE Side Exit shown

DIMENSIONS: in. [mm]

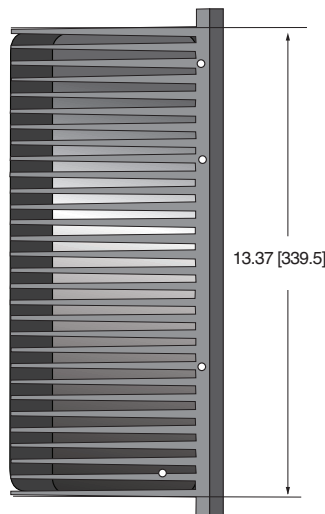
100W TANK TOP VIEW



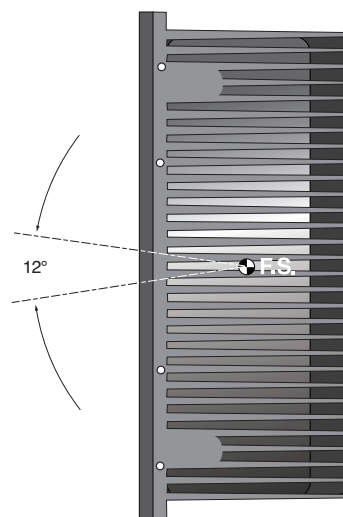
SIDE VIEW



BACK VIEW

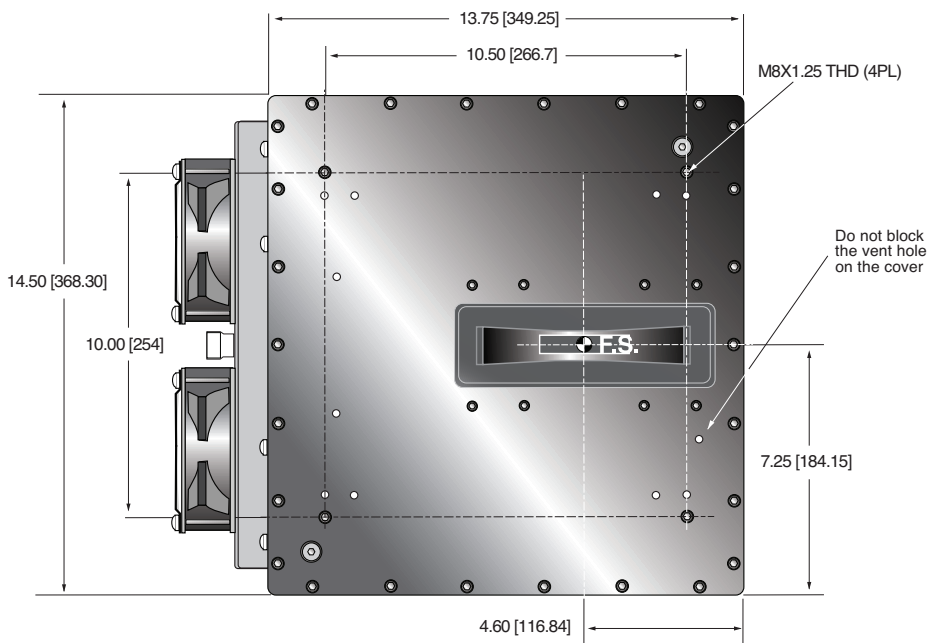


FRONT VIEW

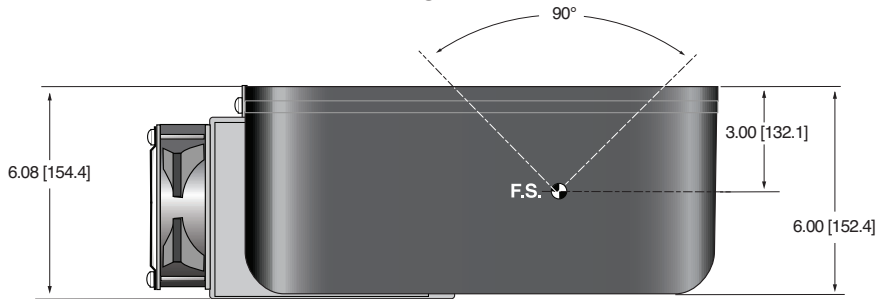


DIMENSIONS: in.[mm]

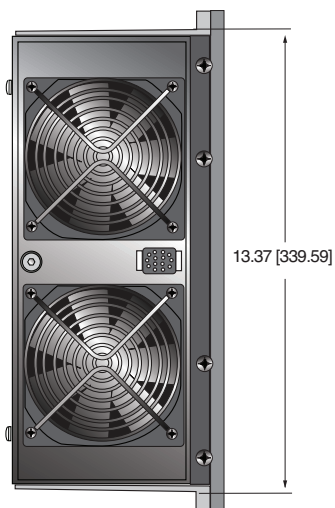
210W TANK TOP VIEW



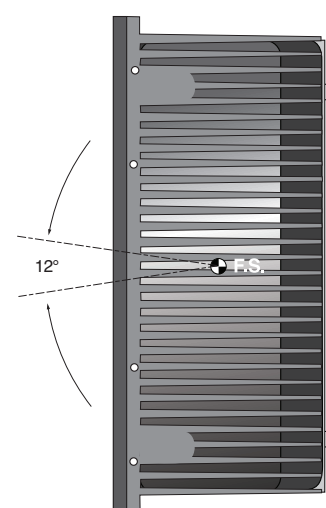
SIDE VIEW



BACK VIEW



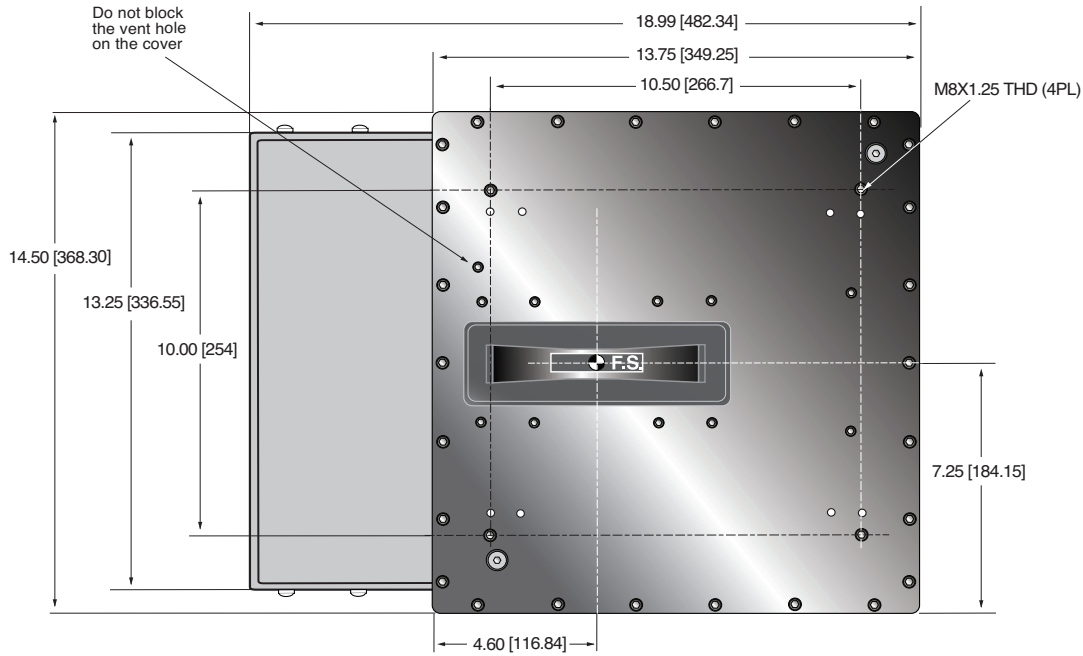
FRONT VIEW



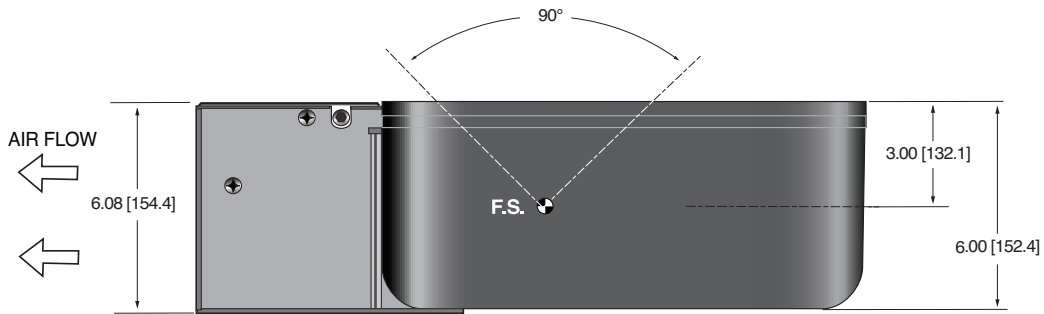
DIMENSIONS: in.[mm]

350/500W TANK

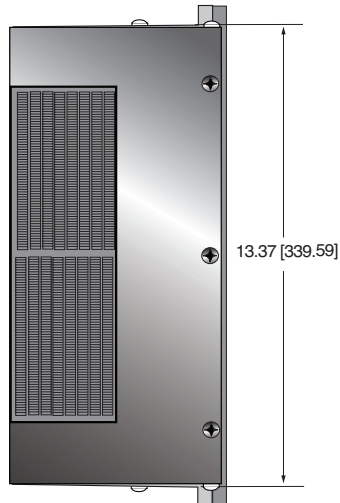
TOP VIEW



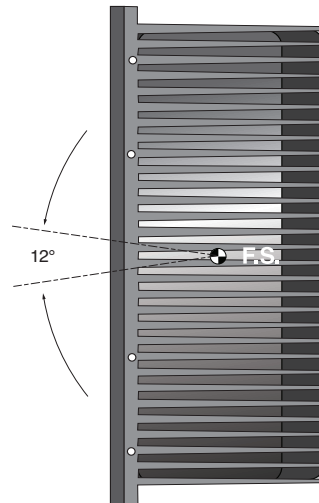
SIDE VIEW



BACK VIEW



FRONT VIEW





- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface, Standard RS-232 Digital Interface and Ethernet**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning**

Spellman's XRBD Series of Monoblock® X-Ray sources are designed for OEM applications powering their internal bipolar X-Ray tube at 160kV at power levels of 100W, 210W, 350W and 500W. Features such as universal input, compact package size and a standard RS-232 digital interface simplify integration of any XRBD model into your X-Ray system. Each XRBD model is available with fan shaped (standard) or cone shaped (optional) beam geometries. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

Food Inspection Systems, Fill Level Confirmation Systems, Security Scanning Systems, Industrial NDT Systems, Thickness/Plating Measurement Systems

OPTIONS

- CB** | Cone Beam
- .5mm** | .5mm focal spot X-Ray tube
- ST-TE**
- RA-SE** | See page 4 for Cable Options
- RA-TE**

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

100-240Vac, ±10%, 50/60 Hertz, .98 power factor

Input Current:

- 100W @ 2.0A
- 210W @ 4.0A
- 350W @ 6.0A
- 500W @ 8.0A

X-Ray Tube Voltage:

See table. Minimum kV for emission current 35kV

X-Ray Tube Current:

See table. Minimum emission current 150uA

X-Ray Tube Power:

See table

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage Risetime:

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

Voltage Ripple:

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

Emission Current Parameters

Current Regulation:

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

Current Accuracy:

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

Current Risetime:

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

Arc Intervention:

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

Filament Configuration:

Internal floating AC filament drive with closed loop filament emission control circuitry

Analog Interface:

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

Digital Interface:

The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature.

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

X-Ray Tank:

100W: Convection/customer supplied forced air so tank is <55°C

210W: Externally powered forced air cooling, 24Vdc @ 2A

350/500W: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A

Controller: Forced air via internal fan

Grounding Point:

M5 ground female thread on tank

M5 ground stud on control chassis provided

Dimensions:

see drawings

Weight:

X-Ray Tank:

100/210W @ 78lbs. (35.4kg)

350/500W @ 84.5lbs. (38.3kg)

Controller:

100W/210W: 4 pounds (1.18kg)

350W/500W: 7 pounds (3.18kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530.

MODEL SELECTION TABLE

MODEL	MAX. VOLTAGE	MAX. CURRENT	MAX. POWER
XRBD160PN100	160kV	1mA	100 watts
XRBD160PN210	160kV	2.1mA	210 watts
XRBD160PN350	160kV	3.5mA	350 watts
XRBD160PN500	160kV	4mA	500 watts

LED INDICATORS

INDICATOR	SIGNAL	CONDITION	Illuminated When...	LED COLOR
1	OV Error 6	High kV occurs		Red
2	UV Error 5	Low kV occurs		Red
3	UC Error 4	Low mA occurs		Red
4	OC Error 3	High mA occurs		Red
5	ARC Error 2	Arc fault occurs		Red
6	OT Error 1	Over temperature occurs		Red
7	X-Ray On	X-Rays are being generated		Green
8	Power On	AC input power is present		Green

SMART XRB

The XRBD has two new digital features: data logging and firmware controlled seasoning.

Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRBD stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Filament Limit Set point
Pre Heat Set point	Line Dip

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRBD knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

Power and Interface Connections

AC INPUT—3 PIN PHOENIX CONTACT 1858772

PIN	SIGNAL	PARAMETERS
1	AC Input (high)	100-240Vac (high)
2	Ground	Ground
3	AC Input (neutral)	100-240Vac (neutral)

DC INPUT FOR HEAT DISSIPATION UNIT—4 PIN AMP (210/350/500W) 206060-1

PIN	SIGNAL	DESCRIPTION	PARAMETERS
1	24Vdc	Fan/Pump Power	24Vdc @ 5 amps
2	24Vdc Return		
3	N/C	No Connection	N/C
4	N/C	No Connection	N/C

It is critical to ensure that 24Vdc is supplied to pins 1 and 2

ANALOG INTERFACE— 10 PIN PHOENIX CONTACT 1792605

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

RS-232 DIGITAL INTERFACE— 9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	N/C
2	Transmitted Data	Conforms to EIA RS-232-C
3	Received Data	Conforms to EIA RS-232-C
4	N/C	N/C
5	Signal Ground	Signal Ground
6	N/C	N/C
7	N/C	N/C
8	N/C	N/C
9	N/C	N/C

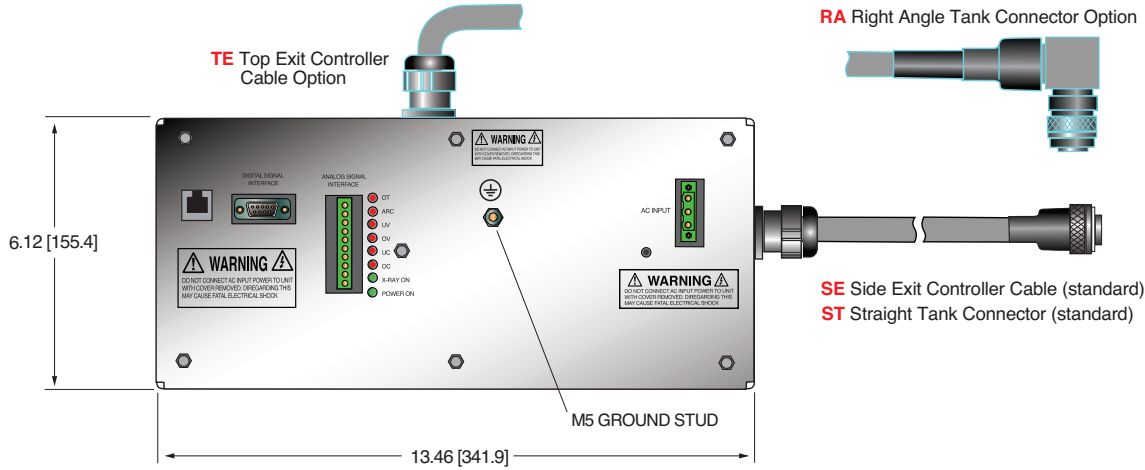
ETHERNET DIGITAL INTERFACE— RJ45 8 PIN FEMALE CONNECTOR

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

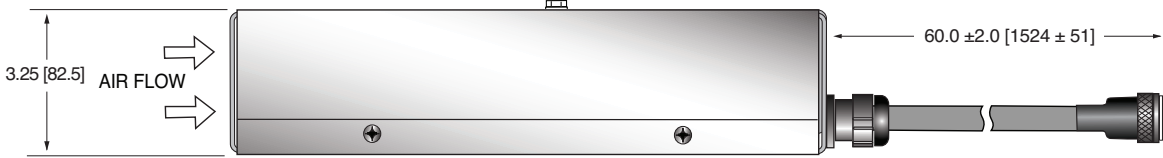
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100/210W CONTROL UNIT

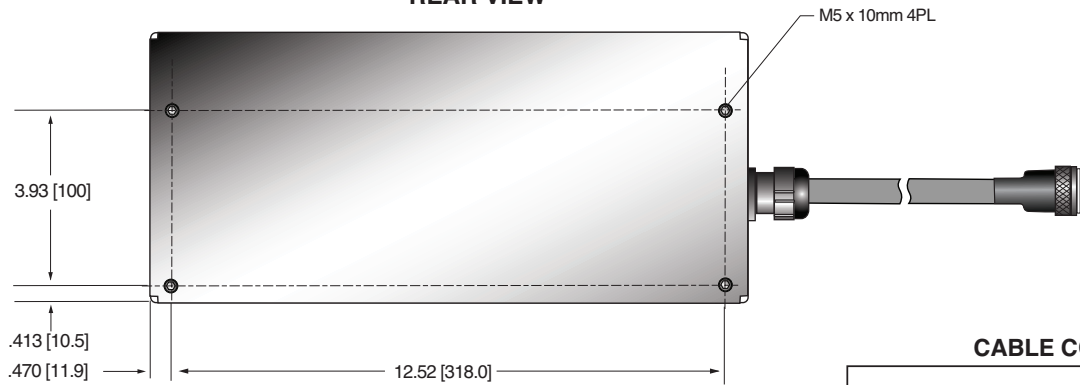
FRONT VIEW



BOTTOM VIEW



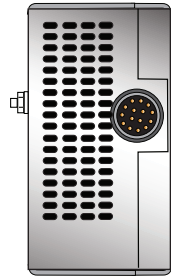
REAR VIEW



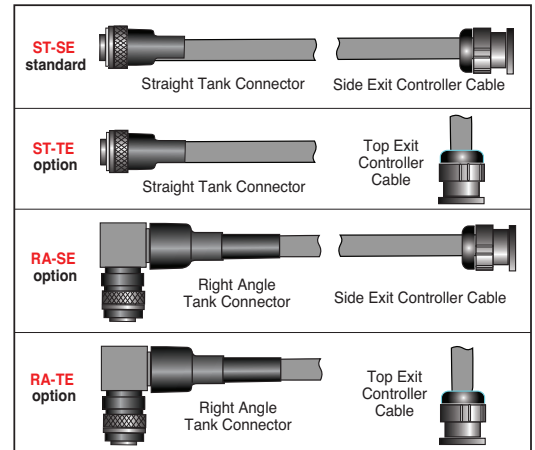
SIDE VIEW



SIDE VIEW



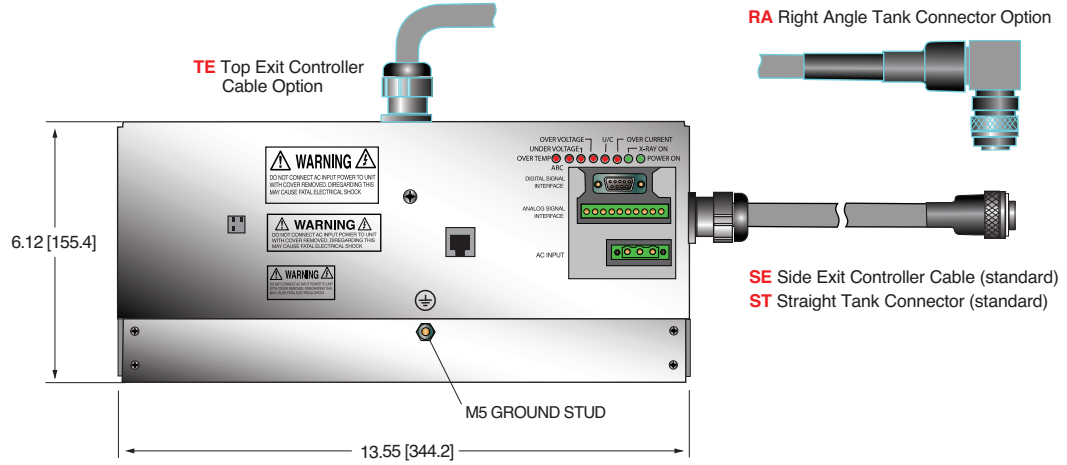
CABLE CONFIGURATIONS



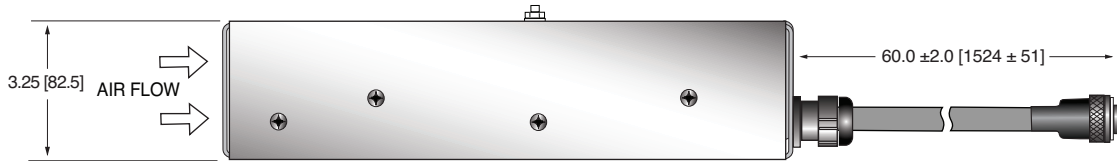
DIMENSIONS: in.[mm]

350/500W CONTROL UNIT

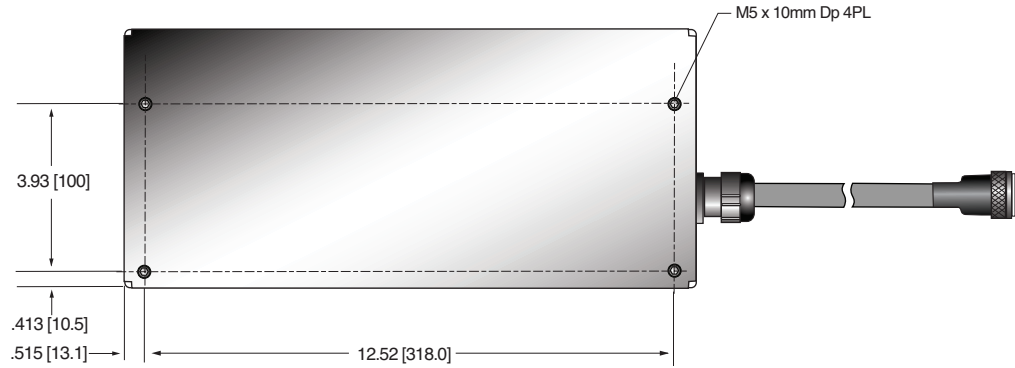
FRONT VIEW



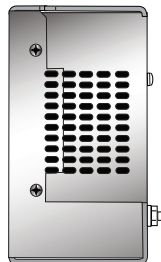
BOTTOM VIEW



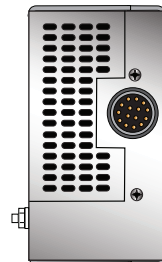
REAR VIEW



SIDE VIEW



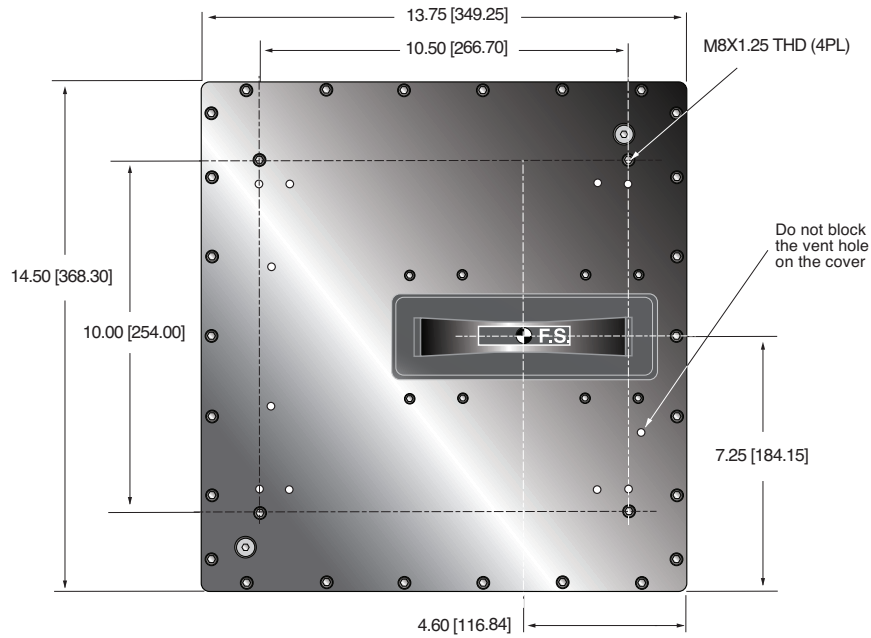
SIDE VIEW



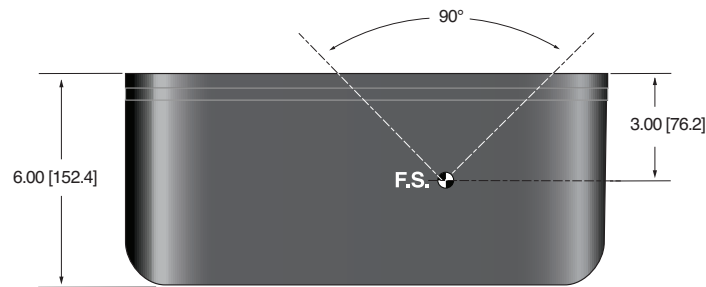
Standard
SE Side Exit
shown

DIMENSIONS: in.[mm]

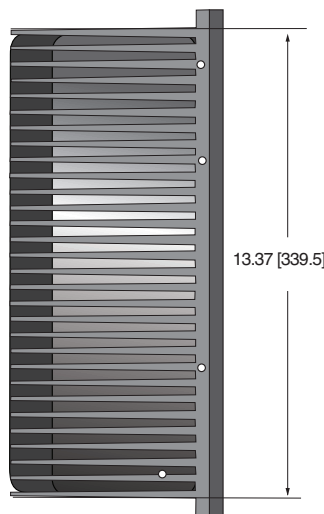
100W TANK TOP VIEW



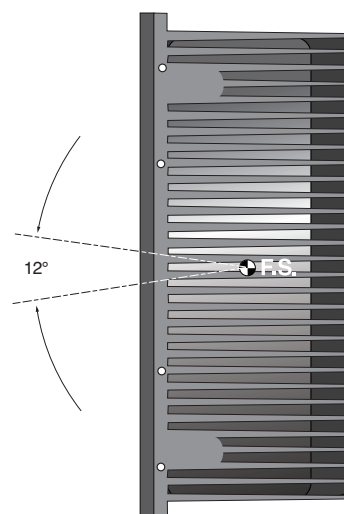
SIDE VIEW



BACK VIEW

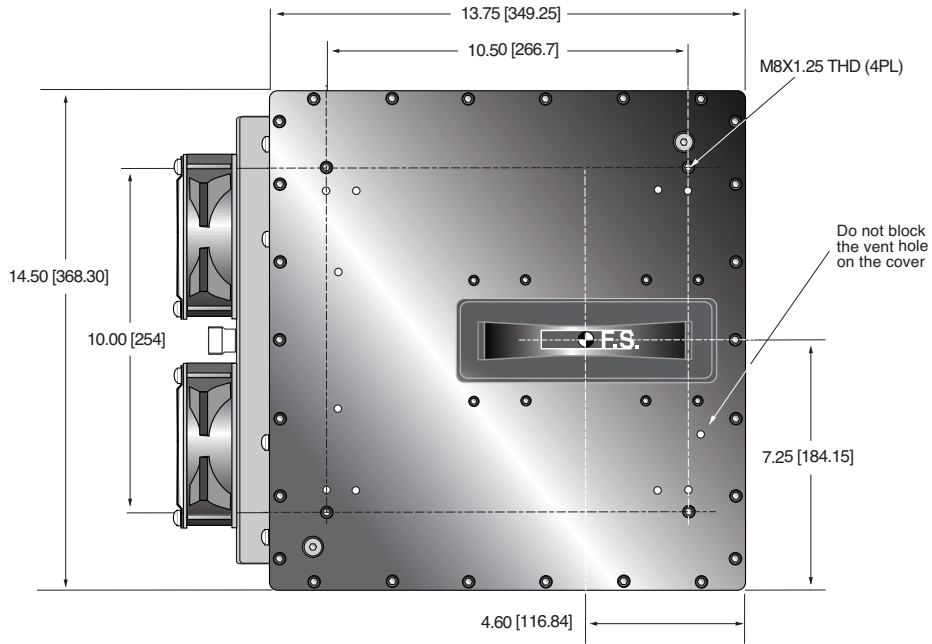


FRONT VIEW

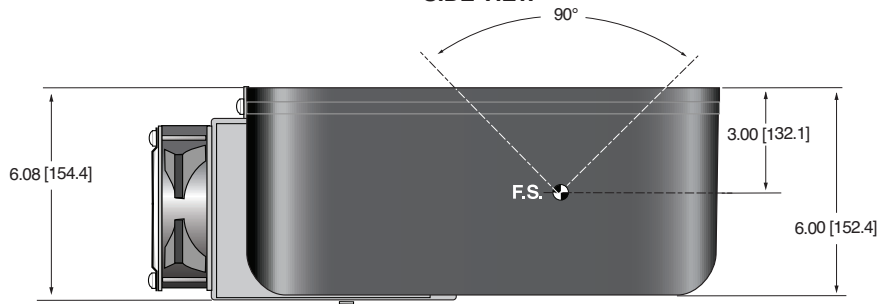


DIMENSIONS: in.[mm]

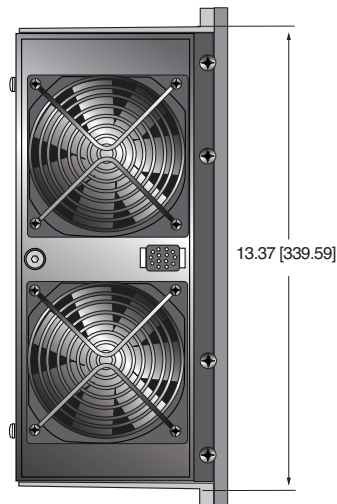
210W TANK TOP VIEW



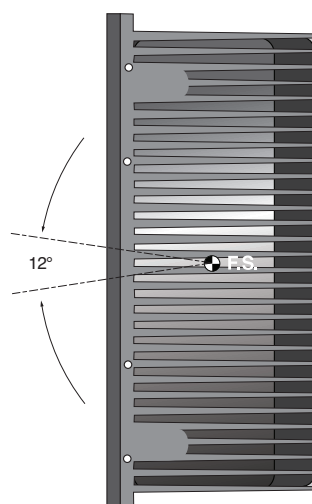
SIDE VIEW



BACK VIEW



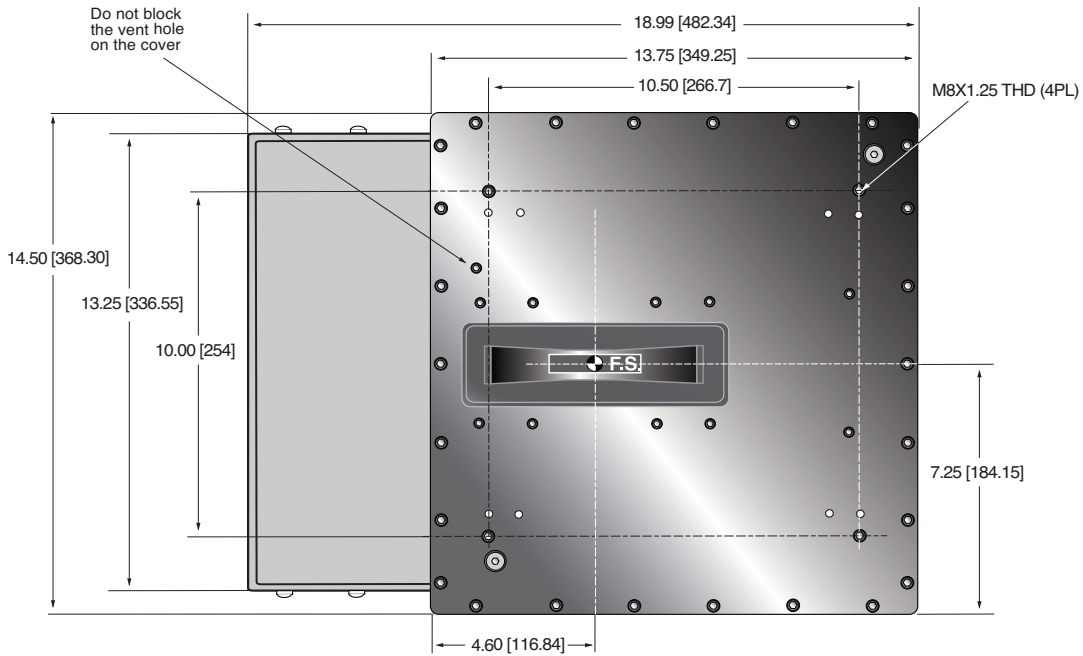
FRONT VIEW



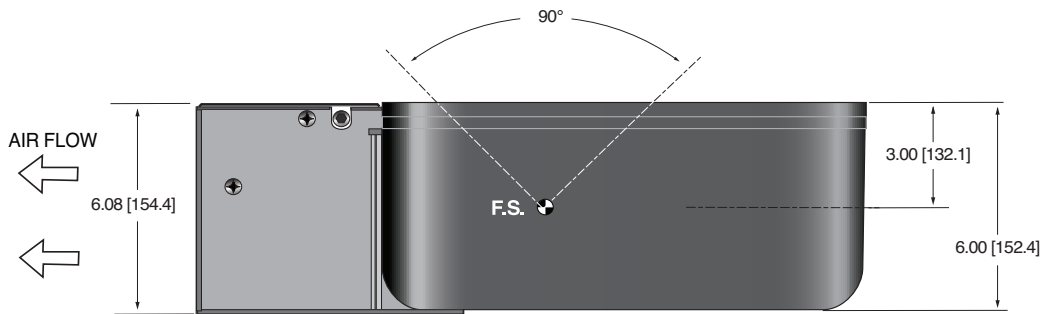
DIMENSIONS: in.[mm]

350/500W TANK

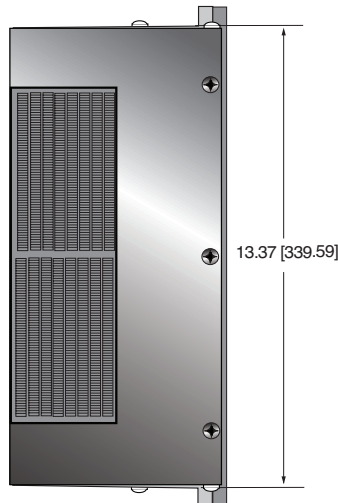
TOP VIEW



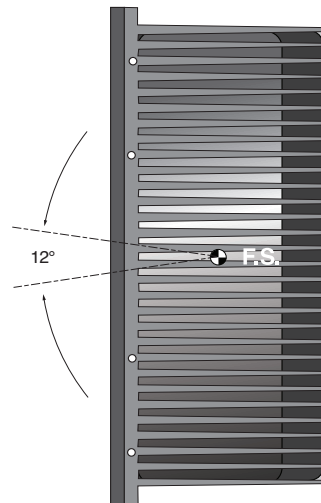
SIDE VIEW

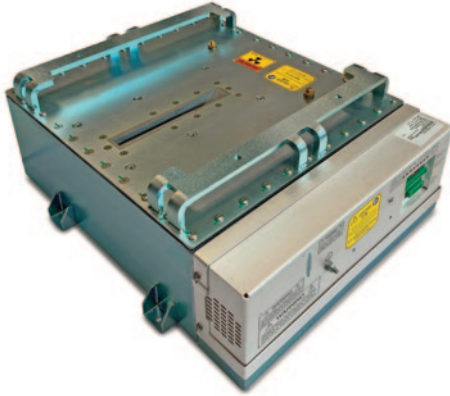


BACK VIEW



FRONT VIEW





- **180kV and 200W**
- **X-Ray Tube Current: 0.5mA to 1.1mA**
- **Focal Spot 0.8 x 0.8mm nominal (IEC60336)**
- **Fan Beam of 80° X 4° , maximum**
- **Power factor corrected input to 0.98**
- **100Vac to 240Vac, ±10%**

Spellman's XRB180PN200 is an integrated X-Ray source operating up to 180kV and 200W, providing OEM users a compact plug-and-play Monoblock for critical inspection and screening applications. The unit incorporates a 25° angle stationary anode X-Ray tube offering a fan beam of 80°x 4°. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, with industry leading dose stability and image quality. This compact model comes with standard analog and RS-232 digital control. Spellman can provide customized versions of this platform for specific OEM system requirements.

TYPICAL APPLICATIONS

Aviation Security Screening: Checked Baggage/EDS, Checkpoint. Vehicle Inspection, General NDT, Food Inspection

SPECIFICATIONS

X-Ray Characteristics:

Tube Type:	Stationary Anode, tungsten target
Focal Spot:	0.8 x 0.8mm nominal (IEC60336)
Beam Filter:	Consists of oil and the curved Ultem 0.079" +/-0.01". Inherent filtration in the X-Ray Tube is 1mm Be, 1.5mm +/-10% glass.
Beam Geometry:	Fan of 80° X 4°, ±1%
Anode Angle:	25°

Input Voltage:

Power factor corrected input to 0.98. 100Vac to 240Vac, ±10%, 50/60 Hertz. 5A, maximum

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 90kV to 180kV.

Voltage Accuracy:

The high voltage measured at the X-ray tube will be within ±1% of the selected value.

Voltage Ripple:

Ripple will be ≤0.2% of maximum rated voltage for frequencies ≤1kHz.

Voltage Regulation:

< ±0.1% for ±10% of nominal input line change
< ±0.1% for 0.5mA to 1.1mA load change

Voltage Overshoot:

kV overshoot will return within 5% of full voltage in less than 10ms.

Risetime:

The voltage and current risetime is controlled by a ramping circuit. Ramp time is less than 0.5 second from 10% to 90% of output voltage and current.

X-Ray Tube Current:

0.5mA to 1.1mA @ 180kV, 200 Watts maximum

Current Accuracy:

<±1% of the selected value.

Current Regulation:

<0.5% at 90-180kV, 0.5mA to 1.1mA

Arc Intervention:

Unit will detect a single arc but HV will not shut down. If multiple arcs occur (4 in 10 seconds) then the unit will shut down.

Filament Configuration:

Internal high frequency AC filament drive operated in current mode with closed loop filament emission control.

Analog Interface:

Ground referenced 0 to 10Vdc for all monitoring signals. Relay contacts and open collector outputs for other signals.

Digital Interface:

The RS-232 interface allows for programming of the voltage, current, and X-Ray Enable. Provides monitoring for voltage, current and oil temperature. Tolerance is 3% (with additional 5uA offset at ≤10%mA programming).

Control Software:

A demo GUI is available for engineering evaluation.

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing.

Cooling:

Via natural convection/external cooling fans of 100CFM minimum or maintaining tank/oil temperature below 55°C.

Input Line Connector:

3 pin Phoenix Contact, p/n 1829167.
Mating connector provided with unit.

Analog Interface Connector:

10 pin Phoenix Contact, p/n 1755503.
Mating connector provided with unit.

Digital Interface Connector:

9 pin female D connector.
Mating connector provided with unit.

Grounding Point:

M4 grounding stud provided on chassis.

Dimensions:

See outline drawing.

Weight:

132 pounds (60kg).

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than .5mR/hr at 5cm from any surface of the Monoblock® when measured at 180kV @ 1.1mA.

Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive.

**AC INPUT POWER
3 PIN PHOENIX CONTACT P/N 1829167**

PIN	SIGNAL	PARAMETERS
1	Line	100-240Vac, ±10%, 50/60 Hertz @ 6 amps
2	GND	Ground
3	Neutral	100-240Vac, ±10%, 50/60 Hertz @ 6 amps

**ANALOG INTERFACE—
10 PIN PHOENIX CONTACT P/N 1755503**

PIN	SIGNAL	PARAMETERS
1	X-Ray On	+24Vdc = Enable X-Ray, Low or open = Disable X-Ray
2	X-Ray On Return	X-Ray on Return
3	N/C	No Connection
4	kV Monitor	0 to 10Vdc = 0 to 200kV, Zout = 10kΩ
5	SGND	Signal Ground
6	mA Monitor	0 to 10Vdc = 0 to 1.5mA, Zout = 10kΩ
7	Fault	Open Collector, High (Open) = No Fault, 35Vdc @ 10mA, maximum
8	HV On Lamp N/O	Relay dry contact, normally open, 30Vdc @ <1A, nominal 50mA DC load
9	HV On Lamp Common	Relay dry contact, common, 30Vdc @ <1A, nominal 50mA DC load
10	HV On Lamp N/C	Relay dry contact, normally closed, 30Vdc @ <1A, nominal 50mA DC load

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

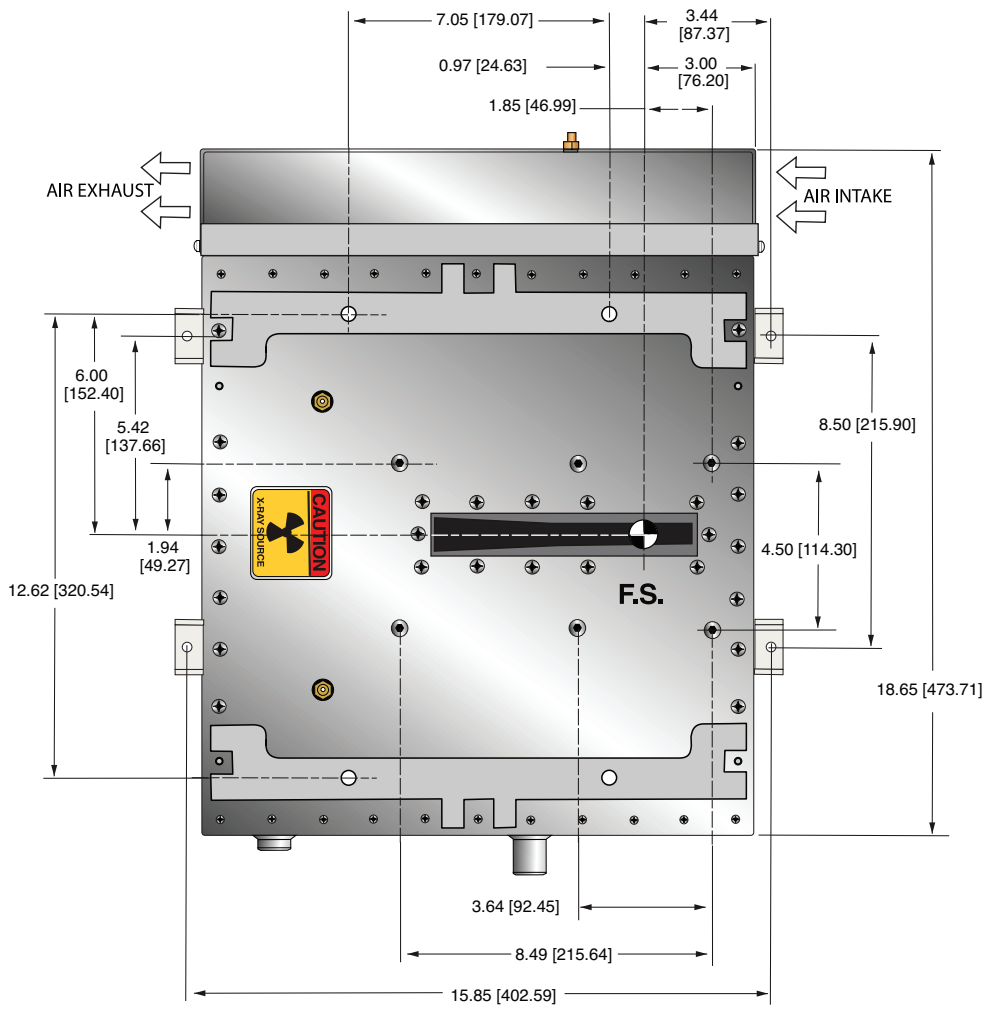
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to EAI RS-232-C
3	Receive Data	Conforms to EAI RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

FRONT PANEL LED INDICATORS

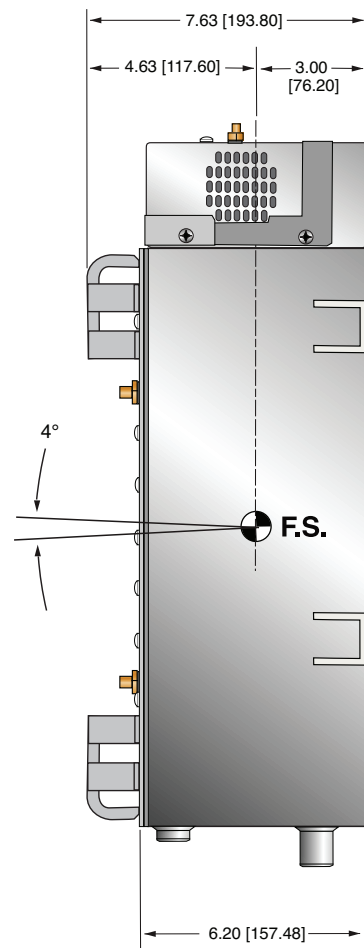
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...	LED COLOR
LED 1	OT	OverTemperature occurs	Red
LED 2	ARC	Arc fault occurs	Red
LED 3	UV	Low kV occurs	Red
LED 4	OV	High kV occurs	Red
LED 5	UC	Low mA occurs	Red
LED 6	OC	High mA occurs	Red
LED 7	X-RAY ON	X-Rays are enabled	Green
LED 8	PWR ON	Power is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

DIMENSIONS: in.[mm]

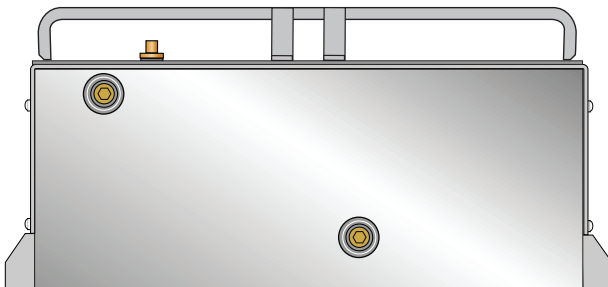
TOP VIEW



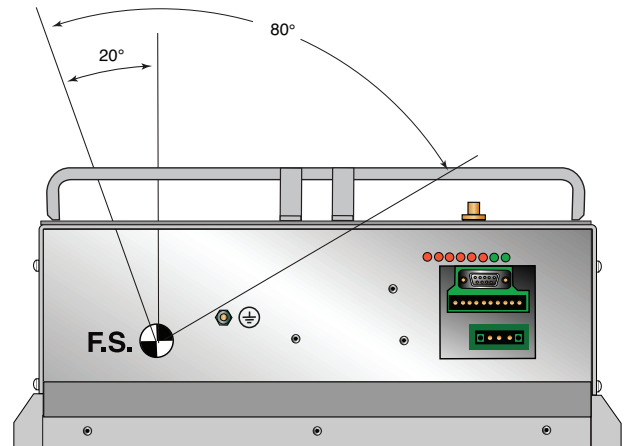
SIDE VIEW



BACK VIEW



FRONT VIEW





Spellman's XRBe80PN300 beryllium window Monoblock® X-Ray sources are designed for OEM applications powering the internal Bipolar X-Ray tube at 80kV at a power level of 300W. Features such as universal input, compact package size and a standard RS-232 digital interface simplify integration of the XRBe80PN300 into your X-Ray system. It is available with a cone shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

Food Inspection Systems, Fill Level Confirmation Systems, Security Scanning Systems, Industrial NDT Systems, Thickness/Plating Measurement Systems

OPTIONS

0.8mm	0.8mm focal spot X-Ray tube
ST-TE	Cable Options (see page 3)
RA-SE	
RA-TE	

SPECIFICATIONS

X-Ray Characteristics:

Focal Spot:	0.8mm (IEC 336) standard
Beam Filter:	Be 0.8mm
Beam Geometry:	
Cone:	Standard. The beam angular coverage will be 40° with the beam plane perpendicular to the X-Ray tube axis

Input Voltage:

100- 240Vac, ±10%, 50/60 Hertz, .98 power factor

Input Current:

300W @ 6A

- **Compact & Lightweight**
- **Universal Input, Power Factor Corrected**
- **Can be Mounted in Any Physical Orientation**
- **Analog Monitoring Interface, Standard RS-232 Digital Interface and Ethernet**
- **Data Logging and Firmware Controlled X-Ray Tube Seasoning**

X-Ray Tube Voltage:

See table. Minimum kV for emission current 40kV

X-Ray Tube Current:

See table. Minimum emission current 300uA

X-Ray Tube Power:

300W

Voltage Regulation:

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

Load: ±0.1% of maximum rated voltage for 150uA to full rated load change

Voltage Accuracy:

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

Voltage Risetime:

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

Voltage Ripple:

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

Emission Current Parameters

Current Regulation:

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

Load: ±0.1% of rated output current for a change from 50% to 100% of rated output voltage

Current Accuracy:

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

Current Risetime:

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

Arc Intervention:

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

Filament Configuration:

Internal floating AC filament drive with closed loop filament emission control circuitry

Analog Interface:

Ground referenced 0 to 9Vdc for all monitoring signals. Relay contacts and open collector signals for other signals. See analog interface connector pinout table.

Digital Interface:

The RS-232 interface allows for programming of kV, mA output and X-Ray enable. Provides monitoring for kV, mA output and oil temperature.

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

X-Ray Tank: Externally powered forced air cooling with oil pump and heat exchanger, 24Vdc @ 5A

Controller: Forced air via internal fan.

Grounding Point:

M5 ground female thread on tank
M5 ground stud on control chassis provided

Dimensions:

X-Ray Tank: see drawings
Controller: see drawings

Weight:

X-Ray Tank: 81.5lbs. (37kg)
Controller: 7lbs. (3.18kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface.

Regulatory Approvals:

Compliant to EEC EMC Directive. Compliant to EEC Low Voltage Directive. UL/CUL recognized file E235530

AC INPUT—3 PIN PHOENIX CONTACT 1858772

PIN	SIGNAL	PARAMETERS
1	AC Input (high)	100-240Vac (high)
2	Ground	Ground
3	AC Input (neutral)	100-240Vac (neutral)

DC INPUT FOR HEAT DISSIPATION UNIT—4 PIN AMP (210/350/500W) 206060-1

PIN	SIGNAL	DESCRIPTION	PARAMETERS
1	24Vdc	Fan/Pump Power	24Vdc @ 5 amps
2	24Vdc Return		
3	N/C	No Connection	N/C
4	N/C	No Connection	N/C

It is critical to ensure that 24Vdc is supplied to pins 1 and 2

LED INDICATORS

INDICATOR	SIGNAL	CONDITION Illuminated When...	LED COLOR
1	OV Error 6	High kV occurs	Red
2	UV Error 5	Low kV occurs	Red
3	UC Error 4	Low mA occurs	Red
4	OC Error 3	High mA occurs	Red
5	ARC Error 2	Arc fault occurs	Red
6	OT Error 1	Over temperature occurs	Red
7	X-Ray On	X-Rays are being generated	Green
8	Power On	AC input power is present	Green

ANALOG INTERFACE—10 PIN PHOENIX CONTACT 1792605

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

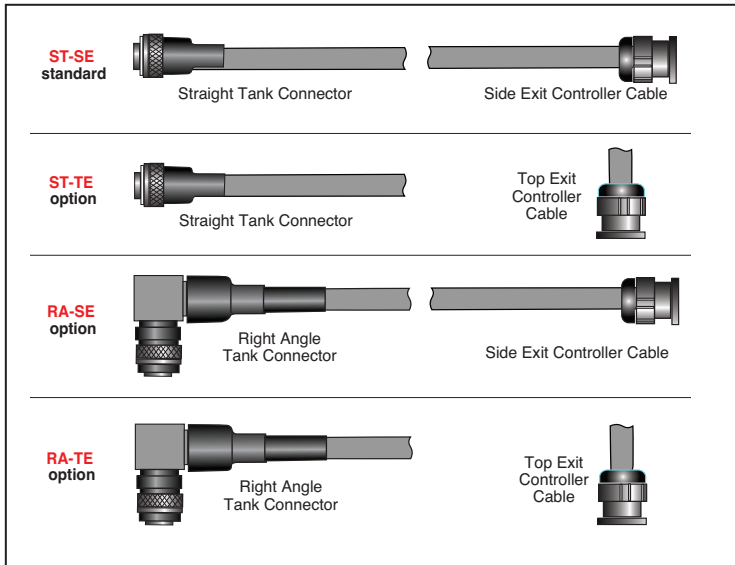
RS-232 DIGITAL INTERFACE—9 PIN MALE D CONNECTOR

PIN	SIGNAL	PARAMETERS
1	N/C	N/C
2	Transmitted Data	Conforms to EIA RS-232-C
3	Received Data	Conforms to EIA RS-232-C
4	N/C	N/C
5	Signal Ground	Signal Ground
6	N/C	N/C
7	N/C	N/C
8	N/C	N/C
9	N/C	N/C

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

CABLE CONFIGURATIONS



SMART XRB

The XRBe80PN300 has two new digital features: **data logging and firmware controlled seasoning.**

Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage:

FAULT EVENTS

Temperature	Arc
High Current	Low Voltage
High Voltage	Watchdog
Power Fault	Interlock

The XRBe80PN300 stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing:

Anode kV	Cathode kV
Total kV	Total mA
Filament	Temperature

We also log non-fault events, these are changes in set points or state of the unit.

NON FAULT EVENTS

HV On	HV Off
kV Set point	mA Set point
Low Current	Filament Limit Set point
Pre Heat Set point	Line Dip

Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

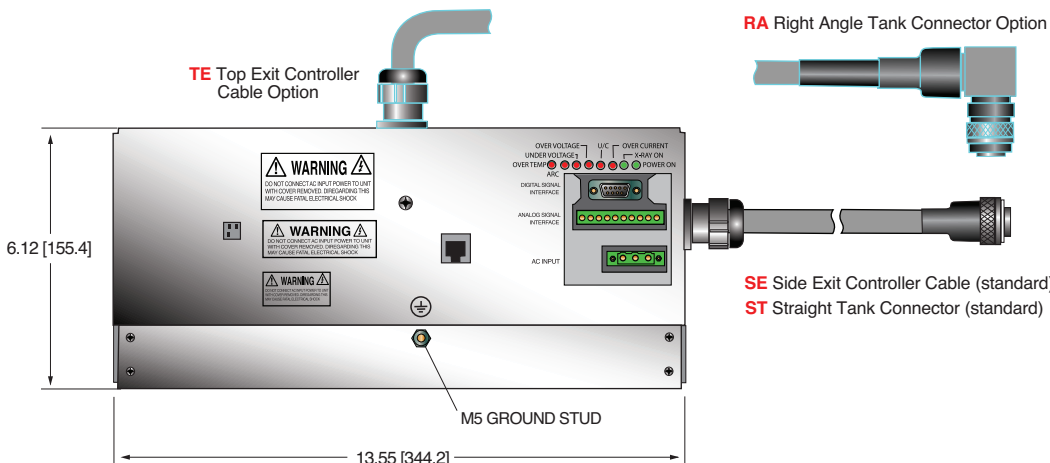
Firmware Controlled Seasoning:

Every unit comes with an initial seasoning table, or customers can set their own. The XRBe80PN300 knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

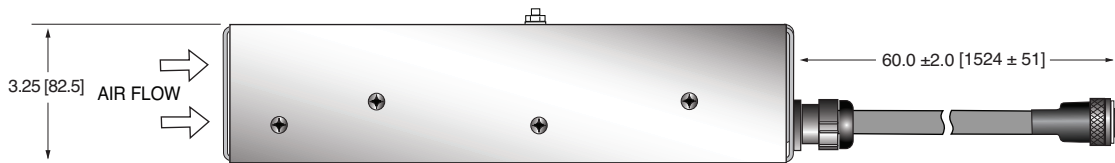
DIMENSIONS: in.[mm]

CONTROL UNIT

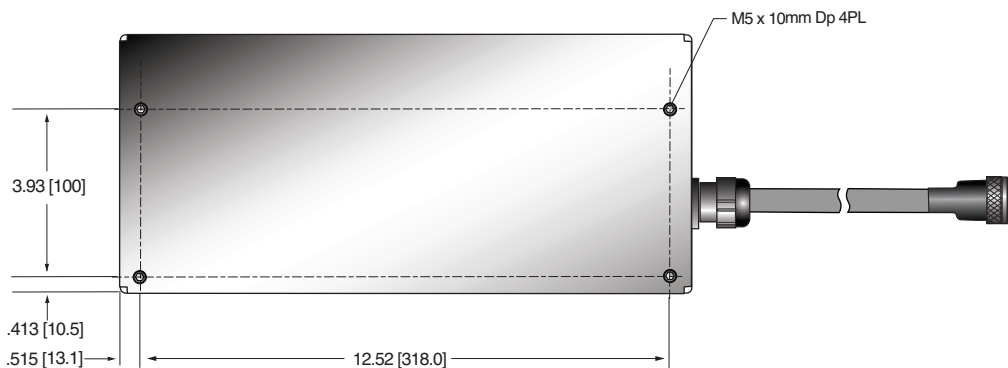
FRONT VIEW



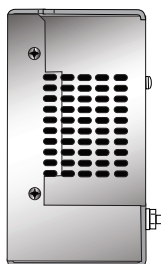
BOTTOM VIEW



REAR VIEW



SIDE VIEW

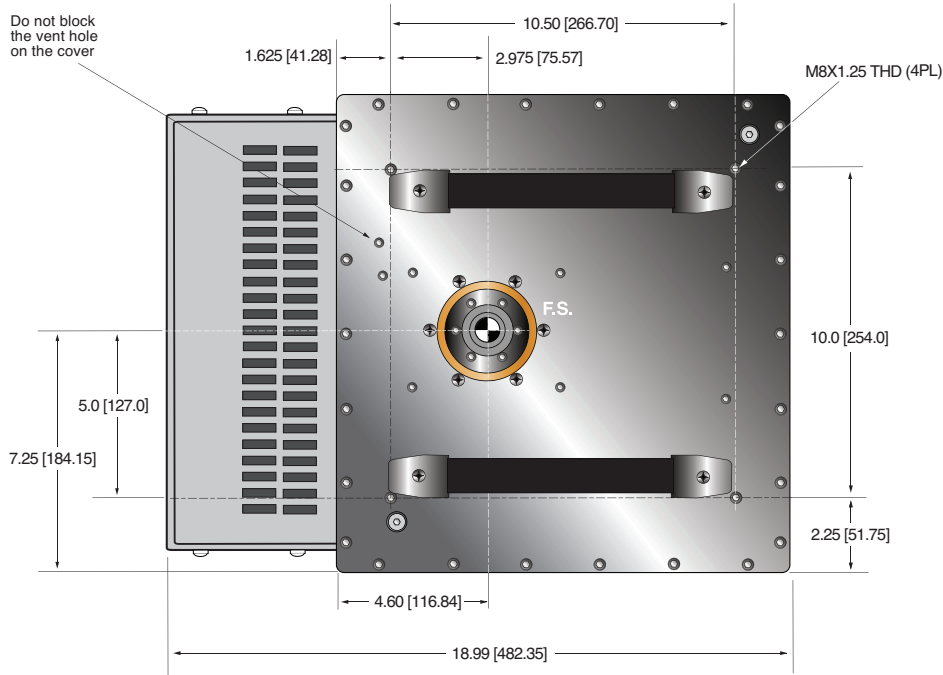


SIDE VIEW

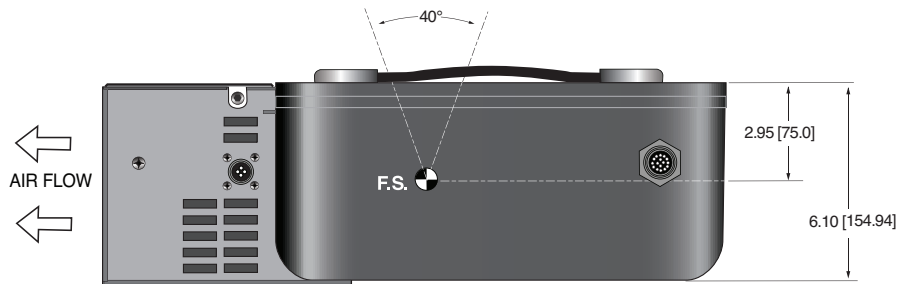


DIMENSIONS: in.[mm]

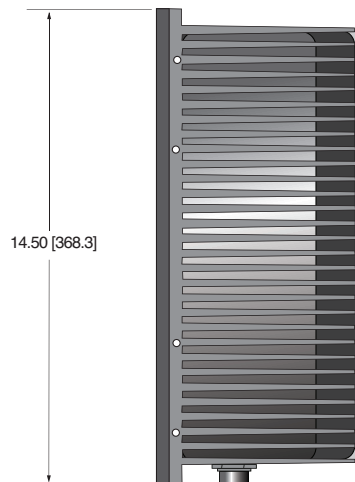
TOP VIEW



SIDE VIEW



FRONT VIEW





- **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**

Spellman's XRB80PN320 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 80kV at 320W. Features like small package size and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

Tube Type: Glass tube, Tungsten target, Be filter
Focal Spot: 0.8mm x 0.8mm (IEC 336)
Beam Filter: 5052 Al, 0.040" (± 0.01 ")
Beam Geometry: Asymmetrical fan 80° x 10° $\pm 2^\circ$

Input Voltage:

200-240Vac $\pm 10\%$, 50/60Hz, 6.5A max

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 40kV to 80kV

X-Ray Tube Current:

0.5mA to 4mA over specified tube voltage range

X-Ray Tube Power:

320W maximum continuous

Voltage Regulation:

Line: $\pm 0.05\%$ 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

Voltage Risetime:

Ramp time shall be $< 500\text{ms}$ from 10% to 90% of rated output

Voltage Overshoot:

Within 5% of rated voltage in $< 10\text{ms}$

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 Risetime:

$< 500\text{ms}$ from 10% to 90% of rated output

Arc Intervention:

4 arcs in 10 seconds = shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Analog Interface:

0 to 10Vdc ground referenced monitoring signals

Digital Interface:

RS-232

Control Software:

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

Interlock Signals:

A hardware interlock functions in digital programming modes.

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 90% relative humidity, non-condensing

Cooling:

Heat exchanger w/fan and oil pump

Input Line Connector:

Terminal block, Schurter, Inc. part no. 6100-33

Digital Interface Connector:

9 pin D, female

Analog Monitoring Connector:

10 pin Phoenix Contact 1755503

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

See line drawing

Weight:

120lbs (54.4kg) maximum

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

Regulatory Approvals:

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

AC INPUT POWER TERMINAL BLOCK

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	Line	Line
3	Line	Line
4	Neutral	Neutral
5	Neutral	Neutral
6	Neutral	Neutral

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

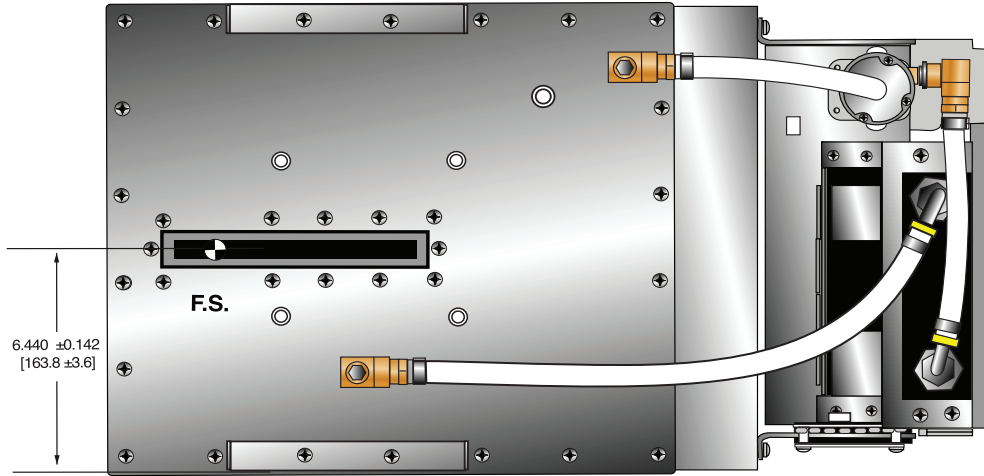
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	RS-232 Transmit
3	RX	RS-232 Receive
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

**ANALOG MONITORING—
JB11 10 PIN PHOENIX CONTACT**

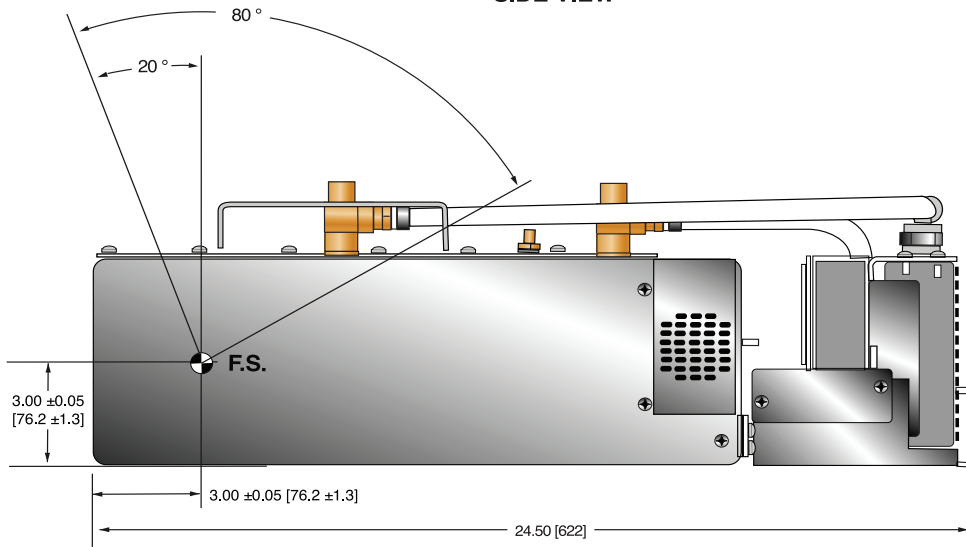
PIN	SIGNAL	PARAMETERS
1	X-Ray Enable	+24Vdc = Enable X-Ray 0Vdc/Open = Disable X-Rays
2	RTN	Signal Return
3	N/C	No Connection
4	kV Monitor	0 to 10Vdc = 0 to 100kV, Zout = 10kΩ
5	SGND	Signal Return
6	mA Monitor	0 to 10Vdc = 0 to 5mA, Zout = 10kΩ
7	Fault	Open Collector, High (Open) = No Fault, 35Vdc @10mA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

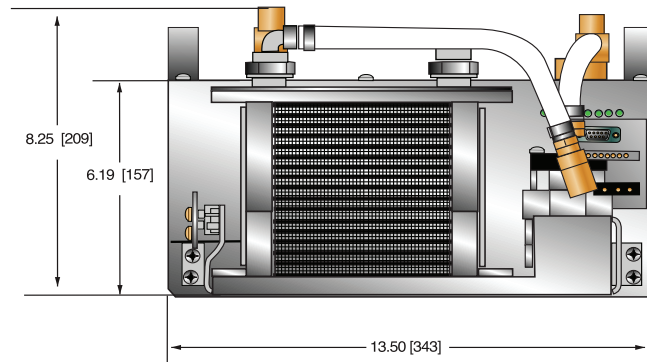
TOP VIEW



SIDE VIEW



BACK VIEW





Spellman's XRB200PN400/CT Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 200kV at 400W. Features like universal input, small package size, standard analog monitoring and RS-232 digital interface simplify integrating this unit into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

100Vac-240Vac ±10%, 50/60Hz, 6A maximum

X-Ray Tube Voltage:

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

X-Ray Tube Current:

0.5mA to 2mA over specified tube voltage range

X-Ray Tube Power:

400W maximum continuous (350W average without external forced air)

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage Risetime:

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

- **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:

≤0.2% pp of rated maximum voltage

Current Regulation:

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

Current Accuracy:

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

Current Risetime:

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

Arc Intervention:

4 arcs in 10 seconds = shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Digital Interface:

RS-232 interface.

Control Software:

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

Interlock Signals:

A hardware interlock function is provided

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

5% to 95% relative humidity, non-condensing

Cooling:

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

Input Line Connector:

3 pin Phoenix Contact 1829167

Analog Interface Connector:

10 pin Phoenix Contact 1755503

Digital Interface Connector:

9 pin D connector, female

Grounding Point:

M5 ground stud provided on chassis

Dimensions:

See drawing

Weight:

148.0lbs (67.0kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 5uSv/hr at 5cm outside the external surface

**AC INPUT POWER
3 PIN PHOENIX CONTACT**

PIN	SIGNAL	PARAMETERS
1	Line	Line
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**

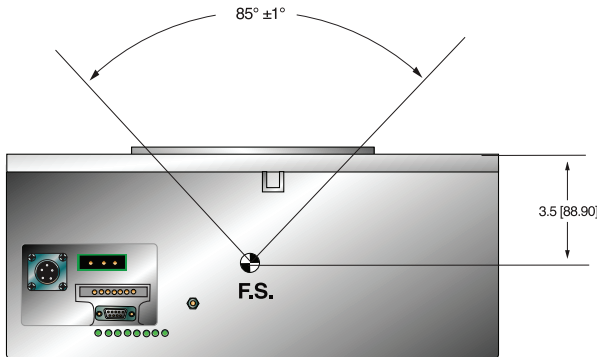
PIN	SIGNAL	PARAMETERS
1	X-Ray	+24Vdc = enable X-Ray
2	X-Ray Return	X-Ray Return
3	N/C	N/C
4	kV Monitor Output	0 to 9Vdc = 0 to 100% Rated Voltage
5	SGND	Signal Ground
6	mA Monitor Output	0 to 9Vdc = 0 to 100% Rated Current
7	Fault	Open Collector, Open = No Fault
8	Relay N/O	HV On, 50V @ 1A maximum
9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

**RS-232 DIGITAL INTERFACE—
9 PIN FEMALE 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]

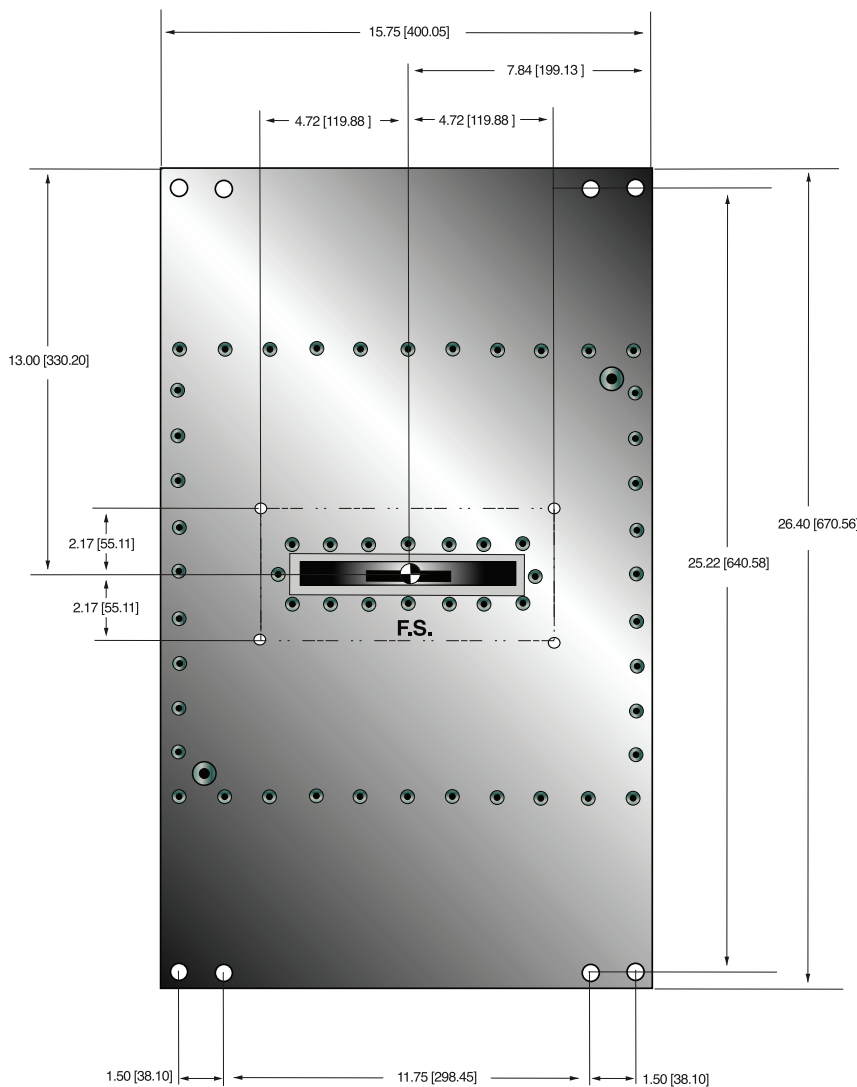
FRONT VIEW



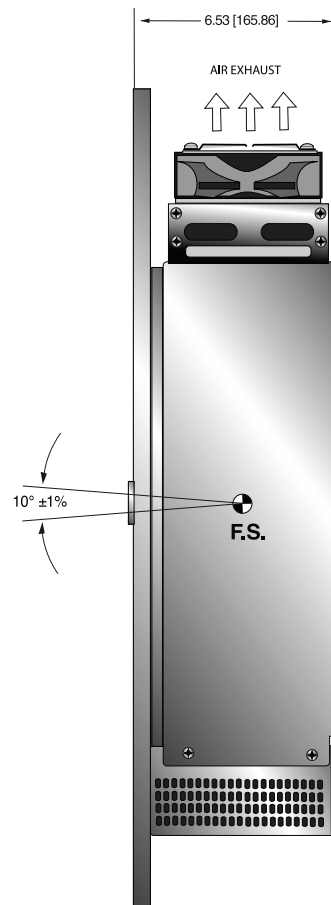
BACK VIEW

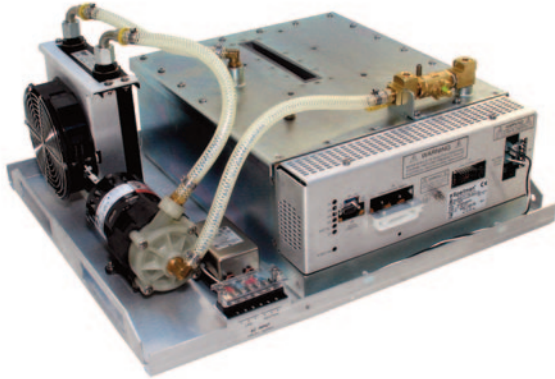


TOP VIEW



SIDE VIEW





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

Spellman's XRB160PN480/1 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 480W. Features like power factor correction, small package size, standard analog monitoring and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Standard models are available with fan shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

220Vac, ±10%, 50/60Hz, 6.5A max

X-Ray Tube Voltage:

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

X-Ray Tube Current:

0.25mA to 3mA over specified tube voltage range

X-Ray Tube Power:

480W maximum continuous

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage Risetime:

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

Voltage Overshoot:

±1% switching between 90kV to 160kV @ 0.25mA

Voltage Ripple:

≤0.1% of rated voltage from 10Hz to 1kHz

Current Regulation:

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

Current Accuracy:

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

Current Risetime:

≤2 seconds from 10% to 90% of rated output

Arc Intervention:

4 arcs in 10 seconds = shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Analog Interface:

0 to 10Vdc ground referenced signals

Digital Interface:

RS-232 interface

Control Software:

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

Interlock Signals:

A hardware interlock function is provided

Operating Temperature:

0°C to +40°C

Storage Temperature:

-20°C to +70°C

Humidity:

5% to 95% relative humidity, non-condensing

Cooling:

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

Input Line Connector:

6 position terminal block

Analog Interface Connector:

7 pin Molex 26-60-5070

Digital Interface Connector:

9 pin D connector, female

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

20" x 22.5" x 10.75" (508mm x 572mm x 273mm)

Weight:

125lbs (56.7kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

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

PIN	SIGNAL	PARAMETERS
1	Line	Line
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

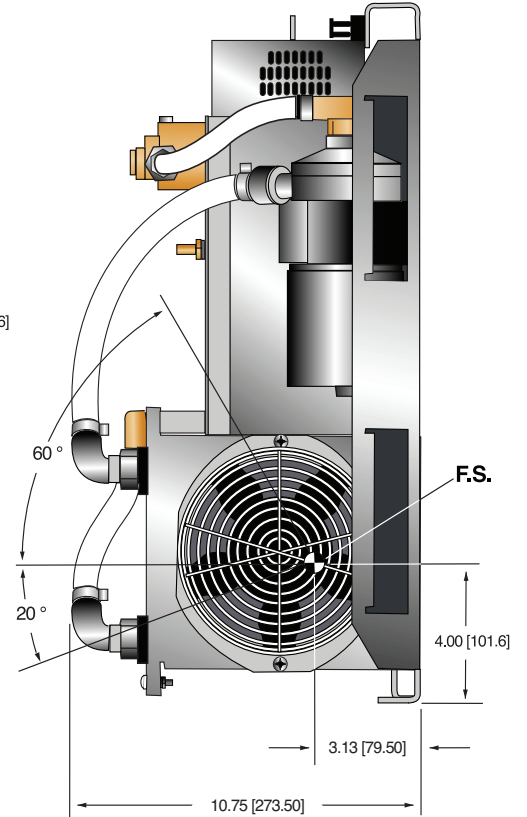
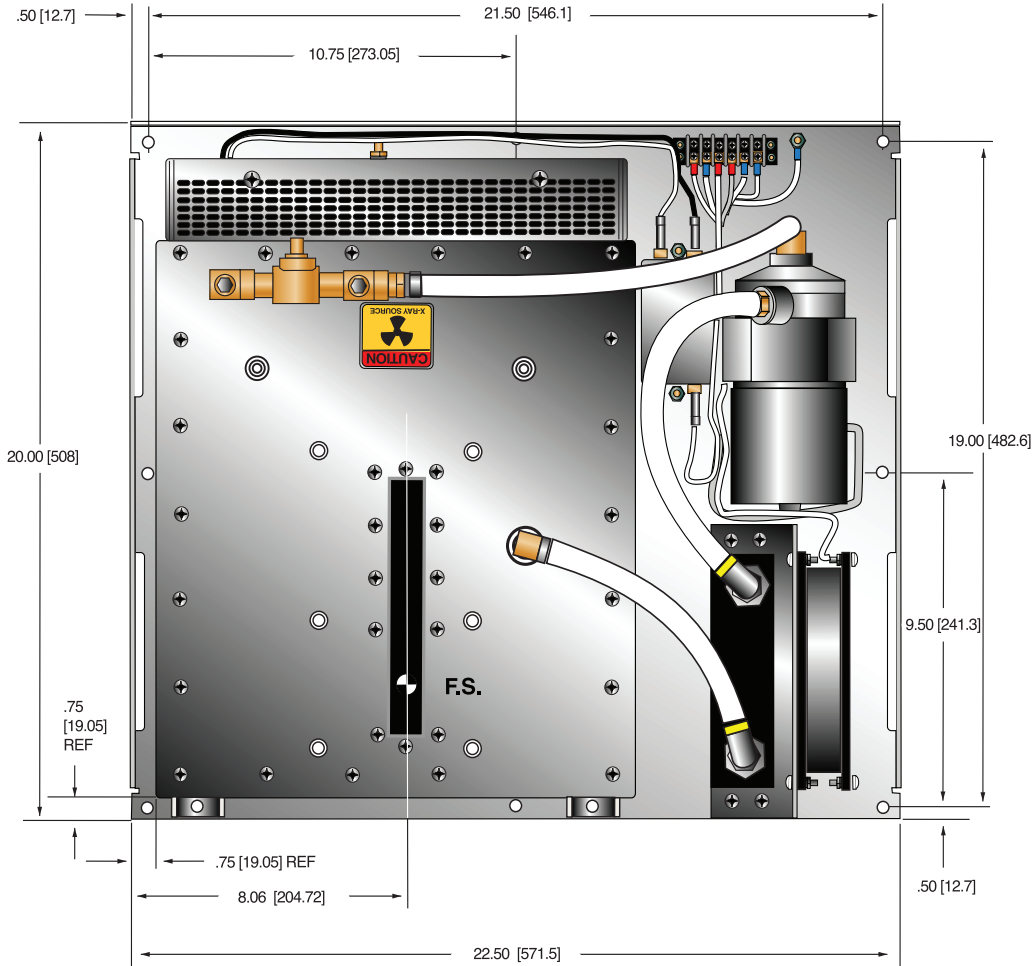
**RS-232 DIGITAL INTERFACE —
9 PIN FEMALE D CONNECTOR**

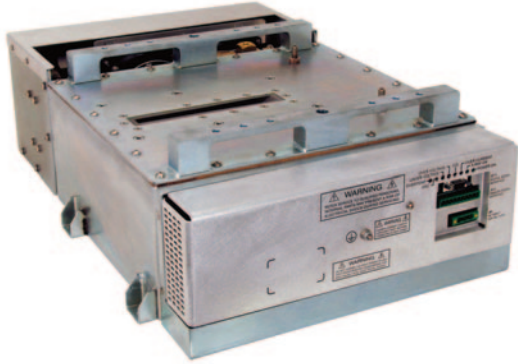
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	X-Ray Enable	+12Vdc @ 16mA = Enable
9	N/C	No Connection

DIMENSIONS: in.[mm]

TOP VIEW

SIDE VIEW





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

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

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

X-Ray Tube Voltage:

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

X-Ray Tube Current:

0.25mA to 3mA over specified tube voltage range

X-Ray Tube Power:

480W maximum

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage 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 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 @ ≤1kHz

Current Regulation:

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

Current Accuracy:

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

Current 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 functions in both analog and digital programming modes.

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

95% relative humidity, non-condensing

Cooling:

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

Input Line Connector:

3 pin, Phoenix Contact 1829167

Analog Interface Connector:

10 pin, Phoenix Contact 1755503

Digital Interface Connector:

9 pin D connector, female

Heat Exchanger Power Connector:

4 pin AMP part no. 206061-1

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

See outline drawing

Weight:

125lbs (56.7kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

**AC INPUT POWER
3 PIN PHOENIX CONTACT**

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Ground
3	Neutral	Neutral

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

PIN	SIGNAL	PARAMETERS
1	+12	+12Vdc
2	RTN	Return
3	+12	+12Vdc
4	RTN	Return

**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 3.4mA, 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

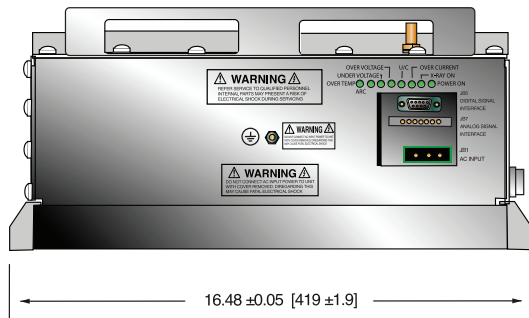
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OT	Over temperature occurs
LED 2	ARC FLT	Arc fault occurs
LED 3	UV	Low kV occurs
LED 4	OV	High kV occurs
LED 5	UC	Low mA occurs
LED 6	OC	High mA occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

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

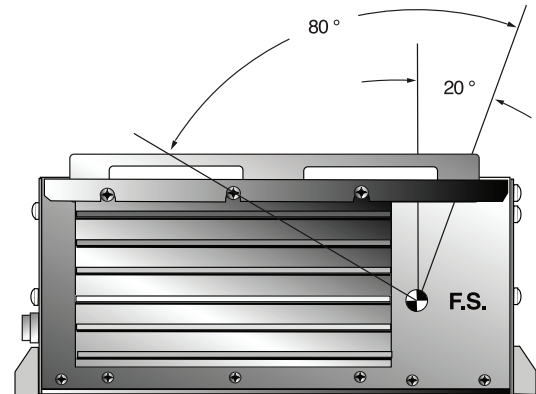
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to E/A RS-232-C
3	Receive Data	Conforms to E/A RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in. [mm]

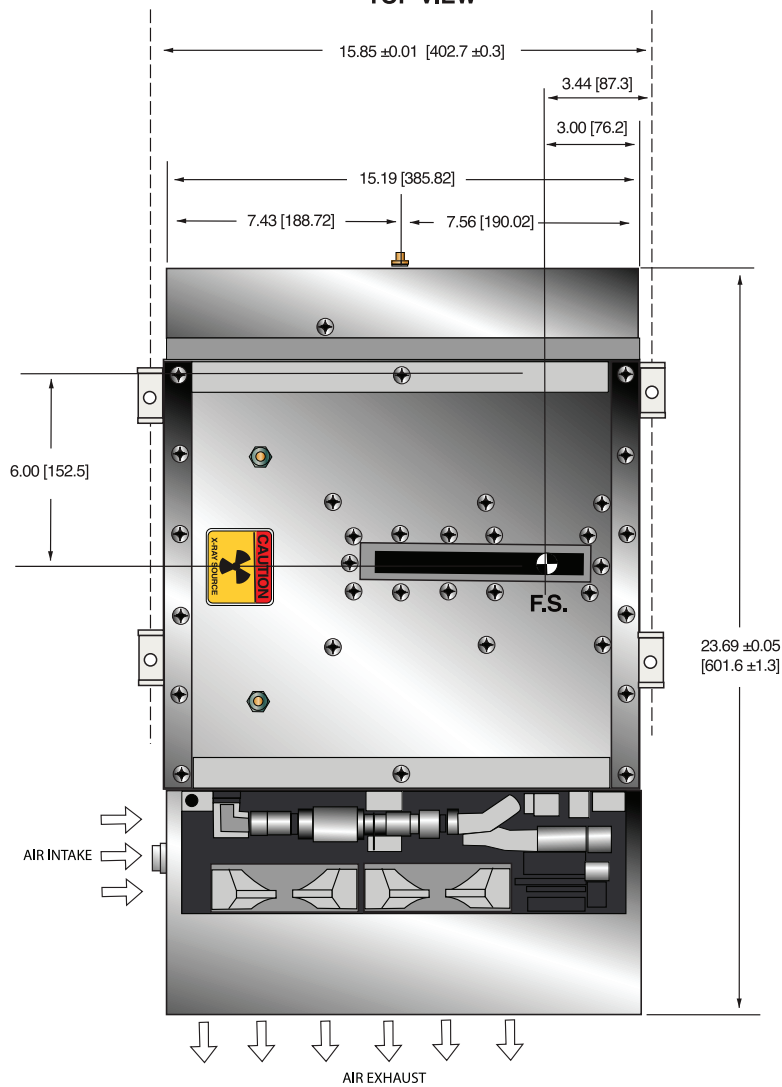
FRONT VIEW



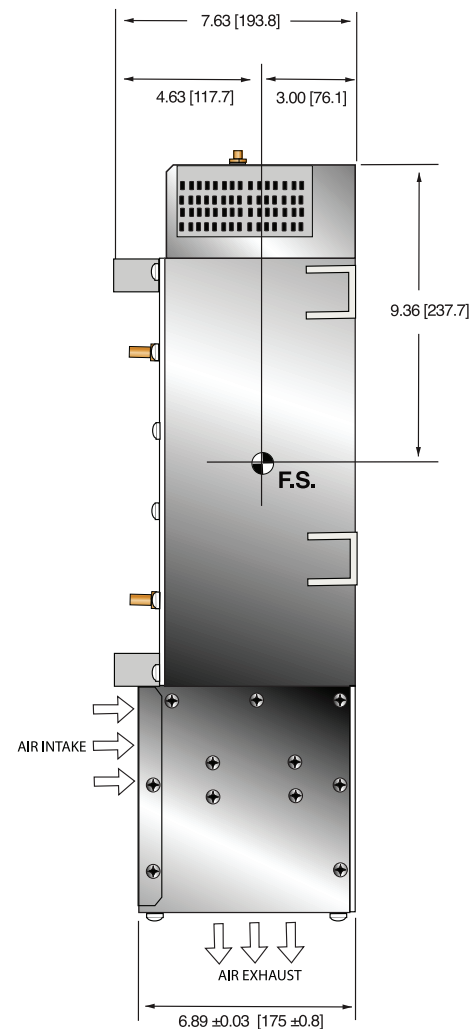
BACK VIEW



TOP VIEW



SIDE VIEW





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

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

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

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

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 20kV to 160kV

X-Ray Tube Current:

0.3mA to 6mA over specified tube voltage range

X-Ray Tube Power:

320W continuous, 480W peak

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage Risetime:

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

Voltage Overshoot:

Within 5% of rated voltage

Voltage Ripple:

0.1% pp of rated voltage @ ≤1kHz

Current Regulation:

Line: ±0.5%
Load: ±0.5%

Current Accuracy:

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

Current Risetime:

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

Arc Intervention:

4 arcs in 10 seconds = Shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Digital Interface:

RS-232

Control Software:

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

Interlock Signals:

A hardware interlock functions in digital programming modes.

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

5% to 90% relative humidity, non-condensing

Cooling:

Heat exchanger w/fan and oil pump, powered from customer provided 24Vdc @ 3A

Input Line Connector:

3 pin Phoenix Contact part no. 1829167

Digital Interface Connector:

9 pin D, female

Analog Signal Connector:

10 pin Phoenix Contact part no. 1755503

Cooler Power Connector:

4 pin AMP part no. 206061-1

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

24.00" x 16.00" x 6.50"
(609.60mm x 406.40mm x 165.10mm)

Weight:

125lbs (49.5kg) ±10lbs (±4.5kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than 0.5mR/hr at 5cm outside the external surface

Special Features:

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

**AC INPUT POWER
3 PIN PHOENIX CONTACT**

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Ground
3	Neutral	Neutral

**ANALOG INTERFACE—
10 PIN PHOENIX CONTACT**

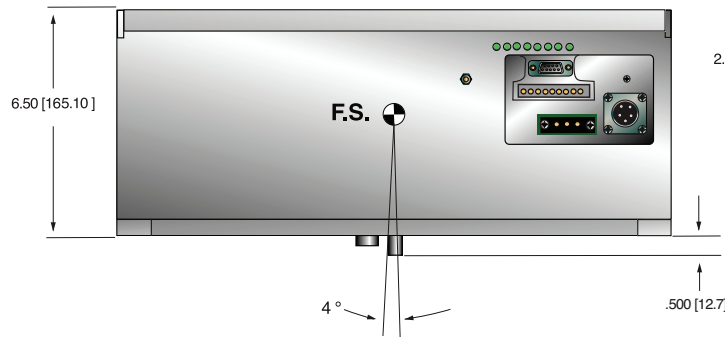
PIN	SIGNAL	PARAMETERS
1	X-Ray	+24Vdc = enable X-Ray
2	X-Ray Return	X-Ray Return
3	N/C	No Connection
4	kV Monitor Output	0 to 9Vdc = 0 to 100% Rated Voltage
5	SGND	Signal Ground
6	mA Monitor Output	0 to 9Vdc = 0 to 100% Rated Current
7	Fault	Open Collector, Open = No Fault
8	Relay N/C	HV On, 50V @ 1A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

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

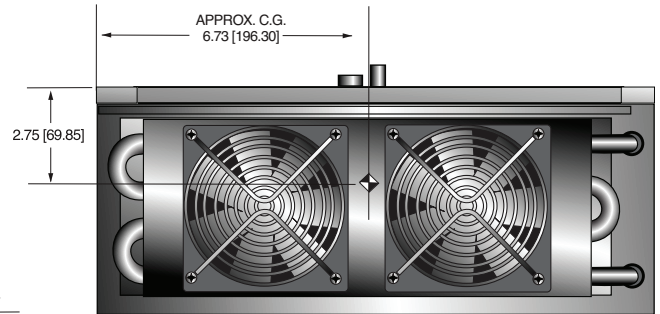
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to E/A RS-232-C
3	Receive Data	Conforms to E/A RS-232-C
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

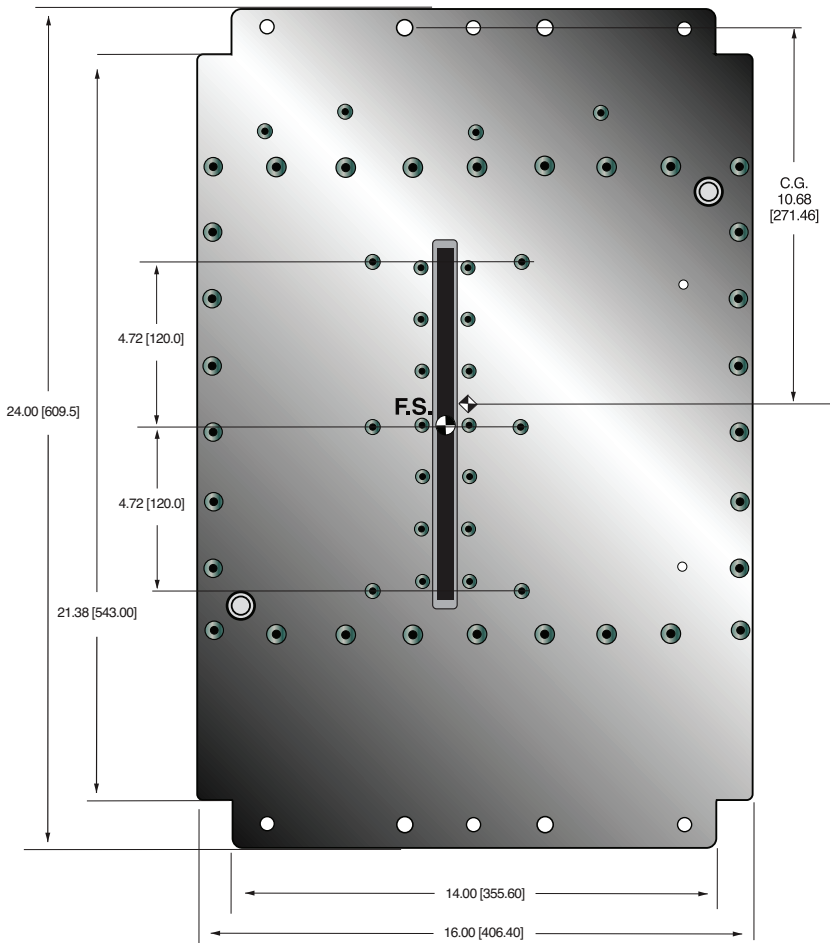
FRONT VIEW



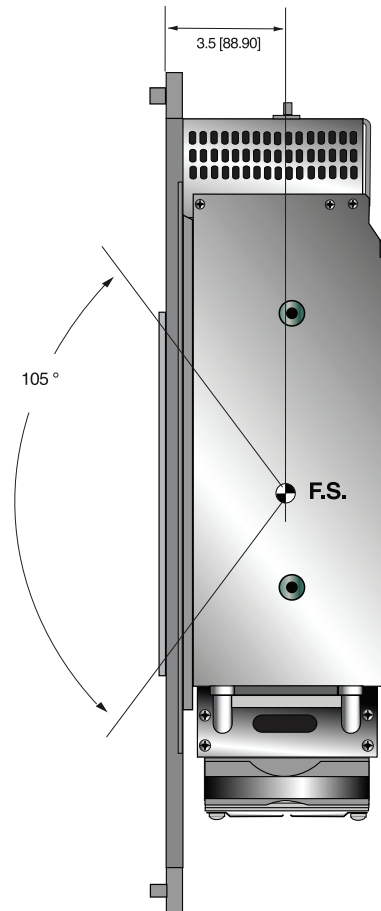
BACK VIEW

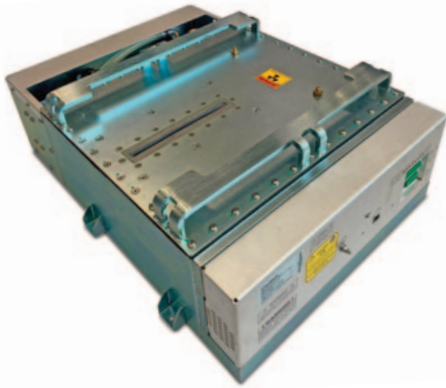


TOP VIEW



SIDE VIEW





Spellman's XRB200PN500 is an integrated X-Ray source operating up to 200kV and 500W, providing OEM users a compact plug-and-play Monoblock® for critical inspection and screening applications. The unit incorporates a 15° angle stationary anode X-Ray tube offering a symmetrical fan beam of 85° X 4°. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, with industry leading dose stability and image quality. This compact model comes with standard analog and RS-232 digital control. Spellman can provide customized versions of this platform for specific OEM system requirements.

TYPICAL APPLICATIONS

Aviation Security Screening: Checked Baggage/EDS
Vehicle Inspection, Cargo Inspection, General NDT

SPECIFICATIONS

X-Ray Characteristics:

Tube Type: Stationary Anode, tungsten target
Focal Spot: 0.8 x 0.5mm nominal (IEC60336)
Beam Filter: Glass 2.1mm, maximum. Oil 18mm.
Beam Geometry: Symmetrical fan of 85° X 4°, ±1%
Anode Angle: 15°

Input Voltage:

Power factor corrected input to 0.98. 100Vac to 240Vac, ±10%, 50/60 Hertz. 6 Amps, maximum

X-Ray Tube Voltage:

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

Voltage Accuracy:

The high voltage measured at the X-ray tube will be within ±1% of the selected value.

Voltage Ripple:

Ripple will be 1% of maximum rated voltage for frequencies ≤1kHz.

Voltage Regulation:

< ±0.1% for ±10% of nominal input line change
< ±0.1% for 0.5mA to 2.5mA load change

Voltage Overshoot:

kV overshoot will return within 5% of full voltage in less than 100ms.

Risetime:

The voltage and current risetime is controlled by a ramping circuit. Ramp time is less than 1.0 second from 10% to 90% of output voltage and current.

- **200kV and 500W**
- **X-Ray Tube Current: 0.5mA to 2.5mA @ 200kV**
- **Focal Spot 0.8 x 0.5mm Nominal (IEC60336)**
- **Symmetrical Fan Beam of 85° X 4°, ±1%**
- **Power Factor Corrected Input to 0.98**
- **100Vac to 240Vac, ±10%**
- **Logging and Firmware Controlled X-Ray Tube Seasoning**

X-Ray Tube Current:

0.5mA to 2.5mA @ 200kV <±1% of the selected value.
500 watts maximum

Current Regulation:

<0.5% at 100 - 200 kV, 0.5mA to 2.5mA

Arc Intervention:

Unit will detect a single arc but HV will not shut down. If multiple arcs occur (4 in 10 seconds) then the unit will shut down.

Filament Configuration:

Isolated high frequency AC filament drive operated in current mode with closed loop thermionic filament emission control.

Digital Interface:

The RS-232 and Ethernet interfaces allow for programming of the voltage, current and X-Ray Enable. Provides monitoring for voltage, current and oil temperature. Tolerance is 3%.

Control Software:

A demo GUI is available for engineering evaluation.

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 with fan and oil pump. Customer provided +24Vdc @ 3A is required. In certain situations, external cooling fans of 250CFM may be required to maintain tank/oil temperature below 55°C.

Input Line Connector:

3 pin Phoenix Contact, p/n 1829167.
Mating connector provided with unit.

Analog Interface Connector:

10 pin Phoenix Contact, p/n 1755503.
Mating connector provided with unit.

RS-232 Connector:

9 pin female D connector. Mating connector provided with unit.

Ethernet Connector:

8 pin RJ45 connector.

Heat Dissipation Unit Connector:

4 pin AMP connector, TE Connectivity (206061-1)
Mating connector provided with unit.

Grounding Point:

M4 grounding stud provided on chassis.

Dimensions:

See outline drawing.

Weight:

181 pounds (80kg).

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Not to be greater than .5mR/hr at 5cm from any surface of the Monoblock® when measured at 200kV @ 2.5mA.

Regulatory Approvals:

Compliant to EEC Low Voltage Directive. Designed to meet EEC EMC Directive with customer provided external line filter, Corcom p/n 6EU1F or equivalent.

**ANALOG INTERFACE—
10 PIN PHOENIX CONTACT P/N 1755503**

PIN	SIGNAL	PARAMETERS
1	X-Ray On	+24Vdc = Enable X-Ray, Low or open = Disable X-Ray
2	X-Ray On Return	X-Ray on Return
3	N/C	No Connection
4	kV Monitor	0 to 10Vdc = 0 to 200kV, Zout = 10kΩ
5	SGND	Signal Ground
6	mA Monitor	0 to 10Vdc = 0 to 2.5mA, Zout = 10kΩ
7	Fault	Open Collector, High (Open) = No Fault, 35Vdc @ 10mA, maximum
8	HV On Lamp N/O	Relay dry contact, normally open, 30Vdc @ <1A, nominal 50mA DC load
9	HV On Lamp Common	Relay dry contact, common, 30Vdc @ <1A, nominal 50mA DC load
10	HV On Lamp N/C	Relay dry contact, normally closed, 30Vdc @ <1A, nominal 50mA DC load

**AC INPUT POWER
3 PIN PHOENIX CONTACT P/N 1829167**

PIN	SIGNAL	PARAMETERS
1	Line	100-240Vac, ±10%, 50/60 Hertz @ 6 amps
2	GND	Ground
3	Neutral	100-240Vac, ±10%, 50/60 Hertz @ 6 amps

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

PIN	SIGNAL	PARAMETERS
1	+24Vdc	+24Vdc @ 3A*
2	24Vdc Return	Return
3	+24Vdc	+24Vdc @ 3A*
4	24Vdc Return	Return

*Both +24V supplies are required for pump and fans

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

PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	Transmit Data	Conforms to EAI RS-232-C
3	Receive Data	Conforms to EAI 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

**ETHERNET INTERFACE—
8 PIN FEMALE RJ45 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

FRONT PANEL LED INDICATORS

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

SMART XRB

The XRB200PN500 features data logging and firmware controlled seasoning.

Data Logging:

Think of this as an "airplane black box". The data logging captures data on fault events and non-fault events. Fault events will turn off the high voltage.

FAULT EVENTS

Temperature, Arc, High Current, High Voltage, Low Voltage, Watchdog, Power Fault, Interlock

The XRB200PN500 stores data 620ms before the event, the event itself and for 620ms after the event. Data is recorded every 20ms (62 samples total) showing: Anode kV, Cathode kV, Total kV, Total mA, Filament, Temperature

We also log non-fault events, these are changes in set points or state of the unit.

NON FAULT EVENTS

HV On, HV Off, kV Set point, mA Set point, Low Current, Filament Limit Set point, Pre Heat Set point, Line Dip

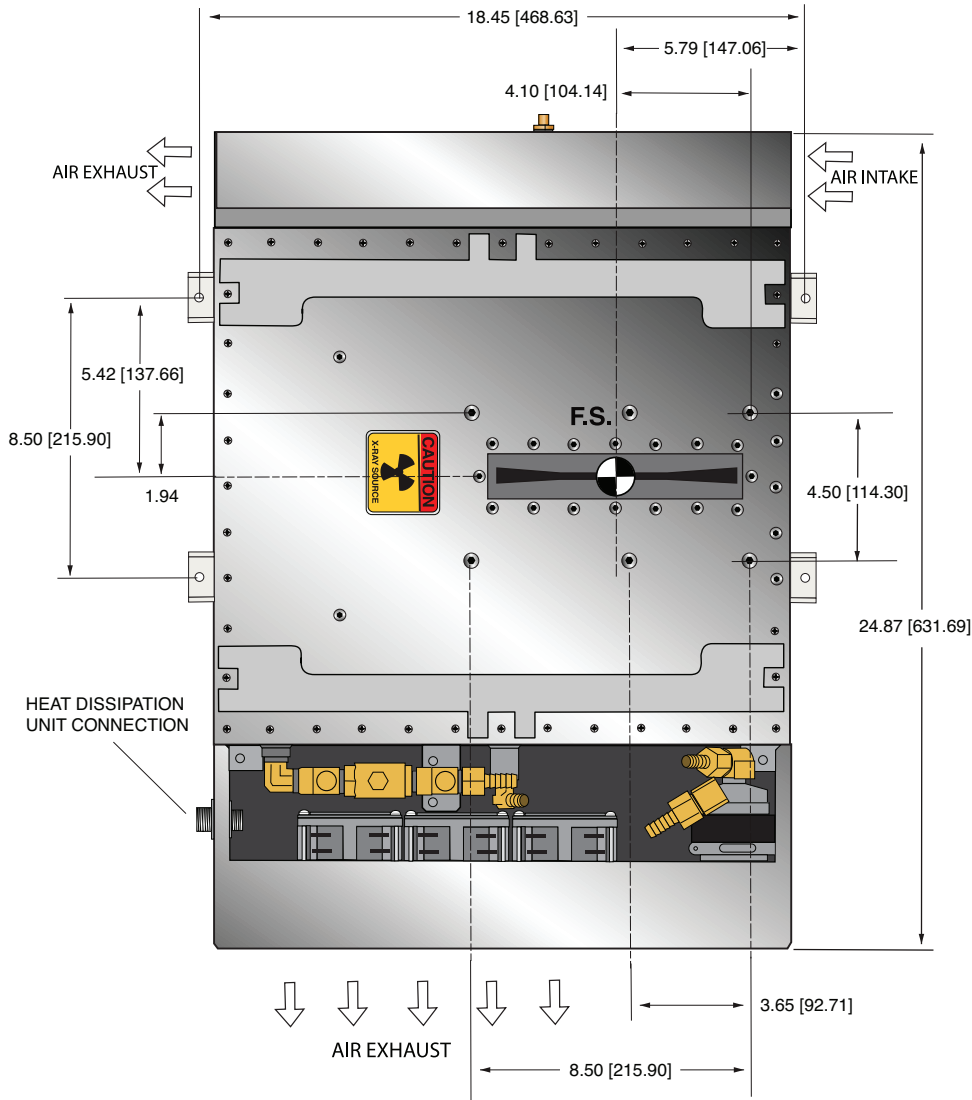
Fault event data is actual graphical data. Non fault event data is just stored as event type, data and timestamp. We also have a preventative maintenance fault, which throws a non-shutdown fault if the X-Ray tube has been factory installed over 4 years ago or if over 15,000 hours of HV ON is logged.

Firmware Controlled Seasoning:

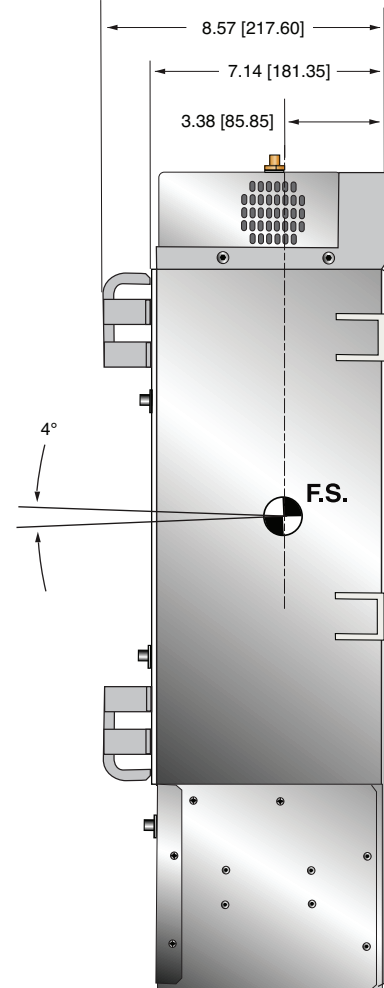
Every unit comes with an initial seasoning table, or customers can set their own. The XRB200PN500 knows when the unit has been on, when it has been off, hours on the X-Ray tube, etc. As a preventative maintenance feature upon turn on, we review the data and suggest that a particular seasoning protocol be run based upon the actual usage history of the unit. Proper seasoning compliance of the X-Ray tube will help get the longest lifetime.

DIMENSIONS: in.[mm]

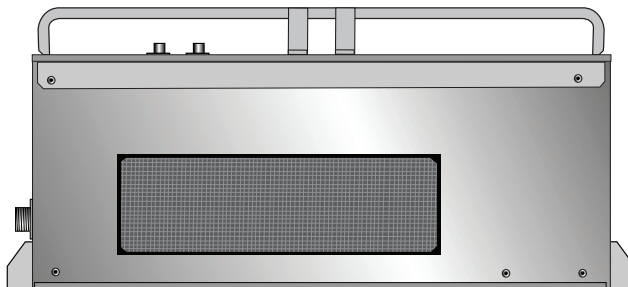
TOP VIEW



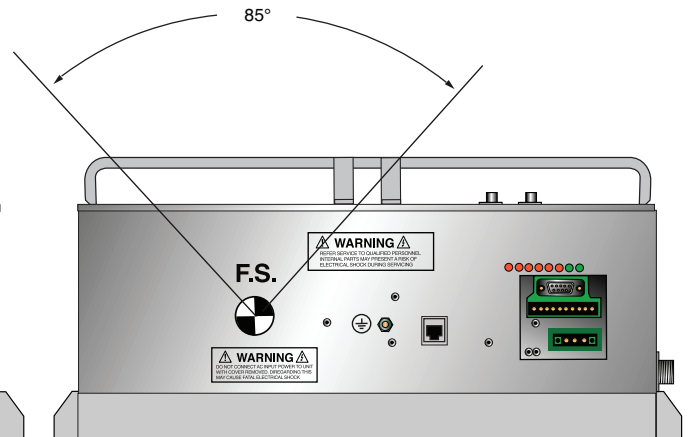
SIDE VIEW



BACK VIEW



FRONT 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 XRB150PN600 Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 150kV at 600W. Features like power factor correction, small package size and a standard analog and RS-232 digital interface simplify integrating this unit into your X-Ray system. Standard models are available with cone shaped beam geometry. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

200-240Vac ±10%, 50/60Hz, 6.5A maximum

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between
70kV to 150kV

X-Ray Tube Current:

1.0mA to 4.0mA over specified tube voltage range

X-Ray Tube Power:

160W continuous, 600W peak
Duty Cycle: 30 seconds on, 300 seconds off
@ 600W peak

Voltage Regulation:

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

Voltage Accuracy:

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

Voltage Risetime:

±1% in less than 300ms

Voltage Overshoot:

±10% during 300ms risetime

Voltage Ripple:

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

Current Regulation:

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

Current Accuracy:

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

Current Risetime:

±1% in less than 300ms

Arc Intervention:

4 arcs in 10 seconds with a 200ms quench = Shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop
filament emission control

Analog Interface:

0 to 5Vdc ground referenced signals

Digital Interface:

RS-232 interface.

Control Software:

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

Interlock/Signals:

A hardware interlock function is provided

Operating Temperature:

0°C to +40°C

Storage Temperature:

-40°C to +70°C

Humidity:

10% to 95% relative humidity, non-condensing

Cooling:

External fan required. 250cfm minimum to maintain
an oil temperature of 55° C

Input Line Connector:

3 pin Phoenix Contact P/N 1829167

Analog Interface Connector:

10 pin Phoenix Contact P/N 1755503

Digital Interface Connector:

9 pin D connector, female

Grounding Point:

8-32 ground stud provided on chassis

Dimensions:

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

Weight:

66lbs (30kg)

Orientation:

Can be mounted in any orientation.

X-Ray Leakage:

Less than 100mR/hr at 1m distance,
measured at 140kV, 3mA

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

PIN	SIGNAL	PARAMETERS
1	Line	Line
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**

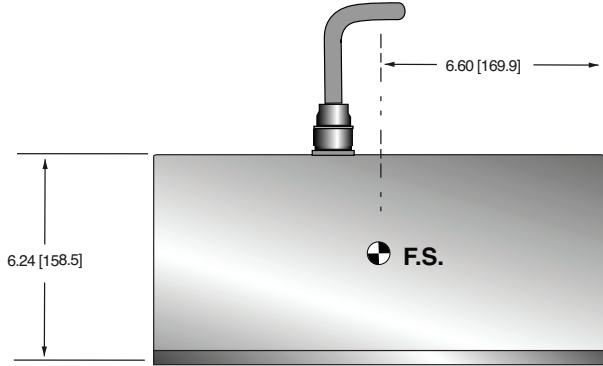
PIN	SIGNAL	PARAMETERS
1	X-Ray Signal	+12Vdc =Enable X-Ray, 0Vdc/open = Disable X-Ray, Zin=1kΩ
2	X-Ray Signal Return	Signal Return
3	N/C	N/C
4	kV Monitor	0 to 5Vdc = 0 to 175kV, Zout= 10kΩ
5	Signal Ground	Signal Ground
6	mA Monitor	0 to 5Vdc = 0 to 4.5mA, Zout= 10kΩ
7	Fault Signal	Open collector, High (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

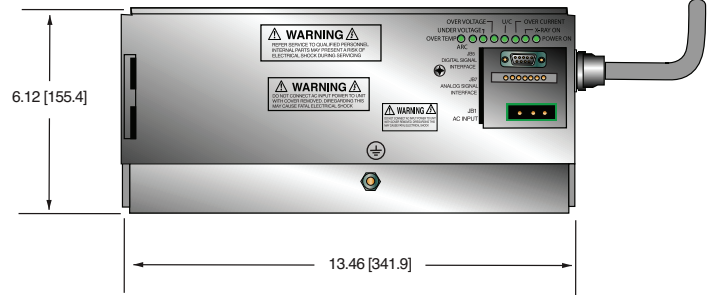
INDICATOR	SIGNAL NAME	CONDITION Illuminated When...
LED 1	OT	Over temperature occurs
LED 2	ARC FLT	Arc fault occurs
LED 3	UV	Low kV occurs
LED 4	OV	High kV occurs
LED 5	UC	Low mA occurs
LED 6	OC	High mA occurs
LED 7	X-RAY ON	X-Rays are enabled
LED 8	PWR	Power is ON

DIMENSIONS: in.[mm]

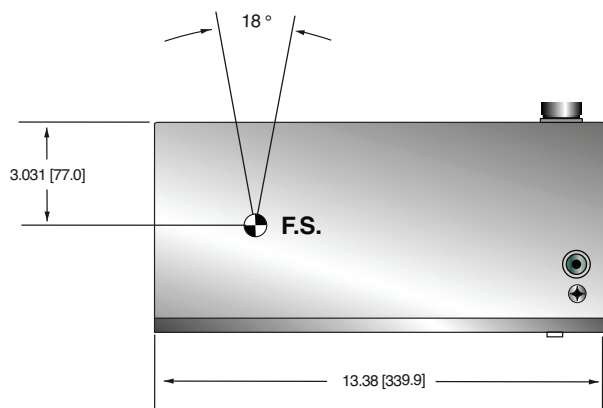
FRONT VIEW TANK



FRONT VIEW CONTROL ASSEMBLY

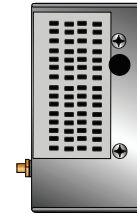


SIDE VIEW TANK

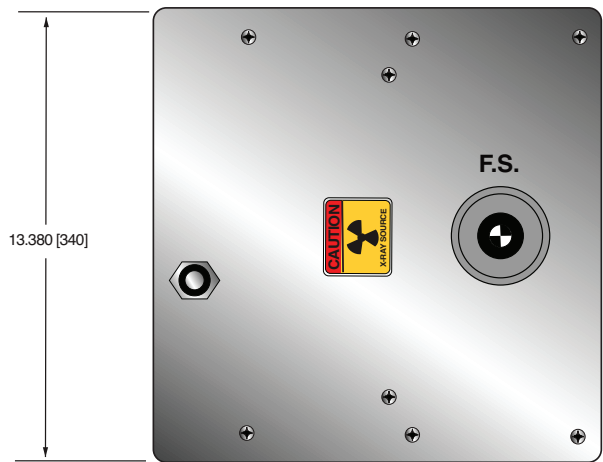


SIDE VIEW CONTROL ASSEMBLY

AIR EXHAUST

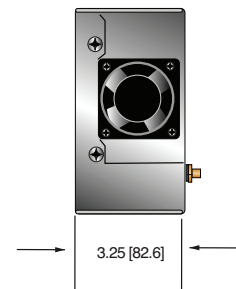


TOP VIEW TANK



SIDE VIEW CONTROL ASSEMBLY

AIR INTAKE





- **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 XRB160PN688/CT Monoblock® X-Ray source is designed for OEM applications powering its internal X-Ray tube up to 160kV at 688W. Features like small package size and RS-232 digital interface simplify integrating this unit into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability performance.

TYPICAL APPLICATIONS

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

SPECIFICATIONS

X-Ray Characteristics:

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

Input Voltage:

230Vac, ±15%, 50/60Hz, 5A max

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 50kV to 160kV

X-Ray Tube Current:

0.25mA to 4.3mA over specified tube voltage range

X-Ray Tube Power:

688W maximum continuous

Voltage Regulation:

Line: ±0.1% ±10%
Load: ±0.1% 0.25 to 4.3mA

Voltage Accuracy:

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

Voltage Risetime:

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

Voltage Overshoot:

Within 5% of rated voltage

Voltage Ripple:

1% p-p of rated voltage

Current Regulation:

Line: ±0.5% ±10%
Load: ±0.5% 0.25 to 4.3mA

Current Accuracy:

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

Current Risetime:

500ms nominal, 1 second maximum

Arc Intervention:

4 arcs in 10 seconds = shutdown

Filament Configuration:

Internal high frequency AC filament drive with closed loop filament emission control

Digital Interface:

RS-232 interface.

Control Software:

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

Interlock Signals:

A hardware interlock function is provided

Operating Temperature:

5°C to +40°C

Storage Temperature:

-25°C to +65°C

Humidity:

10% to 90% relative humidity, non-condensing

Cooling:

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

Input Line Connector:

5 pin Molex 26-60-4050

Heat Exchanger Power Connector:

4 pin AMP part no. 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

Special Features:

Stationary or rotating CT application up to 100rpm at a maximum radius 20.25" (514mm)

**AC INPUT POWER
J1 5 PIN MOLEX 26-60-4050 CONNECTOR**

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

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

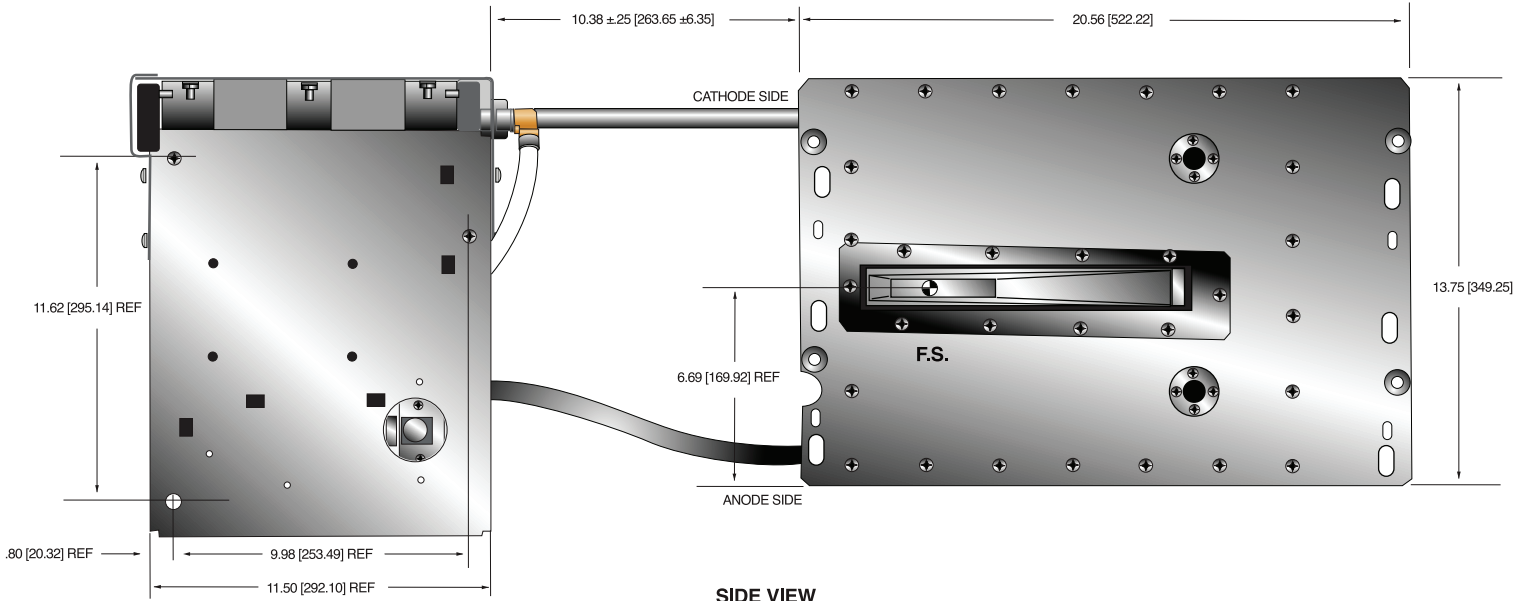
PIN	SIGNAL	PARAMETERS
1	Line	230Vac Input
2	N/C	No Connection
3	Neutral	230Vac Neutral
4	GND	Chassis Ground

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

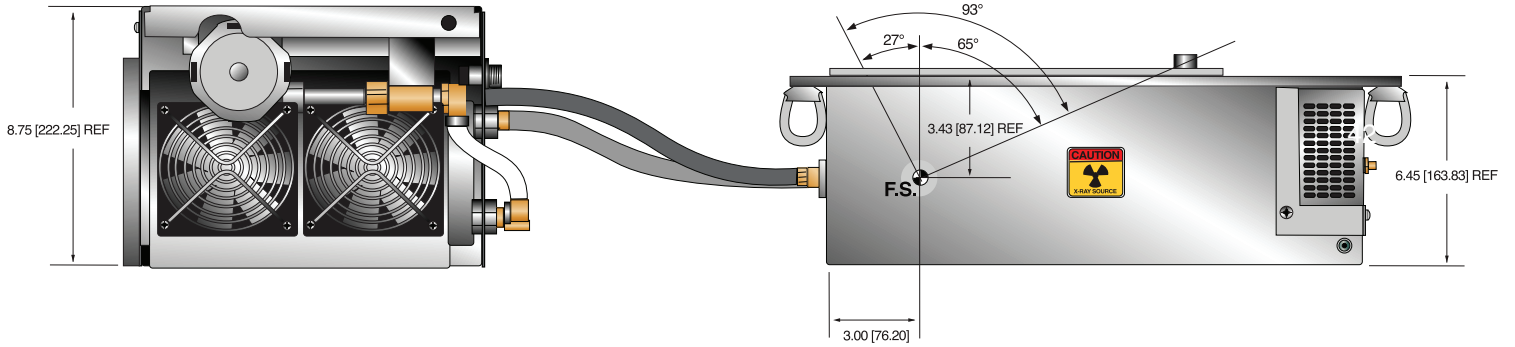
PIN	SIGNAL	PARAMETERS
1	N/C	No Connection
2	TX	Transmit Data
3	RX	Receive Data
4	N/C	No Connection
5	SGND	Signal Ground
6	N/C	No Connection
7	N/C	No Connection
8	N/C	No Connection
9	N/C	No Connection

DIMENSIONS: in.[mm]

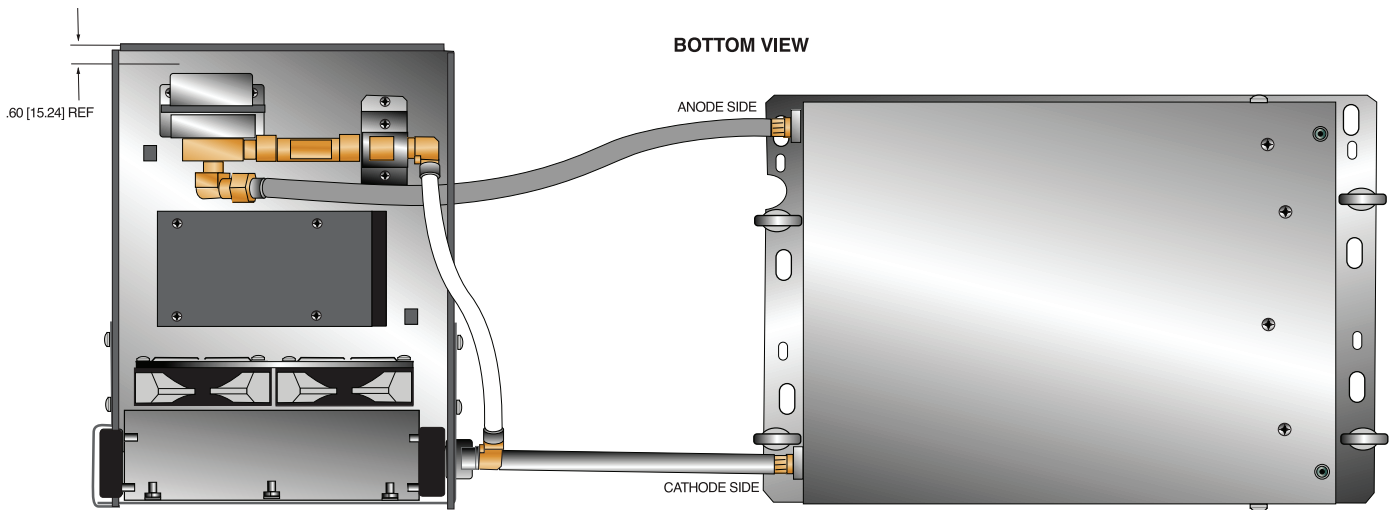
TOP VIEW



SIDE VIEW



BOTTOM VIEW





- **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 PDM90PN900 is designed for extra oral dental X-Ray applications including CT and Panoramic X-Ray. Features like small package size, standard analog and RS-232 digital interface simplify integrating this Monoblock® into your X-Ray system. Proprietary emission control circuitry provides excellent regulation of X-Ray tube current, along with outstanding stability and performance.

TYPICAL APPLICATIONS

Dental X-Ray: Panoramic and CT Imaging

SPECIFICATIONS

X-Ray Tube Characteristics:

Target Angle: 5 degrees
Focal Spot: 0.5mm nominal
Beam Filtration: 3.0mm of Al equivalent
Beam Geometry: see page 3

X-Ray Tube Voltage:

Nominal X-Ray tube voltage is adjustable between 50kV to 90kV

Voltage Regulation:

Line: $\pm 0.5\%$ 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:

900W peak power

Duty Cycle:

CT (Pulsed): ≤ 45 seconds scan time cycle at up to 40 pulses per second available

Panoramic (Continuous): Maximum scan time = 30s, with 60s off-time. Five consecutive scans

Input Voltage:

100-240Vac $\pm 10\%$ 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:

Tank: Convection
Controller: Forced air via provided fan

Dimensions:

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

Weight:

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

X-Ray Leakage:

Less than 100mR/hour (or $< 1mGy/hr$) @ 1meter from the Monoblock® surface.

Regulatory Approvals:

Compliant to EMC 60601-1-2 (external EMC filter and shielding required). UL/CUL recognized file E242584.

AC INPUT POWER 3 PIN PHOENIX CONTACT

PIN	SIGNAL	PARAMETERS
1	Line	Line
2	GND	Ground
3	Neutral	Neutral

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 MALE 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

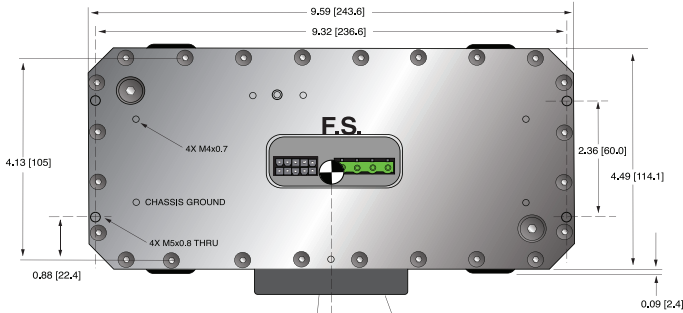
LED INDICATORS

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

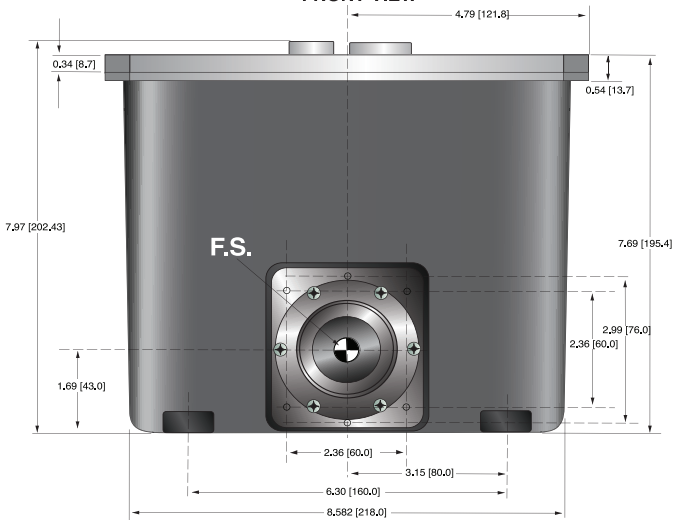
PDM Generator Tank

DIMENSIONS: in.[mm]

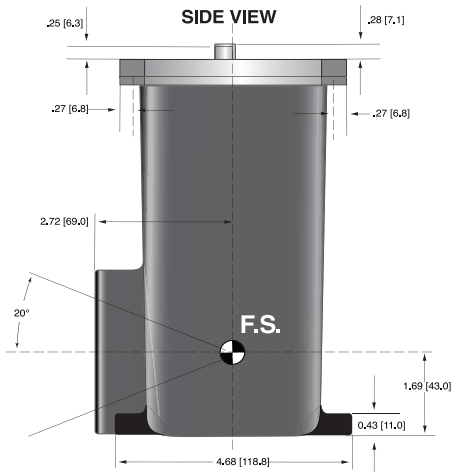
TOP VIEW



FRONT VIEW



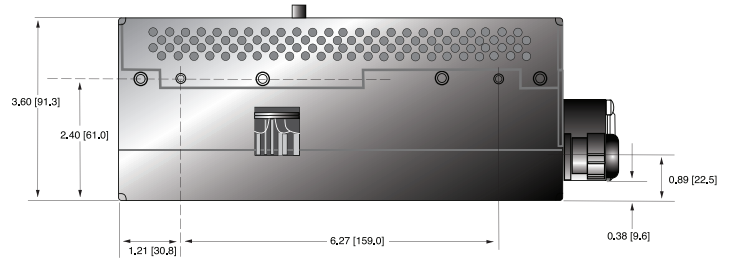
SIDE VIEW



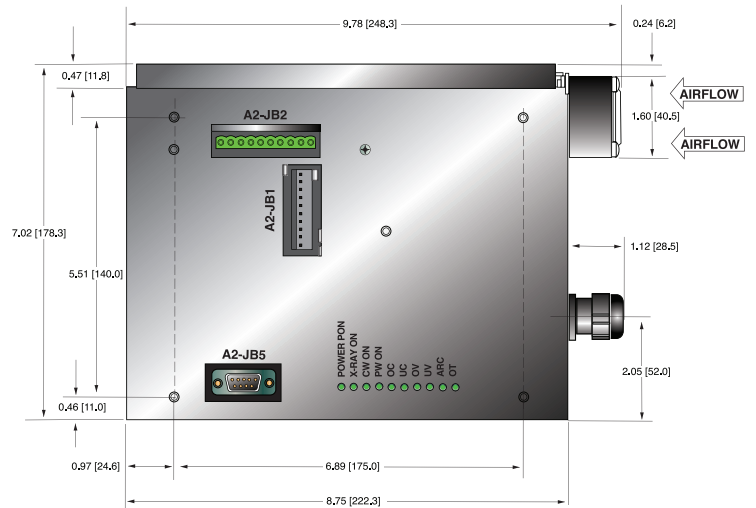
PDM Inverter/Controller

DIMENSIONS: in.[mm]

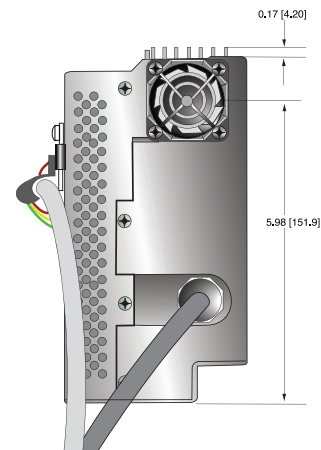
TOP VIEW

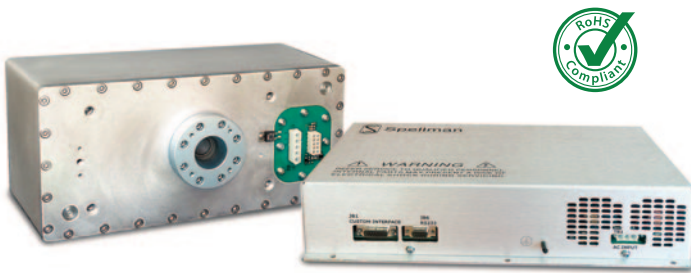


FRONT VIEW



SIDE VIEW





- **Integrated HV Supply, Filament Supply, X-Ray Tube, Beam Port and Control Electronics**
- **Compact & Lightweight**
- **<1ms Rise Time is Ideal for Extremities**
- **Specifically designed for the C-Arm OEM**

Spellman's MMB125PN3.5 Medical Monoblock® with <1ms rise time is ideal for extremities, specialized applications and vascular imaging. Benefit from Spellman's 70 plus years of high voltage innovation with this MMB125PN3.5 Monoblock® X-Ray source specifically designed for the C-Arm OEM. Our advanced technology and design expertise in conjunction with our depth of manufacturing capabilities position Spellman as the wise choice for your Monoblock® requirements.

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

TYPICAL APPLICATIONS

C-Arm OEM

SPECIFICATIONS

X-Ray Characteristics:

Focal Spot:	0.5mm for small focus 1.6mm for large focus
Target Angle:	16°
Target Material:	Tungsten
Beam Filter:	0.8mm Al
Beam Geometry:	Refer to line drawing
X-Ray Leakage:	Less than <1mGy/hour @ 1meter from tank surface.
Maximum Filament Current:	4.3A
Filament Inverter Switching Frequency:	20kHz
Anode Heat Content:	35.5kJ
Maximum Anode Heat Dissipation:	600W
Distance Between Focal Spot to X-Ray Output Window:	45mm
Focal Spot Position:	Refer to outline drawing, additionally it is marked on tank cover.

Input Power:

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

X-Ray Tube Voltage:

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

X-Ray Tube Current:

Fluoro:	0.2mA to 6 mA (small focal spot)
Pulsed Fluoro:	0.5mA to 10 mA (small focal spot)
Radiography:	10mA to 40mA (large focal spot)
mA Accuracy:	±10%

Maximum Operating Conditions:

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

X-Ray Tube Current Protection:

- Over Current (High mA): Trip point is set at 15% over maximum rated current, or at 15% over programmed output current value for longer than 50ms.
- Under Current (High mA): Trip point is set at 15% under programmed output current value for longer than 50ms.
- Over Current (Low mA): Trip point is set at 20% over maximum rated current, or at 20% over programmed output current value for longer than 50ms.
- Under Current (Low mA): Trip point is set at 20% under programmed output current value for longer than 50ms.

X-Ray Tube Voltage Protection:

Over Voltage (High kV): Trip point is when the kV output exceeds 137.5kV for more than 10ms or it set is at 10% over programmed output voltage value for longer than 30ms.

Under Voltage (Low kV): Trip point is set at 10% under the programmed output voltage value for longer than 30ms.

X-Ray Tube Arc Protection:

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

Over Temperature Protection:

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

Operating Temperature: 0 to +40 °C.

Storage Temperature: -20 to +70 °C

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

Humidity: 5 to 95%, non-condensing.

Dimensions:

X-Ray Tank: 12.2" x 6.2" x 5.7" (310mm x 158mm x 145mm)
Refer to outline drawing.

Controller: 14.9" x 10.6" x 3.2" (380mm x 270mm x 83mm)
Refer to outline drawing.

Weight:

X-Ray Tank: 27.5 pounds (13kg)

Controller: 9.9 pounds (4.5kg)

Regulatory Approvals:

Designed to be compliant to:

IEC 60601-1:2005+A

Medical electrical equipment Part 1: General requirements for basic safety and essential performance.

IEC 60601-1-2

2007 Medical electrical equipment Part 1-2: General requirements for basic safety and essential performance- Collateral standard: Electromagnetic compatibility—Requirements and tests.

IEC 60601-1-3

2008 Medical electrical equipment Part 1-3: General requirements for basic safety and essential performance- Collateral standard: Radiation protection in diagnostic X-Ray equipment.

IEC 60601-2-54

2009 Medical electrical equipment Part 2: Particular requirements for the basic safety and essential performance of X-Ray equipment for radiography and radioscopy.

EMC

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

RoHS

Controller and Tank Assembly are RoHS compliant.

AC LINE POWER CONNECTOR— TE: 1-350943-0

PIN	SIGNAL	PARAMETERS
1	Ground	Earth Ground
2	AC Input 1	190 - 264Vac, single phase, 50/60Hz, 34A max.
3	AC Input 2	190 - 264Vac, single phase, 50/60Hz, 34A max.

Note: Ground stud is provided on chassis

DIGITAL INTERFACE—9 PIN FEMALE D CONNECTOR TE: 5747844-5

PIN	SIGNAL	PARAMETERS
1	NC	No Connection
2	RS-232 TX Out	RS-232 Transmit
3	RS-232 RX In	RS-232 Receive
4	NC	No Connection
5	RS-232 Ground	Ground from RS-232 transceiver IC
6	NC	No Connection
7	NC	No Connection
8	NC	No Connection
9	NC	No Connection

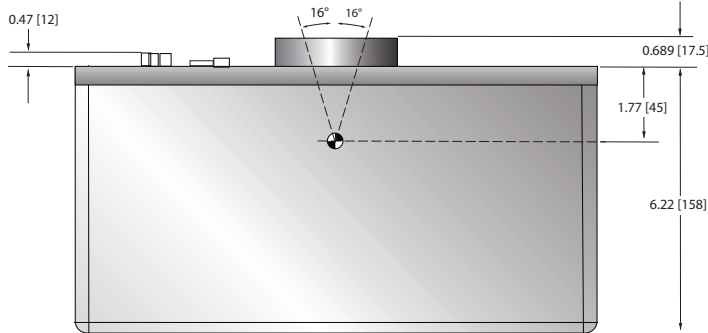
ANALOG INTERFACE—15 PIN FEMALE D CONNECTOR TE: 5747845-5

PIN	SIGNAL	PARAMETERS
1	GND	Signal Ground
2	+5Vdc Out	+5Vdc, 100mA max.
3	Prep	User signal (Contact Closure) to alert the generator that exposure sequence will begin. Once this signal is active, exposure parameters are locked in and cannot be changed. Contact connection to pin 14. Closed = PREP, the filament is placed in preheat mode
4	Ready	The generator is ready for X-Ray exposure. Open Collector. Low/Active = Ready
5	Exposure	User signal (Contact Closure) to generator to generate X-Rays. Filament is boosted, and high voltage is generated after the boost time. Contact connection to pin 14. Closed = Exposure
6	X-Ray ON 75% Status	Transistor output to indicate X-Ray ON status synchronized with 75% of kV set point
7	X-Ray ON Status	Transistor output to indicate X-Ray ON status synchronized with kV start up
8	X-Ray Shutdown	User signal to generator to rapidly turn HV OFF and ON during serial exposure sequence. Low/Active=HV OFF
9	HVG Fault Status	Generator signal indicating generator fault. Open collector transistor output. Low/Active = Fault
10	kV Monitor	Signal from generator. 0-10V = 0-140kV
11	mA Monitor	Signal from generator. Large focus: 0-10V = 0-50mA Small focus: 0-5V=0-10mA
12	Filament Current Monitor	Signal from generator. 0-10V = 0-6A
13	Monitor GND	Ground for reference of monitor signals
14	+24Vdc Out	For connection to PREP and EXPOSURE control relay coils
15	Shield Ground	For connection of interface cable shield to generator chassis ground

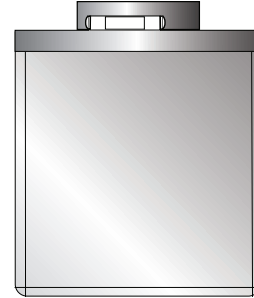
DIMENSIONS: in.[mm]

GENERATOR TANK

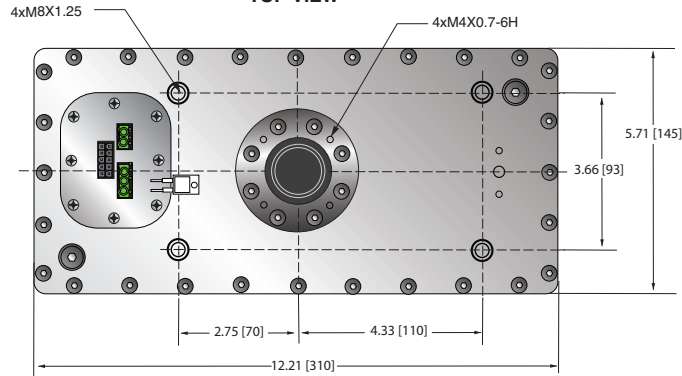
FRONT VIEW



SIDE VIEW



TOP VIEW

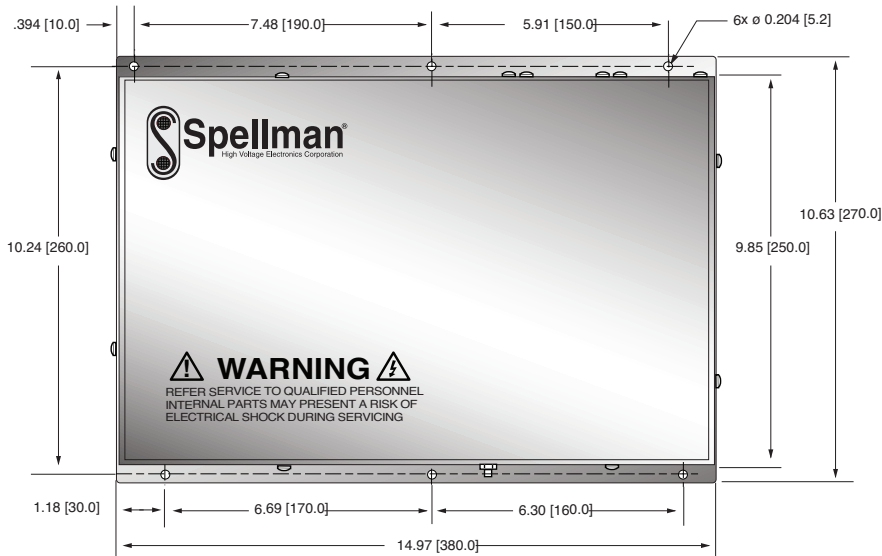


CONTROL UNIT

FRONT VIEW



TOP VIEW



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