

**LUDLUM MODEL 4906 SERIES  
HAND AND FOOT MONITOR  
TECHNICAL MANUAL**

**September 2023**

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

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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.

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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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## Table of Contents

<b>PARTS LIST</b> .....	<b>1</b>
APPLIES TO ALL 4906 SERIES .....	1
<i>Host Board 5420-275</i> .....	1
<i>Power\Relay Board 5540-170</i> .....	4
<i>Sensor Combiner Board 5420-830</i> .....	5
<i>Air Alpha Detector Board 5420-691</i> .....	5
<i>Air Alpha Detector Board (older version) 5420-520</i> .....	9
APPLIES TO 4906AB ONLY .....	12
<i>Detector Slave Board 5420-474</i> .....	12
<i>Gas Flow Control Board 5420-424</i> .....	16
<i>Gas Frisker Slave Board 5420-427</i> .....	17
<i>Gas Flow Sensor Board 5420-430</i> .....	21
APPLIES TO 4906P ONLY .....	22
<i>Detector Slave Board 5420-592</i> .....	22
<i>Model 133-2 Connector/Resistor Board 5002-894</i> .....	24
<b>DRAWINGS</b> .....	<b>25</b>

**Section**  
**1**

**Parts List**

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
<b>Model 4906 Series</b>			
	UNIT	Completely Assembled Model 4906A	48-3687
	UNIT	Completely Assembled Model 4906AB	48-3688
	UNIT	Completely Assembled Model 4906P	48-3919
<b>Applies to all 4906 Series:</b>			
<b>Host Board, Drawing 420 x 275</b>	BOARD	Assembled Host Board	5420-275
CRYSTAL	Y1	32.768 KHZ	01-5740
CAPACITORS			
	C1	1 $\mu$ f, 10V	04-5745
	C2	4.7 $\mu$ f, 50V	04-5819
	C3	10 $\mu$ f, 10V	04-5757
	C4	0.01 $\mu$ f, 50V	04-5741
	C5-C6	4.7 $\mu$ f, 50V	04-5819
	C7	6.8 $\mu$ f, 50V	04-5756
	C8	4.7 $\mu$ f, 50V	04-5819
	C9	0.1 $\mu$ f, 25V	04-5744
	C10	4.7 $\mu$ f, 50V	04-5819
	C11	100 $\mu$ f, 10V	04-5820
	C12	1 $\mu$ f, 10V	04-5745
	C13	0.1 $\mu$ f, 25V	04-5744
	C14	10 $\mu$ f, 10V	04-5757
	C15	0.1 $\mu$ f, 25V	04-5744
	C16	680pf, 100V	04-5801

# Model 4906 Series Technical Manual

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
	C17	10 $\mu$ f, 25V	04-5728
	C18-C19	0.01 $\mu$ f, 50V	04-5741
	C20	10 $\mu$ f, 10V	04-5757
	C21	0.1 $\mu$ f, 25V	04-5744
	C22	1 $\mu$ f, 10V	04-5745
	C23	0.1 $\mu$ f, 25V	04-5744
	C24	1 $\mu$ f, 10V	04-5745
	C25-C28	0.1 $\mu$ f, 25V	04-5744
	C29-C32	0.001 $\mu$ f, 50V	04-5742
TRANSISTORS			
	Q1-Q2	RK7002	05-5931
	Q4-Q7	RK7002	05-5931
	Q8	NDS356	05-5877
	Q9-Q10	RK7002	05-5931
VOLTAGE REGULATORS			
	VR1	TPS71533DCKR	05-5936
	VR2	TPS5420	05-5941
	VR3	TPS61170	05-5940
INTEGRATED CIRCUITS			
	U1-U2	SN74AHC138D	06-6480
	U3	MSP430F2012	06-6729
	U4	SM74JC151D	06-6750
	U5	ADUC843	06-6703
	U6	TPS3825-33	06-6558
	U7	SN74AHC1G14	06-6556
	U8	TPA2012D2	06-6766
DIODES			
	CR1	MBRS130LTS	07-6423
	CR2-CR3	MBR0520LT1	07-6422
	CR4	MBRS340T 3G	07-6469
	CR5	MBR0540LT1	07-6546
RESISTORS			
	R1	10K, 1/10W, 1%	12-7083
	R2	150K, 1/10W, 1%	12-7150
	R3-R8	10K, 1/10W, 1%	12-7083
	R9	1K, 1/10w, 1%	12-7084

# Model 4906 Series Technical Manual

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<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
R10	10K, 1/10W, 1%	12-7083
R11-R14	1K, 1/10w, 1%	12-7084
R15-R16	150K, 1/10W, 1%	12-7150
R17-19	1K, 1/10W, 1%	12-7084
R22	1K, 1/10W, 1%	12-7084
R23	10K, 1/4W, 1%	12-7839
R24-R25	10K, 1/10W, 1%	12-7083
R26	187K, 100mW, 1%	12-8016
R27	3.16K, 1/4W, 1%	12-7903
R28-R32	10K, 1/10W, 1%	12-7083
R33	499, 1/4W, 1%	12-7907
R34-R41	1K, 1/10W, 1%	12-7084
R42	499, 1/4W, 1%	12-7907
R43-50	1K, 1/10W, 1%	12-7084
CONNECTORS		
J1-J8	LP RJ-11 6P	13-9321
J9	53014-0310, MOLEX	13-9038
J10	640456-3 MTA 100X3	13-8081
J11	53014-0310, MOLEX	13-9038
J12	SLM-104-01-S-S, JTAG	13-8986
J13-J14	640456-4, MTA 100X4	13-8088
J15	53014-0310, MOLEX	13-9038
J16	640456-6, MTA 100X6	13-8095
J17	640456-8, MTA 100X8	13-8039
J18	640456-4, MTA 100X4	13-8088
J19	640445-2, MTA 156X2	13-8098
J20-J26	53014-0310, MOLEX	13-9038
J27	640445-2, MTA 156X2	13-8098
J28-J29	640445-2, 640456-2, MTA 100X2	13-8073
J30-J32	640456-4, MTA 100X4	13-8088
P6	640445-2, 640456-2, MTA 100X2	13-8073
INDUCTORS		
L1	CTCDRH125-330M	21-8926
L2	10 $\mu$ H	21-8925
L3-L6	220r-100Mhz	21-9986
MISCELLANEOUS		
F1-F9	300 mA FUSE	21-8924
SW1-SW2	SWITCH (KSC241G)	08-6827

# Model 4906 Series Technical Manual

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## Power/Relay Board, Drawing 540 x 170

	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
	BOARD	Assembled POWER/RELAY BOARD	5540-170
CAPACITORS			
	C1	4.7 $\mu$ f, 50V	04-5819
	C2	10 $\mu$ f, 6.3V	04-5746
	C3	0.1 $\mu$ f, 25V	04-5744
	C4-C5	10 $\mu$ f, 6.3V	04-5746
	C11	1 $\mu$ f, 10V	04-5745
	C14	68 $\mu$ f, 25V	04-5828
	C15	0.1 $\mu$ f, 25V	04-5744
TRANSISTORS			
	Q1-Q5	RK7002AT116	05-5931
VOLTAGE REGULATOR			
	VR1	REG103RA-5	05-5738
DIODES			
	CR1-CR5	MBR0520LT1G	07-6422
	CR6	CMSH1-40	07-6411
	CR7	MBR0520LTG	07-6422
	CR8	CMSH1-40	07-6411
RESISTORS			
	R1-R5	2.21K, 1/10W, 1%	12-7172
	R6-R8	1M, 1/10W, 1%	12-7081
	R9-R10	1K, 1/10W, 1%	12-7084
	R11-R12	1M, 1/10W, 1%	12-7081
	R13	10K, 1/10W, 1%	12-7083
	R14	2.21K, 1/10W, 1%	12-7172
	R15	1K, 1/10W, 1%	12-7084
	R17	1M, 1/10W, 1%	12-7081
CONNECTORS			
	J1	RAPC712, +12VDC	13-8445
	J2	640445-3, MTA 156X3	13-8125



# Model 4906 Series Technical Manual

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<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
J3-J5	640456-2, MTA 100X2	13-8073
J6-J7	640445-2, MTA 156X2	13-8098
J8	640456-2, MTA 100X2	13-8073
J9	640456-5, MTA 100X5	13-8057
J10	640445-2, MTA 156X2	13-8098
J11-J12	640456-2, MTA 100X2	13-8073
J13	640445-6, MTA 156X6	13-8071
J14-J15	640445-3, MTA 156X3	13-8125
J16	640456-2, MTA 100X2	13-8073
J17	640445-2, MTA 156X2	13-8098
J18	640456-6, MTA 100X6	13-8095
J19	640445-2, MTA 156X2	13-8098

## MISCELLANEOUS

DS1-DS8	SML-LX1206SRC	07-6648
F1-F2	FUSE-3A, 60v	21-8890
RY1-RY3	RELAY-G6B-2114P-USPC12	22-9254
RY4-RY5	RELAY-AZ850-5	21-8905
RY6	G6B-2241P	22-9255
SW1	PN11SHNA03QE	08-6900

## **Sensor Combiner, Drawing 420 x 830**

BOARD	Assembled Sensor Combiner Board	5420-830
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## CONNECTORS

P1	640457-4, MTA 100X4	13-8089
P2-P5	640456-3 MTA 100X3	13-8081

## MISCELLANEOUS

MH1-MH2	FASTENTER-CONCORD-90-9451-044	21-9204
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## **Air Alpha Detector Board, Drawing 420 x 691**

BOARD	Assembled Air Alpha Detector Board	5420-691
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## CAPACITORS

C1	10 $\mu$ f, 10V	04-5968
C2	68 $\mu$ f, 16V-T	04-5768
C3	0.01 $\mu$ f, 25V	04-5744
C4	10pf, 100V	04-5749

<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
C5	10 $\mu$ f, 10V	04-5968
C6	0.01 $\mu$ f, 25V	04-5744
C7	1 $\mu$ f, 10V	04-5745
C8	10 $\mu$ f, 10V	04-5968
C9	0.01 $\mu$ f, 25V	04-5744
C10	1 $\mu$ f, 10V	04-5745
C11-C12	10pf, 100V	04-5749
C13	0.01 $\mu$ f, 3kV	04-5762
C14	0.001 $\mu$ f, 50V	04-5742
C15	1 $\mu$ f, 10V	04-5745
C17-C24	0.01 $\mu$ f, 500V	04-5873
C25	68 $\mu$ f, 16V-T	04-5768
C26	0.01 $\mu$ f, 25V	04-5744
C28	0.01 $\mu$ f, 3kV	04-5762
C29-C36	0.01 $\mu$ f, 500V	04-5873
C37	1 $\mu$ f, 10V	04-5745
C38	10 $\mu$ f, 10V	04-5968
C39	1 $\mu$ f, 10V	04-5745
C40	0.01 $\mu$ f, 50V	04-5741
C41	4.7pf, 50V	04-5844
C42-C43	10 $\mu$ f, 10V	04-5968
C44	0.001 $\mu$ f, 25V	04-5951
C45	100pf, 3kV	04-5735
C46	3000pf, 50V	04-5998
C47-C48	10 $\mu$ f, 10V	04-5968
C49	0.01 $\mu$ f, 25V	04-5744
C50	0.001 $\mu$ f, 25V	04-5951
C51	10pf, 100V	04-5749
C52	0.001 $\mu$ f, 25V	04-5951
C54	10 $\mu$ f, 10V	04-5968
C55	1 $\mu$ f, 10V	04-5745
C56	0.01 $\mu$ f, 50V	04-5741
C57	10 $\mu$ f, 10V	04-5968
C58	10pf, 100V	04-5749
C59	10 $\mu$ f, 10V	04-5968
C60-C61	0.01 $\mu$ f, 500V	04-5873
C63	10 $\mu$ f, 10V	04-5968
C65	10 $\mu$ f, 10V	04-5968
C67	10 $\mu$ f, 10V	04-5968
C70-71	1 $\mu$ f, 10V	04-5745
C73	10 $\mu$ f, 10V	04-5968
C74-C75	1 $\mu$ f, 10V	04-5745
C76	10pf, 100V	04-5749

# Model 4906 Series Technical Manual

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
	C77-C78	0.01 $\mu$ f, 500V	04-5873
VOLTAGE REGULATOR			
	VR1	TPS76150DVBR, 5V 100ma	05-5915
	VR2	REF3133AIDBZT	06-6973
	VR3	TPS76133DVBR, 3.3V 100mA	06-6804
INTEGRATED CIRCUITS			
	U1	MPS430F5528IRGCT	06-6797
	U2	SN74AHC14DR	06-6474
	U3	TPS3825-33DBVT	06-6558
	U4	TLV2333	06-6980
	U5	LT1304CS8	06-6394
	U6-U7	LMH6646MA	06-6881
	U8	OPA140AIDBVT	06-6891
	U9	LTC6993-3	06-6892
	U11	LM828M5	06-6518
	U15	TLV333	06-6998
	U16	MAX986EUK+T	06-6601
DIODES			
	CR1	TVS-16V	07-6548
	CR2	MBR0540LT1	07-6546
	CR3	MBR0520LT1G	07-6422
	CR4-C13	CMPD2005SLF	07-6468
	Q4	MMBD7000LT1G	07-6355
RESISTORS			
	R1	1K, 100mW	12-7084
	R2	2.21K, 100mW	12-7172
	R3	1K, 100mW	12-7084
	R4	2.21K, 100mW	12-7172
	R5	10K, 100mW	12-7083
	R6	49.9 Ohm, 100mW	12-7138
	R7	1K, 100mW	12-7084
	R8	2.21K, 100mW	12-7172
	R9	1K, 100mW	12-7084
	R10	500M, 3kV	12-7031
	R11	1M, 250mW	12-7844
	R12	10M, 250mW	12-7996
	R13	499K, 100mW	12-7091

## Model 4906 Series Technical Manual

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<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
R14	500M, 3kV	12-7031
R15	1K, 100mW	12-7084
R16-R17	499K, 100mW	12-7091
R18	1M, 250mW	12-7844
R19-R21	100K, 100mW	12-7082
R22	1M, 100mW	12-7081
R23	1 Ohm, 100mW	12-7221
R24-R25	10 Ohm, 100mW	12-7163
R26	1M, 250mW	12-7844
R27	499 Ohm, 250mW	12-7907
R28	10M, 100mW	12-7090
R29	4.75K, 100mW	12-7149
R30-R33	1K, 100mW	12-7084
R34	49.9 Ohm, 100mW	12-7138
R35	1K, 100mW	12-7084
R36	2K, 100mW	12-7144
R37-R38	1K, 100mW	12-7084
R39	4.75K, 100mW	12-7149
R40-R41	10 Ohm, 100mW	12-7163
R44	1 Ohm, 100mW	12-7221
R59	499K, 100mW	12-7091
R60	10K, 100mW	12-7083
R61	499K, 100mW	12-7091
R62	10K, 100mW	12-7083
R63	1K, 100mW	12-7084
CONNECTORS		
J1	1128-52-0310	18-9252
J2	LP RJ-11 6P	13-9037
MISCELLANEOUS		
L1-L3	470 $\mu$ H	21-9699
T1	32377R TRANSFORMER-4275-156	21-9925
W1	3inch SIGNAL PIGTAIL WIRE	8316-191
W3	TEFLON WHITE #22	21-8993

# Model 4906 Series Technical Manual

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**Air Alpha Detector Board,  
Drawing 420 x 520  
(older version of the board  
above)**

BOARD	Assembled Air Alpha Detector Board	5420-520
CAPACITORS		
C1	10 $\mu$ f, 10V	04-5757
C2	68 $\mu$ f, 16V-T	04-5768
C3	0.1 $\mu$ f, 25V	04-5744
C4	10pf, 100V	04-5749
C5	10 $\mu$ f, 10V	04-5757
C6	0.1 $\mu$ f, 25V	04-5744
C7	1 $\mu$ f, 10V	04-5745
C8	10 $\mu$ f, 10V	04-5757
C9	0.1 $\mu$ f, 25V	04-5744
C10	1 $\mu$ f, 10V	04-5745
C11-C12	10pf, 100V	04-5749
C13	0.01 $\mu$ f, 3kV	04-5762
C14	0.001 $\mu$ f, 50V	04-5742
C15	1 $\mu$ f, 10V	04-5745
C16	100pf, 100V	04-5743
C17-C24	0.01 $\mu$ f, 500V	04-5873
C25	68 $\mu$ f, 16V-T	04-5768
C26	0.1 $\mu$ f, 25V	04-5744
C27-C28	0.01 $\mu$ f, 3kV	04-5762
C29-C36	0.01 $\mu$ f, 500V	04-5873
C37	1 $\mu$ f, 10V	04-5745
C38	10 $\mu$ f, 10V	04-5757
C39	1 $\mu$ f, 10V	04-5745
C40	0.01 $\mu$ f, 50V	04-5741
C41	4.7pf, 50V	04-5844
C42-C43	10 $\mu$ f, 10V	04-5757
C44	0.001 $\mu$ f, 25V	04-5951
C45	100pf, 3kV	04-5735
C46	0.001 $\mu$ f, 25V	04-5951
C47-C48	10 $\mu$ f, 10V	04-5757
C49	0.1 $\mu$ f, 25V	04-5744
C50	470pf, 100V	04-5767
C51	10pf, 100V	04-5749
C52	470pf, 100V	04-5767
C53	10pf, 100V	04-5749
C54	10 $\mu$ f, 10V	04-5757
C55	1 $\mu$ f, 10V	04-5745

# Model 4906 Series Technical Manual

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
	C56	0.01 $\mu$ f, 50V	04-5741
	C57	10 $\mu$ f, 10V	04-5757
	C58	10pf, 100V	04-5749
	C59	10 $\mu$ f, 10V	04-5757
	C61-62	1 $\mu$ f, 10V	04-5745
	C63	10 $\mu$ f, 10V	04-5757
	C64	100pf, 100V	04-5743
	C65	10 $\mu$ f, 10V	04-5757
	C66	1 $\mu$ f, 10V	04-5745
	C67	10 $\mu$ f, 10V	04-5757
	C68	1 $\mu$ f, 10V	04-5745
	C70-C71	1 $\mu$ f, 10V	04-5745
	C72	100pf, 100V	04-5743
	C73	10 $\mu$ f, 10V	04-5757
	C74-C75	1 $\mu$ f, 10V	04-5745
	C76	10pf, 100V	04-5749
VOLTAGE REGULATOR	VR1	TPS71550DCKR	05-5939
	VR2-VR3	TPS71533DCKR	05-5936
INTEGRATED CIRCUITS	U1	MSP430F5528IRGCT	06-6797
	U2	SN74AHC14DR	06-6474
	U3	TPS3925-33DBVT	06-6558
	U4	OPA2347UA	06-6764
	U5	LT1304CS8	06-6394
	U6-U7	LM6172IMX	06-6737
	U8	OPA140AIDBVT	06-6891
	U11	LM828M5/NOPB	06-6518
	U12	LMC7111BIM5X	06-6410
	U13	CD74HC4538PWT	06-6686
	U14	MAX986EUK+T	06-6601
	U15	LMC7111BIM5X	06-6410
	U16	MAX986EUK+T	06-6601
DIODES	CR1	TVS-16V	07-6548
	CR2	MBR0540LT1	07-6546
	CR3	MB40520LT1G	07-6422
	CR4-CR13	CMPD2005SLF	07-6468

	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
RESISTORS	R1	1K, 100 mW, 1%	12-7084
	R2	2.21K, 100mW, 1%	12-7172
	R3	1K, 100 mW, 1%	12-7084
	R4	2.21K, 100mW, 1%	12-7172
	R5	10K, 100mW, 1%	12-7083
	R6	49.9OHM, 100mW, 1%	12-7138
	R7	1K, 100 mW, 1%	12-7084
	R8	2.21K, 100mW, 1%	12-7172
	R9	1K, 100 mW, 1%	12-7084
	R10	150M, 250mW, 10%	12-8021
	R11	10M, 250mW, 1%	12-7996
	R12	1M, 250mW, 1%	12-7844
	R13	150k, 250mW, 1%	12-7150
	R14	500M, 3kV, 2%	12-7031
	R15	1K, 100 mW, 1%	12-7084
	R16-R17	499K, 100mW, 1%	12-7091
	R19-R21	100K, 100mW, 1%	12-7082
	R22	1M, 100mW, 1%	12-8081
	R23	1OHM, 100mW, 1%	12-7221
	R24-R25	10OHM, 100mW, 1%	12-7163
	R26	499OHM, 100mW, 1%	12-7212
	R27	499OHM, 250mW, 1%	12-7907
	R28	10M, 100mW, 1%	12-7090
	R29	4.75K, 100mW, 1%	12-7149
	R30-R33	1K, 100mW, 1%	12-7084
	R34	49.9OHM, 100mW, 1%	12-7138
	R35	1K, 100mW, 1%	12-7084
	R36	2K, 100mW, 1%	12-7144
	R37	1K, 100mW, 1%	12-7084
	R38-R39	4.75K, 100mW, 1%	12-7149
	R40-R41	10OHM, 100mW, 1%	12-7163
	R44	1OHM, 100mW, 1%	12-7221
	R53	100K, 100mW, 1%	12-7082
	R55	499K, 100mW, 1%	12-7091
	R56	10K, 100mW, 1%	12-7083
	R59	22.1K, 100mW, 1%	12-7094
	R60	1K, 100mW, 1%	12-7084
	R61	499K, 100mW, 1%	12-7091
	R62	10K, 100mW, 1%	12-7083
	R63	499OHM, 100mW, 1%	12-7212

# Model 4906 Series Technical Manual

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
CONNECTORS			
	J2	LP RJ-11 6P	13-9037
MISCELLANEOUS			
	L1-L3	470 $\mu$ H, TKS1245	21-9699
	P1	SHIELD-M4500 PREAMP	7436-142
	T1	32377R TRANSFORMER-4275-156	21-9925
<b>For Model 4906AB Only:</b>			
<b>Detector Slave Board, Drawing 420 x 474</b>			
	BOARD	Assembled Detector Slave Board	5420-474
CAPACITORS			
	C1	10 $\mu$ f, 10V	04-5968
	C2	68 $\mu$ f, 16V-T	04-5768
	C3	0.1 $\mu$ f, 25V	04-5744
	C4	10pf, 100V	04-5749
	C5	10 $\mu$ f, 10V	04-5968
	C6	0.1 $\mu$ f, 25V	04-5744
	C7	1 $\mu$ f, 10V	04-5745
	C8	10 $\mu$ f, 10V	04-5968
	C9	0.1 $\mu$ f, 25V	04-5744
	C10	1 $\mu$ f, 10V	04-5745
	C11-C12	10pf, 100V	04-5749
	C13	0.01 $\mu$ f, 3KV, 10%	04-5762
	C14	0.001 $\mu$ f, 50V	04-5742
	C15	1 $\mu$ f, 10V	04-5745
	C16	10 $\mu$ f, 10V	04-5968
	C17-C24	0.01 $\mu$ f, 500V, 10%	04-5873
	C25	68 $\mu$ f, 16V-T	04-5768
	C26	0.1 $\mu$ f, 25V	04-5744
	C28	0.01 $\mu$ f, 3KV, 10%	04-5762
	C29-36	0.01 $\mu$ f, 500V, 10%	04-5734
	C37	1 $\mu$ f, 10V	04-5745
	C38	10 $\mu$ f, 10V	04-5968
	C39	1 $\mu$ f, 10V	04-5745
	C40	0.01 $\mu$ f, 50V	04-5741
	C41	10pf, 50V	04-6013
	C42-C43	10 $\mu$ f, 10V	04-5968
	C44	0.001 $\mu$ f, 25V	04-5951



	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
	C45	100pf, 3kV	04-5735
	C46	3000pf, 50V	04-5998
	C49	10pf, 100V	04-5749
	C50	0.001μf, 50V	04-5951
	C51	10pf, 100V	04-5749
	C54	10μf, 10V	04-5968
	C55	1μf, 10V	04-5745
	C56	0.01μf, 50V	04-5741
	C57	10μf, 10V	04-5968
	C59	10μf, 10V	04-5968
	C61-C62	1μf, 10V	04-5745
	C64	100pf, 100V	04-5743
	C65	10μf, 10V	04-5968
	C66	1μf, 10V	04-5745
	C67	10μf, 10V	04-5968
	C68	1μf, 10V	04-5745
	C69	10pf, 100V	04-5749
	C70-C71	1μf, 10V	04-5745
	C72	100pf, 100V	04-5743
	C73	10μf, 10V	04-5968
	C74-C75	1μf, 10V	04-5745
	C76	10pf, 100V	04-5749
TRANSISTORS			
	Q4	MMBD7000LT1G	07-6355
VOLTAGE REGULATOR			
	VR1	TPS76150DVBR	05-5915
	VR2	REF3133AIDBZT	06-6973
	VR3	TPS76033DBVT	05-5880
INTEGRATED CIRCUITS			
	U1	MSP430F5528IRGCT	06-6797
	U2	SN74AHC14DR	06-6474
	U3	TPS3825-33DBVT	06-6558
	U4	TLV2333	06-6980
	U5	LT1304CS8	06-6394
	U6	LMH6646MA	06-6881
	U7	LTC6993-3	06-6892
	U8	OPA140AIDBVT	06-6891

# Model 4906 Series Technical Manual

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<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
U9	TLV333DBVR	06-6998
U10	MAX986EUK+T	06-6601
U11	ICL7660SCBAZ	06-6437
U12	TLV333DBVR	06-6998
U13	CD74HC4538PWT	06-6686
U14	MAX986EUK+T	06-6601
U15	TLV333DBVR	06-6998
U16	MAX986EUK+T	06-6601
U17	LTC6993-3	06-6892
U19	LTC6993-3	06-6892
DIODES		
CR1	TVS-16V	07-6548
CR2	MBR0540LT1	07-6546
CR3	MBR0520LT1G	07-6422
CR4-CR11	CMPD2005SLF	07-6468
CR14	SD103AW-13-F	07-6420
RESISTORS		
R1	1K, 100mW, 1%	12-7084
R2	2.21K, 100mW, 1%	12-7172
R3	1K, 100mW, 1%	12-7084
R4	2.21K, 100mW, 1%	12-7172
R5	10K, 100mW, 1%	12-7083
R6	49.9 OHMm 100mW, 1%	12-7138
R7	1K, 100mW, 1%	12-7084
R8	2.21K, 100mW, 1%	12-7172
R9	1K, 100mW, 1%	12-7084
R10	500M, 3KV, 2%	12-7031
R11	1M, 250mW, 1%	12-7844
R12	10M, 250mW, 1%	12-7996
R13	499K, 100mW, 1%	12-8260
R14	500M, 3KV, 2%	12-7031
R15	1K, 100mW, 1%	12-7084
R16	499K, 100mW, 1%	12-7091
R17	499K, 100mW, 1%	12-8260
R18	499K, 100mW, 1%	12-7091
R19-R20	10K, 100mW, 1%	12-7083
R21	100K, 100mW, 1%	12-7082
R22	1M, 100mW, 1%	12-7081
R23	1 OHM, 100mW, 1%	12-7221
R24	150 OHM, 100mW, 1%	12-7141
R25	10 OHM, 100mw, 1%	12-7163

## Model 4906 Series Technical Manual

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<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
R26	280K, 100mW, 1%	12-8240
R27	49.9 OHM, 250mW	12-8263
R28	4.75M, 100mW, 1%	12-7089
R29	1K, 100mW, 1%	12-7084
R30	1M, 100mW, 1%	12-7081
R31	18.7K, 100Mw, 1%	12-7242
R32-R33	1K, 100mW, 1%	12-7084
R34	49.9 OHM 100mW, 1%	12-7138
R35	499K, 100mW, 1%	12-7091
R36	2K, 100mW, 1%	12-7144
R37	1K, 100mW, 1%	12-7084
R38	1M, 250mW, 1%	12-7844
R39	1M, 100mW, 1%	12-7081
R41	10 OHM, 100mW, 1%	12-7163
R44	1 OHM, 100mW, 1%	12-7221
R45	499K, 100mW, 1%	12-7091
R46-R47	10K, 100mW, 1%	12-7083
R50	49.9K, 100mW, 1%	12-8259
R51	100K, 100mW, 1%	12-8261
R53	22.1K, 100mW, 1%	12-7094
R54	10K, 100mW, 1%	12-7083
R55	499K, 100mW, 1%	12-7091
R56	10K, 100mW, 1%	12-7083
R57-R58	100K, 100mW, 1%	12-8261
R59	22.1K, 100mW, 1%	12-7094
R60	10K, 100mW, 1%	12-7083
R61	499K, 100mW, 1%	12-7091
R62	10K, 100mW, 1%	12-7083
R63	100Ohm, 100mW, 1%	12-7142
CONNECTORS		
J2	LP RJ-11 6P MOLEX 43860-0026	13-9037
P2	1128-52-0319	18-9251
P3-P4	73412-0110	13-9376
INDUCTORS		
L1-L3	470 $\mu$ H, TKS1245	21-9699
TRANSFORMER		
T1	32377R	21-9925

# Model 4906 Series Technical Manual

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## MISCELLANEOUS

<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
DS1	HSMJ-A401-U40M1 LED Red-Orange	07-6520
W1	3 inch Signal Pigtail	8316-226

## **Gas Flow Control Board, Drawing 420 x 424**

BOARD	Assembled Gas Flow Control Board	5420-424
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## CAPACITORS

C1-C2	68 $\mu$ f, 16V-T	04-5768
C3-C4	10 $\mu$ f, 6.3V	04-5746
C7-C9	10pf, 100V	04-5749
C10	0.1 $\mu$ f, 25V	04-5744
C11	10 $\mu$ f, 10V	04-5757
C12	0.1 $\mu$ f, 25V	04-5744
C13	10 $\mu$ f, 10V	04-5757
C14	1 $\mu$ f, 10V	04-5846
C16	1 $\mu$ f, 16V	04-5701
C17	10 $\mu$ f, 10V	04-5757

## TRANSISTORS

Q1-Q2	RK7002AT116	05-5931
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## VOLTAGE REGULATOR

VR1	TPS76133DVBR, 3.3V 100 mA	06-6804
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## INTEGRATED CIRCUITS

U1	MSP430F5528IRGCT	06-6797
U4	SN74AHC14DR	06-6474
U5	TPS3825-33DBVT	06-6558

## DIODES

CR1-CR4	MBR0540LT1, 40V, 500mW	07-6546
CR5-CR6	MBR0520LT1G	07-6422

## RESISTORS

R1-R2	2.21K, 100mW	12-7139
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# Model 4906 Series Technical Manual

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<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
R3-R4	22.1OHM, 250 mW	12-7055
R5-R7	1K, 100mW	12-7084
R8	49.9 OHM, 100mW	12-7138
R9-R11	2.21K, 100mW	12-7172
R12-R14	10K, 100mW	12-7083

## CONNECTORS

P1-P2	640456-2, MTA 100x2	13-8073
P9	640456-5, MTA 100x5	13-8057
P10	LP RJ-11 6P, MOLEX 43860-0026	13-9037
P11	640456-2, MTA 100x2	13-8073

## MISCELLANEOUS

DS1-DS4	LN1271RAL, Red, LED-SMT-AK	07-6378
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## **Gas Frisker Slave Board, Drawing 420 x 427**

BOARD	Assembled Gas Frisker Slave Board	5420-427
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CRYSTAL	Y1	32.768KHz	01-5740
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## CAPACITORS

C1	10 $\mu$ f, 10V	04-5757
C2	68 $\mu$ f, 16V-T	04-5768
C3	0.1 $\mu$ f, 25V	04-5744
C4	10pf, 100V	04-5749
C5	10 $\mu$ f, 10V	04-5757
C6	0.1 $\mu$ f, 25V	04-5744
C7	1 $\mu$ f, 10V	04-5745
C8	10 $\mu$ f, 10V	04-5757
C9	0.1 $\mu$ f, 25V	04-5744
C10	1 $\mu$ f, 10V	04-5745
C11-C12	10pf, 100V	04-5749
C13	0.01 $\mu$ f, 3KV, 10%	04-5762
C14	0.001 $\mu$ f, 50V	04-5742
C15	1 $\mu$ f, 10V	04-5745
C16	100pf, 100V	04-5743
C17-C24	0.01 $\mu$ f, 500V, 10%	04-5873
C25	68 $\mu$ f, 16V-T	04-5768

<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
C26	0.1 $\mu$ f, 25V	04-5744
C28	0.01 $\mu$ f, 3KV, 10%	04-5762
C29-C36	0.01 $\mu$ f, 500V, 10%	04-5873
C37	1 $\mu$ f, 10V	04-5745
C38	10 $\mu$ f, 10V	04-5757
C39	1 $\mu$ f, 10V	04-5745
C40	0.01 $\mu$ f, 50V	04-5741
C41	100pf, 100V	04-5743
C42-C43	10 $\mu$ f, 10V	04-5757
C44	470pf, 100V	04-5767
C45	100pf, 3KV	04-5735
C46	0.001 $\mu$ f, 50V	04-5742
C47-C48	10 $\mu$ f, 10V	04-5757
C49	0.1 $\mu$ f, 25V	04-5744
C50	470pf, 100V	04-5767
C51	10pf, 100V	04-5749
C52	470pf, 100V	04-5767
C53	10pf, 100V	04-5749
C54	10 $\mu$ f, 10V	04-5757
C55	1 $\mu$ f, 10V	04-5745
C56	0.01 $\mu$ f, 50V	04-5741
C57	10 $\mu$ f, 10V	04-5757
C58	10pf, 100V	04-5749
C59	10 $\mu$ f, 10V	04-5757
C61-C62	1 $\mu$ f, 10V	04-5745
C64	100pf, 100V	04-5743
C65	10 $\mu$ f, 10V	04-5757
C66	1 $\mu$ f, 10V	04-5745
C67	10 $\mu$ f, 10V	04-5757
C68	1 $\mu$ f, 10V	04-5745
C69	10pf, 100V	04-5749
C70-C71	1 $\mu$ f, 10V	04-5745
C72	100pf, 100V	04-5743
C73	10 $\mu$ f, 10V	04-5757
C74-C75	1 $\mu$ f, 10V	04-5745
C76	10pf, 100V	04-5749
C77	68 $\mu$ f, 16V-T	04-5768
C78	10 $\mu$ f, 10V	04-5757
C79	68 $\mu$ f, 16V-T	04-5768
C80	10 $\mu$ f, 10V	04-5757

# Model 4906 Series Technical Manual

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
TRANSISTORS	Q2	RK7002AT116	05-5931
VOLTAGE REGULATOR	VR1	TPS71501	05-5962
	VR2-VR3	TPS71533DCKR	05-5936
INTEGRATED CIRCUITS	U1	MSP430F5528IRGCT	06-6797
	U2	SN74AHC14DR	06-6474
	U3	TPS3825-33DBVT	06-6558
	U4	OPA2347UA	06-6764
	U5	LT1304CS8#TRP	06-6394
	U6-U7	LM6172IMX/NOPB	06-6737
	U8	OPA140AIDBVT	06-6891
	U9	LMC7111BIM5X	06-6410
	U10	MAX986EUK+T	06-6601
	U11	LTC1144IS8	05-5923
	U12	LMC7111BIM5X	06-6410
	U13	CD74HC4538PWT	06-6686
	U14	MAX986EUK+T	06-6601
	U15	LMC7111BIM5X	06-6410
	U16	MAX986EUK+T	06-6601
	U17	MSP430F2012IRSAT	06-6729
	U18	LMC7111BIM5X	06-6410
	U19	LTC6993-3	06-6892
DIODES	CR1	TVS-16V	07-6548
	CR2	MBR0540LT1	07-6546
	CR3	MBR0520LT1G	07-6422
	CR4-CR11	CMPD2005SLF	07-6468
RESISTORS	R1	1K, 100mW, 1%	12-7084
	R2	2.21K, 100mW, 1%	12-7172
	R3	1K, 100mW, 1%	12-7084
	R4	2.21K, 100mW, 1%	12-7172
	R5	10K, 100mW, 1%	12-7083
	R6	49.9 OHM, 100mW, 1%	12-7138

<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
R7	1K, 100mW, 1%	12-7084
R8	2.21K, 100mW, 1%	12-7172
R9	1K, 100mW, 1%	12-7084
R10	500M, 3KV, 2%	12-7031
R11	10M, 250mW, 1%	12-7996
R12	1M, 250mW, 1%	12-7844
R13	499K, 100mW, 1%	12-7091
R14	500M, 3KV, 2%	12-7031
R15	1K, 100mW, 1%	12-7084
R16-R17	499K, 100mW, 1%	12-7091
R18-R21	100K, 100mW, 1%	12-7082
R22	1M, 100mW, 1%	12-7081
R23	1 OHM, 250 mW, 1%	12-7221
R24-R25	10 OHM, 100 mW, 1%	12-7163
R26	2K, 100mW, 1%	12-7144
R27	10K, 250 mW, 1%	12-7839
R28	22.1K, 100mW, 1%	12-7094
R29	4.75K, 100mW, 1%	12-7149
R30-R33	1K, 100mW, 1%	12-7084
R34	49.9 OHM, 100mW, 1%	12-7138
R35-R37	1K, 100mW, 1%	12-7084
R38	10K, 100mW, 1%	12-7083
R39	4.75K, 100mW, 1%	12-7149
R40-R41	10 OHM, 100 mW, 1%	12-7163
R42-R43	1K, 100mW, 1%	12-7084
R44	1 OHM, 250 mW, 1%	12-7221
R45	499K, 100mW, 1%	12-7091
R46-R47	10K, 100mW, 1%	12-7083
R48	1.87M, 100mW, 1%	12-8172
R49	499K, 100mW, 1%	12-7091
R50	49.9K, 100mW, 1%	12-7200
R51	100K, 100mW, 1%	12-7082
R53	100K, 100mW, 1%	12-7082
R54	10K, 100mW, 1%	12-7083
R55	499K, 100mW, 1%	12-7091
R56	10K, 100mW, 1%	12-7083
R57-R58	100K, 100mW, 1%	12-7082
R59	22.1K, 100mW, 1%	12-7094
R60	10K, 100mW, 1%	12-7083
R61	499K, 100mW, 1%	12-7091
R62	10K, 100mW, 1%	12-7083
R63	1K, 100mW, 1%	12-7084
R64	499K, 100mW, 1%	12-7091



## Model 4906 Series Technical Manual

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
	R65	100 OHM, 250mW, 1%	12-7840
	R66	100K, 100mW, 1%	12-7082
	R67	49.9K, 100mW, 1%	12-7200
CONNECTORS			
	J2	LP RJ-11 6P, MOLEX 43860-002	13-9037
	J3	135-3701-201 MMCX Jack	21-9849
	J4	640456-2, MTA 100X2	13-8073
	P1	SHIELD-M4500 P	7436-142
INDUCTORS			
	L1-L3	470 $\mu$ H, TKS1245	21-9699
	L4	56mH	21-9040
TRANSFORMER			
	T1	32377R, TRANSFORMER 4275-156	21-9925

### **Gas Flow Sensor Board, Drawing 420 x 430**

INTEGRATED CIRCUITS	BOARD	Assembled Gas Flow Sensor Board	5420-430
	U3	PCA9546AD	06-6803
RESISTORS			
	R15-R23	1K, 100mW, 1%	12-7084
CONNECTORS			
	P9	640456-5, MTA 100x5	13-8057
MISCELLANEOUS			
	S1-S4	HAFBLF0200C2AX3, Air Flow Sensor	2312068

**For Model 4906P Only:**

**Detector Slave Board,  
Drawing 420 x 592**

<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
BOARD	Assembled Detector Slave Board	5420-592
CAPACITORS		
C1	1 $\mu$ f, 16V	04-5846
C2	68 $\mu$ f, 16V-T	04-5768
C3	10 $\mu$ f, 10V	04-5757
C4	0.1 $\mu$ f, 25V	04-5744
C5	1 $\mu$ f, 10V	04-5745
C6	10pf, 100V	04-5749
C7	10 $\mu$ f, 10V	04-5757
C8	0.1 $\mu$ f, 25V	04-5744
C9	10 $\mu$ f, 10V	04-5757
C10	0.1 $\mu$ f, 25V	04-5744
C11	10pf, 100V	04-5749
C12	10 $\mu$ f, 10V	04-5757
C13	10pf, 100V	04-5749
C14-C15	1 $\mu$ f, 16V	04-5846
C16	0.001 $\mu$ f, 50V	04-5742
C17	100pf, 2kV	04-5971
C18	100pf, 100V	04-5743
C19	1 $\mu$ f, 16V	04-5846
C20	47pf, 50V	04-5740
C21	0.1 $\mu$ f, 25V	04-5744
C22	10 $\mu$ f, 10V	04-5757
C23-C27	0.01 $\mu$ f, 500V	04-5747
C28-C29	10 $\mu$ f, 10V	04-5757
C30	0.1 $\mu$ f, 25V	04-5744
C31-C32	0.001 $\mu$ f, 2kV	04-5838
C33-C37	0.01 $\mu$ f, 500V	04-5747
C38	1 $\mu$ f, 16V	04-5846

# Model 4906 Series Technical Manual

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## INTEGRATED CIRCUITS

<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
U1	MSP430F5528IRGCT	06-6797
U2	SN74AHC14DR	06-6474
U3	TPS3825-33DBVT	06-6558
U4	TLV2333	06-6980
U5	LMI1815	06-6937
U6	LT1304CS8	06-6394

## VOLTAGE REGULATORS

VR1	TPS76133DBVR, 3.3V 100mA	06-6804
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## DIODES

CR1	TVS-16V	07-6548
CR2-CR3	SD103AW-13-F	07-6420
CR4-CR8	CMPD2005SLF	07-6468

## RESISTORS

R1	1K, 100 mW, 1%	12-7084
R2	2.21K, 100mW, 1%	12-7172
R3	1K, 100 mW, 1%	12-7084
R4	10K, 100mW, 1%	12-7083
R5	2.21K, 100mW, 1%	12-7172
R6	49.9OHM, 100mW, 1%	12-7138
R7	1K, 100 mW, 1%	12-7084
R8	2.21K, 100mW, 1%	12-7172
R9	1K, 100 mW, 1%	12-7084
R10	500M, 3kV, 2%	12-7031
R11	499K, 100mW, 1%	12-7091
R12	500M, 3kV, 2%	12-7031
R13	22.1K, 100mW, 1%	12-7094
R14	1K, 100 mW, 1%	12-7084
R15-R16	499K, 100mW, 1%	12-7091
R17	21.5K, 250mW, 1%	12-7001
R18	10K, 100mW, 1%	12-7083
R19	22.1K, 100mW, 1%	12-7094
R20	0 Ohm, 100mW, 1%	12-8013
R21	49.9K, 100mW, 1%	12-7200
R22	1K, 250mW, 1%	12-7832
R23	1M, 250mW, 1%	12-7844
R24	100K, 250mW, 1%	12-7834
R25-R26	100K, 100mW, 1%	12-7082

## Model 4906 Series Technical Manual

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	<u>Reference</u>	<u>Description</u>	<u>Part Number</u>
	R27	1M, 100mW, 1%	12-7081
	R29	100K, 100mW, 1%	12-7082
CONNECTORS			
	J2	LP RJ-11 6P	13-9037
TRANSFORMER			
	T1	32377R	21-9925
MISCELLANEOUS			
	L1	470 $\mu$ H, TKS1245	21-9699

### **Model 133-2 Connector/ Resistor Board, Drawing 2 x 894**

	BOARD	Assembled Model 133-2 Connector/ Resistor Board	5002-894
RESISTORS			
	R1	3.32M, 250mW, 1%	12-7967

**Section**

**2**

**Drawings**

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**For All 4906 Series:**

Host Board, Drawing 420 x 275 (3 sheets)

Host Board Component Layout, Drawing 420 x 276B

Power/Relay Board, Drawing 540 x 170

Power/Relay Board Component Layout, Drawing 540 x 171A (2 sheets)

Sensor Combiner Board, Drawing 420 x 830

Sensor Combiner Board Component Layout, Drawing 420 x 831 (2 sheets)

**For Model 4906A Only:**

Air Alpha Detector Board, Drawing 420 x 691 (3 sheets)

Air Alpha Detector Board Component Layout, Drawing 420 x 693 (2 sheets)

Air Alpha Detector Board (older version of the board above), Drawing 420 x 520 (3 sheets)

Air Alpha Detector Board Component Layout, Drawing 420 x 521A (2 sheets)

**For Model 4906AB Only:**

Detector Slave Board, Drawing 420 x 474 (3 sheets)

Detector Slave Board Component Layout, Drawing 420 x 475 (2 sheets)

Gas Flow Control Board, Drawing 420 x 424 (3 sheets)

Gas Flow Control Board Component Layout, Drawing 420 x 425

Gas Frisker Slave Board, Drawing 420 x 427 (4 sheets)

Gas Frisker Slave Board Component Layout, Drawing 420 x 428

Gas Flow Sensor Board, Drawing 420 x 430

Gas Flow Sensor Board Component Layout, Drawing 420 x 431

**For Model 4906P Only:**

Detector Slave Board, Drawing 420 x 594

## Model 4906 Series Technical Manual

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Detector Slave Board Component Layout, Drawing 420 x 592 (2 sheets)

Model 133-2 Connector/Resistor Board, Drawing 2 x 894

Model 133-2 Connector/Resistor Board Component Layout, Drawing 2 x 895A

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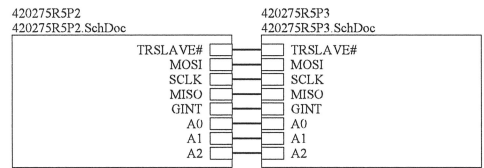
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		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: JK	3/27/2012	Title: Host Board	
Design: RDS	6/28/2011	Model: 4906A/2100	
		Board#: 5420-275	
Approved: <i>[Signature]</i>	23/11/15	Sheet: 1 of 3	Series
Print Date: 1/29/2014 9:00:59 AM		Rev: 5	Sheet
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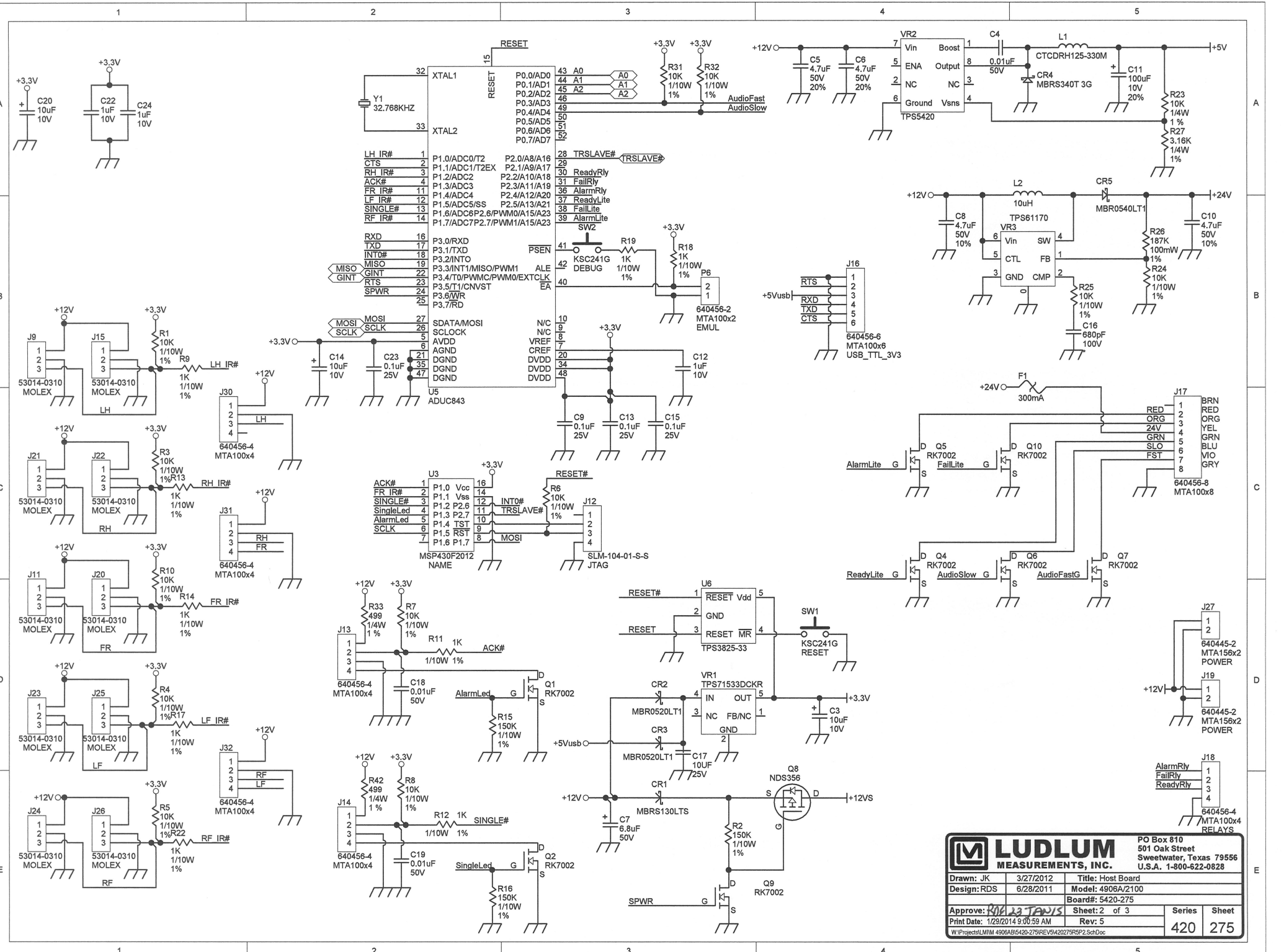
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LH IR#	1	P1.0/ADC0/T2	P2.0/A8/A16	28	TRSLAVE#	TRSLAVE#
CTS	2	P1.1/ADC1/T2EX	P2.1/A9/A17	29		
RH IR#	3	P1.2/ADC2	P2.2/A10/A18	30	ReadyRly	
ACK#	4	P1.3/ADC3	P2.3/A11/A19	31	FailRly	
FR IR#	11	P1.4/ADC4	P2.4/A12/A20	36	AlarmRly	
LF IR#	12	P1.5/ADC5/SS	P2.5/A13/A21	37	ReadyLite	
SINGLE#	13	P1.6/ADC6/P2.6/PWM0/A15/A23		38	FailLite	
RF IR#	14	P1.7/ADC7/P2.7/PWM1/A15/A23		39	AlarmLite	

RXD	16	P3.0/RXD		41	PSEN	
TXD	17	P3.1/TXD		42	KSC241G	DEBUG
INT0#	18	P3.2/INT0		40		
MISO	19	P3.3/INT1/MISO/PWM1	ALE	10		
GINT	22	P3.4/T0/PWM0/PWM0/EXTCLK		9		
RTS	23	P3.5/T1/CNVST		8		
SPWR	24	P3.6/MR		7		
	25	P3.7/RD		6		

MOSI	27	SDATA/MOSI		20	AVDD	
SCLK	28	SCLOCK		19	AGND	
	29			18	DGND	
	30			17	DGND	
	31			16	DGND	
	32			15	DGND	
	33			14	DGND	
	34			13	DGND	
	35			12	DGND	
	36			11	DGND	
	37			10	DGND	
	38			9	DGND	
	39			8	DGND	

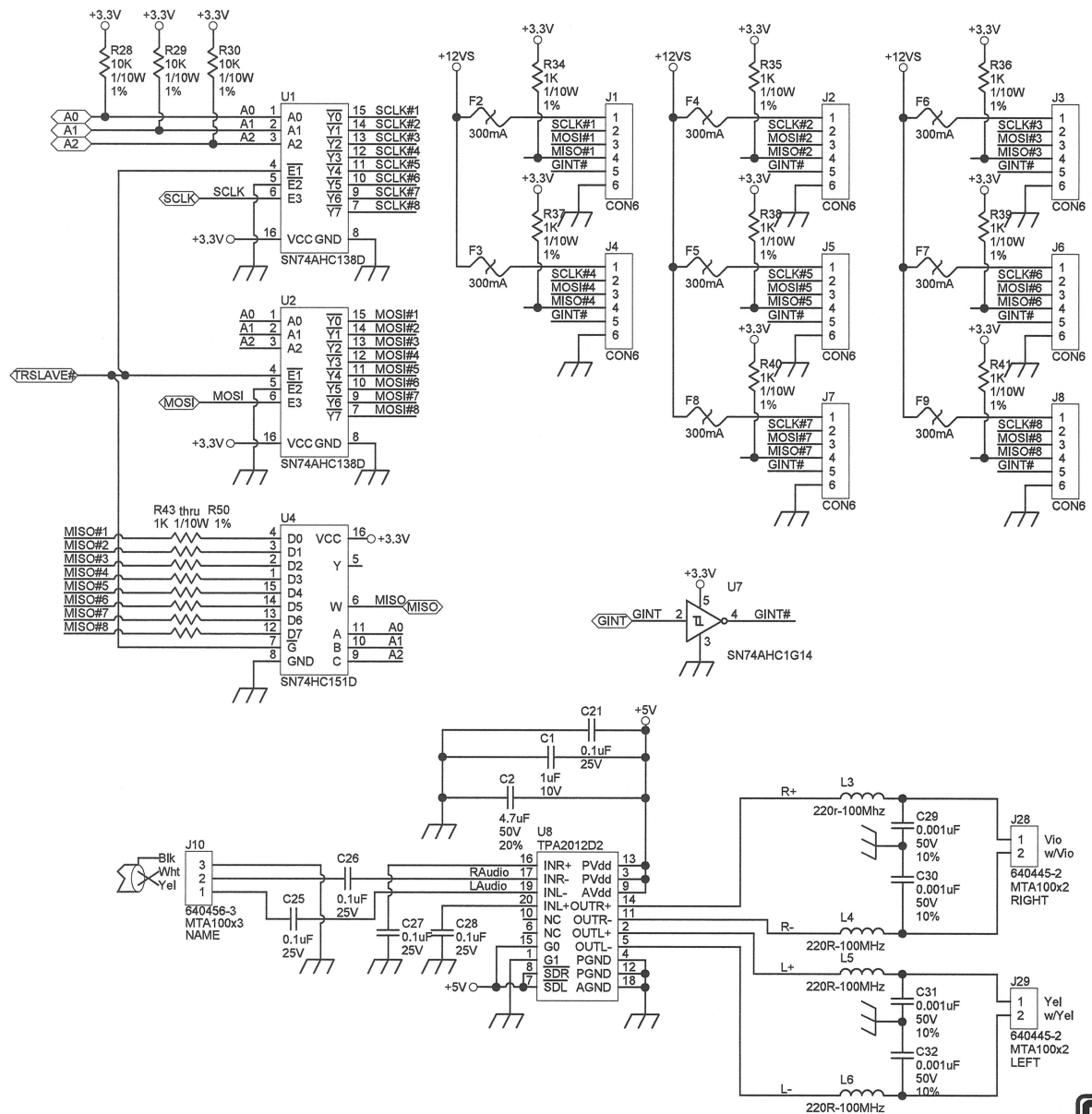
ACK#	1	P1.0 Vcc	16	RESET#	
FR IR#	2	P1.1 Vss	14		
SINGLE#	3	P1.2 P2.6	12		
AlarmLed	4	P1.3 P2.7	11		
	5	P1.4 TST	10		
SCLK	6	P1.5 RST	9		
	7	P1.6 P1.7	8		

**LUDLUM MEASUREMENTS, INC.**

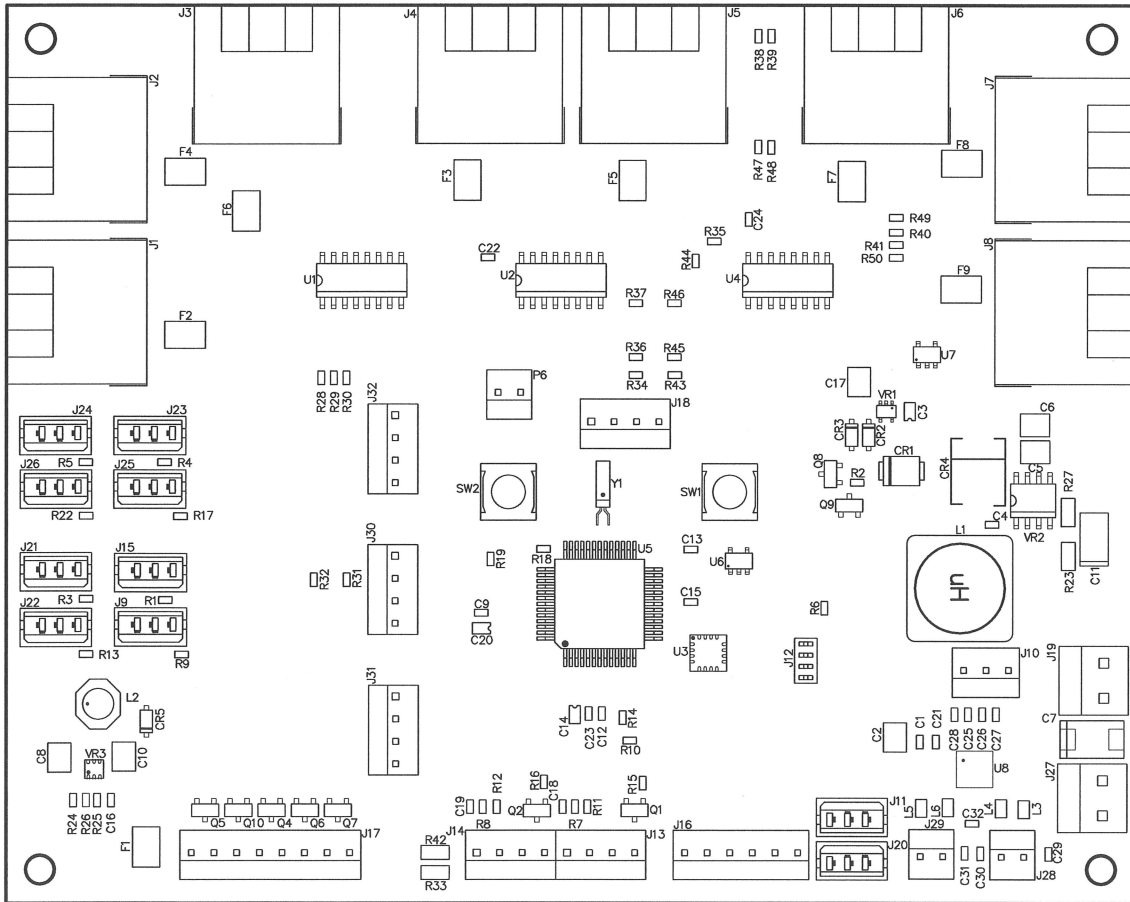
PO Box 810  
501 Oak Street  
Sweetwater, Texas 79556  
U.S.A. 1-800-622-0828

Drawn: JK	3/27/2012	Title: Host Board
Design: RDS	6/28/2011	Model: 4906A/2100
Board#: 5420-275		
Approve: <i>RDS</i>	Sheet: 2 of 3	Series
Print Date: 1/29/2014 9:05:59 AM	Rev: 5	Sheet
W:\Projects\LMM\4906A\5420-275\REV9\420275RSP2.SchDoc	420	275





		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
		Drawn: JK Design: RDS Approved: <i>[Signature]</i> Print Date: 1/29/2014 9:00:59 AM W:\Projects\LMM 4906A\5420-275\REV5420275R3P3.SchDoc	Title: Host Board Model: 4906A/2100 Sheet: 3 of 3 Rev: 5

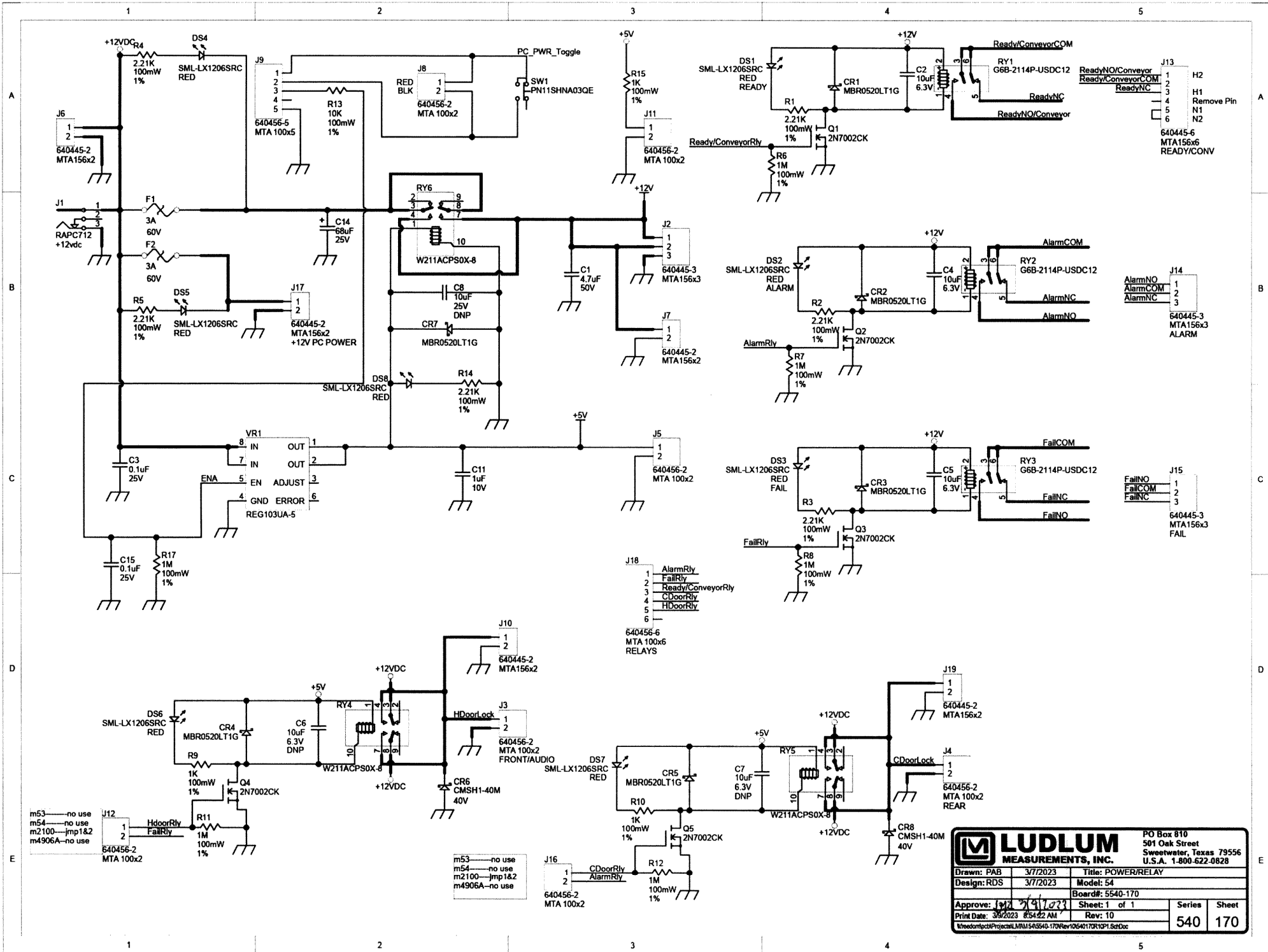


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501 Oak Street  
Sweetwater, TX 79556  
U.S.A. 1-800-622-0828

Title: Host Board

Drawn: JK	3/27/2012	Model: 4906A/2100
Design: RDS	6/28/2011	Board#: 5420-275
Approve: <i>RDS</i>	<i>2/2/2011</i>	Rev: 5
PCBA Manual Drawing		SCALE: 1.00
Print Date: 1/29/2014	9:01:04 AM	Top Overlay
		Series 420
		Sheet 276B

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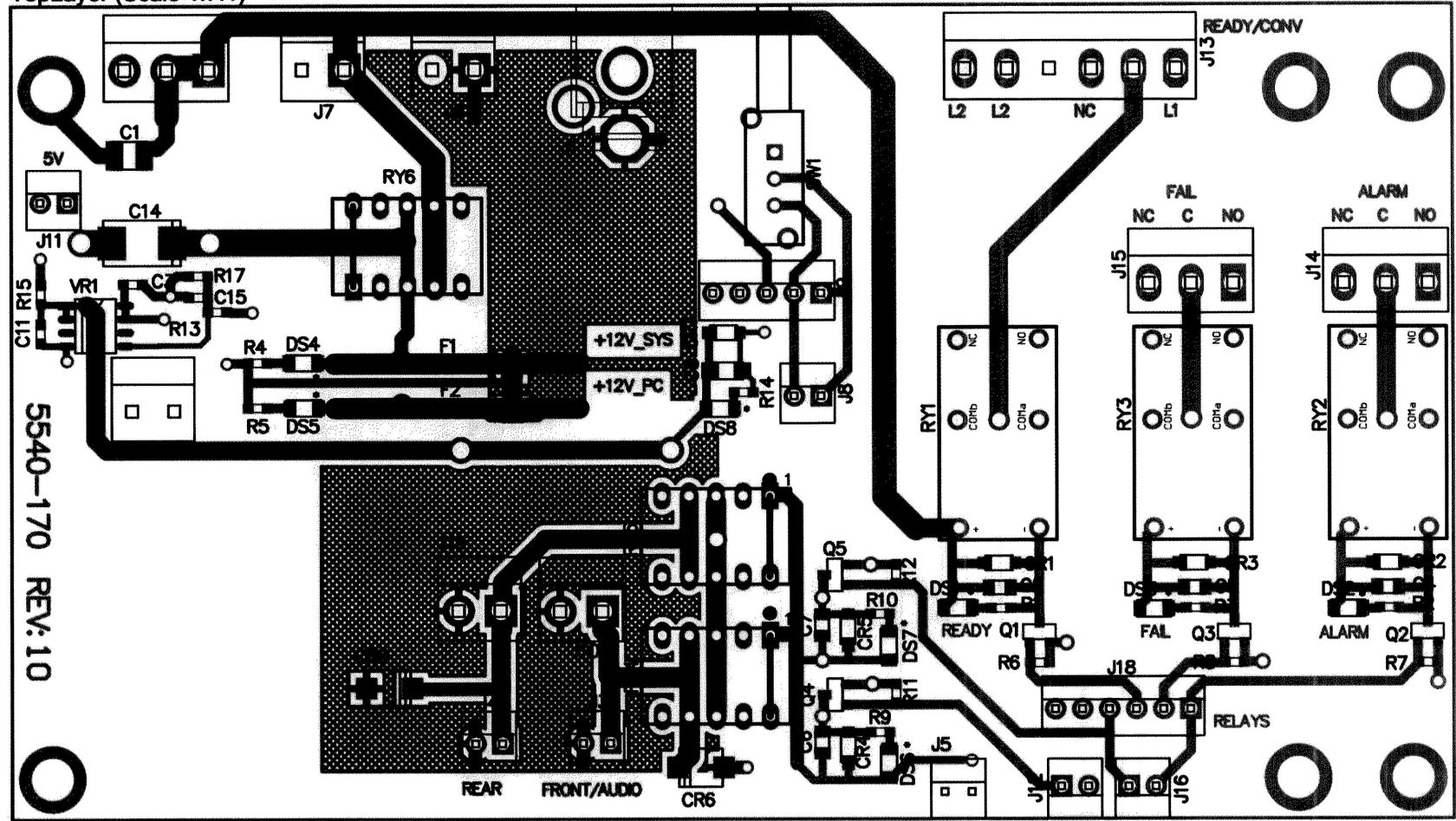


m53 — no use  
 m54 — no use  
 m2100 — jmp1&2  
 m4906A — no use

m53 — no use  
 m54 — no use  
 m2100 — jmp1&2  
 m4906A — no use

		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
		Drawn: PAB Design: RDS Approve: [Signature] Print Date: 3/7/2023 8:54:22 AM W:\electron\Project\LMM\543543-170\Rev106\0170R10P1.SchDoc	Title: POWER/RELAY Model: 54 Board#: 5540-170 Sheet: 1 of 1 Rev: 10
		540	170

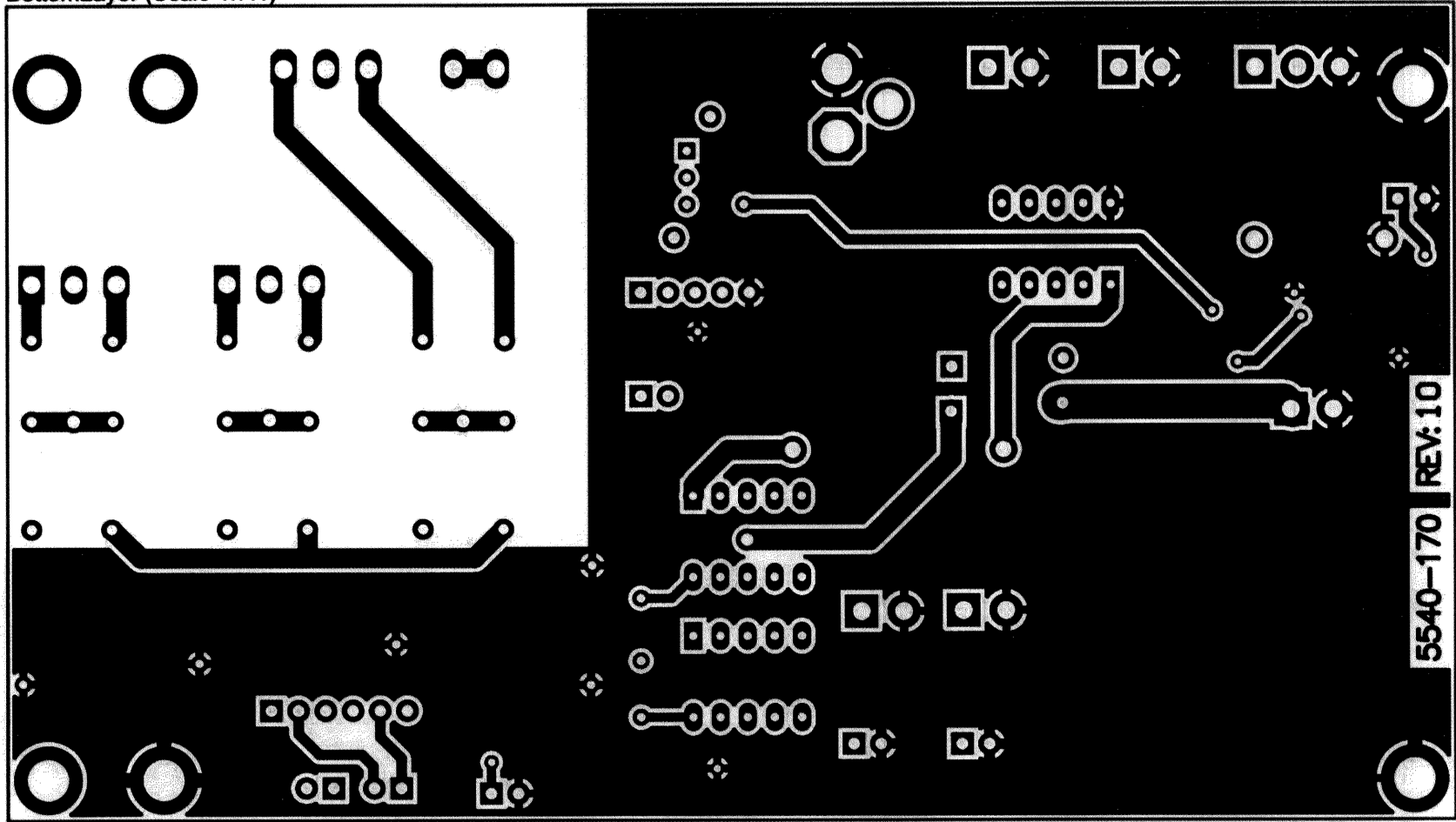
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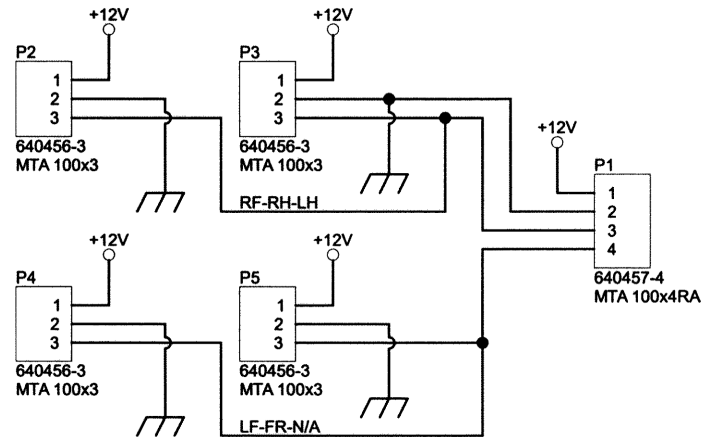
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Part: 5540-170		Model: 54		
Desc: POWER/RELAY				
Design: RDS	Date: 3/7/2023	Rev:	10	
Drawn: PAB	Date: 3/9/2023	SHEET	SERIES	SHEET
Apr: JMS	Date: 3/9/2023	1 of 3	540	171A
\\freedom\pcb\Projects\LMIM 54\5540-170\Rev10				

BottomLayer (Scale 1.7:1)



<b>M LUDLUM MEASUREMENTS</b>				
Part: 5540-170		Model: 54		
Desc: POWER/RELAY				
Design: RDS	Date: 3/7/2023	Rev:	10	
Drawn: PAB	Date: 3/9/2023	SHEET	SERIES	SHEET
Apr: JJC	Date: 3/9/2023	2 of 3	540	171A
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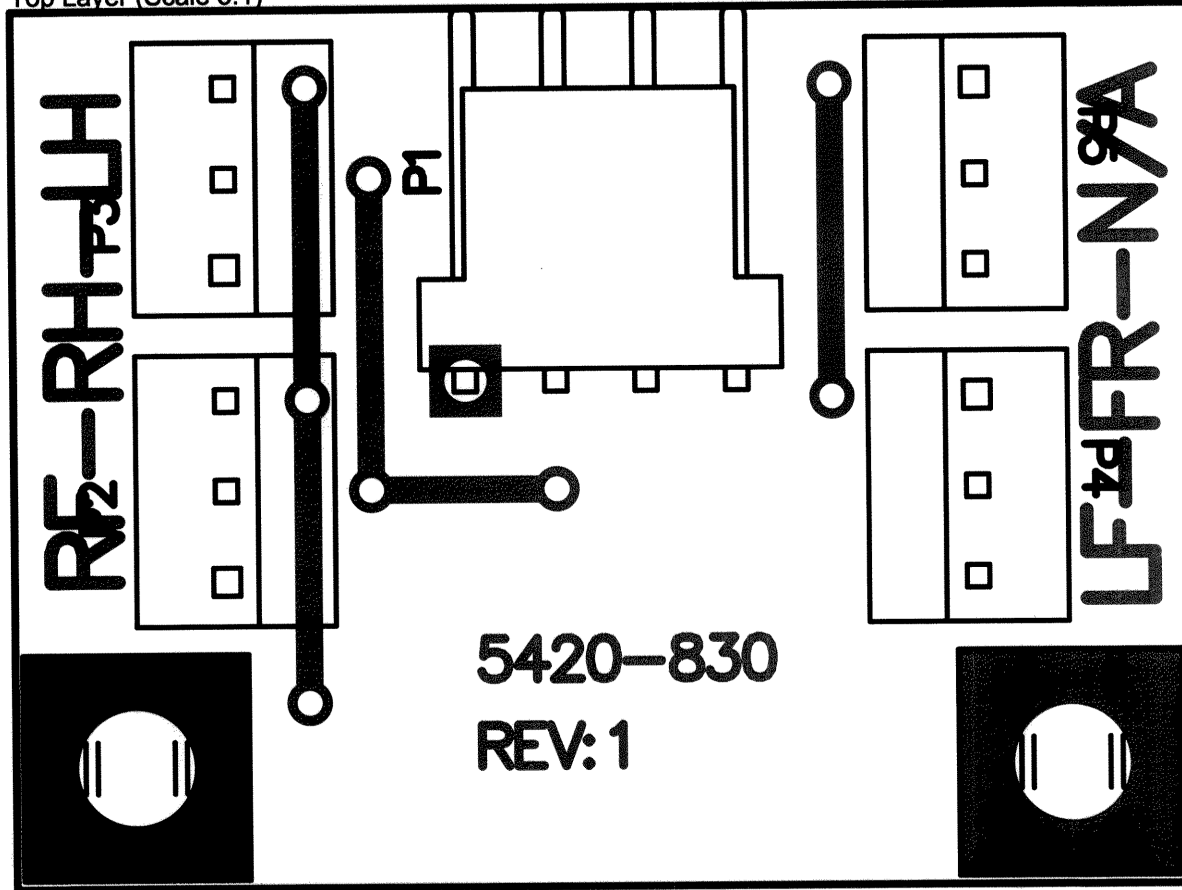


MH1  
 ●  
 CONCORD-90-9451-044

MH2  
 ●  
 CONCORD-90-9451-044

		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
		<b>Drawn:</b> PAB <b>Design:</b> RDS	4/20/2022 4/20/2022
<b>Approved:</b> <i>RDS 20/4/2022</i>	<b>Print Date:</b> 4/20/2022 2:06:30 PM	<b>Sheet:</b> 1 of 1 <b>Rev:</b> 1	<b>Series:</b> 420 <b>Sheet:</b> 830
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Top Layer (Scale 5:1)



5420-830  
REV: 1

<b>M LUDLUM MEASUREMENTS</b>				
Part: 5420-830		Model: 4906A/AB		
Desc: SENSOR COMBINER				
Design: RDS	Date: 4/20/2022	Rev:	1	
Drawn: PAB	Date: 4/20/2022	SHEET	SERIES	SHEET
Apr: <i>RIS</i>	Date: <i>20 Apr 22</i>	of 3		
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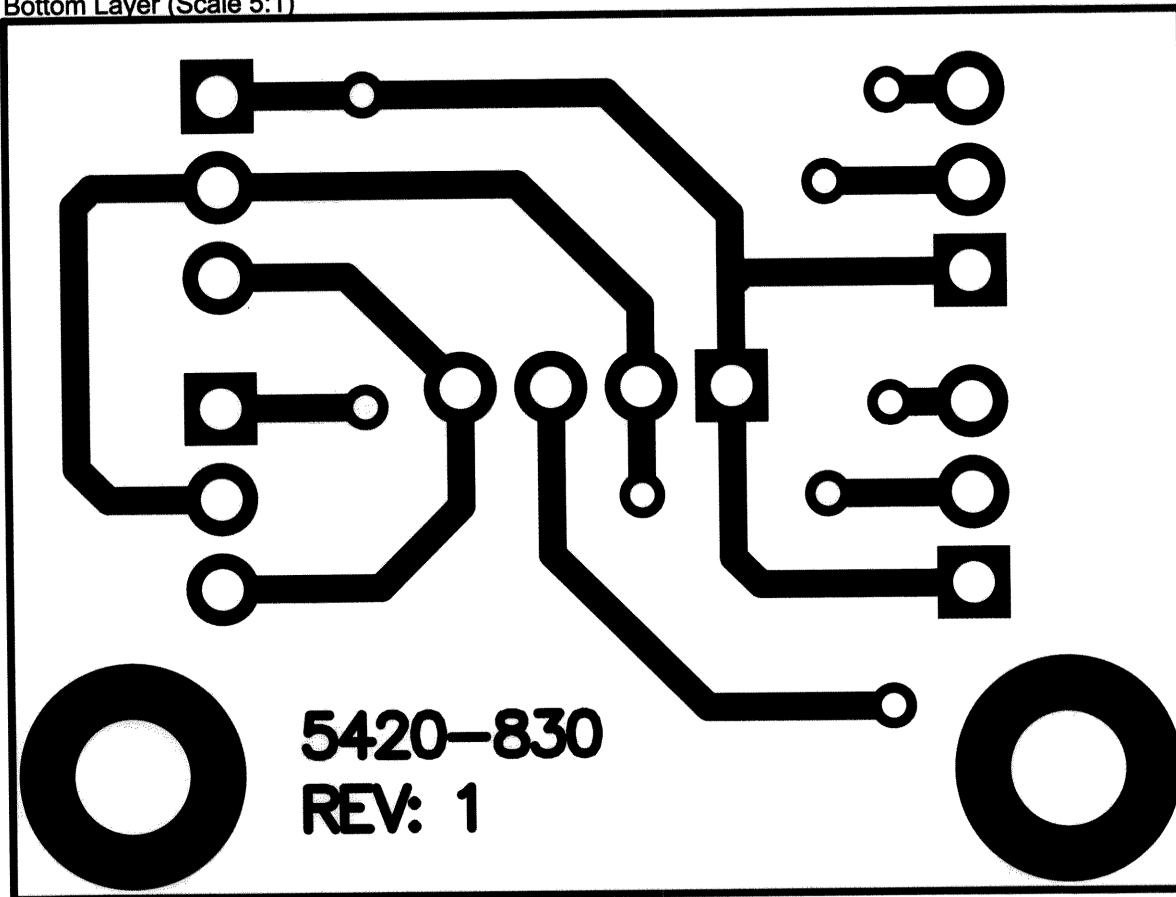
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Bottom Layer (Scale 5:1)



**5420-830**  
**REV: 1**

 <b>LUDLUM MEASUREMENTS</b>				
Part: 5420-830		Model: 4906A/AB		
Desc: SENSOR COMBINER				
Design: RDS	Date: 4/20/2022	Rev:	1	
Drawn: PAB	Date: 4/20/2022	SHEET	SERIES	SHEET
Apr: <i>R/S</i>	Date: <i>20 Apr 2022</i>	of 3		
W:\Projects\LM\4906A\5420-830\Rev1			420	831

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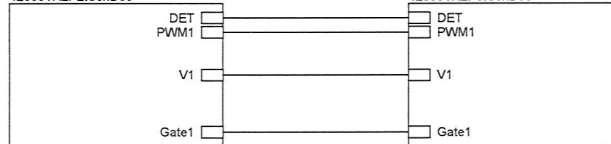
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U\_420691R1P2  
420691R2P2.SchDoc

U\_420691R1P3  
420691R2P3.SchDoc



		<b>LUDLUM</b>		PO Box 810	
		MEASUREMENTS, INC.		501 Oak Street	
				Sweetwater, Texas 79556	
				U.S.A. 1-800-622-0828	
Drawn: PAB	5/10/2019	Title: AIR ALPHA DETECTOR BOARD			
Design: RDS	5/10/2019	Model: 4906A			
		Board#: 5420-691			
Approved: 		Sheet: 1	of 3	Series	Sheet
Print Date: 7/29/2019 11:20:42 AM		Rev: 2		420	691
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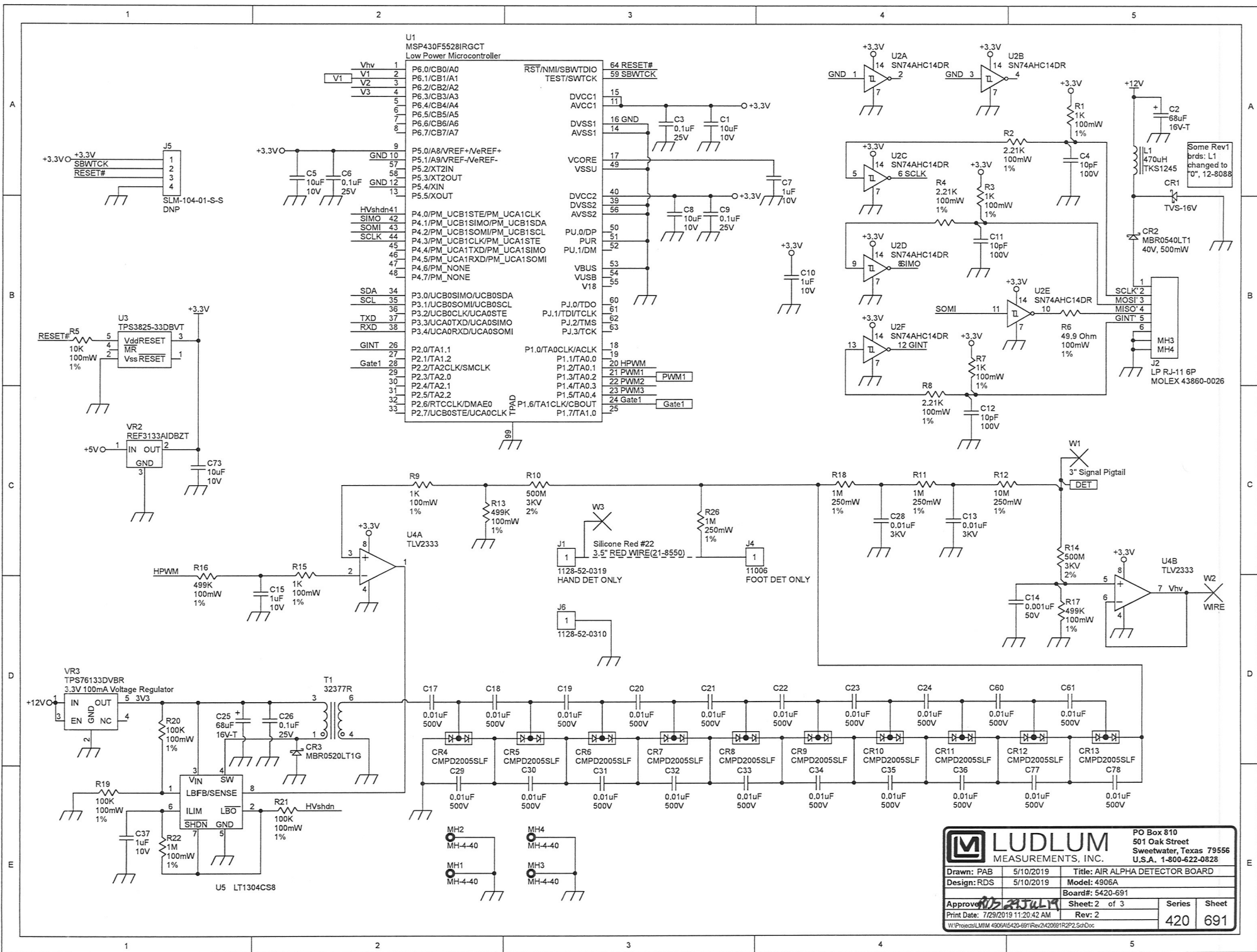
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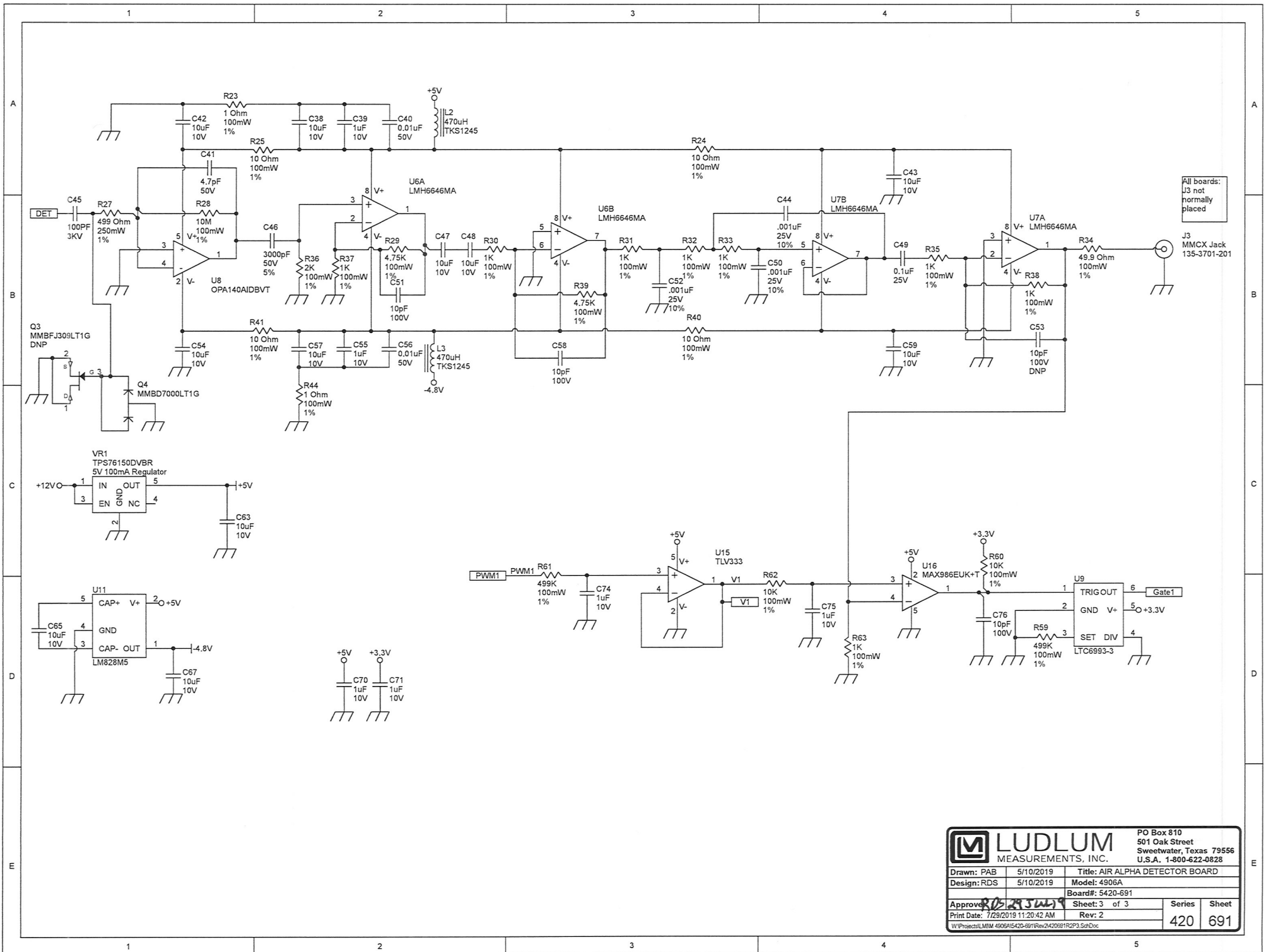
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		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
		Drawn: PAB Design: RDS Approved: <i>[Signature]</i> Print Date: 7/29/2019 11:20:42 AM	Title: AIR ALPHA DETECTOR BOARD Model: 4906A Board#: 5420-691 Sheet: 2 of 3 Rev: 2

W:\Projects\MIM 4906A\5420-691\Rev2\420691R2P2.SchDoc



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Drawn: PAB	5/10/2019	Title: AIR ALPHA DETECTOR BOARD
Design: RDS	5/10/2019	Model: 4906A
Approved: <i>[Signature]</i>		Board#: 5420-691
Print Date: 7/29/2019 11:20:42 AM	Sheet: 3 of 3	Series
	Rev: 2	Sheet
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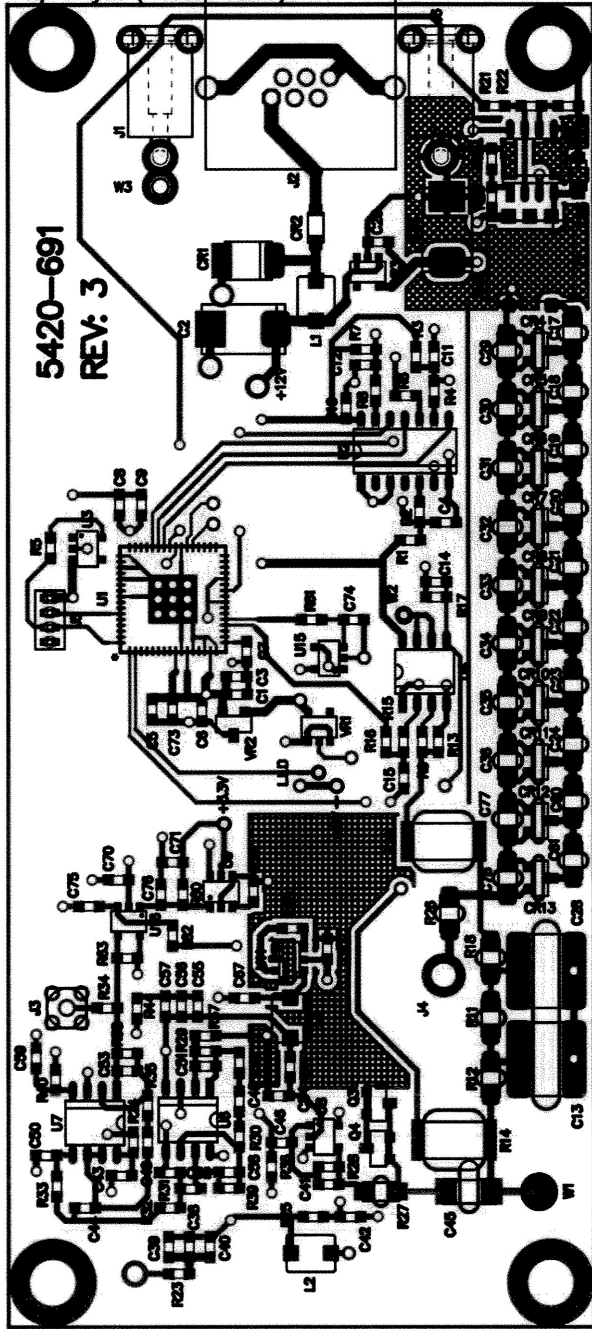
B

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DO NOT PLACE J3, J4, J5, J6, Q3, C53 and W3

Top Layer (Scale 1.6:1)



**LUDLUM MEASUREMENTS**

Part: 5420-691

Model: 4906A

Desc: AIR ALPHA DETECTOR BOARD

Design: RDS

Date: 5/10/2019

Rev: 3

Drawn: PAB

Date: 3/24/2023

SHEET

SERIES

SHEET

Apr: RDS

Date: 24/Mar/23 1 of 3

420

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\\freedom\pcb\Projects\LM\MM 4906A\5420-691\Rev3

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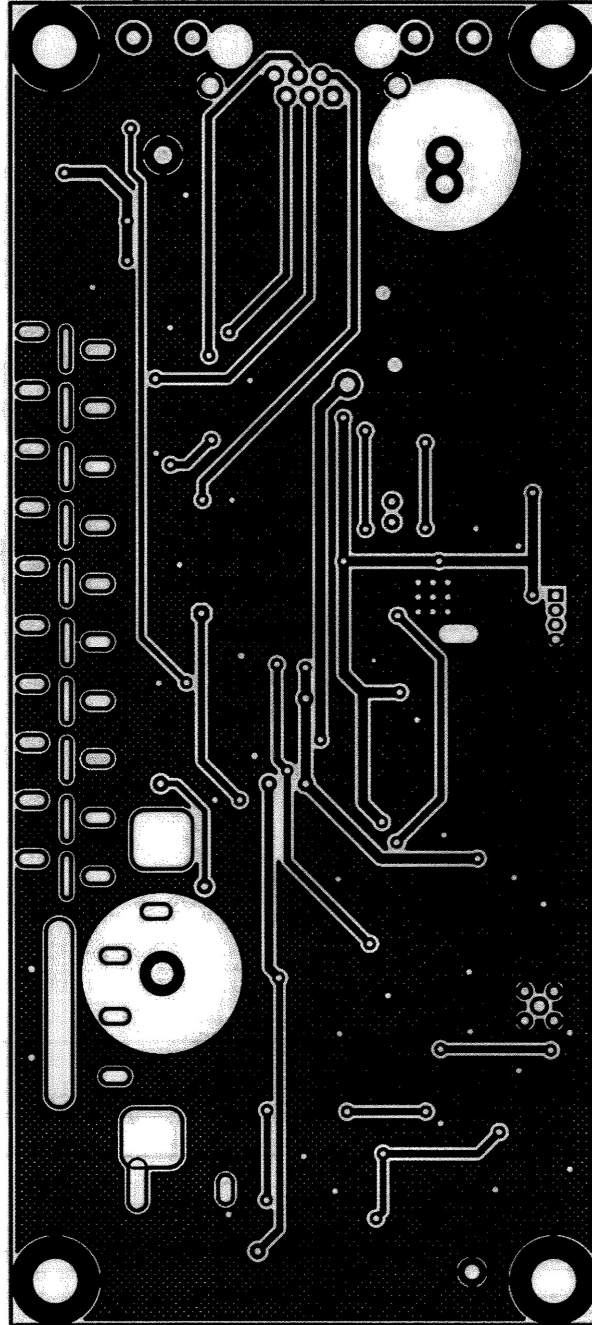
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Bottom Layer (Scale 1.6:1)



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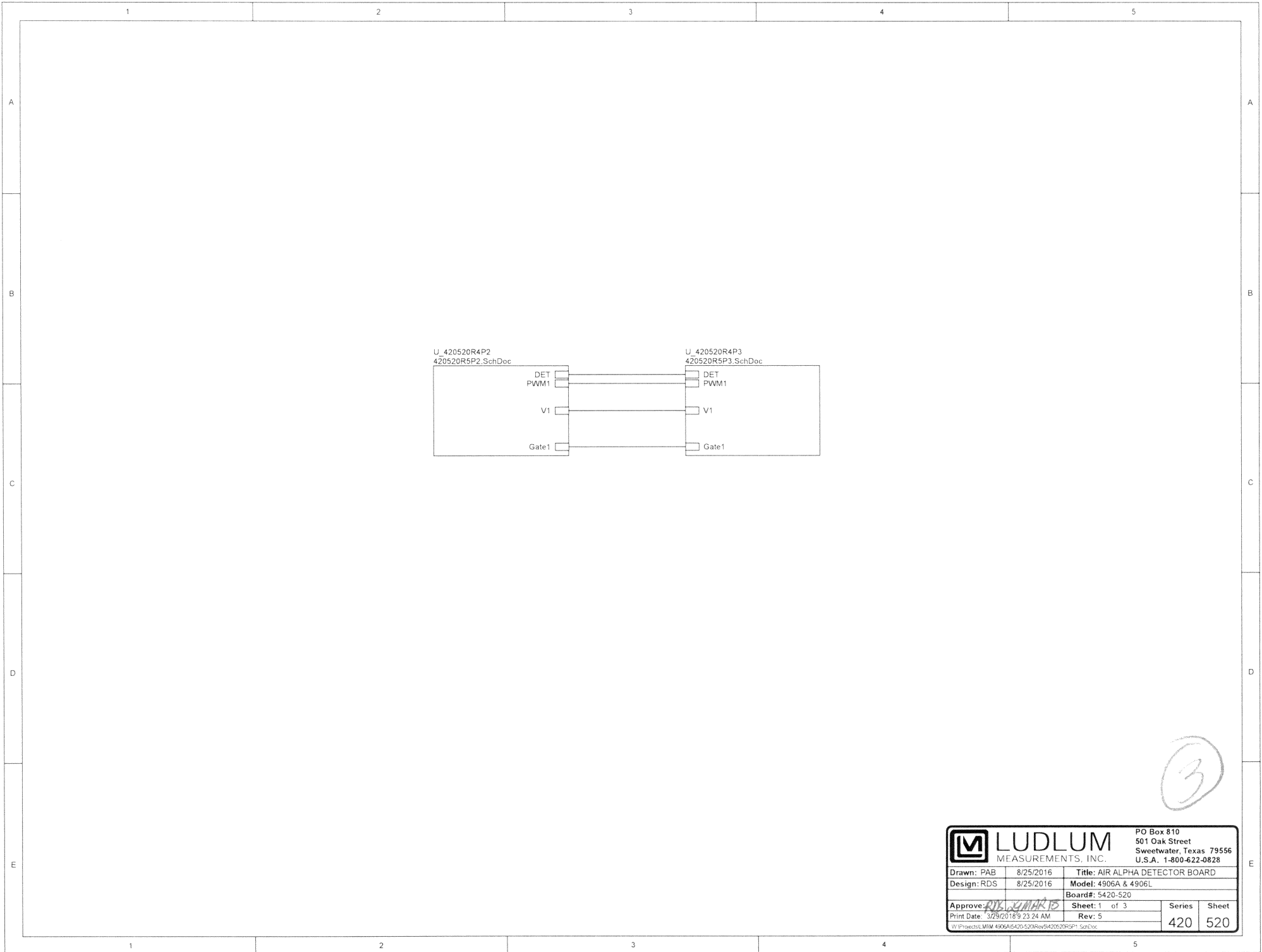
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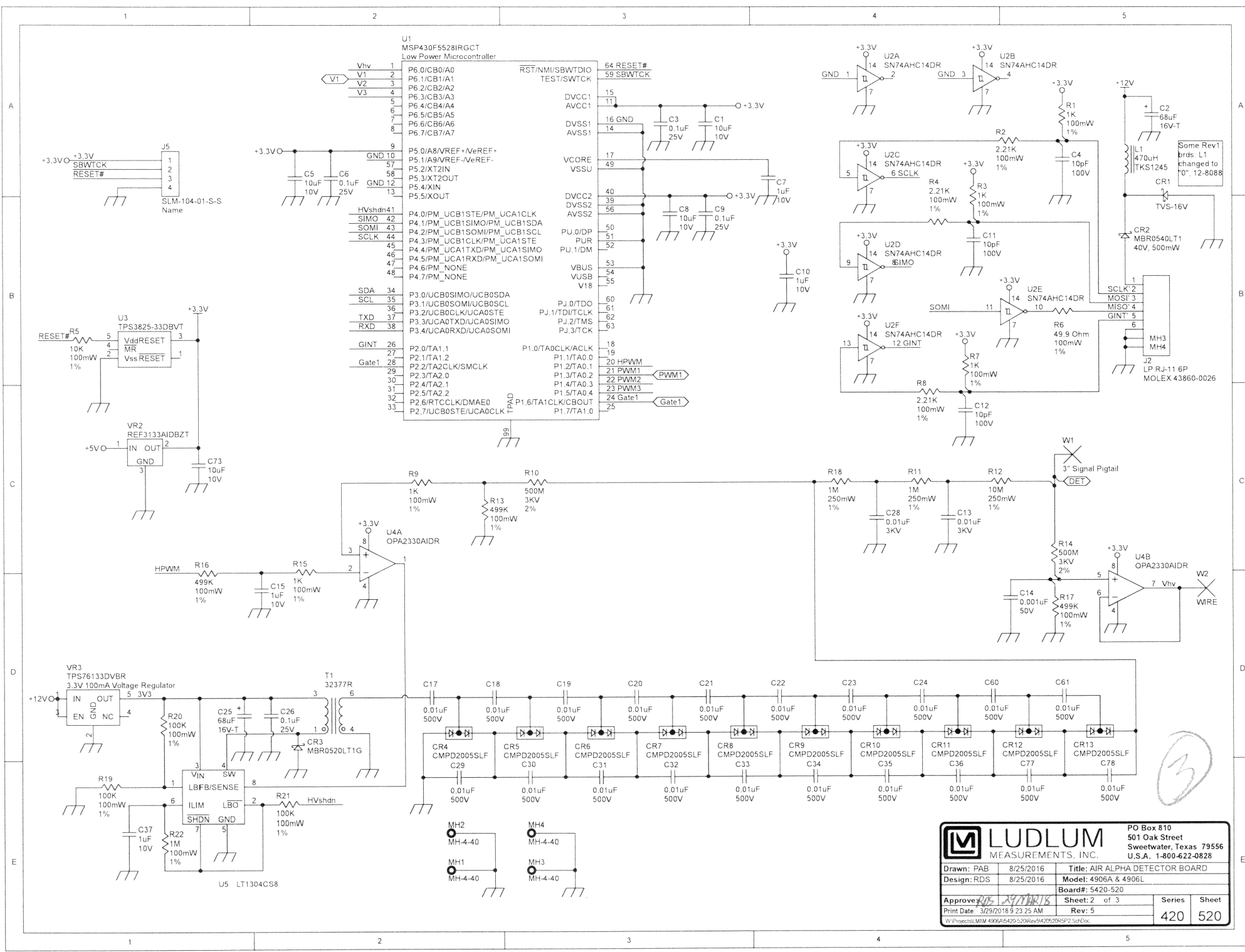
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<b>M LUDLUM MEASUREMENTS</b>				
Part: 5420-691		Model: 4906A		
Desc: AIR ALPHA DETECTOR BOARD				
Design: RDS	Date: 5/10/2019	Rev:	3	
Drawn: PAB	Date: 3/24/2023	SHEET	SERIES	SHEET
Apr: <i>RDS</i>	Date: <i>24 Mar 23</i>	2 of 3		
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		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
		Drawn: PAB 8/25/2016	Title: AIR ALPHA DETECTOR BOARD
Design: RDS 8/25/2016	Model: 4906A & 4906L		Board#: 5420-520
Approve: <i>RYS. GARRIS</i>	Sheet: 1 of 3	Series	Sheet
Print Date: 3/29/2018 9:23:24 AM	Rev: 5	420	520
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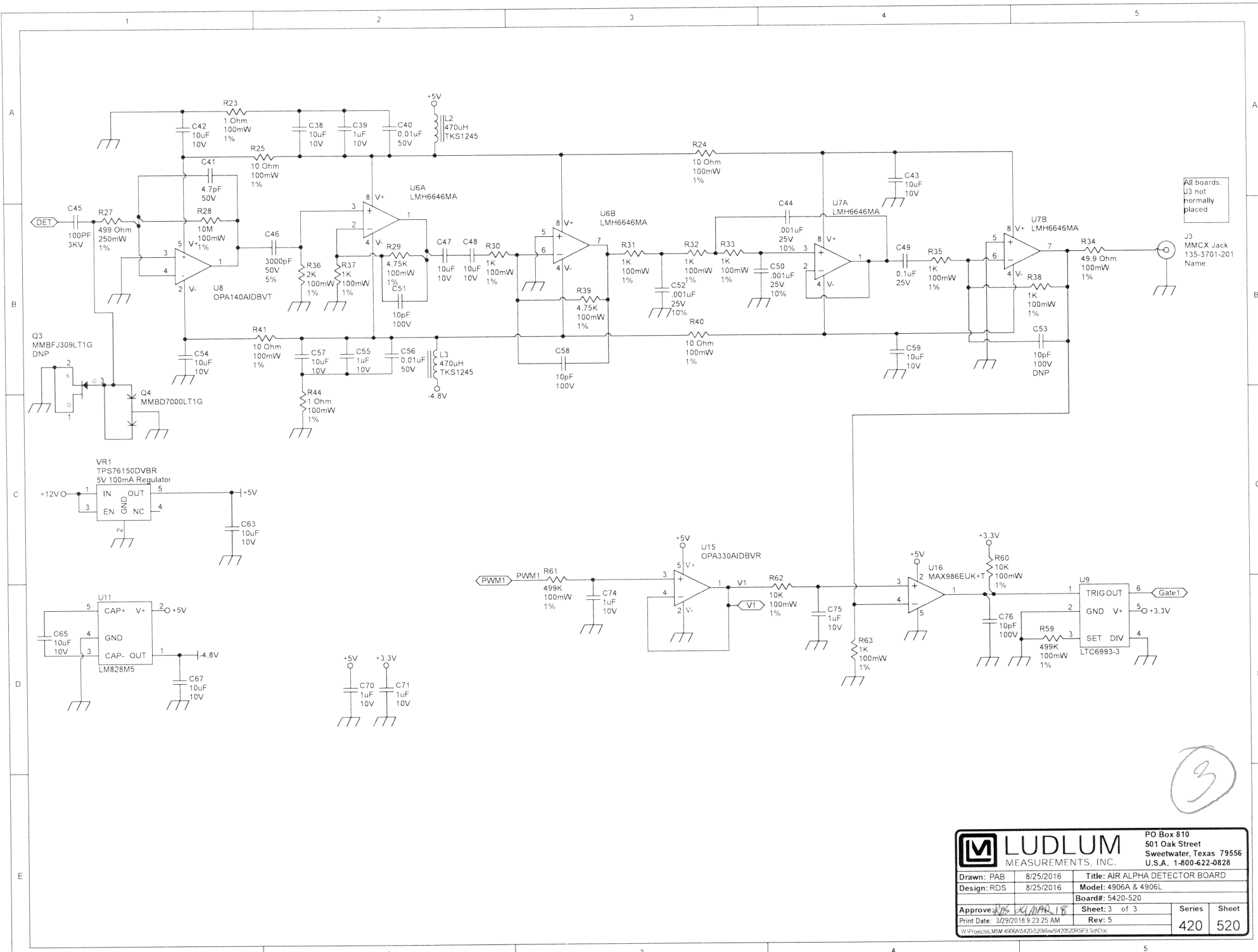


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PO Box 810  
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U.S.A. 1-800-622-0828

Drawn: PAB	8/25/2016	Title: AIR ALPHA DETECTOR BOARD
Design: RDS	8/25/2016	Model: 4906A & 4906L
Board#: 5420-520	Sheet: 2 of 3	Series
Print Date: 3/29/2018 9:23:25 AM	Rev: 5	Sheet
W:\Projects\LMW 4906A\4906L\Rev9\4906L\20180225\5420-520.dwg		420 520

3



All boards:  
U13 not  
normally  
placed

J3  
MMCX Jack  
135-3701-201  
Name

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PO Box 810  
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Sweetwater, Texas 79556  
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Drawn: PAB	8/25/2016	Title: AIR ALPHA DETECTOR BOARD
Design: RDS	8/25/2016	Model: 4906A & 4906L
		Board#: 5420-520
Approved: <i>[Signature]</i>	8/25/2016	Sheet: 3 of 3
Print Date: 3/29/2016 9:23:25 AM	Rev: 5	Series
		420
		520

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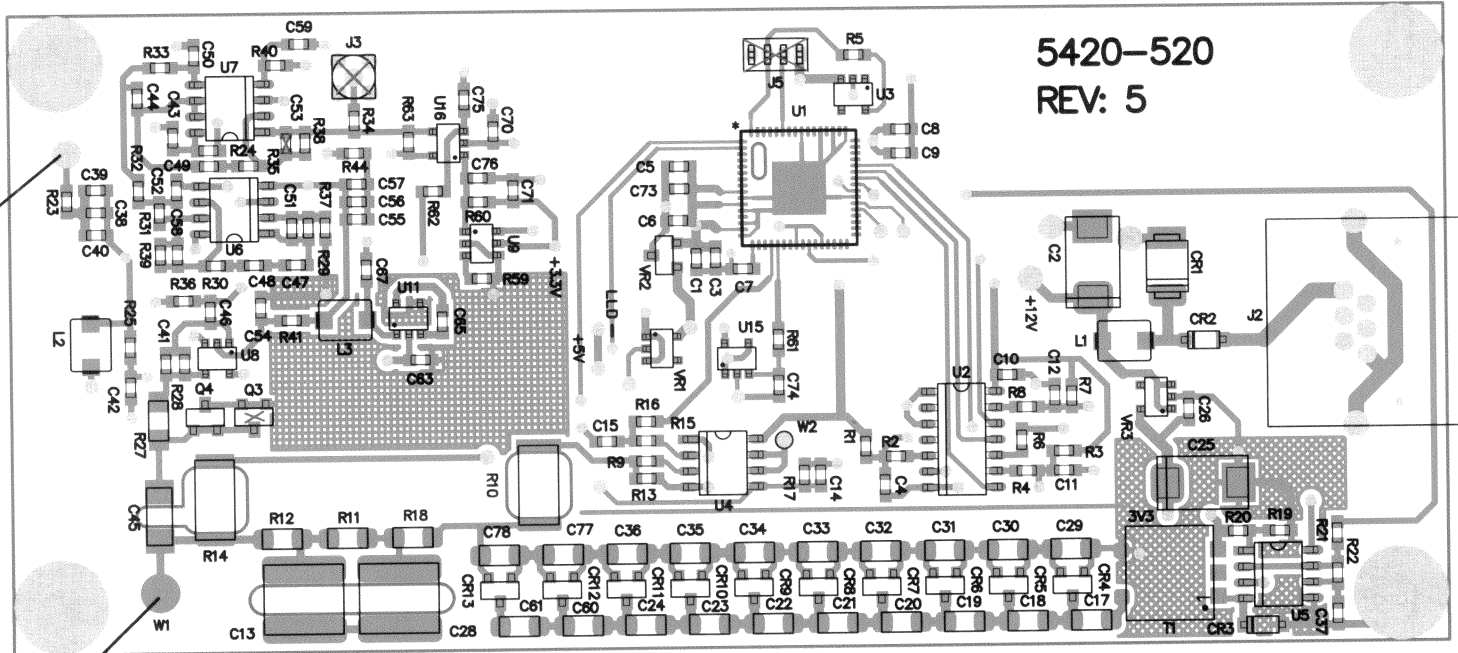


DO NOT PLACE J3, J5, Q3 and C53

5420-520  
REV: 5

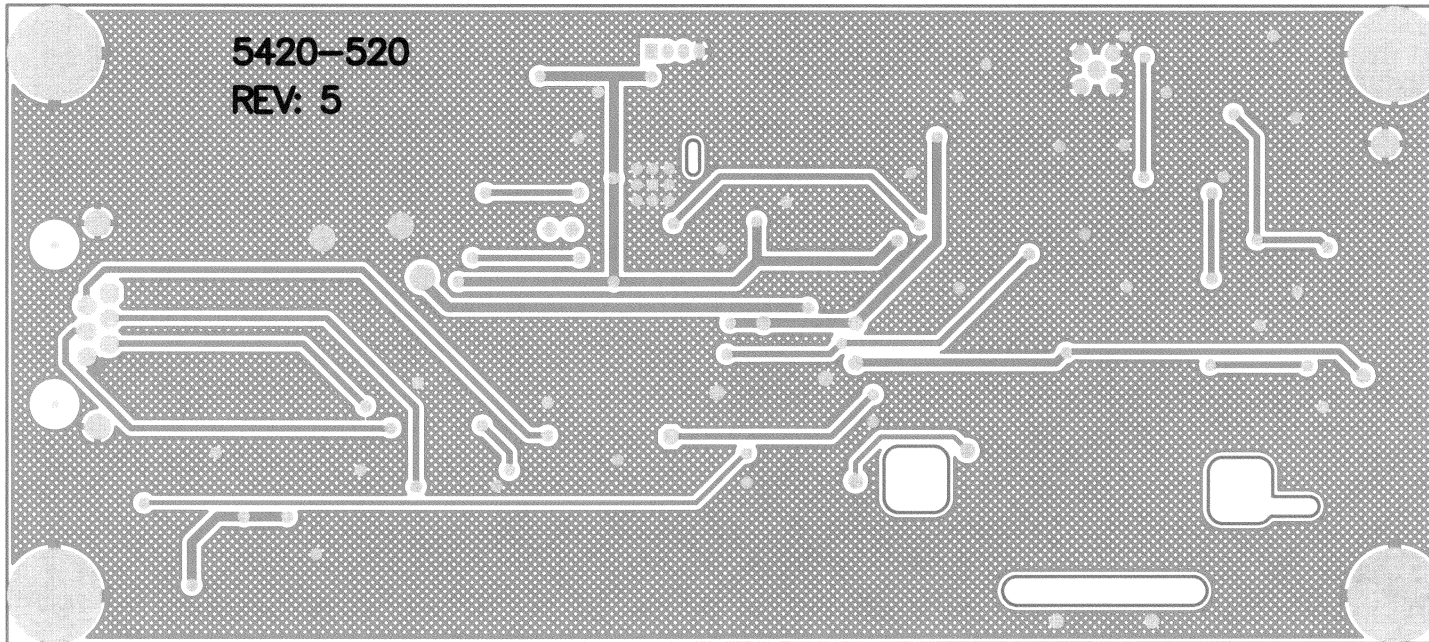
8316-190  
GND PIGTAIL

8316-191  
SIGNAL IN PIGTAIL




		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828		
		Title: AIR ALPHA DETECTOR BOARD		
Drawn: PAB Design: RDS Approve: <i>RDS</i>	8/25/2016 8/25/2016 29 MAR 18	Model: 4906A & 4906L Board#: 5420-520 Rev: 5	SCALE: 1.08 Top Overlay	Series Sheet 420 521 A
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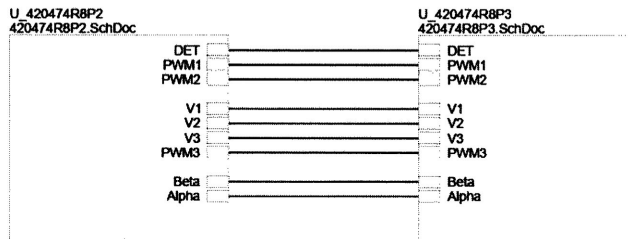
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5420-520  
REV: 5

 <b>LUDLUM</b> <b>MEASUREMENTS, INC.</b>		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828	
		<b>Title:</b> AIR ALPHA DETECTOR BOARD	
<b>Drawn:</b> PAB	8/25/2016	<b>Model:</b> 4906A & 4906L	
<b>Design:</b> RDS	8/25/2016	<b>Board#:</b> 5420-520	
<b>Approve:</b> <i>RDS</i>	<i>29/MAR/18</i>	<b>Rev:</b> 5	
<b>Print Date:</b>		<b>SCALE:</b> 1.08	<b>Series</b> <b>Sheet</b>
3/29/2018	9:30:25 AM	Bottom Overlay	420 521 A
<small>W:\Projects\LM\4906A\5420-520\Rev5\420520R5 Assy.PcbDoc</small>			

②



		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: PAB	11/10/2022	Title: DETECTOR SLAVE (NO AUDIO)	
Design: RDS	11/10/2022	Model: 4906AB	
Approved:		Board#: 5420-474	
Print Date: 11/10/2022 09:37 AM		Sheet: 1 of 3	Series Sheet
		420	474

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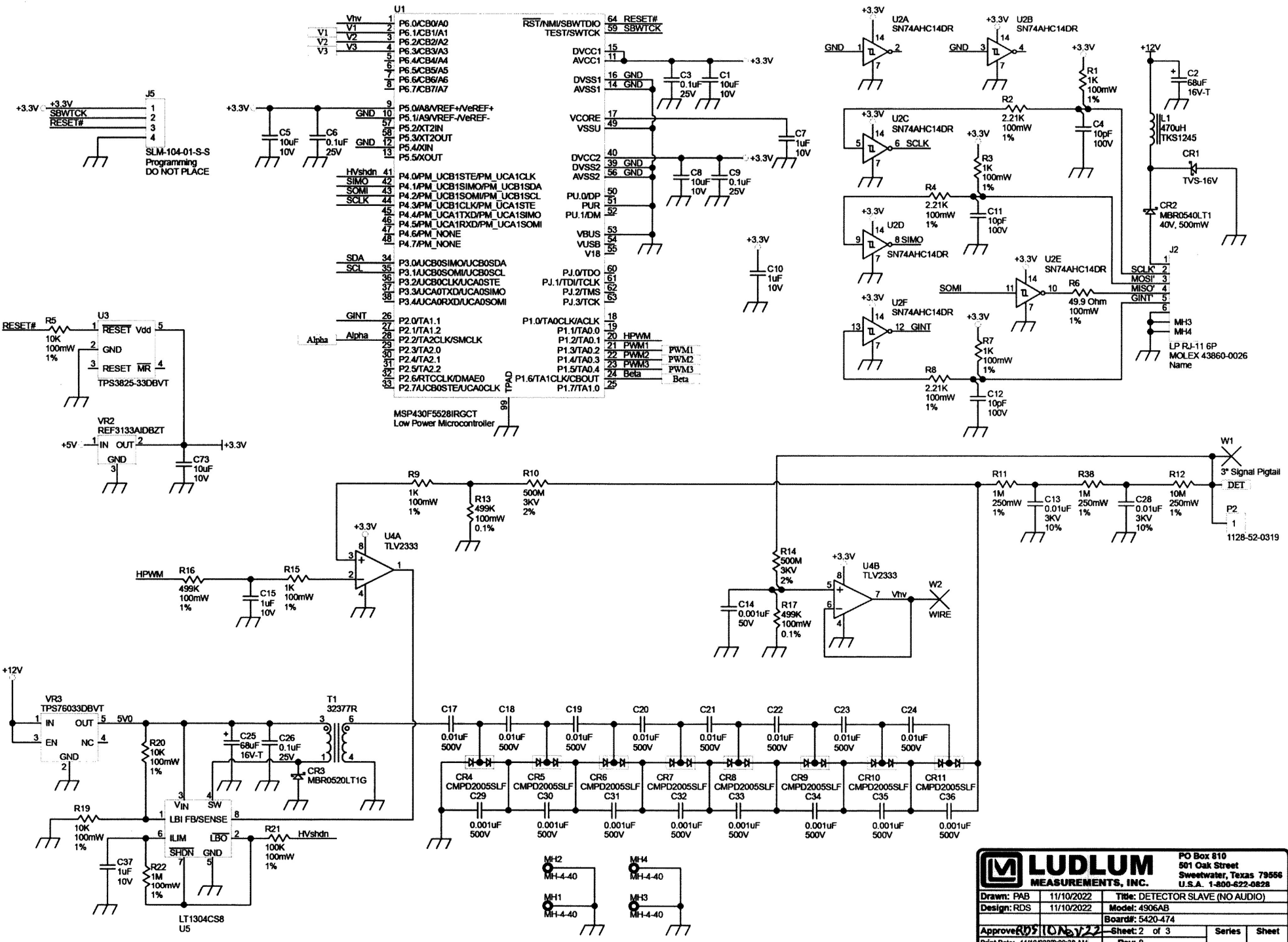
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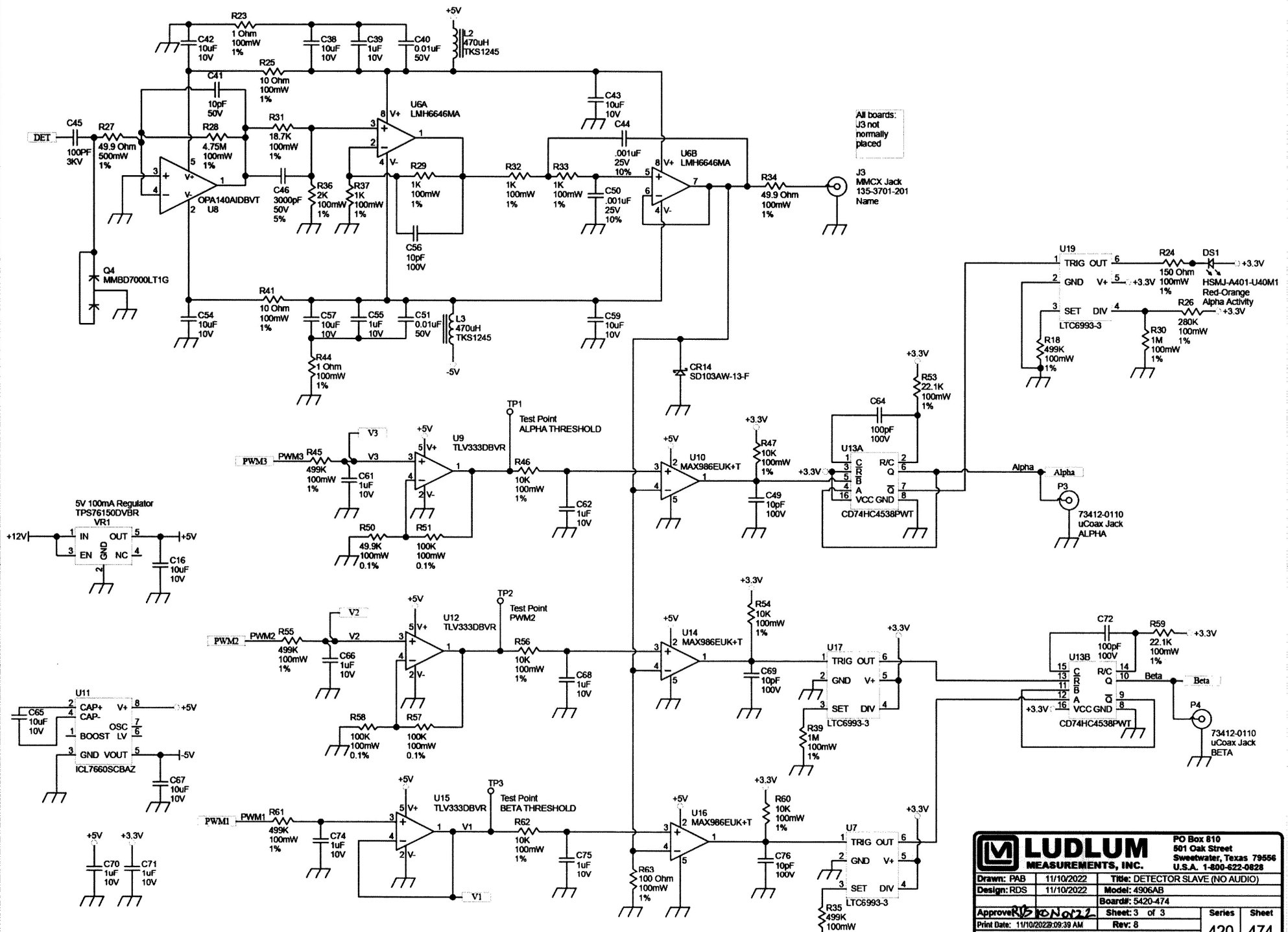
D

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E



		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
		Drawn: PAB 11/10/2022 Design: RDS 11/10/2022	Title: DETECTOR SLAVE (NO AUDIO) Model: 4906AB Board#: 5420-474
Approved:  11/10/2022 Print Date: 11/10/2022 09:38 AM	Sheet: 2 of 3 Rev: 8	Series 420	Sheet 474



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 501 Oak Street  
 Sweetwater, Texas 79556  
 U.S.A. 1-800-622-0828

Drawn: PAB	11/10/2022	Title: DETECTOR SLAVE (NO AUDIO)
Design: RDS	11/10/2022	Model: 4906AB
Approved: <i>[Signature]</i>	Rev: 8	Board#: 5420-474
Print Date: 11/10/2022 09:39 AM	Sheet: 3 of 3	Series: 420
Sheet: 474		

\\thead\pc\Projects\LMMI\4906AB\5420-474\Rev04\20174R2P1.SchDoc

A

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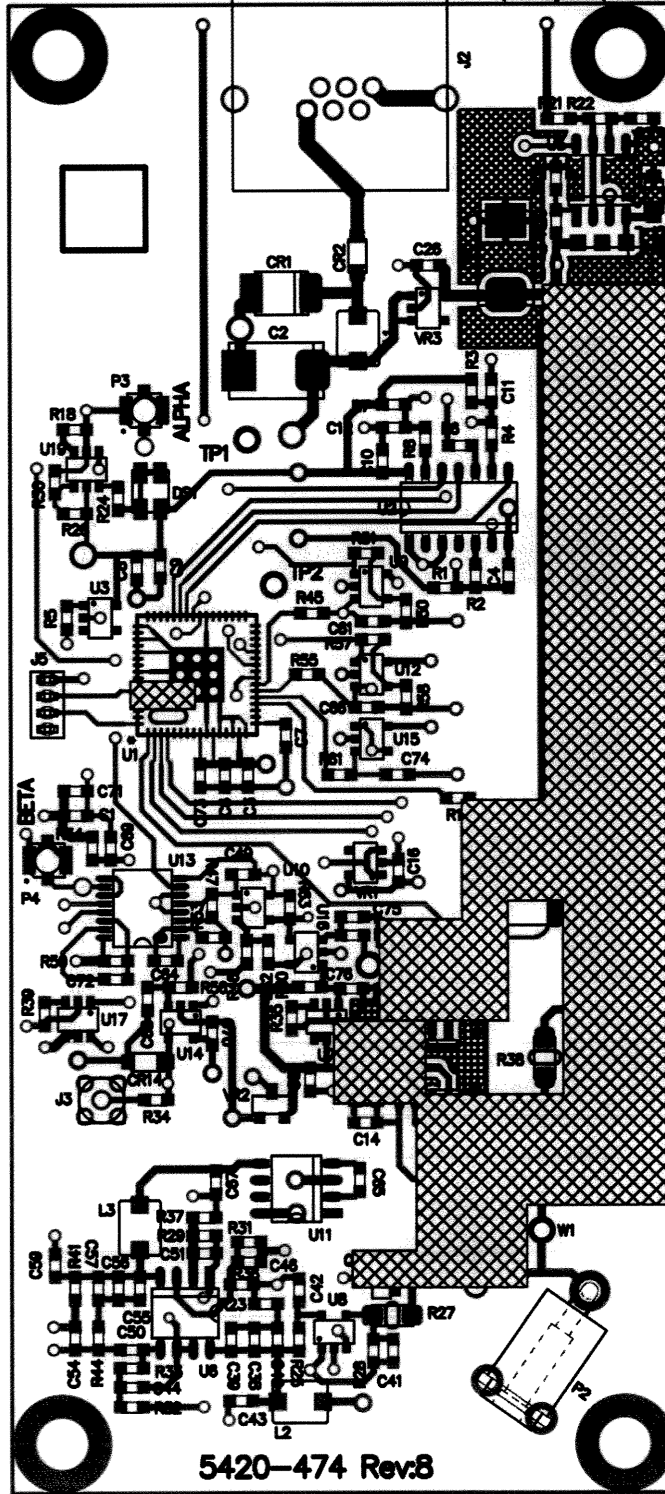
D

DO NOT PLACE J3 AND J5  
P2 MUST BE PARALLEL (LEVEL) TO BOARD BEFORE  
SOLDERING



ADD CORONA DOPE

Top Layer (Scale 1.8:1)



5420-474 Rev:8



**LUDLUM MEASUREMENTS**

Part: 5420-474

Model: 4906AB

Desc: DETECTOR SLAVE (NO AUDIO)

Rev: 8

Design: RDS

Date: 11/10/2022

SERIES

SHEET

Drawn: PAB

Date: 11/10/2022

SHEET

Apr: RDS

Date: 10 Nov 22

1 of 4

420

475

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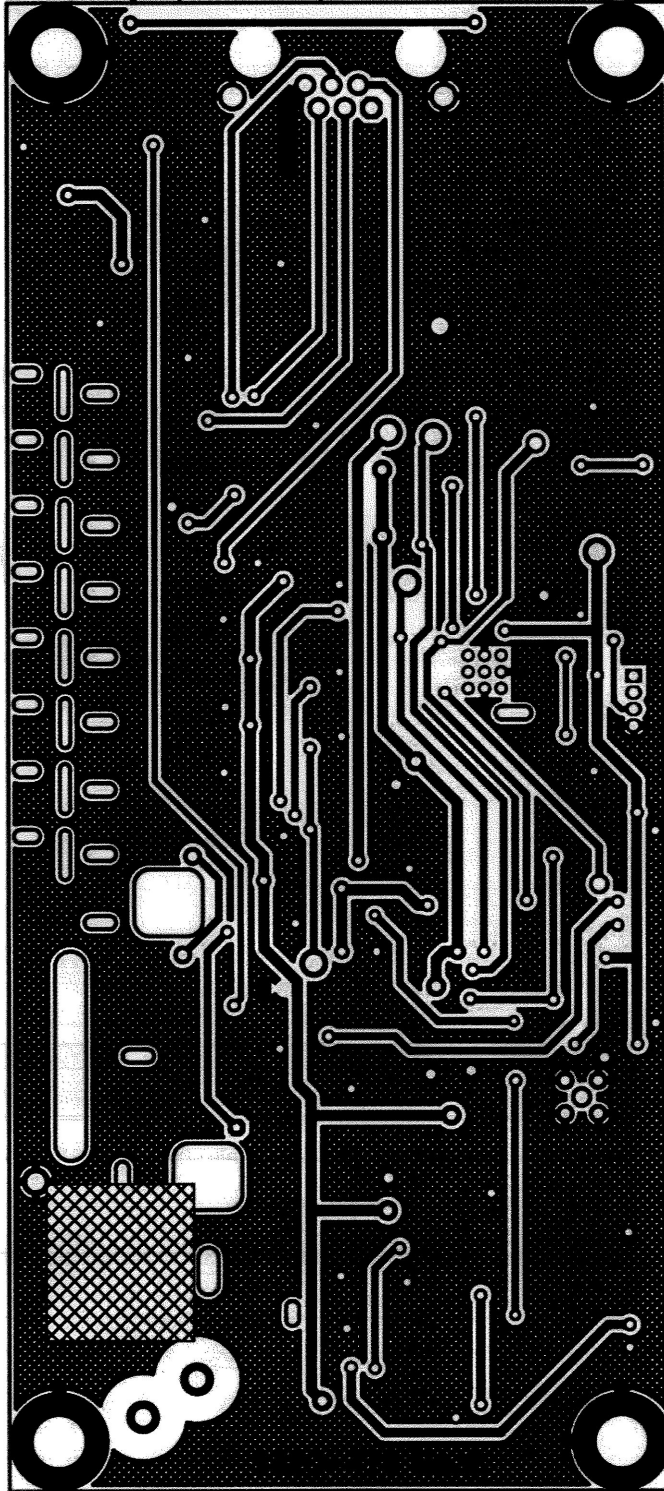
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ADD CORONA DOPE

Bottom Layer (Scale 1.8:1)



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		<b>LUDLUM MEASUREMENTS</b>	
Part: 5420-474		Model: 4906AB	
Desc: DETECTOR SLAVE (NO AUDIO)		Rev:	8
Design: RDS	Date: 11/10/2022	SERIES	SHEET
Drawn: PAB	Date: 11/10/2022	420	475
Apr: <i>RDS</i>	Date: <i>10 Nov 22</i>	2 of 4	

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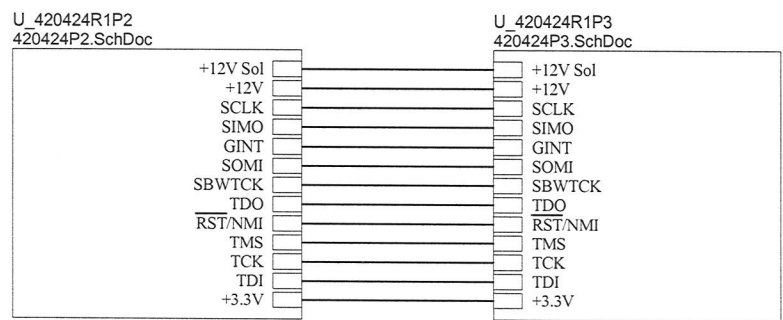
C

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E



**NOTE: Rev 2.0 Schematic is accurate representation of Rev 1.0 board with modifications as of November 9, 2011**

		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828		
		Drawn: TWM Design: TWM Approve: <i>TWM 10/10/2011</i> Print Date: 11/10/2011 2:05:04 PM <small>420424P1.SchDoc</small>	09-NOV-2011 09-NOV-2011 11/10/2011 2:05:04 PM	Title: Gas Flow Control Board Model: 4906AB Board#: 5420-424 Sheet: 1 of 3 Rev: 2.0

1

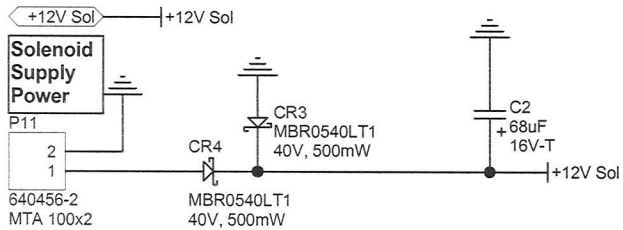
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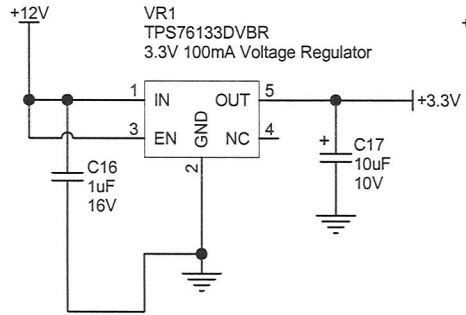
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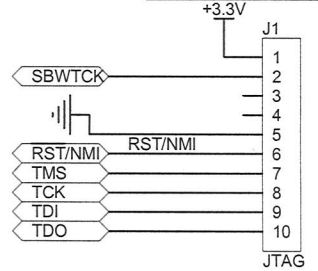




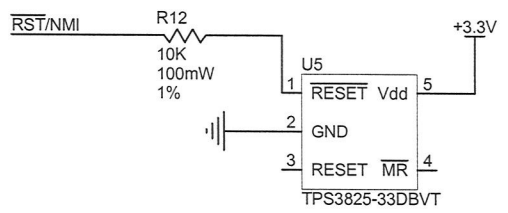
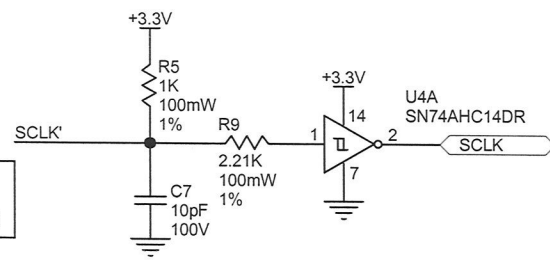
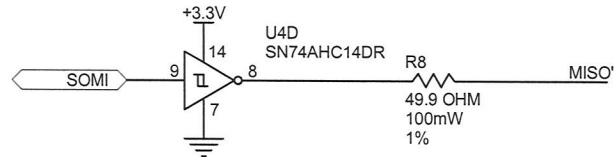
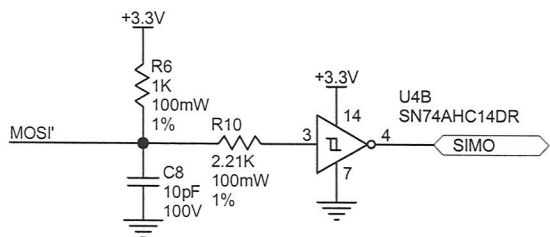
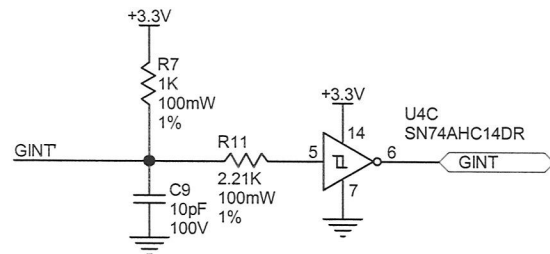
**Voltage Regulators for +3.3V and +5V**



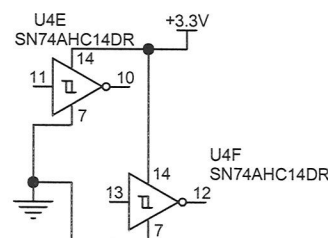
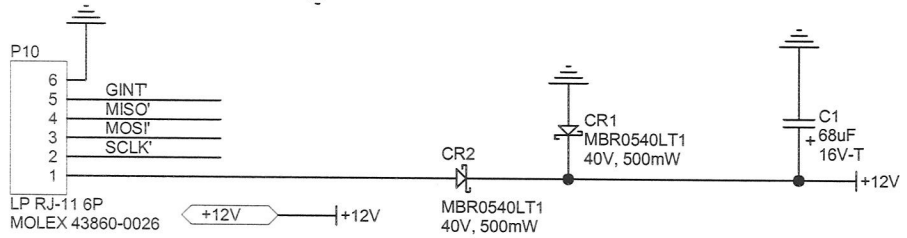
**Programming connection to JTAG/SBW adapter board**



**NOTE: Rev 2.0 Schematic is accurate representation of Rev 1.0 board with modifications as of November 9, 2011**



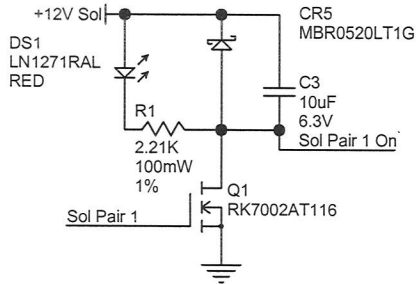
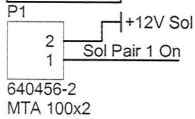
**Power and Communication from Host Board**



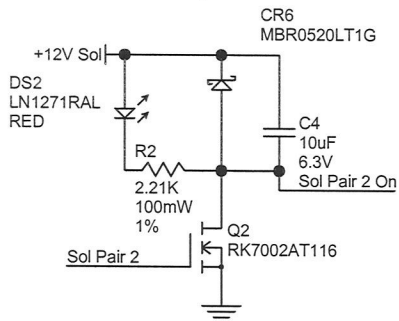
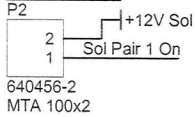
<b>LUDLUM MEASUREMENTS, INC.</b>		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: TWM	09-NOV-2011	Title: Gas Flow Control Board	
Design: TWM	09-NOV-2011	Model: 4906AB	
Approve: <i>TWM</i>		Board#: 5420-424	
Print Date: 11/10/2011 2:28:37 PM	Sheet: 2 of 3	Series	Sheet
	Rev: 2.0	420	424

420424P2.SchDoc

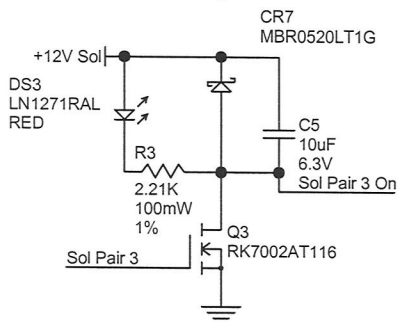
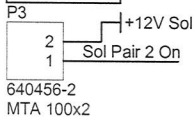
**Hand Detectors Input Flow Solenoid**



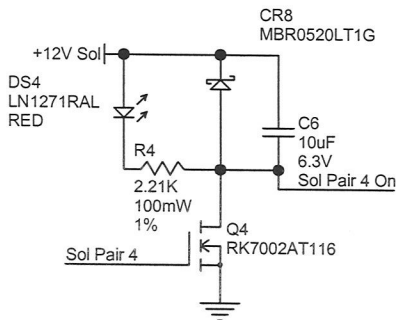
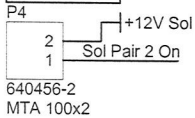
**Hand Detectors Exh Flow Solenoid**



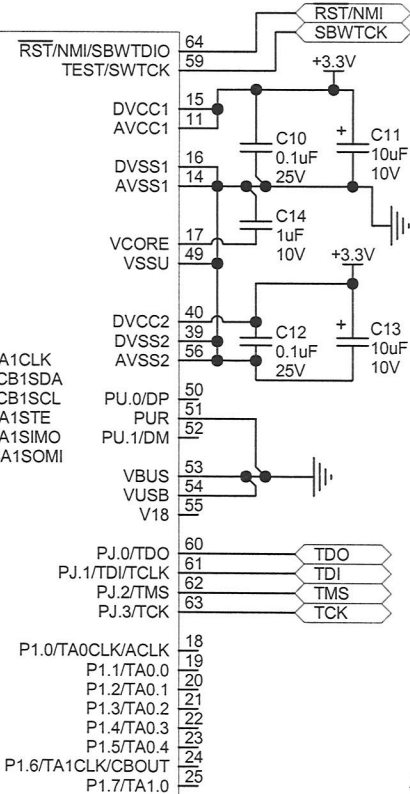
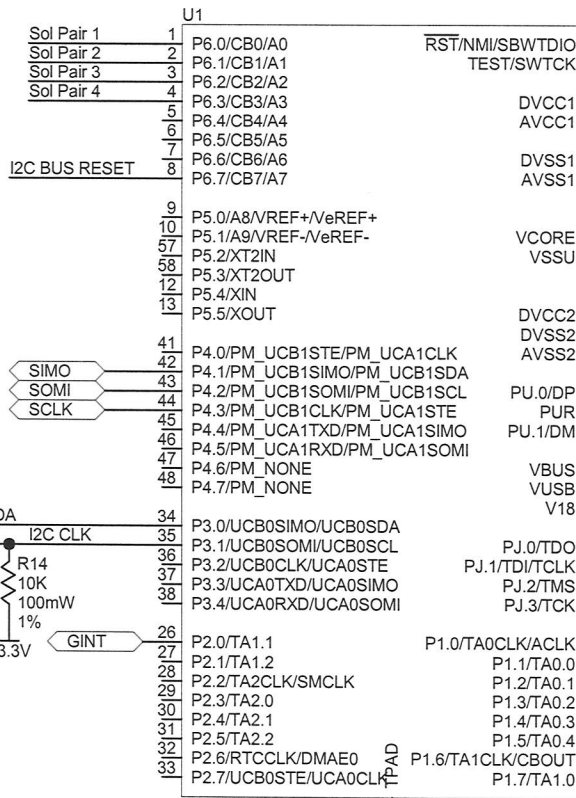
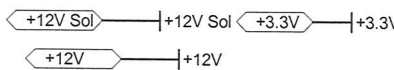
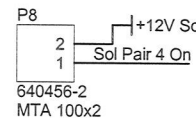
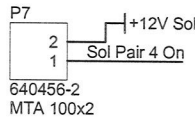
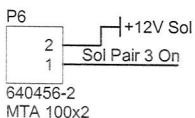
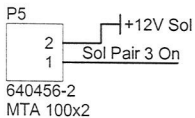
**Foot Detectors Input Flow Solenoid**



**Foot Detectors Exh Flow Solenoid**

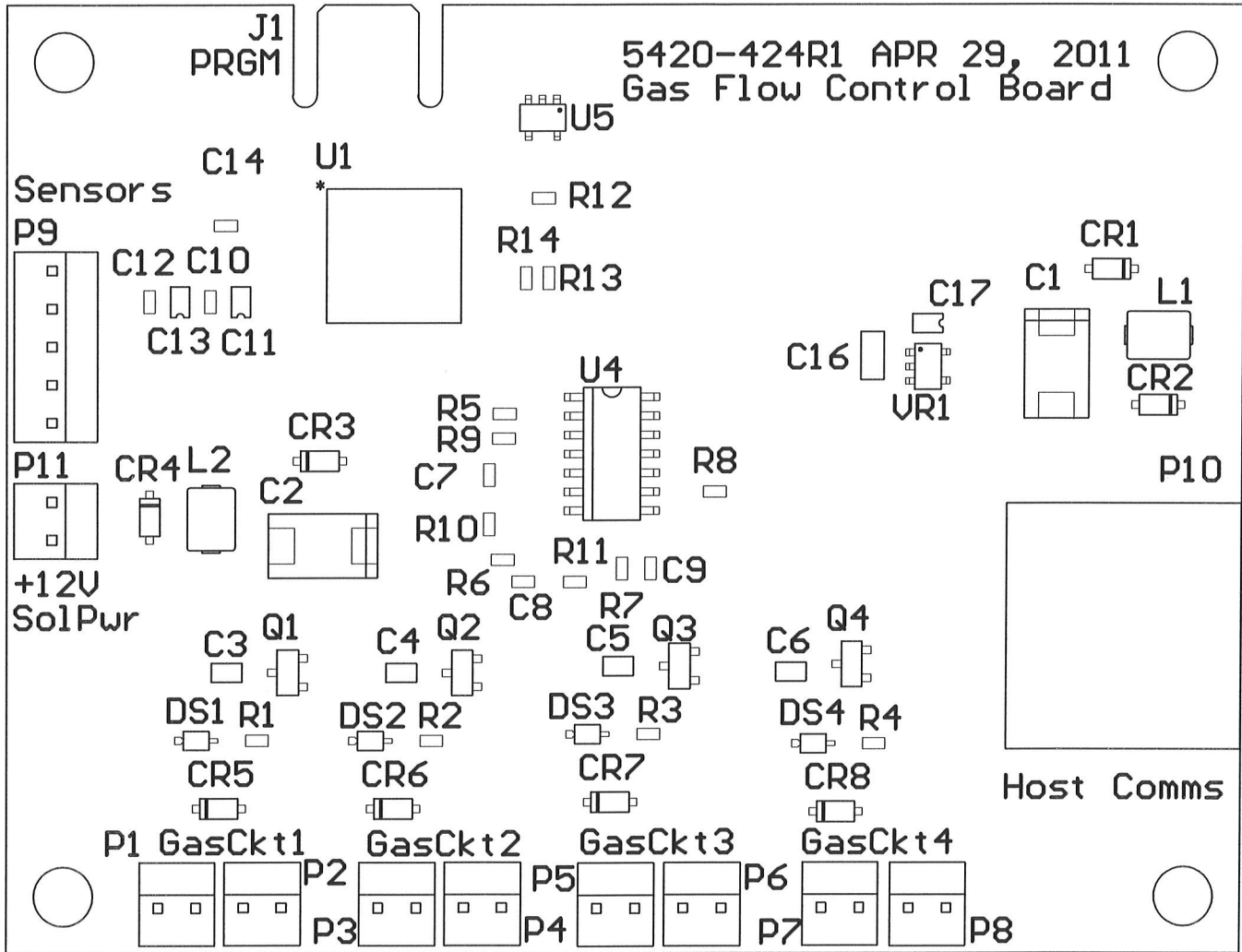


**Additional Solenoid Pairs**



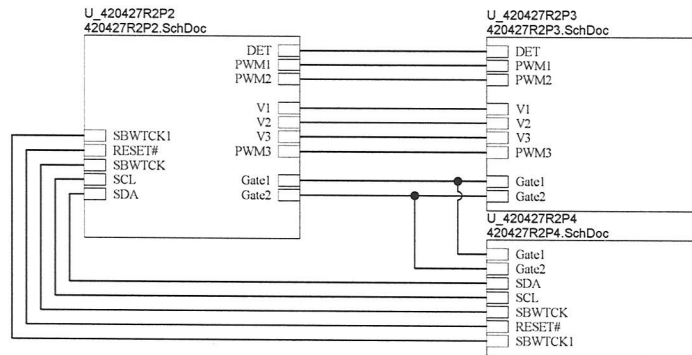
**NOTE: Rev 2.0 Schematic is accurate representation of Rev 1.0 board with modifications as of November 9, 2011**

<b>LUDLUM MEASUREMENTS, INC.</b>		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: TWM	09-NOV-2011	Title: Gas Flow Control Board	
Design: TWM	09-NOV-2011	Model: 4906AB	
Approve: <i>TWM</i>		Board#: 5420-424	
Print Date: 11/10/2013 01:19 PM	Rev: 2.0	Sheet: 3 of 3	Series
420424P3.SchDoc		420	Sheet 424

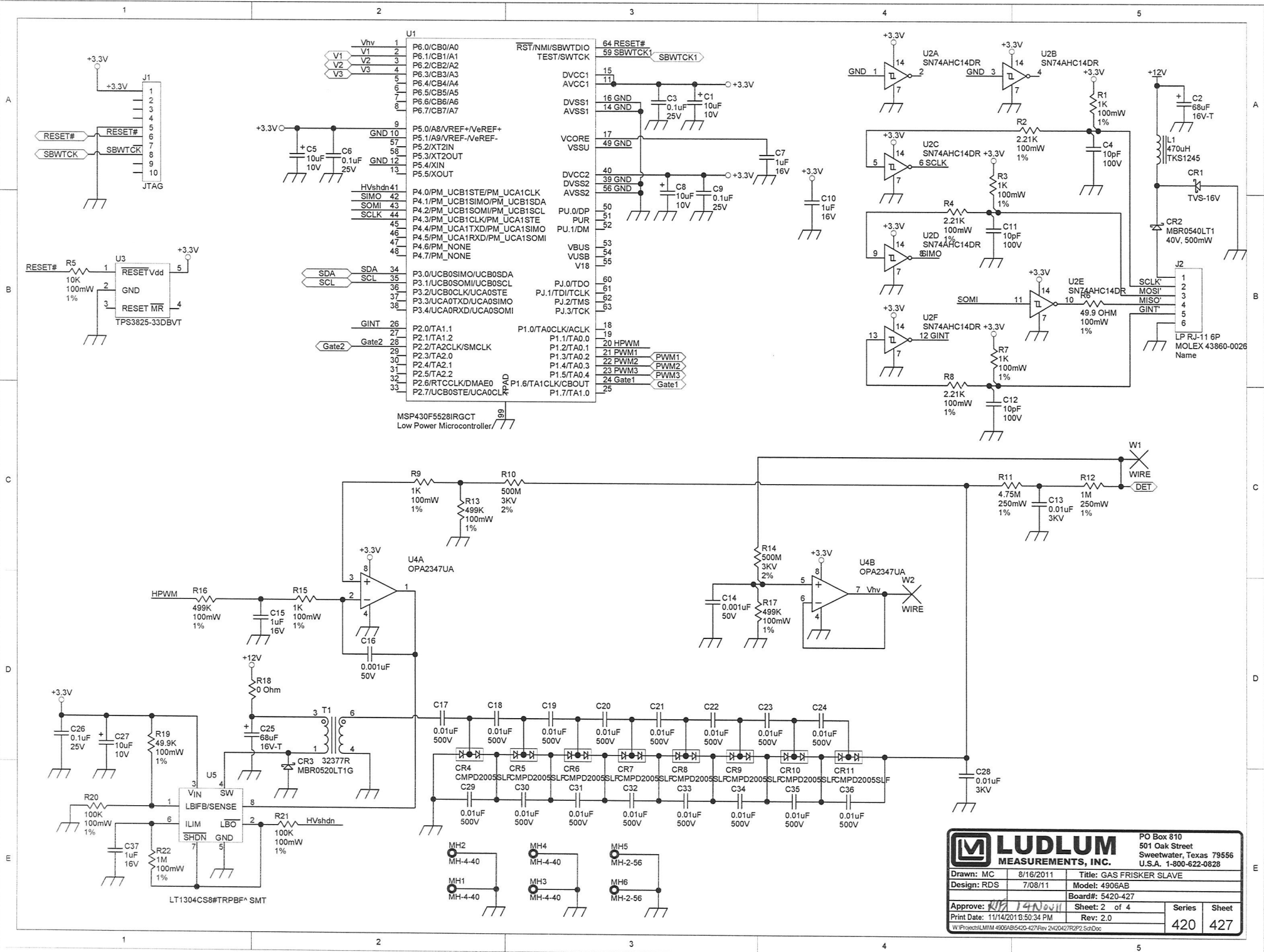


<b>LUDLUM</b> MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828	
		<b>Title:</b> Gas Flow Control Board	
<b>Drawn:</b> TWM	05-MAY-2011	<b>Model:</b> 4906AB	
<b>Design:</b> TWM	05-MAY-2011	<b>Board#:</b> 5420-424	
<b>Approve:</b> <i>TWM</i>	<i>09-NOV-2011</i>	<b>Rev:</b> 1.0	
<b>Print Date:</b>		<b>SCALE:</b> 2.14	<b>Series</b>
11/9/2011	4:44:00 PM	Top Overlay	420
420424_Assy.PcbDoc			

**Sheet**  
425



		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: MC	8/16/2011	Title: GAS FRISKER SLAVE	
Design: RDS	7/08/11	Model: 4906AB	
		Board#: 5420-427	
Approve:	11/14/2011	Sheet: 1 of 4	Series
Print Date: 11/14/2011 10:50:34 PM		Rev: 2.0	Sheet
W:\Projects\LMIM\4906AB\5420-427\Rev 2\420427R2P1.SchDoc			420 427

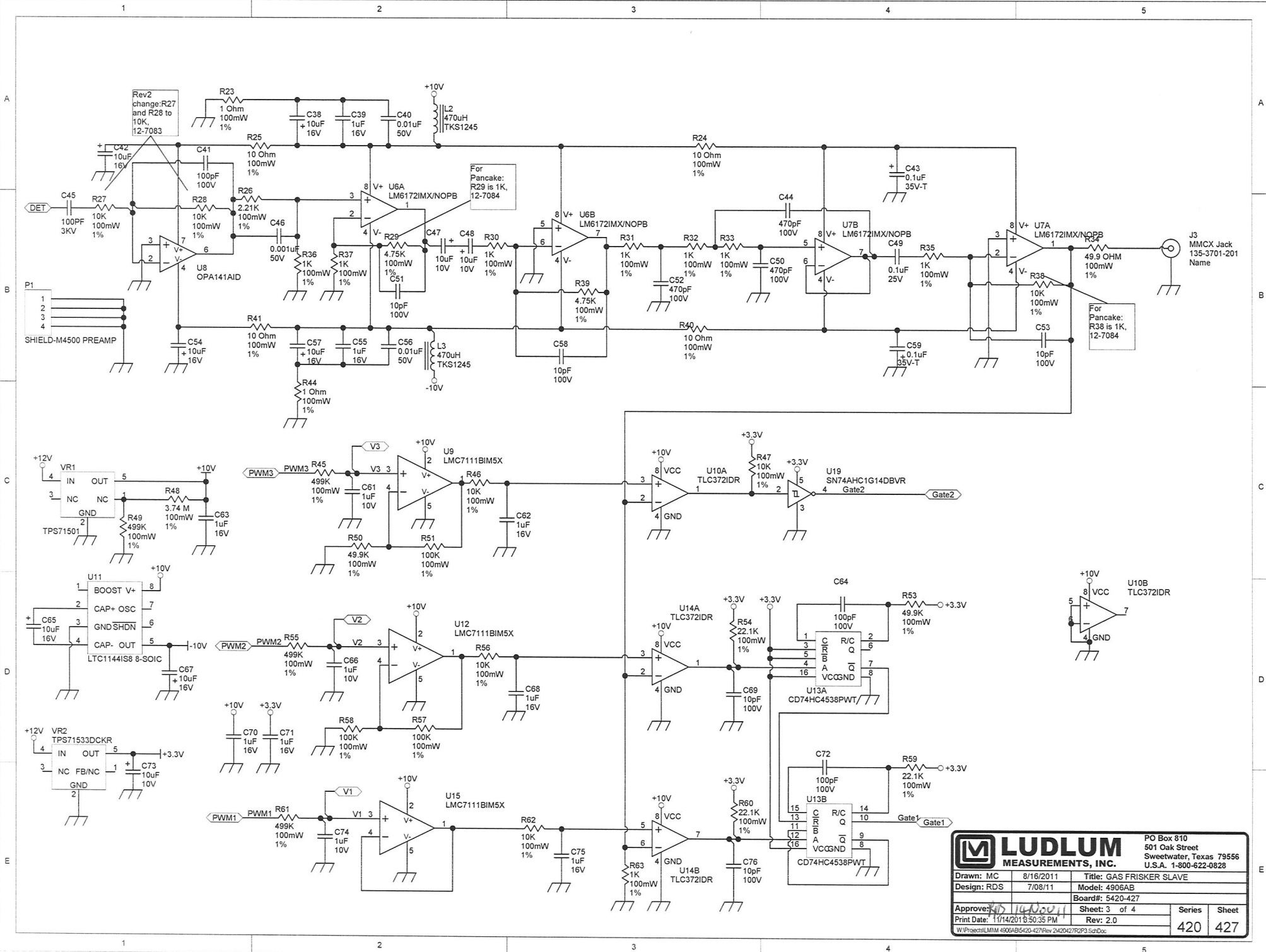


**LUDLUM MEASUREMENTS, INC.**

PO Box 810  
501 Oak Street  
Sweetwater, Texas 79556  
U.S.A. 1-800-622-0828

Drawn: MC	8/16/2011	Title: GAS FRISKER SLAVE
Design: RDS	7/08/11	Model: 4906AB
Board#: 5420-427		
Sheet: 2 of 4		
Series		Sheet
420		427

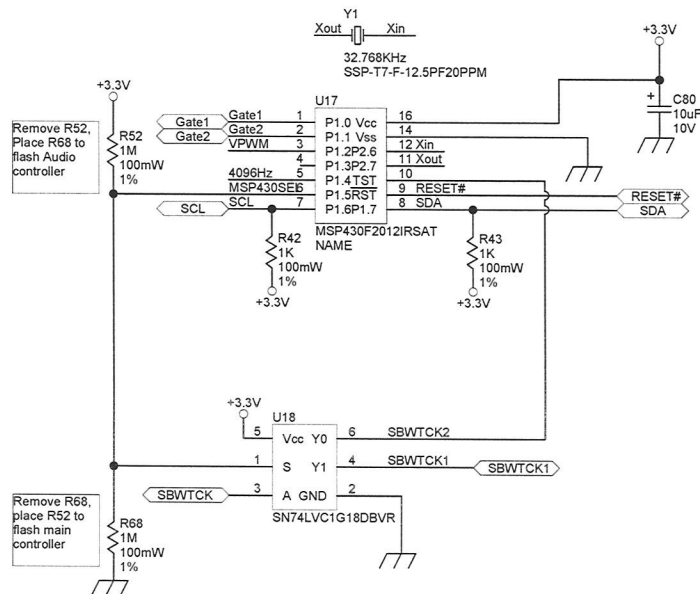
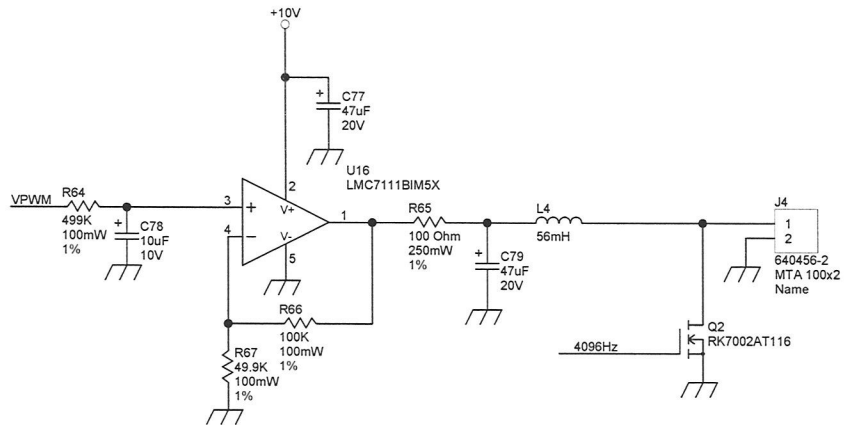
Print Date: 11/14/2018 5:34 PM Rev: 2.0  
W:\Projects\LMM\4906AB\5420-427\Rev 2\24027R2P.SchDoc



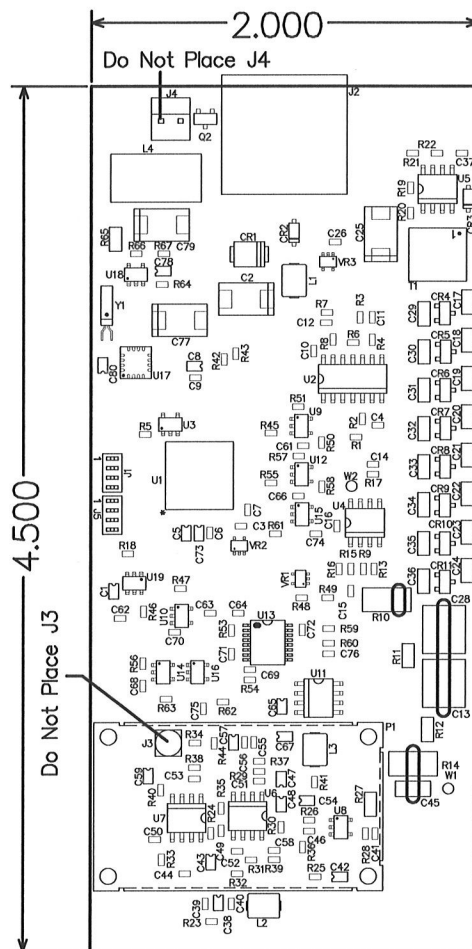
**LUDLUM MEASUREMENTS, INC.**

PO Box 810  
501 Oak Street  
Sweetwater, Texas 79556  
U.S.A. 1-800-622-0828

Drawn: MC	8/16/2011	Title: GAS FRISKER SLAVE
Design: RDS	7/08/11	Model: 4906AB
Board#: 5420-427		Sheet: 3 of 4
Approved: <i>[Signature]</i>	11/14/2011 5:35 PM	Rev: 2.0
Series	420	Sheet
W:\Projects\LMIM-4906A\5420-427\Rev 242042\F2P3 SchDoc		427



		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: MC	8/16/2011	Title: GAS FRISKER SLAVE	
Design: RDS	7/08/11	Model: 4906AB	
		Board#: 5420-427	
Approve: <i>RDS</i>	<i>11/14/2011</i>	Sheet: 4 of 4	Series
Print Date: 11/14/2011 8:50:35 PM		Rev: 2.0	Sheet
W:\Projects\LMM\4906AB\5420-427\Rev 2\420427R2P4.SchDoc		420	427



		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828	
		<b>Title:</b> Detector Board (Frisker)	
<b>Drawn:</b> JK	04/24/2012	<b>Model:</b> 4906AB	
<b>Design:</b> RDS	04/24/2012	<b>Board#:</b> 5420-427	
<b>Approve:</b> <i>JMK</i>	<i>03/24/12</i>	<b>Rev:</b> 4	
<b>Print Date:</b> 12/3/2012 10:29:52 AM		<b>SCALE:</b> 1.00 Top Overlay	<b>Series</b> 420 <b>Sheet</b> 428
<small>W:\Projects\LMIM 4906AB\5420-427\Rev4\420427R4_Manual.PcbDoc</small>			



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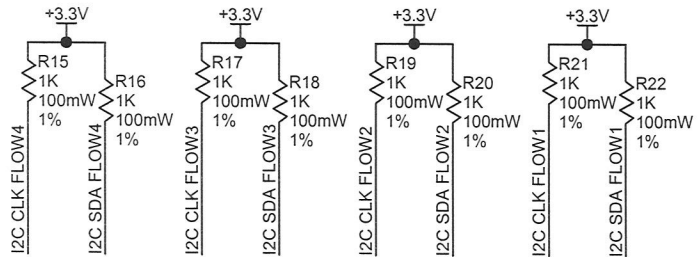
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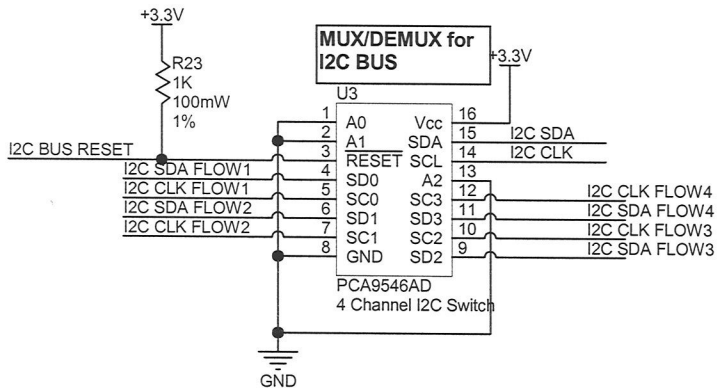
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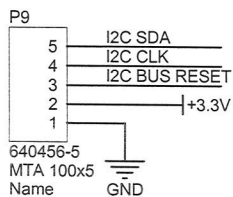
### I2C Bus Pull-Ups



### MUX/DEMUX for I2C BUS

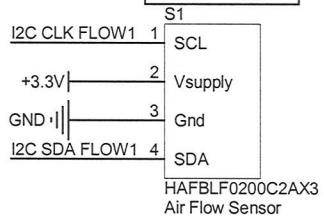


### I2C Comm to MCU

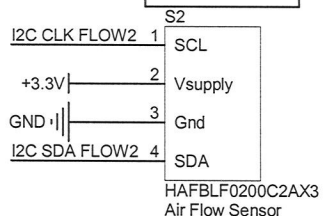


**NOTE: Rev 2.0 Schematic is accurate representation of Rev 1.0 board with modifications as of November 9, 2011**

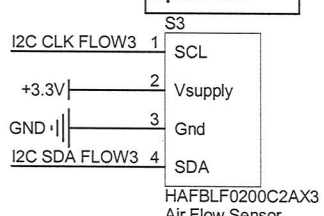
### Hand Detectors Input Flow



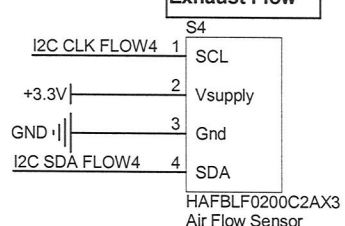
### Hand Detectors Exhaust Flow



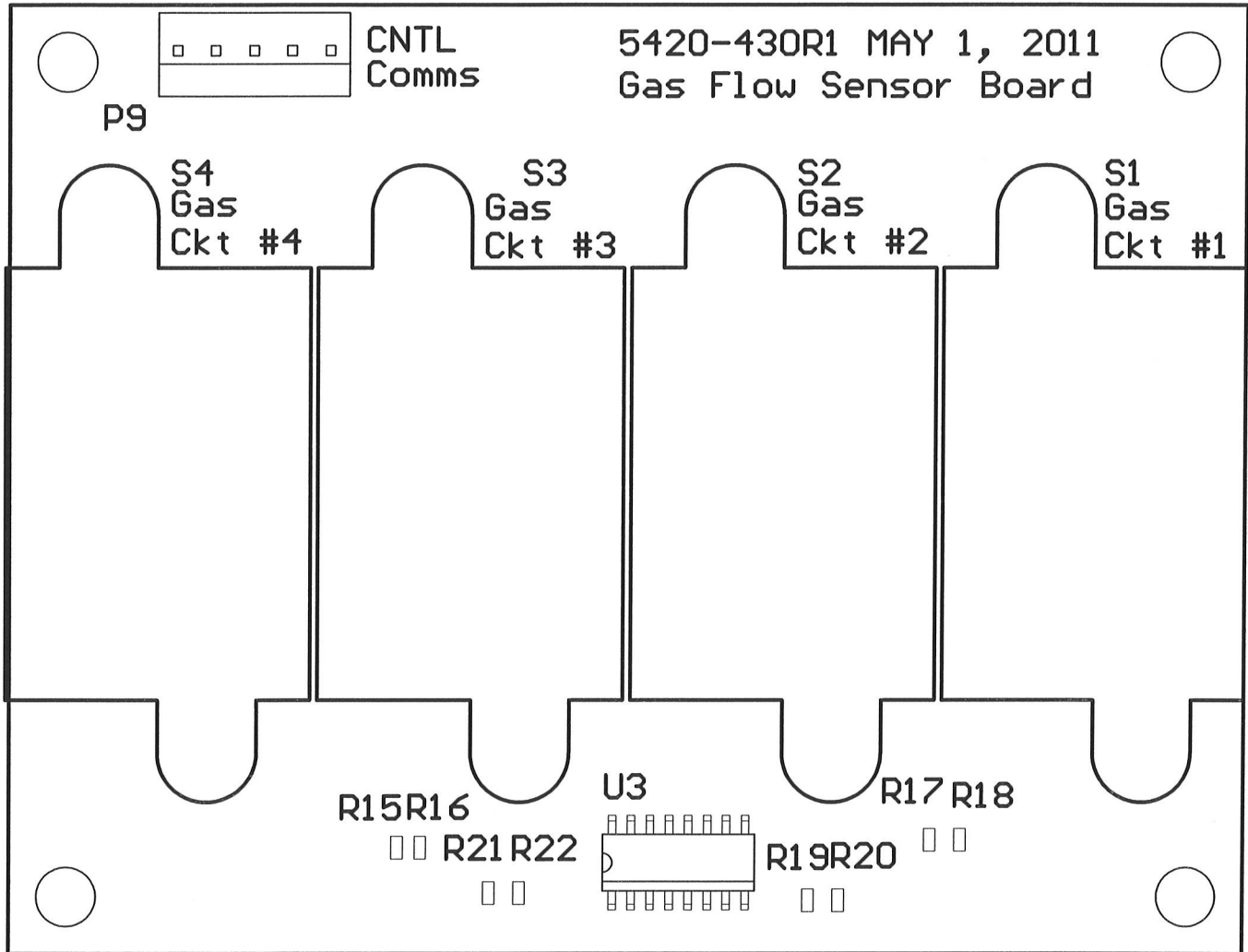
### Foot Detectors Input Flow




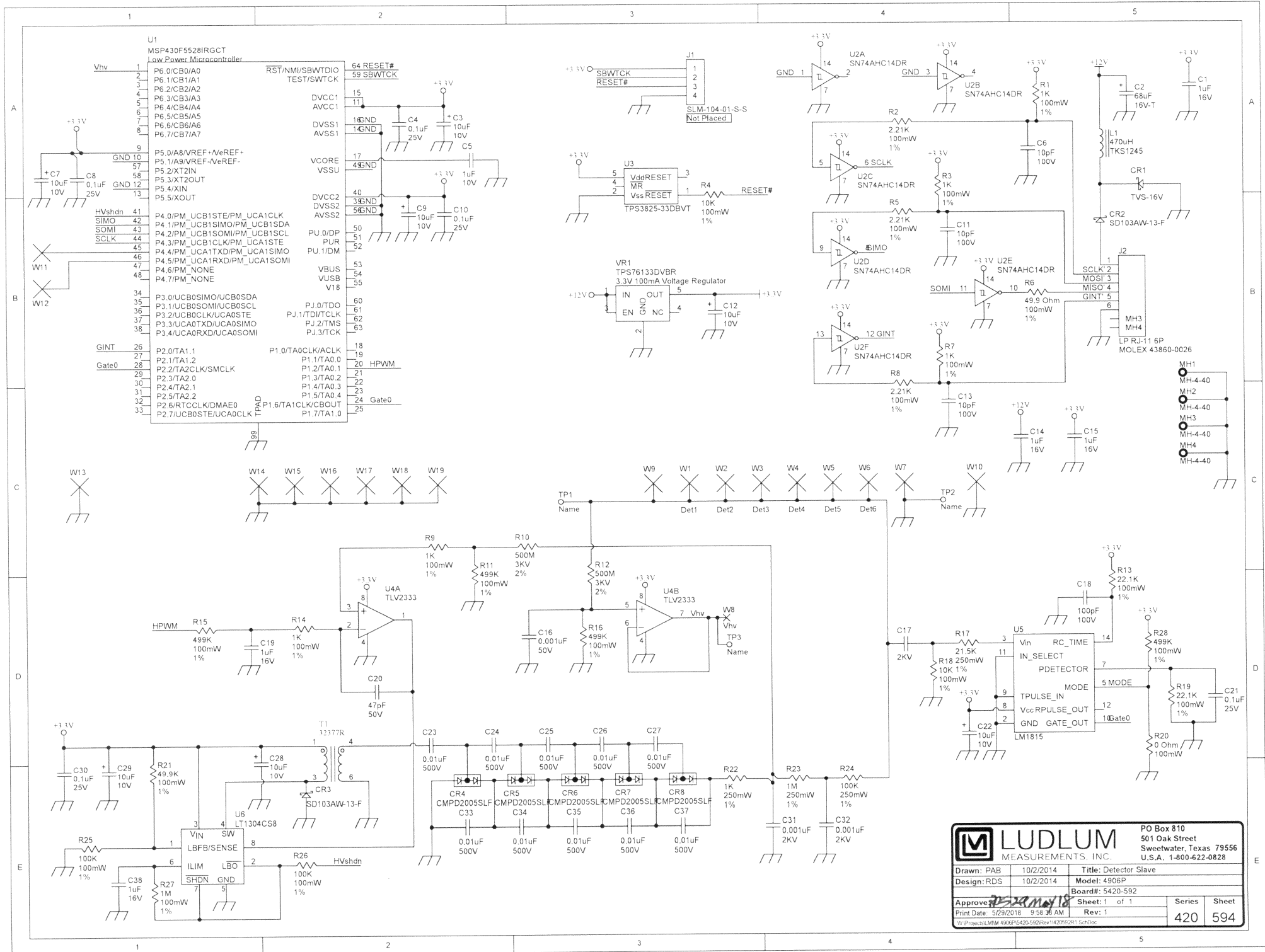
### Foot Detectors Exhaust Flow



		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: TWM	09-NOV-2011	Title: Gas Flow Sensor Board	
Design: TWM	09-NOV-2011	Model: 4906AB	
Approve: <i>TWM 9/Nov/2011</i>		Board#: 5420-430	
Print Date: 11/9/2011 5:09:10 PM	Rev: 2.0	Sheet: 1 of 1	Series
420430P1.SchDoc		420	Sheet 430



	<h1 style="margin: 0;">LUDLUM</h1> <h2 style="margin: 0;">MEASUREMENTS, INC.</h2>		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828	
	<b>Title:</b> Gas Flow Sensor Board			
<b>Drawn:</b> TWM	05-MAY-2011	<b>Model:</b> 4906AB		
<b>Design:</b> TWM	05-MAY-2011	<b>Board#:</b> 5420-430		
<b>Approve:</b> <i>TWM</i>	<i>09-NOV-2011</i>	<b>Rev:</b> 1.0		
<b>Print Date:</b>		<b>SCALE:</b> 2.14	<b>Series</b>	<b>Sheet</b>
11/9/2011	4:56:46 PM	Top Overlay	420	431
420430_Assy.PcbDoc				



**LUDLUM**  
MEASUREMENTS, INC.

PO Box 810  
501 Oak Street  
Sweetwater, Texas 79556  
U.S.A. 1-800-622-0828

Drawn: PAB	10/2/2014	Title: Detector Slave
Design: RDS	10/2/2014	Model: 4906P
Board: 5420-592		
Approved: <i>[Signature]</i>	Sheet: 1 of 1	Series
Print Date: 5/29/2018 9:58:36 AM	Rev: 1	Sheet
W:\Projects\MIM_4906P\5420-592\Rev1\420592R1_SchDoc		420 594

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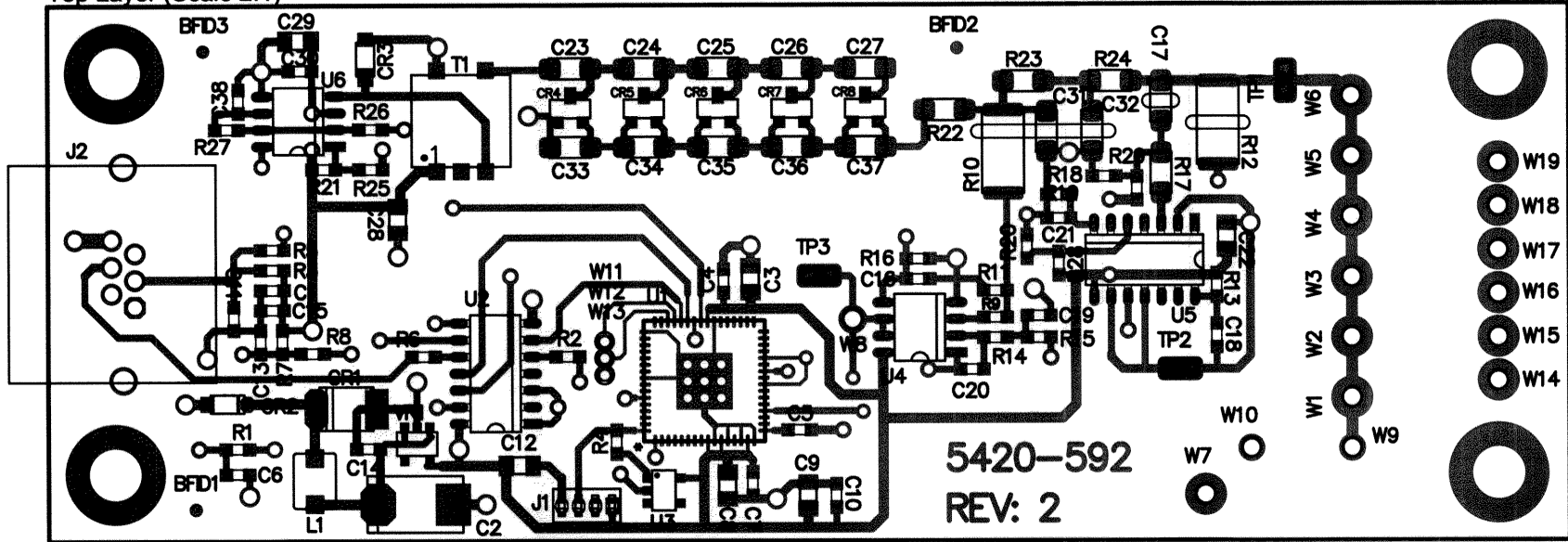
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Top Layer (Scale 2:1)



<b>M LUDLUM MEASUREMENTS</b>				
Part: 5420-592		Model: 4906P		
Desc: Detector Slave				
Design: RDS	Date: 2/8/2023	Rev:	2	
Drawn: PAB	Date: 3/24/2023	SHEET	SERIES	SHEET
Apr: <i>RDS</i>	Date: <i>24 Mar 23</i>	1 of 3		
\\freedom\pcb\Projects\LM\4906P\5420-592\Rev2			420	592

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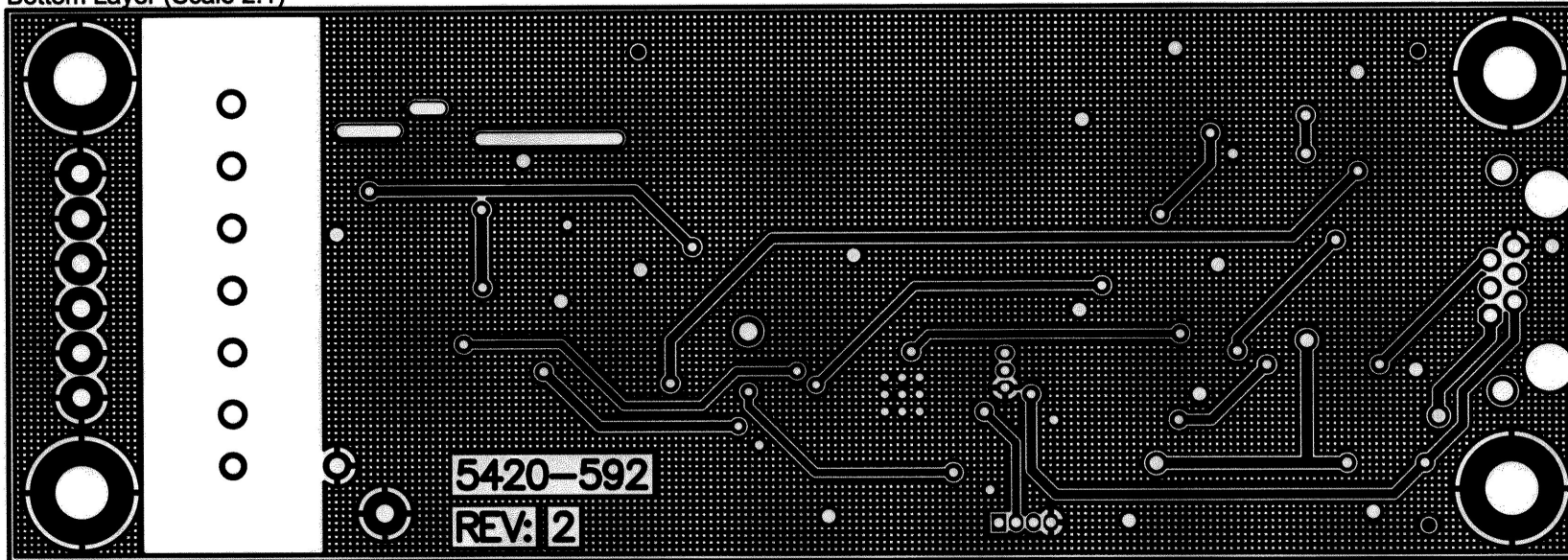
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Bottom Layer (Scale 2:1)



5420-592

REV: 2

<b>M LUDLUM MEASUREMENTS</b>				
Part: 5420-592		Model: 4906P		
Desc: Detector Slave				
Design: RDS	Date: 2/8/2023	Rev:	2	
Drawn: PAB	Date: 3/24/2023	SHEET	SERIES	SHEET
Apr: <i>RDS</i>	Date: <i>24 Mar 2022</i>	of 3		
\\freedom\pcb\Projects\LM\IM 4906P\5420-592\Rev2			420	592

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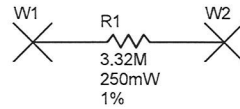
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		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: JK	03/08/2005	Title: Connector/Resistor Board	
Design: RDS	03/08/2005	Model: 133-2	
		Board#: 5002-894	
Approve: <i>RB</i>	<i>11/7/2013</i>	Sheet: 1 of 1	Series
Print Date: 11/7/2013 11:27:19 AM	Rev: 1		Sheet
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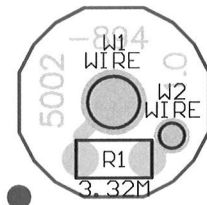
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 <b>LUDLUM</b> MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, TX 79556 U.S.A. 1-800-622-0828	
		<b>Title:</b> Connector/Resistor Board	
<b>Drawn:</b> JK	03/08/2005	<b>Model:</b> 133-2	
<b>Design:</b> RDS	03/08/2005	<b>Board#:</b> 5002-894	
<b>Approve:</b> <i>RDS</i>	<i>11/7/13</i>	<b>Rev:</b> 1	
<i>PCBA Drawing</i>		<b>SCALE:</b> 1.05	<b>Series</b> <b>Sheet</b>
<b>Print Date:</b> 11/7/2013 11:27:21 AM		Top Overlay	2   895A
<small>W:\Projects\LMIM 133\5002-894\Rev1\002894R1_Assy.PcbDoc</small>			