

**LUDLUM MODEL 3A
SURVEY METER**

**September 2023
Serial No. 336641 and Succeeding
Serial Numbers**

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

STATEMENT OF WARRANTY

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material, and design for a period of twelve months from the date of delivery. The calibration of a product is warranted to be within its specified accuracy limits at the time of shipment. In the event of instrument failure, notify Ludlum Measurements to determine if repair, recalibration, or replacement is required.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than intended.

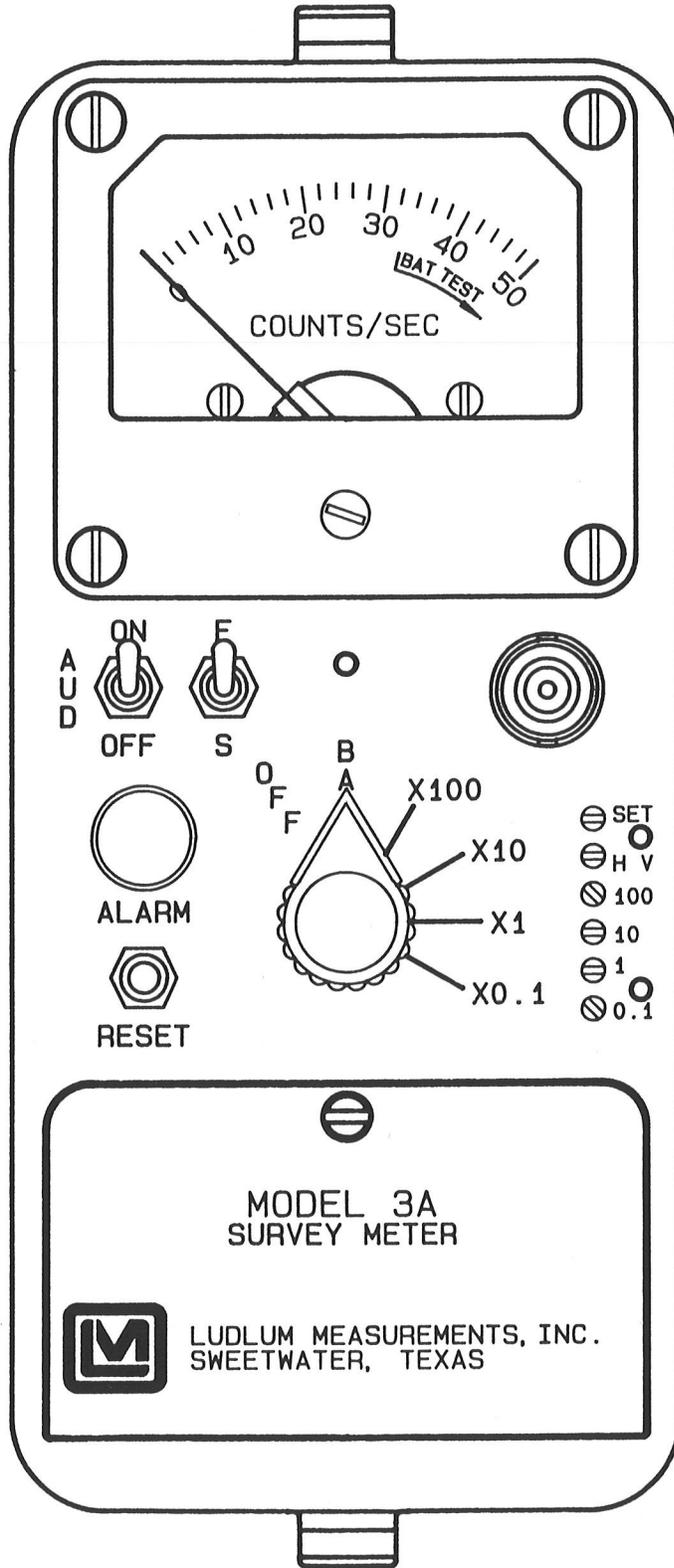
There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face there of. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages, arising from the purchase, use, or inability to use product.

RETURN OF GOODS TO MANUFACTURER

If equipment needs to be returned to Ludlum Measurements, Inc. for repair or calibration, please send to the address below. All shipments should include documentation containing return shipping address, customer name, telephone number, description of service requested, and all other necessary information. Your cooperation will expedite the return of your equipment.

**LUDLUM MEASUREMENTS, INC.
ATTN: REPAIR DEPARTMENT
501 OAK STREET
SWEETWATER, TX 79556**

**800-622-0828 325-235-5494
FAX 325-235-4672**



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DWN DATE	BK 7/18/91	CHK DATE	7-15-02	APP DATE	7-15-02
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TITLE MODEL 3A SURVEY METER					
	LUDLUM MEASUREMENTS, INC. 821 BAX STREET SWEETWATER, TEXAS 76089	SERIES	363	SHEET	413

Model 3A Survey Meter

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Model 3A Survey Meter

Model 3A Survey Meter

1. GENERAL

The Model 3A Survey Meter is a portable radiographic survey instrument with the additional feature of an audible and visual alarm. The alarm circuit is adjustable from a meter scale deflection of 0 to above full scale for each range multiple. The meter scale presentation is 0-50 counts per second (cps) with a total range of 0-5000 cps.

The unit body is made of cast aluminum, including the meter housing. 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 six-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 GM probe offered by the company will operate on this unit as well as many of the scintillation detectors. The instrument is set for 900-volt, GM tube operation. For special requirements, it may be adjusted for operation with any GM or scintillator tube between 400 and 1500 volts.

The unit is operated with batteries for operation from -20 to 50 °C (-4 to 122 °F). For temperature operation to -40 to 65 °C (-40 to 150 °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 5000 counts per second (CPS); meter scale presentation is 0 to 50 CPS with range multipliers of X0.1, X1, X10, and X100

THRESHOLD: 40 ±10 mV

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

HIGH VOLTAGE: externally adjustable from 400 to 1500 volts

RESPONSE: 4 or 22 seconds, 10-90% of final reading

LINEARITY: ±10% of true value

ALARM INDICATION: audible and visual indication when above alarm threshold

ALARM RANGE: 0 to off-scale for each range multiple; latching alarm

BATTERY DEPENDENCE: Instrument calibration changes less than 3% within battery check limits on meter.

METER: 1 milliamperes, pivot-and-jewel suspension, 6.4 cm (2.5 in.) scale

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

SIZE: 16.5 x 8.9 x 21.6 cm (6.5 x 3.5 x 8.5 in.) (H x W x L), including handle

WEIGHT: 1.6 kg (3.5 lb), including batteries

FINISH: drawn-and-cast aluminum powder-coat paint.

3. DESCRIPTION OF CONTROLS AND FUNCTIONS

Range Multiplier Selector Switch: A six-position switch marked OFF, BAT, X100, X10, X1, and 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 0-5000 cps. Multiply the scale reading by the multiplier for determining the actual reading.

AUDIO ON-OFF Toggle Switch: In the ON position the switch 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, the higher the audio frequency. The audio should be turned OFF when not required to reduce battery drain.

Model 3A Survey Meter

F-S Toggle Switch: Provides meter response. Selecting the "F" position of the toggle switch provides 10-90% of final meter reading in 4 seconds. In "S" position, 10-90% of final meter reading takes 22 seconds. In the "F" position, there is fast response and large meter deviation. The "S" position should be used for slow response and damped meter deviation.

RESET Pushbutton Switch: When depressed, this switch provides a rapid means to drive the meter to zero and reset the alarm.

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: 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.

ALARM Light: a red lamp that comes on to give visual alarm when radiation is above the alarm threshold

Alarm SET: a screwdriver adjustment to set the threshold for the alarm circuit. The threshold is set by desired needle displacement on the meter scale. The range is adjustable from 10% to off-scale on each range multiple.

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: The enter post of the battery is positive.

- Close the battery box lid.
- 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.
- Connect the cable to the instrument and detector.

- 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. If the alarm circuit energizes, move the source away from the detector and push the reset button.
- 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". Keep the source at a distance from the detector that will keep the alarm circuit from energizing.
- Depress the RESET switch. The meter should zero and the audio/visual alarm should turn off.
- Check calibration and proceed to use the instrument.

5. CALIBRATION

5.1 Calibrating CPS Scale

- To calibrate the CPS scale, a Ludlum Model 500 Pulser generator or equivalent is required.
- Adjust the ALARM SET control fully counterclockwise to keep the alarm circuit from tripping during scale calibration.
- Connect the pulse generator to the instrument and adjust the pulse frequency to provide 4/5-scale deflection on the X100

range (4,000 cps). Adjust the X100 range calibration potentiometer as required.

- Decrease the pulser frequency by decades and adjust each range calibration potentiometer accordingly.

5.2 Detector Operating Point

- For scintillation detectors, adjust the HV for plateau operations. Expose the unit to a source and develop an operating voltage-versus-count

Model 3A Survey Meter

rate-plot on semi-log paper. Set the operating voltage at the flattest position of the curve near the knee of the curve.

- For GM detectors, adjust the HV to 900 volts. For special applications, the power supply may be adjusted from 400 to 1500 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. Do not use a vacuum

tube type voltmeter for this adjustment unless an external, high-voltage multiplier probe is used.

5.3 Alarm Circuit

After HV and range controls are set, the alarm set control may be adjusted to the desired alarm threshold. Minimum setting is 10% of the meter scale; maximum setting is full-scale deflection. When the alarm circuit is energized, both the audio and visual indications should occur. Pushing the reset button resets the meter and alarm circuit.

6. MAINTENANCE

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

To assure proper operation of the instrument between calibrations, the instrument should be tested with a check source prior to each use. A reference reading should be obtained when exposed to the check source in a constant and reproducible manner at the time of calibration. If the instrument response differs from the reference reading by more than $\pm 20\%$, the instrument should be returned to a calibration facility for maintenance, repair, or recalibration as required.

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 regulatory agency's 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 dusty or corrosive atmosphere, service batteries more frequently.

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 38 °C (100 °F).

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7. PARTS LIST

Ref. No.	Description	Part No.	Ref. No.	Description	Part No.
Model 3A Survey Meter			U2	TLC372	06-6265
			U3	CD4098	06-6066
			U4	CMXT3906TRLF	05-5890
UNIT	Completely Assembled Model 3A Survey Meter 48-1408		U5	ICM7555	06-6136
			U6	TLC27M7IP	06-6248
			U7	MAX631	06-6249
			U8	CMXT3906TRLF	05-5890
Main Board, Drawing 464 X 639			U9-U11	CMXT3904TRLF	05-5888
BOARD	Assembled Circuit	5464-639	U101	LM385Z-1.2	05-5808
CAPACITORS			DIODES		
C38	0.0015μF, 3kV, C	04-5518	CR94	1N4148	07-6272
C40-C41	0.0015μF, 3kV, C	04-5518	CR166-CR167	1N4007	07-6274
C42	0.0027μF, 3kV, C	04-5520	CR169	1N4007	07-6274
C50	100pF, 3kV	04-5532	CR175	1N4007	07-6274
C56	100μF, 10V, DT	04-5576	CR202	1N4148	07-6272
C57	100pF, 3kV	04-5532	CR207	1N4148	07-6272
C102	100μF, 10V, DT	04-5576	RESISTORS		
C103	10μF, 20V, DT	04-5592	R18	1k	10-7009
C104	47μF, 16V, DT	04-5550	R27	33k	10-7019
C105	10μF, 20V, DT	04-5592	R36	10M	10-7031
C106	0.001μF, 100V, C	04-5519	R46	10k	10-7016
C109	0.01μF, 100V	04-5523	R47	1G	12-7686
C112	470pF, 100V, C	04-5555	R63	82k	10-7022
C113	0.01μF, 100V	04-5523	R64	1k	10-7009
C115	100μF, 10V, DT	04-5576	R65	10k	10-7016
C117	100pf, 100v, C	04-5527	R66	1k	10-7009
C119	0.001μF, 100V, C	04-5519	R68	8.2k	10-7015
C121	330pF, 100V	04-5531	R70	4.7k	10-7014
C126	10μF, 20V, DT	04-5592	R72	33k	10-7019
C134	100μF, 10V, DT	04-5576	R74	180k	10-7068
C163	0.01μF, 100V	04-5523	R75	33k	10-7019
C170	0.1μF, 100V, C	04-5521	R76	100 OHM	10-7004
C171	1μF, 35V, DT	04-5575	R77	2.2k	10-7012
C191	0.0015μF, 3kV, C	04-5518	R78	22k	10-7070
C199	0.01μF, 100V	04-5523	R79	100k	10-7023
TRANSISTORS			R81	10k	10-7016
Q6	2N3904G	05-5755	R83	100k	10-7023
Q15	MPSW51AG	05-5765	R84	470k	10-7026
Q44	2N3904G	05-5755	R86	2.7M	10-7029
Q96	2N3904G	05-5755	R87	10k	10-7016
Q145	2N4402BU	05-5763	R89	100k	10-7023
Q200	2N4402BU	05-5763	R91	4.7k	10-7014
Q201	2N7000	05-5820	R128	100k	10-7023
Q213	2N3904G	05-5755	R137	10k	10-7016
INTEGRATED CIRCUITS			R138	1M	10-7028
U1	CMXT3904TRLF	05-5888	R147	715K	12-7645
			R150	2.37k	12-7648
			R159	10k	10-7016
			R172	47k	10-7020
			R177	200 OHM	10-7006

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Ref. No.	Description	Part No.
R189	301 OHM	12-7855
R196	10k	10-7016
R203	22k	10-7070
R204-R205	100k	10-7023
R206	22k	10-7070
R208	1k	10-7009
R209-R210	100k	10-7023
R211	1M	10-7028

THERMISTORS

RT181	150 OHM	07-6332
RT190	150 OHM	07-6332

TRANSFORMERS

T165	L8050	40-0902
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INDUCTORS

L13	470uH	21-9600
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MISCELLANEOUS

P1	1-640456-5	13-8355
P2	640456-2	13-8073
W2-28	Cloverleaf	18-8771

Calibration Board, Drawing 363 x 650

BOARD Assembled Calibration	5363-811
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CAPACITORS

C1	0.047μF, 100V, C	04-5565
C2	0.0047μF, 100V, C	04-5570

RESISTORS

R1-R3	1M Trimmer	09-6814
R4-R6	100k Trimmer	09-6813
R7	100k	10-7023

RESISTOR NETWORK

RN1	10k SIP 8P	12-7720
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MISCELLANEOUS

P3	640456-5 MTA100	13-8057
P4	640456-4 MTA100	13-8088

Ref. No. Description Part No.

Wiring Diagram, Drawing 363 x 653

AUDIO

DS1	UNIMORPH #6030	21-9251
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CONNECTORS

J1	1-640442-5 MTA100	13-8383
J2	640442-2 MTA100	13-8178
J3	640442-5 MTA100	13-8140
J4	640442-4 MTA100	13-8170
J5	RECPT-UG706/U SCREW-IN "C"	13-7751

SWITCHES

S1	PA-600-210	08-6501
S2-S3	7101-SYZ-QE	08-6511
S4	30-1-PB GRAYHIL	08-6517

BATTERY

B1-B2	DURACELL "D"	21-9313
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MISCELLANEOUS

DS1	BULB #338	21-9307
*	LAMP HOLDER 101-8430-09-201	21-9410
*	RED LENS 140-1471	21-9411
M1	PORT BEZEL W/MOVEMENT	4363-188
*	METER BEZEL W/GLASS W/O SCREWS	4363-352
*	METER MOVEMENT (1mA)	15-8030
*	PORTABLE METER FACE	7363-136
*	PORTABLE BATTERY NEGATIVE CONTACT ASSY.	2001-065
*	PORTABLE BATTERY POSITIVE CONTACT ASSY.	2001-066
*	PORTABLE CAN ASSY	4363-441
*	PORT. CAL COVER W/SCREWS	4363-200
*	PORT KNOB CASTOM	08-6613
*	PORTABLE BATTERY LID WITH STAINLESS CONTACT	2009-036
*	PORTABLE BATTERY LID X100	7363-190
*	PORT LATCH KIT W/O BAT LID	4363-349
*	MAIN HARNESS Model 2A/3A	8363-827

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Ref. No.	Description	Part No.
*	HARNES-PORT	
	CAN WIRES	8363-462
*	PORT HANDLE (ROLLED)	
	W/SCREWS	4363-139
*	PORT HANDLE FOR CLIP	
	W/SCREWS	7363-203
*	REPLACEMENT CABLE	
	(STD 1 m [39 in.])	40-1004
*	CLIP (44-3 TYPE)	
	W/SCREWS	4002-026-01
*	CLIP (44-7 TYPE)	
	W/SCREWS	4010-007-01
*	CLIP (44-6 TYPE)	
	W/SCREWS	4010-008-01

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DRAWINGS AND DIAGRAMS

Main Circuit Board, Drawing No. 464 x 639

Main Circuit Board Component Layout, Drawing 464 x 642 (2 sheets)

Calibration Board, Drawing No. 363 x 650

Calibration Board Component Layout, Drawing 363 x 651

Wiring Diagram, Drawing No. 363 x 653

1

2

3

4

5

A

A

B

B

C

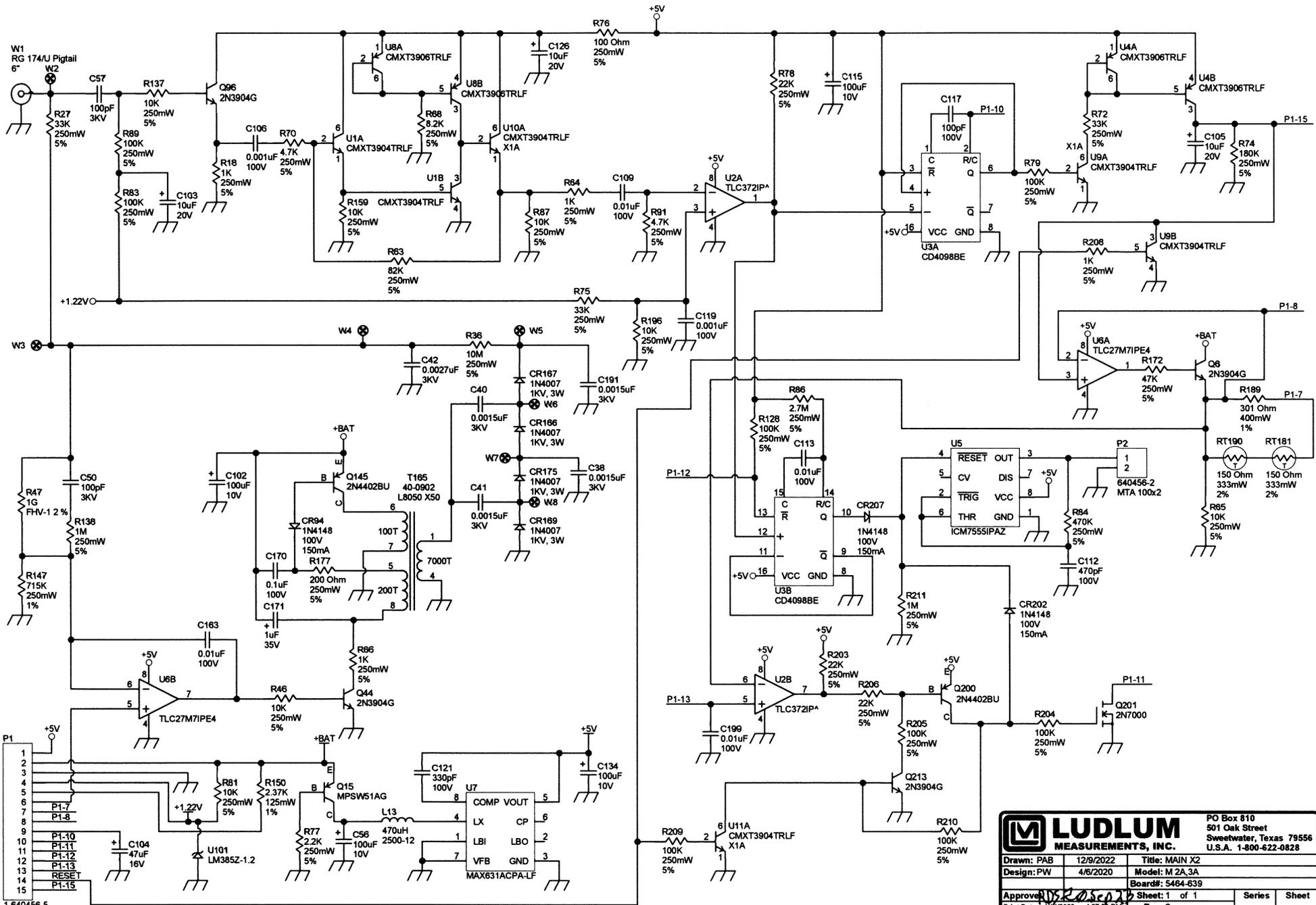
C

D

D

E

E

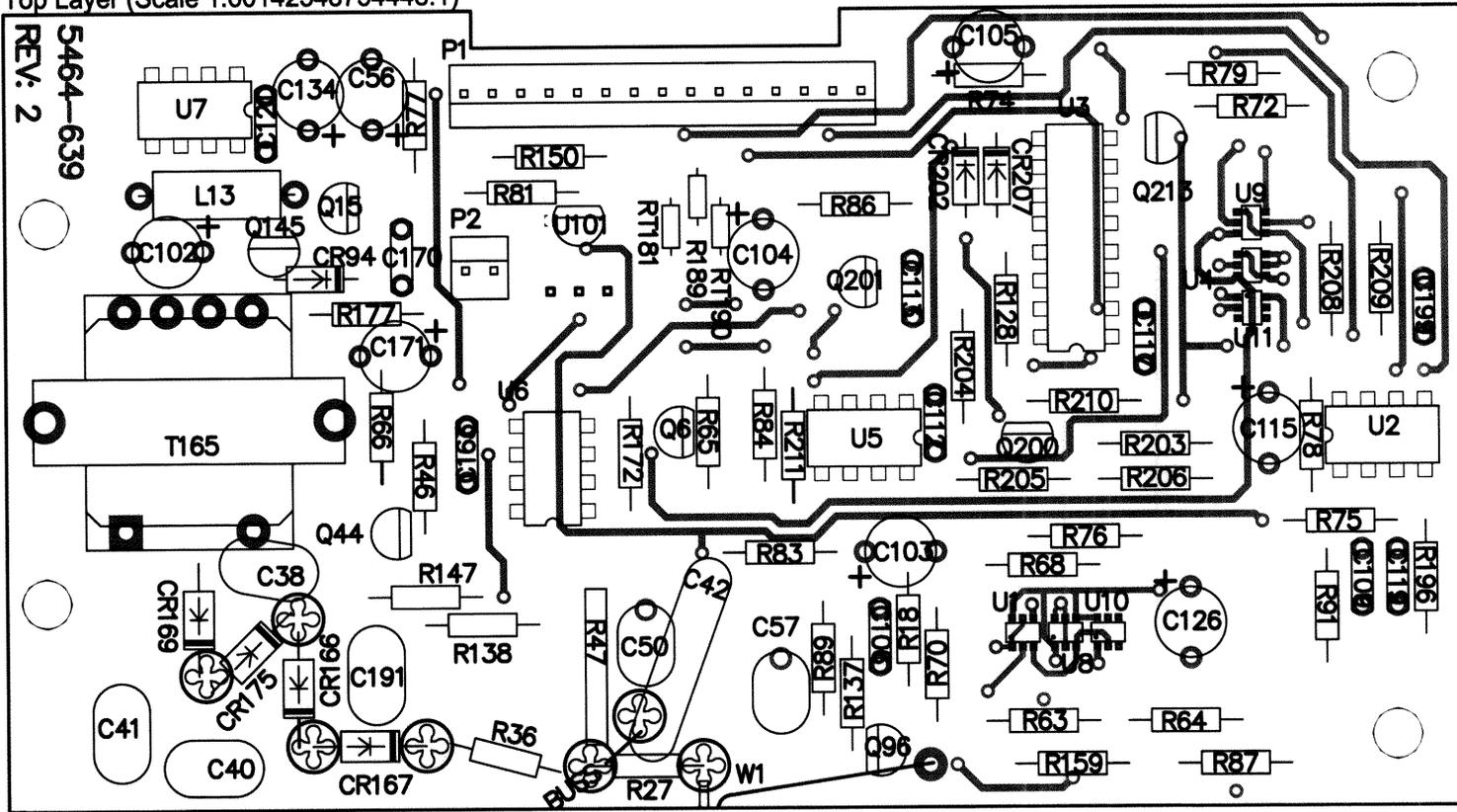


1-640456-5
MTA 100x15

LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: PAB	12/9/2022	Title: MAIN X2	
Design: PW	4/6/2020	Model: M 2A_3A	
Approved: <i>[Signature]</i>		Sheet: 1 of 1	
Print Date: 4/14/2023	4:57:58 PM	Rev: 2	Series
Web: www.ludlum.com		464	639

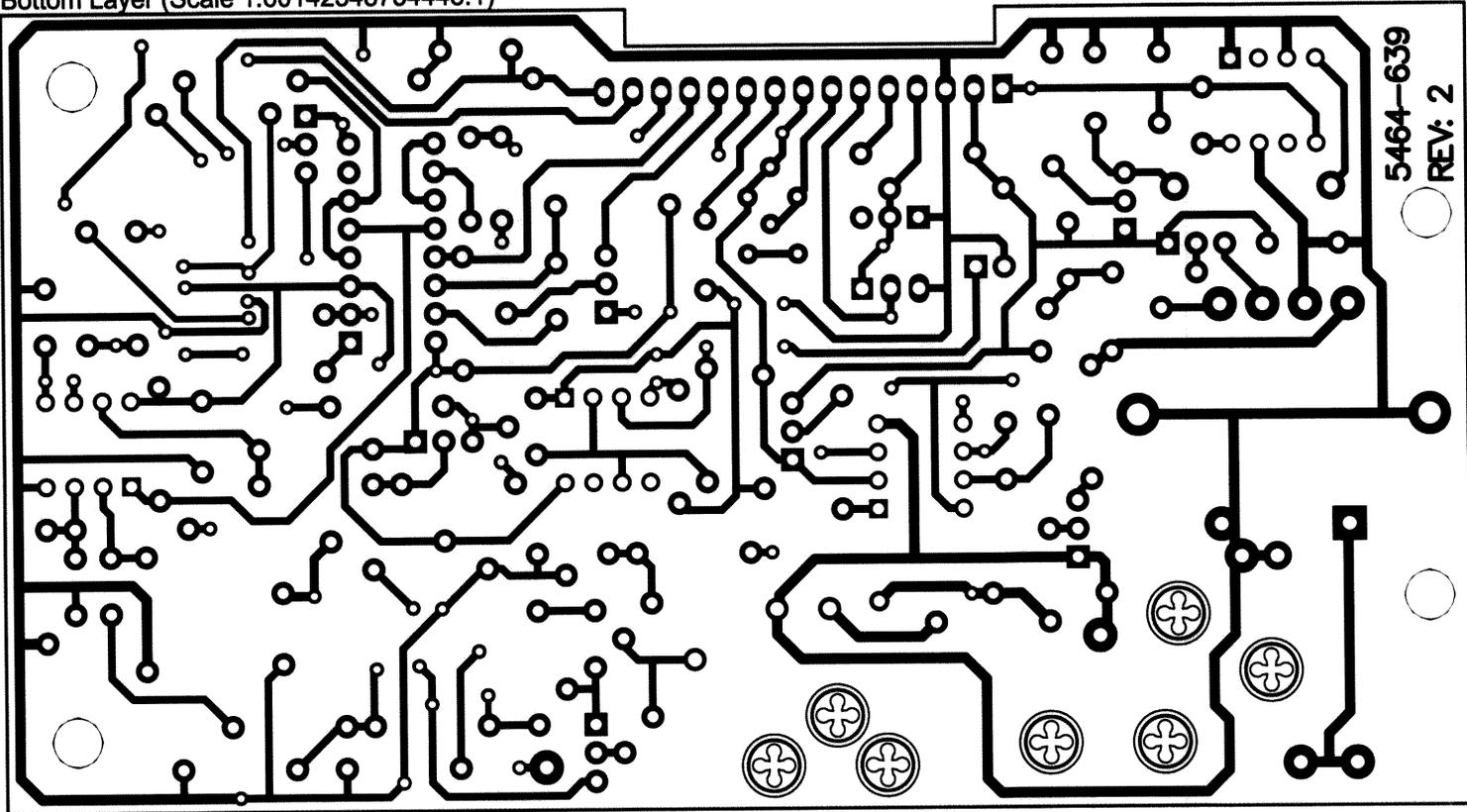
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5464-639
REV: 2



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Design: PW	Date: 4/6/2020	Rev:	2	
Drawn: PAB	Date: 12/9/2022	SHEET	SERIES	SHEET
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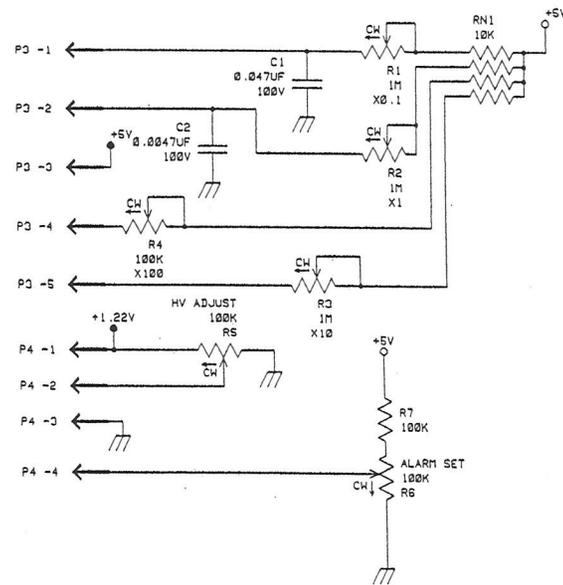
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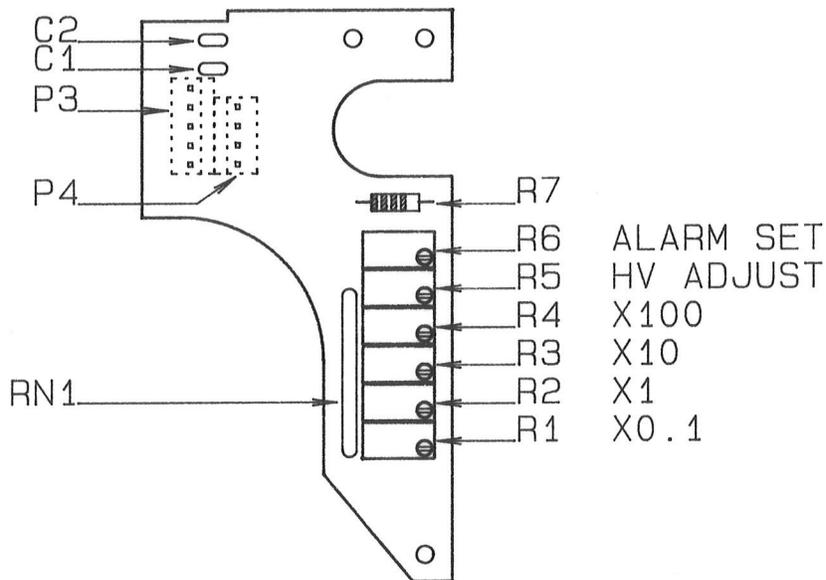
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REV: 2

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Drawn: PAB	Date: 12/9/2022	SHEET	SERIES	SHEET
Apr: <i>PAB</i>	Date: <i>12/9/2022</i>	of 3	464	642
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REVISIONS				
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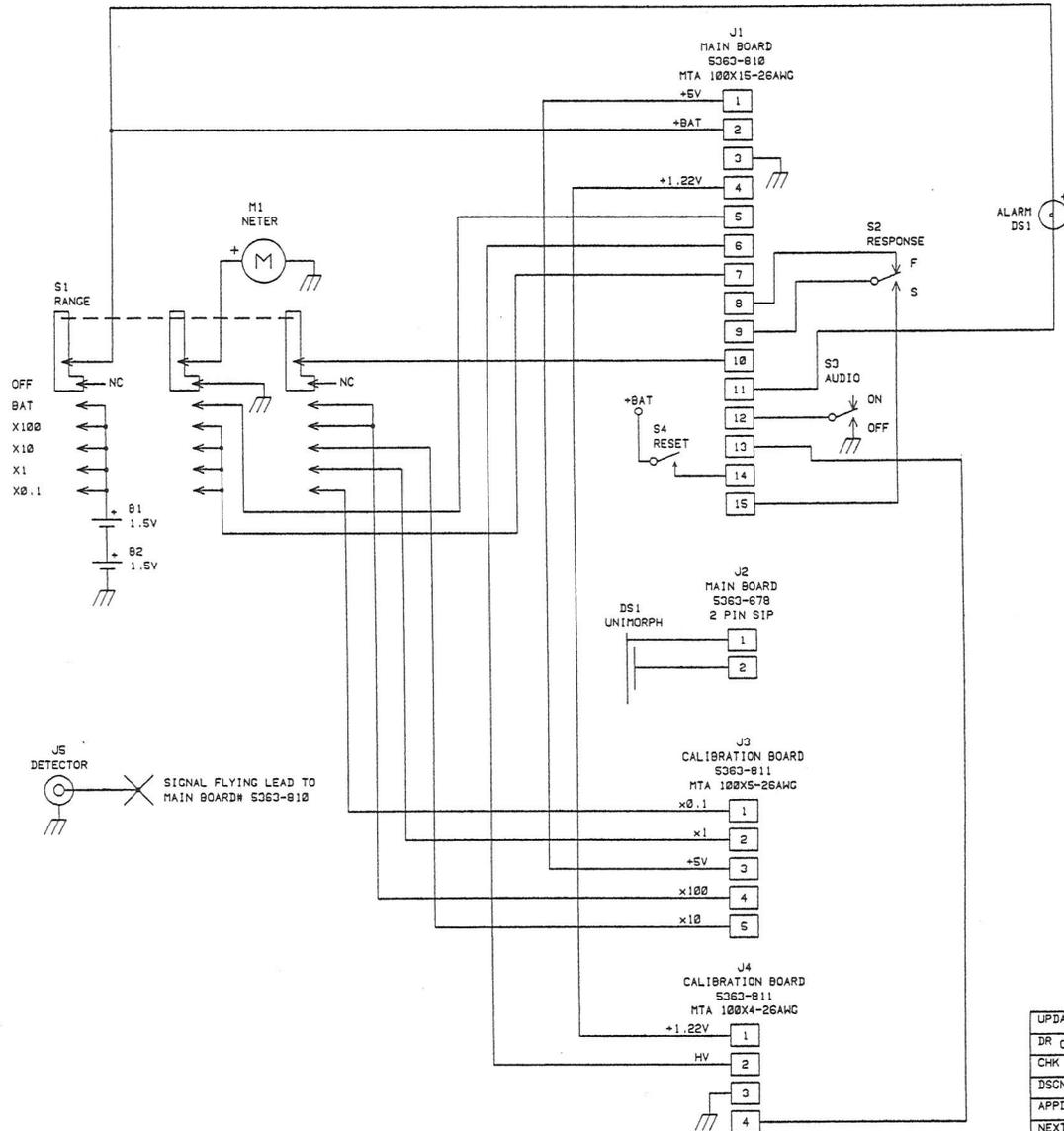
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NEXT HIGHER ASST.			D	JA	363
16:23:28	11-Nov-94	S0602011			SHEET 1 OF 1



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MODEL: 3A	
PART #: 5363-811	
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DSGN:	DATE:

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TITLE M3A CALIBRATION BOARD				
LUDLUM MEASUREMENTS, INC.		SERIES	SHEET	
801 OAK STREET		363	851	
ORANGE TEXAS 76655				

REVISIONS				
EFF	AUTHORITY	ZONE	LTR	APPROVED



LUDLUM MEASUREMENTS INC.				
UPDATED -				
DR CKB	10/20/94			
CHK DW	12/1/94			
DSGN PW	06/03/94			
APPD J6W	12/1/94			
NEXT HIGHER ASSY.				
08:47:52	20-Oct-94	W363812		

TITLE: WIRING DIAGRAM				
BOARD# 363-812				
SIZE D	MODEL 3A	SERIES 363	SHEET 653	
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