

**MODEL 99539**

**DL Instruments**

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**CURRENT PREAMPLIFIER**

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The Model 99539 is a modular, multi (up to eight)-channel current preamplifier with parallel, logic level, gain control input. It consists of circuit boards which plug into a 3 ½" high by 19" wide rack chassis.

Each board comprises a single preamplifier channel. Each board includes a front panel with controls to manually override the remote gain control inputs. The front panel also contains indication light emitting diodes. The 19" rack chassis accommodates eight preamplifier channels.



It also has a ninth slot for a user-provided microprocessor which provides gain control outputs, digitizes the preamplifier outputs and communicates via the VME

bus to other system components. The 19” rack chassis incorporates a regulated DC supply which provides power to all nine modules and detector bias potentials.

### Preamplifier Module Specifications

#### Gain

Programmable from  $10^4$  V/A to  $10^{10}$  V/A in decade steps.

#### Bandwidth

-3dB frequency shall be 300 Hz nominal  $10^4$  to  $10^{10}$ .

Gain (A/V) G	Input Spectral Density A RMS/ $\sqrt{\text{Hz}}$ @ 1kHz Max. $L_f$	Output Broadband dc-1kHz Volts RMS, typ. $E_f$ Open Circuit
$10^4$	$4 \times 10^{-12}$	$1 \times 10^{-6}$
$10^5$	$6 \times 10^{-13}$	$1.5 \times 10^{-6}$
$10^6$	$1.5 \times 10^{-13}$	$4 \times 10^{-6}$
$10^7$	$5 \times 10^{-14}$	$12 \times 10^{-6}$
$10^8$	$2 \times 10^{-14}$	$50 \times 10^{-6}$
$10^9$	$2 \times 10^{-14}$	$500 \times 10^{-6}$
$10^{10}$	$2 \times 10^{-14}$	$5 \times 10^{-3}$

#### Input Offset Current

20pA typical @ 25° C.  $10^8 - 10^{10}$  only –  $(20)(10^{-12})(10^{10}) = 20 \times 10^{-2} = 200\text{mV}$  200pA typical.,  $10^4 - 10^7$ . Note: This parameter is dependent on the ambient humidity and temperature. If lower values are required it is important to reduce both the temperature and humidity.

#### Power Requirements

+15V  $\pm$  0.6V @ 15mA maximum

-15V  $\pm$  0.6V @ 15mA maximum

Analog Ground

+5V  $\pm$  0.2V @ 15mA maximum  
Digital Ground

## Controls

Two miniature bat handled switches

a. Remote/Local Mode Switch

Module operates under front panel control in LOCAL position and under microprocessor control in REMOTE position

b. GAIN UP/DOWN Switch

Center off, spring loaded action. Sequences through the seven gain steps on each successive up or down actuation.

## Control Coding

Bit 3	Bit 2	Bit 1	Command
0	0	0	$10^4$ V/A
0	0	1	$10^5$ V/A
0	1	0	$10^6$ V/A
0	1	1	$10^7$ V/A
1	0	0	$10^8$ V/A
1	0	1	$10^9$ V/A
1	1	0	$10^{10}$ V/A
1	1	1	Calibration
MSB		LSB	

## Gain Indicator

Eight light emitting diodes, one for each gain step.

## Status Output

Single logic line to indicate LOCAL or REMOTE mode. This allows the microcontroller to know if any module is unavailable for control due to being set manually to LOCAL mode. All lines are tied together and will only indicate “high” when all switches are in the “Remote” position.

## Logic Inputs and Outputs

5 Volt, positive = true = 1, TTL compatible logic

Logic 0 < 0.8V; Logic 1 > 2.0V for inputs

Logic 0 < 0.4V; Logic 1 > 2.4V for outputs

Positive logic; true = 1 = high

MOSFET Input Impedance

Current drive (output)

## Pin Assignments

The following are pins are on the rear connector of the preamplifier board

Shield Ground	1	13	Analog Ground
Signal Input	2	14	Analog Ground
Analog Ground	3	15	-15V
-15V	4	16	N/C
N/C	5	17	+15V
+15V	6	18	N/C
N/C	7	19	Shield Ground
Signal Output	8	20	N/C
GAIN Bit 1	9	21	N/C
Remote/Local	10	22	N/C
GAIN Bit 2	11	23	N/C
GAIN Enable	12	24	Gain Bit 3

## Gain Switching Time

10 microseconds, maximum except  $10^7 - 10^8$  transition, 1msec maximum

## Output Polarity

Positive conventional current into input (electron loss by detector) results in positive going voltage output.

## Input Protection

Anti-parallel diodes across input

## **Analog Output Impedance**

50 ohms

## **Accuracy**

$\pm 1\%$

## **Output Range**

$\pm 10\text{Vdc}$

## **Input Overload Detection**

None

## **Input/Output Signal**

Single ended. BNC shells connected to analog ground on the corresponding preamplifier P. C. Board.

## **Construction**

Modular P.C. Board with front panel and rear plug. Connector mates with chassis socket to receive power, signal and control wiring. Module is removable with the front of the 19" rack chassis.

## **Power Supply Specifications**

### **Analog Supply**

$\pm 15\text{V @ } 250\text{mA}$ ,  $\pm 0.6\text{V}$ ; 1mV ripple/noise

Analog Ground

### **Digital Supply**

$+5\text{V @ } 1\text{A}$ ;  $\pm 0.2\text{V}$ ; 1mV ripple/noise

Digital Ground

### **Bias Supplies**

51 Volt bias # 1 @ 1mA;  $\pm 3V$ ; 20mV ripple/noise  
Bias Ground # 1, floating

51 Volt bias # 2 @ 1mA;  $\pm 3V$ ; 20mV ripple/noise  
Bias Ground # 2, floating

## **Grounding**

Analog ground and digital ground tie together at the power supply via a removable jumper wire (to allow the tie point to be moved elsewhere if need be; for example, to the site of the microprocessor board A/D converter). This ground optionally may be tied to the chassis safety ground. Chassis ground connects to ac line safety ground (third wire in power cord). The two 50V bias supplies are powered from separate transformer secondary windings. These supplies float separately from one another, with their return conductors isolated from other grounds. The shield grounds connect to analog ground at the individual channel modules.

## **AC Input**

105 or 135 Vac; 50-60Hz; single phase, 50VA, maximum. Connection via detachable power cord and EMI/fuse module on chassis rear panel.

## **Front Panel**

Contains the power on/off switch and pilot light.

## **Construction**

Non-modular. The power supply is not removable from the front of the chassis and does not employ a plug – in connector. DC outputs are distributed via cables soldered to the regulator P.C. Board.

## **Chassis Specifications**

### **Construction**

19" side x 3 1/2" high x 16" deep, rack mountable with slides (Optional).

## **Rear Panel**

Contains 117Vac input module, 8 BNC analog inputs and 8 BNC analog outputs. All BNC connectors have their shields isolated from the chassis (however, they are connected if Analog/Digital ground are connected to chassis).

## **Order of Components**

Viewed from the front:

Power Supply leftmost

Then, from left – to – right, preamplifier channels 1 through 8 in ascending order.

Empty slot next (for microprocessor)

## **Power Supply Distribution**

$\pm 15V$ , analog ground;  $+5V$ , digital ground bussed to analog channels 1-8. Separate wiring from power supply for these supply lines to the microprocessor board connector.

## **VME Bus Connection**

User shall provide microprocessor board, A/D, etc. Provision is made for  $\pm 15V$ ,  $+5V$  power, card guides and rear “D” connector.

## **Temperature Range, Operating**

$0^{\circ}C$  to  $45^{\circ}C$ , Specifications apply  $25^{\circ}C \pm 5^{\circ}C$

## **Slot Size for Modules**

Panel width:	1.4 inches
Board height:	2.20 inches overall
	2.00 inches subtracting card guide depth
Circuit Area	10.5 inches along length
	$2.0 \times 10.50 = 21$ square inches

## System Rear Panel Connector Assignments

	<b>Designator</b>	<b>Function</b>	<b>Connector(J37)</b>
<b>PREAMP CONTROL GROUP</b>	<b>R/L</b>	<b>Remote/Local</b>	<b>6</b>
	<b>GEN0</b>	<b>Gain Enable, CH-1</b>	<b>20</b>
	<b>GEN1</b>	<b>Gain Enable, CH-2</b>	<b>1</b>
	<b>GEN2</b>	<b>Gain Enable, CH-3</b>	<b>21</b>
	<b>GEN3</b>	<b>Gain Enable, CH-4</b>	<b>2</b>
	<b>GEN4</b>	<b>Gain Enable, CH-5</b>	<b>22</b>
	<b>GEN5</b>	<b>Gain Enable, CH-6</b>	<b>3</b>
	<b>GEN6</b>	<b>Gain Enable, CH-7</b>	<b>23</b>
	<b>GEN7</b>	<b>Gain Enable, CH-8</b>	<b>4</b>
	<b>G1</b>	<b>Gain Bit 1</b>	<b>24</b>
	<b>G2</b>	<b>Gain Bit 2</b>	<b>5</b>
	<b>G3</b>	<b>Gain Bit 3</b>	<b>25</b>
	<b>POWER</b>	<b>+15</b>	<b>Analog Supply (+)</b>
<b>AGND</b>		<b>Analog Supply Return</b>	<b>7</b>
<b>-5</b>		<b>Analog Supply (-)</b>	<b>27</b>
<b>+7.5</b>		<b>Digital Supply (+)</b>	<b>8</b>
<b>+7.5 RTN</b>		<b>Digital Supply Return</b>	<b>28</b>
<b>AUX.GROUND</b>	<b>AGND</b>	<b>Analog Ground</b>	<b>29</b>
	<b>DGND</b>	<b>Digital Ground</b>	<b>10</b>
	<b>DGND</b>	<b>Digital Ground</b>	<b>30</b>
	<b>DGND</b>	<b>Digital Ground</b>	<b>11</b>
	<b>DGND</b>	<b>Digital Ground</b>	<b>31</b>
<b>NOT USED</b>			<b>37,18,19,17, 34,35,9,12, 13-16,32,33,36</b>





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