Remote Control of the 1999 DMAD System – Manual –

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The AMANDA multiplicity trigger system DMAD in its 1999 configuration is remotely controllable since January 1999. This allows to set any aribitrary pattern of channels, on which the DMAD-majority trigger decision is made. Examples for applications are (1) triggering on a sub-array (e.g on a single string only) and (2) accumulation of noise spectra for individual channels ("amplitude calibration").

1 Introduction

During last Antarctic summer season we added functionality to the installed in 1997 DMAD multiplicity trigger system. With the help of Pavel Marciniewski, we installed some hard- and software to allow for a remote control of the DMAD trigger signal masking mechanism. This functionality and the user interface are kept relatively modest, since for AMANDA-II in the 1999/2000 season an upgrade of the majority trigger hardware was foreseen anyway. Also, some of the DMAD modules were repaired in January 1999 (by Nick Starinski).

The remote control was for the same reasons not incorporated into the Main-DAQ. This means the DMAD control is via the standalone program `dmad` that is running on one of the Linux-PC's in MAPO.

We mention some examples for applications of the programmable trigger masking for detector systematics or physics studies:

- triggering on a small subarray with a low multiplicity threshold (like a single string with two-fold multiplicity);
  usable for physics cross checks as well as for low level functionality proofs of the array (calibration, cabeling, ...)
- investigation of individual channels irrespective of all other OMs, like for "amplitude calibration" (trigger multiplicity 1, only one channel in trigger at a time)
- investigation of the correlated triggering of some selected channels (e.g. for cross-talk debugging)
- physics studies of response of certain topologies, like e.g. OMs located at a large distance (e.g. for a high statistics study of light detection far away from a selected "muon trigger hodoscope" that could consist of 2 or more OMs located on a string).

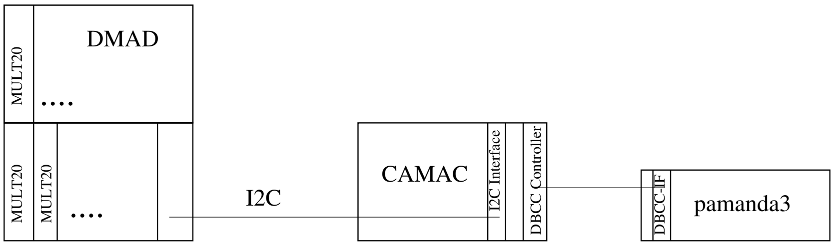

Figure 1: The DMAD control setup as of January 1999. It includes the control PC `pamanda3` with the DBCC interface card, a CAMAC crate housing the DBCC crate controller and the I2C-interface (at N=22) and the DMAD crates, connected via I2C bus.

The DMAD control functionality was used in January and February 1999 to take for the first time muon data with a single string low-mulitplicity trigger configuration for most of the B13-strings (remember that the DMAD setup is not stringwise, i.e. simple recableing/connector-unplugging never allows for string-wise trigger patterns). Also, first individual ADC spectra with the Main-DAQ have been taken, without modifying any of the hardware components (i.e. in the true Main-DAQ trigger regime). It is also used in summer 1999/2000 to take dedicated trigger.

2 Hardware

The whole system consists of the following components: The DMAD is connected via a I2C-bus to a custom I2C-bus controller, which is sitting in slot 22 of a CAMAC crate (e.g. the "small DAQ CAMAC Crate" = "Zeuthen-T0-DAQ"). The CAMAC crate houses also the DBCC CAMAC crate controller. This controller is connected to an ISA bus interface located in the Linux-PC `pamanda3, /dev/camac0`. The remote control is done by a small standalone program `dmad`, running on `pamanda3`.

The DAMD hardware allows for setting of the individual trigger channel masks. However, there's no read-back option for the true status of the trigger masks implemented in the current hardware (see below). The DMAD hardware allows also to set the multiplicty threshold in the final DMAD-Adder (the majority trigger threshold). This option is not used by the `dmad` program, since this can trivially (and much safer) be set by the front-panel switches of the DMAD. Note, that the default status of the trigger masks of all DMAD modules is "un-masked", i.e. all the channels participate in the trigger decision after power-on. For a detailed DMAD description see the Manual (P. Marciniewski, "MADD - A Fast Multiplicity Trigger System").

3 Software

If you log in as `daq`, change to the directory `/home/daq/dmad` and start the `dmad` program by typing `dmad <enter>`. The program will first read the file `dmad_setup.map`, which holds the mapping information about which AMANDA channel is connected to which of the DMAD channels (see Appendix). Afterwards, `dmad` tries to open the DBCC CAMAC- ISA bus interface (`/dev/camac0`). It is assumed for any future operation that the I2C-Bus controller is located in slot 22. If all hardware components are correctly found, `dmad` will return a command prompt. Typing `h <enter>` will display the command summary.

The user interface is a simple prompt,
`command (mask mode):`
or
`command (unmask mode):`,
after which one can type in the following commands (followed by `<enter>`):

•	**h**	comand summary	
•	**i**	channel trigger status information:	
		X	masked
		.	unmasked
		?	status unknown
			not connected
•	**m**	switch to mask mode	
•	**ma**	mask all channels and switch to mask mode	
•	**u**	switch to unmask mode	
•	**ua**	unmask all channels and switch to unmask mode	
•	**#n**	(un)mask AMANDA channel #n	
•	**#n1,#n2**	(un)mask AMANDA channel #n1 and #n2	
•	**#n1-#n2**	(un)mask AMAMDA channels #n1 to #n2	
•	**x**	exit	

Some remarks:

- After program-start, the software has no idea, what is really going on in the DMAD, since there's no read-back mode for the true DMAD status. Consequently, the command `i <enter>` after runstart will display only `?` for all channels.

  Type `ua <enter>` first, to produce a relatively save working base by unmasking all AMANDA channels in the DMAD.

- "Unmasked" AMANDA channels contribute to a DMAD trigger decision, "masked" channels do not.

- In the `mask` mode every number, number sequence, number interval you type in will lead to masking of the so specified AMANDA channels.

- In the `unmask` mode every number, number sequence, number interval you type in will lead to unmasking of the so specified AMANDA channels.

- (Un)masking AMANDA channels that are defined in a long list consumes a lot of time. Because of this, it is sometimes better/faster to take the detour via the `ma <enter>` or `ua <enter>` commands (Here, 16 channels are operated at once).

- Per command line one can type in several commands divided by `;` or `,` or `.` or `<blank>` or `/`.
- If `dmad` has to be re-started during a programming session, the programming status of the DMAD will not be influenced (i.e. no reset is done at program start). The be safe, we recommend however to either explicitely check the correct DMAD status or re-program the DMAD again.

Example:

Let us assume all AMANDA channels are unmasked, the software is in the `unmask` mode and you want to mask all AMANDA channels except channels 4, 9, 18, 19, 20, 21, 22. Possible alternative command sequences would be:

- `ma <enter>, u <enter>, 4 <enter>, 9 <enter>, 18 <enter>, 19 <enter>, 20 <enter>, 21 <enter>, 22 <enter>`
- `ma <enter>, u 4,9,18,19,20,21,22 <enter>`
- `ma <enter>, u <enter>, 4,9 <enter>, 18-22 <enter>`
- `ma u 4,9,18-22<enter>`
- ...

4 Warning

The whole system was set up and programmed in some hurry ! So please, check always the result of your operations by using the `i <enter>` command, which gives the status of the internal `dmad` software tables for the DMAD channels.

The true DMAD masking status can only be checked however by looking into the data that are taken. The easiest way is by using the Main-DAQ online histogramming capabilities (e.g. the TDC ar ADC hit channel rates). There's also a possibility of a hardware check for individual DMAD channels being masked or not: the output panel (LEMO connectors) of the MULT20 units give the DMAD input signals only for unmasked channels. Also, the DMAD trigger rate (as measured e.g. with a NIM counter) can give some qualitative information about the masking status (0 Hz would correspond to all being masked, a change of the masking setup is reflected in a trigger rate change etc).

A final word of caution. Since the `dmad` program is a standalone program, any user starting the Main-DAQ for a muon run will not see automatically the DMAD masking status. This means, that after usage of the DMAD program, you have the **full responsbility to bring the channel mapping back into the desired status.** Default status: all channels being unmasked, i.e. participating in the trigger (which is done by the command `ua`).

In case of trouble (e.g. failure of the `dmad` program or the related interface hardware), you can achieve a resetting of the DMAD to default un-masked status also by "hard-reset": power-off/on of the DMAD crates. This should not be the standard reset mechanism, however.

5 Appendix - The DMAD channel setup table

Below, we give the content of the input file `setup_dmad.map` to the program `dmad`. This file defines the location of the readout channels for those OMs that are wired up in the trigger system. It also gives the I2C-adresses of the MULT20-DMAD-modules and the corresponding input channnels that are used.
In detail: The OM-number (1...428) is given by `chan`, the two adress bytes by `adr0` and `adr1`, the input channel on the MULT20 unit (1...20) by `inp`, the logical module ID (front panel label) by `DMAD module`, and string and OM number within string by `str` and `OM`.

OMs not connected to the DMAD system are marked with `"-1"`. For the default B13-setup, these non-triggering OMs are OMs 81-86 and the lower and upper sections on string 11-13: the first and last 8 OMs per string each. (By mistake, the non-connected OM421 is indicated as connected).

The status of the file is as for January 1999, which is identical to the commissioned in January 1998 setup. Therefore, the removal of st11-13 from the trigger during winter-99 (done by simply unplugging of the DMAD input connectors coming from the discriminators) is not accounted for here. For completeness we note that for the January 1999 setup a few MULT20 boards had been physically exchanged with respect to the 1998 setup.

```
#   B-13 String and DMAD Map
#     T.Schmidt & R.Wischnewski,  16.01.1999
#
# Chan      DMAD            DMAD   Str OM
#       Adr0 Adr1 Inp      Module
#
#
```

Chan	DMAD Adr0	DMAD Adr1	DMAD Inp	DMAD Module	Str	OM
1	40	12	1	107	1	1
2	40	12	2	107	1	2
3	40	12	3	107	1	3
4	40	12	4	107	1	4
5	40	12	5	107	1	5
6	40	12	6	107	1	6
7	40	12	7	107	1	7
8	40	12	8	107	1	8
9	40	12	9	107	1	9
10	40	12	10	107	1	10
11	40	12	11	107	1	11
12	40	12	12	107	1	12
13	40	12	13	107	1	13
14	40	12	14	107	1	14
15	40	12	15	107	1	15
16	40	12	16	107	1	16
17	40	12	17	107	1	17
18	40	12	18	107	1	18
19	40	12	19	107	1	19
20	40	12	20	107	1	20
21	40	13	1	108	2	1
22	40	13	2	108	2	2
23	40	13	3	108	2	3
24	40	13	4	108	2	4
25	40	13	5	108	2	5
26	40	13	6	108	2	6
27	40	13	7	108	2	7
28	40	13	8	108	2	8
29	40	13	9	108	2	9
30	40	13	10	108	2	10
31	40	13	11	108	2	11
32	40	13	12	108	2	12
33	40	13	13	108	2	13
34	40	13	14	108	2	14
35	40	13	15	108	2	15
36	40	13	16	108	2	16
37	40	13	17	108	2	17
38	40	13	18	108	2	18
39	40	13	19	108	2	19
40	40	13	20	108	2	20
41	40	14	1	109	3	1
42	40	14	2	109	3	2
43	40	14	3	109	3	3
44	40	14	4	109	3	4
45	40	14	5	109	3	5
46	40	14	6	109	3	6
47	40	14	7	109	3	7
48	40	14	8	109	3	8
49	40	14	9	109	3	9
50	40	14	10	109	3	10
51	40	14	11	109	3	11
52	40	14	12	109	3	12
53	40	14	13	109	3	13
54	40	14	14	109	3	14
55	40	14	15	109	3	15
56	40	14	16	109	3	16
57	40	14	17	109	3	17
58	40	14	18	109	3	18
59	40	14	19	109	3	19
60	40	14	20	109	3	20
61	40	15	1	110	4	1
62	40	15	2	110	4	2
63	40	15	3	110	4	3
64	40	15	4	110	4	4
65	40	15	5	110	4	5
66	40	15	6	110	4	6
67	40	15	7	110	4	7
68	40	15	8	110	4	8
69	40	15	9	110	4	9
70	40	15	10	110	4	10
71	40	15	11	110	4	11
72	40	15	12	110	4	12
73	40	15	13	110	4	13
74	40	15	14	110	4	14
75	40	15	15	110	4	15
76	40	15	16	110	4	16
77	40	15	17	110	4	17
78	40	15	18	110	4	18
79	40	15	19	110	4	19
80	40	15	20	110	4	20
81	-1	-1	-1	-1	4	21
82	-1	-1	-1	-1	4	22
83	-1	-1	-1	-1	4	23
84	-1	-1	-1	-1	4	24
85	-1	-1	-1	-1	4	25
86	-1	-1	-1	-1	4	26
87	40	00	1	201	5	1
88	40	00	2	201	5	2
89	40	00	3	201	5	3
90	40	00	4	201	5	4
91	40	00	5	201	5	5
92	40	00	6	201	5	6
93	40	00	7	201	5	7
94	40	00	8	201	5	8
95	40	00	9	201	5	9
96	40	00	10	201	5	10
97	40	00	11	201	5	11
98	40	00	12	201	5	12
99	40	00	13	201	5	13
100	40	00	14	201	5	14
101	40	00	15	201	5	15
102	40	00	16	201	5	16
103	40	01	1	202	5	17
104	40	01	2	202	5	18
105	40	01	3	202	5	19
106	40	01	4	202	5	20
107	40	01	5	202	5	21
108	40	01	6	202	5	22
109	40	01	7	202	5	23
110	40	01	8	202	5	24
111	40	01	9	202	5	25
112	40	01	10	202	5	26
113	40	01	11	202	5	27
114	40	01	12	202	5	28
115	40	01	13	202	5	29
116	40	01	14	202	5	30
117	40	01	15	202	5	31
118	40	01	16	202	5	32
119	40	02	1	203	5	33
120	40	02	2	203	5	34
121	40	02	3	203	5	35

122	40	02	4	203	5	36
123	40	02	5	203	6	1
124	40	02	6	203	6	2
125	40	02	7	203	6	3
126	40	02	8	203	6	4
127	40	02	9	203	6	5
128	40	02	10	203	6	6
129	40	02	11	203	6	7
130	40	02	12	203	6	8
131	40	02	13	203	6	9
132	40	02	14	203	6	10
133	40	02	15	203	6	11
134	40	02	16	203	6	12
135	40	03	1	204	6	13
136	40	03	2	204	6	14
137	40	03	3	204	6	15
138	40	03	4	204	6	16
139	40	03	5	204	6	17
140	40	03	6	204	6	18
141	40	03	7	204	6	19
142	40	03	8	204	6	20
143	40	03	9	204	6	21
144	40	03	10	204	6	22
145	40	03	11	204	6	23
146	40	03	12	204	6	24
147	40	03	13	204	6	25
148	40	03	14	204	6	26
149	40	03	15	204	6	27
150	40	03	16	204	6	28
151	40	04	1	205	6	29
152	40	04	2	205	6	30
153	40	04	3	205	6	31
154	40	04	4	205	6	32
155	40	04	5	205	6	33
156	40	04	6	205	6	34
157	40	04	7	205	6	35
158	40	04	8	205	6	36
159	40	04	9	205	7	1
160	40	04	10	205	7	2
161	40	04	11	205	7	3
162	40	04	12	205	7	4
163	40	04	13	205	7	5
164	40	04	14	205	7	6
165	40	04	15	205	7	7
166	40	04	16	205	7	8
167	40	05	1	206	7	9
168	40	05	2	206	7	10
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172	40	05	6	206	7	14
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175	40	05	9	206	7	17
176	40	05	10	206	7	18
177	40	05	11	206	7	19
178	40	05	12	206	7	20
179	40	05	13	206	7	21
180	40	05	14	206	7	22
181	40	05	15	206	7	23
182	40	05	16	206	7	24
183	40	03	17	204	7	25
184	40	03	18	204	7	26
185	40	03	19	204	7	27
186	40	03	20	204	7	28

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188	40	04	18	205	7	30
189	40	04	19	205	7	31
190	40	04	20	205	7	32
191	40	05	17	206	7	33
192	40	05	18	206	7	34
193	40	05	19	206	7	35
194	40	05	20	206	7	36
195	40	06	1	207	8	1
196	40	06	2	207	8	2
197	40	06	3	207	8	3
198	40	06	4	207	8	4
199	40	06	5	207	8	5
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214	40	07	4	208	8	20
215	40	07	5	208	8	21
216	40	07	6	208	8	22
217	40	07	7	208	8	23
218	40	07	8	208	8	24
219	40	07	9	208	8	25
220	40	07	10	208	8	26
221	40	07	11	208	8	27
222	40	07	12	208	8	28
223	40	07	13	208	8	29
224	40	07	14	208	8	30
225	40	07	15	208	8	31
226	40	07	16	208	8	32
227	40	08	1	209	8	33
228	40	08	2	209	8	34
229	40	08	3	209	8	35
230	40	08	4	209	8	36
231	40	08	5	209	9	1
232	40	08	6	209	9	2
233	40	08	7	209	9	3
234	40	08	8	209	9	4
235	40	08	9	209	9	5
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240	40	08	14	209	9	10
241	40	08	15	209	9	11
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243	40	09	1	210	9	13
244	40	09	2	210	9	14
245	40	09	3	210	9	15
246	40	09	4	210	9	16
247	40	09	5	210	9	17
248	40	09	6	210	9	18
249	40	09	7	210	9	19
250	40	09	8	210	9	20
251	40	09	9	210	9	21

252	40	09	10	210	9	22
253	40	09	11	210	9	23
254	40	09	12	210	9	24
255	40	09	13	210	9	25
256	40	09	14	210	9	26
257	40	09	15	210	9	27
258	40	09	16	210	9	28
259	40	0A	1	211	9	29
260	40	0A	2	211	9	30
261	40	0A	3	211	9	31
262	40	0A	4	211	9	32
263	40	0A	5	211	9	33
264	40	0A	6	211	9	34
265	40	0A	7	211	9	35
266	40	0A	8	211	9	36
267	40	0A	9	211	10	1
268	40	0A	10	211	10	2
269	40	0A	11	211	10	3
270	40	0A	12	211	10	4
271	40	0A	13	211	10	5
272	40	0A	14	211	10	6
273	40	0A	15	211	10	7
274	40	0A	16	211	10	8
275	40	0B	1	212	10	9
276	40	0B	2	212	10	10
277	40	0B	3	212	10	11
278	40	0B	4	212	10	12
279	40	0B	5	212	10	13
280	40	0B	6	212	10	14
281	40	0B	7	212	10	15
282	40	0B	8	212	10	16
283	40	0B	9	212	10	17
284	40	0B	10	212	10	18
285	40	0B	11	212	10	19
286	40	0B	12	212	10	20
287	40	0B	13	212	10	21
288	40	0B	14	212	10	22
289	40	0B	15	212	10	23
290	40	0B	16	212	10	24
291	40	09	17	210	10	25
292	40	09	18	210	10	26
293	40	09	19	210	10	27
294	40	09	20	210	10	28
295	40	0A	17	211	10	29
296	40	0A	18	211	10	30
297	40	0A	19	211	10	31
298	40	0A	20	211	10	32
299	40	0B	17	212	10	33
300	40	0B	18	212	10	34
301	40	0B	19	212	10	35
302	40	0B	20	212	10	36
303	-1	-1	-1	-1	11	1
304	-1	-1	-1	-1	11	2
305	-1	-1	-1	-1	11	3
306	-1	-1	-1	-1	11	4
307	-1	-1	-1	-1	11	5
308	-1	-1	-1	-1	11	6
309	-1	-1	-1	-1	11	7
310	-1	-1	-1	-1	11	8
311	40	0C	1	101	11	9
312	40	0C	2	101	11	10
313	40	0C	3	101	11	11
314	40	0C	4	101	11	12
315	40	0C	5	101	11	13
316	40	0C	6	101	11	14
317	40	0C	7	101	11	15
318	40	0C	8	101	11	16
319	40	0C	9	101	11	17
320	40	0C	10	101	11	18
321	40	0C	11	101	11	19
322	40	0C	12	101	11	20
323	40	0C	13	101	11	21
324	40	0C	14	101	11	22
325	40	0C	15	101	11	23
326	40	0C	16	101	11	24
327	40	0D	1	102	11	25
328	40	0D	2	102	11	26
329	40	0D	3	102	11	27
330	40	0D	4	102	11	28
331	40	0D	5	102	11	29
332	40	0D	6	102	11	30
333	40	0D	7	102	11	31
334	40	0D	8	102	11	32
335	40	0D	9	102	11	33
336	40	0D	10	102	11	34
337	-1	-1	-1	-1	11	35
338	-1	-1	-1	-1	11	36
339	-1	-1	-1	-1	11	37
340	-1	-1	-1	-1	11	38
341	-1	-1	-1	-1	11	39
342	-1	-1	-1	-1	11	40
343	-1	-1	-1	-1	11	41
344	-1	-1	-1	-1	11	42
345	-1	-1	-1	-1	12	1
346	-1	-1	-1	-1	12	2
347	-1	-1	-1	-1	12	3
348	-1	-1	-1	-1	12	4
349	-1	-1	-1	-1	12	5
350	-1	-1	-1	-1	12	6
351	-1	-1	1	-1	12	7
352	-1	-1	-1	-1	12	8
353	40	0D	11	102	12	9
354	40	0D	12	102	12	10
355	40	0D	13	102	12	11
356	40	0D	14	102	12	12
357	40	0D	15	102	12	13
358	40	0D	16	102	12	14
359	40	0E	1	103	12	15
360	40	0E	2	103	12	16
361	40	0E	3	103	12	17
362	40	0E	4	103	12	18
363	40	0E	5	103	12	19
364	40	0E	6	103	12	20
365	40	0E	7	103	12	21
366	40	0E	8	103	12	22
367	40	0E	9	103	12	23
368	40	0E	10	103	12	24
369	40	0E	11	103	12	25
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371	40	0E	13	103	12	27
372	40	0E	14	103	12	28
373	40	0E	15	103	12	29
374	40	0E	16	103	12	30
375	40	0F	1	104	12	31
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377	40	0F	3	104	12	33
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379	-1	-1	-1	-1	12	35
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381	-1	-1	-1	-1	12	37

382	-1	-1	-1	-1	12	38
383	-1	-1	-1	-1	12	39
384	-1	-1	-1	-1	12	40
385	-1	-1	-1	-1	12	41
386	-1	-1	-1	-1	12	42
387	-1	-1	-1	-1	13	1
388	-1	-1	-1	-1	13	2
389	-1	-1	-1	-1	13	3
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391	-1	-1	-1	-1	13	5
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393	-1	-1	-1	-1	13	7
394	-1	-1	-1	-1	13	8
395	40	0F	5	104	13	9
396	40	0F	6	104	13	10
397	40	0F	7	104	13	11
398	40	0F	8	104	13	12
399	40	0F	9	104	13	13
400	40	0F	10	104	13	14
401	40	0F	11	104	13	15
402	40	0F	12	104	13	16
403	40	0F	13	104	13	17
404	40	0F	14	104	13	18
405	40	0F	15	104	13	19
406	40	0F	16	104	13	20
407	40	10	1	105	13	21
408	40	10	2	105	13	22
409	40	10	3	105	13	23
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411	40	10	5	105	13	25
412	40	10	6	105	13	26
413	40	10	7	105	13	27
414	40	10	8	105	13	28
415	40	10	9	105	13	29
416	40	10	10	105	13	30
417	40	10	11	105	13	31
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419	40	10	13	105	13	33
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421	40	10	15	105	13	35
422	-1	-1	-1	-1	13	36
423	-1	-1	-1	-1	13	37
424	-1	-1	-1	-1	13	38
425	-1	-1	-1	-1	13	39
426	-1	-1	-1	-1	13	40
427	-1	-1	-1	-1	13	41
428	-1	-1	-1	-1	13	42