PROGRAM DESCRIPTION I

Program Title YACHT RACING RULES JUDGE

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Program Description, Equations, Variables The program uses a decision tree to determine which yacht should be disqualified in any "right-of-way" situation (see page 2). Multi-boat situations are not directly covered but may be resolved by solving for two adjacent yachts and iterating. The logical decision tree approach illustrates the relative rank of rule changes in varying circumstances. The program will be helpful to:

a) race protest committees

b) sailors interested in improving their understanding of rules

Necessary Accessories 3-memory modules are required; printer and card reader are very desirable.

Operating Limits and Warnings Multi-boat situations are not directly involved.

Reference(s) Stephen A. Falk, SAILING RACING RULES THE EASY WAY, St. Martin's Press, New York, 1972.

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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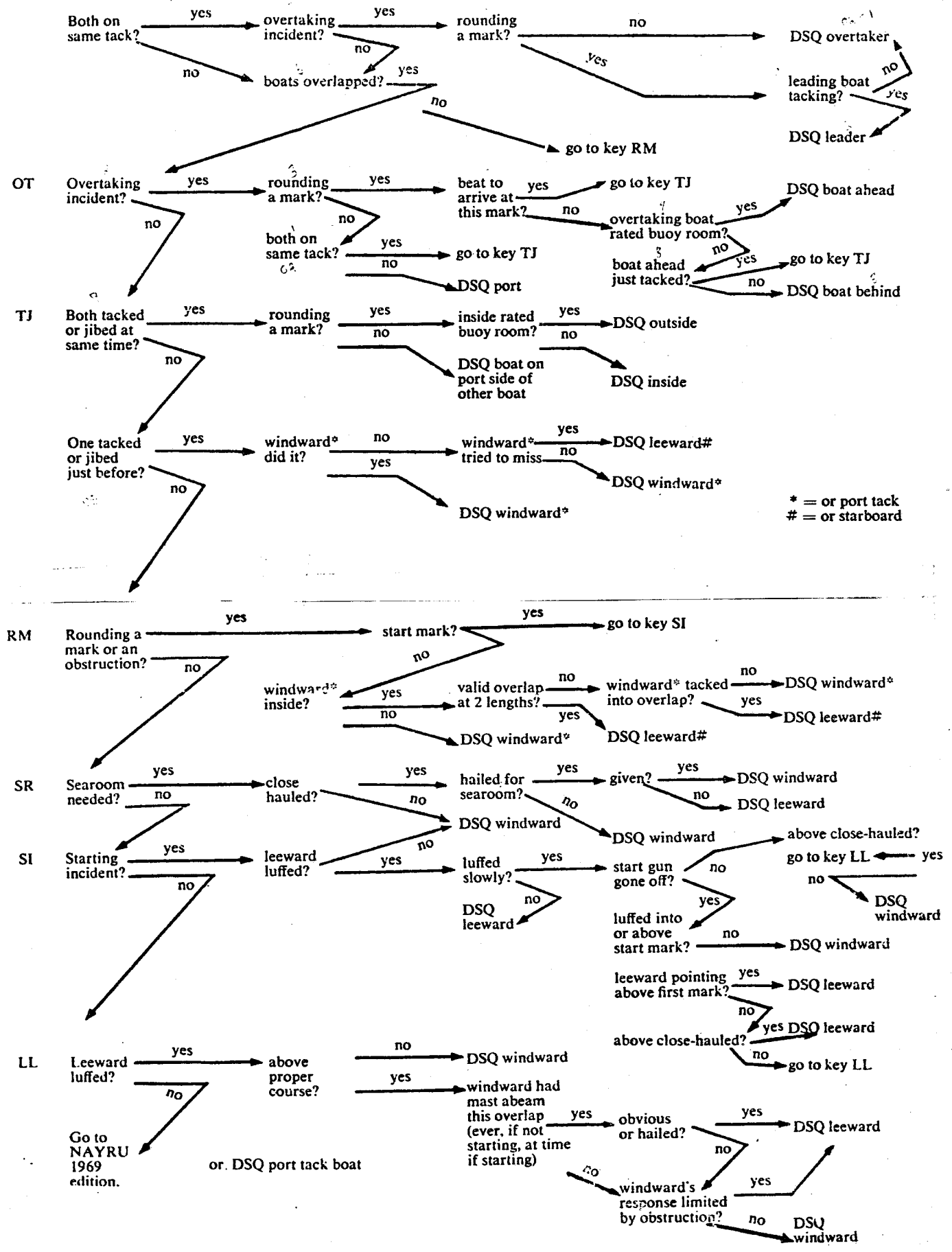
005201

DESCRIPTION I

ING RULES JUDGE

ecision Tree

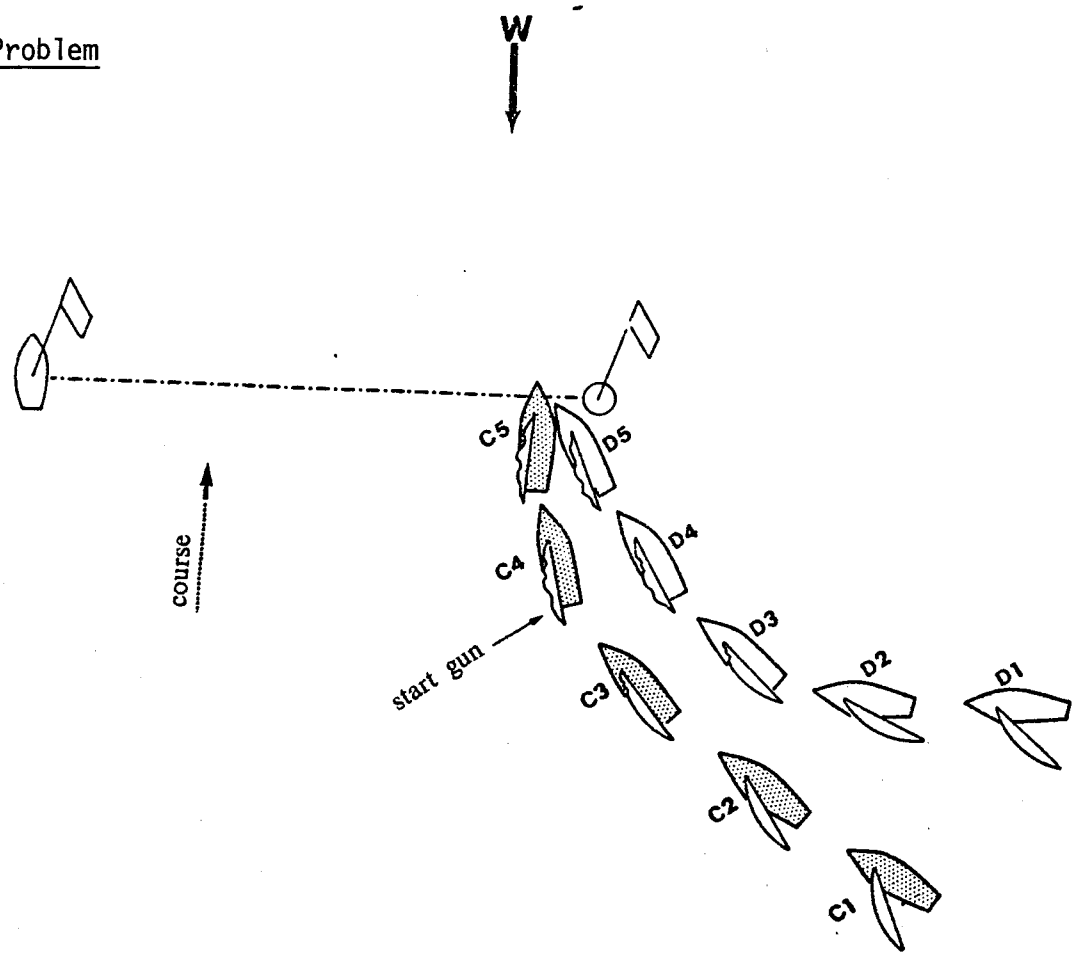


PROGRAM DESCRIPTION II

YACHT RACING RULES JUDGE

00520C

Sample Problem



Consider the famous case which occured during the 1970 America's Cup regatta. Intrepid was the windward boat (D), and Gretel II was the leeward boat (C). The start gun fired when the yachts were in position 3. In position 4, Gretel II (C) luffed Intrepid (D) and contact occured in position 5. Begin with the decision tree solution:

Condition	Answer
. Both on same tack?	Yes
. Overtaking incident?	No
. Overlap established?	Yes
. Overtaking incident (OT)? *	No
. Both tacked or jibed at same time (TJ)?	No
. One tacked or jibed just before?	No
. Rounding a mark or obstruction (RM)?	Yes
. Start mark?	Yes (Go to SI)
. Starting incident (SI)?	Yes
. Leeward luffed?	Yes
. Luffed slowly?	Yes
. Start gun gone off?	Yes
. Luffed into or above start mark?	Yes
. Leeward pointing above first mark?	No
. Above close-hauled?	Yes **

* Occasionally a question is asked twice, depending upon other conditions.

** This was the critical condition -- if you conclude that Gretel II was sailing above close-hauled, you would determine that she should be disqualified, as did the Race Committee.

PROGRAM DESCRIPTION II

Sample Problem (Sketch if Desired)

(see page 3)

SOLUTION:

Input	Function	Display	Comments
	USER		Set USER made
	[ASN] "RULES" [TAN]		Assign program to one key to permit easy evaluation of alternative conditions
	[TAN]	Racing rules Prgm determines DSQ in two boat incident	
			Pause
		Both boats on same tack.?	Initial question
Y	[R/S]	Y Overtaking incident?	Questions follow decision tree logic sequence
N	[R/S]	N Boats overlapped?	
Y	[R/S]	Y Overtaking incident	
N	[R/S]	N Both tacked jibed at same time?	
N	[R/S]	N One tacked or jibed just before?	
N	[R/S]	N Mark rounding?	
Y	[R/S]	Y Start mark?	
Y	[R/S]	Y Starting sit.?	
Y	[R/S]	Y Starboard or leeward luffed?	
Y	[R/S]	Y Luffed slowly?	
Y	[R/S]	Y Startgun fired?	
Y	[R/S]	Y Luffed into or above start mark?	
Y	[R/S]	Y Leeward pointing above 1st mark?	
N	[R/S]	N Above Closehauled	
Y	[R/S]	Y DSQ leeward	Race rules determine which yacht should be disqualified

USER INSTRUCTIONS

00520C

				SIZE: (HP-41C) 010
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1.	Execute size 010		[XEQ] SIZE 010	
2.	Enter program			
3.	Assign "Rules" to TAN key		[ASN] RULES [TAN]	
4.	Initiate program ...		[TAN]	RACING RULES
	(Program qualifies itself)			PRGM DETERMINES
				DSQ IN TWO
				BOAT INCIDENT
	(PAUSE)			
				BOTH BOATS ON
				SAME TRACK?
5.	Program prompts for "yes" or	Y	[R/S]	
	"no" answer ("Tone" sounds when answer is	N	[R/S] or	
	required)			
6.	Program will ask a series of questions			
	until a decision is reached			
	"Beep" sounds when program determines			DSQ _ _ _ _ _ _
	disqualified yacht			

PROGRAM LISTING

☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
01	♦LBL "RULES"		Initiate program
02	ADV		
03	"RACING RULES"		Print heading
04	SF 12		
05	AVIEW		
06	CF 12		
07	"PRGM DETERMINES"		
08	AVIEW		
09	PSE		
10	"DSQ IN TWO"		
11	AVIEW		
12	PSE		
13	"BOAT INCIDENT"		
14	AVIEW		
15	ADV		
16	PSE		
17	PSE		
18	GTO "START"		
19	♦LBL "SIT"		Situations subroutine a/
20	GTO IND X		
21	♦LBL 01		
22	"BOTH BOATS ON"		"Both boats on same tack?"
23	AVIEW		
24	PSE		
25	"SAME TACK?"		
26	GTO "YN"		
27	♦LBL 02		
28	"OVERTAKING"		"Overtaking Incident?"
29	AVIEW		
30	PSE		
31	"INCIDENT?"		
32	GTO "YN"		
33	♦LBL 03		
34	"MARK ROUNDING?"		"Mark rounding?"
35	GTO "YN"		
36	♦LBL 04		
37	"STARBOARD OR"		"Starboard or leeward luffed?"
38	AVIEW		
39	PSE		
40	"LEEWRD LUFFED?"		
41	GTO "YN"		
42	♦LBL 05		
43	"ABOVE"		"Above closehauled?"
44	AVIEW		
45	PSE		
46	"CLOSEHAULED?"		
47	♦LBL "YN"		"Yes/No" routine
48	AVIEW		
49	AON		
50	TONE 4		
51	STOP		
52	AOFF		
53	AVIEW		
54	ASTO Y		"No" sets flag 1
55	"N"		
56	ASTO X		
57	CF 01		"Yes" clears flag 1
58	X=Y?		
59	SF 01		
60	RTN		
61	♦LBL "START"		Begin decision tree analysis
62	1		
63	XEQ "SIT"		
64	FS? 01		
65	GTO 01		
66	2		
67	XEQ "SIT"		
68	FS? 01		
69	GTO 01		
70	3		
71	XEQ "SIT"		
72	FS? 01		
73	GTO 02		
74	"LEADER TACKING?"		"Leader tacking?"
75	XEQ "YN"		

a/ Please note that all situation statements end with a "?" and a tone sound.

PROGRAM LISTING

☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
76	FS? 01		
77	GTO 02		
78	2		
79	XEQ "DEC"		"DSQ Leader"
80	◆LBL 02		
81	1		
82	XEQ "DEC"		"DSQ Overtaker"
83	◆LBL 01		
84	"BOATS OVRLAPED?"		"Boats overlapped?"
85	XEQ "YN"		
86	FS? 01		
87	GTO "RM"		
88	2		
89	XEQ "SIT"		"Overtaking incident?"
90	FS? 01		
91	GTO "TJ"		
92	3		
93	XEQ "SIT"		"Mark rounding?"
94	FS? 01		
95	GTO 03		
96	"BEAT TO MARK?"		"Beat to mark?"
97	XEQ "YN"		
98	FC? 01		
99	GTO "TJ"		
100	"OVERTAKING BOAT"		"Overtaking boat rated buoy room?"
101	AVIEW		
102	PSE		
103	"RATED BUOYROOM?"		
104	XEQ "YN"		
105	FC? 01		
106	GTO 04		
107	"LEADER TACKED?"		"Leader tacked?"
108	XEQ "YN"		
109	FC? 01		
110	GTO "TJ"		
111	4		
112	XEQ "DEC"		"DSQ boat behind"
113	◆LBL 04		
114	3		
115	XEQ "DEC"		"DSQ boat ahead"
116	◆LBL 03		
117	1		
118	XEQ "SIT"		"Both boats on same tack?"
119	FC? 01		
120	GTO "TJ"		
121	5		
122	XEQ "DEC"		"DSQ port-tack"
123	◆LBL "TJ"		
124	"BOTH TACKED"		"Both tacked or jibed at same time?"
125	AVIEW		
126	PSE		
127	"OR JIBED AT"		
128	AVIEW		
129	PSE		
130	"SAME TIME?"		
131	XEQ "YN"		
132	FS? 01		
133	GTO 05		
134	3		
135	XEQ "SIT"		"Mark rounding?"
136	FS? 01		
137	GTO 06		
138	"INSIDE RATED"		"Inside rated buoy room?"
139	AVIEW		
140	PSE		
141	"BUOYROOM?"		
142	XEQ "YN"		
143	FS? 01		
144	GTO 07		
145	6		
146	XEQ "DEC"		"DSQ outside"
147	◆LBL 07		
148	7		
149	XEQ "DEC"		"DSQ inside"

Note: Refer to "HP-41C OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for specific information on keystrokes. The Function Index is found at the very back of the Handbook. Refer to Appendix E in 67 or 97 "OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for exact keystrokes.

PROGRAM LISTING

☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
150	♦LBL 06		
151	8		
152	XEQ "DEC"		"DSQ port-side boat"
153	♦LBL 05		
154	"ONE TACKED"		"One tacked or jibed just before?"
155	AVIEW		
156	PSE		
157	"OR JIBED"		
158	AVIEW		
159	PSE		
160	"JUST BEFORE?"		
161	XEQ "YN"		
162	FS? 01		
163	GTO "RM"		
164	"WNDWARD DID IT?"		"Windward did it?"
165	XEQ "YN"		
166	FC? 01		
167	GTO 08		
168	"WINDWARD"		"Windward tried to miss?"
169	AVIEW		
170	PSE		
171	"TRIED TO MISS?"		
172	XEQ "YN"		
173	FS? 01		
174	GTO 08		
175	♦LBL 09		
176	9		
177	XEQ "DEC"		"DSQ lee-ward or DSQ star-board?"
178	♦LBL 08		
179	10		
180	XEQ "DEC"		"DSQ port-side?"
181	♦LBL "RM"		
182	3		
183	XEQ "SIT"		"Mark rounding?"
184	FS? 01		
185	GTO "SR"		
186	"START MARK?"		
187	XEQ "YN"		
188	FC? 01		
189	GTO "SI"		
190	"WNDWARD INSIDE?"		"Windward inside?"
191	XEQ "YN"		
192	FS? 01		
193	GTO 08		
194	"VALID OVERLAP"		"Valid overlap at 2 lengths?"
195	AVIEW		
196	PSE		
197	"AT 2 LENGTHS?"		
198	XEQ "YN"		
199	FC? 01		
200	GTO 09		
201	"WINDWARD TACKED"		"Windward tacked into over-lap?"
202	AVIEW		
203	PSE		
204	"INTO OVERLAP?"		
205	XEQ "YN"		
206	FS? 01		
207	GTO 08		
208	GTO 09		
209	♦LBL "SR"		
210	"SEAROOM NEEDED?"		"Searoom needed?"
211	XEQ "YN"		
212	FS? 01		
213	GTO "SI"		
214	"CLOSE HAULED?"		"Closehauled?"
215	XEQ "YN"		
216	FS? 01		
217	GTO 12		
218	"SEAROOM HAILED?"		"Searoom hailed?"
219	XEQ "YN"		
220	FS? 01		
221	GTO 12		
222	"GIVEN?"		"Given?"
223	XEQ "YN"		
224	FC? 01		
225	GTO 12		
226	♦LBL 11		
227	11		
228	XEQ "DEC"		"DSQ leeward"

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PROGRAM LISTING

☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
229	♦LBL 12		
230	12		
231	XEQ "DEC"		"DSO wind-ward?"
232	♦LBL "SI"		"Starting situation"
233	"STARTING SIT.?"		
234	XEQ "YN"		
235	FS? 01		
236	GTO "LL"		
237	4		
238	XEQ "SIT"		"Starboard or leeward luffed?
239	FS? 01		
240	GTO 12		
241	"LUFFED SLOWLY?"		"Luffed slowly?"
242	XEQ "YN"		
243	FS? 01		
244	GTO 11		
245	"STARTGUN FIRED?"		"Startgun fired?"
246	XEQ "YN"		
247	FS? 01		
248	GTO 10		
249	"LUFFED INTO"		"Luffed into or above start mark?"
250	AVIEW		
251	PSE		
252	"OR ABOVE"		
253	AVIEW		
254	PSE		
255	"START MARK?"		
256	XEQ "YN"		
257	FS? 01		
258	GTO 12		
259	"LEEWRD POINTING"		"Leeward pointing above 1st mark?"
260	AVIEW		
261	PSE		
262	"ABOVE 1ST MARK?"		
263	XEQ "YN"		
264	FC? 01		
265	GTO 11		
266	5		
267	XEQ "SIT"		"Above close-hauled?"
268	FS? 01		
269	GTO "LL"		
270	GTO 11		
271	♦LBL 10		
272	5		
273	XEQ "SIT"		"Above close-hauled?"
274	FS? 01		
275	GTO 12		
276	♦LBL "LL"		
277	4		
278	XEQ "SIT"		"Starboard or leeward luf-fed?"
279	FS? 01		
280	GTO 14		
281	"ABOVE"		"Above proper course?"
282	AVIEW		
283	PSE		
284	"PROPER COURSE?"		
285	XEQ "YN"		
286	FS? 01		
287	GTO 12		
288	"WINDWRD HAD"		"Windward had mast abeam this overlap?"
289	AVIEW		
290	PSE		
291	"MAST ABEAM"		
292	AVIEW		
293	PSE		
294	"THIS OVERLAP?"		
295	XEQ "YN"		
296	FS? 01		
297	GTO 15		
298	"HAILED?"		"Hailed?"
299	XEQ "YN"		
300	FC? 01		
301	GTO 11		
302	♦LBL 15		
303	"WINDWARDS"		"Windward's course limited by obstruc-tion?"
304	AVIEW		
305	PSE		

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PROGRAM LISTING

☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
306	"COURSE LIMITED"		
307	AVIEW		
308	PSE		
309	"BY OBSTRUCTION?"		
310	XEQ "YN"		
311	FS? 01		
312	GTO 12		
313	GTO 11		
314	◆LBL 14		
315	5		
316	◆LBL "DEC"		Decision subroutine a/
317	GTO INDX		
318	◆LBL 01		
319	"DSQ OVERTAKER"		"DSQ overtaker"
320	GTO 13		
321	◆LBL 02		
322	"DSQ LEADER"		"DSQ leader"
323	GTO 13		
324	◆LBL 03		
325	"DSQ BOAT AHEAD"		"DSQ boat ahead?"
326	GTO 13		
327	◆LBL 04		
328	"DSQ BOAT BEHIND"		"DSQ boat behind"
329	GTO 13		
330	◆LBL 05		
331	"DSQ PORTTACK"		"DSQ port-tack"
332	GTO 13		
333	◆LBL 06		
334	"DSQ OUTSIDE"		"DSQ outside"
335	GTO 13		
336	◆LBL 07		
337	"DSQ INSIDE"		"DSQ inside"
338	GTO 13		
339	◆LBL 08		
340	"DSQ [illegible]		"DSQ portside boat"
341	GTO 13		
342	◆LBL 09		
343	"DSQ LEEWARD OR"		"DSQ leeward or DSQ starboard"
344	BEEP		
345	AVIEW		
346	PSE		
347	"DSQ STARBOARD"		
348	GTO 13		
349	◆LBL 10		
350	"DSQ WINDWARD OR"		"DSQ windward or DSQ port-tack"
351	BEEP		
352	AVIEW		
353	PSE		
354	"DSQ PORTTACK"		
355	GTO 13		
356	◆LBL 11		
357	"DSQ LEEWARD"		"DSQ leeward"
358	GTO 13		
359	◆LBL 12		
360	"DSQ WINDWARD"		"DSQ windward"
361	◆LBL 13		
362	BEEP		
363	SF 12		
364	AVIEW		
365	CF 12		
366	STOP		
90			
00			

a/ Please note that all decision subroutine messages begin with a "DSQ" statement and a "Beep" sound.

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00520C

REGISTERS, STATUS, FLAGS, ASSIGNMENTS

DATA REGISTERS

	None Required		

STATUS

SIZE 010 TOT. REG. 231 USER MODE

ENG ____ FIX ____ SCI ____ ON X OFF ____

DEG X RAD ____ GRAD ____

FLAGS

#	INIT S/C	SET INDICATES	CLEAR INDICATES
01	C	"No" response	"Yes" response
12	C	Double wide print	Normal print

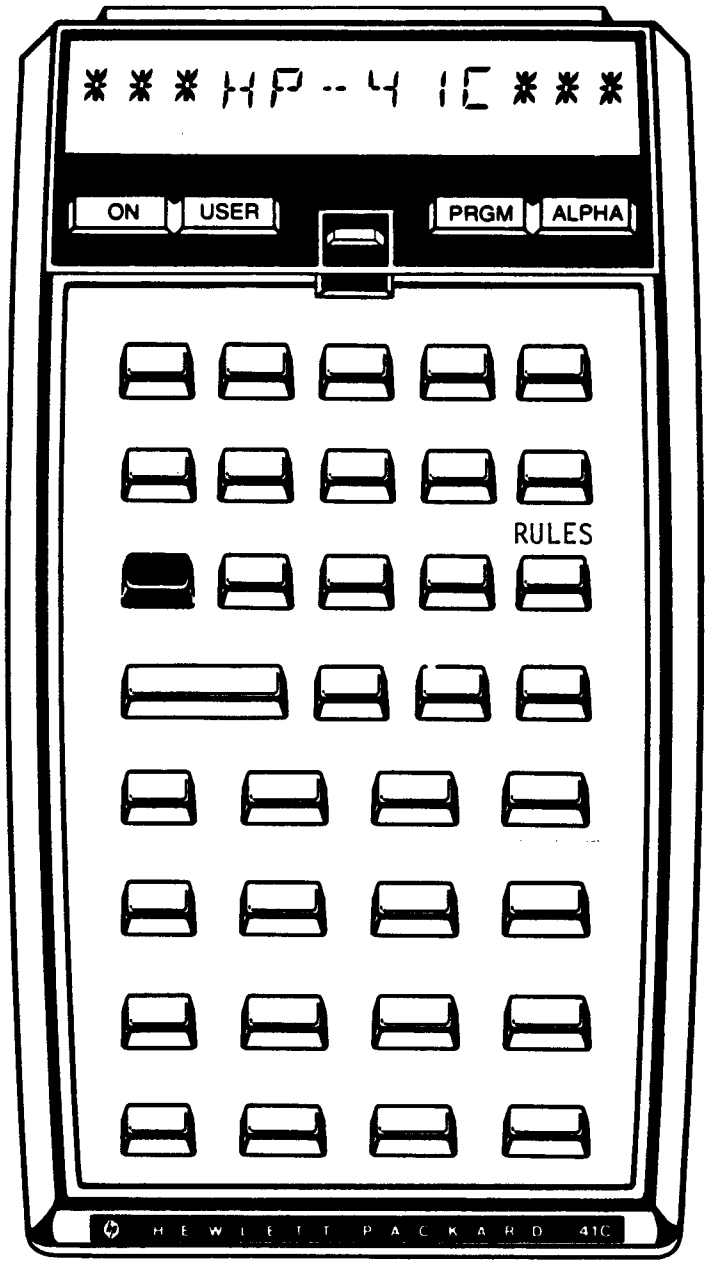
ASSIGNMENTS

FUNCTION	KEY	FUNCTION	KEY
Initiate "Rules" program	TAN		

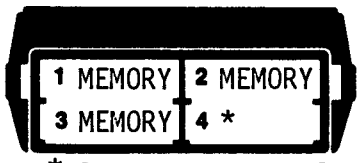
00520C

KEYBOARD CARD LABELING

KEYBOARD

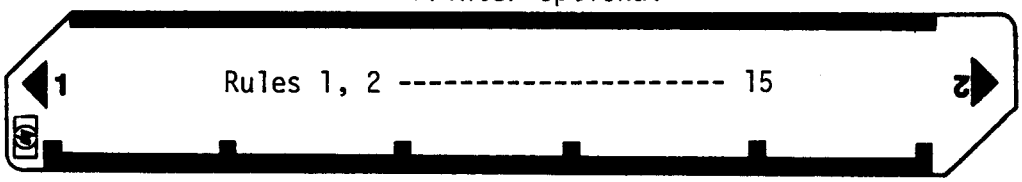


SYSTEM CONFIGURATION



* Printer optional

CARD



YACHT RACING
RULES JUDGE
PROGRAM REGISTERS NEEDED: 231

USERS' LIBRARY
PROGRAM NUMBER: 00520C

ROW 1 (1 : 3)

ROW 2 (3 : 5)

ROW 3 (6 : 7)

ROW 4 (7 : 10)

ROW 5 (10 : 13)

ROW 6 (13 : 18)

ROW 7 (18 : 19)

ROW 8 (20 : 22)

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