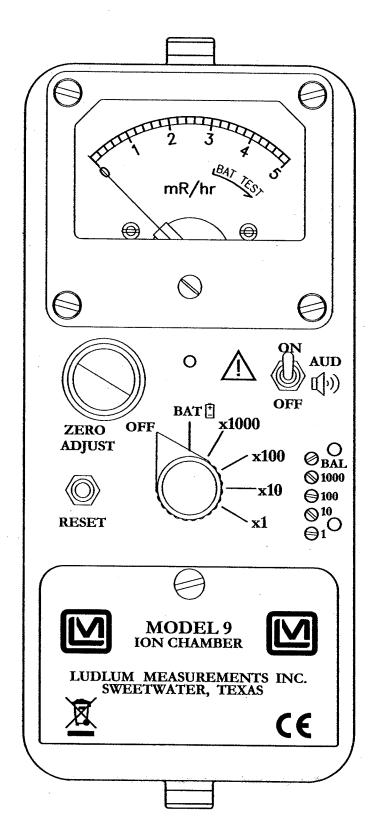
LUDLUM MODEL 9 ION CHAMBER

March 2007
Serial Number 229043 and Succeeding
Serial Numbers



LUDLUM MEASUREMENTS, INC. 501 OAK STREET, P.O. BOX 810 SWEETWATER, TEXAS 79556 325-235-5494, FAX: 325-235-4672

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Table of Contents

Introduction	1
Getting Started	2
Battery Installation	2-1
Battery Test	2-1
Instrument Test	2-1
Operational Check	2-2
Specifications	3
Identification of Controls and Functions	4
Safety Considerations and Maintenance	5
Environmental Conditions for Normal Use	5-1
Warning Markings and Symbols	5-1
Mylar Window Precaution	5-2
Cleaning and Maintenance Precautions	5-2
Maintenance	5-3
Recalibration	5-3
Batteries	5-3
Ion Chamber	5-3
Technical Theory of Operation	6
Chamber	6-1
Chamber Window	6-1
Electrometer	6-1
Range Change	6-1
Reset	6-2
Zero Adjust	6-2
Electrometer Stability	6-2
Range Calibration	6-2
Audio Circuit	6-2
Meter Circuit	6-3
Low Voltage Shutdown	6-3
Power Supply	6-3

Recycling	7
Parts List	8
Model 9 Ion Chamber	8-1
Main Circuit Board, Drawing 293 × 355	8-1
Calibration Board, Drawing 293 × 358	8-3
Electrometer Board, Drawing 293 × 396	8-3
Wiring Diagram, Drawing 293 × 361	8-3
Drawings and Diagrams	9

Ludlum Measurements, Inc.



Introduction

he Ludlum Model 9 is a portable Ion Chamber instrument with four linear ranges used in combination with an exposure rate meter dial for detection of beta-gamma radiation. The instrument features unimorph speaker with audio ON-OFF capability, meter reset button, zero adjust, retractable beta shield, and a six-position switch for selecting battery check or range multiples of ×1, ×10, ×100 and ×1000. Each range multiplier has its own calibration potentiometer. The unit body and meter housing are made of cast aluminum and the can is 0.090" thick aluminum.

The unit is powered by two "D" cell batteries for operation from 32°F (0°C) to 100°F (38°C).

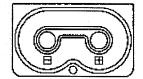
MODEL 9 Technical Manual Section 2



Getting Started

Battery Installation

Ensure the Model 9 range selector switch is in the OFF position. Open the battery lid by pushing down and turning the quarter-turn thumbscrew counterclockwise 1/4 turn. Install two "D" size batteries in the compartment.



Note the (+) and (-) marks inside the battery door. Match the battery polarity to these marks. Close the battery box lid, push down and turn the quarter-turn thumb screw clockwise ½ turn.

Note:

Center post of a flashlight battery is positive. The batteries are placed in the battery compartment in opposite directions.

Battery Test

The batteries should be checked each time the instrument is turned on. Move the range switch to the BAT position. Ensure that the meter needle deflects to the battery check portion on the meter scale. If the meter does not respond, check to see if the batteries have been correctly installed. Replace the batteries if necessary.

Instrument Test

After checking the batteries, turn the instrument range switch to the ×1000 position. Allow up to two minutes for the chamber wall to stabilize.

Place the AUD ON-OFF switch in the ON position. The instrument speaker frequency should increase with increase in meter reading. The AUD ON/OFF switch will silence the audible clicks if in the OFF position. It is recommended that the AUD ON/OFF switch be kept in the OFF position when not needed in order to preserve battery life.

Once the chamber has stabilized, turn the range switch to the ×1 position and adjust the ZERO ADJUST knob for a meter reading of "0".

Expose the center of the chamber to a check source. Ensure the check source reading is within 20% of the reference reading obtained during the last calibration.

Note:

The depressions on the side of the instrument housing indicate the center of the chamber.

Check the meter reset function by depressing the RESET pushbutton switch, ensuring the meter needle drops to "0".

Once this procedure has been completed, the instrument is ready for use. When using the instrument, slide the beta shield down for greater beta response, and up for less.

Caution!

Damage to the Mylar window on the back side of the instrument may result if careful instrument handling is not practiced. The window is very fragile and may be punctured quite easily.

Operational Check

To assure proper operation of the instrument between calibrations and periods of nonuse, an instrument operational check including battery test and instrument test (as described above) should be performed prior to use. A reference reading with a check source should be obtained at the time of initial calibration or as soon as possible for use in confirming proper instrument operation. In each case, ensure a proper reading on each scale.. If the instrument fails to read within $\pm 20\%$ of a proper reading, it should be sent to a calibration facility for recalibration.



Specifications

Chamber:

Chamber Wall Construction: Carbon coated acrylic.

Chamber Volume: 220 cm³.

Window: 7 mg/cm² aluminized Mylar

Window Area:

Active: 40 cm².

Open: 30 cm².

Beta Shield: Retractable 300 mg/cm² phenolic slide.

Beta Factor with the instrument exposed to a depleted uranium slab of 234 mrad/hr:

Reading with slide open: 50 mR/hr.

Reading with slide closed: 7 mR/hr.

Thus, Beta Factor = 234 divided by (50 minus 7) = 5.4.

Beta Factor without the protective screen = 3.7.

Energy Response: Within 20% of true value from 10 keV to 2 MeV.

Multipliers: $\times 1$, $\times 10$, $\times 100$ and $\times 1000$ selected by a front panel range selector switch. Momentary abnormal meter movement will be seen when switching between the $\times 10$ and $\times 100$ ranges; allow three seconds for the meter to stabilize.

Meter: 2.5" (6.4 cm) arc, 1 mA, pivot-and-jewel suspension.

Meter Dial: 0-5 mR/hr, BAT TEST (others available).

Range: Typically 0-5,000 mR/hr.

Linearity: Reading within $\pm 10\%$ of true value.

Power: Two "D" cell batteries housed in a sealed externally accessible compartment, providing 2 to 3 volts at 25 milliamps.

Battery Life: Typically greater than 200 hours with alkaline batteries (battery condition may be checked on the meter).

End-of-Battery Life Warning: At 2.1 Vdc the meter needle will drop to the edge of the BAT TEST or BAT OK area when the meter selector switch is moved to the BAT position.

Battery Dependence: Instrument calibration change less than 5% within battery check limits on the meter.

Warm-up Time: After power-up, allow up to 2 minutes for the chamber to stabilize.

Calibration Controls: Individual potentiometers for each range; accessible from the front cover while in operational status.

Audio: Built-in unimorph speaker with ON-OFF switch (greater than 60 dB at 2 feet).

Response: Approximately 3 seconds for 90% of final meter deflection on the ×1 and ×10 scales, and 5 seconds on the ×100 and ×1000 scales.

Reset: Pressing the reset button causes the chamber to discharge with a zero ($\pm \frac{1}{2}$ small division) meter reading; releasing the button will cause momentary meter fluctuation (up or down scale). Allow up to 10 seconds for the reading to stabilize.

Noise: Approximately every three minutes an up-scale "kick" may be noted on the ×1 scale. This is normal and should be ignored.

Magnetic Interference: Operation in high ambient magnetic fields may cause reed relays (utilized by zero and range switch) to close. Use a radiation check source to ensure proper operation.

Dimensions: $9.2"(23.4 \text{ cm}) \text{ H} \times 3.5" (8.9 \text{ cm}) \text{ W} \times 8.5" (21.6 \text{ cm}) \text{ L}$, including instrument handle.

Weight: 4.2 lbs. (1.9 kg), including batteries.

Construction: Cast and drawn aluminum with beige powder-coating and silk-screened nomenclature.



Identification of Controls and Functions

Range Selector Switch: This is a six-position switch marked OFF, BAT, $\times 1000$, $\times 100$,

AUD ON-OFF Toggle Switch: In the ON position this switch energizes the unimorph speaker, located on the left side of the instrument. The frequency of the clicks is relative to the meter reading; the higher the reading, the higher the audio frequency. To reduce battery drain, the switch should be turned OFF when not needed.

ZERO ADJUST: This is a full three-turn control which allows for compensation of electrometer drift or leakage; utilized when the instrument is in the ×1 scale only. Additionally used for background subtract. Adjust the meter needle to zero in a low radiation field. Alternatively, place the instrument in a known radiation field and adjust for proper reading.

Range Calibration Adjustments: Recessed potentiometers located under the calibration cover, on the right side of the front panel. These adjustment controls allow for individual calibration of each range multiplier.

BAL (Balance Control): Recessed potentiometer located under the calibration cover; used to calibrate the meter to zero with the RESET button depressed. This adjustment affects all ranges of the instrument.

RESET Button: When depressed, this button provides a means of discharging the chamber. Momentary abnormal meter movement is expected when the button is released. Allow up to 10 seconds for the meter to stabilize following a reset function.

Beta Shield (back side): A retractable shield for shielding beta particles. Slide the beta shield down for greater beta response, and up for less.



Safety Considerations and Maintenance

Environmental Conditions for Normal Use

Indoor or outdoor use

Altitude dependant: Response decreases 3% for every increase in 1000 feet of elevation above the calibration elevation. (For further information see the Average Model 9 Altitude Dependence graph in Section 9 of this manual).

Temperature range of 0°C to 38°C (32°F to 100°F).

Maximum relative humidity of less then 95% (non-condensing)

Pollution Degree 1 (as defined by IEC 664)

Warning Markings and Symbols

Caution!

The operator or responsible body is cautioned that the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by Ludlum Measurements, Inc.

The Model 9 Ion Chamber is marked with the following symbols:



CAUTION (per ISO 3864, No. B.3.1) – designates hazardous live voltage and risk of electric shock. During normal use, internal components are hazardous live. This instrument must be isolated or disconnected from the hazardous live voltage before accessing the internal components. This symbol appears on the front panel. **Note the following precautions:**

Warning!

The operator is strongly cautioned to take the following precautions to avoid contact with internal hazardous live parts that are accessible using a tool:

- 1. Turn the instrument power OFF and remove the batteries.
- 2. Allow the instrument to sit for 1 minute before accessing internal components.



The "crossed-out wheelie bin" symbol notifies the consumer that the product is not to be mixed with unsorted municipal waste when discarding; each material must be separated. The symbol is placed on the battery compartment lid. See section 7, "Recycling" for further information.

Mylar Window Precaution

Caution!

Damage to the Mylar window on the back side of the instrument may result if careful instrument handling is not practiced. The window is very fragile and may be punctured quite easily.

Cleaning and Maintenance Precautions

Instrument maintenance consists of keeping the instrument clean and periodically checking the batteries, desiccants and calibration. The Model 9 (excluding chamber window) may be cleaned externally with a damp cloth, using only water as the wetting agent. Do not immerse the instrument in any liquid. Observe the following precautions when cleaning or performing maintenance on the instrument:

- 1. Turn the instrument OFF and remove the batteries.
- 2. Allow the instrument to sit for 1 minute before cleaning the exterior or accessing any internal components for maintenance.

Maintenance

RECALIBRATION

Recalibration should be accomplished after maintenance or adjustments have been performed on the instrument. Recalibration is not normally required following instrument cleaning, desiccant servicing or battery replacement

Note:

Ludlum Measurements, Inc. recommends recalibration at intervals no greater than one year. Check the appropriate regulations to determine required recalibration intervals.

Ludlum Measurements offers a full service repair and calibration department. We not only repair and calibrate our own instruments but most other manufacturer's instruments. Calibration procedures are available upon request for customers who choose to calibrate their own instruments.

BATTERIES

The batteries should be removed any time the instrument is placed into storage. Battery leakage may cause corrosion on the battery contacts, which must be scraped off and/or washed using a paste solution made from baking soda and water. Use a spanner wrench to unscrew the battery contact insulators, exposing the internal contacts and battery springs. Removal of the handle will facilitate access to these contacts.

Note:

Never store the instrument over 30 days without removing the batteries. Although this instrument will operate at very high ambient temperatures, battery seal failure may occur at temperatures as low as 100°F.

ION CHAMBER

The Ion Chamber has a box containing indicator desiccant. The desiccant should have a bluish color. If the color is pink, replace with dry desiccant.

The desiccant may be removed from the instrument and dried out by placing it in a warm (150°F) oven until the desiccant returns to a bluish color. Cotton packing is placed in the desiccant cartridge to prevent the desiccants from rattling.

If the instrument is stored in an area with high humidity, rapid changes in temperature should be avoided. A storage cabinet with a light bulb inside is one means of keeping the instrument in a slightly warmer than ambient temperature environment, in order to prevent problems from rapid changes in temperature and humidity.



Technical Theory of Operation

Chamber

The chamber housing is constructed from acrylic and is coated inside and outside with carbon. The internal wall is maintained at approximately 55 volts. The external wall is at ground potential.

The electrode is connected to the electrometer input and is held at ground potential, though isolated through a 5×10^{11} ohm resistor on the $\times 1$ scale.

Chamber Window

The chamber window consists of four parts. The gamma slide is 300 mg/cm² phenolic. The protective screen is 1/32-inch aluminum which is approximately 73% open. The beta window consists of one layer of polyester film (5.8 mg/cm²) plus two layers of aluminized mylar (each 0.4 mg/cm²) glued to a window frame mount behind the gamma slide. One layer of 0.4 mg/cm² mylar is used for the chamber itself, resulting in a total beta window of approximately 7 mg/cm².

Electrometer

The electrometer consists of U1, R2, and supporting components. On the ×1 scale, RRLY1 and RRLY2 are open. With conduction in the chamber to the positive wall, pin 2 of U1 goes slightly positive causing pin 6 of U1 to go negative, drawing current through R2, holding pin 2 of U1 near zero.

This feedback system allows op amp U1 to supply the chamber current through R2. For a chamber current of 10-12, with feedback resistance of 5×10^{11} ohms, output voltage is negative (-) 0.5 volts.

Range Change

When the instrument is switched to the $\times 100$ or $\times 1000$ range, RRLY1 is closed, reducing the feedback resistance to 5×10^9 ohms.

With a current of 10^{-10} amps, the voltage out at pin 6 of U1 will be $10^{-10} \times 5 \times 10^9 = 0.5$ volts.

Reset

Relay RRLY2 allows the chamber to be shorted for calibration and discharge purposes.

Zero Adjust

An offset current is fed through R1 (Electrometer Board), via R1 (zero adjust), to pin 2 of U1 to compensate for electrometer drift and leakage. Zero adjust control R1, (Wiring Diagram), will vary \pm 0.05 volts through R1, which makes it effective, primarily for the $\times 1$ range.

Electrometer Stability

The electrometer circuit may become unstable if the chamber capacitance becomes too large. This capacitance is compensated for by C1.

Range Calibration

Note:

All of the following output voltages referenced from the Electrometer Board are negative voltages.

Full scale voltage for the electrometer output, pin 6 of U1 (electrometer board) is approximately –0.03 volts for the ×1 range; 0.3 volts for the ×10 range; –0.03 volts for the ×100; and –0.3 volts for the ×1000 range. These output voltages are coupled through the calibration controls to U133 (main circuit board). After the instrument is source calibrated, each scale will have the same voltage at pin 6 of U133. R181 (NULL) is adjusted for 0-volt output at pin 6 of U133 with both of the inputs at circuit ground potential. R5 (BAL control on the calibration board) is adjusted for zero meter reading with the front panel RESET switch depressed.

Audio Circuit

Pins 1, 2, and 3 of U135,Q128 and related components form a voltage to frequency convertor. Frequency is set by R170 and C119. Pulses are fed to Audio transformer driver Q120 and are proportional to the voltage at pin 3 of U135.

Meter Circuit

Current from U133, through R154, through meter buffer U135 and meter driver Q125, is coupled to 1mA meter. The meter movement is damped by R166. Negative 5.5 volts through R164 allows meter movement to swing below zero reading referenced to circuit ground. On battery test, the meter is coupled through R168 to the battery. When the instrument is OFF, the meter is shorted to prevent damage in transit.

Low Voltage Shutdown

The Q126-Q127 circuit senses supply voltage. When the supply voltage drops below an arbitrary value set by U132-R175, the output meter and audio drive is shorted by Q127, rendering the instrument inoperable. This prevents improper meter indication that may occur with low battery voltage and unstable power supplies. The power supply maintains operation during this period.

Power Supply

Supply voltages and references are provided by blocking oscillator. Output voltages are:

```
+7 to +9 volts at the junction of CR137 & C115
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−5 to −7 volts at the Junction of CR136 & C118

These voltages are regulated to:

```
+5 \pm 0.1 volt by U129 & U131
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 -2.5 ± 0.1 volt by U130

 $+54 \pm 4$ volts by U134 (Voltage measured at the junction of R161 & C2.)

The regulated voltages must be stable to ± 0.003 volts.



Recycling

udlum Measurements, Inc. supports the recycling of the electronics products it produces for the purpose of protecting the environment and to comply with all regional, national and international agencies that promote economically and environmentally sustainable recycling systems. To this end, Ludlum Measurements, Inc. strives to supply the consumer of its goods with information regarding reuse and recycling of the many different types of materials used in its products. With many different agencies, public and private, involved in this pursuit it becomes evident that a myriad of methods can be used in the process of recycling. Therefore, Ludlum Measurements, Inc. does not suggest one particular method over another, but simply desires to inform its consumers of the range of recyclable materials present in its products, so that the user will have flexibility in following all local and federal laws.

The following types of recyclable materials are present in Ludlum Measurements, Inc. electronics products, and should be recycled separately. The list is not all-inclusive, nor does it suggest that all materials are present in each piece of equipment:

Batteries Glass

Aluminum and Stainless Steel

Circuit Boards

Plastics

Liquid Crystal Display (LCD)

Ludlum Measurements, Inc. products which have been placed on the market after August 13, 2005 have been labeled with a symbol recognized internationally as the "crossed-out wheelie bin" which notifies the consumer that the product is not to be mixed with unsorted municipal waste when discarding; each material must be separated. The symbol will be placed near the AC receptacle, except for portable equipment where it will be placed on the battery lid.

The symbol appears as such:



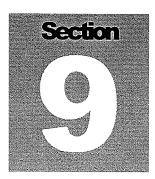
Parts List

	<u>Reference</u>	<u>Description</u>	Part Number
Model 9 Ion Chamber	UNIT	Completely Assembled Model 9 Ion Chamber	48-1608
Main Circuit Board, Drawing 293 × 355	BOARD	Completely Assembled Main Circuit Board	5293-355
CAPACITORS	C1-C2 C3 C4 C110 C111 C112 C114 C115 C116 C117 C118 C119	0.47uF, 100V 0.001uF, 100V 0.1uF, 100V 0.47uF, 100V 0.01uF, 100V 0.1uF, 100V 0.001uF, 100V 100uF, 20V 4.7uF, 10V 100uF, 20V 10uF, 20V 1uF, 50V	04-5631 04-5519 04-5521 04-5611 04-5523 04-5521 04-5519 04-5583 04-5578 04-5576 04-5592 04-5607
TRANSISTORS	Q120-121 Q122 Q123-Q124 Q125-Q128	2N3904 2N4402 2N6515 2N3904	05-5755 05-5763 05-5870 05-5755
INTEGRATED CIRCUITS	U129-U131 U132 U133 U134-U135	LM385Z-2.5 LM385Z-1.2 ICL7611 ICL7621	05-5791 05-5808 05-5786 06-6171
DIODES	CR136-CR139 CR140	1N4148 1N5262	07-6272 07-6331

	Reference	Description	Part Number
	CR141	1N4148	07-6272
	CR179-CR180	1N4007	07-6274
POTENTIOMETER	R181	25K, 8026EKX-253, NULL	09-6832
RESISTORS	R1	100K, 1/4W, 5%	10-7023
	R143	1K, 1/4W, 5%	10-7009
	R144	3.9K, 1/4W, 5%	10-7084
	R145	1M, 1/4W, 5%	10-7028
	R146	10M, 1/4W, 5%	10-7031
	R147	1K, 1/8W, 1%	12-7637
	R148	8.2K, 1/4W, 5%	10-7015
	R149	37.4K, ½(1/8)W, 1%	12-7641
	R150	1K, 1/8W, 1%	12-7637
	R151-R153	22K, 1/4W, 5%	10-7070
	R154	56, 1/4W, 5%	10-7021
	R155	1M, 1/3W, 1%	12-7609
	R156	1M, 1/4W, 5%	10-7028
	R157	4.7M, 1/4W, 5%	10-7030
	R158	412K, ½(1/8)W, 1%	12-7688
	R159	47K, 1/4W, 5%	10-7020
	R160	1M, 1/4W, 5%	10-7028
	R161	10M, 1/4W, 5%	10-7031
	R162	75K, 1/8W, 1%	12-7504
	R163	1.2M, 1/4W, 5%	10-7037
	R164	47K, 1/4W, 5%	10-7020
	R165	1.2M, 1/4W, 5%	10-7037
	R166	8.2K, 1/4W, 5%	10-7015
	R167	47K, 1/4W, 5%	10-7020
	R168	2.1K, 1/8W, 1%	12-7599
	R169	5.6K, 1/4W, 5%	10-7042
	R170	150K, 1/4W, 5%	10-7042
	R171	47K, 1/4W, 5%	10-7024
	R172	39K, 1/4W, 5%	10-7020
	R172 R173	82K, 1/4W, 5%	10-7077
	R173	10K, 1/4W, 5%	10-7016
	R174 R175	, , ,	
		680 Ohm, 1/4W, 5%	10-7056
	R182	4.7K, 1/4W, 5%	10-7014
CONNECTORS	P1	640456-8 MTA100×8	13-8039
	P2	640456-2 MTA100×2	13-8073
	P3	1-640456-4 MTA100×4	13-8141

	Reference	Description	Part Number
TRANSFORMERS	T1 T178	AUDIO M 9 POWER	4275-083 4275-088
Calibration Board, Drawing 293 × 358	BOARD	Completely Assembled Calibration Board	5293-358
POTENTIOMETERS	R5 R6 R7 R8 R9	100K, 64W104, BALANCE 100K, 64W104, ×1 1M, 64W105, ×10 100K, 64W104, ×100 1M, 64W105, ×1K	09-6813 09-6813 09-6814 09-6813
CONNECTOR	P5	640456-8 MTA100×8	13-8039
Electrometer Board, Drawing 293 × 396	BOARD	Completely Assembled Electrometer Board	5293-396
CAPACITORS	C1	2pF, 200V	04-5726
INTEGRATED CIRCUIT	U1	LMC6041M	06-6502
DIODES	CR1-CR2	MMBD914LT1	07-6353
RESISTORS	R1-R2 R3	500G, 330 mV, 20% 5G, 330 mV, 20%	12-7021 12-7022
RELAYS	RL1-RL2 with	M9/17 BOBBIN ASSY M9/M17 REED BENT	4293-339 7293-349
MISCELLANEOUS	W1-W8	HARNESS	8293-342
Wiring Diagram, Drawing 293 × 361			
SWITCHES	S1 S2 S3	RANGE RESET AUDIO	08-6501 08-6517 08-6511
POTENTIOMETER	R1	10K, ZERO SET	09-6780

	Reference	Description	Part Number
CONNECTOR	J1	MAIN BOARD 5293-355, 640442-8 MTA100×8	13-8184
	J2	MAIN BOARD 5293-355, 640442-2 MTA100×2	13-8178
	Ј3	MAIN BOARD 5293-355, 1-640442-4 MTA100×14	13-8173
	J5	CALIBRATION BOARD 5293-358, 640442-8 MTA100×8	13-8184
		3273-330, 0 1011 2-0 W11W100\0	13-010-4
AUDIO	DS1	UNIMORPH 60690	21-9251
BATTERY	B1-B2	Duracell "D", 1.5V	21-9313
MISCELLANEOUS			
	DET1 *	M9 CHAMBER ASSY M9 BATTERY LID	4293-340
	*	W/CONTACTS PORT. BEZEL	9293-262
		W/MOVEMENT ASSY	4363-188
	*	CAN ASSY	4293-261
	*	CASTING	9293-254
	*	MAIN HARNESS	8293-363
	*	PORT. BEZEL W/GLASS	4363-352
	*	PORTABLE METER FACE	7363-136
	M1 *	METER MOVEMENT (1 mA) PORTABLE CALIBRATION	15-8030
	*	COVER W/SCREWS PORTABLE HANDLE	9363-200
		(ROLLED)W/SCREWS	7363-139



Drawings

MAIN BOARD, Drawing 293 × 355

MAIN BOARD LAYOUT, Drawing 293 × 356

CALIBRATION BOARD, Drawing 293 × 358

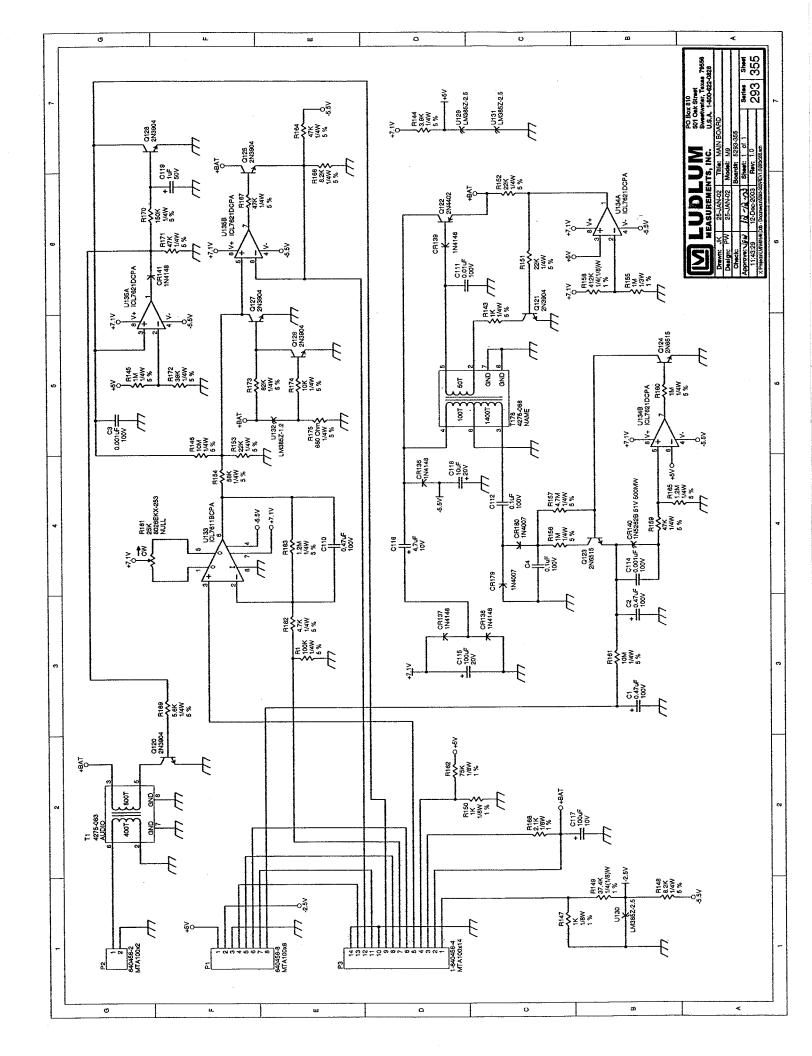
CALIBRATION BOARD LAYOUT, Drawing 293 × 359 (2 sheets)

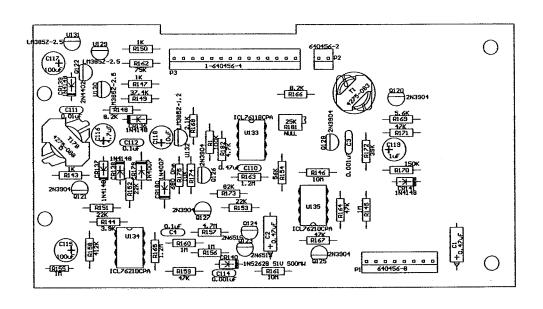
ELECTROMETER BOARD, Drawing 293 × 396

ELECTROMETER BOARD LAYOUT, Drawing 293 × 397

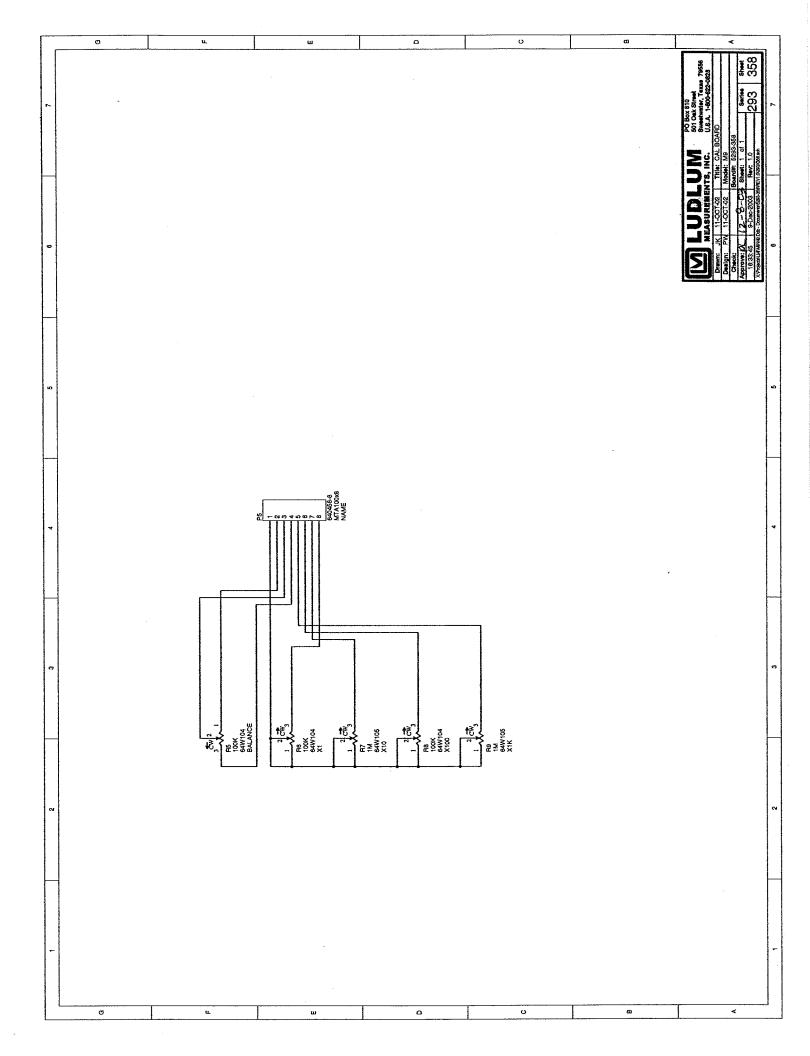
WIRING DIAGRAM, Drawing 293 × 361

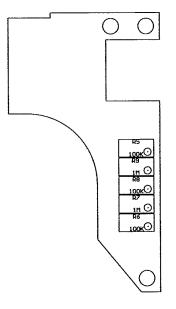
AVERAGE MODEL 9 ALTITUDE DEPENDANCE



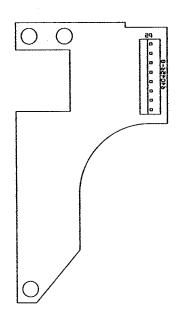


Draw	n: JK	25-JAN-02	Title:			
Desig	n: PW	25-JAN-02	MAIN BOARD			
Check:			Model: M9			
Approve: 0C 12-8-03		Board#: 5	5293-355		يدائيون	
Layer: Top Overlay			Rev: 1		Series	Sheet
Mech.1 Mech.2	MD:		SCALE	1.00	293	356
Mech.4	16:31:51	9-Dec-2003	SCALE	1.00	290	220

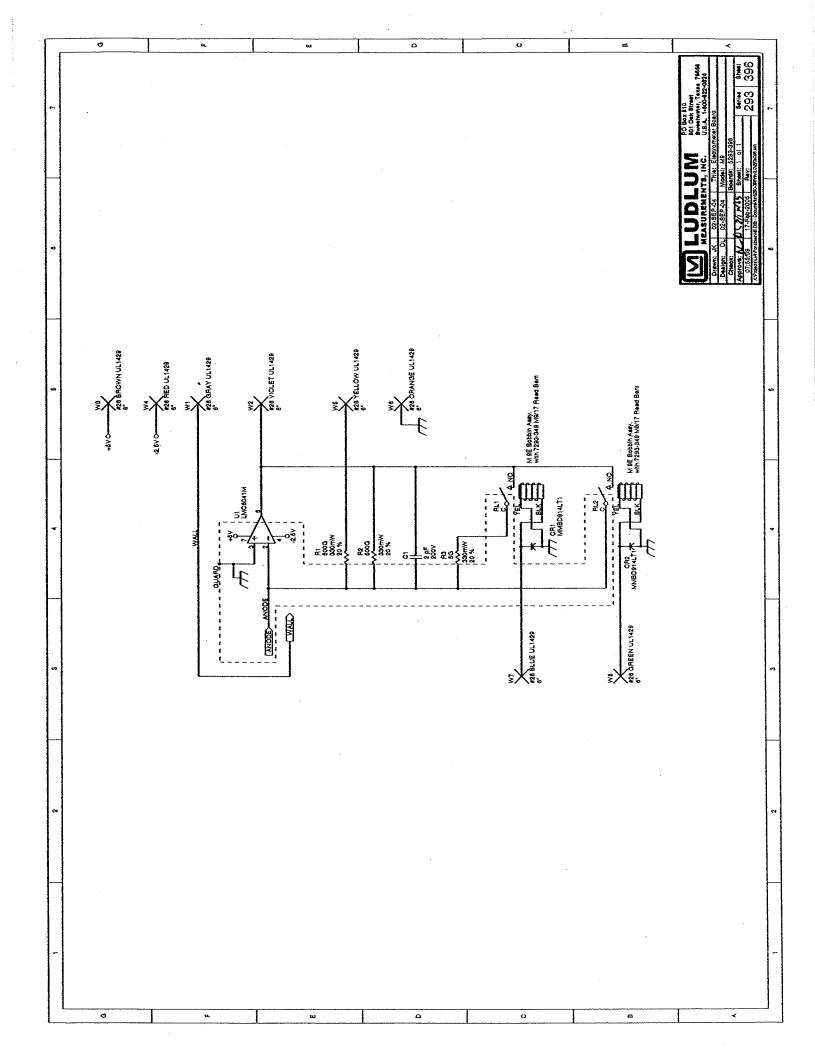


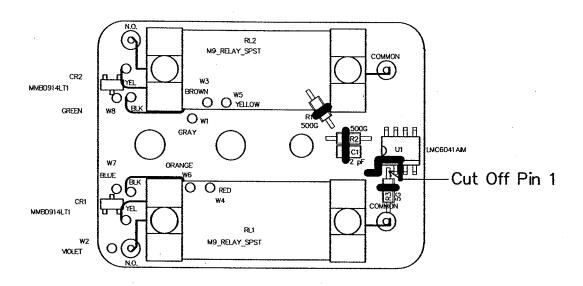


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Draw	n: JK	11-0CT-02	Title: CAL BOARD		
Desig	n; PW	11-OCT-02	CAL BUARD		
Check:		Model: M9			
Approve: 0C /2-8-03		Board#: 5293-358			
Layer:			Rev: 1.0	Series	Sheet
İ	MD:		SOALE 100	1207	359
İ	16:33:49	9-Dec-2003	SCALE: 1.00	1293	559

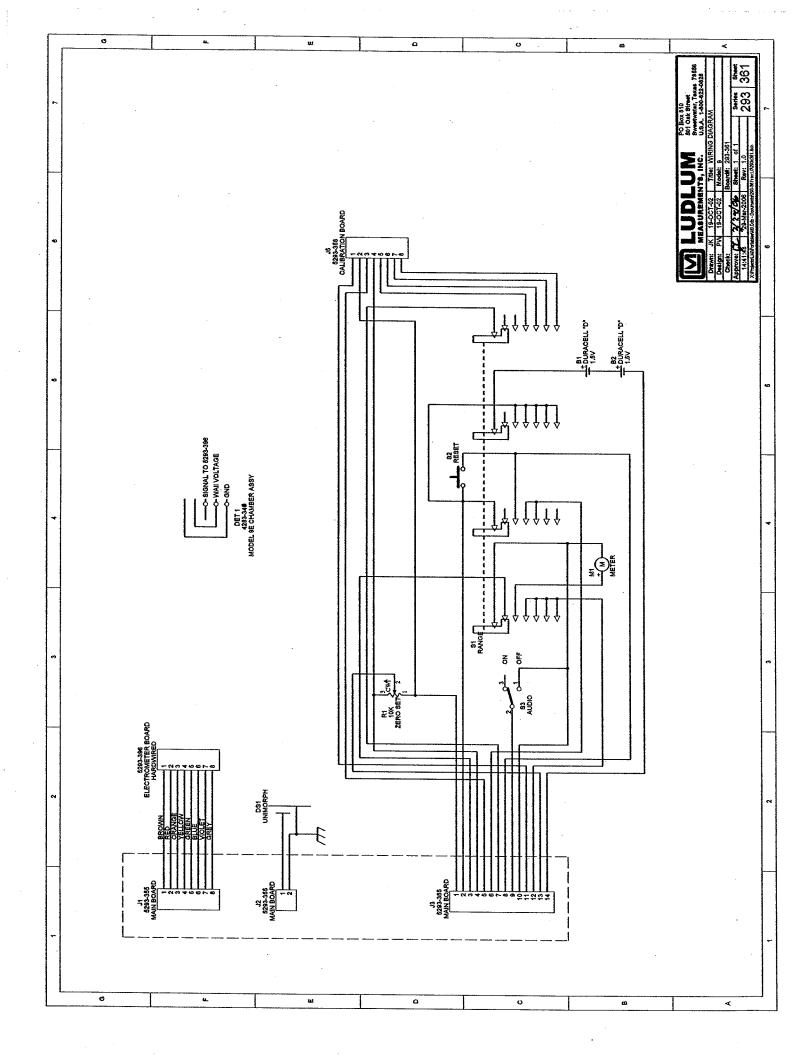


Drawn: JK 11-OCT-0:		11-0CT-02	Title:		
Design: PW 11-OCT-02		11-OCT-02	CAL BOARD		
Check:		Model: M9			
Approve: 0L 12-8-63		Board#: 5293-358			
Loyer:		Rev: 1.0	Series	Sheet	
MID: 16:33:49 9-Dec-2003			20115 4 22	1007	750
		SCALE: 1.00	293	359	





Drawn	: JK	02-SEP-04	Title:		
Design: DL 02—SEP—04 Electrometer Board					
Check: Model: M9					
Approve: 01 2-17-05		Board#: 5293-396			
Top Overlay		Rev: 2.0	Series	Sheet	
MID:		00415 000	1007	707	
	10:47:31 17–Feb–2005 SCALE: 2.02 293 39		139/		
bs293396.pcb			bs293396.pcb		



AVERAGE MODEL 9 ALTITUDE DEPENDANCE

