

Semiplane

**Model XCD single channel
amplifier/discriminator**
(Semiplane part number 314-001)

Technical Manual

Issue 1.2
08-17-2015

REVISION HISTORY

ISSUE	DATE	DESCRIPTION
1.0	2004-08-11	Initial revision.
1.1	2012-05-21	Revised format
1.2	2015-08-17	Revised for new power supply

Safety Information:

The unit contains no user-serviceable parts. Refer all servicing to qualified persons

Do not open unit. Do not operate unit with cover(s) or panel(s) removed.

The following general precautions are applicable to the installation and operation of the XCD preamplifier/discriminator.

Remove power from unit by disconnecting the Emerson external power supply cord from the rear panel jack.

This unit is not internally fused and must be operated only with the current limited low voltage power obtained from the supplied Emerson model AD2412N3L or equivalent external power supply included with each XCD preamplifier/discriminator.

The unit contains only low voltage components.

The unit is intended to be used indoors in a dry location providing adequate ventilation. Keep all connections to and from the unit short.

Electrostatic Discharge / Electrical Fast Transient Information

This unit is intended for the measurement of fast-changing signals. It may therefore accept and process unintended event signals arising from electrostatic discharges (ESD) and/or electromagnetic fast transients (EFT). This behavior is normal and expected. Contact SEMIPLANE to determine suitability if the unit is to be used in an environment subject to such transients.

Materials / Disposal Information

This unit may contain materials subject to European Union regulations concerning Waste Electrical and Electronic Equipment (WEEE) and/or Reduction of Hazardous Substances (RoHS). As such the unit **MUST NOT** be disposed of as household trash at the end of its useful life. Contact SEMIPLANE to determine proper disposal procedures.

Document Conventions

As used in this document the indication XCD will indicate information which applies equally to the XCD single channel and the XCD four channel amplifier/discriminator. Information specific to the different models will be indicated by the appropriate model designator.

Trademark and Trade Name Information

ALL TRADEMARKS AND/OR TRADE NAMES REFERRED TO IN THIS DOCUMENT ARE PROPERTY OF THEIR RESPECTIVE OWNERS AND ARE USED HERE ONLY FOR EDITORIAL CONVENIENCE.

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1 Purpose

This manual is intended for technical personnel engaged in hardware and software integration and use of the Model XCD unit as part of an experiment or instrument design. It includes general operational information, mechanical, electrical specifications and general performance parameters.

2 XCD preamplifier/discriminator Description

The Semiplane XCD preamplifier/signal discriminator is designed for connection to micro-channel plate detectors and other sources of fast analog pulses. Bandwidth and frequency response have been tailored to detect fast rise time pulses of low amplitude. Detected input pulses are output as NIM pulses of adjustable duration. The XCD is a form of level crossing discriminator.

Potential applications are time-of-flight mass spectroscopy and other systems requiring fast pulse discrimination

2.1 XCD Functions & Block Diagram

2.1.1 Block Diagram

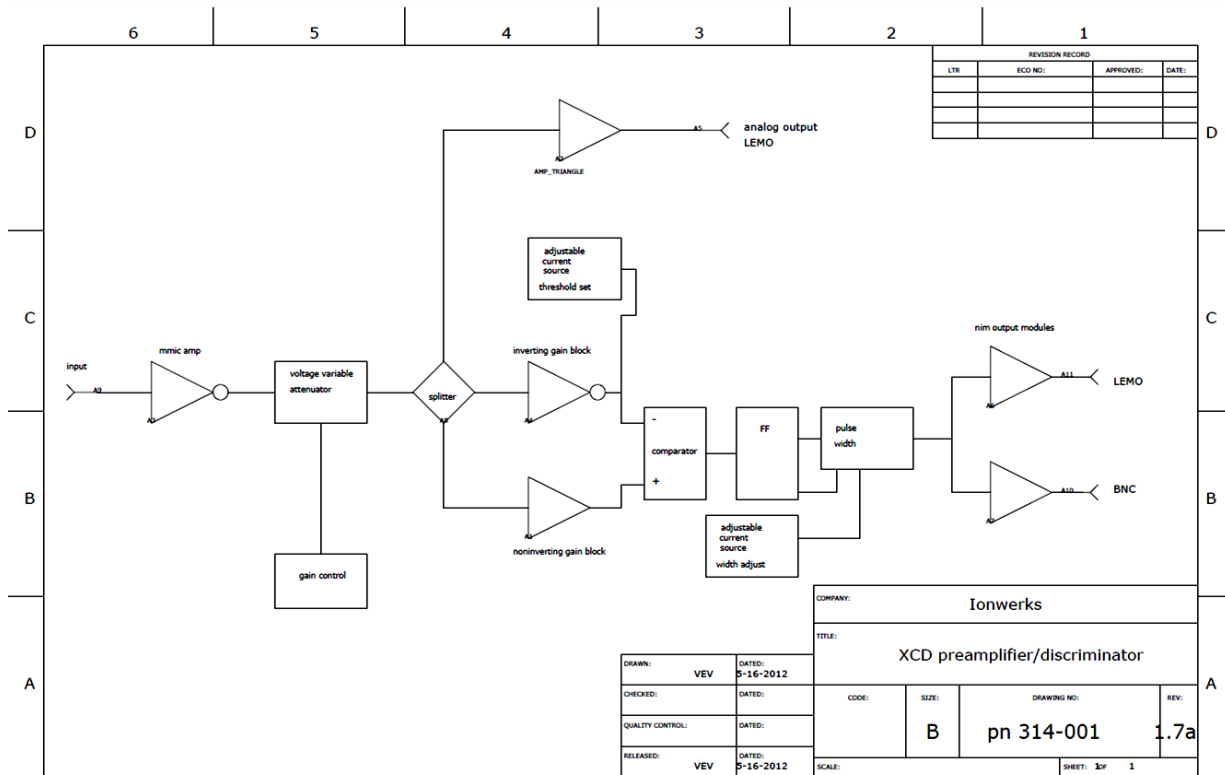


Figure 1

2.1.2 XCD Main Board Functions

2.1.2.1 Input Amplifier

The MMIC (Monolithic Microwave Integrated Circuit) amplifier is AC coupled to detect only fast rising edges . Input protection against transients is provided. The input impedance is 50 ohms at pulse frequencies.

2.1.2.2 Signal Attenuator

A voltage attenuator is used to prevent signal overload and provide selectable gain prior to the input pulse being presented to the comparator.

2.1.2.3 Signal Splitter

The splitter divides the inverted and amplified input signal three ways while preserving 50 ohm impedance.

2.1.2.4 Gain blocks

One of the splitter outputs is routed to a gain block and provides an amplified replica of the input signal. The gain of the analog output is the same as the gain of the signal presented at the comparator inputs. This facilitates use of the analog output to set threshold level. Analog output is 50 ohm. The second splitter output is amplified and preserved as an inverted signal. The third splitter output is amplified and has a non-inverted output. The gain of the inverted and non-inverted gain blocks are equal.

2.1.2.5 Threshold variable current source

The output of the inverted gain block is offset via an adjustable current source. A front panel potentiometer is used to adjust the current and set threshold level. By utilizing a current source, the signal may be voltage offset to the comparator. This provides noise immunity while preserving 50 ohm impedance.

2.1.2.6 Comparator

Inverted and non-inverted gain block output is applied to a fast comparator utilizing ECL logic

2.1.2.7 Flip flop and output width adjustment

An ECL flip-flop is used to set the output state. The output state is reset via a capacitor discharging through a current source. The current source is adjustable through a potentiometer on the rear panel labeled width. Width may be adjusted to suit externally connected equipment.

2.1.2.8 NIM Output Circuit

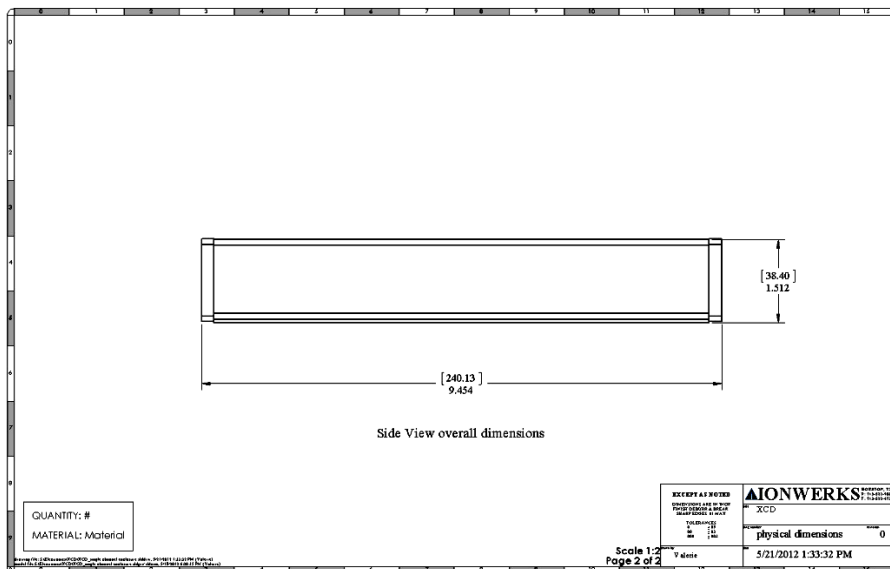
differential line receivers and discrete differential amplifiers are used to produce NIM level outputs at both the LEMO and BNC connectors. The LEMO and BNC outputs may each be connected to a 50 ohm load.

2.1.3 Power Board

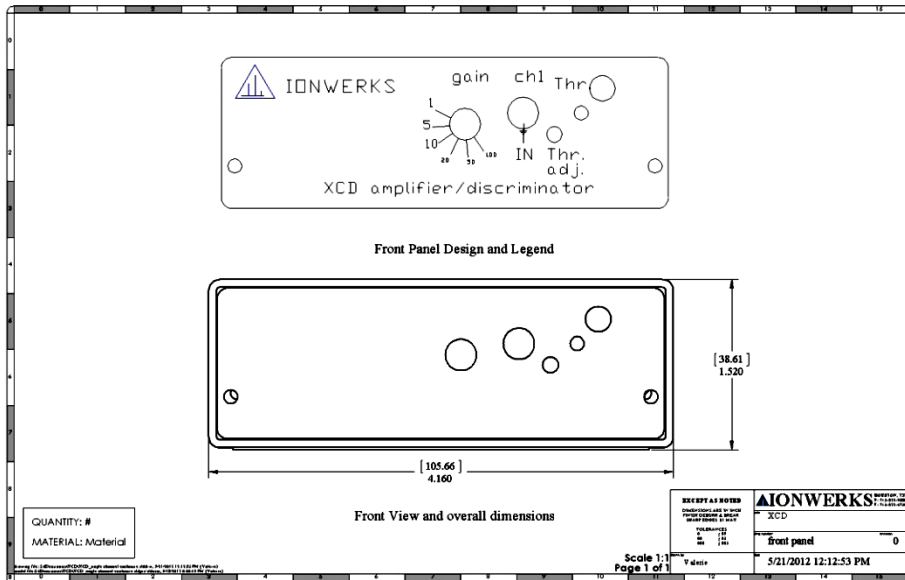
The power board contains DC/DC converters to generate the multiple voltages required internally by the XCD. The power board also contains LC filtering to reduce power supply ripple. Connection of power supply to XCD is via a 2.5mm i.d./5.5 mm o.d. coaxial DC power connector with center pin (+)

3 Mechanical interface specifications

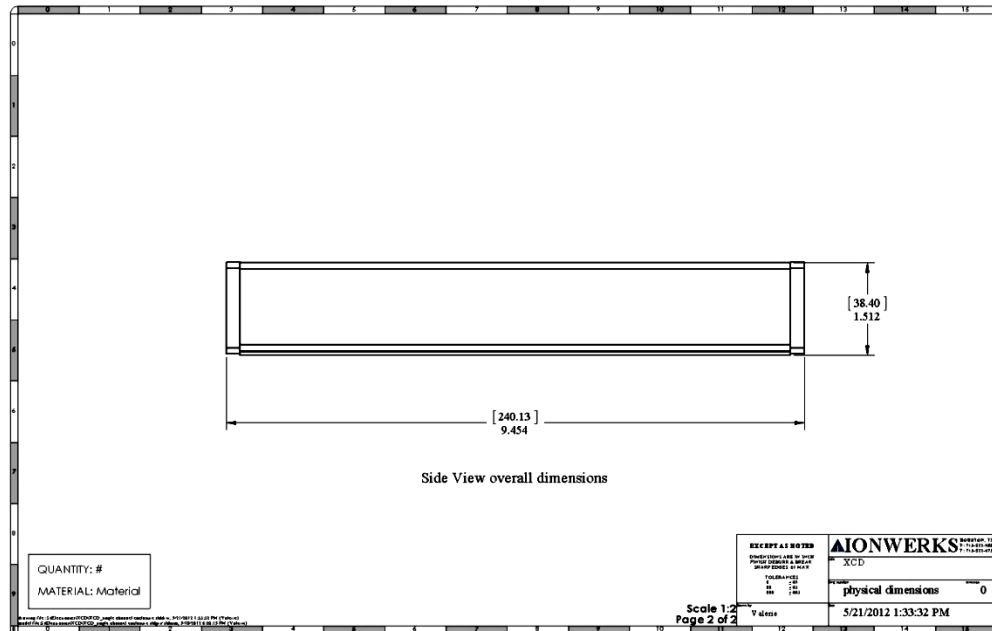
3.1 Side View



3.2 Front View



3.3 Rear View



3.4 Rack Mounting Information

If the unit is used in a rack-mounting configuration the following instructions, in addition to the general Safety Information found at the beginning of this manual apply.

Rack mounting accessories are available from Lansing Instrument Corp., www.lansing-enclosures.com See the Lansing catalog for C style MicroPak rack mounts for Q or E width enclosures.

4 Electrical Interface Specification

4.1 Front Panel Input/Output

4.1.1 Signal Input

Connector: LEMO camac

Termination: 50 ohm

Input Level: Analog, negative going ion pulses

Function: analog signal input, range 0 to 1V

Minimum Pulse Width: <1nS

Maximum Pulse Width: NA

4.1.2 Threshold monitor output

Connector: pin jack (sized for DMM lead)

Termination: 300 ohm

Output Level: DC analog

Function: detection threshold level DC Vout

4.1.3 Ground

Connector: pin jack (sized for DMM lead)

Level: signal ground

Function: ground for DMM lead to facilitate threshold measurements

4.2 Front Panel Adjustments

4.2.1 Detection Threshold adjustment

Screwdriver adjustment multi-turn trim potentiometer. Turning clockwise increases sensitivity, decreases threshold level.

4.2.2 Gain Adjustment

Gain selector switch, available settings X1,X5,X10,X20,X50,X100 times input signal amplitude

4.3 Rear Panel Outputs

4.3.1 NIM Outputs

LEMO and BNC outputs with NIM level signals, 0, -1V, 50 ohm

4.3.2 Analog Output

LEMO, 50 ohm

4.4 Rear Panel Adjustments

NIM output pulse width adjustment. Range 10 to 70 nS. Note: input is disabled during output pulse to prevent retriggering. Output pulse must complete before XCD is ready to detect another input pulse.