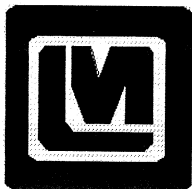
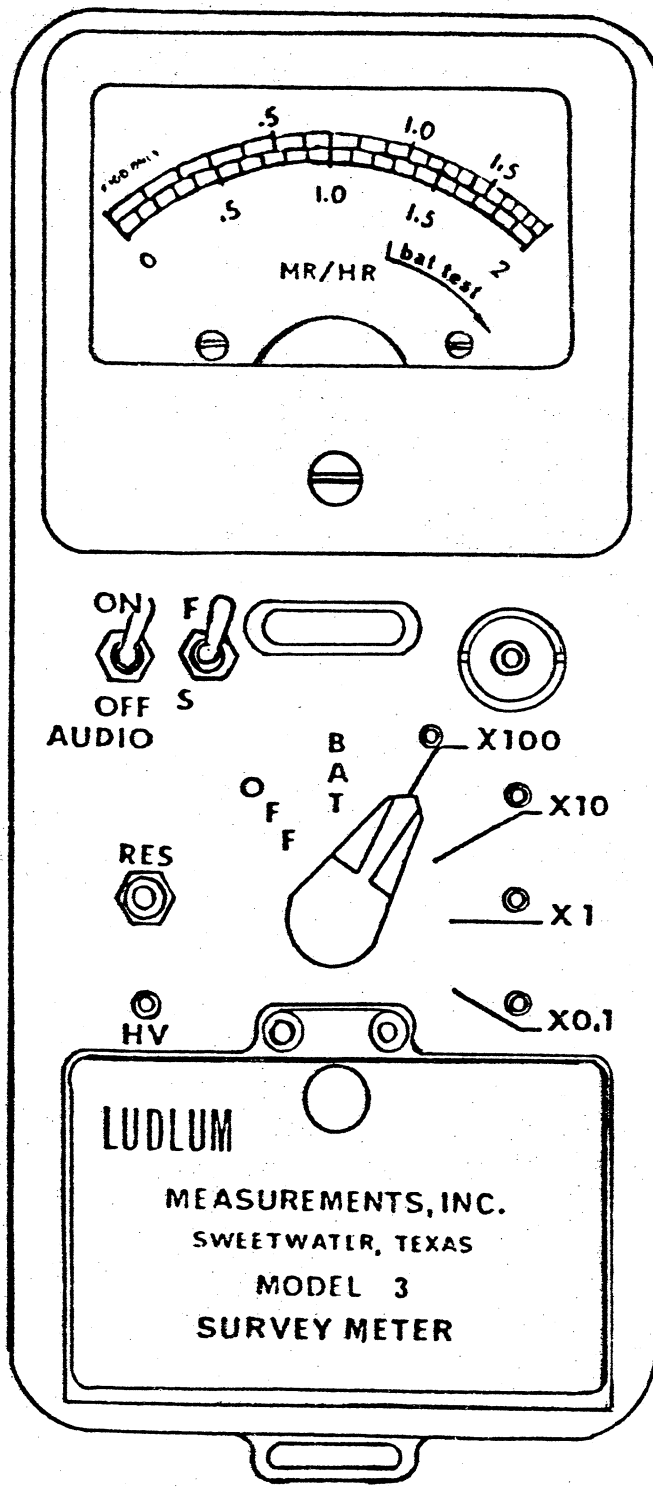


LUDLUM MODEL 3
SURVEY METER
SN 21227 AND SUCCEEDING
SERIAL NUMBERS
MARCH 11, 1982



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



LUDLUM MODEL 3 SURVEY METER

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LUDLUM MODEL 3 SURVEY METER

1. GENERAL

The Model 3 is a portable survey instrument that operates on two standard "D" cell flashlight batteries. The instrument features a regulated high-voltage, power supply adjustable from 400 to 1500 volts and provides a 4-linear range from 0-200 mR/Hr.

The unit body is made of cast aluminum, including the meter housing. The can is 1/16 aluminum. Other operating features of the instrument include a unimorph speaker mounted to the instrument can with an audio ON-OFF capability, fast-slow meter response, meter reset button and a 6-position switch for selecting battery check or scale multiples of X0.1, X1, X10 and X100. Each range multiplier has its own calibration potentiometer.

Any G-M probe offered by the company will operate on this unit as well as many of the scintillator-type detectors. The instrument is set for 900-volt, G-M tube operation. For special requirements, it may be adjusted for operation with any G-M or scintillator tube between 400 and 1500 volts.

The unit is operated with two flashlight batteries for operation from 150° to approximately 32°F. For temperature operation to 0°F, either very fresh alkaline batteries or rechargeable NiCd batteries may be used. Battery drain averages 30 milliamperes.

2. SPECIFICATIONS

POWER: two standard "D" size batteries

FOUR LINEAR RANGES: from 0 to 200 mR/Hr; meter scale presentation - 0 to 2 mR/Hr with range multiples of X0.1, X1, X10, X100; 0 to 5K Counts per Minute option

SENSITIVITY: 40 millivolts, (+20mV, -16mV)

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

HIGH VOLTAGE: externally adjustable from 400 to 1500 volts

RESPONSE: 5 or 25 seconds for 90% of final meter reading

LINEARITY: plus or minus 5% full scale

LUDLUM MODEL 3 SURVEY METER

CALIBRATION STABILITY: less than 15% variance to battery end point

METER: 50 Micro-amp, 2 1/2-inch scale, with pivot-and-jewel suspension

CONNECTOR: Series "C", 706 U/G; BNC or MHV may also be provided

SIZE: 3.4 x 3.5 x 7.0 inches (H x W x L exclusive of handle)

WEIGHT: 3.5 pounds less detector

FINISH: drawn-and-cast aluminum, with computer-beige polyurethane enamel and silk-screened nomenclature.

3. DESCRIPTION OF CONTROLS AND FUNCTIONS

Range Multiplier Selector Switch is a 6-position switch marked OFF, BAT, X100, X10, X1, X0.1. Turning the range selector switch from OFF to BAT position provides operator a battery check of the instrument. A BAT check scale on the meter provides a visual means of checking the battery status. Moving the range selector switch to one of the range multiplier positions (X0.1, X1, X10, X100) provides the operator with an overall range of 0-200 mR/Hr (0-500K if the CPM scale is installed). Multiply the scale reading by the multiplier for determining the actual reading.

AUDIO ON-OFF Toggle Switch in the ON position operates 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 is, 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 "F" position of the toggle switch provides 90% of the final meter reading in 5 seconds. In "S" position, 90% of the final meter reading takes 11 seconds. In "F" position there is fast response and large meter deviation. In "S" position there is a slow response and damped meter deviation.

RES Button, when depressed, provides a rapid means to drive the meter to zero.

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High Voltage Adjustment provides a means to vary the high voltage from 400 to 1500 volts. The high voltage setting may be checked at the connector with an appropriate voltmeter.

Range Calibration Adjustments are recessed potentiometers located on line with each multiplier position. These adjustment controls allow individual calibration for each range multiplier.

4. OPERATING PROCEDURES

- 4.1 Slide the battery box button to the rear. 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 flashlight battery is positive.

DO NOT TWIST LID BUTTON - It slides to rear.

Close the battery box lid.

- 4.2 Switch the range switch to BAT. The meter should deflect to the battery check portion of the meter scale. If the meter does not respond, recheck that the batteries have proper polarity.
- 4.3 Connect the cable to the instrument and detector.
- 4.4 Turn the instrument range switch to X100. Expose the detector to a check source. The speaker should click with the AUDIO ON-OFF switched to ON.
- 4.5 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" and slow response in "S".
- 4.6 Depress the RES switch. The meter should zero.
- 4.7 Proceed to use the instrument.

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5. CALIBRATION

- 5.1 Detector Operating Point: Adjust the HV control for 900 volts at the instrument connector for G-M detectors.

NOTE: If an electrostatic voltmeter is not available, use an ordinary volt-ohm-milliammeter with an attenuator to provide at least 20,000 ohms-per-volt meter resistance. Select the appropriate scale and then adjust high voltage to read 850 volts.

Do not use a vacuum-tube-type voltmeter for this adjustment unless an external high voltage multiplier probe is used.

Turn the instrument to X100. Expose the instrument to a calibrated gamma field and vary the range calibration adjustment control for proper reading.

- 5.2 Special Use Calibration: For special G-M detector applications, the power supply may be adjusted for 450-volt and 1200-volt G-M tubes. Follow the above procedure, only set the supply at the new operating voltage.

For scintillation counters, connect the scintillator. Expose the unit to a source and develop an operating voltage versus count-rate plot. Set the operating voltage at the flattest portion of this curve; then proceed to adjust each calibration control for the desired meter reading.

- 5.3 Calibrating CPM Scale: To calibrate the CPM scale, a precision pulse generator is required. The pulse generator should be capable of providing a 40-millivolt, or greater, negative pulse with a rise time of 1 microsecond and a pulse width of 5 microseconds.

Connect the pulse generator to the instrument and adjust the pulse frequency to provide a 4/5-scale deflection on the X100 range (400,000 CPM). Adjust the X100 range calibration potentiometer as required. Decrease the pulse frequency by decades and adjust each range calibration potentiometer accordingly.

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6. MAINTENANCE

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 DEGREES FAHRENHEIT. NEGLECTED BATTERY SEAL FAILURE WILL SURELY CAUSE ONE AWFUL MESS!

Instrument maintenance consists of keeping the instrument clean and periodically checking batteries and calibration. Once initial calibration is performed, recalibration should not be required if batteries are maintained in good condition.

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

Under certain conditions, NRC requires instrument recalibration every three months. Check the appropriate regulations to determine recalibration schedule.

Also at three month intervals, the batteries should be removed and the battery contacts cleaned of any corrosion. If the instrument has been exposed to very dusty or corrosive atmosphere, more frequent battery servicing should be used.

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

LUDLUM MODEL 3 SURVEY METER

BILL OF MATERIALS

CIRCUIT BOARD, DRAWING 176 X 17

CAPACITORS

C1	100PF, 3KV, C	04-5532
C2	.01MF, 50V, C	04-5523
C3	500PF, 500V, C	04-5555
C4	.0047MF, 100V, P	04-5513
C5	.01MF, 50V, C	04-5523
C6	10MF, 20V, OST	04-5507
C7-C8	100MF, 10V, DST	04-5576
C9	4.7MF, 10V, OST	04-5578
C10	.1MF, 10V, C	04-5521
C11	4.7MF, 10V, OST	04-5578
C12	22MF, 20V, T	04-5579
C13	.01MF, 50V, C	04-5523
C14	.1MF, 10V, C	04-5521
C15	100MF, 10V, OST	04-5576
C16	1MF, 35V, OST	04-5575
C17	.1MF, 10V, C	04-5521
C18	100PF, 3KV, OST	04-5532
C19	.005MF, 2KV, C	04-5520
C20	.001MF, 3KV, C	04-5518
C21-C23	.001MF, 1KV, C	04-5519
C24	.01MF, 50V, C	04-5523
C25	500PF, 500V, C	04-5555

TRANSISTORS

Q1-Q2	2N2713	05-5755
Q3	MPSU01	05-5778
Q4	MPS6534	05-5763
Q5-Q6	2N3877	05-5758
Q7	MPS6534	05-5763

INTEGRATED CIRCUITS

U1	CA3096	06-6023
U2	CD4093	06-6030
U3	CD4098	06-6066
U4	CA3096	06-6023
U5-U6	LM358	06-6024

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DIODES

CR1	1N34A	07-6253
CR2-CR5	1N4007	07-6274
CR6	1N456	07-6254
CR7	1N4148	07-6272
CR8	1N456	07-6254
CR9-CR10	1N4148	07-6272
CR11	LM385	05-5808

RESISTORS

R1	22K	10-7070
R2	2.7M	10-7029
R3	10K	10-7016
R4	470K	10-7026
R5	1 MEG	10-7028
R6	12K	10-7048
R7	SAT @ 820K	10-7060
R8	1 MEG	10-7028
R9	3.3K	10-7013
R10	560K	10-7027
R11	100K	10-7023
R12	10K	10-7016
R13	1 MEG	10-7028
R14	2.7 MEG	10-7029
R15	82K	10-7022
R17	33K	10-7019
R20	1.5K	10-7065
R21	8.2K	10-7015
R22	82K	10-7022
R23	100K	10-7023
R28	SAT	
R29	330 OHM	10-7053
R30	470K	10-7026
R31	75K	10-7074
R32	10K	10-7016
R33	15K	10-7017
R34	100K 1%	12-7557
R35	16.5K 1%	12-7541
R36	10K	10-7016
R37	1.5K	10-7065
R38	200 OHM	10-7006
R39	10 MEG	10-7031
R40	1 MEG	10-7028
R41	SAT	
R51	75K	10-7074
R52	1 GIG OHM	12-7686

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R58 4.7K 10-7014

TRANSFORMERS

T1 L8050 40-0902
T2 LVPS 40-0944

MISCELLANEOUS

7 EACH CLOVERLEAF RECEPTACLES 011-6809 18-8771
1 EACH WALDON 16-06-0007 SMALL RECEPTACLE 18-8792
1 EACH WALDON 16-06-0004 LARGE PIN 18-8795

ASSEMBLED CIRCUIT BOARD 5176-017-00

LU DLUM MODEL 3 SURVEY METER

BILL OF MATERIALS

CHASSIS WIRING DIAGRAM, DRAWING NO. 176 X 18

AUDIO

PART NO.

DS1 UNIMORPH 60690 21-9251

CONNECTOR

P1 SERIES "C" UG 706/U 13-7751

SWITCHES

S1 CENTRALAB PA600-210 08-6501
S2 RESPONSE F/S MST 105-D 08-6511
S3 AUDIO ON-OFF MST 105-D 08-6511
S4 RESET 30-1 P/B 08-6517

POTENTIOMETERS

R42 5M LOCK POTENTIOMETER 09-6783
R43 500K LOCK POTENTIOMETER 09-6782
R44 50K LOCK POTENTIOMETER 09-6773
R45 100K LOCK POTENTIOMETER 09-6785
R46 5M LOCK POTENTIOMETER 09-6783

BATTERY

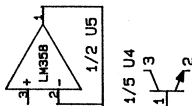
BT1-BT2 "D" DURACELL BATTERY 21-9313

MISCELLANEOUS

MODEL 3 CASTING 7062-053-01
MODEL 3 HARNESS 8176-020-00
PORTABLE HANDLE 7001-012-01
PORTABLE METER 40-1801
MODEL 3 BATTERY BOX LID 7203-006-01
MODEL 295 BATTERY CONTACT SET 40-1707
PORTABLE KNOB 08-6613

NO.	DEVICE	POWER CONNECTIONS		
		10-20V	+5V	GND
U1	CA3096			15
U2	CD4093		14	7
U3	CD4096		16	8
U4	CA3096		8	16
U5	LM358		8	4
U6	LM358		8	4

UNUSED CONNECTIONS



DESC: CIRCUIT BOARD SCHEMATIC
 MODEL: MODEL 3
 PART #: 5176-017-00
 DMN: VR DATE: 10/17/83
 DSGN: DATE:

*R7 WAS SAT AT B20K
 5/22/84

*R1 FOR 10mV INPUT SENSITIVITY:
 R1 = 10K
 R6 = 24K

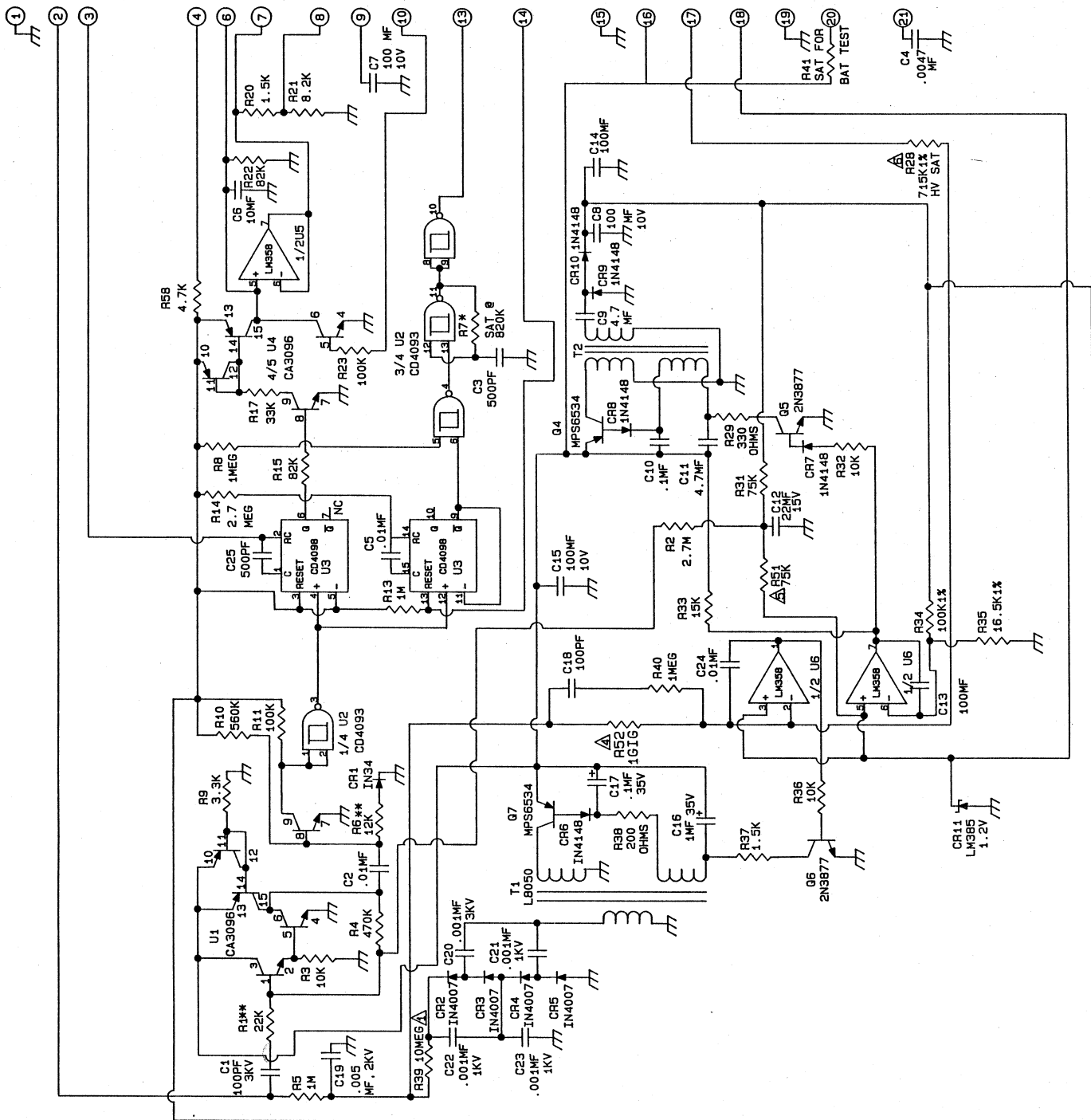
CHG#	ALTERATIONS	DATE	BY
1	R39 WAS 1 MEG PER LARRY	1/14/85	IRS
2	R25 WAS 330P PER JACK	4/23/85	GT
3	C4 WAS .01 100VP PER JACK	4/23/85	GT
4	R52 WAS .8M 500M	5/13/86	IDS
5	R51 ADDED	5/13/86	IDS
6	R28 WAS 374K 1%	5/13/86	IDS

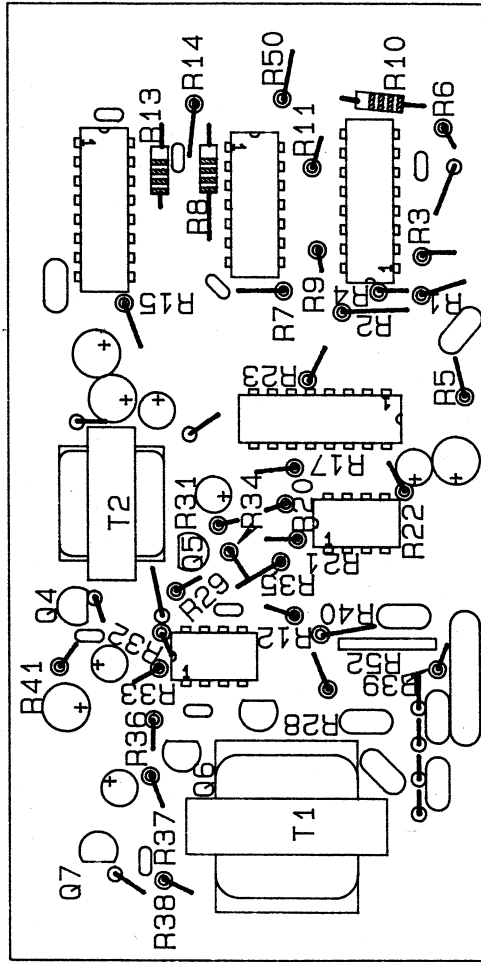
***FOR MODEL 3-6 ONLY

R6 = 24K
 C4 = 0.047MF
 C25 = .001MF

CHG NO.	DMN	CHK	APP
7-9-86			
DATE	DATE	DATE	DATE
7-9-86			
VR			
TOL: SHOP STD			
OTHER			
SCALE: FULL			
OTHER			

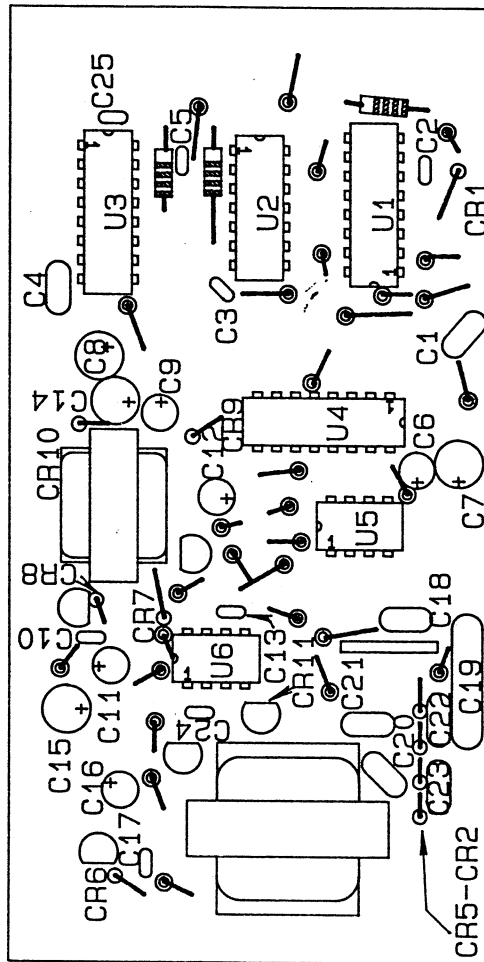
TITLE MODEL 3 CIRCUIT BOARD





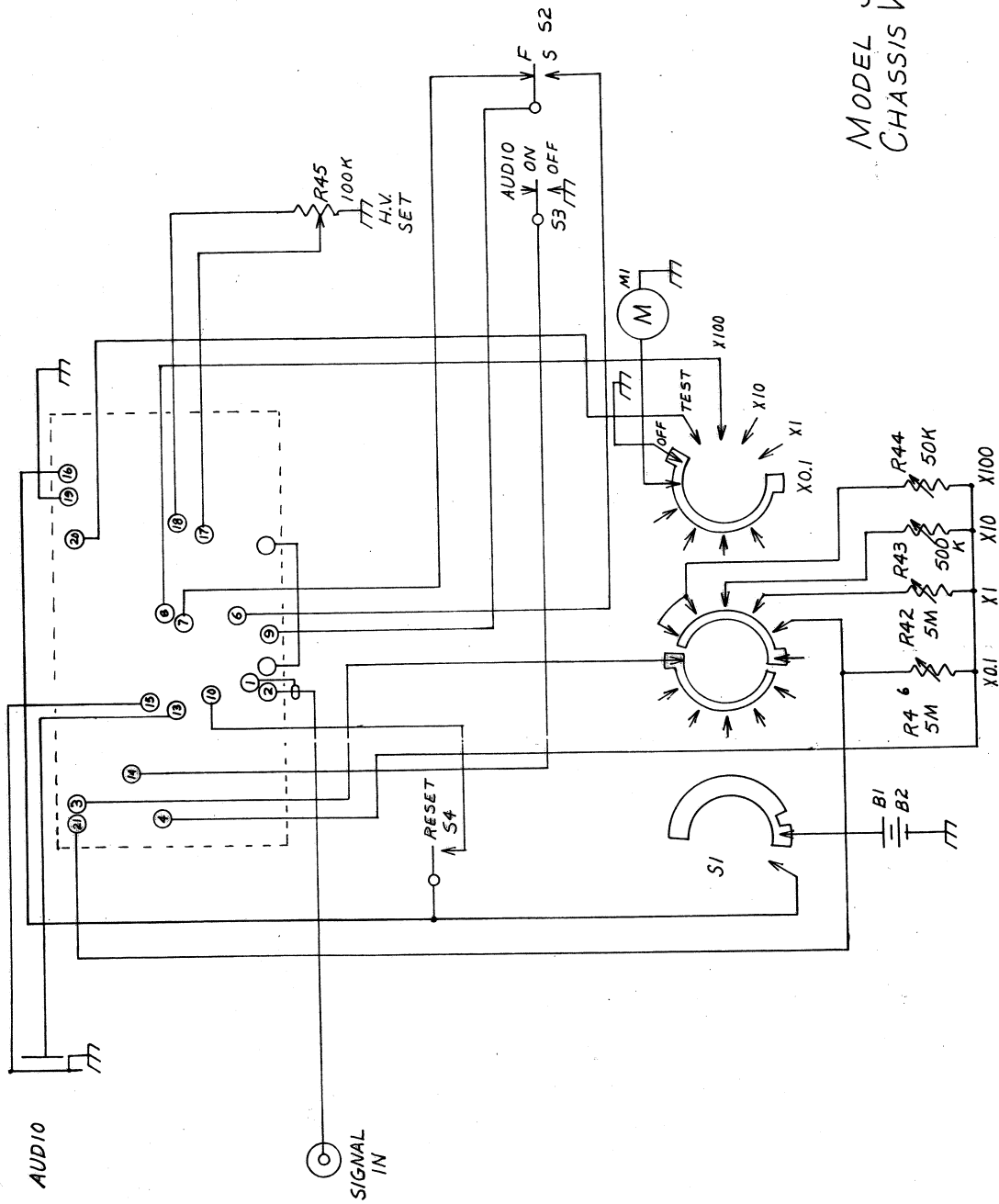
DESC: CIRCUIT BOARD.	
BOARD #: 5176-017	
DWN: S.L.C.	DATE: 10-23-86
DSGN:	DATE:

CHG NO.	DWN	CHK	APP
DWN DATE	CHK DATE	APP DATE	
10-21-86			
TOL: SHOP STD	SCALE: FULL	OTHER	OTHER
TITLE: M3 GEIGER COUNTER			SHEET
LUDLUM MEASUREMENTS, INC. SERIES			52
901 OAK STREET, BRECKENRIDGE, TEXAS 76606			176



DESC: CIRCUIT BOARD.
 BOARD #: 5176-017
 DWN: S.L.C. DATE: 10-23-86
 DSGN: DATE:

CHG NO.	DWN	CHK	APP
DATE	CHK	DATE	APP
10-21-86			
TOL: SHOP STD	<input type="checkbox"/>	SCALE: FULL	<input type="checkbox"/>
OTHER	<input type="checkbox"/>	OTHER	<input type="checkbox"/>
TITLE: M3 GEIGER COUNTER			
LUCAS INSTRUMENTS, INC.			SHEET
5400 N. ALIQUA			176
DALLAS, TEXAS 75248			51



MODEL 3
CHASSIS WIRING