Checkerboard wiring for the M64 Alner boxes

Phil Adamson
UCL

April 13, 2002

This note presents "checkerboard" wiring for the 5 kinds of Alner box for M64s in the near detector. It supersedes my earlier note numbered **NuMI-NOTE-SCINT,ELEC-805**, and contains the updated mappings for the type 4 and 5 boxes to echieve even multiplexing in the spectrometer section. The lacing patterns described in this note are final.

1. Conventions

The diagrams on the following pages are oriented as follows:

8	7	6	5	4	3	2	1
16	15	14	13	12	11	10	9
24	23	22	21	20	19	18	17
32	31	30	29	28	27	26	25
40	39	38	37	36	35	34	33
48	47	46	45	44	43	42	41
56	55	54	53	52	51	50	49
64	63	62	61	60	59	58	57

This is the face of a PMT cookie. The side labelled "North" in Oxford parlance is to the right of this diagram, and the side labelled "East" is the top. The numbering is the pixel numbering as defined by Hamamatsu. To obtain the face of a PMT in the standard orientation, reflect in the line $y = x$.

1.1. Spectrometer region

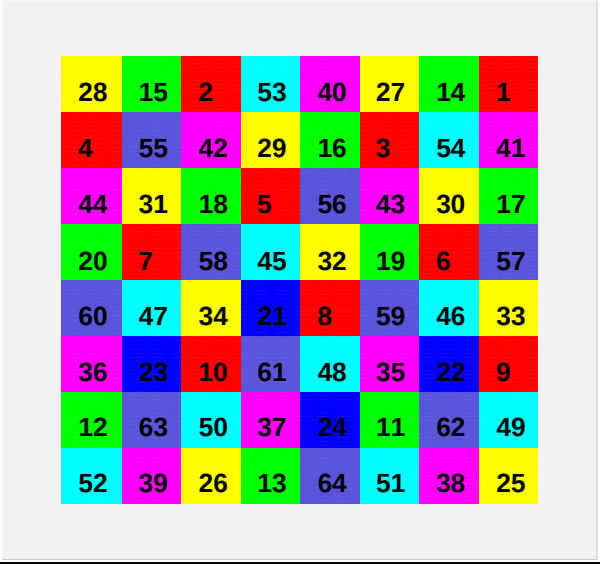
The type 4 and 5 boxes serve the spectrometer region. The anodes of the phototubes in these boxes are tied together in groups of 4; different logical "pixels" are separated by white lines on the diagrams for those boxes.

The type 5 box spans two ND planes. Strips in the second plane (which is 10 planes further down the detector) are numbered $100 + \text{stripnum}$, so strip '120' is strip 20 on the second plane. For the pattern presented here, there is no multiplexing in 'z'.

2. Mappings

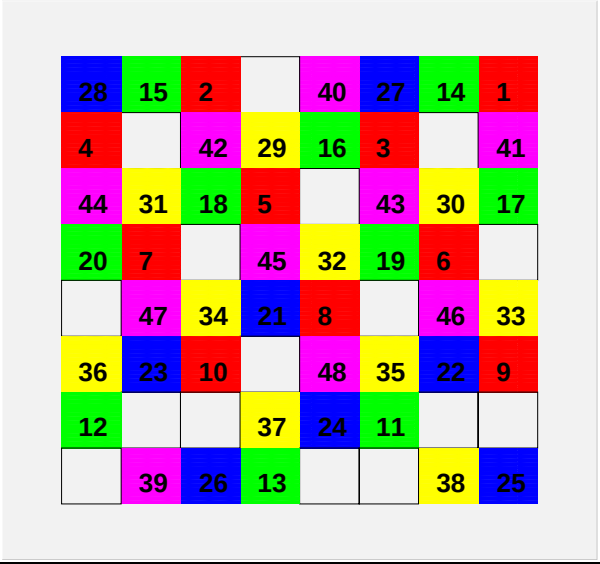
There are 5 kinds of Alner box, described elsewhere. Here are the required mappings. The numbers on the diagrams are fibre numbers, different colours indicate different light injection "ashtrays". Diagrams with strip numberings appear in the appendix.

2.1. Type 1



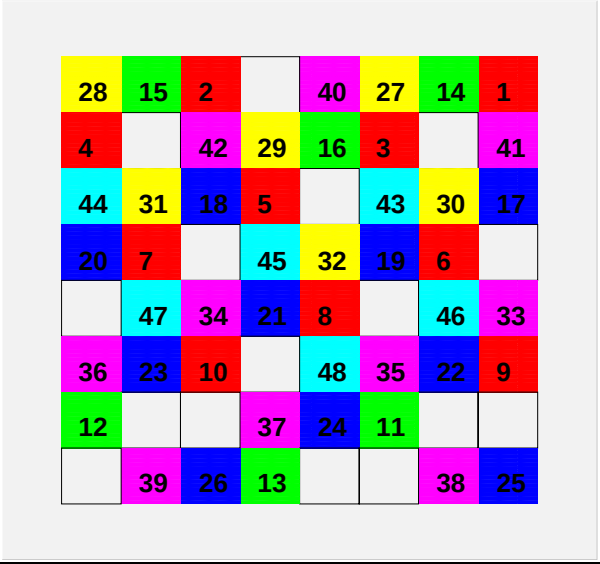
Strip	Fibre no.	Connector	Hole	Pixel	Strip	Fibre no.	Connector	Hole	Pixel
24	1	1	1	1	23	2	1	2	6
22	3	1	3	11	21	4	1	4	16
20	5	1	5	21	19	6	1	6	26
18	7	1	7	31	17	8	1	8	36
16	9	1	9	41	15	10	1	10	46
14	11	1	11	51	13	12	1	12	56
12	13	1	13	61	11	14	1	14	2
10	15	1	15	7	9	16	1	16	12
8	17	1	17	17	7	18	1	18	22
6	19	1	19	27	5	20	1	20	32
4	21	1	21	37	3	22	1	22	42
2	23	1	23	47	1	24	1	24	52
44	25	2	1	57	43	26	2	2	62
42	27	2	3	3	41	28	2	4	8
40	29	2	5	13	39	30	2	6	18
38	31	2	7	23	37	32	2	8	28
36	33	2	9	33	35	34	2	10	38
34	35	2	11	43	33	36	2	12	48
32	37	2	13	53	31	38	2	14	58
30	39	2	15	63	29	40	2	16	4
28	41	2	17	9	27	42	2	18	14
26	43	2	19	19	25	44	2	20	24
45	45	3	1	29	46	46	3	2	34
47	47	3	3	39	48	48	3	4	44
49	49	3	5	49	50	50	3	6	54
51	51	3	7	59	52	52	3	8	64
53	53	3	9	5	54	54	3	10	10
55	55	3	11	15	56	56	3	12	20
57	57	3	13	25	58	58	3	14	30
59	59	3	15	35	60	60	3	16	40
61	61	3	17	45	62	62	3	18	50
63	63	3	19	55	64	64	3	20	60

2.2. Type 2



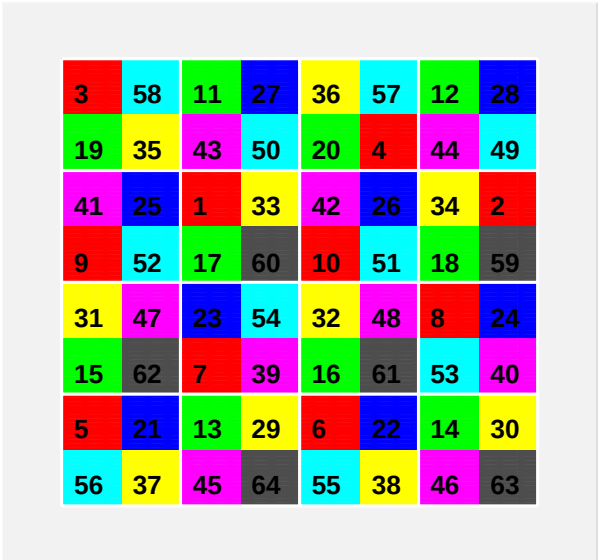
Strip	Fibre no.	Connector	Hole	Pixel	Strip	Fibre no.	Connector	Hole	Pixel
28	1	1	1	1	27	2	1	2	6
26	3	1	3	11	25	4	1	4	16
24	5	1	5	21	23	6	1	6	26
22	7	1	7	31	21	8	1	8	36
20	9	1	9	41	19	10	1	10	46
18	11	1	11	51	17	12	1	12	56
16	13	1	13	61	15	14	1	14	2
14	15	1	15	7	13	16	1	16	12
12	17	1	17	17	11	18	1	18	22
10	19	1	19	27	9	20	1	20	32
8	21	1	21	37	7	22	1	22	42
6	23	1	23	47	5	24	1	24	52
4	25	1	25	57	3	26	1	26	62
2	27	1	27	3	1	28	1	28	8
48	29	2	1	13	47	30	2	2	18
46	31	2	3	23	45	32	2	4	28
44	33	2	5	33	43	34	2	6	38
42	35	2	7	43	41	36	2	8	48
40	37	2	9	53	39	38	2	10	58
38	39	2	11	63	37	40	2	12	4
36	41	2	13	9	35	42	2	14	14
34	43	2	15	19	33	44	2	16	24
32	45	2	17	29	31	46	2	18	34
30	47	2	19	39	29	48	2	20	44

2.3. Type 3



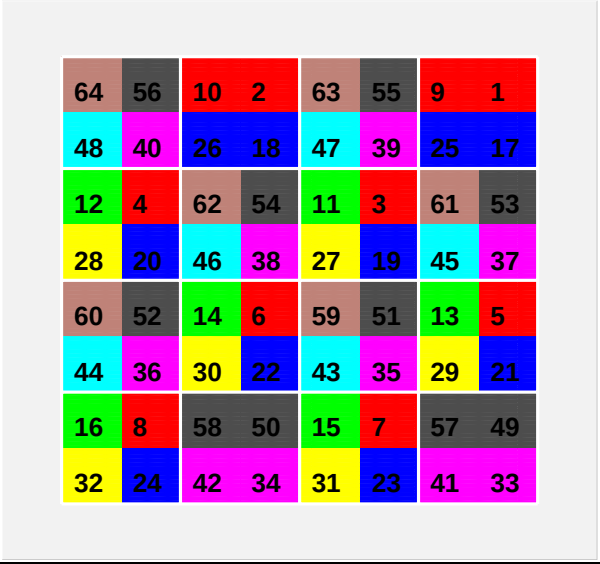
Strip	Fibre no.	Connector	Hole	Pixel	Strip	Fibre no.	Connector	Hole	Pixel
49	1	1	1	1	50	2	1	2	6
51	3	1	3	11	52	4	1	4	16
53	5	1	5	21	54	6	1	6	26
55	7	1	7	31	56	8	1	8	36
57	9	1	9	41	58	10	1	10	46
59	11	1	11	51	60	12	1	12	56
61	13	1	13	61	62	14	1	14	2
63	15	1	15	7	64	16	1	16	12
65	17	2	1	17	66	18	2	2	22
67	19	2	3	27	68	20	2	4	32
69	21	2	5	37	70	22	2	6	42
71	23	2	7	47	72	24	2	8	52
73	25	2	9	57	74	26	2	10	62
75	27	2	11	3	76	28	2	12	8
77	29	2	13	13	78	30	2	14	18
79	31	2	15	23	80	32	2	16	28
81	33	3	1	33	82	34	3	2	38
83	35	3	3	43	84	36	3	4	48
85	37	3	5	53	86	38	3	6	58
87	39	3	7	63	88	40	3	8	4
89	41	3	9	9	90	42	3	10	14
91	43	3	11	19	92	44	3	12	24
93	45	3	13	29	94	46	3	14	34
95	47	3	15	39	96	48	3	16	44

2.4. Type 4



Strip	Fibre no.	Connector	Hole	Pixel	Strip	Fibre no.	Connector	Hole	Pixel
28	1	1	1	22	27	2	1	2	17
26	3	1	3	8	25	4	1	4	11
24	5	1	5	56	23	6	1	6	52
22	7	1	7	46	21	8	1	8	34
20	9	1	9	32	19	10	1	10	28
18	11	1	11	6	17	12	1	12	2
16	13	1	13	54	15	14	1	14	50
14	15	1	15	48	13	16	1	16	44
12	17	1	17	30	11	18	1	18	26
10	19	1	19	16	9	20	1	20	12
8	21	1	21	55	7	22	1	22	51
6	23	1	23	38	5	24	1	24	33
4	25	1	25	23	3	26	1	26	19
2	27	1	27	5	1	28	1	28	1
48	29	2	1	53	47	30	2	2	49
46	31	2	3	40	45	32	2	4	36
44	33	2	5	21	43	34	2	6	18
42	35	2	7	15	41	36	2	8	4
40	37	2	9	63	39	38	2	10	59
38	39	2	11	45	37	40	2	12	41
36	41	2	13	24	35	42	2	14	20
34	43	2	15	14	33	44	2	16	10
32	45	2	17	62	31	46	2	18	58
30	47	2	19	39	29	48	2	20	35
49	49	3	1	9	50	50	3	2	13
51	51	3	3	27	52	52	3	4	31
53	53	3	5	42	54	54	3	6	37
55	55	3	7	60	56	56	3	8	64
57	57	3	9	3	58	58	3	10	7
59	59	3	11	25	60	60	3	12	29
61	61	3	13	43	62	62	3	14	47
63	63	3	15	57	64	64	3	16	61

2.5. Type 5

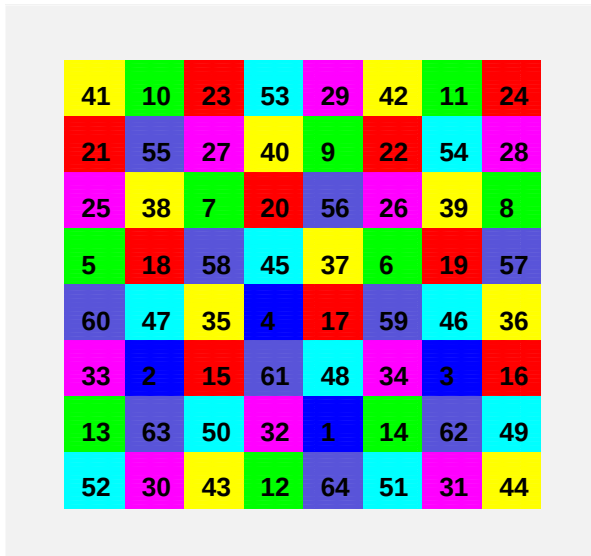


Strip	Fibre no.	Connector	Hole	Pixel	Strip	Fibre no.	Connector	Hole	Pixel
65	1	1	1	1	66	2	1	2	5
67	3	1	3	19	68	4	1	4	23
69	5	1	5	33	70	6	1	6	37
71	7	1	7	51	72	8	1	8	55
73	9	1	9	2	74	10	1	10	6
75	11	1	11	20	76	12	1	12	24
77	13	1	13	34	78	14	1	14	38
79	15	1	15	52	80	16	1	16	56
81	17	2	1	9	82	18	2	2	13
83	19	2	3	27	84	20	2	4	31
85	21	2	5	41	86	22	2	6	45
87	23	2	7	59	88	24	2	8	63
89	25	2	9	10	90	26	2	10	14
91	27	2	11	28	92	28	2	12	32
93	29	2	13	42	94	30	2	14	46
95	31	2	15	60	96	32	2	16	64
165	33	3	1	57	166	34	3	2	61
167	35	3	3	43	168	36	3	4	47
169	37	3	5	25	170	38	3	6	29
171	39	3	7	11	172	40	3	8	15
173	41	3	9	58	174	42	3	10	62
175	43	3	11	44	176	44	3	12	48
177	45	3	13	26	178	46	3	14	30
179	47	3	15	12	180	48	3	16	16
181	49	4	1	49	182	50	4	2	53
183	51	4	3	35	184	52	4	4	39
185	53	4	5	17	186	54	4	6	21
187	55	4	7	3	188	56	4	8	7
189	57	4	9	50	190	58	4	10	54
191	59	4	11	36	192	60	4	12	40
193	61	4	13	18	194	62	4	14	22
195	63	4	15	4	196	64	4	16	8

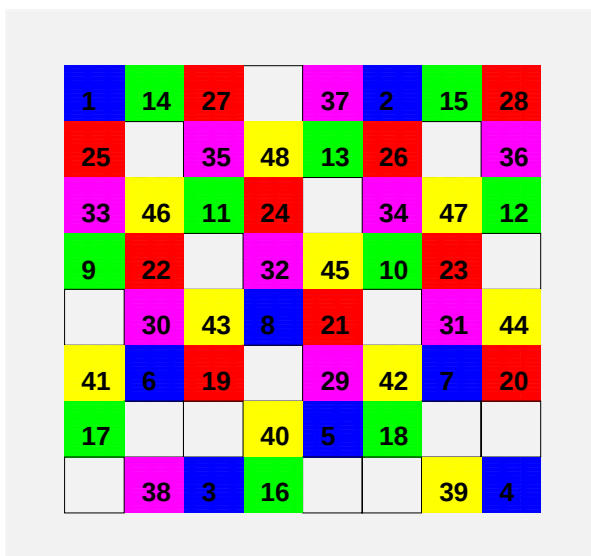
A. Diagrams with strip numberings

The diagrams in this appendix are the same as those in the main part of the document, however the pixels are numbered with the number of the strip that is read out by that pixel. Strip 1 is the strip nearest the edge of the detector that is read out, strip 64 falls in the middle of the coil bypass and strip 96 is the final strip in a full plane.

A.1. Type 1



A.2. Type 2



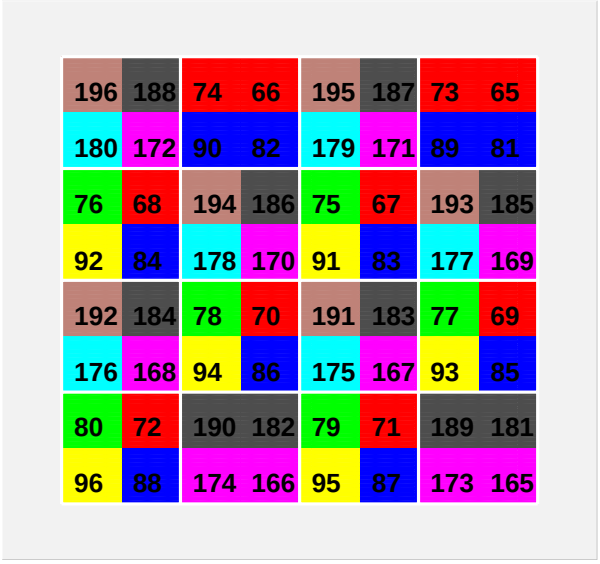
A.3. Type 3

76	63	50		88	75	62	49
52		90	77	64	51		89
92	79	66	53		91	78	65
68	55		93	80	67	54	
	95	82	69	56		94	81
84	71	58		96	83	70	57
60			85	72	59		
	87	74	61			86	73

A.4. Type 4

26	58	18	2	41	57	17	1
10	42	34	50	9	25	33	49
36	4	28	44	35	3	43	27
20	52	12	60	19	51	11	59
46	30	6	54	45	29	21	5
14	62	22	38	13	61	53	37
24	8	16	48	23	7	15	47
56	40	32	64	55	39	31	63

A.5. Type 5


196 188 74 66 195 187 73 65
180 172 90 82 179 171 89 81
76 68 194 186 75 67 193 185
92 84 178 170 91 83 177 169
192 184 78 70 191 183 77 69
176 168 94 86 175 167 93 85
80 72 190 182 79 71 189 181
96 88 174 166 95 87 173 165