LUDLUM MODEL 19
MICRO R METER
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LUDLUM MODEL 19 MICRO R METER

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MODEL 19 MICRO R METER

I. INTRODUCTION

The Ludlum Model 19 Micro R Meter utilizes an internally mounted 1"x1" NaI(Tl) scintillator to offer an optimum performance in counting low level gamma radiation. Designed to be moisture and dust resistant, conveniences are not overlooked as the unit features a push button lighted meter.

Five range divisions are provided to select the most desirable range in the 0-5000 micro R/Hr spectrum. The meter face is made up of two scales 0-50 and 0-25, plus battery test. The 0-50 scale corresponds to the 50, 500 and 5000 positions on the range selector switch. The 0-25 scale corresponds to the 25 and 250 positions on the range selector switch.

The instrument is capable of using either the standard carbon zinc battery or the nickel cadmium rechargeable battery. However, the Model 19 does not include circuitry for recharging the batteries. The BAT TEST scale is marked to indicate BATT OK.

All controls, including a calibration potentiometer for each range, are located on the front panel. Two "D" cell batteries are located in an isolated compartment, and easily changed from the front panel. The meter is housed in a rugged, two piece aluminum bezel with water proof seals.

1.1 SPECIFICATIONS

Linearity: Plus or minus 5% of full scale.

Input Impedance: 0.1 Megohm

High Voltage: Variable from 400 to 1500 volts DC electronically regulated to within -1%

Calibration Stability: Less than 15% variance to battery end point.

Battery: Exceeds 100 hours when using standard flashlight "D" cells. RM-42R Mercury cells or nickel cadmium cells are directly interchangeable.

Audio Output: Unit is furnished with built-in unimorph speaker, ON-OFF switch provided on front panel.

Battery Complement: Two standard size "D" cell batteries, secured with screws and a gasket for dust and moisture proofing.

Counting Ranges: Two scale meter face presenting 0-50 Micro R/Hr with full scale range positions of X5000, X500, and X50; and, 0-25 Micro R/Hr with range selections of X250 and X25.

1.1 SPECIFICATIONS, cont'd

Meter: 50 micro-amp, 2 1/2" scale

Detector: An RCA 6199 coupled to a 1" x 1" NaI(Tl) mounted inside the instrument housing.

Finish: Instrument housing is of drawn and cast aluminum fabrication with brown epoxy paint and silk screened nomenclature. Switches are rubber booted.

Size: 6.4 x 3.5 x 7.0 inches (H x W x L exclusive of handle).

Weight: 4.5 lbs.

1.2 DESCRIPTION OF CONTROLS AND FUNCTIONS

OFF-RANGE SELECTOR SWITCH: A six position switch for turning the instrument OFF or selecting one of 5 counting ranges.

AUDIO ON-OFF TOGGLE SWITCH: The audio ON-OFF only controls the audio speaker output.

FAST-SLOW TOGGLE SWITCH: Selects reaction time of meter. In "F" position, 90% scale deflection requires 3 seconds. In "S" position, 11 seconds is required.

BATTERY PUSH BUTTON SWITCH: When range selector is out of the OFF position,depressing the BAT switch indicates battery charge status on the meter.

RESET: Push button switch provides a rapid means to reset meter from an overscale meter deflection. Depressing the "RES" button causes the needle to return to zero position.

LIGHT PUSH BUTTON SWITCH: Depressing "L" button lights the meter face.

HIGH VOLTAGE SCREW DRIVER ADJUST: Adjusts the high voltage from 400 to 1500 volts.

RANGE CALIBRATION SCREW DRIVER ADJUSTS (5): Provides means to calibrate each range.

2. OPERATING PROCEDURES

The Model 19 is a simple instrument to operate. All controls and adjustments are located on the front panel along with the battery compartment. The 1"xl" NaI(Tl) Scintillator is mounted internally deleting external cords or cables.

2.1 PRIOR TO TURN-ON

1. Check batteries - type installed and no corrosion

2. Audio ON-Off switch - as desired.

3. Meter response switch - as desired.

2.2 TURN-ON

1. Range Selector Switch - Select 0-5000 range

2. BAT TEST Button - dpressed
   Check BAT test on appropriate scale. Replace batteries if meter pointer is below the battery OK line.

3. Light Button -depressed. Check for light on meter face.

4. Meter Response Switch - Check "F" and "S" positions.

5. Audio On-Off Switch - Check for audio indication.

6. Check instrument for proper scale indication with known source. Check all ranges for appropriate scale indication.

7. Reset Button - Depressed. Check meter pointer returns to zero position.

8. Instrument ready for monitoring.

3. CALIBRATION

The Model 19 radiation response is energy sensitive. The detector plateau characteristic must be determined for the anticipated radiation field.

3.1 CALIBRATION EXAMPLE

1. Remove instrument from case.

2. With instrument off - remove H. V. jumper at C19-R5 junction.

3. Connect pulser to C1-R5 junction.
   a. Set pulse height at 80 millivolts, negative.
   b. Calibrate scales as follows:

Scale	Reading	Pulses/Minute
25	20	3,200
50	40	6,400
250	200	32,000
500	400	64,000
5,000	4,000	640,000

3.1 CALIBRATION EXAMPLE, cont'd

4. Connect jumber back to C19-R5 junction.

5. With background radiation, plateau meter reading vs. H. V. from 500 to 1,400 volts.

   a. Voltmeter must have 120 megohm or greater input resistance.
   b. Instrument must be returned to case for each reading. The detector is not light tight ouside case. (Typical natural background is in the range of 10 to 30 micro R/Hr.

6. Determine the plateau center voltage. Set operating point above the center voltage.

7. Take the Model 19 to a certified calibration range. Calibrate each scale for best fit at 1/5 and 4/5 scale. If reading error exceeds 10% of reading, record field vs. meter reading at 5 points on scale.

Fix a copy of this meter correction an instrument case.

8. If calibration range background is too high for the micro R scales, calibrate 5000 scale as in Step 7. Remove instrument from case. Remove H. V. jumper. Connect pulser and determine pulse rate vs. Micro R-Hour on X5000 scale. Calibrate lower scales with pulse.

4. MAINTENANCE

Instrument maintenance consists of keeping the instrument clean, periodic battery and calibration maintenance.

An instrument calibration check should be performed as required to keep the instrument in proper working order. Normally recalibration should not be required if the batteries are maintained in good condition.

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 insulation, exposing the internal contacts and battery spring. Removing the handle will facilitate access to these contacts.

NOTE: Never store instrument over 30 days without removing batteries. Although the instrument will operate at very high ambient temperatures, battery seal failure can occur at temperatures as low as 100°F. Neglected battery seal failure can cause excessive corrosion and render the instrument inoperative.

MODEL 19 MICRO R METER

GENERAL SCHEMATIC — Drawing No. 120X5

RESISTORS - All 1/4 Watt

			Part No.
R42	5 Meg	WA2L040S - 505MC	6783
R43	1 Meg	WA2L040S - 105MC	6784
R44	500K	WA2L040S - 504UC	6782
R45	100K	WA2L040S - 104UC	6785
R46	5 Meg	WA2L040S - 505MC	6783
R47	50K	Lock-W-503UC	6773

MISCELLANEOUS

S1	PA600-210	6501
S2	ALCO MST 105-D	6511
S3	ALCO MST 105-D	6511
S4	Grayhill 30-1 P/B	6517
LAMP	Grayhill 30-1 P/B	6517
BAT	923 P/B Switchcraft	6518
DETECTOR	RCA6199	5001
METER	Beede	1801
AUDIO	Unimorph PN60690	9251

MODEL 19 MICRO R METER

BILL OF MATERIAL

Drawing No. 120X6

RESISTORS - All 1/4 Watt

		Part No.			Part No.
R1	22K	7018	R20	22K	7018
R2	27 Meg	7029	R21	8.2K	7015
R3	10K	7016	R22	82K	7022
R4	470K	7026	R23	100K	7023
R5	1 Meg	7028	R28	220K	7066
R6	12K	7048	R29	330 Ohms	7053
R7	SAT @ 820K	7063	R30	470K	7026
R9	3.3K	7013	R31	10K	7016
R10	560K	7027	R32	10K	7016
R11	100K	7023	R33	15K	7017
R12	470K	7026	R34	120K	7050
R13	1 Meg	7028	R35	15K	7017
R14	2.7 Meg	7029	R38	200 Ohms	7006
R15	82K	7022	R41	SAT	
R17	3.3K	7013			
R18	1K	7009			

CAPACITORS

				PART NO.
C1	100MMFD	3KV	Ceramic	5532
C2	.01MFD	50V	Ceramic	5523
C3	500MMFD	600V	Ceramic	5555
C4	500MMFD	600V	Ceramic	5555
C5	.01MFD	50V	Ceramic	5523
C6	22MFD	15V	Tantalum OST	5579
C7	100MFD	10V	Tantalum DST	5576
C8	100MFD	10V	Tantalum DST	5576
C9	4.7MFD	10V	Tantalum	5506
C10	.1MFD	10V	Ceramic	5521
C11	4.7MFD	10V	Tantalum	5506
C12	22MFD	15V	Tantalum OST	5579
C13	.01MFD	50V	Ceramic	5523
C14	.1MFD	10V	Ceramic	5521
C15	100MFD	10V	Tantalum DST	5576
C16	1MFD	35V	Tantalum OST	5575
C17	.1MFD	10V	Ceramic	5521
C18	100MMFD	3KV	Ceramic	5532
C19	.005MFD	2KV	Ceramic	5520
C20	.001MFD	3KV	Ceramic	5518
C21	.001MFD	1KV	Ceramic	5519
C22	.001MFD	1KV	Ceramic	5519
C23	.001MFD	1KV	Ceramic	5519
C24	.01MFD	50V	Ceramic	5523
C25	500MMFD	600V	Ceramic	5555

MODEL 19 MICRO R METER

BILL OF MATERIAL
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Drawing No. 120X6

INTEGRATED CIRCUITS

		Part No.
U1	CA3096	6023
U2	CD4093	6030
U3	CD4098	6066
U4	CA3096	6023
U5	LM358	6024
U6	LM358	6024

TRANSFORMERS

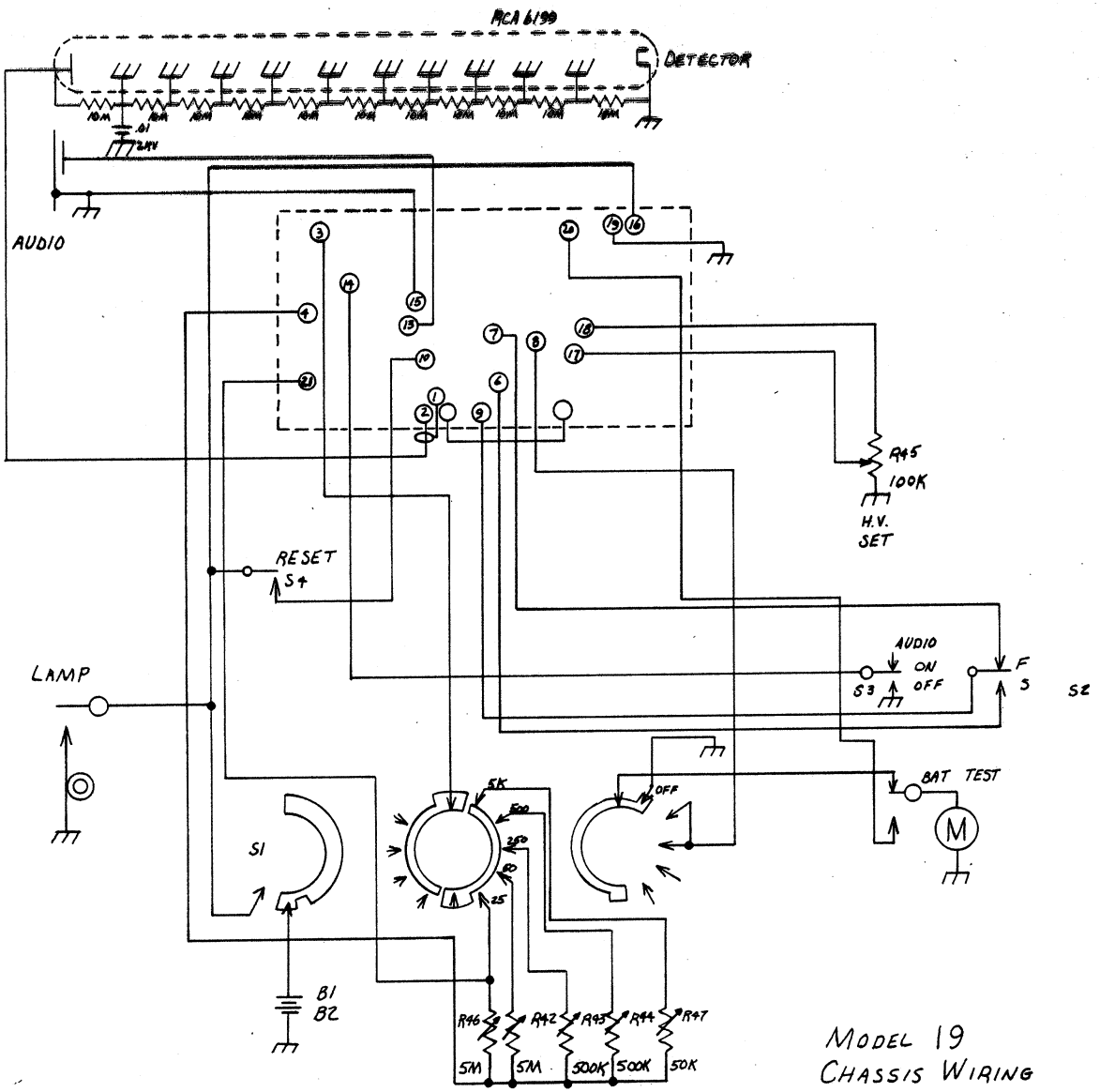
T1	L8050	0902
T2	LVPS	0944

DIODES

CR1	1N34	6253
CR2	1N4007	6274
CR3	1N4007	6274
CR4	1N4007	6274
CR5	1N4007	6274
CR6	1N4148	6272
CR7	1N4148	6272
CR8	1N4148	6272
CR9	1N34	6253
CR10	1N34	6253
CR11	1N5232	6269

TRANSISTORS

Q4	MPS6534	5763
Q5	2N3877	5758
Q6	2N3877	5758
Q7	MPS6534	5763



MODEL 19
CHASSIS WIRING

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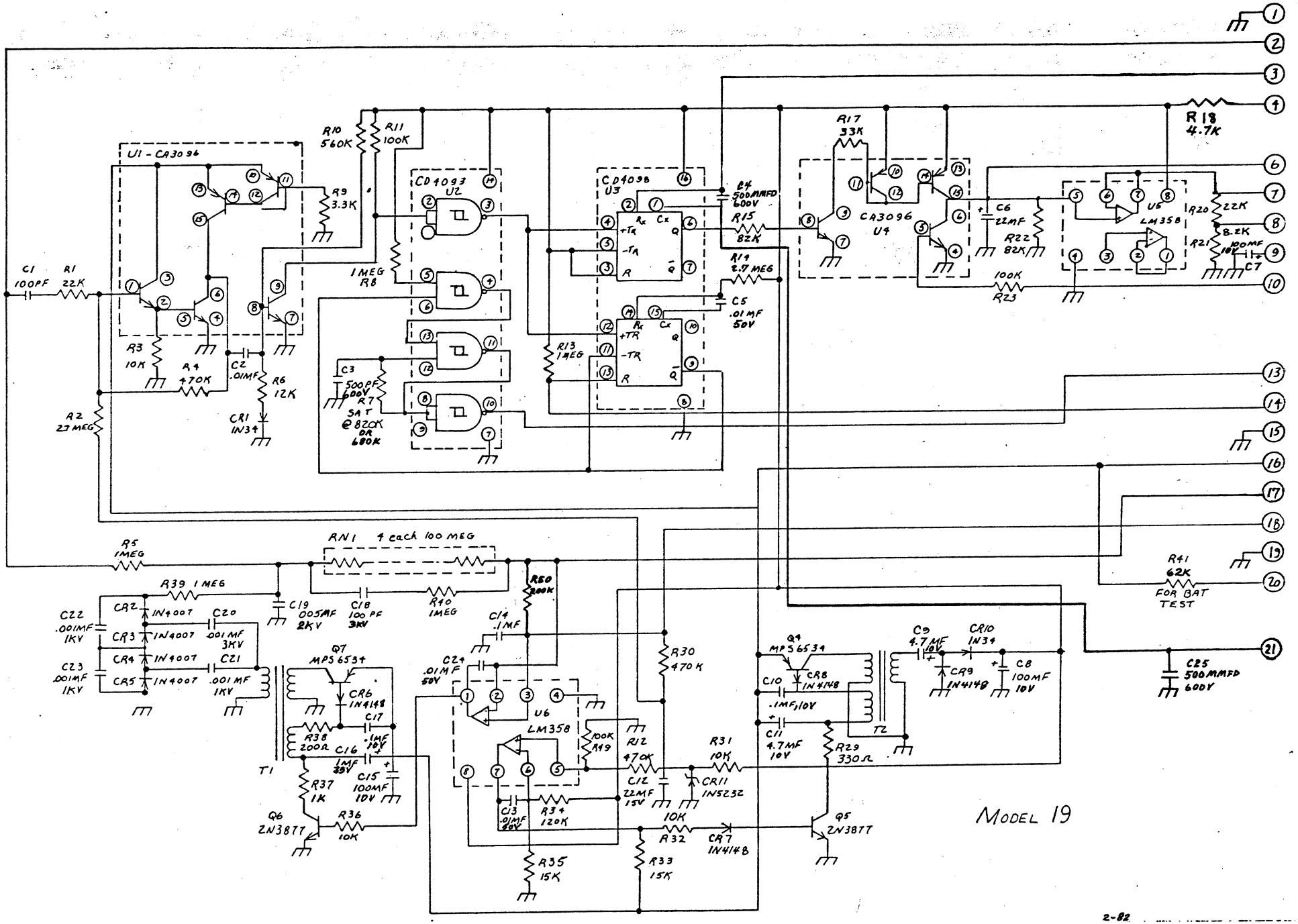
LUDLUM MEASUREMENTS INC SWEETWATER TEXAS	DWG NO 120 x 5	



DATE 10-23

INSTRUMENTS INC SOUTHWATER TEXAS

DWG NO 120x6