Filter Box

Sept 9, 2001

This PDF document contains a schematic, manufacturing drawings, assembly drawings and parts list. Also on page 10 are measured data for the three filters. Detailed graphs and a mechanical enclosure drawing will follow shortly. A second document, which contains the gerber files to manufacture the circuit board, is also attached.

The Heater and Temperature Monitor filters use an LC Balun filter while the Valve Contact Closure uses an RC filter on each line.

Seven turns (x2) of AWG 18 magnet wire are used for each Heater Filter coil winding. Seven turns (x4) of AWG 24 stranded wire are used for the Temperature Filter coil winding. And, seven turns (x5) of AWG 24 stranded wire are used for each Valve Closure filter coil winding.

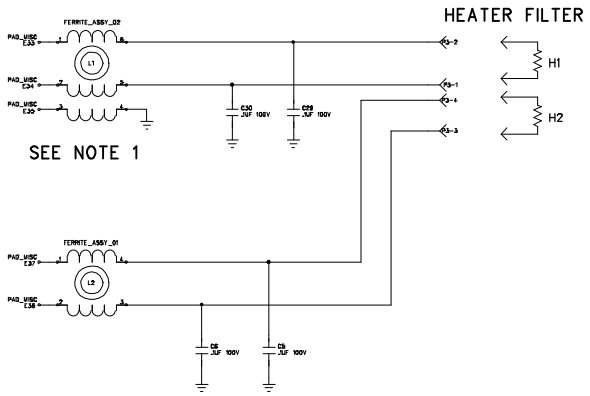
Provisions for a 2.2 ufd capacitor in parallel with a .01ufd capacitor have also been provided for the Temperature Monitor filters. Our measurements indicate that the filtering at lower frequencies is more effective without this component and we recommend that it not be installed. The reason is that the low input impedance of the Balun filter reduces the effectiveness of the low frequency component isolation.

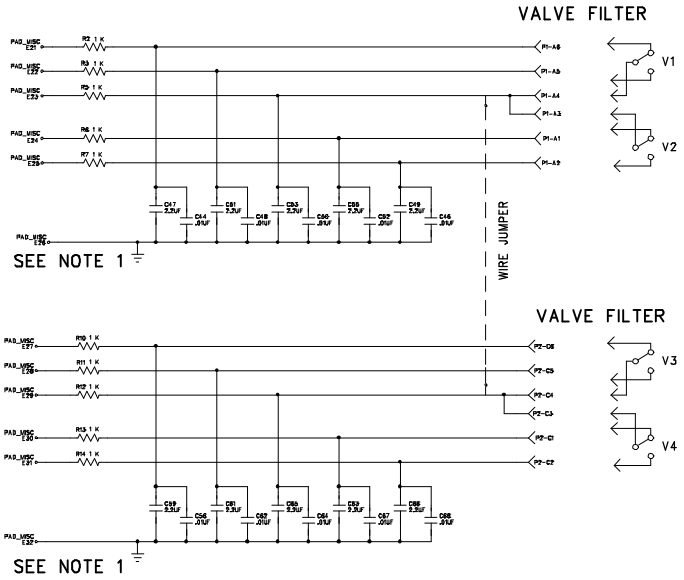
JMP1 is a jumper, which may be installed. The purpose of this jumper is to allow all of the common connections on the Valve Closure filter to use a single wire. This permits the use of commercially available 25-conductor cable for the Temperature Monitor and Valve Closure filters.

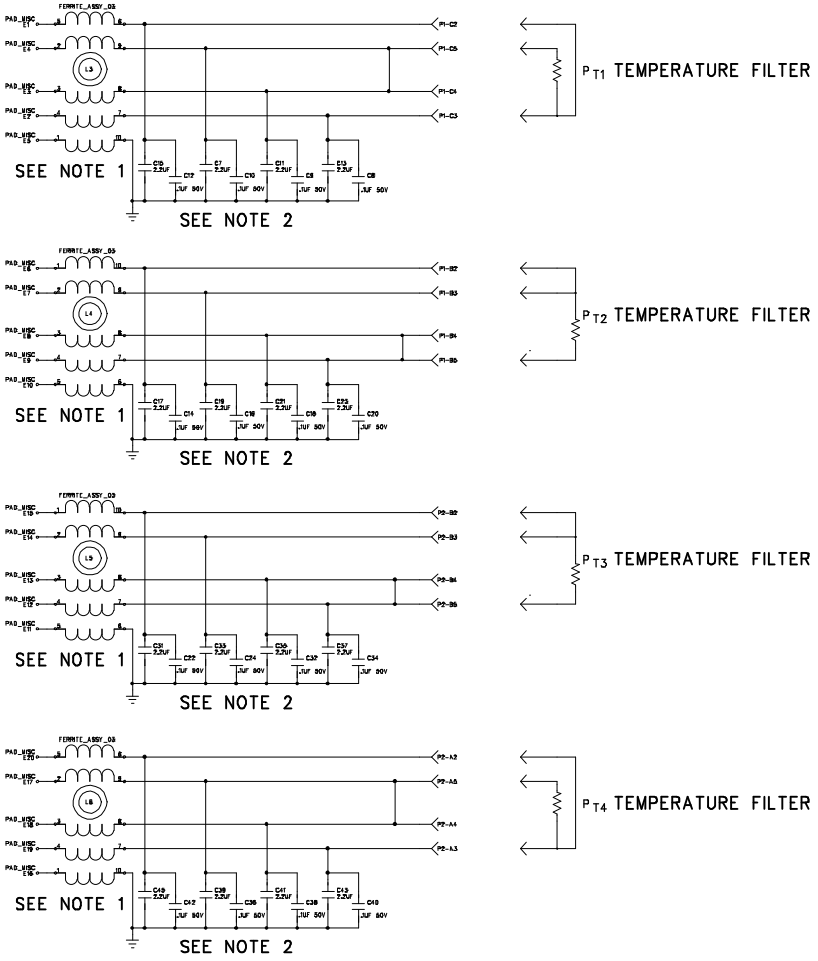
The two Heyco straight-thru fittings for flexible cable accept a minimum cable diameter of 5.8mm and a maximum diameter of 10 mm.

The cable connectors have not yet been defined, although, we have made recommendations in an earlier paper.

REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:

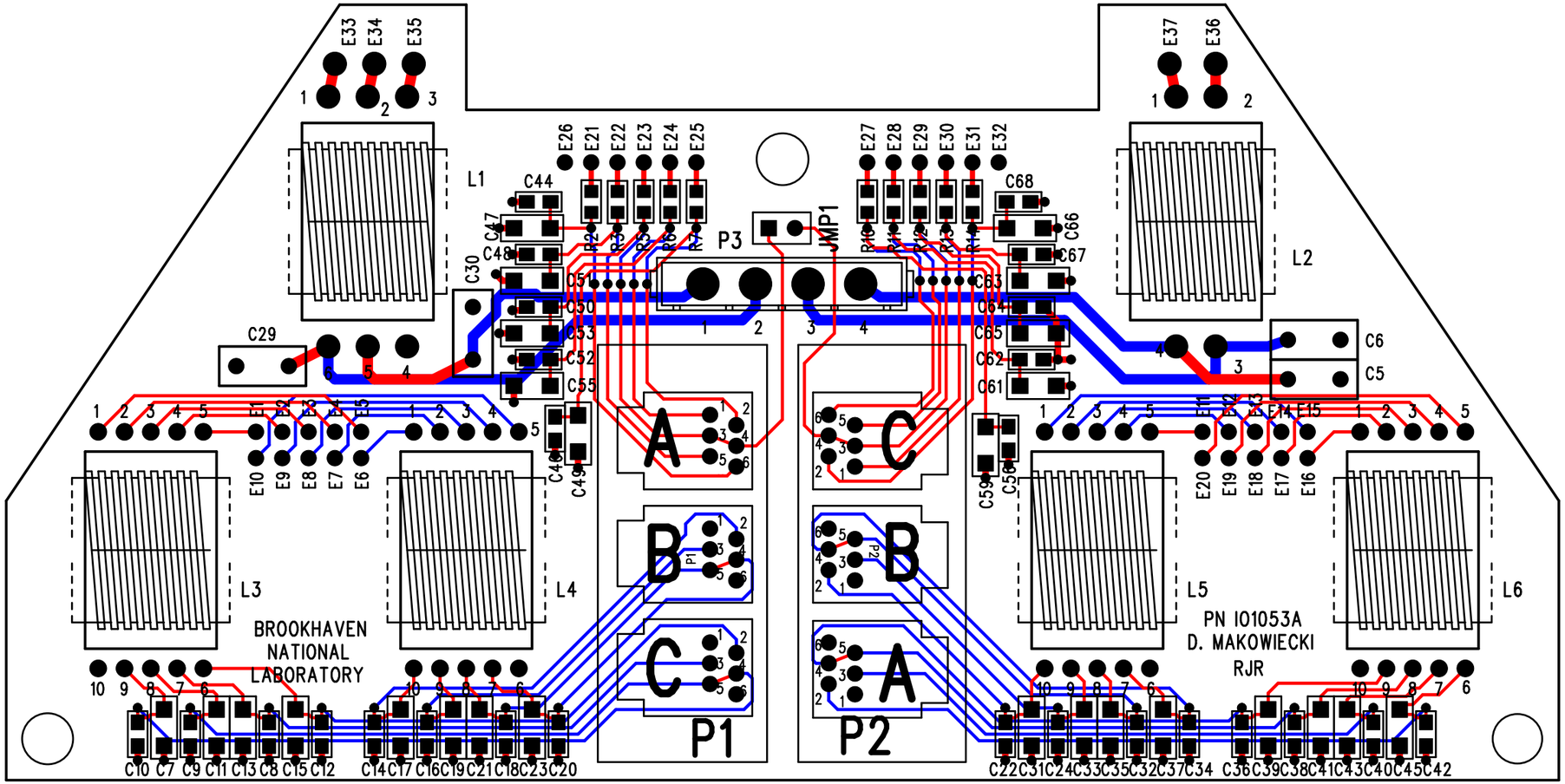




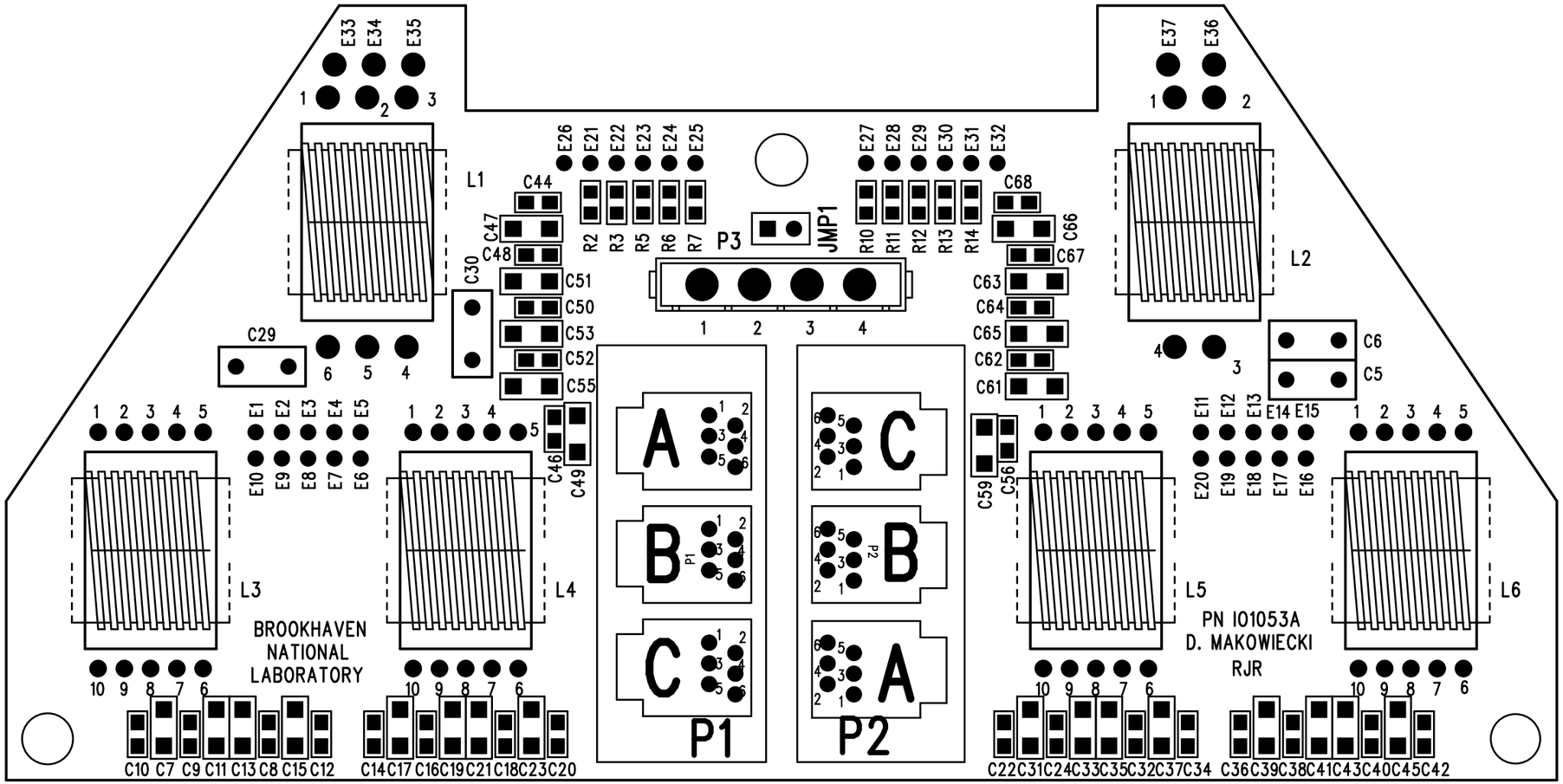


NOTE 1: SHIELD NOT CONNECTED
NOTE 2: 2.2UF CAPACITORS NOT INSTALLED

COMPANY:	BROOKHAVEN NATIONAL LABORATORY INSTRUMENTATION DIVISION
TITLE:	SCHEMATIC DIAGRAM FILTER BOARD
DRAWN: RON RYAN	DATE: 6/1/2001
ENGINEER: DON MAKOWIECKI	DATE: 6/1/2001
QUALITY CONTROL:	DATE:
RELEASED:	DATE:
CODE:	SIZE:
DRAWING NO: 101053 REV A	REV:
SCALE:	SHEET: 1 OF 1



BNL 101053A LAYER SCREEN



BNL 101053A LAYER SILKSCREEN

FSCM	DWG NO.	SH	REV

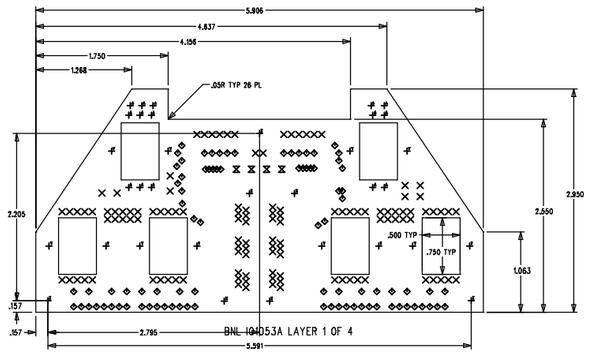
REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED

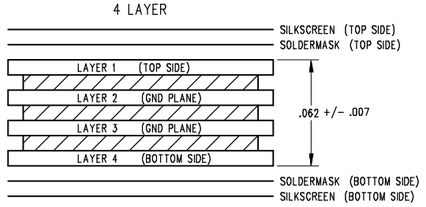
NOTES:

1. FABRICATE IN ACCORDANCE WITH IPC-600, CLASS 2.
2. MATERIAL: GLASS EPOXY TYPE GF, MINIMUM MATERIAL GLASS TRANSMISSION TEMPERATURE TO BE 150C MINIMUM IN ACCORDANCE WITH MIL-P-13949. STARTING COPPER FOIL TO BE 1 OUNCE FOR EXTERNAL LAYERS, AND 1 OUNCE FOR INTERNAL LAYERS.
3. FRONT TO BACK REGISTRATION TO BE WITHIN +/-.005.
4. ALL HOLES TO BE PLATED THRU MIN. PLATING TO BE .001 THICK COPPER.
5. MIN. ANNULAR RING TO BE .005 FOR EXTERNAL LAYERS AND .002 FOR INTERNAL.
6. WARP AND TWIST NOT TO EXCEED .005 INCHES PER INCH.
7. APPLY GREEN LIQUID PHOTOIMAGEABLE SOLDER RESIST OVER BARE COPPER,
8. APPLY SILK SREEN LEGEND USING WHITE EPOXY INK, BOTH SIDES.
9. 100% ELECTRICAL TEST FOR OPENS AND SHORTS AT 40 VOLTS MIN. PER IPC-T-652.

SIZE	QTY	SYM	PLTD
37	118	⨯	PLTD
15	87	◇	PLTD
70	4	⧖	PLTD
50	15	A	PLTD
120	4	X	PLTD
110	12	Y	NPLTD
125	3	Z	NPLTD



LAYUP DETAIL
4 LAYER



NEXT ASSY	USED ON
APPLICATION	

QTY REQD	FSCM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX=.005 ANGLES ±

MATERIAL: SEE NOTES

FINISH: SEE NOTES

DO NOT SCALE DRAWING

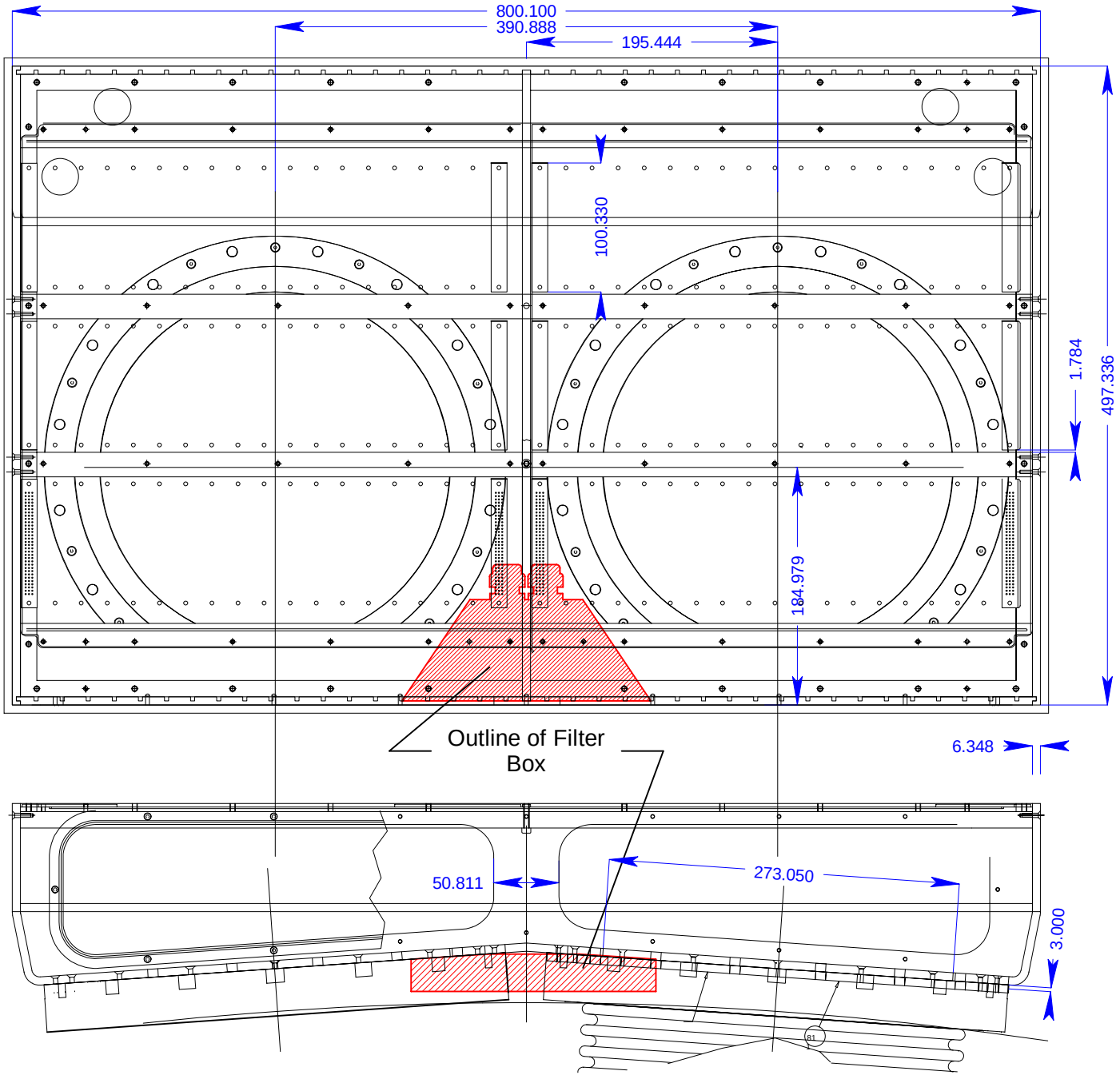
EXPERIMENT: ATLAS

APPROVALS	DATE
DESIGNER RON RYAN	6/11/2001
ENGINEER D. MAKOWIECKI	6/11/2001
ISSUED	

TITLE
PRINTED CIRCUIT BOARD
FILTER BOARD

SIZE	FSCM NO.	DWG NO.	REV.
C		101053 REV A	

SCALE | SHEET 1 OF 1



13 June 2001
DSM

PARTS LIST IO1053A
FILTER BOARD
DON MAKOWIECKI

BROOKHAVEN NATIONAL LABORATORY

Name	*PART NUMBER*	*Value*	*PART DESCRIPTION*	*MANUFACTURER*
C5	CKO6 X7R	.1UF 100 V	CAPACITOR CERAMIC MONOLITHIC RADIAL	
C6	CKO6 X7R	.1UF 100 V	CAPACITOR CERAMIC MONOLITHIC RADIAL	
C7	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C8	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C9	CC0805	.1UF 50V	SURFACE MOUNT CAPACITOR, 0805	
C10	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C11	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C12	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C13	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C14	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C15	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C16	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C17	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C18	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C19	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C20	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C21	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C22	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C23	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C24	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C29	CKO6 X7R	.1 UF 100 V	CAPACITOR CERAMIC MONOLITHIC RADIAL	
C30	CKO6 X7R	.1UF 100 V	CAPACITOR CERAMIC MONOLITHIC RADIAL	
C31	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C32	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C33	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C34	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C35	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C36	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C37	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C38	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C39	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C40	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C41	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C42	CC0805	.1UF 50 V	SURFACE MOUNT CAPACITOR, 0805	
C43	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C44	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	

PARTS LIST IO1053A
FILTER BOARD
DON MAKOWIECKI

BROOKHAVEN NATIONAL LABORATORY

C45	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C46	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C47	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C48	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C49	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C50	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C51	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C52	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C53	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C55	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C56	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C59	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C61	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C62	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C63	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C64	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C65	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C66	CC1206	2.2 UF	SURFACE MOUNT CAPACITOR, 1206	
C67	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
C68	CC0805	.01UF	SURFACE MOUNT CAPACITOR, 0805	
L1	FERRITE 59-61-000-501		INDUCTOR 2 WIRE PAIR 7 TURNS	ELNA FERRITE TECHNOLOGIES
L2	FERRITE 59-61-000-501		INDUCTOR 2 WIRE PAIR 7 TURNS	ELNA FERRITE TECHNOLOGIES
L3	FERRITE 59-61-000-501		INDUCTOR 4 WIRE PAIR 7 TURNS	ELNA FERRITE TECHNOLOGIES
L4	FERRITE 59-61-000-501		INDUCTOR 4 WIRE PAIR 7 TURNS	ELNA FERRITE TECHNOLOGIES
L5	FERRITE 59-61-000-501		INDUCTOR 4 WIRE PAIR 7 TURNS	ELNA FERRITE TECHNOLOGIES
L6	FERRITE 59-61-000-501		INDUCTOR 4 WIRE PAIR 7 TURNS	ELNA FERRITE TECHNOLOGIES
P1	TM2RE-18CL222-0796-5		CONNECTOR 3 X 6 - 6 ENTRY PC JACK	HIROSE ELECTRIC CO
P2	TM2RE-18CL222-0796-5		CONNECTOR 3 X 6 - 6 ENTRY PC JACK	HIROSE ELECTRIC CO
P3	770997-1		SOCKET HEADER ASSY 4 PIN MATE & LOCK	AMP
R2	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R3	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R5	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R6	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R7	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R10	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R11	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R12	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	

PARTS LIST IO1053A
FILTER BOARD
DON MAKOWIECKI

BROOKHAVEN NATIONAL LABORATORY

R13	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
R14	CR0805	1 K	SURFACE MOUNT RESISTOR, 0805	
	3214		STRAIN RELIEF FOR ELECTRICAL CORD	HEYCO PRODUCTS
	3214		STRAIN RELIEF FOR ELECTRICAL CORD	HEYCO PRODUCTS

Valve Filter

Frequency	Input(V)	Output(mV)	Atten.(db)
50	3.76	180	-26.3
100	3.76	180	-26.3
200	3.76	180	-26.3
500	3.76	172	-26.7
1000	3.76	156	-27.6
2000	3.76	128	-29.3
5000	3.76	71	-34.4
10000	3.76	39	-39.7
20000	3.76	20	-45.5
50000	3.76	8	-53.4
100000	3.76	3.8	-60
200000	3.76	1.6	-67.4
500000	3.76	0.16	-87.4
1000000	3.76	0.04	-99
2000000	3.76	0.04	-99
5000000	3.6	0.008	-73
10000000	3.12	1.9	

Heater Filter (47ufd/0.01ufd) Chart 1

Frequency	Input(V)	Output(V)	Atten.(db)	Input Z (ohm)
50	1.8	1.84	0.2	45.9
100	1.52	1.52	0	38.8
200	1.04	1.04	0	26.5
500	0.5	0.53	0.5	12.8
1000	0.3	0.34	1.1	7.7
2000	0.24	0.26	0.7	6.1
5000	0.44	0.22	-6	11.2
10000	0.78	0.22	-11	19.9
20000	1.42	0.2	-17	36.2
50000	2.6	0.15	-24	66.3
100000	3.36	0.1	-30	85.7
200000	3.8	0.06	-36	96.9
500000	3.92	0.02	-45.8	100.0
1000000	3.92	0.01	-51.8	100.0
2000000	3.88	0.007	-54.8	99.0
5000000	3.64	0.006	-55.7	92.9
10000000	3.12	0.009	-50.8	79.6

Heater Filter (0.01ufd) Chart 2

Frequency	Input(V)	Output(V)	Atten.(db)	Input Z (ohm)
50	1.96	1.96	0	50.0
100	1.96	1.96	0	50.0
200	1.96	1.96	0	50.0
500	1.96	1.96	0	50.0
1000	1.96	1.96	0	50.0
2000	1.96	1.96	0	50.0
5000	1.96	1.92	0	50.0
10000	2	1.92	-0.2	51.0
20000	2.04	1.92	-0.5	52.0
50000	2.2	1.84	-1.6	56.1
100000	2.8	1.44	-5.8	71.4
200000	3.64	0.7	-14.3	92.9
500000	3.92	0.13	-29.6	100.0
1000000	3.92	0.03	-42.3	100.0
2000000	3.92	0.006	-56.3	100.0
5000000	3.68	0.004	-59.2	93.9
10000000	3.16	0.003	-60.5	80.6

Temperature Probe Filter (2.2 ufd/.01ufd)

Frequency	Input(V)	Output(V)	Atten.(db)	Input Z (ohm)
50	1.96	1.92	0	50.0
100	1.96	1.92	0	50.0
200	1.96	1.92	0	50.0
500	1.92	1.92	0	48.0
1000	1.76	1.76	0	40.7
2000	1.4	1.48	0	27.8
5000	0.72	0.95	2.4	11.2
10000	0.21	0.58	8.8	2.8
20000	0.81	0.32	-8	13.0
50000	2.18	0.13	-24.5	62.6
100000	3.08	0.047	-36.3	183.1
200000	3.64	0.014	-48.2	647.7
500000	3.88	0.0016	-67.7	4731.7
1000000	3.88	0.00016	-87.7	4731.7
2000000	3.84	0.00012	-90.1	2370.4
5000000	3.68	0.00032	-81	763.5
10000000	3.12	0.0015		

Temperature Probe Filter (0.1ufd)

Frequency	Input(V)	Output(V)	Atten.(db)	Input Z (ohm)
50	1.96	1.96	0	50.0
100	1.96	1.96	0	50.0
200	1.96	1.96	0	50.0
500	1.96	1.96	0	50.0
1000	1.96	1.96	0	50.0
2000	1.96	1.96	0	50.0
5000	1.96	1.96	0	50.0
10000	1.88	1.92	0	46.1
20000	1.88	1.6	-1.4	46.1
50000	1.44	1.28	-1	29.0
100000	2.76	0.7	-11.9	118.9
200000	3.64	0.22	-24.4	647.7
500000	3.92	0.034	-41.2	196000.0
1000000	3.92	0.007	-55	196000.0
2000000	3.84	0.001	-71.6	2370.4
5000000	3.68	0.0002	-84	763.5
10000000				

Temperature Probe Filter (0.01ufd)

Frequency	Input(V)	Output(V)	Atten.(db)	Input Z (ohm)
50	1.96	1.96	0	50.0
100	1.96	1.92	0	50.0
200	1.96	1.92	0	50.0
500	1.96	1.96	0	50.0
1000	1.96	1.96	0	50.0
2000	1.96	1.92	0	50.0
5000	1.96	1.92	0	50.0
10000	1.96	1.92	0	50.0
20000	1.92	1.92	0	48.0
50000	1.8	1.84	0	42.4
100000	2.36	1.36	14.8	75.6
200000	3.52	0.56	-16	438.9
500000	3.88	0.09	-32.7	4731.7
1000000	3.88	0.02	-45	4731.7
2000000	3.84	0.0048	-58	2370.4
5000000	3.64	0.0005	-77	647.7
10000000	3.08	0.0056		

Heater Filter (0.1ufd) Chart 3

Frequency	Input(V)	Output(V)	Atten.(db)	Input Z (ohm)
50	1.96	1.96	0	50.0
100	1.96	1.96	0	50.0
200	1.96	1.96	0	50.0
500	1.96	1.96	0	50.0
1000	1.96	2	0	50.0
2000	1.96	1.96	0	50.0
5000	1.96	1.88	-0.4	50.0
10000	1.72	1.9	0.7	43.9
20000	1.16	1.68	3.2	29.6
50000	2.08	1.86	-7.7	53.1
100000	3.32	0.32	-20.3	84.7
200000	3.8	0.14	-28.7	96.9
500000	3.96	0.03	-42.4	101.0
1000000	3.92	0.01	-51.9	100.0
2000000	3.88	0.006	-56.2	99.0
5000000	3.68	0.004	-59.3	93.9
10000000	3.16	0.004	-57.9	80.6

Heater Filter (0.01ufd w/o 5 ohm) Chart 4

Frequency	Input(V)	Output(V)	Atten.(db)	Input Z (ohm)
50	1.96	1.96	0	50.0
100	1.96	1.96	0	50.0
200	1.96	1.96	0	50.0
500	1.96	1.96	0	50.0
1000	1.96	1.96	0	50.0
2000	1.96	1.96	0	50.0
5000	1.88	1.92	0.2	48.0
10000	1.72	1.88	0.7	43.9
20000	1.16	1.72	3.4	29.6
50000	2.08	0.88	-7.5	53.1
100000	3.32	0.31	-20.5	84.7
200000	3.56	0.09	-31.9	90.8
500000	3.92	0.01	-51.9	100.0
1000000	3.92	0.003	-62.3	100.0
2000000	3.84	0.0002	-85.6	98.0
5000000	3.68	0.0001	-91.3	93.9
10000000	3.16	0.0003	-80.4	80.6

Project file name: e:\ron\my_fire\io1053a\io1053a.cam
Date: Mon Sep 10 09:12:42 2001
Layer: All Layers

Dcode	Type	Size	Angle	Flashes	Draws
10	Round	10.0	0.0	0	316
13	Round	15.0	0.0	0	1299
14	Round	25.0	0.0	0	57
15	Round	20.0	0.0	0	10
16	Round	8.0	0.0	0	678
19	Round	60.0	0.0	154	0
21	Square	48.0	0.0	0	20
22	Square	50.0	0.0	0	52
23	Square	60.0	0.0	2	52
24	Round	125.0	0.0	8	0
25	Round	90.0	0.0	40	0
27	Round	65.0	0.0	234	0
28	Round	12.0	0.0	0	494
29	Round	40.0	0.0	0	40
30	Round	35.0	0.0	174	0
31	Round	50.0	0.0	0	68
36	Round	175.0	0.0	6	0
37	Round	80.0	0.0	152	0
38	Round	95.0	0.0	30	0
39	Round	145.0	0.0	8	0
40	Round	110.0	0.0	18	0
41	Round	155.0	0.0	24	0
42	Round	85.0	0.0	72	0
43	Thermal	85.0:63.8:45.0	0.0	8	0
44	Thermal	110.0:82.5:45.0	0.0	2	0
45	Thermal	55.0:41.3:45.0	0.0	102	0
46	Round	55.0	0.0	72	0
48	Square	53.0	0.0	0	20
49	Square	55.0	0.0	0	52
50	Square	65.0	0.0	2	52
51	Round	130.0	0.0	8	0
53	Round	70.0	0.0	80	0
54	Round	7.0	0.0	0	5313
55	Round	9.0	0.0	0	24
56	Thermal	80.0:60.0:45.0	0.0	12	0
57	Round	5.0	0.0	0	36
			Totals:	1208	8583

Heyco Products, Inc.

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Heyco®Liquid Tight Straight-Thru Fittings For Flexible Cords

US PATENT No. 5,405,172
Foreign Patents

Listed under Underwriters' Laboratories File #E-51579

Recognized under the Components Program of Underwriters' Laboratories File #E-51579

CSA Certified by Canadian Standards Association File #LR-93876.

PG HUBS--Install in either clearance or threaded holes.

					Part Dimensions				
					A	C	D	E	F
		Part No.		UL/CSA	Clearance Hole	Max. O.A. Length	Thread Length	Wrenching Nut Thk.	Wrenching Flats
Min. Dia.	Max. Dia.	Black	Gray		in. mm	in. mm	in. mm	in. mm	in. mm
.064 1,6	.210 5,3	3444	3445	RLTF 7	.492 12,5	1.17 29,7	.33 8,4	.22 5,6	.59 15,0
.114 2,9	.250 6,4	3207	3208	LTF 7	.492 12,5	1.17 29,7	.33 8,4	.22 5,6	.59 15,0
.069 1,8	.187 4,7	3446	3447	RLTF 9	.599 15,2	1.30 33,0	.34 8,6	.20 5,1	.75 19,1
.181 4,6	.312 7,9	3210	3211	LTF 9	.599 15,2	1.30 33,0	.34 8,6	.20 5,1	.75 19,1
.069 1,8	.260 6,6	3448	3449	RLTF 11	.733 18,6	1.46 37,1	.39 9,9	.20 5,1	.86 21,8
.230 5,8	.395 10,0	3213	3214	LTF 11	.733 18,6	1.46 37,1	.39 9,9	.20 5,1	.86 21,8
.170 4,3	.470 11,9	3216	3217	LTF 13,5*	.804 20,4	1.53 38,9	.41 10,4	.20 5,1	.95 24,1
.230 5,8	.546 13,9	3219	3220	LTF 16*	.886 22,5	1.66 42,2	.45 11,4	.23 5,8	1.05 26,7
.250 6,4	.485 12,3	3454	3455	RLTF 21*	1.115/28,3	1.87 47,5	.52 13,2	.23 5,8	1.30 33,0
.450 11,4	.709 18,0	3222	3223	LTF 21	1.115/28,3	1.87 47,5	.52 13,2	.23 5,8	1.30 33,0
.590 15,0	1.000/25,4	3225	3226	LTF 29*	1.470/37,3	2.23 56,6	.59 15,0	.28 7,1	1.66 42,2
.787 20,0	1.020 26,0	M3206	-	RLTF 36*	1.85 47,0	2.38 60,5	.50 12,7	.32 8,1	2.09 53,1
.866 22,0	1.260 32,0	M3204	-	LTF 36*	1.85 47,0	2.38 60,5	.50 12,7	.32 8,1	2.09 53,1
.984 25,0	1.220 31,0	3218	-	RLTF 42*	2.125/54,0	2.36 60,0	.51 13,0	.33 8,3	2.36 60,0
1.260 32,0	1.496 38,0	3212	-	LTF 42*	2.125/54,0	2.36 60,0	.51 13,0	.33 8,3	2.36 60,0
1.142 29,0	1.378 35,0	3283	-	RLTF 48*	2.335/59,3	2.40 61,0	.55 14,0	.33 8,3	2.56 65,0

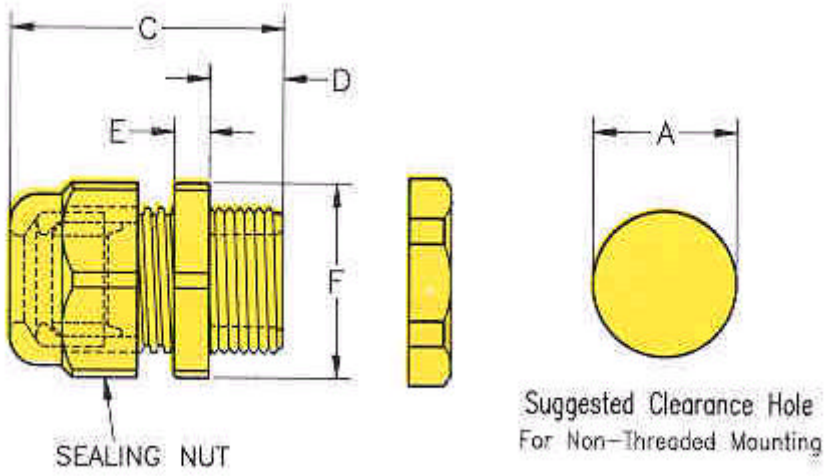
1.45737,0	1.732 44,0	**3281**	-	LTF 48*	2.335/59,3	2.40 61,0	.55 14,0	.33 8,3	2.56 65,0

Standard Colors: Black or Gray.

* **Listed under Underwriters' Laboratories**

- NEW! Acme threads on body prevent skipping; speed installation.
- "PG" hub threads are steel conduit threads per DIN 40430. For DIN 40430 see page 1-20.
- Seventeen sizes for cable, tubing, etc. with diameters ranging from .064"(1.6mm) to 1.732"(44,0mm).
- All nylon construction with TPE gland resists salt water, weak acids, gasoline, alcohol, oil, grease and common solvents.
- Working temperatures:-22°F (-30°C) to 212°F (100°C). For short periods to 302°F (150°C).
- Protection class IP 68 per DIN 40050 up to 70 psi (5 bar) water pressure.
- Suitable for NEMA type 4 and 6 enclosures.
- Locknuts are included. For nylon locknut specifications or to order locknuts separately see page 1-13.
- **We recommend using the smallest maximum diameter fitting that will fit your application.**

Click here to see our guide on choosing the best LTF for your application.
Click here for our Detailed Installation Instructions.
Click here for Recommended Torque Chart.



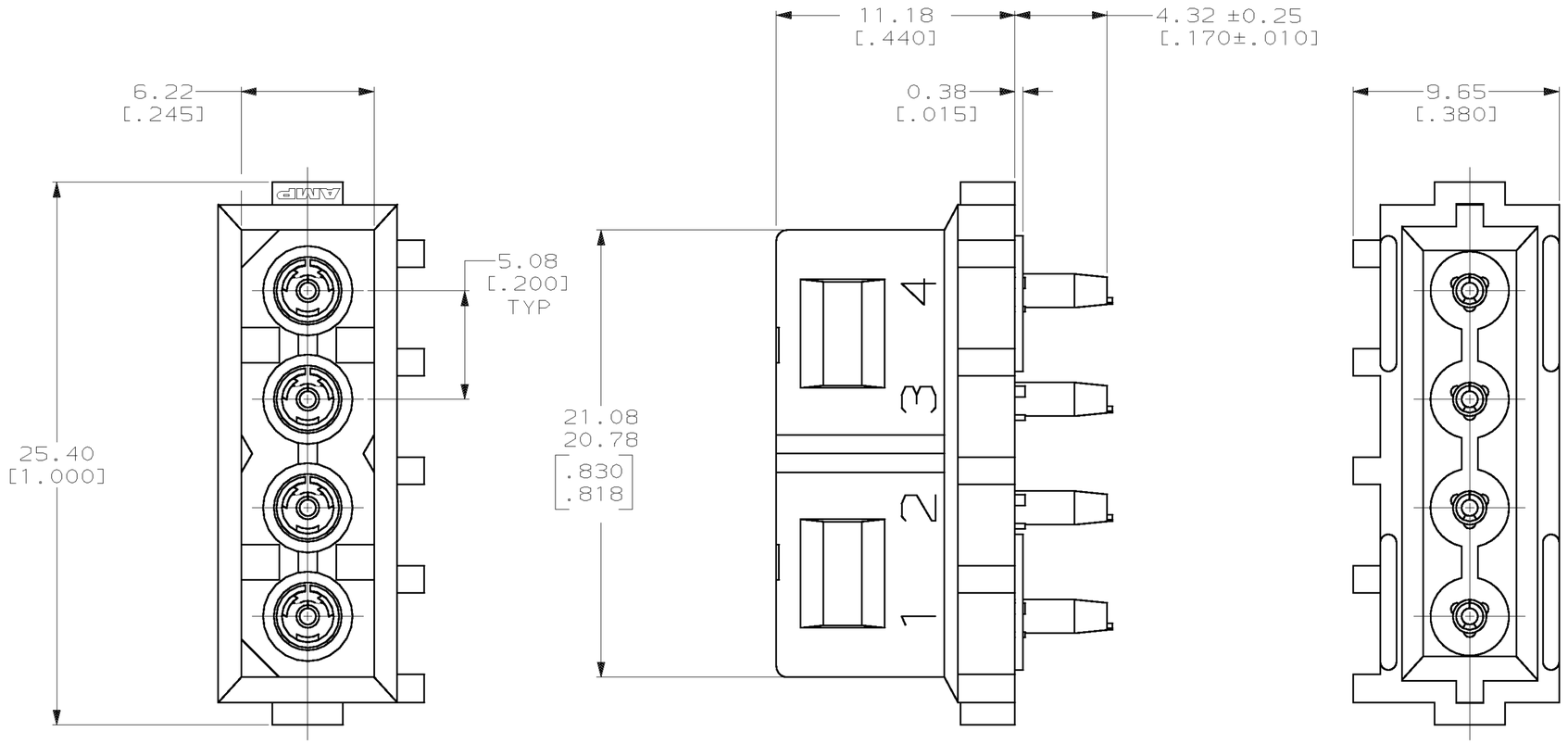
[Company History] [Press Releases] [Product Selection]
[Monthly Product Spotlight] [New Product Update] [Salesperson Lookup]
[Foreign Distributors] [Domestic Distributors] [FAQ's]
[Search] [Sample Request Form] [Feedback] [Catalog Selection]

DRAWING MADE IN THIRD ANGLE PROJECTION

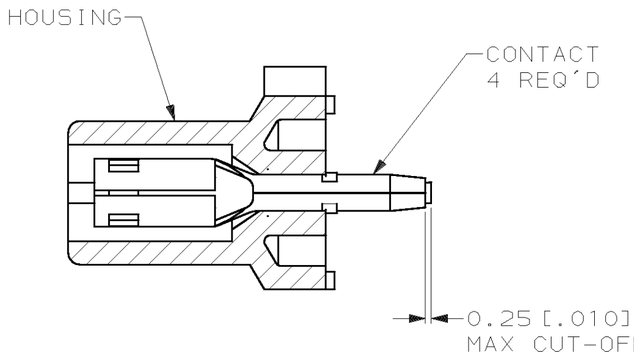
LOC	DIST	P	F
CM	53		

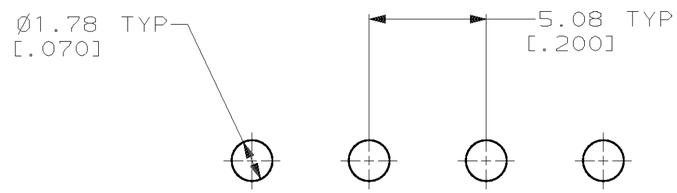
REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPD
	C	REV PER EC 0L30-0053-97	6-10-97	JH / RS

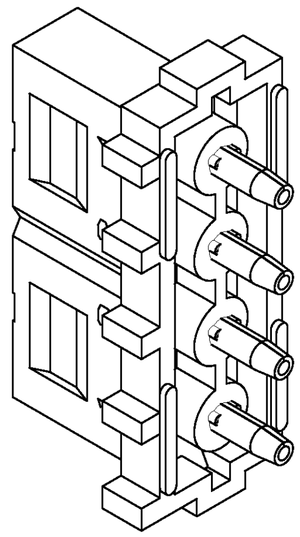


1. PARTS COMPLY WITH AMP SOLDERABILITY SPEC. 109-11-5.
2. DIMENSIONS IN BRACKETS ARE IN INCHES.





RECOMMENDED MOUNTING HOLE PATTERN
FOR 1.57 [.062] THICK P.C. BOARD



3-DIMENSIONAL MODEL
NTS

0.251 [.0099] THK PH BRZ,PRE-TIN	NYLON UL94V-2,NATURAL	770997-1
CONTACT MATERIAL & FINISH	HOUSING MATERIAL & COLOR	PART NO

DO NOT SCALE PRINT.
UNLESS SPECIFIED
DIMENSIONS IN mm [INCHES]
TOLERANCES ON :
2 PLC DEC ±-
3 PLC DEC ±0.13 [.005]
ANGLES ± 0°30'

MATERIAL: SEE TABLE

FINISH: SEE TABLE

DR 8-25-92 K. WHITAKER
CHK 8-25-92 R. SWING
APPD 8-26-92 G. BROWN
APPD 8-26-92 G. BROWN
PRODUCT SPEC -
APPLICATION SPEC -
WEIGHT _

AMP Incorporated
Harrisburg, PA 17105-3608

NAME
SOCKET HEADER ASSEMBLY,
4 CIRCUIT,
COMMERCIAL MATE-N-LOK™

SIZE	CAGE CODE	DRAWING NO
C	00779	C-770997

SCALE 5:1 SHEET 1 OF 1

METRIC

THIS DRAWING IS A CONTROLLED DOCUMENT FOR AMP INCORPORATED. IT IS SUBJECT TO CHANGE AND THE CONTROLLING ENGINEERING ORGANIZATION SHOULD BE CONTACTED FOR THE LATEST REVISION.

CUSTOMER DRAWING

770997

Project file name: e:\ron\my_fire\io1053a\io1053a.cam
Date: Mon Sep 10 09:11:55 2001
Table: IO1053A.drl Layer: All Layers
Drill Usage:

Table #	Tool Ref	Tool #	Size	Exp Ord	Plated Hits	Unplated Hits	Total Hits
1	1	1	15.0	1	87	0	87
1	2	2	37.0	2	118	0	118
1	3	3	50.0	3	15	0	15
1	4	4	70.0	4	4	0	4
1	5	5	110.0	5	0	12	12
1	6	6	120.0	6	4	0	4
1	7	7	125.0	7	0	3	3
				Totals:	228	15	243