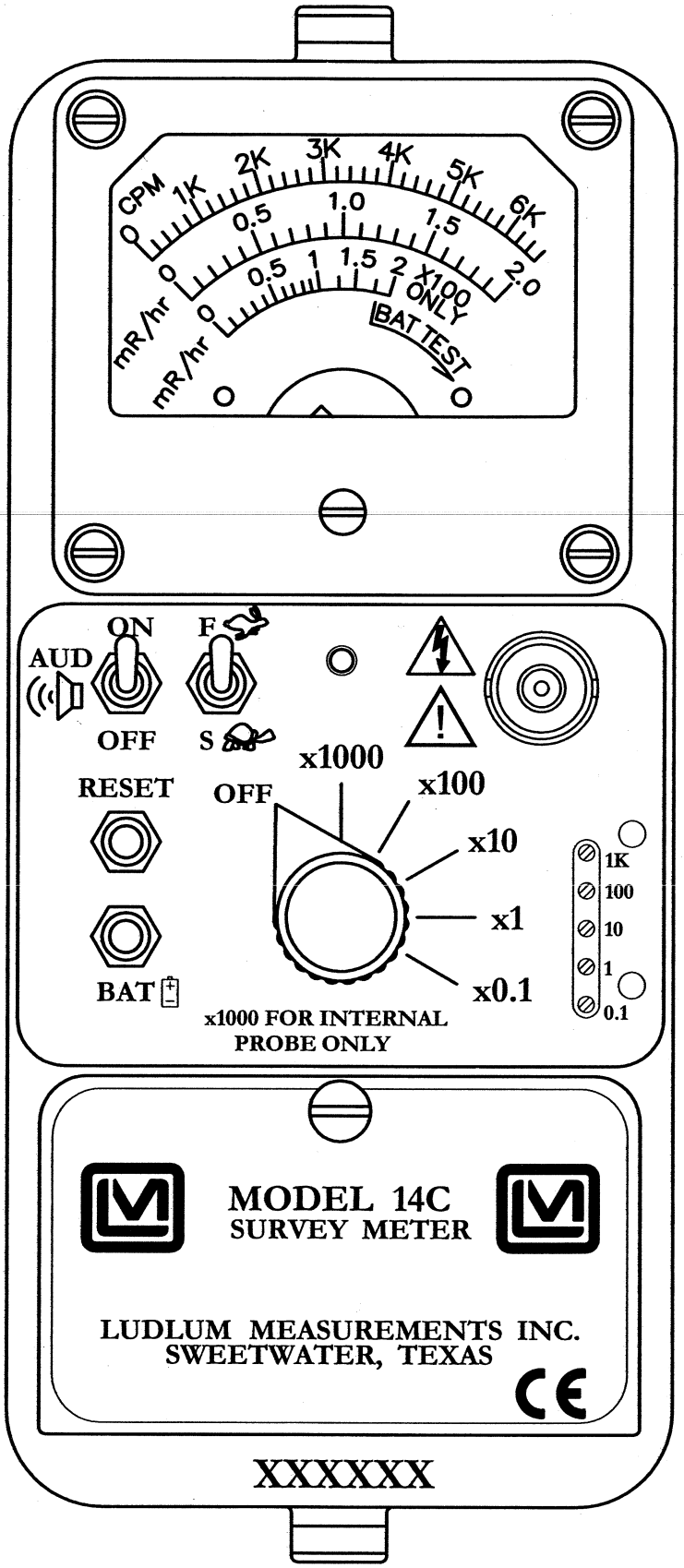
LUDLUM MODEL 14C

SURVEY METER

November 2004
Serial No. 212998 and Succeeding
Serial Numbers

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

REV #	ALTERATIONS	DATE	BY
	VALID	10/25/03	PW



DWN	DATE	CHECKED	APPROVED
PW	10/25/03		JGW 2-24-04

TITLE: MODEL 14C ASSY

LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556

SERIES	SHEET
464	180

M14C Survey Meter
November 2004

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M14C Survey Meter
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1. GENERAL

The Model 14C is a ruggedized, portable survey instrument that operates on two (2) standard "D" cell alkaline batteries. The instrument features a regulated high voltage power supply set at 900 volts and provides five linear ranges to 2000 mR/hr.

The unit body is made of ruggedized cast-aluminum, including the meter housing. The can is made of 0.090" aluminum. Other operating features of the instrument include a unimorph speaker, mounted to the instrument can with an audio ON-OFF, fast-slow meter response, meter reset button, a battery check button and a 6-position switch for selecting scale multiples of X0.1, X1, X10, X100 and X1000. Each range multiplier has its own calibration potentiometer.

This instrument is set for 900-volt G-M tube operation and is typically used with either a thin wall G-M tube or pancake G-M tube; however, other external detectors are compatible with the Model 14C. An internal energy-compensated, high-range detector is used for the X1000 range only.

The unit is operated with two "D" cell alkaline batteries for operation from 32° to approximately 150°F. For temperature operation to 0°F, either very fresh alkaline batteries or rechargeable NiCd batteries may be used. Battery drain is typically 5-7 mA in low radiation fields and up to 50 mA in high radiation fields (exposure rate up to 200 R/hr).

2. SPECIFICATIONS

- **POWER**: two (2) "D"-size batteries

- **RANGES**: 5 linear ranges from 0 to 2000 mR/hr; meter scale presentation of 0-2 mR/hr with multiples of X0.1, X1, X10, X100, and X1000

- **INPUT SENSITIVITY**: 40 millivolts ± 10 mV

- **AUDIO**: a built-in unimorph speaker with an ON-OFF switch

- **HIGH VOLTAGE**: 900 volts

- **RESPONSE**: 4 seconds in fast "F" position and 22 seconds in slow "S" position for 90% of final meter reading

- **LINEARITY**: plus or minus 5% of full scale

- **BATTERY LIFE**: Exceeds 2000 hours with a fresh set of alkaline "D" cell batteries

- **BATTERY DEPENDANCE**: Instrument calibration change less than 3% within Battery Check limits on the meter

- **METER**: 1 mA with 2 1/2-inch scale, pivot-and-jewel movement

- **CONNECTOR**: series "C", others available.

- **DETECTORS**:

  internal (supplied) – an energy compensated G-M detector for X1000 range (supplied)

  external (not supplied) - typically a G-M detector for X0.1 through X100 ranges; however, other detectors are compatible.

- **CALIBRATION CONTROLS**: individual recessed potentiometers for each range

- **SIZE**: 10.67 cm (4.2") H X 8.9 cm (3.5") W X 21.6 cm (8.5") L, exclusive of handle

- **WEIGHT**: 1.45 kg (3.2 lbs.), with internal detector and batteries.

- **FINISH**: computer-beige powdercoating with printed membrane front panel

- **ENVIRONMENTAL CONDITIONS FOR NORMAL USE**:
  - Indoors or Outdoors
  - No maximum altitude
  - Temperature range of -20°C to 50°C
  - Maximum relative humidity less than 95% (non-condensing)
  - Pollution Degree 1 (as defined by IEC 664)

3. DESCRIPTION OF CONTROLS AND FUNCTIONS

- **Range Multiplier Selector Switch**: A six-position switch marked OFF, X1000, X100, X10, X1, X0.1. Moving the range selector switch to one of the range multiplier positions (X1000, X100, X10, X1, X0.1) provides the operator with an overall range of 0-2000 mR/hr. Multiply the scale reading by the multiplier for determining the actual scale reading.

- **AUDIO ON-OFF Toggle Switch**: In the ON position, the switch energizes the unimorph speaker, located on the left side of the instrument. The frequency of the clicks is relative to the rate of the incoming pulses. The higher the rate, the higher the audio frequency. The audio should be turned OFF when not required to reduce battery drain.

- **Fast-Slow Toggle Switch**: Provides meter response. Selecting the fast, "F", position of the toggle switch provides 90% of final meter reading of four seconds. In slow, "S", position, 90% of final meter reading takes 22 seconds. Set on "F" for fast response and large meter deviation. "S" position should be used for slow response and damped meter deviation.

- **RESET Button**: When depressed, provides a rapid means to drive the meter to zero.

- **BAT Check**: When depressed, provides a visual means of checking the battery charge status. The instrument must be turned on to do this check.

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

4. OPERATING PROCEDURES

✓ **NOTE**: To open the Battery Lid, twist the lid button counterclockwise 1/4 turn. To close, twist clockwise 1/4 turn.

- Open the lid and install two "D" size batteries. Note (+) (-) marks on the inside of the lid. Match the battery polarity to these marks.

✓ **NOTE**: Center post of battery is positive. Close the battery box lid.

- Turn the instrument range switch to X1000. Depress the BAT switch. The meter should deflect at or above the battery check position of the meter scale. If the meter does not respond, recheck to be certain that the batteries have proper polarity. Replace the batteries if needed.

- Expose the internal detector to a radiation check source. The speaker should click with the audio switch in the ON position.

- Utilizing the external detector, move the range switch to the lower scales until a meter reading is indicated. The toggle switch labeled F-S should have fast response in "F" position, slow response in "S" position.

- Press the RESET button. The meter should zero.

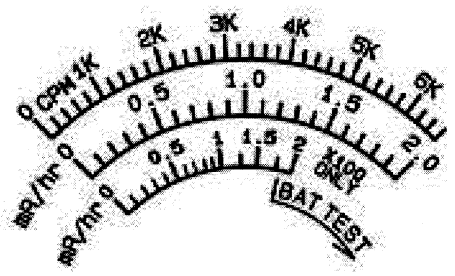
- Proceed to use the instrument.

✓ **NOTE**: To assure proper operation of the instrument between calibrations, an instrument operational check should be performed prior to each use. A reference reading with a check source should be obtained at the time of initial calibration or as soon as possible afterwards, for confirming correct operation. Confirm the proper reading on each scale.

If the instrument reading doesn't fall within ±20% of the proper reading, it should be sent in to a calibration facility for recalibration.

4.1 Reading the Meterface Dial

- After checking the battery response, turn the instrument selector switch to the highest range and if no readings are seen on the meter, turn the selector switch down to the lower scales until a reading is seen. The ranges on the instrument selector switch are *multipliers* for the meter readings. A typical dial is seen below:

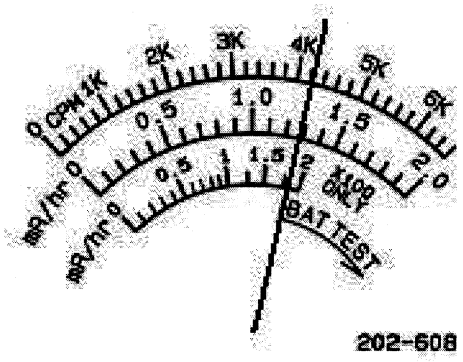


- This dial has three arcs; a counts per minute scale (CPM), a linear mR/hr scale, and a non-linear mR/hr scale for the X100 range only.

- The top CPM scale is valid for the X0.1, X1 and X10 ranges. The linear (middle) mR/hr scale is valid for the X0.1, X1, X10 and X1000 ranges. The non-linear mR/hr scale is valid for the X100 range only. This meterface is commonly referred to as a "combo" meterface, since it has both countrate (CPM) and exposure rate (mR/hr) arcs. Simpler meterfaces may have either just a countrate arc or just an exposure rate arc.

- A "combo" meterface is specifically designed for a particular detector. In the example above, the 1.0 mR/hr mark on the middle arc lines up with 3.3K CPM on the upper arc. This meterface is designed to work with a detector that gets 3.3K CPM per mR/hr, which is the Ludlum Model 44-9 pancake detector. Additional detectors may be used with this meterface, but only the CPM dial is valid. The mR/hr scale is not valid for these additional detectors.

- In the picture below, the needle is in the first tick mark past the 4K CPM mark. So, if the instrument selector switch is on the X0.1 range, the reading is 4.2 K CPM times X0.1 = 420 CPM.



The same needle indication on the other ranges would be:
X1 = 4.2 K CPM (or 4200 CPM)
X10 = 42 K CPM (or 42,000 CPM)
X100 = 420 K CPM (or 420,000 CPM)

If you are using the mR/hr scales then the readings would be:

X0.1 = 0.13 mR/hr
X1 = 1.3 mR/hr
X10 = 13 mR/hr
X100 = 130 mR/hr*

✓ **NOTE:** This reading is using the bottom (non-linear) scale.

There are many different dials available, but each can be used as described above.

5. CALIBRATION

5.1 Detector Operating Point

- Remove the instrument housing and adjust R8 for 900 volts (+15/-5 volts).

✓ **NOTE**: Measure High Voltage with a Model 500 pulser or a High Impedance voltmeter with a high meg probe. If one of these instruments is not available, use a voltmeter with a minimum of 1000 megohm input resistance.

5.2 Setting Overload

For calibration of new instruments:

- Adjust R3 fully clockwise.
- Connect P2 to external voltmeter.
- Set Range Selector Switch to X100.

WARNING
Open instrument has shock potential. Do not allow any conductive thing to touch internal parts.

- Expose internal detector to 2 R/hr. Record voltage.

- Proceed with the steps below.

For re-calibration only:

- Adjust R3 until unit shows overrange at 10 R/hr and no overrange at 4 R/hr. (Overrange is indicated by full-scale reading on X100 scale.)

- Expose internal detector to 1000 R/hr. Confirm full-scale on X100. Record voltage at P2.

- Replace the instrument housing.

5.3 Range Calibration

- Turn the instrument range multiplier switch to the appropriate range. Expose the detector to a calibrated gamma field and adjust the respective range potentiometer for proper reading.

- Repeat the above procedure for the other scales.

6. MAINTENANCE

Instrument maintenance consists of keeping the instrument clean and periodically checking the batteries and the calibration.

An instrument operational check should be performed prior to each use by exposing the detector to a known source and confirming the proper reading on each scale.

Recalibration should be accomplished after any maintenance or adjustment of any kind has been performed on the instrument. Battery replacements are not considered to be maintenance and do not normally require the instrument to be recalibrated.

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

The batteries should be removed and the battery contacts cleaned of any corrosion at least every three months. If the instrument has been exposed to a very damp or corrosive atmosphere, more frequent battery servicing should be used.

Use a spanner wrench to unscrew the battery contact insulators, exposing the internal contacts and battery springs. Removing the handle will facilitate access to these contacts.

NOTE

NEVER STORE THE INSTRUMENT OVER 30 DAYS WITHOUT REMOVING BATTERIES. ALTHOUGH THIS INSTRUMENT WILL OPERATE AT VERY HIGH AMBIENT TEMPERATURES, BATTERY SEAL FAILURE CAN OCCUR AT TEMPERATURES AS LOW AS 100° FAHRENHEIT.

NOTE

7. THEORY OF OPERATION

7.1 Input

The external detector pulses are coupled from the detector through C4 to amplifier U9/U15/Q2. CR1 protects the amplifier from input shorts. R40 couples the detector to the high voltage supply.

The internal detector (V1) is located on the HV Power Supply circuit board. V1 pulses are coupled through C6 to comparator U13 on the Main circuit board. R46 and R47 set the comparator level to approximately 0.5 volts. R9 on the HV Power Supply circuit board limits the detector current. With the Range Selector switch on X1K, U5B is closed, coupling high-range pulses to the counting circuitry.

The internal detector is used only when the range switch is in the X1K position. In the X0.1, X1, X10, and X100 ranges, the external detector is used. When the Range Selector switch is on the 1K position, Q4 is saturated, blocking external detector pulses.

7.2 Amplifier

A self-biased amplifier provides gain in proportion to R43/C11 divided by R41 for the external detector. Transistor (pin 3 of U9) provides amplification. Pin 2, 5 of U15 are coupled as a current mirror to provide a load for pin 3 of U9. The output self-biases to 2 Vbe (approximately 1.4 volts) at emitter of Q2. This provides just enough bias current through pin 2 of U9 to conduct all of the current from the current mirror.

Positive pulses from emitter of Q2 are coupled to the comparator U12.

7.3 Discriminator

Comparator U12 provides discrimination. The discriminator is set by the voltage divider, R9 and R25, coupled to pin 3 of U12. The comparator trip point is approximately 0.16 volts. U12 pulses are coupled to pin 5 of U7A for meter drive and pin 12 of U7B for audio.

7.4 Audio

Discriminator pulses are coupled to univibrator pin 12 of U7B. Front panel audio ON-OFF selector controls the reset at pin 13 of U7B. When ON, pulses from pin 10 of U7B turns on oscillator U17. Pin 5 of U17 drives the can-mounted unimorph. Speaker tone is set by R49, C20 duration by R48, C16.

7.5 Digital Analog Convertor

Pins 2/3/5 of U8 are coupled as a current mirror. For each pulse of current through R36, an equal current is delivered to C8. This charge is drained off by R38. The voltage across C8 is proportional to the incoming count rate.

7.6 Scale Ranging

Detector pulses from the discriminator are coupled to univibrator pin 5 of U7A. For each scale, the pulse width of pin 6 of U7A is increased by a factor of 10 with the actual pulse width being controlled by the front panel calibration controls and their related capacitors. This arrangement allows the same current to be delivered to C8 by one-tenth of a count on the X .1 range as 10 counts on X100 range.

7.7 Meter Drive

The meter is driven by the collector of Q1, coupled as a constant current source in conjunction with pin 1 of U10.

For Battery Test, U18A opens and U18B closes, and the meter movement is directly coupled to the battery through R31.

7.8 Fast/Slow Time Constant

For slow time constant, C7 is switched from the output of the meter drive to parallel C8.

7.9 Low Voltage Supply

Battery voltage is coupled to U16 and associated components (a switching regulator) to provide 5 volts at pin 8 to power all circuits.

7.10 High Voltage Supply

On the HV Power Supply circuit board, high voltage is developed by C1-T1 and rectified by voltage multiplier CR1–CR6. Output voltage increases as R8 is decreased.

High voltage is coupled back through R6 to pin 8 of U1. R7/R8 completes the high voltage circuit to ground. High voltage output is set by R8. During stable operation, the voltage at pin 8 of U1 will stabilize at approximately 1.2 volts.

7.11 Overload

The cathode of V1 is connected through R3 to ground. With R3 on the Main board fully clockwise and the instrument in a 2 R/hr radiation field, voltage at the cathode ranges from 0.2 to 0.4 volts, depending on exact High Voltage setting and the internal tube.

The cathode voltage is conducted from the HV Power Supply board through P1 to pin 4, U11 on the Main circuit board. Comparator U11 is biased at 0.22 volts. When pin 4, U11 exceeds 0.22 volts, U3B switch is closed, grounding R39, causing high current flow through R38 and causing the meter circuit to drive full-scale.

7.12 Low Battery Alarm

When the battery voltage drops to 2.2 volts, Pin 2 of U16 causes U5A switch to open, allowing Pin 3 of U17 to go high. The audio will make a continuous noise.

7.13 Switching

All switching, except Fast/Slow and audio On/Off, is accomplished with analog switches. Switch schematics are shown enabled, although typically, only one switch is enabled at any given time.

8. SAFETY CONSIDERATIONS & WARNING MARKINGS

✓ **NOTE: 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 3 is marked with the following warning symbols:**

CAUTION, RISK OF ELECTRIC SHOCK: (per ISO 3864, No.B.3.6) – designates a terminal (connector) that allows connection to a voltage exceeding 1 kV. Contact with the subject connector while the instrument is on or shortly after turning off may result in electric shock. Appears on front panel.

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. Appears on front panel. **Note the following precautions:**

WARNING! The operator is cautioned to take the following precautions to avoid contact with internal hazardous live parts that are accessible.

(1) Turn instrument OFF.

(2) Allow the instrument to sit for 1 minute before accessing internal components.

9. CLEANING THE INSTRUMENT

The Model 3 may be cleaned 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:

(1) Turn instrument OFF.

(2) Allow the instrument to sit for 1 minute before accessing internal components.

PARTS LIST

Ref. No.	Description	Part No.
	Model 14C Survey Meter	
UNIT	Completely Assembled M14C Survey Meter	48-1611
	Main Board, Drawing 464 X 86	
BOARD	Assembled Main	5464-086
	• **CAPACITORS**	
C1	047pF, 50V	04-5740
C2	100pF, 100V	04-5661
C3	100pF, 100V	04-5661
C4	100pF, 3kV	04-5735
C5	0.1µF, 35V-T	04-5755
C6	0.0047µF, 100V	04-5669
C7	47µF, 10V, DT	04-5666
C8	10µF, 25V	04-5655
C9	1µF, 16V	04-5701
C10	470pF, 100V	04-5668
C11	10pF, 100V	04-5673
C12	0.01µF, 50V	04-5664
C13-C14	0.001µF, 100V	04-5659
C15	100pF, 100V	04-5661
C16	0.022µF, 50V, DT	04-5667
C17	68µF, 10V	04-5654
C18	68µF, 10V	04-5654
C19	1µF, 16V	04-5701
C20	470pF, 100V	04-5668
C21	0.001µF, 2kV	04-5703
	• **TRANSISTORS**	
Q1	MMBT4403LT1	05-5842
Q2	MMBT3904LT1	05-5841
Q3	2N7002L	05-5840
Q4	MMBT3904LT1	05-5841
	• **INTEGRATED CIRCUITS**	
U1-U3	MAX4542ESA	06-6453
U5	MAX4543ESA	06-6596
U7	CD74HC4538M	06-6297
U8-U9	CMXT3904	05-5888
U10	LMC7111BIM5X	06-6410
U11	MAX985EUK-T	06-6459
U12-U13	MAX986EUK-T	06-6601
U15	CMXT3906	05-5890
U16	LT1304CS8-5	06-6434
U17	MIC1557BM5	06-6457
U18	MAX4543ESA	06-6596
	• **DIODES**	
CR1	CMPD2004S	07-6402
CR2	CMSH1-40M	07-6411
	• **SWITCHES**	
S1	CENTRAL-2P6P	08-6761
S2	7101SDCQE	08-6781
S3-S4	TP11LTCQE	08-6770
S5	7101SDCQE	08-6781
	• **RESISTORS**	
R1-R6	200K, 1/8W, 1%	12-7992
R7-R8	100K, 1/8W, 1%	12-7834
R9	68.1K, 1/8W, 1%	12-7881
R10-R13	100K, 1/8W, 1%	12-7834
R14	250K TRIMMER	09-6819
R15-R19	10K, 1/8W, 1%	12-7839
R20	100K, 1/8W, 1%	12-7834
R21	4.75K, 1/8W, 1%	12-7858
R22-R24	10K, 1/8W, 1%	12-7839
R25	2.21K, 7/8W, 1%	12-7835
R26	8.25K, 1/8W, 1%	12-7838
R27	250K TRIMMER	09-6819
R28	500K TRIMMER	09-6850
R29-R30	250K TRIMMER	09-6819
R31	2.37K,, 1/8W, 1%	12-7861
R32	2K, 1/8W, 1%	12-7926
R33	200 OHM, 1/8W, 1%	12-7846
R34	100K, 1/8W, 1%	12-7834
R35	1K, 1/4W, 1%	12-7832
R36	14.7K, 1/8W, 1%	12-7068
R37	68.1K, 1/8W, 1%	12-7881
R38-R39	200K, 1/8W, 1%	12-7992
R40	100K, 1/8W, 1%	12-7834
R41-R42	4.75K, 1/8W, 1%	12-7858
R43	165K, 1/8W, 1%	12-7877
R44-R45	1K, 1/8W, 1%	12-7832
R46	137K, 1/8W, 1%	12-7061
R47	14.7K, 1/8W, 1%	12-7068
R48	1MEG, 1/8W, 1%	12-7844
R49	475K, 1/8W, 1%	12-7859

M14C Survey meter
November 2004

Ref. No.	Description	Part No.
	• **INDUCTORS**	
L1	22µH	21-9808
	• **CONNECTORS**	
P1	640456-5 MTA100	13-8057
P2	640456-4 MTA100	13-8088
P3	640456-6 MTA100	13-8095
P4	640456-2 MTA100	13-8073
	• **MISCELLANEOUS**	
W1	HV WIRE	**
W1	EXT. DET. WIRE	**

HV Power Supply Board, Drawing 464 X 89

BOARD	Assembled HV Power Supply	5464-087
	• **CAPACITORS**	
C1	10µF, 25V	04-5655
C2-C5	0.001µF, 2kV	04-5703
C6	100pF, 3kV	04-5735
C7-C9	0.01µF, 500V	04-5696
C10-C12	0.01µF, 500V	04-5696
C13	68µF, 10V	04-5654
C14	0.1µF, 50V	04-5663
	• **INTEGRATED CIRCUITS**	
U1	LT1304CS8	06-6394
	• **DIODES**	
CR1-CR6	CMSD2004S	07-6417
CR7	CMSH1-40M	07-6411
	• **RESISTORS**	
R1	1.5MEG, 1/4W, 1%	12-7987
R2	100K, 1/8W, 1%	12-7834
R3	25K TRIMMER	09-6832
R4	1MEG, 1/4W, 1%	12-7844
R5	4.75K, 1/4W, 1%	12-7858
R6	500MEG, 3Kv, 2%	12-7031
R7	475K, 1/4W, 1%	12-7859
R8	1MEG TRIMMER	09-6778
R9	1MEG, 1/4W, 1%	12-7844

Ref. No.	Description	Part No.
	• **CONNECTORS**	
P5	640456-2 MTA100	13-8073
P6	640456-4 MTA100	13-8088
	• **TRANSFORMERS**	
T1	31032R	21-9925

Wiring Diagram, Drawing 464 X 175

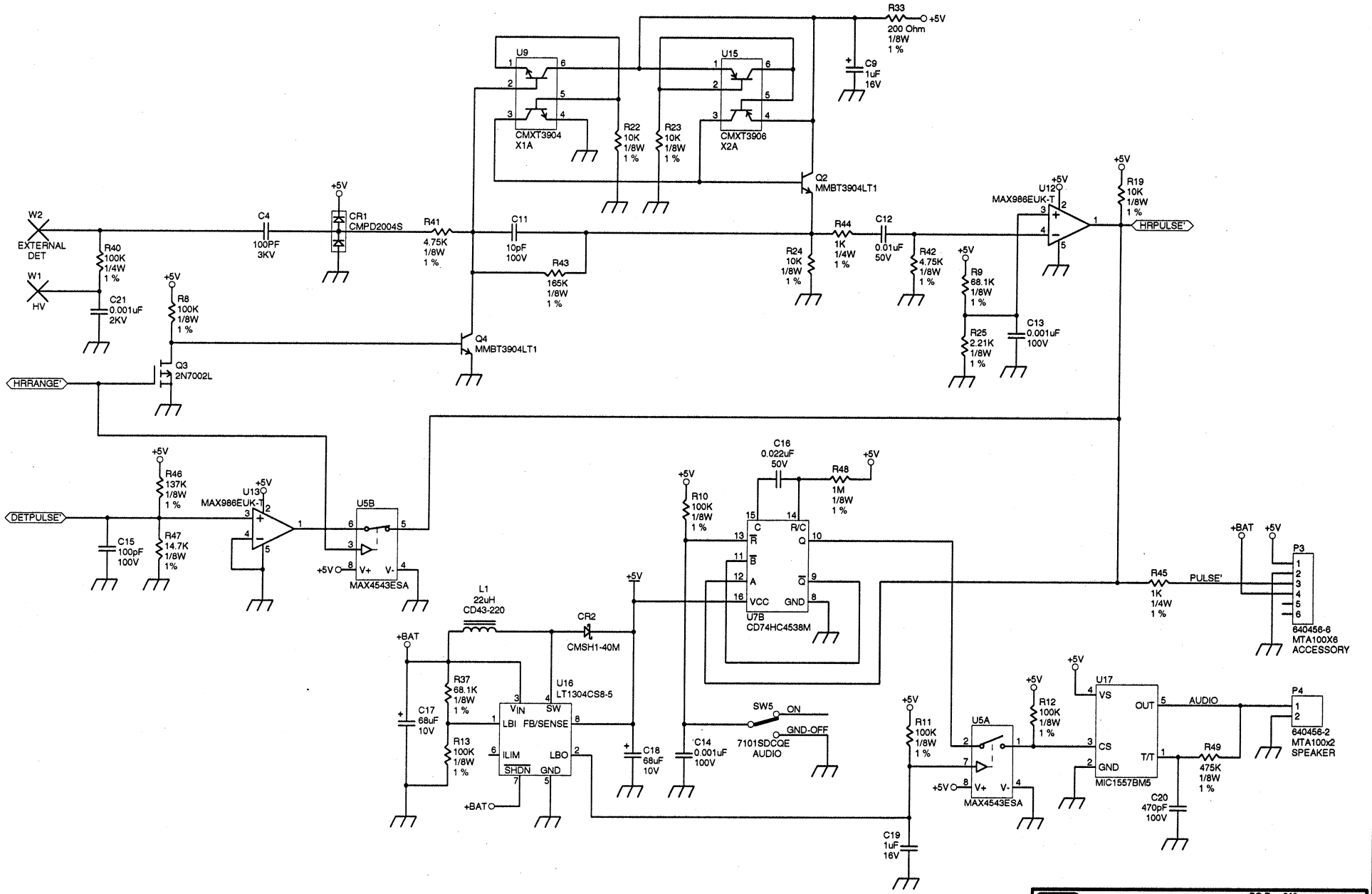
	• **AUDIO**	
DS1	UNIMORPH 60690	21-9251
	• **CONNECTORS**	
J1	640442-5 MTA100	13-8140
J2	640442-4 MTA100	13-8170
J3	640442-6 MTA100	13-8171
J4-J5	640442-2 MTA100	13-8178
J6	640442-4 MTA100	13-8170
	• **BATTERY**	
B1-B2	"D" DURACELL BATTERY	21-9313
	• **MISCELLANEOUS**	
FL2-FL4	WIRE	*******
W1	RECPT-UG706/U "C" LMI	4478-011
M1	METER MOVEMENT	15-8030
*	CABLE-C (STD 39")	40-1004
*	M14C BATTERY BOX LID W/LATCH SET	2363-191
*	BATT. CONTACT ASSY	2001-042
*	CALIBRATION COVER W/SCREWS	9363-200
*	BEZEL W/MOVEMENT ASSY	4363-572
*	PORT. BEZEL GLASS W/O SCREWS	4363-352
*	PORTABLE KNOB	08-6613
*	CAN ASSY O-RING	16-8261
*	LATCH KIT W/O BATTERY LID	4363-349
*	PORTABLE HANDLE (ROLLED) W/SCREWS	7363-139
*	PORTABLE HANDLE FOR CLIP W/SCREWS	7363-203

DRAWINGS

Main Circuit Board, Drawing 464 x 86 (3 Sheets)
Main Circuit Board Component Layout, Drawing 464 x 87 (2Sheets)

HV Power Supply Board, Drawing 464 x 89
HV Power Supply Board Component Layout, Drawing 464 x 90

Wiring Diagram, Drawing 464 x 175



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Design: DL	20-OCT-03	Model: M14C	
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14:06:37	11-Nov-2004	Rev: 7.0	
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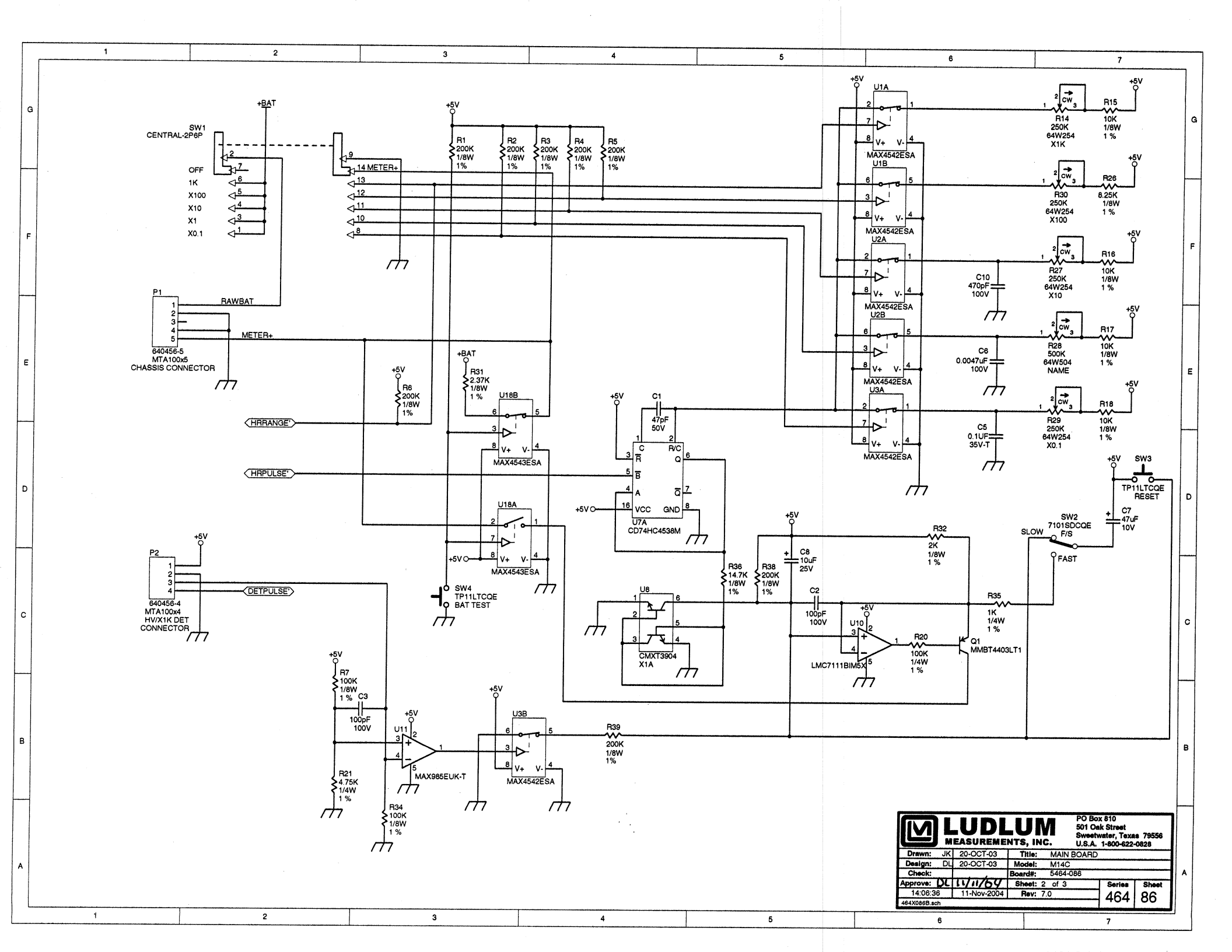

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Design: DL	20-OCT-03	Model: M14C	
Check:		Board#: 5464-086	
Approve: DL	11/11/04	Sheet: 2 of 3	Series 464 / Sheet 86
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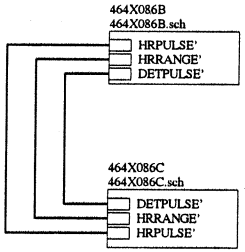
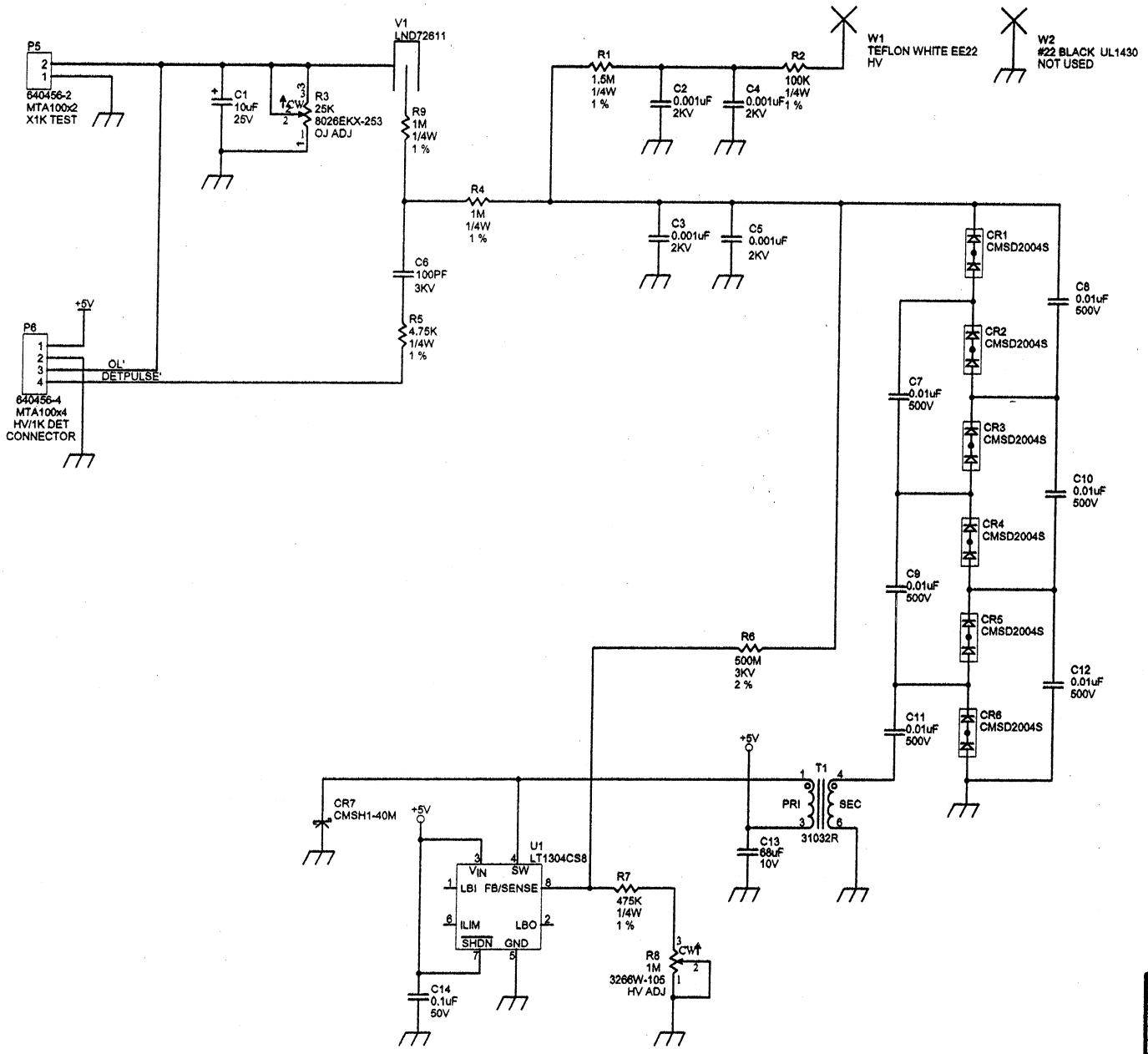


LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: JK	20-OCT-03	Title: MAIN BOARD	
Design: DL	20-OCT-03	Model: M14C	
Check:		Board#: 5464-086	
Approve: PL	11/11/04	Sheet: 1 of 3	Series 464 / Sheet 86
14:06:36	11-Nov-2004	Rev: 7.0	
464x086A.sch			



LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: JK	16-SEP-03	Title: HV POWER SUPPLY	
Design: DL	16-SEP-03	Model: M14C	
Check:		Board#: 5464-087	
Approve:	22-OCT-03	Sheet: 1 of 1	Series 464 / Sheet 89
13:43:15	22-Oct-2003	Rev: 8.0	
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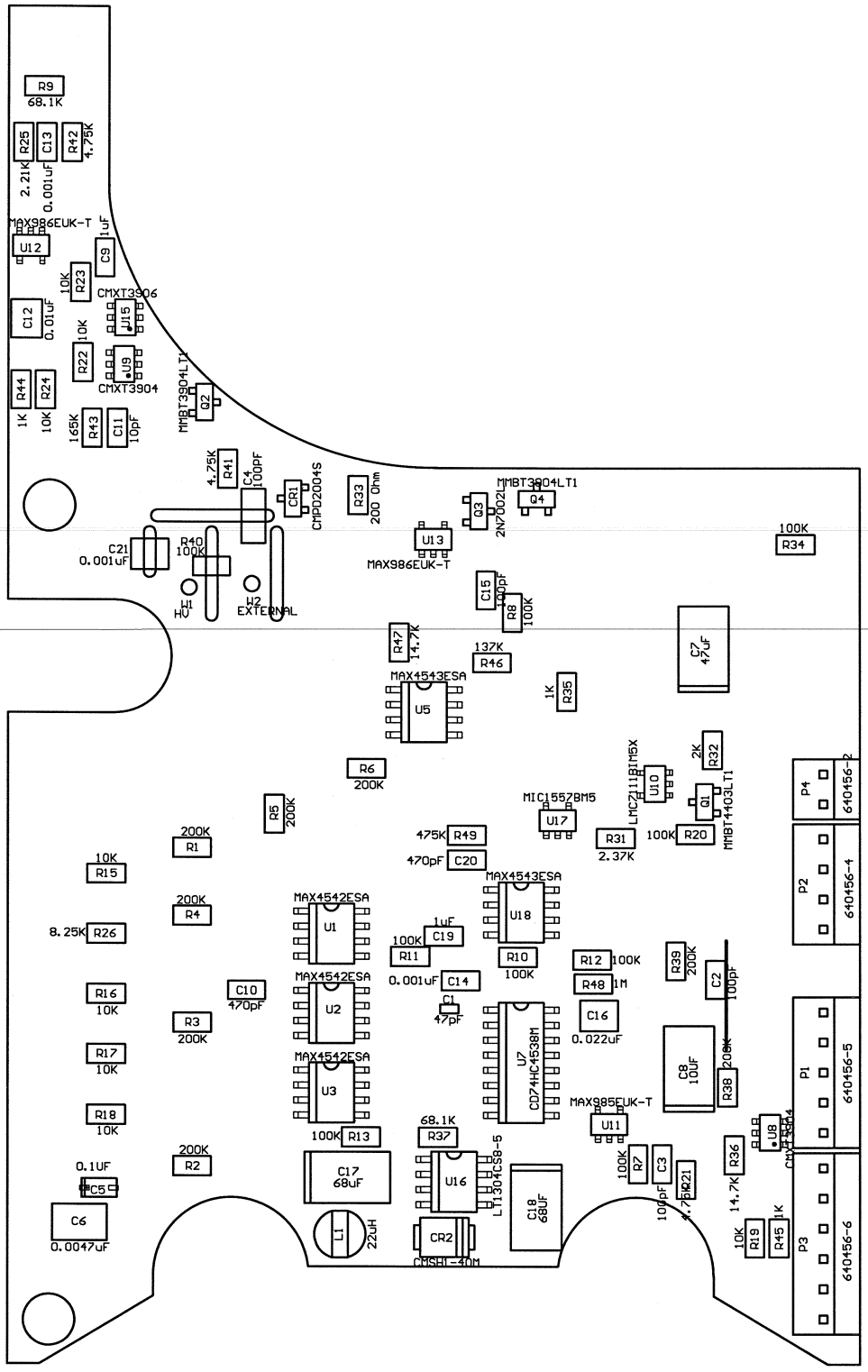
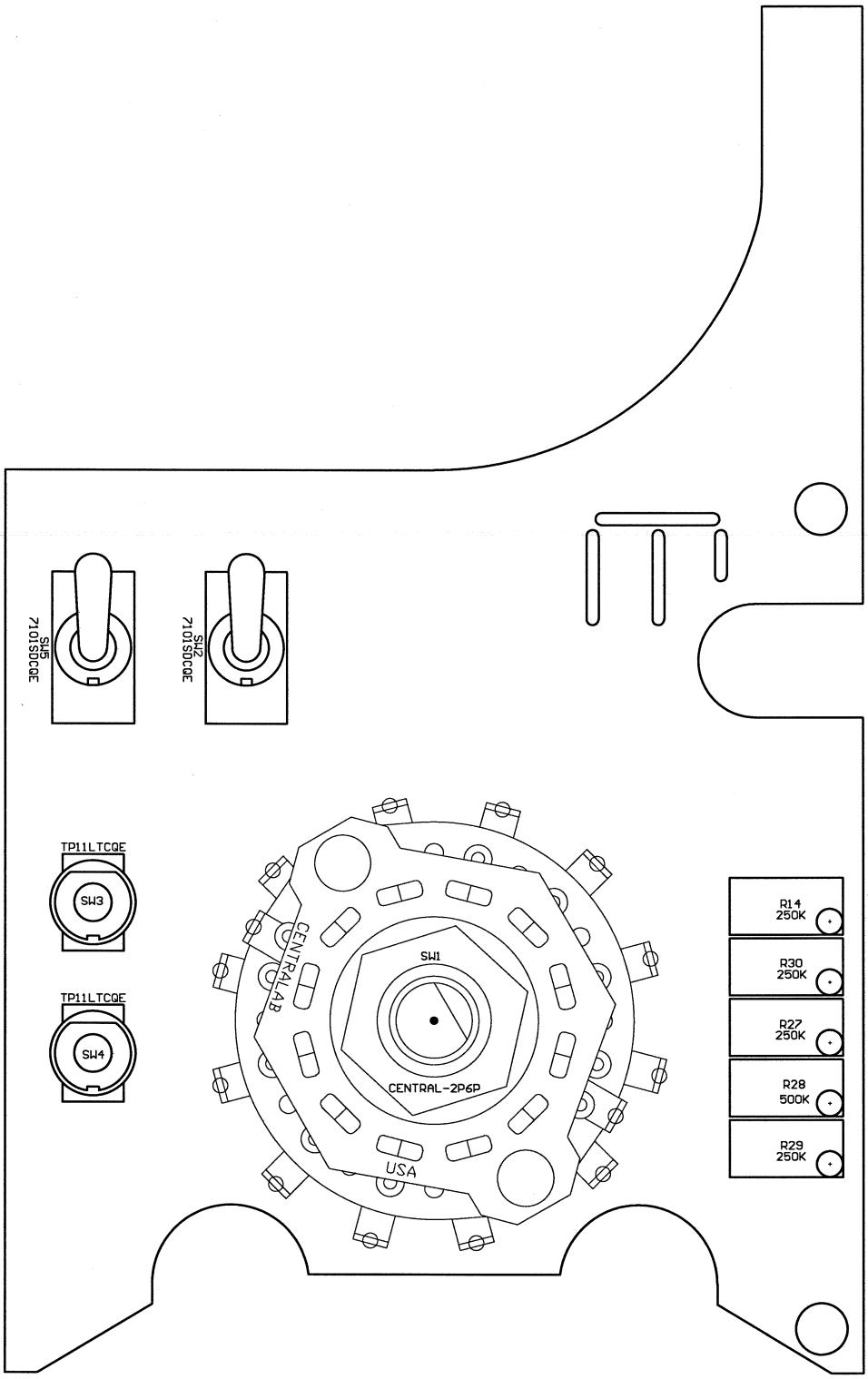
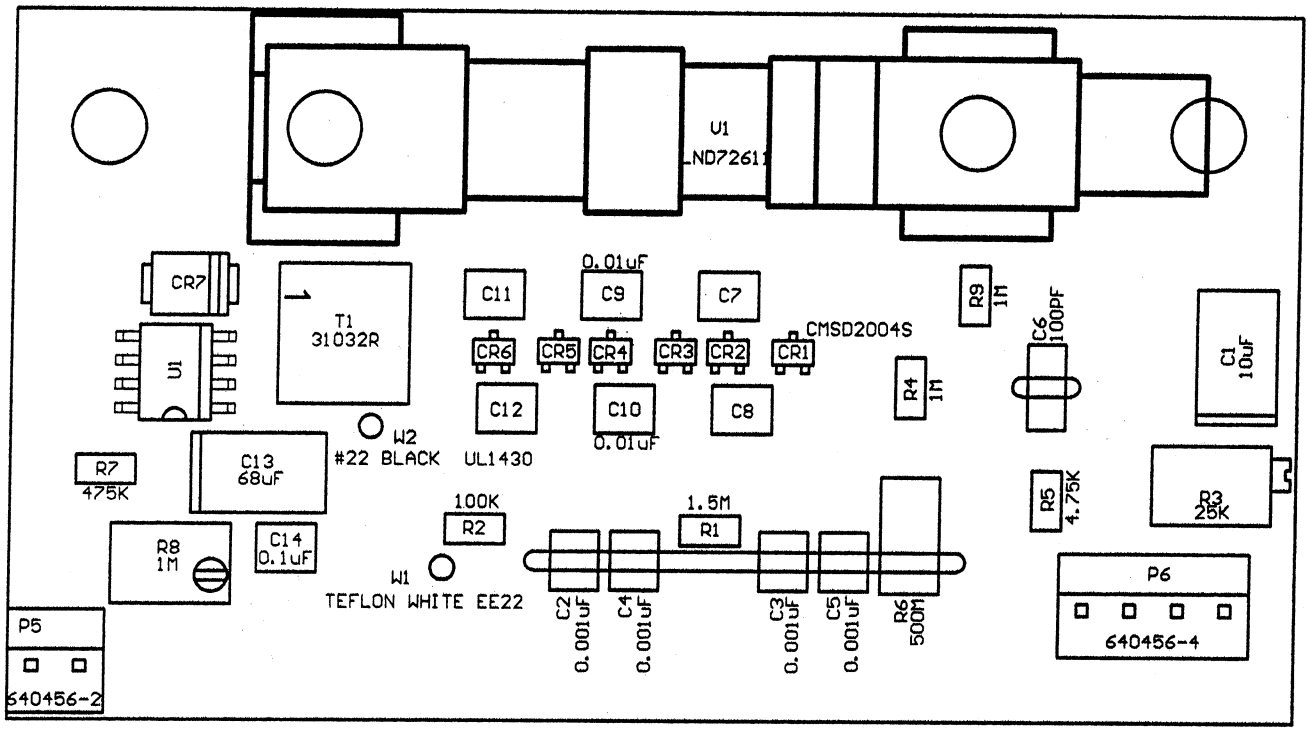


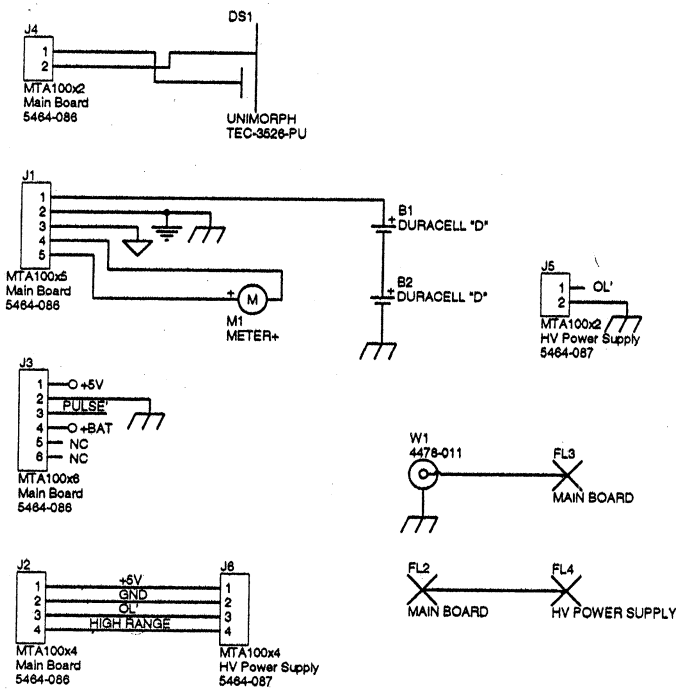
Drawn: JK	20-OCT-03	**Title:** MAIN BOARD			
Design: DL	20-OCT-03				
Check:		**Model:** M14C			
Approve:		**Board#:** 5464-086			
Layer:		**Rev:** 7.0	**Series** 464	**Sheet** 87	
	13:23:01 15-Nov-2004	**SCALE: 1.74**			



Drawn: JK	09–JUL–03	**Title:** MAIN BOARD			
Design: DL	09–JUL–03				
Check:		**Model:** M14C			
Approve:		**Board#:** 5464–086			
Layer:		**Rev:** 3.0	**Series** 464	**Sheet** 87	
	13:23:02 15–Nov–2004	**SCALE: 1.74**			



Drawn: JK	16-SEP-03	**Title:** HV POWER SUPPLY	
Design: DL	16-SEP-03		
Check:		**Model:** M14C	
Approve: DCL	22-OCT-03	**Board#:** 5464-087	
		Rev: 8.0	**Series** 464 / **Sheet** 90
		SCALE: 2.45	



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Drawn: KKH	13-SEP-03	Title: WIRING DIAGRAM	
Design: PW	07-AUG0-2	Model: 14C	
		Board#: 464-172	
Approved:		Sheet: 1 of 1	Series 464 / Sheet 175
13:52:41	31-Oct-2003	Rev: 1.0	
464X175			