

3-of-5 field Ionization Chamber Calibration Procedure for
Pre-Amplifier board assembly 61174A
(Also valid for the pre-amp assemblies listed below)

The following adjustments apply to the calibration of a 61174A pre-amplifier board for a stationary 3-of-5 field ion chamber, e.g. for chest or table use.

Pre-amp Assembly	Description	Difference from 61174A
61174A	Calculated Gain Range = 1 to 21	None
61174D	Calculated Gain Range = 1 to 21	Side-Turn Pots
61174S	Calculated Gain Range = 2.68 to 63.7	R31 = 2200 ohm R32 = 820 ohm R6 = 50K ohm
61174T	Calculated Gain Range = 2.68 to 63.7	R31 = 2200 ohm R32 = 820 ohm R6 = 50K ohm Side-Turn Pots

WARNING:

- Do not attempt to service the equipment unless this service manual has been consulted and is understood.
- Failure to heed this warning may result in injury to the service provider, operator or patient from electric shock and mechanical or other hazards.

Note: When working with the pre-amplifier assembly it is important that electrostatic discharge (ESD) prevention techniques be observed. Before touching the pre-amp assembly, attach an ESD wrist strap to yourself. Be sure to ground yourself and the ion chamber frame to dissipate static charges.

Note: The pre-amp assembly is a very delicate and sensitive device. It is important to keep it as clean as possible. Wash and dry your hands thoroughly before working with it and, when possible, use unpowdered latex or cotton gloves. Take care to touch the pre-amp board as little as possible. Take extra care to avoid touching the three air-mounted field inputs. Oils from your fingers on the air-mounts or their components can cause performance degradation.

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The procedure assumes that the installation of the Automatic Exposure Control (AEC) is complete and that the AEC and x-ray generator are in proper working condition. After making the necessary interconnections between the ion chamber and the AEC, power up the system.

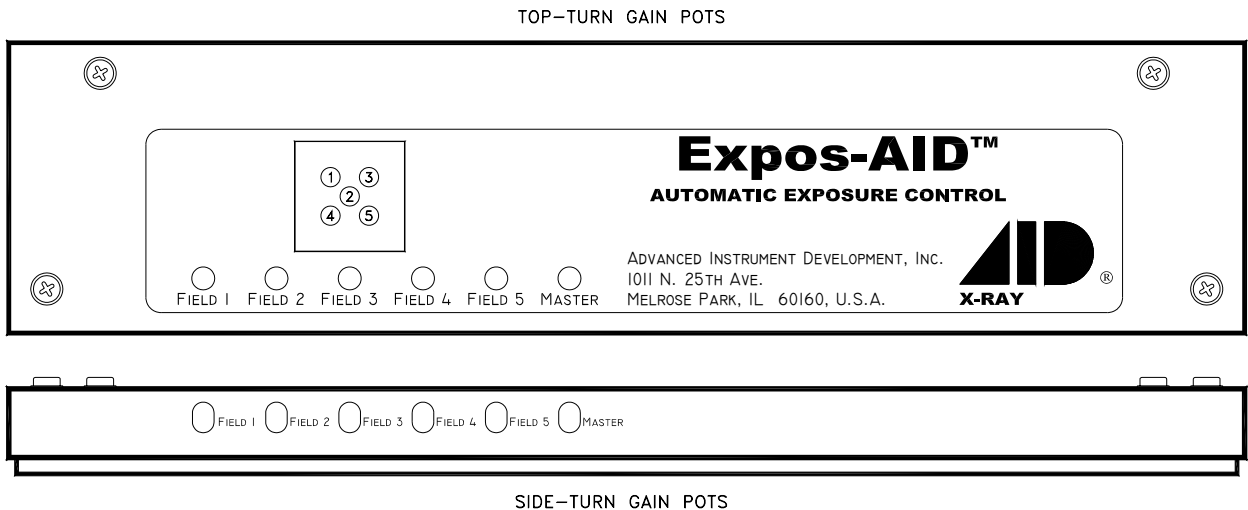
The 61174A pre-amplifier board can be configured to operate with several different AEC systems. If specified at the time of purchase, the ion chamber will be delivered with the pre-amplifier board already configured for a particular application. To reconfigure an ion chamber for a different configuration, see the section on Ion Chamber Inputs and Output and the section on Specific Configurations at the end of this document.

Calibration/Test Set Up:

Your X-Ray Generator/AEC Manual should cover this subject. Calibration procedures are specific to the X-Ray Generator/AEC. The Following is provided as additional information only.

Select the center field of the ion chamber. Set the generator for 100 kVp and maximum backup time. For 100 kVp use 8 to 10 inches (20 to 25 cm) of water or plastic for a phantom. Metals such as copper, aluminum or lead are not suitable for use as phantoms. Make sure the phantom is homogeneous and completely covers all fields equally. Center the x-ray beam on the center field. Collimate the x-ray beam so that it completely covers all three fields but does not extend beyond the limits of the phantom.

Adjustment Potentiometers:



All necessary adjustment potentiometers are accessible through the pre-amp chassis cover. There is no need to open the pre-amp cover during normal calibration procedures.

Master Gain Adjustment:

The master gain adjustment should be used to adjust the ion chamber to produce the correct optical density (OD) while only the Center Field (Field B) is selected. A replacement ion chamber's film optical density should usually be matched to that of other stationary ion chambers connected to the system. Note that the master gain adjustment is a multi-turn potentiometer. A clockwise adjustment to the master gain potentiometer will increase the sensitivity of the chamber, causing the length of the exposure (mAs) to decrease.

Make an exposure and record the post exposure mAs reading. Process the film. Measure and record the film optical density. Adjust the master gain for the desired optical density (normally between 1.1 and 1.8 OD, depending upon the user). Make the master gain adjustment using this formula:

$$\text{Desired mAs} = (\text{Desired OD} / \text{Measured OD}) \times \text{Measured mAs}$$

Note: Make sure that a film cassette is present while making all exposures. Cassette backscatter affects AEC operation.

Field Balance Check:

Using the AEC post-exposure mAs display or other calibrated mAs meter check the individual fields to see that they are balanced, that is, that they produce the same mAs reading. If mAs readings are not stable from exposure to exposure for an individual field, then it will be necessary to expose films and make these adjustments based upon optical density.

If necessary, adjust the individual gain potentiometers to balance the outputs to give the same mAs reading for each field selected individually.

Note that individual gain adjustments are multi-turn potentiometers. A clockwise adjustment to a field gain potentiometer will increase the sensitivity of that field, causing the length of the exposure (mAs) to decrease.

Ionization Chamber Pin-outs:

61174A Pre-amp Board Pin-out	Pre-amp Chassis Wire Color	Function	15-Pin Sub-D Pin-Out
1	BLACK	NONE	1
2	BROWN	<u>LEFT FIELD SELECT</u>	2
3	RED	<u>CENTER FIELD SELECT</u>	3
4	ORANGE	START INTEGRATING	4
5	YELLOW	OUTPUT	5
6	GREEN	<u>RIGHT FIELD SELECT</u>	6
7	BLUE	NEGATIVE SUPPLY	7
8	VIOLET	POSITIVE SUPPLY	8
9	GRAY	GROUND	9
10	WHITE	PORTRAIT OUT	10
11	TAN	<u>PORTRAIT</u>	11
12	PINK	NONE	12
13	WHITE/RED	<u>INVERTED</u>	13
14	WHITE/GREEN	INVERTED OUT	14
15	WHITE/BLUE	NONE	15

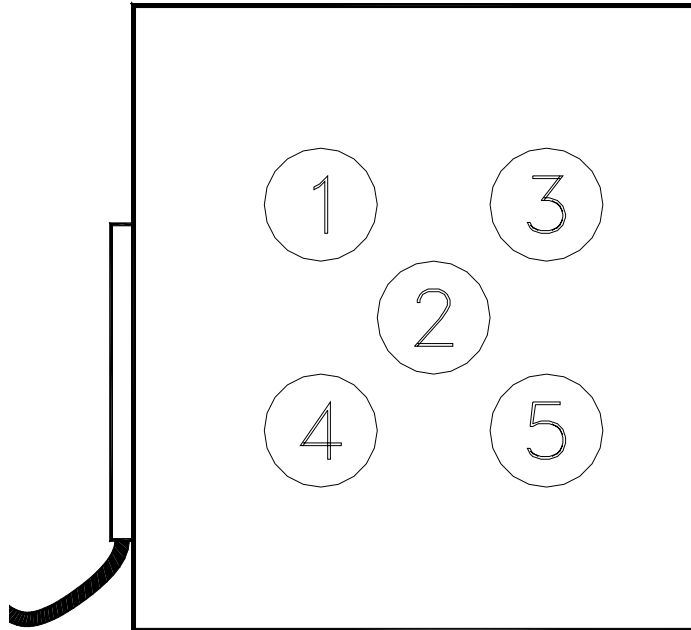
NOTE: Cable wire colors do not match those inside the pre-amp chassis. Cable pin-out details are available on-line at <http://www.aidxray.com> or by contacting Advanced Instrument Development, Inc.

Low-Active Field Orientation Selections:

Portrait	Inverted	Left Field	Center Field	Right Field
Low (On)	High (Off)	1	2	3
High (Off)	High (Off)	3	2	5
Low (On)	Low (On)	5	2	4
High (Off)	Low (On)	4	2	1

High-Active Field Orientation Selections:

Portrait	Inverted	Left Field	Center Field	Right Field
High (On)	Low (Off)	1	2	3
Low (Off)	Low (Off)	3	2	5
High (On)	High (On)	5	2	4
Low (Off)	High (On)	4	2	1

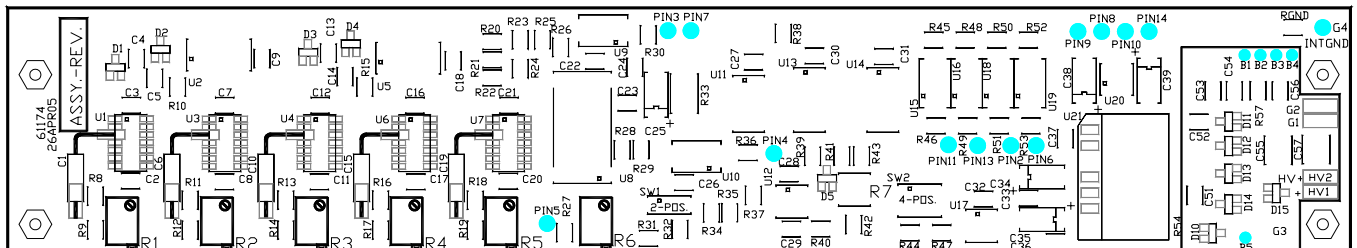


Acceptable Power Supply Ranges for 61174A Pre-amp:

Supply Voltage	Measurement Point	Acceptable Range
External +12VDC	61174A pin 8 (Referenced to 61174A pin 9)	+11.4VDC to +15.8VDC
External -12VDC	61174A pin 7 (Referenced to 61174A pin 9)	-11.4VDC to -15.8VDC
Internal +12VDC Isolated	Measure across 61174A C35	+10.8VDC to +12.5VDC
Internal -12VDC Isolated	Measure across 61174A C34	-10.8VDC to -12.5VDC
Internal +5VDC	Measure across 61174A C32	+4.7VDC to +5.3VDC
Internal +75VDC	Measure across 61174A C57 (HV1 to G1)	+65VDC to +85.0VDC

Ionization Chamber Inputs and Output:

Signal	61174A Switch	Comments
Positive Supply Voltage Range	None	+11.4VDC to +15.75VDC less than 85 mA.
Negative Supply Voltage Range	None	-11.4VDC to -15.75VDC less than 85 mA.
Positive Output	SW1-1 = ON SW1-2 = OFF	Time integrated signal ramping from 0VDC to a maximum of at least 80% of the supply voltage (+9.6VDC for +12VDC supply). The slope of this signal is directly proportional to the amount of x-ray flux received.
Negative Output	SW1-1 = OFF SW1-2 = ON	Time integrated signal ramping from 0VDC to a maximum of at least 80% of the supply voltage (-9.6VDC for -12VDC supply). The slope of this signal is directly proportional to the amount of x-ray flux received.
Low-active Field orientation	SW2-1 = ON SW2-2 = OFF	Low-active: Pulling the field orientation lines to ground (0VDC) will select the three active fields according to the truth-table listed in the "Low-Active Field Orientation Selections" section.
High-active Field orientation	SW2-1 = OFF SW2-2 = ON	High-active: Driving the field orientation lines high (+12VDC to +24VDC) will select the three active fields according to the truth-table listed in the "High-Active Field Orientation Selections" section.
Low-Active Field Selects And Reset (Start Integration)	SW2-3 = OFF SW2-4 = ON	Pulling this line to ground (≤ 8 VDC) beginning at exposure start and lasting for the entire duration of the exposure allows the integrator to operate.
High-Active Field Selects And Reset (Start Integration)	SW2-3 = ON SW2-4 = OFF	Pulling this high (≥ 4 VDC) beginning at exposure start and lasting for the entire duration of the exposure allows the integrator to operate.



Specific Configurations:

Unless specified otherwise, ICX ion chambers are delivered with an AID compatible jumper configuration. AID compatible means that the input and output signals will interface with Advanced Instrument Development, Inc's Expos-AID™ Automatic Exposure Control. This same configuration will also interface with Acoma, Control-X, CPI, Del Medical (Gendex), Electromed (EMD, Triton), OEC, Quantum Medical Imaging, Sedecal (Innerscan), Summit Industries, etc.

AID Compatible jumper configuration:

Positive Output; Low-Active Field Orientation; Low-Active Field Selects and Reset

61174A Switch	Position	Function
Sw1-1	ON	Positive output signal (enabled)
Sw1-2	OFF	Negative output signal (disabled)
Sw2-1	ON	Low-active field orientation (enabled)
Sw2-2	OFF	High-active field orientation (disabled)
Sw2-3	OFF	High -active field selects & reset (disabled)
Sw2-4	ON	Low-active field selects & reset (enabled)

Hologic/Trex Medical - Continental, Keithley, Ratheon, Xonics Compatible jumper configuration:

Positive Output; High-Active Field Orientation; Low-Active Field Selects and Reset

61174A Switch	Position	Function
Sw1-1	ON	Positive output signal (enabled)
Sw1-2	OFF	Negative output signal (disabled)
Sw2-1	OFF	Low-active field orientation (disabled)
Sw2-2	ON	High-active field orientation (enabled)
Sw2-3	OFF	High -active field selects & reset (disabled)
Sw2-4	ON	Low-active field selects & reset (enabled)

Hologic/Trex Medical - Bennett Compatible jumper configuration:

Negative Output; High-Active Field Orientation; Low-Active Field Selects and Reset

61174A Switch	Position	Function
Sw1-1	OFF	Positive output signal (disabled)
Sw1-2	ON	Negative output signal (enabled)
Sw2-1	OFF	Low-active field orientation (disabled)
Sw2-2	ON	High-active field orientation (enabled)
Sw2-3	OFF	High -active field selects & reset (disabled)
Sw2-4	ON	Low-active field selects & reset (enabled)

GE, Fischer, Varian Compatible jumper configuration:

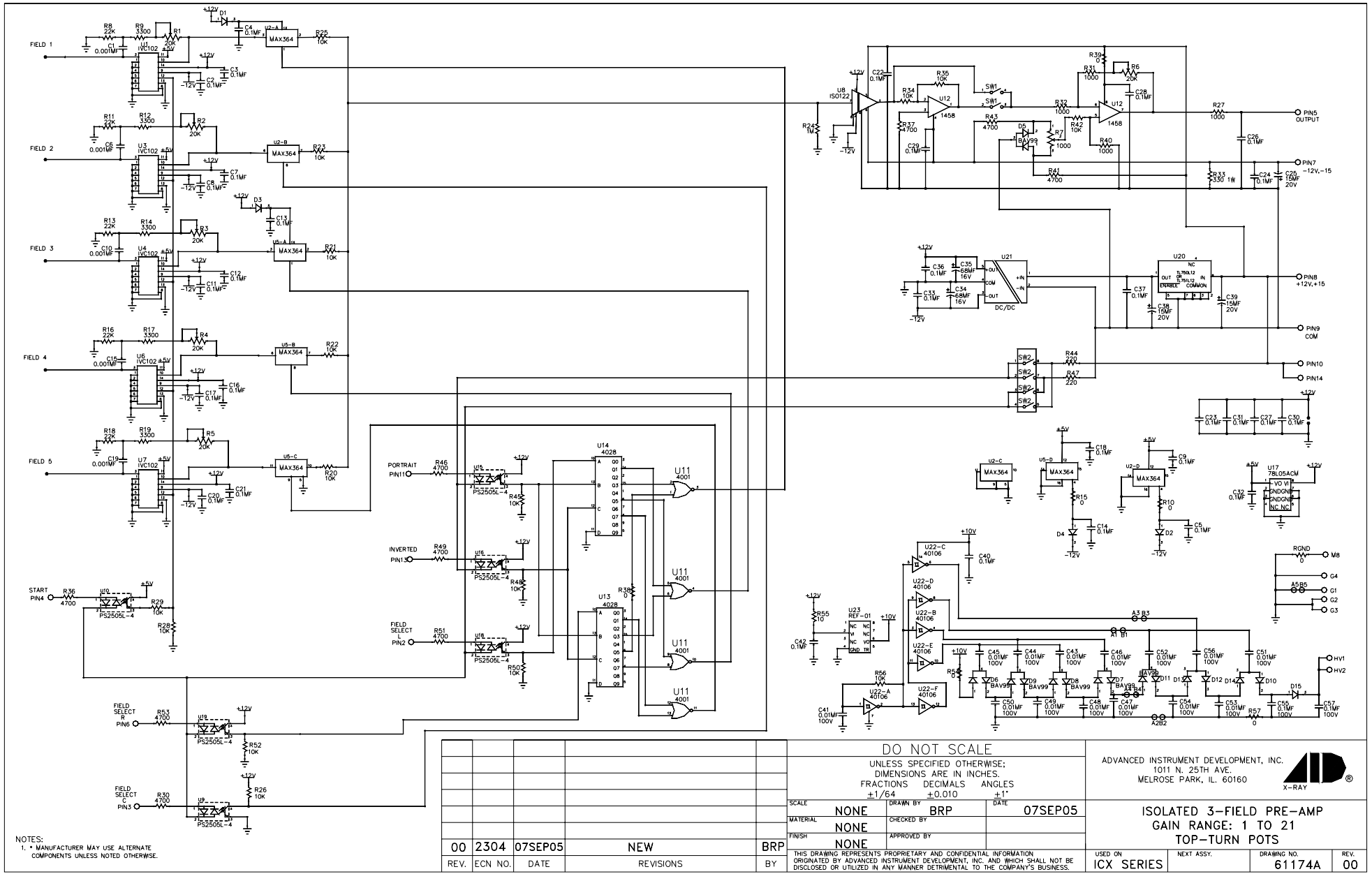
Positive Output; High-Active Field Orientation; High-Active Field Selects and Reset

61174A Switch	Position	Function
Sw1-1	ON	Positive output signal (enabled)
Sw1-2	OFF	Negative output signal (disabled)
Sw2-1	OFF	Low-active field orientation (disabled)
Sw2-2	ON	High-active field orientation (enabled)
Sw2-3	ON	High -active field selects & reset (enabled)
Sw2-4	OFF	Low-active field selects & reset (disabled)


Picker Compatible jumper configuration:

Negative Output; Low-Active Field Orientation; Low-Active Field Selects and Reset

61174A Switch	Position	Function
Sw1-1	OFF	Positive output signal (disabled)
Sw1-2	ON	Negative output signal (enabled)
Sw2-1	ON	Low-active field orientation (enabled)
Sw2-2	OFF	High-active field orientation (disabled)
Sw2-3	OFF	High -active field selects & reset (disabled)
Sw2-4	ON	Low-active field selects & reset (enabled)



NOTES:
 1. * MANUFACTURER MAY USE ALTERNATE COMPONENTS UNLESS NOTED OTHERWISE.

				DO NOT SCALE			ADVANCED INSTRUMENT DEVELOPMENT, INC. 1011 N. 25TH AVE. MELROSE PARK, IL. 60160 								
				UNLESS SPECIFIED OTHERWISE; DIMENSIONS ARE IN INCHES. FRACTIONS DECIMALS ANGLES $\pm 1/64$ ± 0.010 $\pm 1^\circ$											
00	2304	07SEP05	NEW	BRP	SCALE	NONE	DRAWN BY	BRP	DATE	07SEP05	ISOLATED 3-FIELD PRE-AMP GAIN RANGE: 1 TO 21 TOP-TURN POTS	USED ON	NEXT ASSY.	DRAWING NO.	REV.
REV.	ECN NO.	DATE	REVISIONS	BY	MATERIAL	NONE	CHECKED BY	APPROVED BY				ICX SERIES		61174A	00