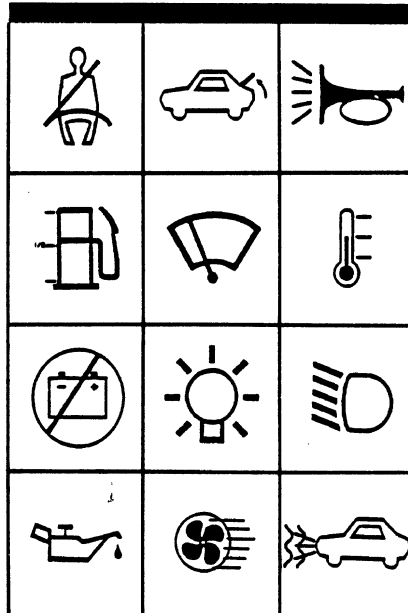


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# Automobile Instrument Panel Symbols: Do Drivers Prefer Alternatives Over Those in the ISO Standard?

James R. Sayer  
Paul Green



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16. Abstract  <p>Suggestions for pictographic symbols for identifying automotive controls and displays were obtained from 32 drivers. A total of 142 symbol candidates were developed from these suggestions for 25 functions.</p> <p>Subsequently, 104 people at a driver licensing office ranked these candidates and corresponding symbols in ISO Standard 2575 from best to worst in terms of how well the candidates represented the functions of interest. Based on those data the authors recommend replacing the ISO symbols for the lighter, fog lights, hood release, master lighting switch, and temperature. The authors also recommend continuing to seek alternatives for the front defrost, hazard, headlamp cleaner, high beam headlamps, unleaded fuel, parking lights, rear defrost, windshield washer, and windshield washer/wiper.</p>					
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- ABSTRACT -

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## ACKNOWLEDGMENTS

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In addition, we would like to thank Flora Simon for her timely help in the completion of this report and the Michigan Secretary of State branch office in Ann Arbor for their cooperation.

- ACKNOWLEDGMENTS -



## **PREFACE**

This technical report is an expansion of an almost identical document presented at the Society of Automotive Engineers International Congress and Exposition in Detroit, Michigan (Sayer and Green, 1988). Because of space constraints, it was not possible to include all of the test materials in the SAE paper which are included in this document. This report was written after the SAE document, but prior to its delivery.

- PREFACE -

# INTRODUCTION

In order to safely operate a motor vehicle, it is essential that the driver be able to identify controls and interpret displays. To provide drivers with the information they need to complete those tasks pictographic symbols are frequently used. There are circumstances when pictographic symbols can be recognized more rapidly and accurately than words (Green and Pew, 1978), which makes the vehicle easier to operate. In addition, the use of language-free (non-verbal) labeling of controls and displays is a definite advantage to the manufacturer for vehicles sold on the international market, since the same design can be used worldwide.

This report concerns the development of new symbols to identify automobile controls and displays, and how well these and existing pictographic symbols are understood. Several studies (e.g., Green and Burgess, 1980; Green and Pew, 1978; Saunby, Farber and DeMello, 1987a, b, 1988; and Wiegard and Glumm, 1979) have shown low comprehension and/or recognition of some of the symbols in ISO Standard 2575 (International Standards Organization, 1982) and SAE Recommended Practice J1048 (Society of Automotive Engineers, 1980). This paper utilizes the stereotype production method for symbol development (Mudd and Karsh, 1961; Howell and Fuchs, 1968). This method has been shown to lead to better symbols than those developed based on just the ideas of designers (Karsh and Mudd, 1962), human factors experts, or a limited number of subject matter experts. In addition, the authors make recommendations for the modification or replacement of some symbols in ISO Standard 2575.

- *INTRODUCTION* -

# SYMBOL PRODUCTION EXPERIMENT

## TEST PLAN

**PARTICIPANTS** - Thirty-two people (17 men and 15 women) from the general populous in and around the Central Campus of The University of Michigan in Ann Arbor volunteered to serve in this experiment. The experiment was conducted on a very hot and humid afternoon when people could be induced to participate in exchange for an ice cold soft drink. Approximately one-half of the participants were approached at random as they walked on campus between classes. The remaining half of the participants were members of either a course in art history or Spanish, and were asked to participate after class.

Participants ranged in age from 19 to 37 (mean = 23). Most were students at The University of Michigan (though the group included a doctor and a journalist). All were licensed drivers and had been licensed for an average of six years. Participants reported having driven a variety of different vehicles (Chevrolet Chevette, Ford Escort, and Saab 900), though the majority drove domestic economy cars. The average model year was 1981.

**TEST MATERIALS** - The experimental materials were photocopies of a ten-page test booklet and broad tipped felt pens. (See Appendix A.) The first page of the booklet was a consent form. The second requested biographical information; while the third and remaining seven pages contained instructions, descriptions of symbols, and response boxes. Each function for which a symbol suggestion was being sought included a brief description/scenario in which the control or display might be used. Immediately below these descriptions were 1-1/2 inch (38 mm) square response boxes. Participants were instructed to draw an image they thought could be used to represent the function, trying to fill the space provided.

Broad tipped felt pens were used in an attempt to limit the amount of detail people included in their drawings. Fine details can not easily or economically be incorporated in the actual symbols for controls and displays. Further, the ISO standards for symbols state that all lines in a symbol must be at least 2 mm in thickness.

**TEST STRUCTURE AND SEQUENCE** - Participants completed the test booklet in various locations on the University of Michigan campus, such as classrooms and the Diag (the campus central walkway). After completing the first three pages, participants drew a picture in each response box which they thought represented the function described. These functions were divided into two sections, one being 19 controls examined and the other for 5 displays. Controls were always presented

first. It took participants about 20 minutes to complete this survey.

## RESULTS

Reduced versions of the participants' drawings, grouped by function, appear in Appendix B. For the most part, participants tended to enjoy this experiment. Some even went to great lengths to produce symbols for the various functions. One participant spent 1-1/2 hours on the task. However, participants often included the use of words, letters and abbreviations in their drawings for functions they found difficult to represent (contrary to the instructions).

While at times the authors were not able to interpret some drawings produced by participants, many other drawings were very creative and innovative. It was surprising to observe the commonality between participants drawings for a particular function (i.e., the use of an arrow in the hood release function). For several of the functions participants frequently offered suggestions which closely resembled those symbols in the ISO Standard 2575 (i.e., battery charging condition and fan suggestions). While for other functions, few if any suggestions resembled the ISO standards (i.e., hazard warning suggestions). In general, participants understood the need for simple yet meaningful suggestions and were able to provide them. Examples of suggestions provided by participants are shown in Figures 1-4.

**FIGURE 1** - In suggestions for the front fog light function, participants frequently tried to show the location of the fog lights relative to the remainder of the car, specifically the front end of the car. A few participants also included features to represent fog in the path of the car.

**FIGURE 2** - Participants in the production study had various suggestions for representing the headlamp cleaner. These suggestions included featuring wiper blades, smiling faces, and even laundry detergent. While a few participants showed the headlamps relative to the front of the automobile, most suggestions focused on the headlamp(s).

**FIGURE 3** - Suggestions from participants for representing the parking light function were varied considerably. Suggestions depicted parking meters, parking stalls, and automobiles with their running lights on. A few suggestions also included the use of the letter "P".

**FIGURE 4** - Participants were almost unanimous in their suggestions for the temperature function. Almost every drawing was of a thermometer in one form or another. While some suggestions included gradations, others did not. A few drawings included a snowman, ice cube, or other feature to represent the range of temperature. Oddly though, no

- *SYMBOL PRODUCTION EXPERIMENT* -

suggestions included the "waves" as featured in the ISO standard to represent engine coolant.

- SYMBOL PRODUCTION EXPERIMENT -

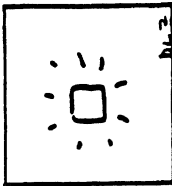
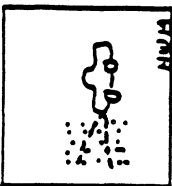
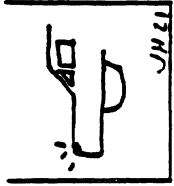
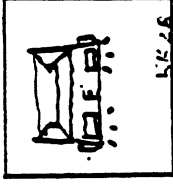
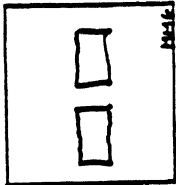
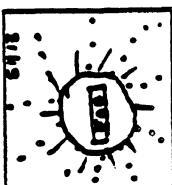

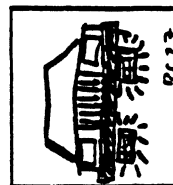
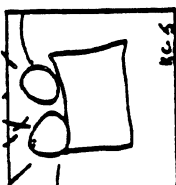
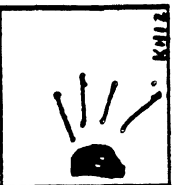
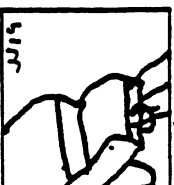
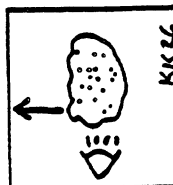
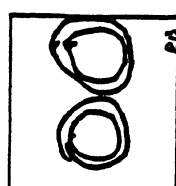
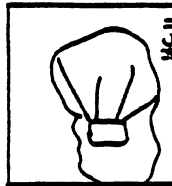
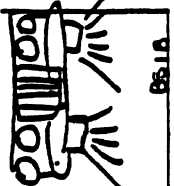
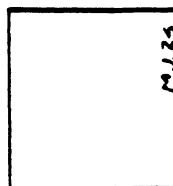
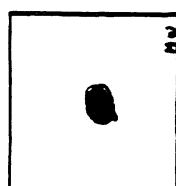
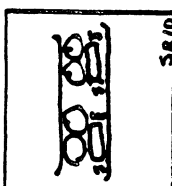

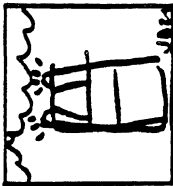
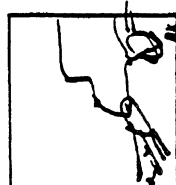
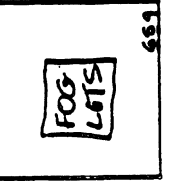
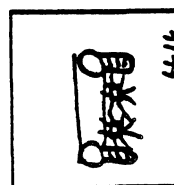
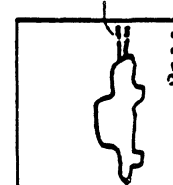
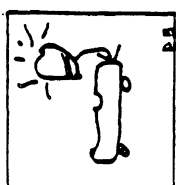

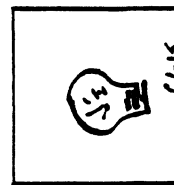
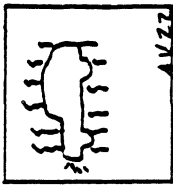
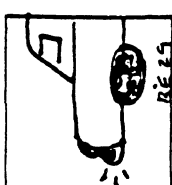
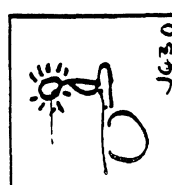
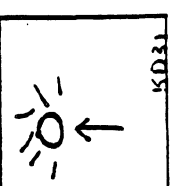
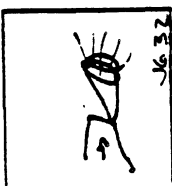
			
			
			
			
			
			
			
			

Figure 1,  
FRONT FOG LIGHTS



- SYMBOL PRODUCTION EXPERIMENT -

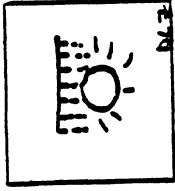
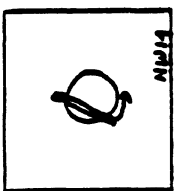

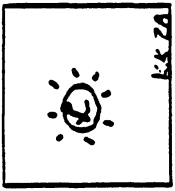
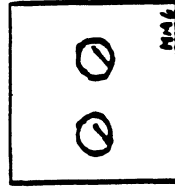

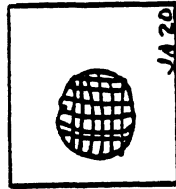
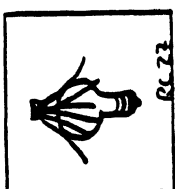

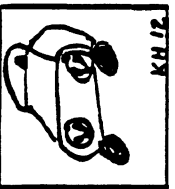
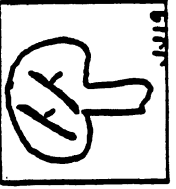
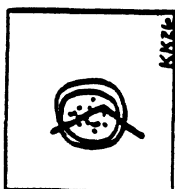
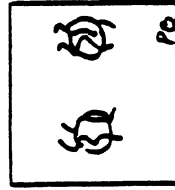
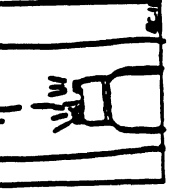
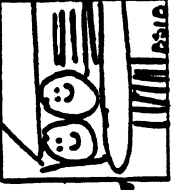
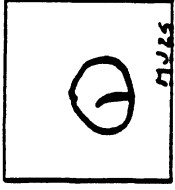
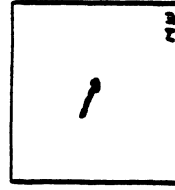
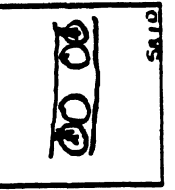
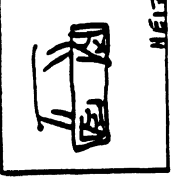
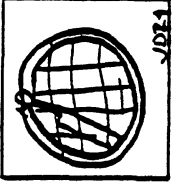
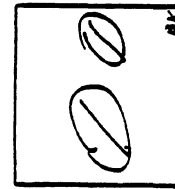
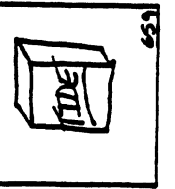
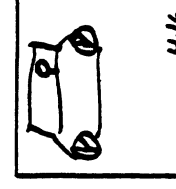
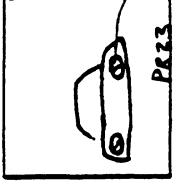
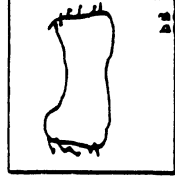


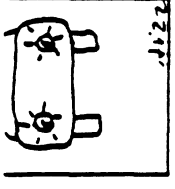
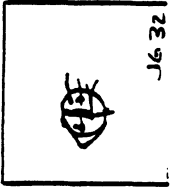
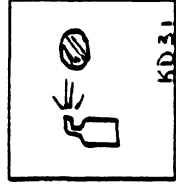
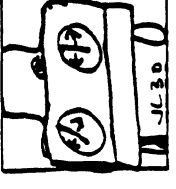
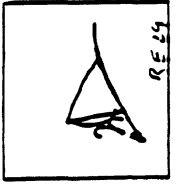
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 BK	 SS	 LL 12	 PR 23
 DL	 PL 8	 EL 5	 JM 22
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Figure 2.  
HEADLAMP CLEANER

- SYMBOL PRODUCTION EXPERIMENT -

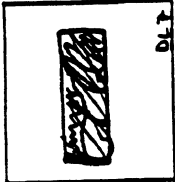
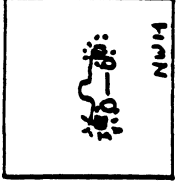
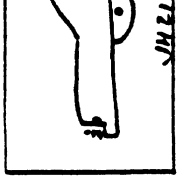
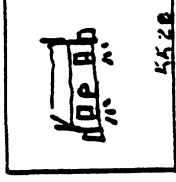
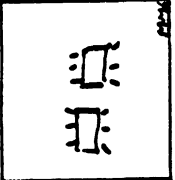
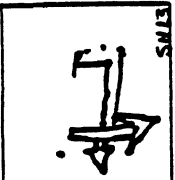
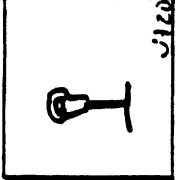
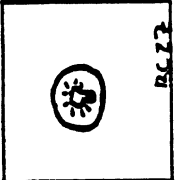
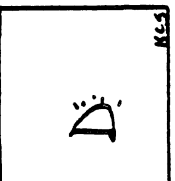

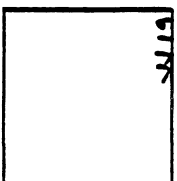
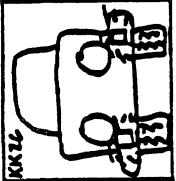
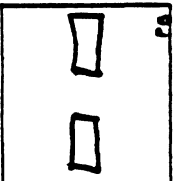
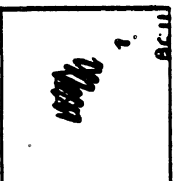
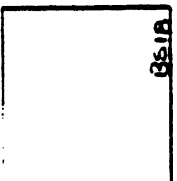
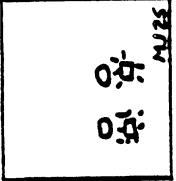
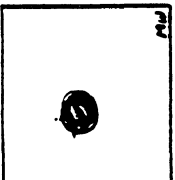
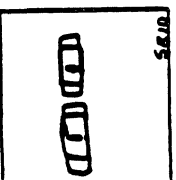
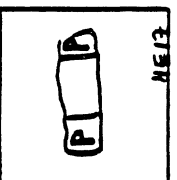
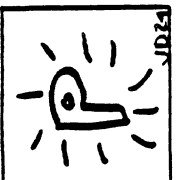
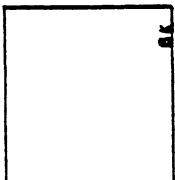
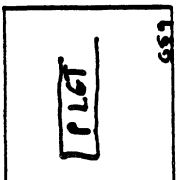
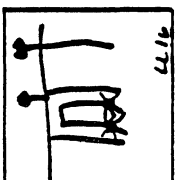
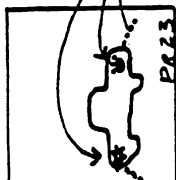
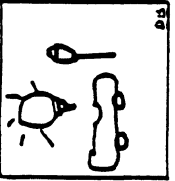
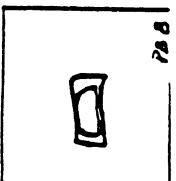
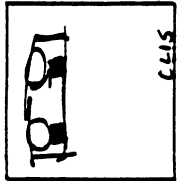
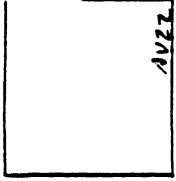
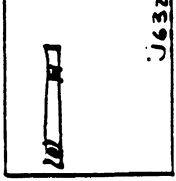
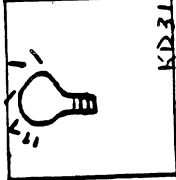
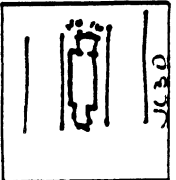
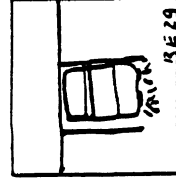
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 KCS	 KM1Z	 J19	 KK7Z
 PA	 BC11	 BS10	 MJ25
 MW	 SR10	 ME1Z	 JD24
 BL	 GS1	 LL16	 PR23
 PS	 PB1	 CL15	 AV2Z
 J63Z	 KD31	 JC30	 ME29

Figure 3.  
PARKING LIGHTS

- SYMBOL PRODUCTION EXPERIMENT -

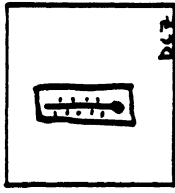
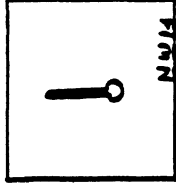
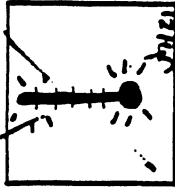
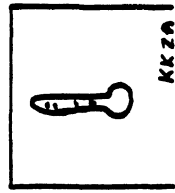
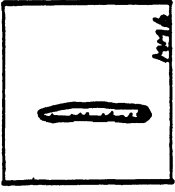
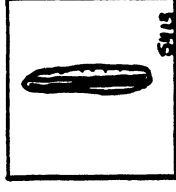
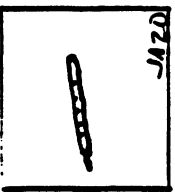
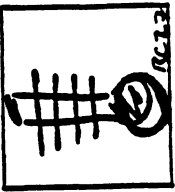
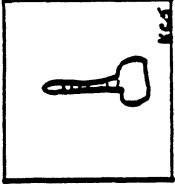
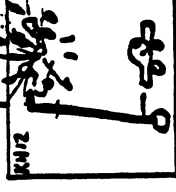
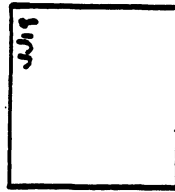
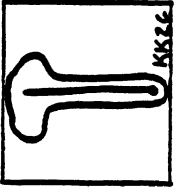
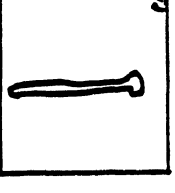
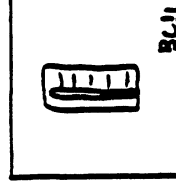
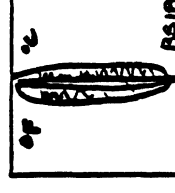
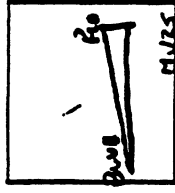
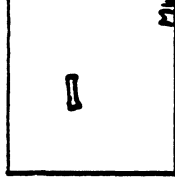
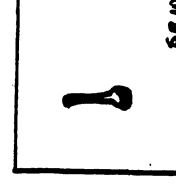
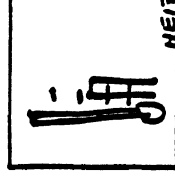
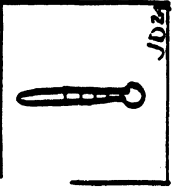
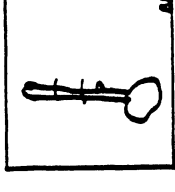
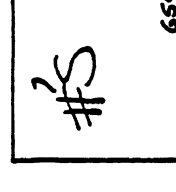
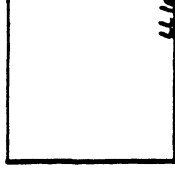
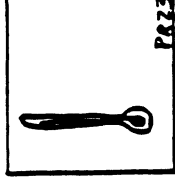
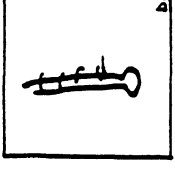

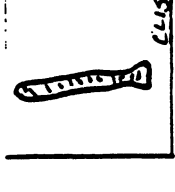
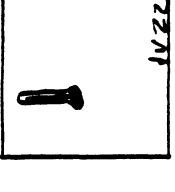




 D67	 N914	 PHE1	 KK2A
 M76	 S113	 JAZD	 RC12
 K65	 K912	 J919	 K526
 2	 B111	 B910	 M125
 M7	 S910	 NE12	 J024
 AK	 659	 LL14	 PR23
 69	 P80	 CL15	 IV22
 1A24	 1A24	 1A24	 1A24

Figure 4,  
TEMPERATURE

- SYMBOL PRODUCTION EXPERIMENT -

# SYMBOL RANKING EXPERIMENT

## TEST PLAN

**PARTICIPANTS** - One hundred and four patrons (60 men and 44 women) of the Michigan Secretary of State's office in Ann Arbor volunteered to participate in this experiment. They were asked to participate after they had completed business within the office (e.g., license renewal, change of address, etc.). In addition, individuals who had come with a friend or relative and who were just waiting were also approached.

Participants ranged in age from 17 to 82 (mean = 33), and all but five were licensed drivers. They averaged 16 years of licensed driving experience. The participants reported having driven a variety of different vehicles (Mercedes 190S, Buick Century, BMW 320I). Imported and domestic cars were equally represented. With regard to size, mid-sized vehicles were most common. The average model year was 1982, only one year different from that reported in the first experiment.

**TEST MATERIALS** - Participants were given photocopies of the 28-page booklet and pencils with erasers. (See Appendix C.) As in the production study, the first three pages contained a consent form, biographical data sheet and instructions. The remaining 25 pages were devoted to the ranking of symbol candidates for 25 automotive functions, 1 function per page. The candidates were arranged in circular arrays of four to nine symbols, with a label and description at the top of each page. All candidates were randomly distributed in this circular array, with care taken not to place variations of the same theme adjacent to one another.

Symbol candidates were obtained from various sources. Most were modified versions of drawings provided by participants in the first experiment. However, additional symbols were obtained from ISO Standard 2575/3 and SAE J1048, and still others were products of the authors' imaginations. In all, some 167 different candidates were presented.

**TEST STRUCTURE AND SEQUENCE** - After having completed the first three pages of the booklet, participants were asked to rank the symbols provided based on their meaningfulness in representing the described functions. The most meaningful candidate was ranked "1", and the second most "2" (etc.) until all possible choices had been ranked. The 25 automotive functions tested were arranged in six counterbalanced orders of presentation in the experiment booklet. It took participants an average of 22 minutes to complete this task.

## RESULTS

The analysis of drivers' rankings for the symbol candidates appears on the following pages. Each contains a scale on which symbols are ordered from best to worst based on the mean ranking averaged over participants. Tables explaining the ranking distribution for each of the candidates is also provided. For each function a Kruskal-Wallis test was performed and the  $H$  statistic for differences in the means is represented. For every function a significant difference among rankings of candidates was observed. Also presented are statistical comparisons of the ISO standard symbols with the most preferred symbols when they were not the same.

In examining each of the results, the reader should notice several recurring points.

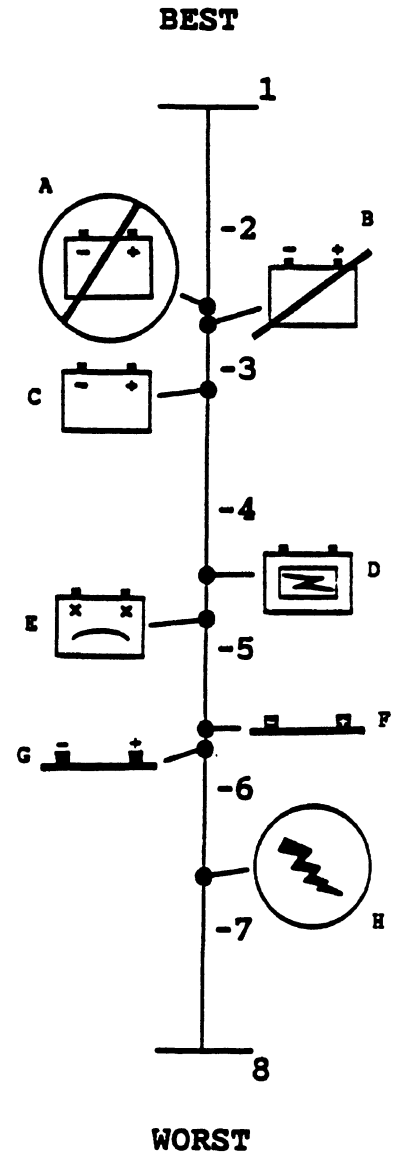
- (1) The characteristic(s) which participants found most informative for the function.
- (2) The statistical comparison of the ISO standard symbol to other candidates which had been preferred.
- (3) The recommendations made by the authors for the various symbols based upon the results observed in this experiment and found in the experiment performed by Saunby, Farber, and DeMello (1987a, 1987b, 1988).

# 1. BATTERY CHARGING CONDITION

For the battery charging condition, all five of the top ranked candidates were variations of the automotive battery outline. In one variation (A), the use of a line drawn diagonally through the figure produced a statistically significant difference with relation to the ISO standard (C) ( $H(1) = 5.95$ ,  $p < .05$ ). The authors were surprised that other candidates, such as the frowning battery (E), were not more highly ranked. While "A" was significantly different from the ISO standard (C), the difference is not large. Further, Saunby et al. (1987a, b, 1988) found the current ISO symbol was well understood (Identification = 93.7%, Matching = 94.1%). This would suggest that it is not worth changing the standard symbol for this function.

$H(7) = 296.2$ ,  $p < .001$   
 $Median(7) = 229.9$ ,  $p < .001$

	BEST----->WORST								MISS	MEAN
	1	2	3	4	5	6	7	8		
A	41	18	17	11	5	4	3	3	2	2.6
B	19	41	16	15	3	3	3	2	2	2.7
C	28	11	23	16	13	9	1	2	1	3.2
D	4	16	13	15	25	9	16	5	1	4.5
E	4	10	15	20	12	17	16	8	2	4.8
F	1	5	3	13	24	22	25	9	2	5.6
G	2	4	7	9	17	26	25	12	2	5.7
H	3	3	8	5	3	12	9	56	5	6.6



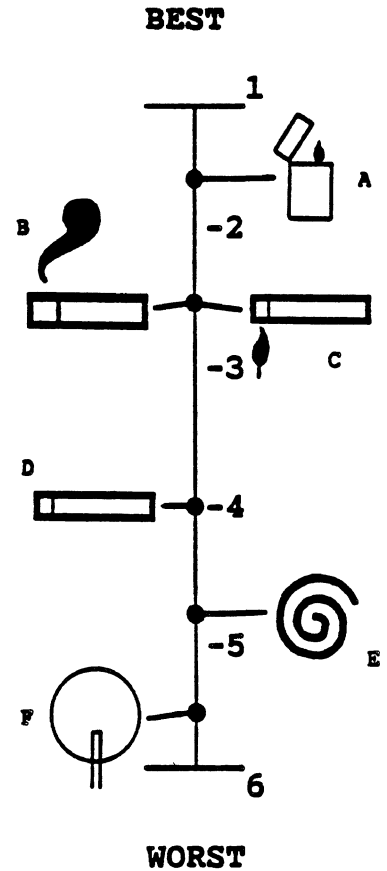
## 2. CIGARETTE LIGHTER

For the cigarette lighter symbol, showing a cigarette was not an informative characteristic. Those three candidates were ranked second, third and fourth. The top ranked choice (mean 1.6) was that of a pocket style cigarette lighter (candidate A). Rankings of it were significantly different from those of the ISO standard (B), ( $H(1) = 39.97$ ,  $p < .001$ ) with "A" receiving more than three times as many #1 rankings as the ISO standard (B)(66 of 104). In the Saunby et al. study, the current ISO standard symbol fared poorly (Identification = 28.5%, Matching = 67.3%). Therefore, replacing the ISO standard symbol (C) with the lighter (A) should be considered.

$H(5) = 369.6$ ,  $p < .001$

Median(5) = 265.0,  $p < .001$

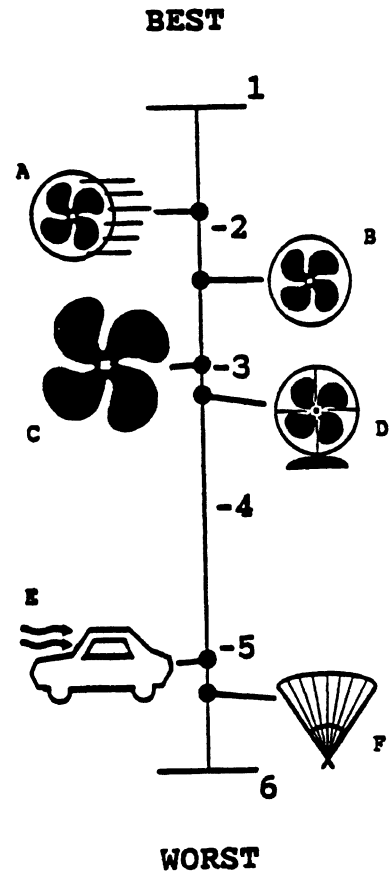
	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	66	20	13	3	1	0	1	1.6
B	21	28	32	14	6	2	0	2.4
C	11	47	29	10	5	1	1	2.6
D	2	4	17	50	23	6	2	4.0
E	3	4	10	11	34	38	4	4.8
F	0	0	2	13	32	54	3	5.4





### 3. FAN

Of the candidates for the fan control, subjects preferred candidate "A" significantly over the ISO standard symbol "C" ( $\underline{H}(1) = 35.91, p < .001$ ) with "A" receiving almost 3 times as many #1 rankings than "C". While the standard fan blade was a characteristic of "A", other symbols which used car profiles (E) and a hand-held fan were not favorably ranked. Though the preferred symbol was ranked much more highly than the ISO standard, it is debatable whether the standard should be changed. Saunby et al. found the current ISO symbol was well understood (Identification = 77.4%, Matching = 95.0%). Further, the fan blades, the critical portion of the image, are large in the ISO standard symbol, and hence that symbol is likely to be more legible under suboptimal lighting conditions.



$\underline{H}(5) = 351.9, p < .001$

MEDIAN(5) = 183.3,  $p < .001$

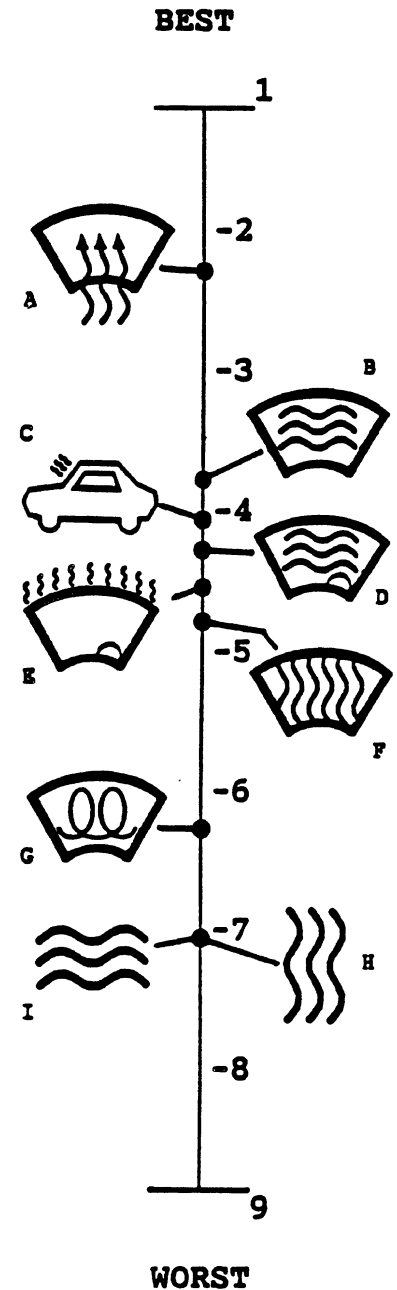
	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	56	17	19	11	0	1	0	1.9
B	19	44	29	7	4	1	0	2.4
C	18	17	25	34	8	2	0	3.0
D	6	23	26	41	6	2	0	3.2
E	3	1	6	6	47	41	0	5.1
F	2	1	0	5	39	56	1	5.4

## 4. FRONT WINDSHIELD DEFROST

In testing symbol candidates for the front windshield defrost control, the ISO standard "A" was found to be preferred over all others. The arrowheads on the lines which appear to be in motion provided the indication that air is being forced across the windshield surface. Attempts to represent a windshield with frost on it or a defrosting mechanism were not well ranked by subjects. However, while the ISO standard may be preferred, results observed by Saunby et al. (Identification = 23.2%, Matching = 74.5%) would suggest that an alternative symbol is necessary. Therefore, the authors suggest continuing the search for alternative symbol candidates for this function.

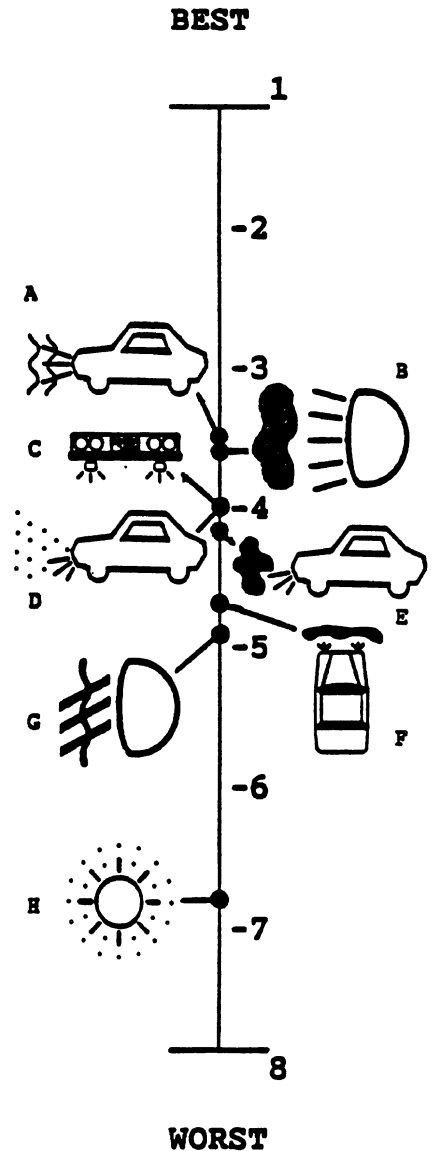
$H(8) = 320.9, p < .001$   
MEDIAN(8) = 239.9,  $p < .001$

	BEST----->WORST										MISS	MEAN
	1	2	3	4	5	6	7	8	9			
A	51	19	12	7	9	1	3	1	0	1	2.3	
B	12	22	21	13	8	11	10	4	1	2	3.8	
C	28	14	9	10	9	5	7	10	10	2	4.1	
D	1	14	21	19	22	11	1	7	2	6	4.3	
E	6	16	13	21	13	10	9	7	7	2	4.6	
F	3	13	18	12	11	20	15	9	1	2	4.8	
G	1	3	5	10	15	12	19	14	17	8	6.3	
H	0	0	2	4	8	20	23	21	22	4	7.1	
I	1	3	1	6	7	12	14	29	26	5	7.1	



## 5. FRONT FOG LIGHTS

Previous studies have shown there to be low recognition with the ISO standard for this function (Weigard and Glumm, 1979), and resulted in some interesting new ideas. One of these ideas was prompted by the lack of understanding as to how a symbol's orientation (i.e. light rays directed to the left versus the right) expressed the front versus the rear of the automobile. To eliminate this confusion, an attempt was made to express the location of the lights on the automobile itself, while at the same time presenting some characteristic to represent fog. Symbol "A" was found to be significantly preferred over the ISO standard symbol "G" ( $H(1) = 17.20, p < .001$ ), and in general participants tended to prefer candidates which showed the lights relative to the automobile (A, C, D, E). The ISO standard was ranked next to last in the overall mean ranking. However, the distribution of rankings was unusual in that both "B" and "C" received more #1 rankings than did "A", and there was a considerable amount of missing data for symbol "H". Combined with previously found low levels of recognition for the ISO standard by Saunby et al. (Identification = 9.1%, Matching = 47.7%), this suggests replacing the ISO standard (G) with candidate "A".

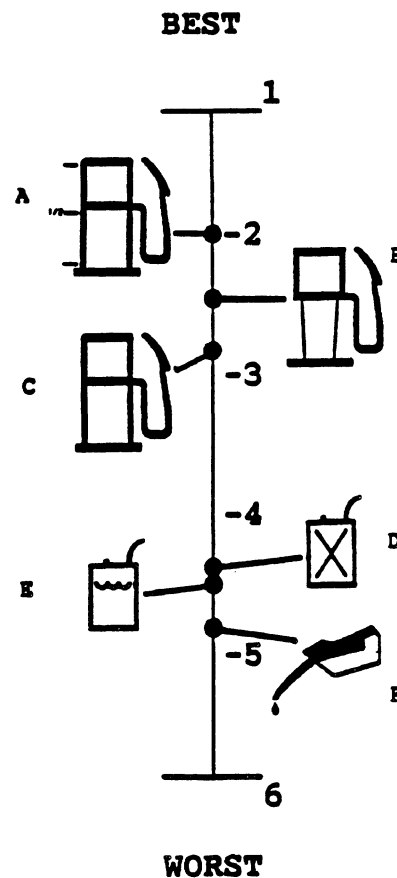


$H(7) = 138.3, p < .001$   
MEDIAN(7) = 69.8,  $p < .001$

	BEST----->WORST								MISS	MEAN
	1	2	3	4	5	6	7	8		
A	17	22	23	8	12	6	11	3	2	3.5
B	22	21	8	11	15	11	8	5	3	3.6
C	29	7	8	8	12	16	15	5	4	4.0
D	12	15	15	17	19	9	12	3	2	4.0
E	7	13	21	21	15	11	7	7	2	4.2
F	6	8	15	19	14	21	13	6	2	4.7
G	8	14	8	16	10	13	21	12	2	4.9
H	2	3	4	1	4	15	13	51	11	6.8

## 6. FUEL

For the fuel display symbol, the top three ranked symbol candidates were all variations of a gasoline pump outline. One of the candidates (A) used markings to represent the amount of fuel remaining in the fuel tank. This minor addition to the standard ISO symbol (C) resulted in a statistically significant difference ( $H(1) = 24.8, p < .001$ ), with "A" receiving 61 of the 104 #1 rankings (five times more than the ISO standard received). The authors also noted that candidate "B", while it did not include gradations, received a favorable ranking. This might be in part because symbol "B" more closely resembles a modern fuel pump than does the ISO standard. A preference for the slightly more modern fuel pump was also observed in a study by Green and Burgess (1980). Possibly the ideal symbol is a modern pump with gradations, though this alternative was not tested. While "A" did produce a significant difference when compared to "C", the difference was not overwhelming. Further, Saunby et al. found that the current ISO standard symbol is well understood (Identification = 82.2%, Matching = 85.0%). This suggests that it is not worth changing the ISO standard for this function.



$H(5) = 254.8, p < .001$

MEDIAN(5) = 161.5,  $p < .001$

	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	61	11	16	6	7	3	0	2.0
B	16	41	37	2	5	2	1	2.5
C	11	35	36	12	4	4	2	2.8
D	3	6	7	29	41	17	1	4.4
E	7	5	4	28	33	25	2	4.5
F	6	5	3	26	13	50	1	4.8

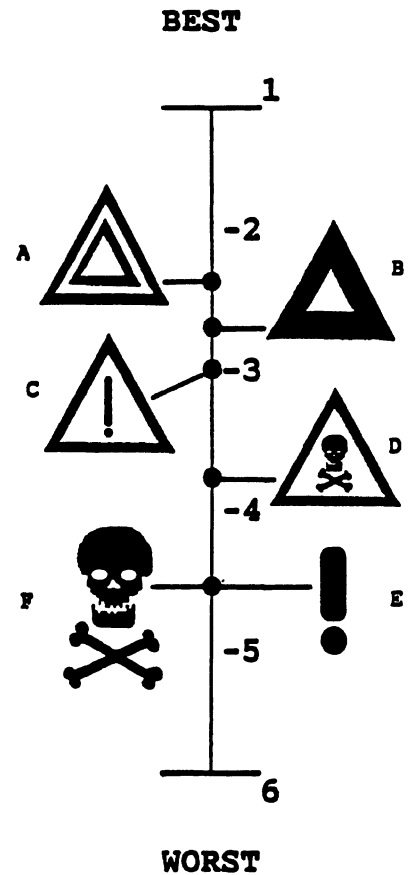
## 7. HAZARD WARNING

In examining the results of various candidates offered to subjects for the hazard warning lights function, the preferred choice of participants was the current ISO standard. The study by Saunby et al. has shown that the ISO standard is not well understood (Identification = 24.6%, Matching = 61.8%). Therefore, further investigation of alternative candidates is necessary.

$H(5) = 153.3, p < .001$

MEDIAN(5) = 166.1,  $p < .001$

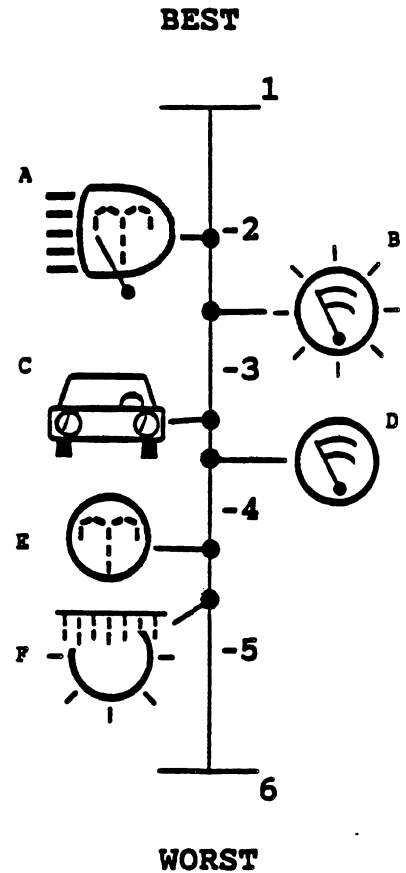
	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	27	43	13	9	5	5	2	2.4
B	16	9	10	23	39	6	2	2.7
C	23	10	34	14	15	5	3	3.0
D	16	9	10	23	39	6	1	3.8
E	2	4	9	41	8	38	2	4.6
F	11	11	5	7	21	48	2	4.6



## 8. HEADLAMP CLEANER

In the results of subject preference for the headlamp cleaner control symbol, the current ISO standard symbol was the top ranked choice (A, mean = 2.1). While most other candidates did not receive favorable ranking by participants, the current degree of recognizability for the ISO symbol is highly variable. The methods of testing in the study by Saunby et al. found that how well drivers understood this symbol very much depended upon the experimental procedure used to evaluate it (Identification = 26.1%, Matching = 75.5%). Poor understanding of symbols for this function may be because few cars are fitted with headlamp cleaners and therefore it is not a function drivers think about. The authors believe that further investigation of alternative symbols for this function is necessary.

$\underline{H}(5) = 166.5, p < .001$   
 $\underline{MEDIAN}(5) = 143.1, p < .001$



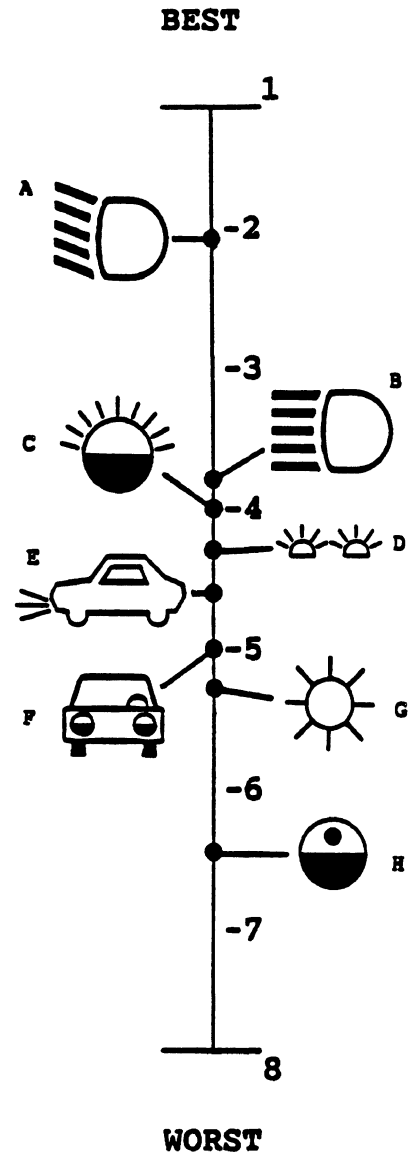
	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	46	27	13	8	2	5	2	2.1
B	23	32	16	25	7	1	0	2.6
C	24	14	19	11	12	23	1	3.4
D	7	14	25	25	22	10	1	3.7
E	2	10	17	19	29	24	3	4.3
F	0	8	13	14	30	37	2	4.7

## 9. HIGH BEAM HEADLAMPS

Of the candidates for the high beam headlamp function, participants preferred candidate "A" over the ISO standard symbol "B" ( $H(1) = 32.6, p < .001$ ), with "A" receiving more than twice as many #1 rankings as "B". While symbol "A" is only a slight variation of the ISO standard symbol, altering the angle of the depicted light rays differentiated the high beam headlamp symbol from the low beam symbol. However, Saunby et al. found the ISO standard symbol to have a high degree of recognition (Identification = 79.8%, Matching = 74.5%). Yet the overwhelming choice was for participants to rank "A" as most preferred. These contradictory results support the need for further evaluation of possible alternative symbols for this function.

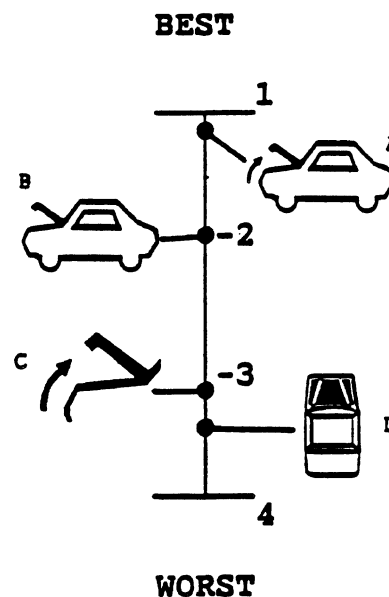
$H(7) = 218.0, p < .001$   
MEDIAN(7) = 160.4,  $p < .001$

	BEST----->WORST								MISS	MEAN
	1	2	3	4	5	6	7	8		
A	55	21	10	7	4	3	1	2	1	2.1
B	19	24	13	7	5	12	19	14	1	3.8
C	6	18	19	20	16	13	6	4	2	4.0
D	3	5	11	17	15	13	10	13	3	4.3
E	9	9	17	17	15	13	10	13	1	4.6
F	3	7	15	13	20	18	15	11	2	5.0
G	3	11	11	8	13	21	19	14	4	5.3
H	4	2	1	6	11	13	24	39	4	6.5



## 10. HOOD RELEASE

The production study did not produce many alternative suggestions to represent the hood release control. However, one characteristic suggested by participants was significantly preferred when it was combined with the existing ISO standard (B). The addition of an arrow indicating the motion of the hood resulted in a significant difference in the mean ranking by subjects between symbols "A" and "B" ( $H(1) = 80.8, p < .001$ ). In fact, 86 of the 104 participants ranked "A" as #1 while 85 participants ranked "B" as #2. Saunby et al. found that people recognize the ISO standard symbol representing the hood release function quite well (Identification = 75.0%, Matching = 92.7%). Nonetheless, the strong preference of participants suggests that "A" should be considered as an alternative.



$H(3) = 270.1, p < .001$

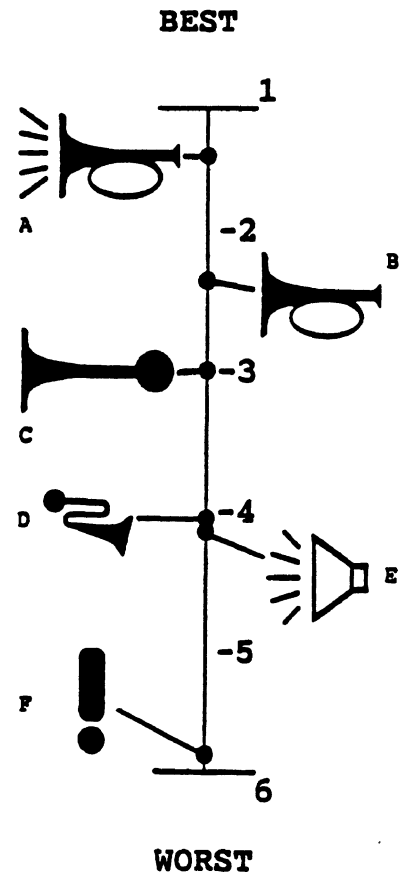
MEDIAN(3) = 313.4.  $p < .001$

	BEST----->WORST					
	1	2	3	4	MISS	MEAN
A	86	14	3	1	0	1.2
B	9	85	9	1	0	2.0
C	8	4	50	42	0	3.2
D	1	1	42	60	0	3.5



## 11. HORN

As found in suggestions for other symbols, minor changes or additions to the ISO standard (B) produce lower mean ranks than the ISO standard alone. In the case of the horn control, including lines which are characteristic of sound waves projecting from the standard symbol results in a significant difference between symbols "A" and "B" ( $H(1) = 60.9, p < .001$ ). However, as reported by Saunby et al., the horn control has a very high rate of recognition (Identification = 97.0%, Matching = 98.2%). Even though 75 of 104 participants ranked "A" #1, the authors would suggest that it is not worth changing the standard symbol for this function.



$H(5) = 399.8, p < .001$   
MEDIAN(5) = 322.9, p < .001

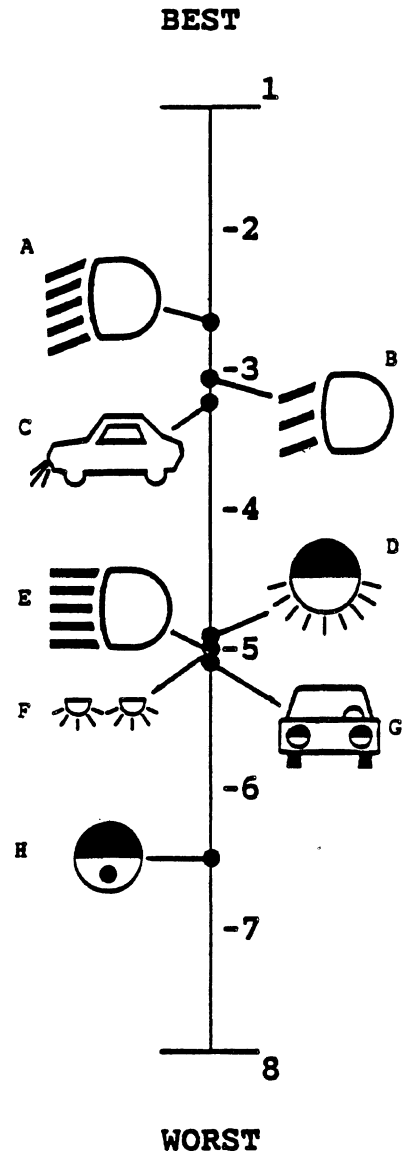
	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	75	16	8	2	0	1	2	1.4
B	10	58	20	12	2	0	2	2.4
C	7	16	50	23	5	1	2	3.0
D	2	5	13	44	35	3	2	4.1
E	7	7	10	17	51	10	2	4.2
F	1	0	1	4	9	87	2	5.8

## 12. LOW BEAM HEADLAMPS

Of the candidates for the low beam headlamp function, candidate "C" received the most #1 rankings (33). However, the ISO standard symbol (A) received the best overall mean ranking (mean = 2.7). This data, as well as the rates of recognition found by Saunby et al. (Identification = 72.2%, Matching = 80.5%), would suggest that the current ISO standard should not be replaced.

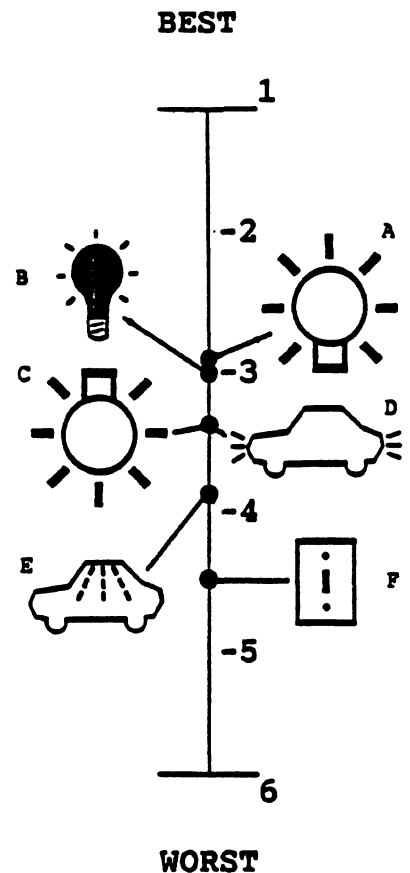
$H(7) = 226.8, p < .001$   
MEDIAN(7) = 210.1, p < .001

	BEST----->WORST								MISS	MEAN
	1	2	3	4	5	6	7	8		
A	30	29	20	6	7	6	5	0	1	2.7
B	15	30	24	14	7	7	4	2	1	3.1
C	33	13	18	10	9	7	8	5	1	3.3
D	4	9	11	15	22	16	20	4	3	4.9
E	4	5	9	25	15	18	14	12	2	5.0
F	12	6	13	12	10	17	10	22	2	5.0
G	3	5	7	19	21	19	20	5	5	5.1
H	2	7	1	1	11	13	21	42	6	6.5



### 13. MASTER LIGHTING SWITCH

Of the candidates offered for the master lighting switch function, participants frequently commented as to how similar all six were in preference. This can be seen in the small differences in the mean rankings. However, one candidate (A) received a significantly better ranking (mean = 2.9) than the current ISO standard symbol (C, mean = 3.4) ( $H(1) = 4.2, p < .05$ ). Candidate "A" is identical to the ISO standard with the exception that it has been rotated 180 degrees. This orientation was also found in almost all suggestions from the production study which included light bulbs. Similarly, candidate "B" received a favorable ranking (mean = 3.0) while representing a more traditional view of a light bulb in the same orientation as candidate "A". Any further testing which involves a symbol similar to "B" may however consider reversing the contrast of the "light bulb". Yet a bimodal distribution was observed, with the ISO standard (C) receiving more #1 rankings than any of the other candidates. The significant level of difference between the mean rankings of the ISO standard (C) and candidate "A", along with the low levels of recognition for the current ISO symbol as found by Saunby et al. (Identification = 20.9%, Matching = 57.5%), would suggest that the current ISO standard should be replaced by candidate "A".



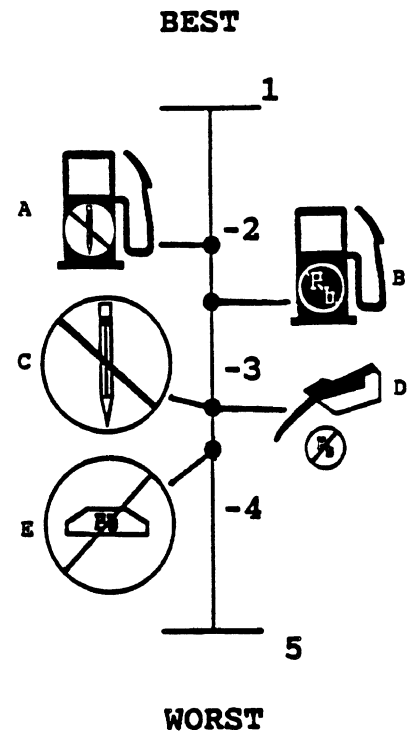
$H(5) = 57.5, p < .001$

$MEDIAN(5) = 17.7, p < .0033$

	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	18	26	26	20	7	7	0	2.9
B	24	19	23	15	17	6	0	3.0
C	27	9	10	24	15	17	2	3.4
D	9	26	23	19	19	8	0	3.4
E	17	14	15	11	26	21	0	3.8
F	9	10	7	14	20	43	1	4.5

## 14. UNLEADED FUEL ONLY

A frequent comment made by participants while ranking the candidates for the unleaded fuel symbol was that none of them were very good. While candidate "A" received the lowest mean ranking (mean = 2.2), this mean was not found to be significantly different than that of the ISO standard (B) ( $H = 1.8$ ,  $p = .17$ ). However, as seen in the study by Saunby et al., how well drivers understood the symbol depended upon how the question was asked (Identification = 18.6%, Matching = 86.6%). The authors feel that further study of alternative symbol candidates is necessary for the unleaded fuel function. In addition, the authors would like to point out the unusual distribution of rankings for candidate "D".



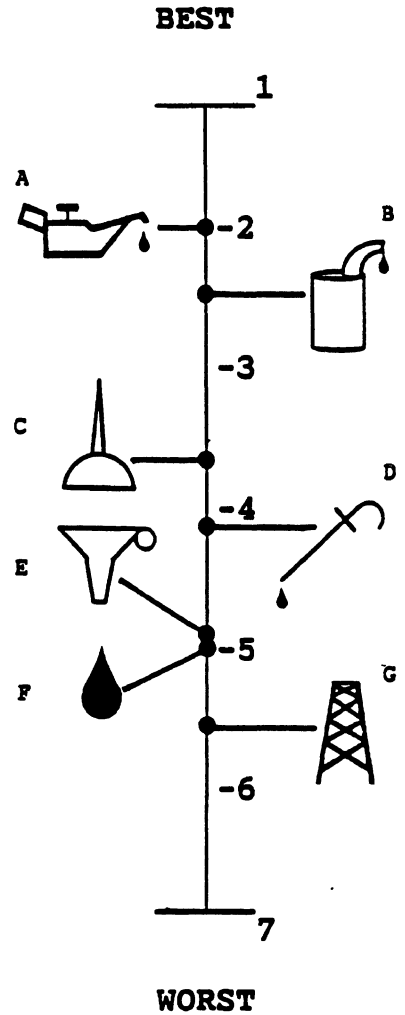
$H(4) = 73.6$ ,  $p < .001$

MEDIAN(4) = 56.9,  $p < .001$

	BEST----->WORST						
	1	2	3	4	5	MISS	MEAN
A	38	29	12	19	3	3	2.2
B	33	16	31	10	10	4	2.5
C	9	19	23	30	19	4	3.3
D	16	22	10	16	36	4	3.3
E	5	14	24	25	32	4	3.6

## 15. OIL

For the oil display function seven candidates were ranked by participants. The candidate with the best mean ranking was the ISO standard symbol (A). This result was surprising to the authors as this type of oil can is no longer commonly seen, while a can of oil (B) is much more common. However, "A" received the best mean ranking (58 of 104 participants ranked "A" #1) and the study by Saunby et al. found the current ISO standard to have a high degree of recognition (Identification = 76.8%, Matching = 85.7%). Yet in a previous study by Green and Burgess (1980) participants preferences for a very similar set of candidates was significantly different. Participants in the Green and Burgess experiment ranked candidates that were very similar to "B", "C", "D", and "G" as being more meaningful than the ISO standard. This may possibly be accounted for by the differences in the mean ages of the groups studied (21 versus 33 years of age). In addition, the span of time which exists between the two studies (seven years) would allow for greater exposure to the ISO standard.

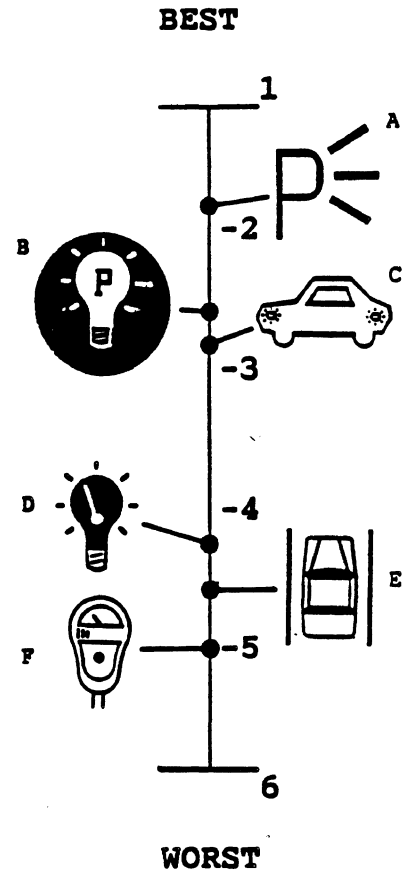


$\bar{H}(6) = 26.4, p < .001$   
MEDIAN(6) = 230.2,  $p < .001$

	BEST----->WORST								
	1	2	3	4	5	6	7	MISS	MEAN
A	58	15	15	7	4	3	2	0	2.0
B	23	37	24	13	2	2	2	1	2.5
C	7	22	20	19	19	13	4	0	3.7
D	11	11	19	20	10	14	18	1	4.2
E	2	3	13	19	33	18	15	1	4.9
F	1	12	9	13	20	24	24	1	5.0
G	2	4	4	13	14	29	37	1	5.6

## 16. PARKING LIGHTS

For the parking light symbol there were a wide variety of candidates as a result of participant suggestions made in the production survey. Yet, the ISO standard symbol "A" still received the best mean ranking (mean = 1.8) in the second experiment. The difficulty with the current ISO standard is that it requires that a driver understand that the "P" characteristic used in the symbol represents the word "park" or "parking". This is, however, contrary to the philosophy of developing language-free controls and displays for the international market. Similarly, candidate "B" also violates this philosophy. In addition, Saunby et al. found results which were dependent upon the method of testing (Identification = 48.5%, Matching = 77.3%). Therefore, the authors feel that further candidates need to be developed and studied for this function that do not incorporate characteristics which are bound to the knowledge of certain languages. The authors are uncertain as to whether "P" is recognized across languages.

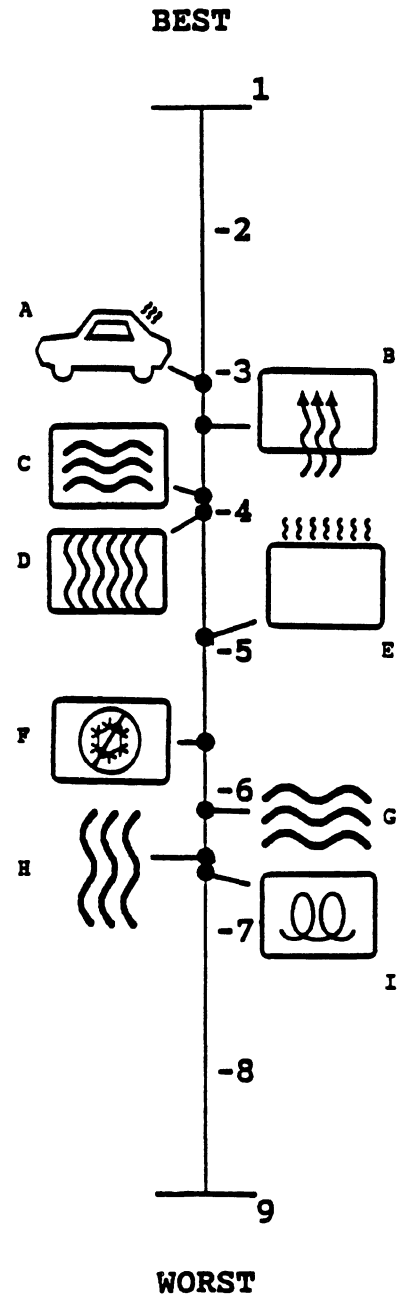


$H(5) = 289.4, p < .001$   
 $MEDIAN(5) = 226.0, p < .001$

	BEST----->WORST							
	1	2	3	4	5	6	MISS	MEAN
A	56	28	14	3	1	2	0	1.8
B	20	38	23	14	8	1	0	2.6
C	25	18	33	14	9	5	0	2.8
D	1	8	13	36	23	22	1	4.3
E	2	7	11	23	33	28	0	4.6
F	0	5	10	14	30	45	0	5.0

## 17. REAR DEFROST

Of the candidates to represent the rear defrost function, many were very similar in nature. As for the front windshield defrost candidates, an attempt was made to represent frost on the rear window or the defrosting mechanism used on the rear window. However, candidate "A", which showed the position of the window relative to the remainder of the automobile, received the best mean rank (mean = 3.1). The authors were surprised that candidate "F" did not receive a lower ranking from subjects (mean = 5.7). While "A" received a lower mean ranking than the ISO standard (B, mean = 3.4), this difference was not statistically significant. Saunby et al. found the level of recognition for the rear defrost ISO standard to be highly variable (Identification = 37.4%, Matching = 75.2%). That, combined with the lack of a better candidate suggests that the search for alternative candidates for this function should continue. (Note that there may be legibility problems with candidate "A", as the lines over the rear window could be washed out.)



$H(8) = 236.0, p < .001$   
MEDIAN(8) = 186.6, p < .001

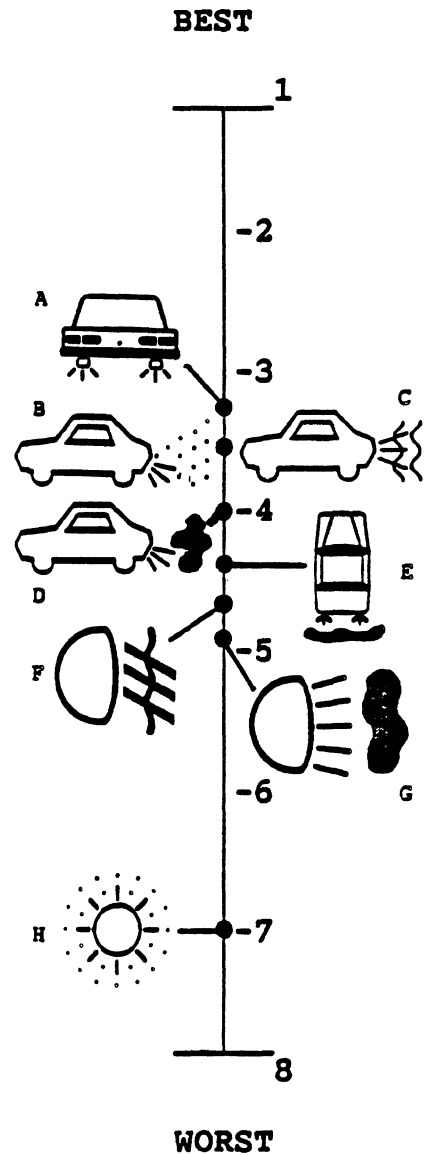
	BEST----->WORST										
	1	2	3	4	5	6	7	8	9	MISS	MEAN
A	41	14	15	5	6	8	7	3	4	1	3.1
B	27	19	8	19	12	9	3	5	2	0	3.4
C	15	14	27	12	10	13	3	9	1	0	3.9
D	7	25	19	14	8	13	14	1	2	1	4.0
E	4	5	18	22	18	6	13	12	3	3	4.9
F	7	14	6	7	7	17	7	18	18	3	5.7
G	0	5	3	10	19	13	21	14	14	5	6.2
H	1	3	3	9	11	16	21	24	14	2	6.5
I	2	5	4	8	12	10	16	16	27	4	6.6

## 18. REAR FOG LIGHTS

As was the case in the design of the front fog light candidates, an important characteristic of the symbols was that they represent their location relative to the remainder of the automobile (i.e., the front vs. the rear). Participants ranked those candidates which best represented the location of the function they were to be controlling, as is offered in the five most favorably ranked candidates. Candidate "A" was significantly favored by participants over the ISO standard "F" ( $H = 17.4, p < .001$ ). Saunby et al. similarly found very poor levels of recognition for the ISO standard (Identification = 1.2%, Matching = 47.3%). These results suggest that a candidate such as "A" should replace the current ISO standard.

$\underline{H}(7) = 177.1, p < .001$   
 $\underline{\text{MEDIAN}}(7) = 89.7, p < .001$

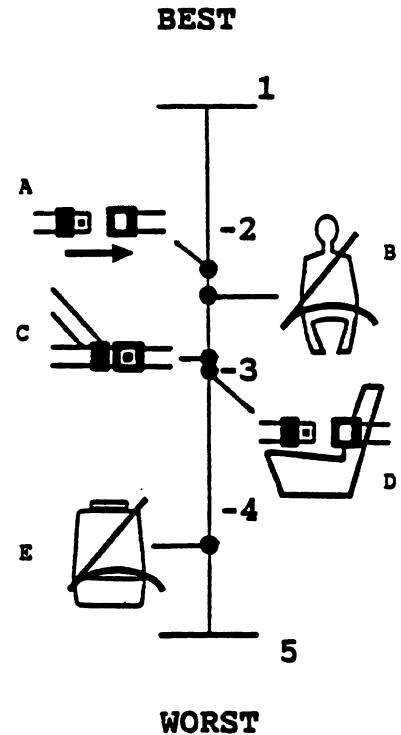
	1	2	3	4	5	6	7	8	MISS	MEAN
A	40	11	8	8	12	10	5	9	1	3.3
B	11	25	19	15	11	5	12	2	4	3.6
C	19	16	16	18	14	6	13	0	2	3.6
D	8	17	20	20	10	15	4	6	4	4.0
E	6	11	13	20	26	13	8	5	2	4.4
F	10	10	14	11	10	16	22	7	4	4.7
G	10	11	10	7	12	25	15	11	3	4.9
H	0	2	2	3	6	12	22	50	7	7.0





## 19. SEAT BELT

Of the symbol candidates for the seat belt function, candidate "A" received the best mean ranking (mean = 2.3). While this ranking was lower than that of the ISO standard (B, mean = 2.5), it was not significantly different ( $H = 0.17, p > .673$ ). In fact, the ISO standard (B) received more #1 rankings than did candidate "A". While recognition of the ISO seat belt symbol was not studied by Saunby et al., there is no other symbol of the presented candidates which is significantly preferred by subjects. Therefore, the authors feel that the current ISO standard should not be changed.



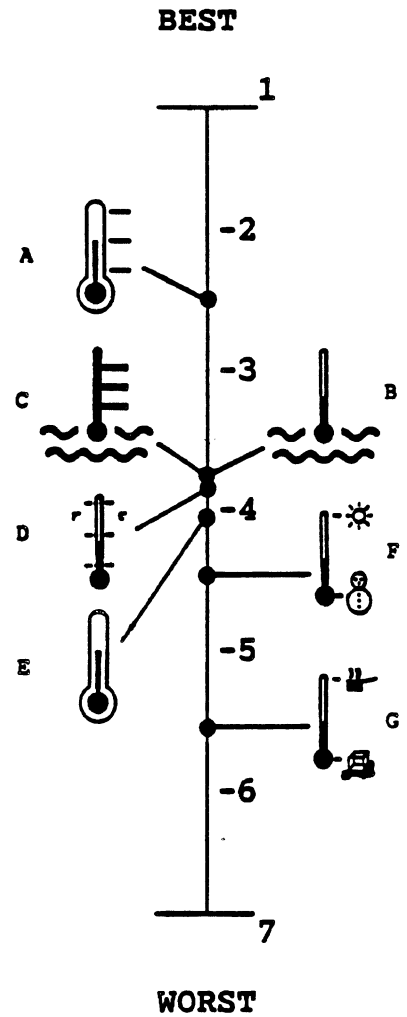
$H(4) = 121.8, p < .001$

MEDIAN(4) = 63.5,  $p < .001$

	BEST----->WORST						
	1	2	3	4	5	MISS	MEAN
A	32	28	28	10	6	0	2.3
B	40	17	14	25	8	0	2.5
C	18	25	25	24	12	0	2.9
D	12	26	27	24	15	0	3.0
E	2	8	10	21	63	0	4.3

## 20. TEMPERATURE

All the symbol candidates for the temperature function were similar in that they show a thermometer in one form or another. This reflects the suggestions received from participants in the production study. Frequently, participants commented that the ISO standard more closely resembled a buoy floating in water than it did a thermometer, and had also been called a periscope. Therefore, it was not the actual characteristic of the symbol, but the manner in which it was presented that resulted in the moderate levels of recognition observed by Saunby et al. (Identification = 62.0%, Matching = 75.2%). Of the candidates presented, "A" received the lowest mean ranking (mean = 2.5) and was significantly preferred over the ISO standard symbol "C" (mean = 3.7) ( $H = 15.92$ ,  $p > .001$ ). The authors, however, were surprised that candidate "E" was not ranked more favorably considering that it is almost identical to "A", with the exception of the gradation marks. In addition, a symbol similar to "E" received favorable ranking by participants in a study by Green and Burgess (1980). This would suggest that the gradation marks are an important characteristic of the thermometer symbol. Based on these results, the authors believe that the ISO standard symbol should be replaced by candidate "A".



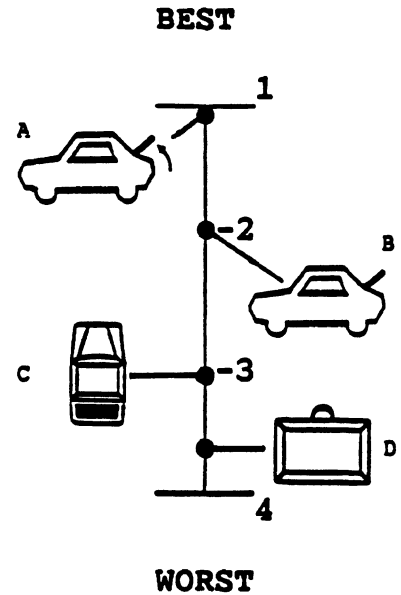
$H(6) = 132.7$ ,  $p < .001$

MEDIAN(6) = 105.5,  $p < .001$

	BEST----->WORST								
	1	2	3	4	5	6	7	MISS	MEAN
A	37	19	22	12	4	5	3	2	2.5
B	20	15	13	15	15	8	14	4	3.7
C	9	20	17	23	14	17	1	3	3.7
D	9	17	21	19	14	10	10	4	3.8
E	9	14	20	12	19	9	17	4	4.1
F	15	8	8	9	19	25	17	3	4.5
G	2	6	0	12	16	26	39	3	5.6

## 21. TRUNK

As was the case with the hood release symbol candidates, the production study did not produce many alternative suggestions to represent the trunk release function. However, once again the addition of an arrow to indicate the motion of the trunk resulted in a significant difference in the mean ranking by participants. They significantly preferred candidate "A" (mean = 1.1) over the ISO standard symbol "B" (mean = 2.0) ( $H = 96.40$ ,  $p > .001$ ). However, Saunby et al. found a high level of recognition for the current ISO trunk symbol (Identification = 84.4%, Matching = 96.6%). Yet the distribution of #1 rankings by participants overwhelmingly prefer candidate "A" (92 of 104 participants ranked "A" as #1). This would suggest that the current ISO standard for the trunk symbol could be changed, though the authors differ as to whether including an arrow should be optional.



$H(3) = 310.7$ ,  $p < .001$   
MEDIAN(3) = 296.7,  $p < .001$

	BEST----->WORST					
	1	2	3	4	MISS	MEAN
A	92	9	3	0	0	1.1
B	8	90	5	1	0	2.0
C	2	3	77	21	1	3.1
D	2	2	18	81	1	3.7

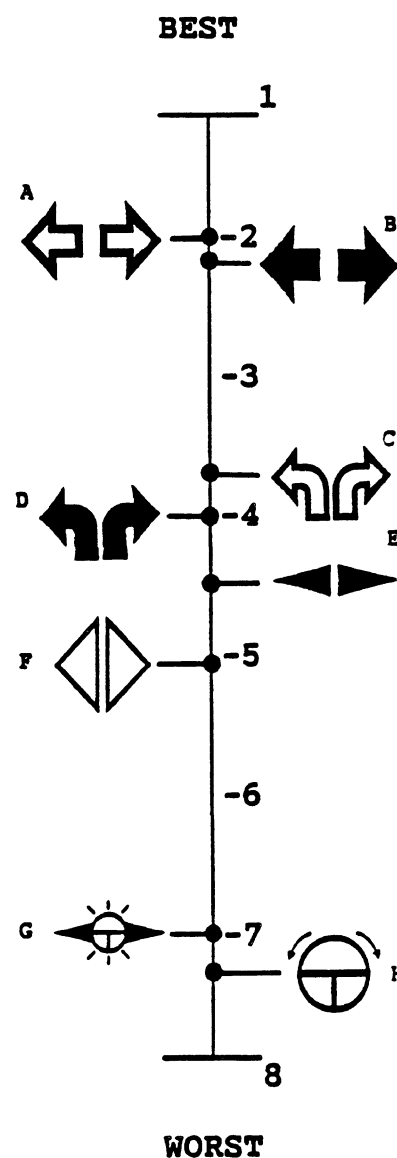
## 22. TURN SIGNAL

Of the candidates presented to participants in the rating study, there was little variation in the characteristics used to construct these symbols. This was due primarily to the limited number of alternative suggestions produced by both participants in the production experiment and the authors. Of the candidates presented, the ISO standard received the lowest mean ranking (mean = 2.0). This in combination with the high level of recognition observed by Saunby et al. (Identification = 91.3%, Matching = 85.7%) would suggest that the current ISO standard for the turn signal function should not be changed.

$H(7) = 512.7, p < .001$

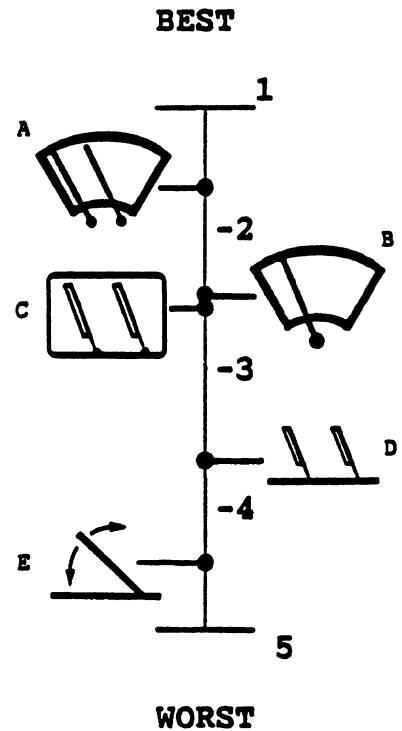
MEDIAN(7) = 330.5,  $p < .001$

	BEST----->WORST								MISS	MEAN
	1	2	3	4	5	6	7	8		
A	46	31	13	7	2	2	1	0	2	2.0
B	35	33	17	11	5	0	0	1	2	2.2
C	12	14	20	22	21	10	1	2	2	3.7
D	4	10	19	36	16	13	3	0	3	4.0
E	3	8	16	13	32	24	5	0	3	4.5
F	0	2	16	10	21	38	8	4	2	5.1
G	2	0	0	1	3	7	55	31	5	7.0
H	0	1	1	2	3	6	29	59	3	7.3



## 23. WINDSHIELD WIPER

The suggestions received in the production study for the windshield wiper symbol frequently included two wiper blades as a characteristic rather than only one. This preference was evident in that participants significantly preferred candidate "A" (mean = 1.7) over the ISO standard symbol "B" (mean = 2.5) ( $H = 12.13$ ,  $p > .001$ ). Saunby et al. found moderate levels of recognition for the current ISO standard wiper symbol (Identification = 62.0%, Matching = 74.8%). However, it is debatable as to whether the addition of one more wiper blade, without the changing of any other characteristics, is likely to raise the overall level of recognition as observed in the Saunby et al. study. The authors therefore feel that the current ISO standard symbol for the windshield wiper should not be changed. Yet if changes take place in either the windshield washer standard or the windshield washer/wiper standard, the symbol for this function should remain consistent with the features of other similar functions.



$H(4) = 239.9$ ,  $p < .001$

MEDIAN(4) = 205.2,  $p < .001$

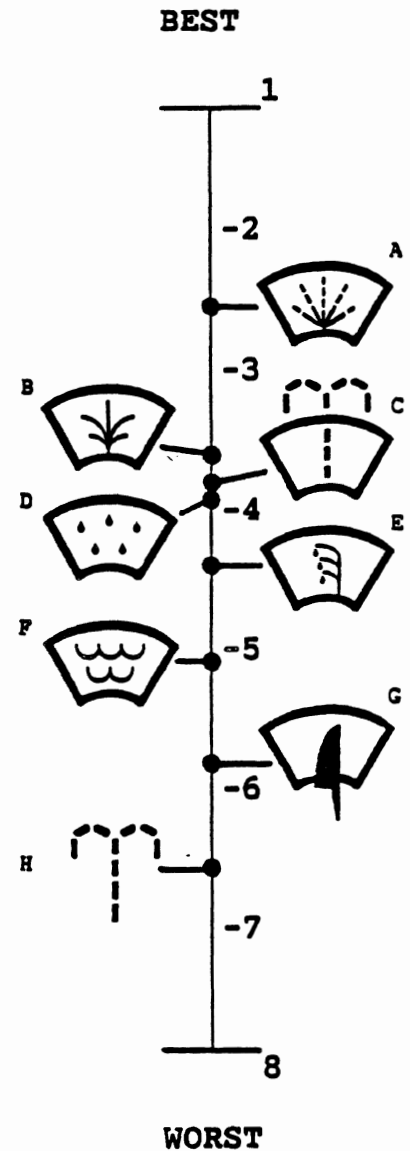
	BEST----->WORST						
	1	2	3	4	5	MISS	MEAN
A	46	44	9	2	2	1	1.7
B	34	26	14	18	11	1	2.5
C	15	27	52	6	3	1	2.6
D	4	5	25	54	15	1	3.7
E	4	1	4	22	72	1	4.5

## 24. WINDSHIELD WASHER

Of the windshield washer candidates offered to participants in the preference study, all but one (H) used the same outline to represent the front windshield. How the fluid spray was represented resulted in a significant difference between "A" (mean = 2.6) and the current ISO standard "C" (mean = 3.8) ( $H = 8.85$ ,  $p > .005$ ), despite that "C" received a considerable number of #1 rankings. In testing the level of recognition for the current ISO windshield washer symbol, the Saunby et al. study produced results which were dependent upon the method of testing (Identification = 58.2%, Matching = 87.0%). The authors feel that this would suggest further investigation into the changing of the current ISO standard, possibly replacing it with the symbol candidate "A". However, "A" may create a legibility problem under conditions of suboptimal lighting, with drivers possibly confusing this symbol with the wiper control.

$H(7) = 221.1$ ,  $p < .001$   
MEDIAN(7) = 142.1,  $p < .001$

	BEST----->WORST									
	1	2	3	4	5	6	7	8	MISS	MEAN
A	30	27	22	8	8	6	2	0	1	2.6
B	5	24	23	22	16	5	4	2	3	3.6
C	28	12	13	7	11	15	9	7	2	3.8
D	18	12	10	23	14	8	13	3	3	3.9
E	10	11	11	17	25	11	13	4	2	4.4
F	4	5	10	18	14	27	14	10	2	5.1
G	7	9	8	2	6	16	23	31	2	5.8
H	1	2	7	3	8	14	24	41	4	6.6



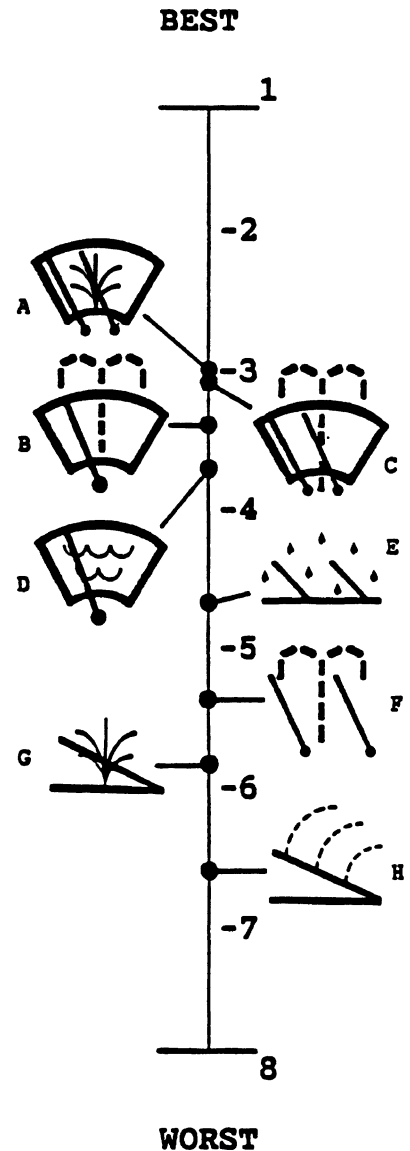
## 25. WINDSHIELD WASHER/WIPER

Of the candidates for the windshield washer/wiper symbol, "A" received the best mean ranking (mean 3.0). However, this was not a significantly different from the mean ranking of the current ISO standard (mean = 3.4). It is not surprising that candidate "A" incorporated both characteristics found to be preferable in the windshield wiper and windshield washer symbol candidates (symbols 23 and 24). These characteristics are two wiper blades rather than just one, and a fluid spray rather than a stream. While candidate "A" is not preferred significantly over the ISO standard, the moderate levels of recognition observed by Saunby et al. for the standard (Identification = 50.9%, Matching = 79.5%) would suggest that an alternative symbol can and should be developed. However, any considered changes in the washer/wiper standard symbol must also take the independent washer and wiper functions into consideration.

$H(7) = 245.1, p < .001$

MEDIAN(7) = 158.8,  $p < .001$

	BEST----->WORST									
	1	2	3	4	5	6	7	8	MISS	MEAN
A	21	22	21	21	9	8	1	0	1	3.0
B	19	29	20	16	7	3	7	2	1	3.1
C	27	17	13	13	12	12	5	4	1	3.4
D	18	14	16	19	14	12	6	3	2	3.7
E	12	11	11	6	20	15	14	13	2	4.7
F	1	7	10	16	21	12	15	20	2	5.4
G	1	3	8	10	15	27	20	18	2	5.8
H	4	1	4	3	3	15	33	34	7	6.6







# CONCLUSIONS

Soliciting drivers for ideas for symbols provided the authors with many ideas for candidate symbols. While this step did take some time, it is believed to have led to a superior set of candidates. Because many good symbols were identified in the first round, the number of symbols requiring retesting (and the associated time and cost) were all reduced.

With regard to the specific symbols tested, significant differences were observed between preferences for the ISO standard and a candidate participants preferred for 15 of the 25 functions. Of these 15, the authors suggest a replacement for 6 ISO standard symbols (cigarette lighter, front fog lights, hood release, master lighting switch, rear fog lights, and temperature). For an additional nine symbols, the authors believe that further investigation of alternative symbols is necessary in order to arrive at a standard symbol which has a greater degree of understandability than the current ISO symbol (front defrost, hazard warning, headlamp cleaner, high beam headlamps, unleaded fuel, parking lights, rear defrost, windshield washer, and windshield washer/wiper).

Readers should bear in mind that these recommendations are based on a single group of people, American drivers. If symbols are to be recognized worldwide, then cross-cultural investigations of understandability must be conducted. That has rarely been true in the past.

Considering that the ISO symbols have been in use for several years, the poor recognition of them, along with driver preferences for alternatives reported here, should be of concern to automotive designers and engineers. Those problems have occurred because:

- (1) limited sets of candidates were examined in previous studies,
- (2) candidates were often not based on suggestions from drivers (unlike the candidates tested here),
- (3) and in some cases, no testing was conducted.

Designers are therefore urged to obtain suggestions for symbols from drivers and to rigorously test candidates before proposing they be included in future international standards. If the manufacturers want satisfied customers, they must listen to them.

- *CONCLUSIONS* -

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# APPENDIX A

- APPENDIX A -

AUTOMOTIVE INSTRUMENTATION SYMBOL PRODUCTION TASK

SUBJECT CONSENT FORM

The purpose of this experiment is to create possible alternatives to existing automotive instrument symbols. It is hoped that this data will provide car manufacturers with alternative ideas to some symbols which are not well understood by drivers.

You will be asked to draw pictures that might be used as symbols to label automotive controls and displays. This experiment will take about 20 minutes, and you will be asked to complete a biographical data sheet (name, age, etc.). You can withdraw from this experiment at any time. We can not think of any hazards this experiment might expose you to.

-----  
I have read and understand the information above.

\_\_\_\_\_  
print your name

\_\_\_\_\_  
date

\_\_\_\_\_  
sign your name

Jim Sayer  
experimenter(witness)



**BIOGRAPHICAL DATA SHEET  
SYMBOL PRODUCTION TASK**

1. Name: \_\_\_\_\_
2. Sex:    male            female    (circle one)
3. Age: \_\_\_\_\_
4. In what country were you born? (USA, Can., etc.) \_\_\_\_\_
5. Current citizenship? (USA, Canada, etc.) \_\_\_\_\_
6. How long have you lived in the U.S.A.? \_\_\_\_\_
7. What is your native language? (English, Spanish, etc.) \_\_\_\_\_
8. What is your occupation? (student, engineer, etc.)  
\_\_\_\_\_
9. Are you a licensed driver?    Yes    No    (circle one)  
    If yes, for how long? \_\_\_\_\_
10. What type of car do you drive most often?  
    Make:(Ford, Dodge, etc.) \_\_\_\_\_  
    Model:(Escort, Omni, etc.) \_\_\_\_\_  
    Year: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

This portion will be filled out by the experimenter.

Date & Time \_\_\_\_\_ Subject # \_\_\_\_\_



**AUTOMOTIVE INSTRUMENTATION SYMBOLS  
PRODUCTION TASK**

**INSTRUCTIONS**

In this study you will be asked to draw pictures which might be used to identify automotive controls and displays. There are no right or wrong drawings, and artistic talent is not important. Make sure that the pictures you draw are meaningful to you relative to the control or display they are supposed to represent.

1. Do not use letters or words as we would like these symbols to be language independent.
2. Assume that these symbols are in black and white only.
3. Use as much of the space provided as possible (without going outside of the square).
4. Draw only one symbol per space.

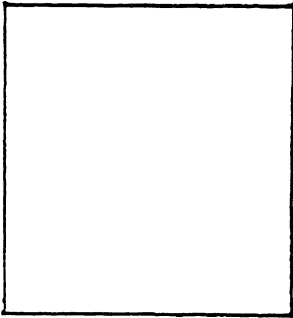
**Hint:** An ideal symbol will be simple yet meaningful.

Following are descriptions of different situations in which displays or controls might be used. Some you may have not seen before, and others may only be found on luxury cars.

CONTROLS

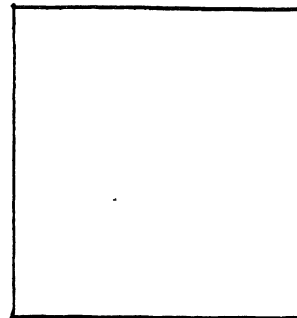
WINDSHIELD WASHER/WIPER

Suppose you are driving on a dusty road and want to clean the windshield of your car. Draw a symbol that might be used to label the windshield washer/wiper control.



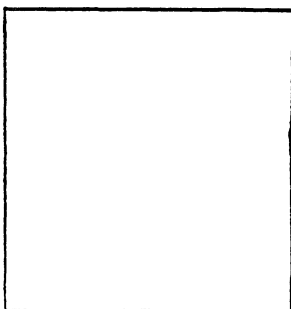
REAR FOG LIGHTS

Imagine your driving on the highway in a dense fog and want to turn on your rear fog lights to avoid being struck from behind. Draw a symbol that might be used to label the rear fog light control.



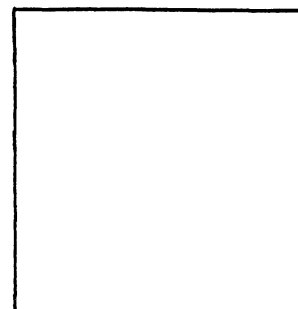
HORN

Suppose you are stopped at a red light when the light turns green. The car in front of you does not move, so you want to honk your horn. Draw a symbol that might be used to label the horn.



HEADLAMP CLEANER

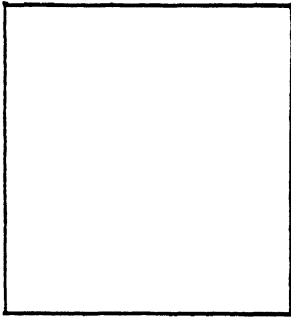
Suppose your headlamps have become partially obstructed with dirt and mud. Draw a symbol that might be used to label a headlamp cleaner.



CONTROLS

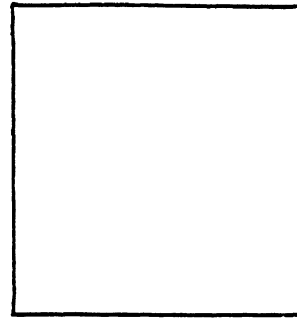
HOOD RELEASE

Suppose you want to raise the hood of your car from inside the car. Draw a symbol that might be used to label the hood release control.



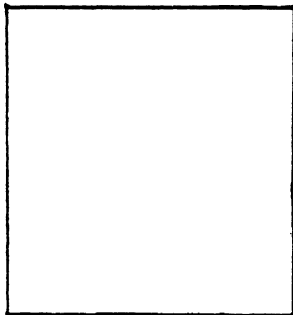
REAR DEFROST

Suppose its a cold morning and there is a build-up of frost on the rear windshield. Draw a symbol that might be used to label the rear defrost control.



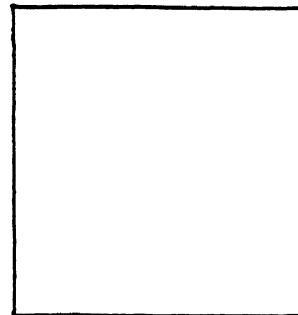
FRONT FOG LIGHTS

As you are driving, you drive into an area covered with dense fog and can hardly see the road. Draw a symbol that might be used to label the front fog light control.



TRUNK

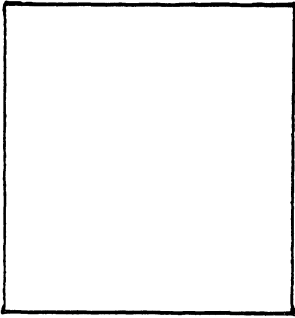
Suppose you want to open your car trunk from inside of the car. Draw a symbol that might be used to label the trunk control.



## CONTROLS

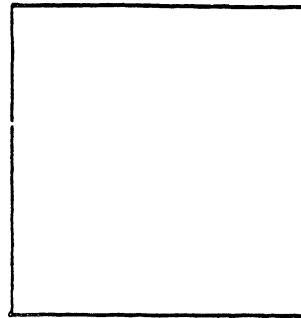
### TURN SIGNALS

Suppose your car is approaching a corner at which you would like to turn (left or right). Draw a symbol that might be used to label a turn signal control.



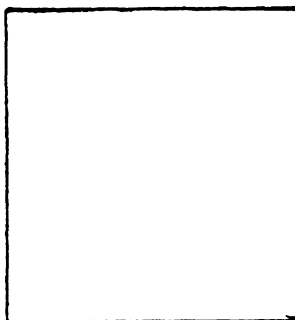
### PARKING LIGHTS

Suppose you want to turn on your parking lights. Draw a symbol that might be used to label the parking light control.



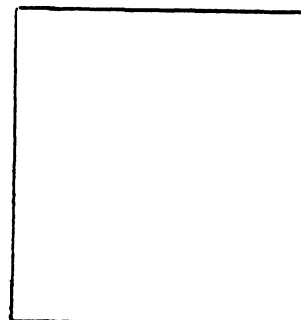
### FRONT WINDSHIELD DEFROST

Suppose that your front windshield has frost on it one cold morning. Draw a symbol that might be used to label a front windshield defrost control.



### WINDSHIELD WIPER

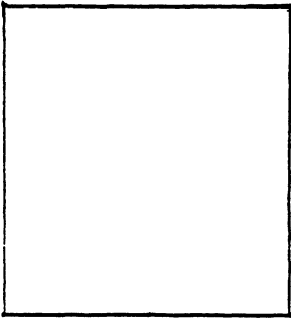
As you are driving, it begins to rain. Draw a symbol that might be used to label the windshield wiper control.



CONTROLS

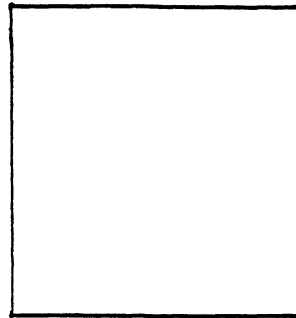
CIGARETTE LIGHTER

Draw a symbol that might be used to label the cigarette lighter.



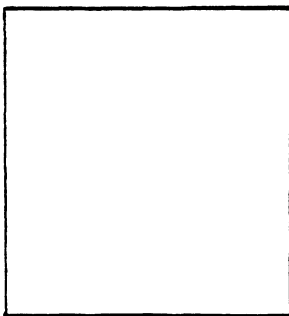
LOW BEAM HEADLIGHTS

As you are driving, you want to turn on your car's low beam headlights (normal driving lights). Draw a symbol that might be used to label the low beam headlight control.



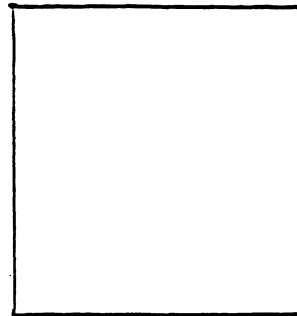
FAN

Suppose you would like to blow warm air from the heater inside your car. Draw a symbol that might be used to label the fan.



WINDSHIELD WASHER

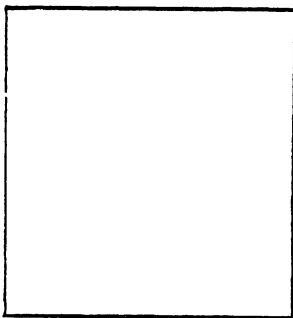
Suppose that you are driving in a light rain and your windshield is becoming smeared with dirt and oil from the roadway. Draw a symbol that might be used to label the windshield washer control.



## CONTROLS

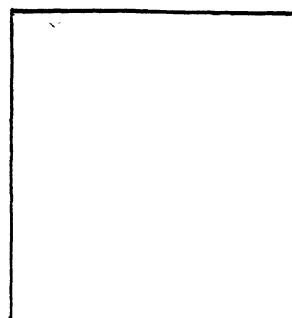
### HIGH BEAMS HEADLIGHTS

Suppose you are driving down a dark country road late at night and you want to turn on your car's high beam headlights. Draw a symbol that might be used to label the high beam headlight control.



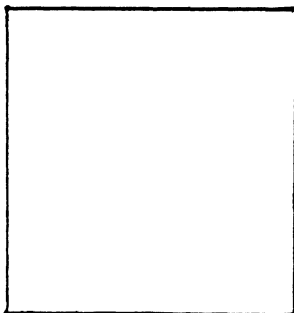
### HAZARD WARNING

Suppose your car is broken down on the side of the road, and you need to turn on the hazard warning lights (flashers). Draw a symbol that might be used to label the hazard warning control.



### MASTER LIGHTING SWITCH

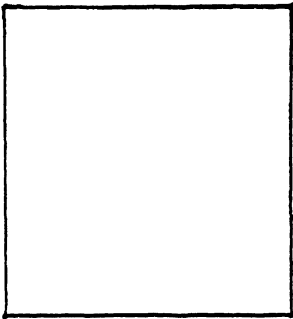
Suppose that all of the controls for your car's headlights and instrument lights were located on one switch with various different positions. Draw a symbol that might be used to label the master lighting switch.



## DISPLAYS

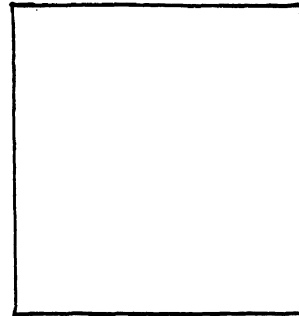
### BATTERY

Suppose you have left your car's headlights on, and the battery display on the dash is lit to tell you the battery is dead. Draw a symbol that might be used to label the battery display.



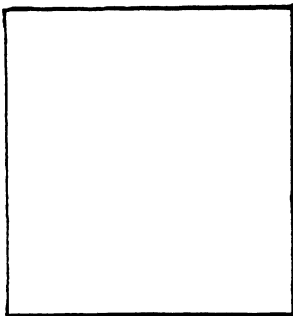
### FUEL

As you are driving, you look at your fuel gage and notice that you need fuel. Draw a symbol that might be used to label the fuel gage display.



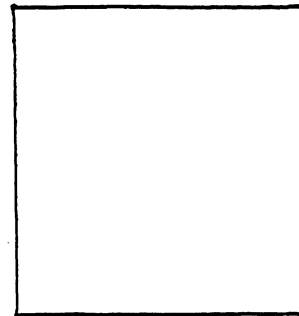
### OIL

Suppose that when you are driving the oil light on your dash comes on. Draw a symbol that might be used to label the oil display.



### TEMPERATURE

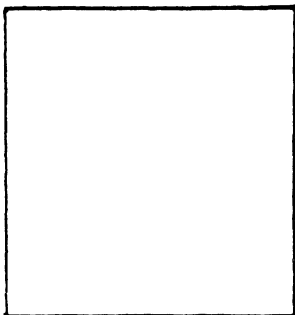
As you are driving, you glance at your temperature gage to make certain your engine is not overheating. Draw a symbol that might be used to label the temperature display.



## DISPLAYS

### UNLEADED FUEL ONLY

As you are about to fill your cars fuel tank, you find it will take only unleaded fuel. Draw a symbol that might be used to label the unleaded fuel only display.

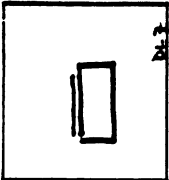
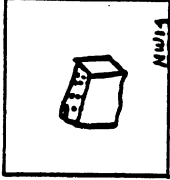
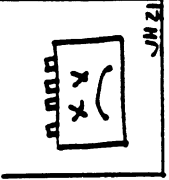
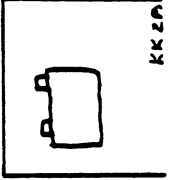
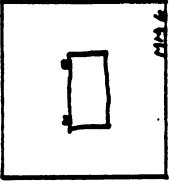
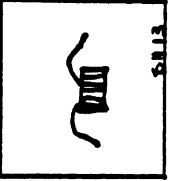
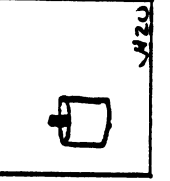

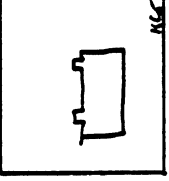
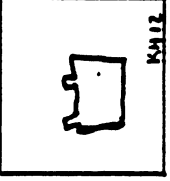
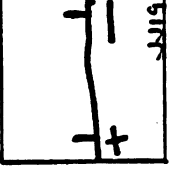
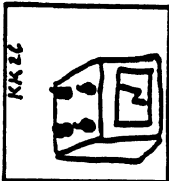
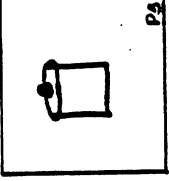
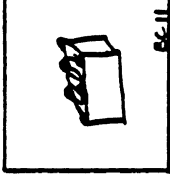
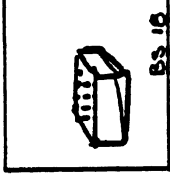
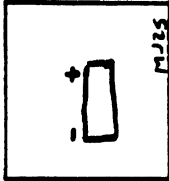
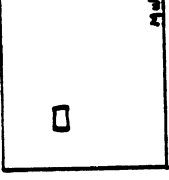
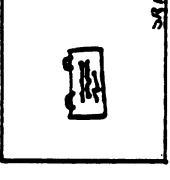
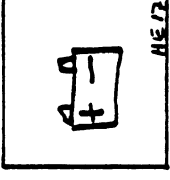
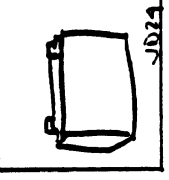
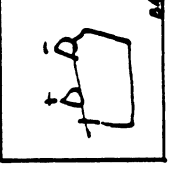
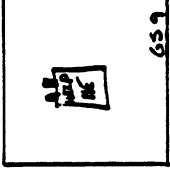
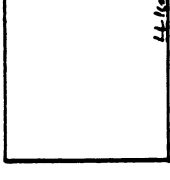
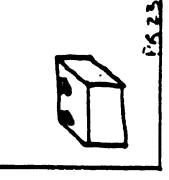
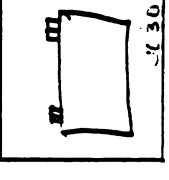
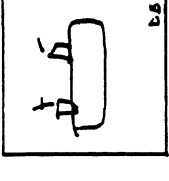
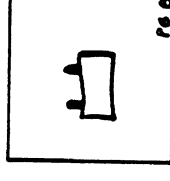
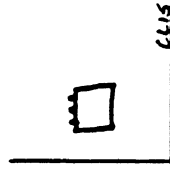
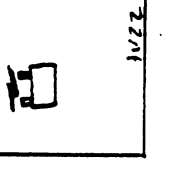




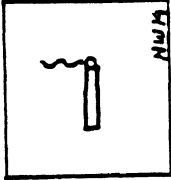
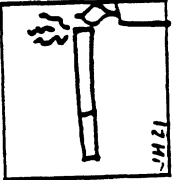
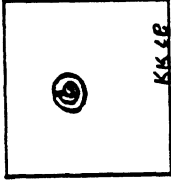
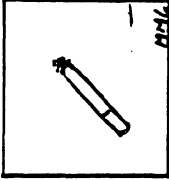
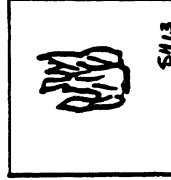
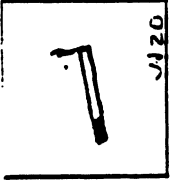
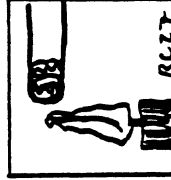
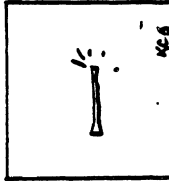
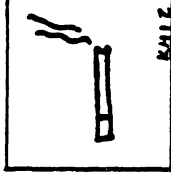

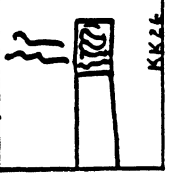
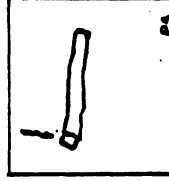
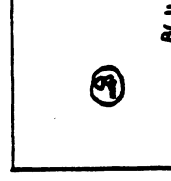
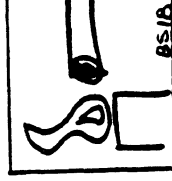
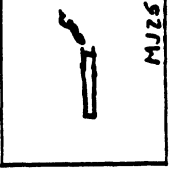
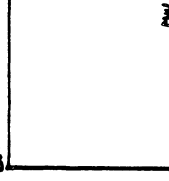
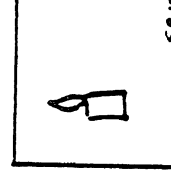
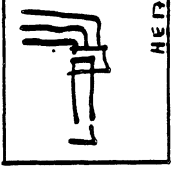
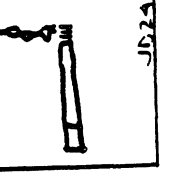
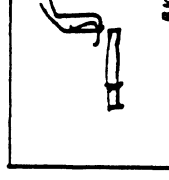
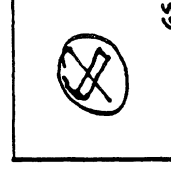
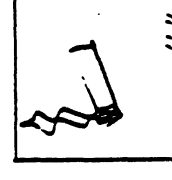
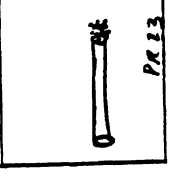
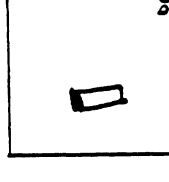
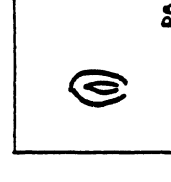

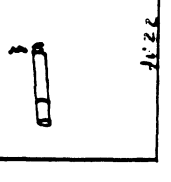



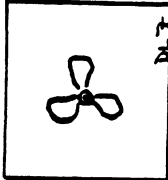
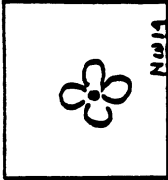

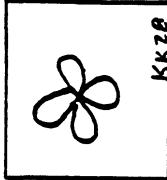
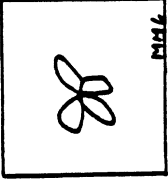
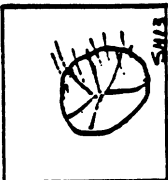
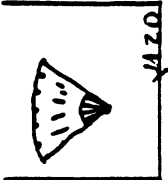
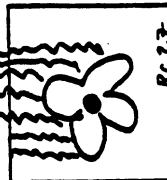
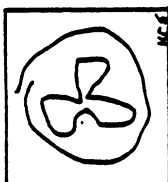
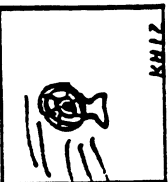

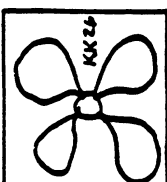
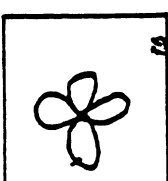
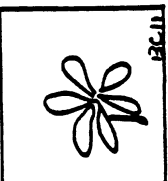
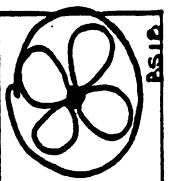
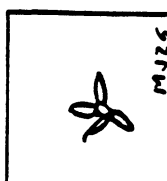
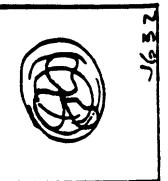
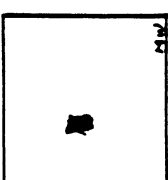
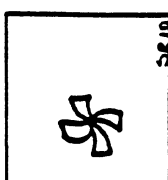
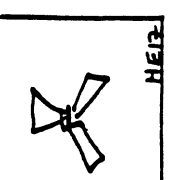
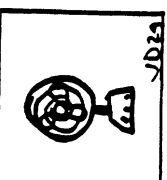
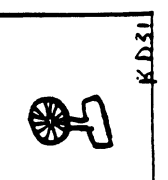
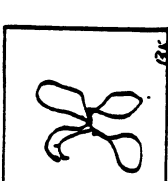
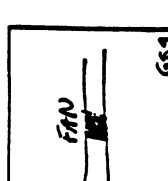
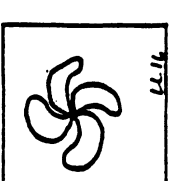
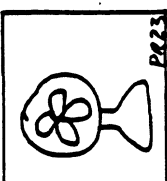
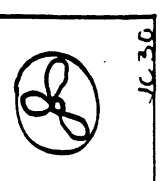
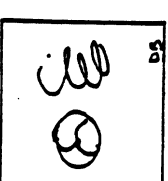
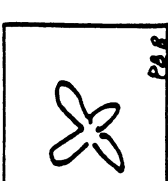
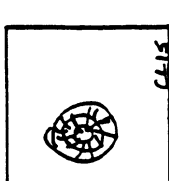

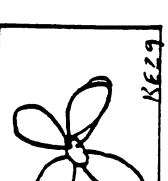
## **APPENDIX B**

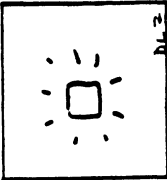
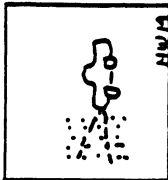
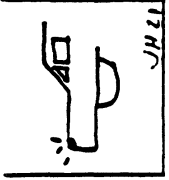
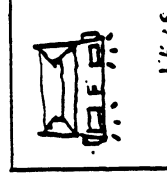
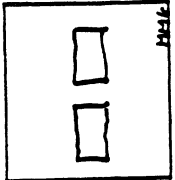
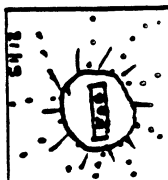
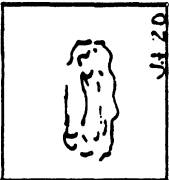
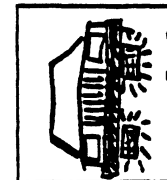
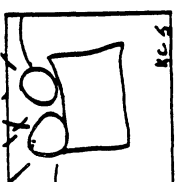
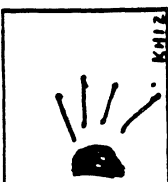
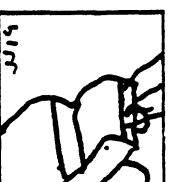
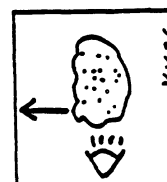
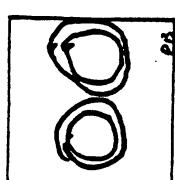
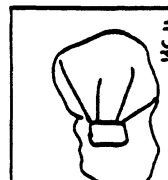
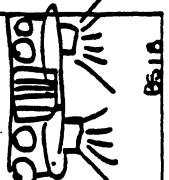
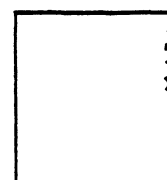
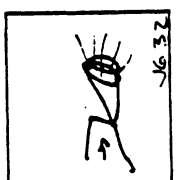
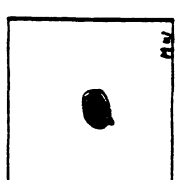
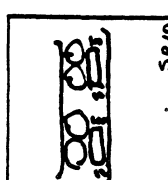
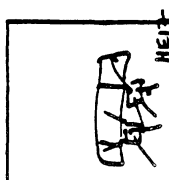
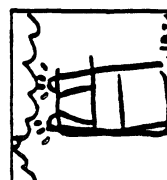
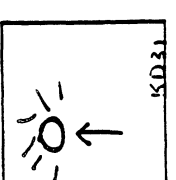
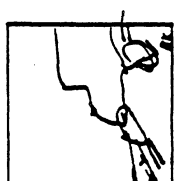
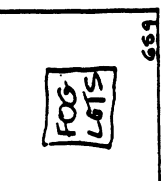
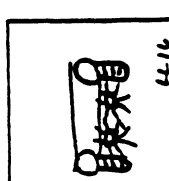
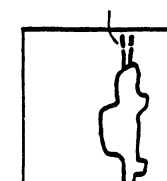
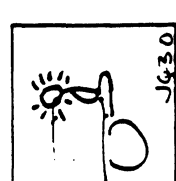
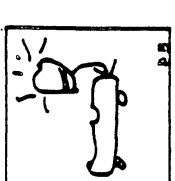
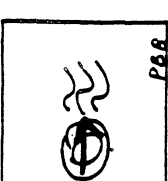
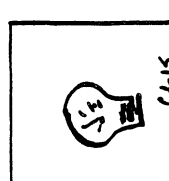
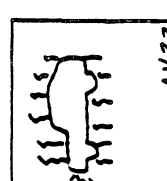
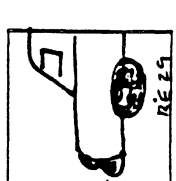
- APPENDIX B -

APPENDIX

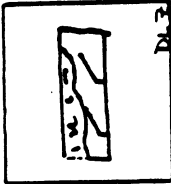
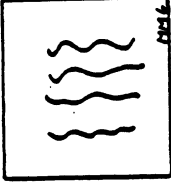
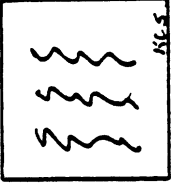
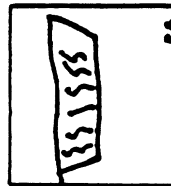
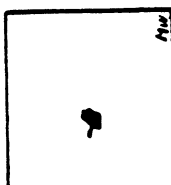

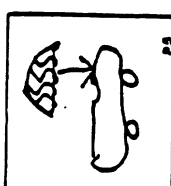
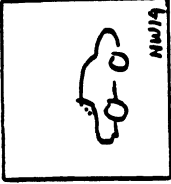
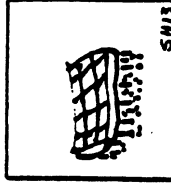

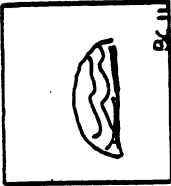
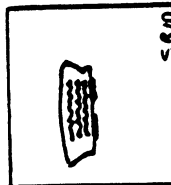
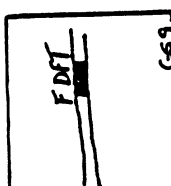
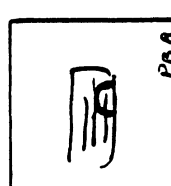
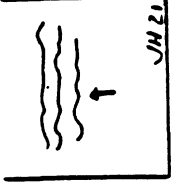


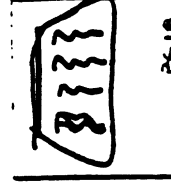

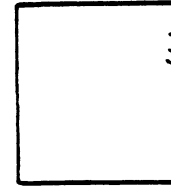
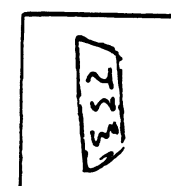
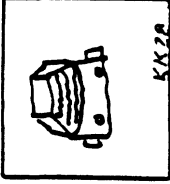

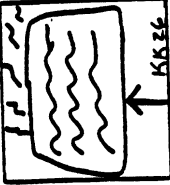
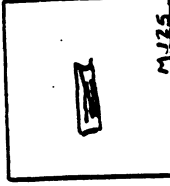
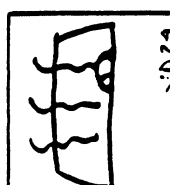
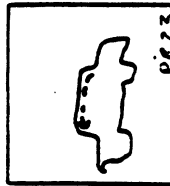
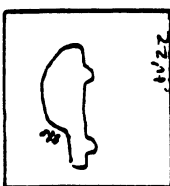
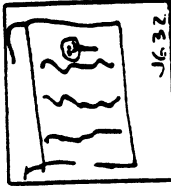
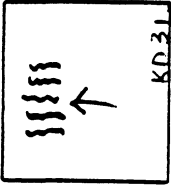

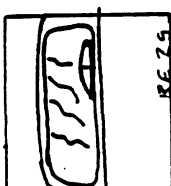
				
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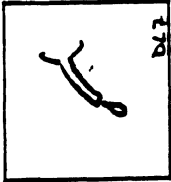
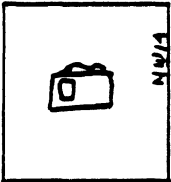
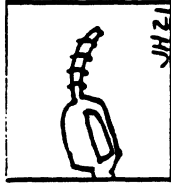
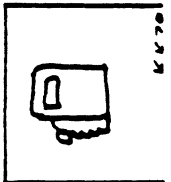
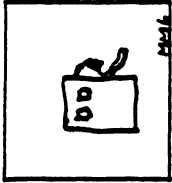
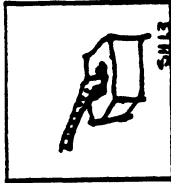
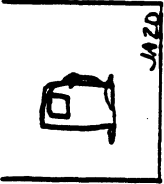
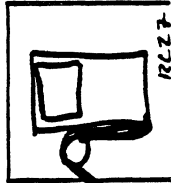
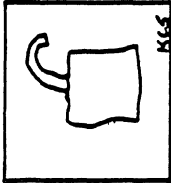
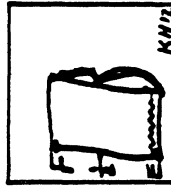
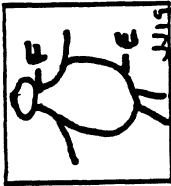


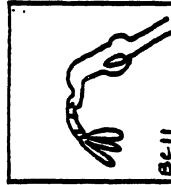
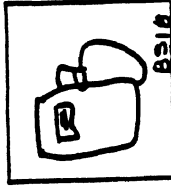
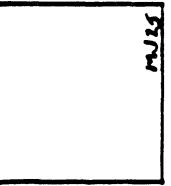
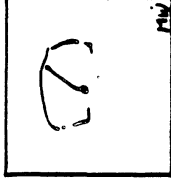
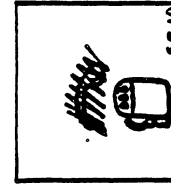
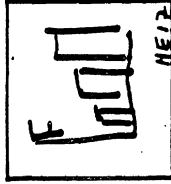
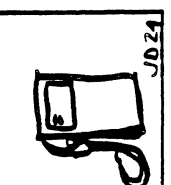
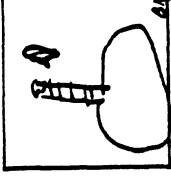
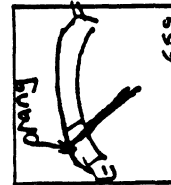
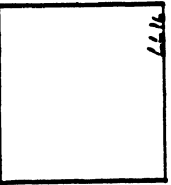
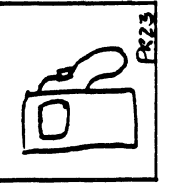
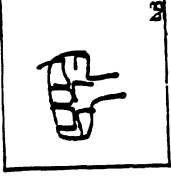
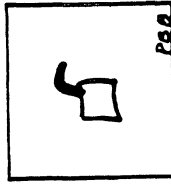
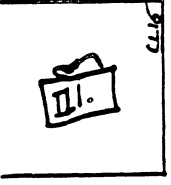
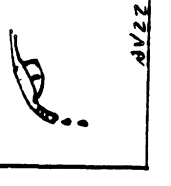
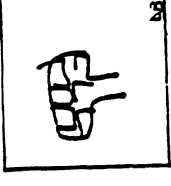
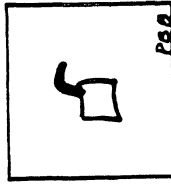
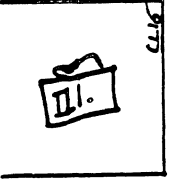
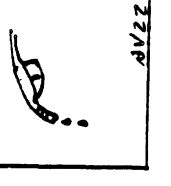
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 NML	 SR11	 HE12	 JD24	
 BK	 GS9	 LL16	 PR23	
 PB	 PB8	 CL15	 JH22	
 KE29				

 DL 7	 N 014	 JH 21	 KK 28	
 MH 6	 SH 13	 JH 20	 RC 27	
 KC 6	 KH 12	 JH 15	 KK 24	
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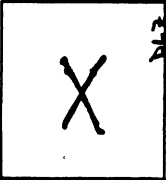



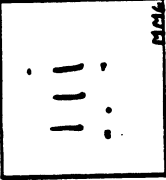


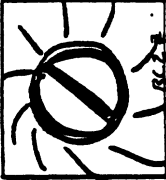
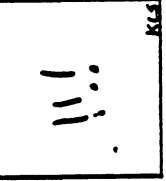

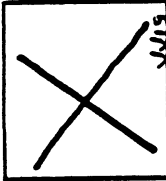
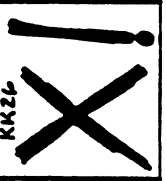
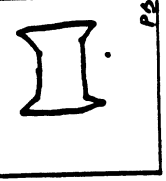
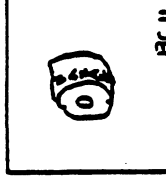
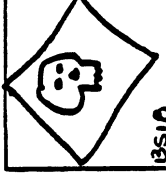
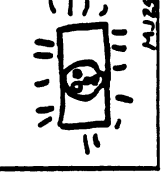
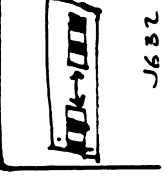
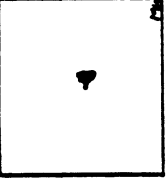
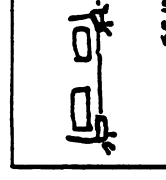
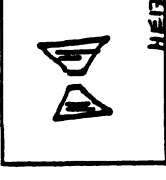
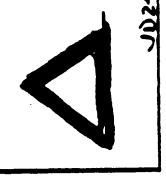

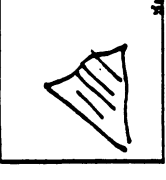
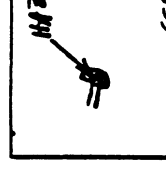
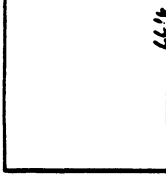
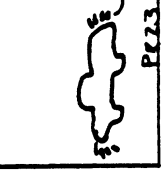
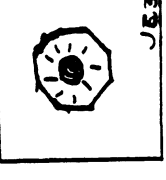
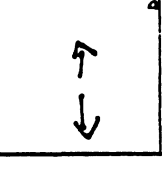
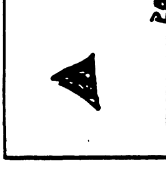
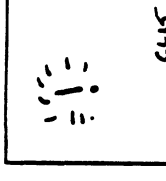
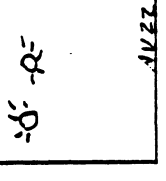
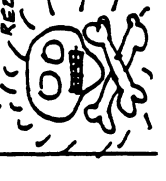
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 PM 2	 SH 2	 JH 20	 SC 27					
 KC 5	 KH 2	 JH 19	 KX 24					
 PA	 MC 11	 BS 1A	 M 25				 JK 32	
 NW	 SR 10	 HE 2	 JH 25				 KD 21	
 RL	 GSS	 LL 16	 PR 23				 JG 20	
 PR	 PBR	 CL 15	 AV 22				 RE 25	

FRONT FOG LIGHTS

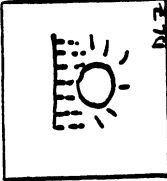
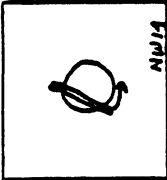
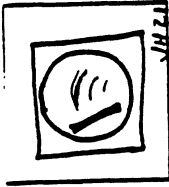
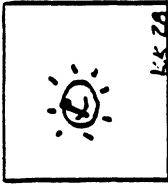
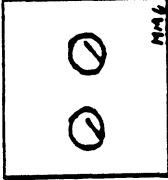
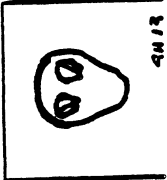
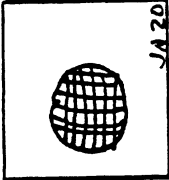
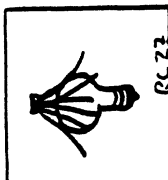
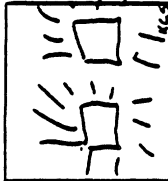
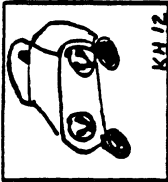
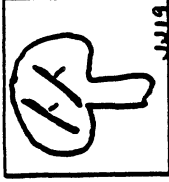
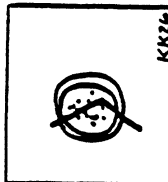
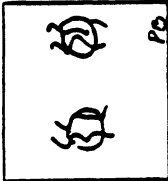
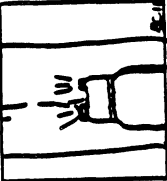
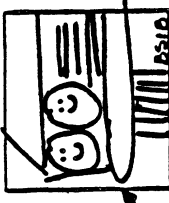
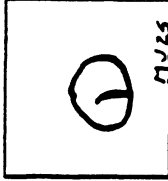
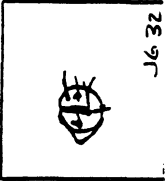
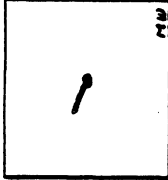
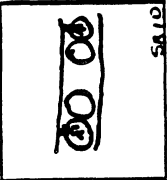

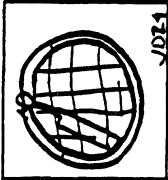
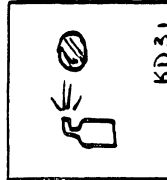
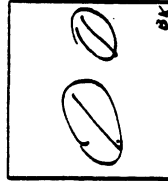
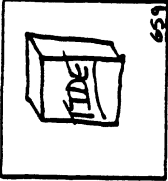
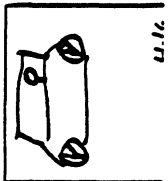
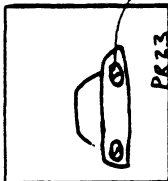
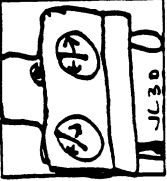
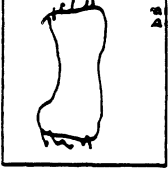
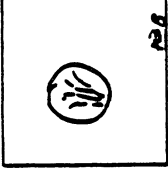
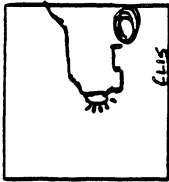
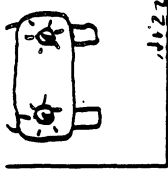
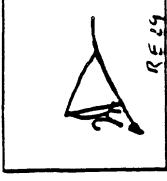
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 JM21	 SZ20	 JM19	 BS1A	 HE17	 LL16	 CL15
 KK22	 RC23	 KK26	 M25	 SD24	 DR23	 AV22
<b>FRONT WINDSHIELD DEFROST</b>						
 JG32	 KD31	 JK30	 RE29			

 DL7	 NW14	 JH21	 KX70	<b>FUEL</b>
 MW16	 SW13	 JAZD	 RCZ7	
 KLS	 KW72	 JH19	 KK26	
 PB	 BL11	 BS18	 MJ25	
 MW	 SG10	 HE12	 JD24	
 AK	 ES9	 LL16	 PR23	
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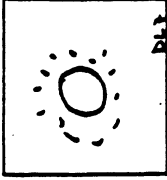
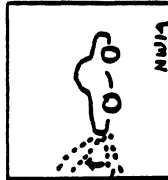

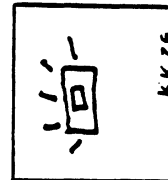
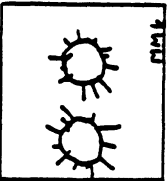
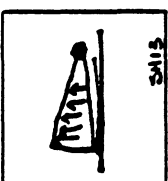
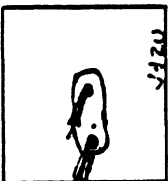


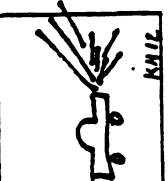
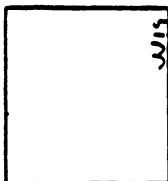
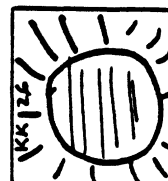
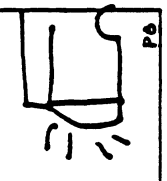
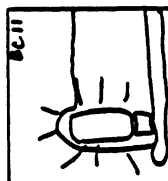
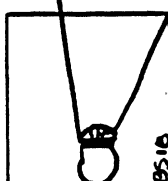
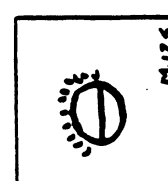
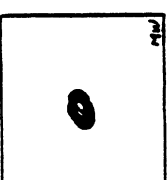
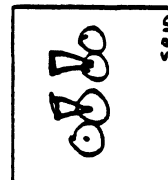
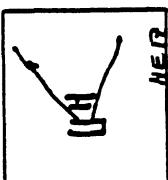


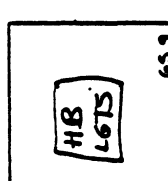
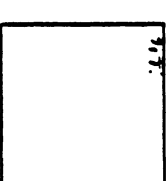
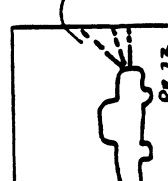
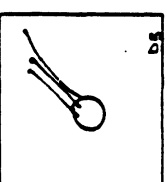
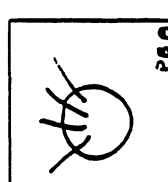
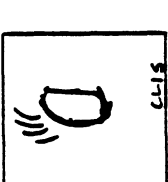
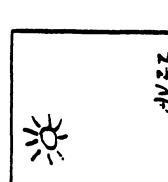
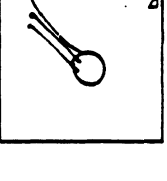
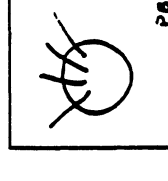
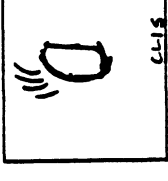
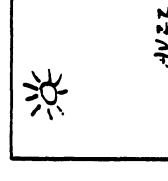


 DLZ	 NM14	 JM 21	 KK20						
 MM16	 SM15	 J120	 RL24						
 KK13	 KM12	 JM15	 KK26						
 P2	 BC11	 BS10	 MJ25	 J632					
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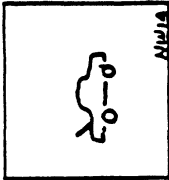
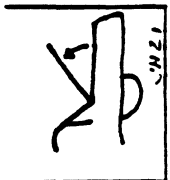
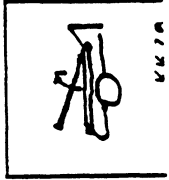
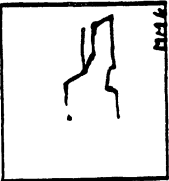

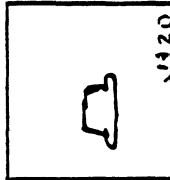
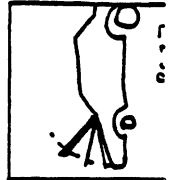

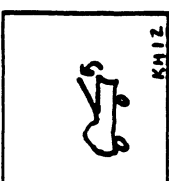
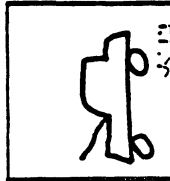
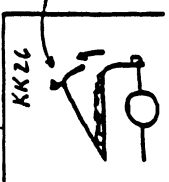

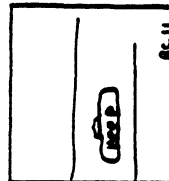
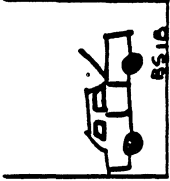
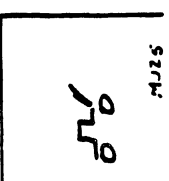
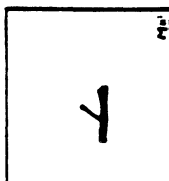
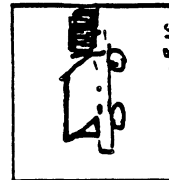

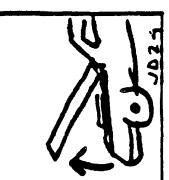
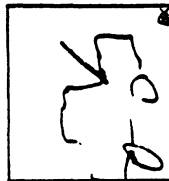
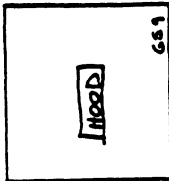
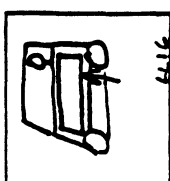
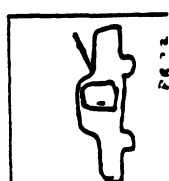
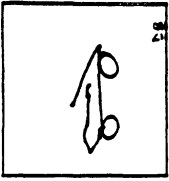

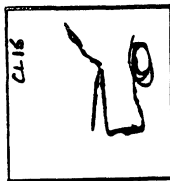
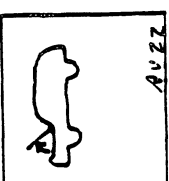
HAZARD WARNING

 DL27	 NM19	 JH21	 K521						
 MM2	 4M18	 JA20	 RL22						
 LK5	 KH12	 JJ19	 KR26						
 PD	 BU	 AS10	 NJ25	 JG32					
 MW	 SA10	 NE12	 JD21	 KD31					
 BK	 659	 JJ16	 PK23	 JL30					
 28	 28	 615	 JJ27	 RE29					

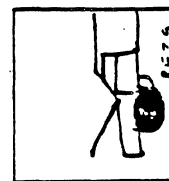
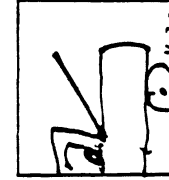
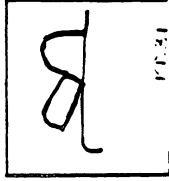
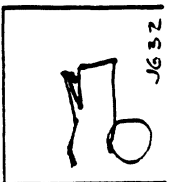
HEADLAMP CLEANER

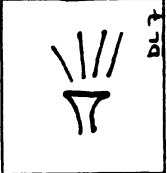
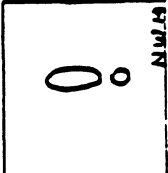
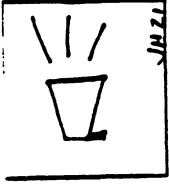
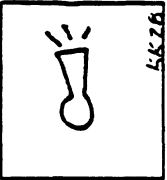
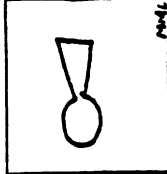
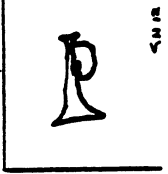
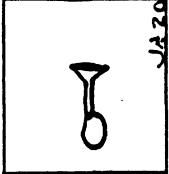
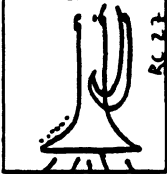
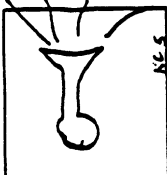

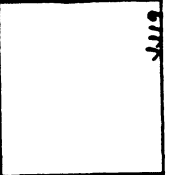


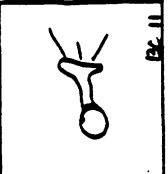
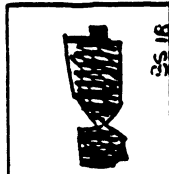


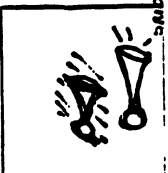
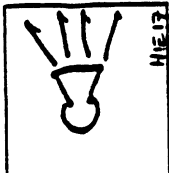



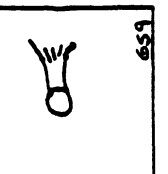
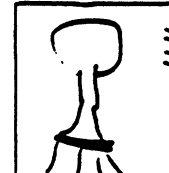
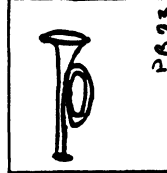
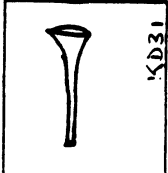
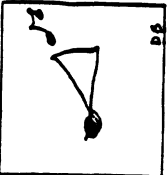
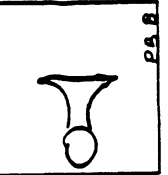
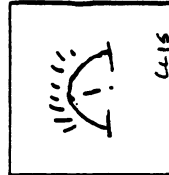

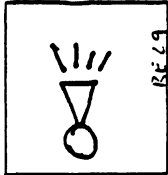
 DLY	 NMI4	 JH21	 KK26	<b>HIGH BEAM HEADLIGHTS</b>
 NMI4	 SH15	 JI20	 BC27	
 KS1	 KM12	 JI15	 KK26	
 PD	 BC11	 BS10	 MJ25	
 HJW	 SS10	 HE12	 JD24	
 BK	 HIB L6TS 653	 L14	 PR23	
 DS	 PBO	 CL15	 JV22	
 JC30	 KE29	 KE29	 KE29	

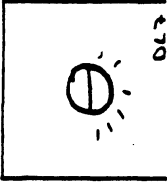
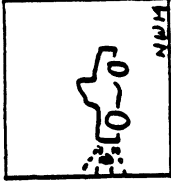

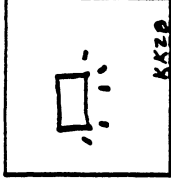
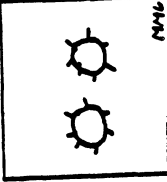

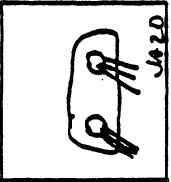
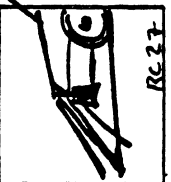

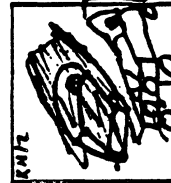

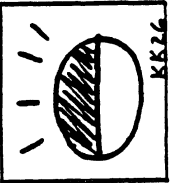
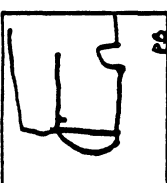
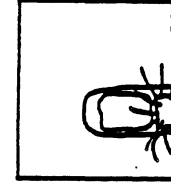
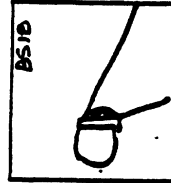
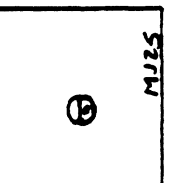
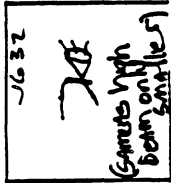
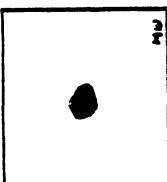
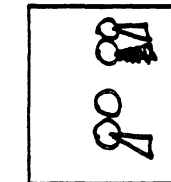
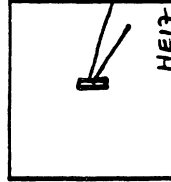
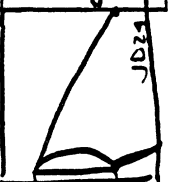
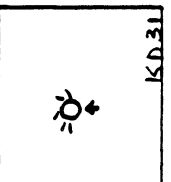

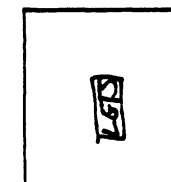
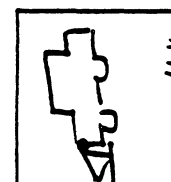
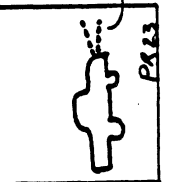
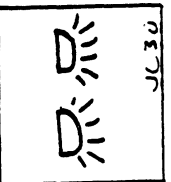
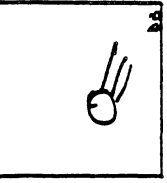
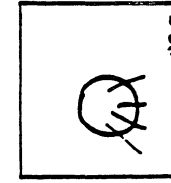
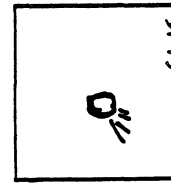
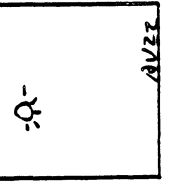
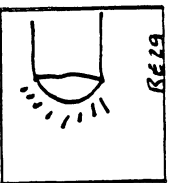
bigger than low beam  
-G-32

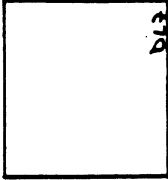
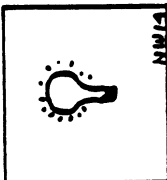
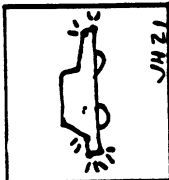
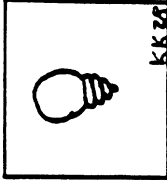
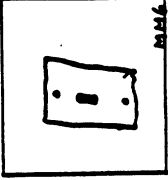
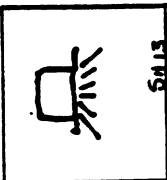
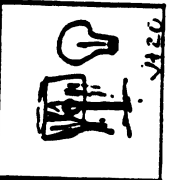
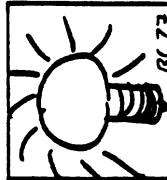
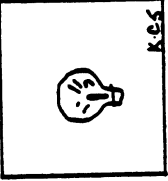
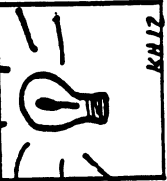
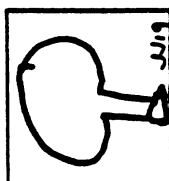
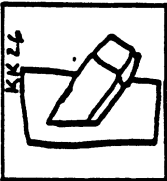
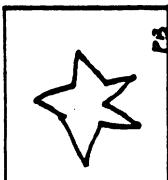
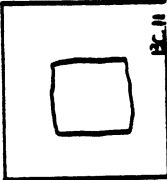
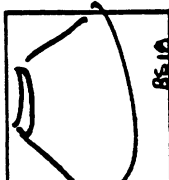
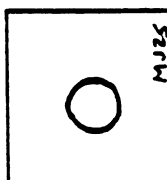
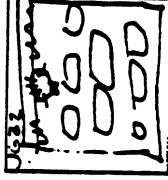
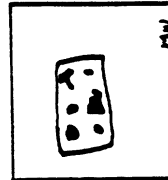
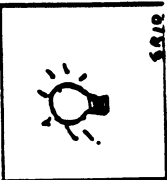
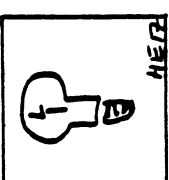
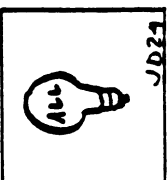
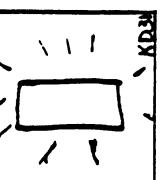
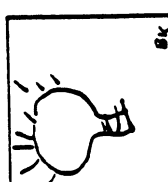

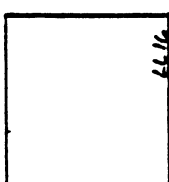
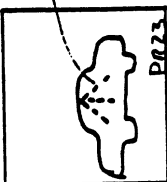
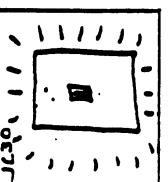
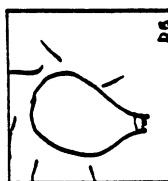
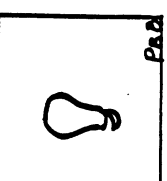
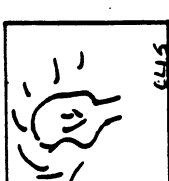
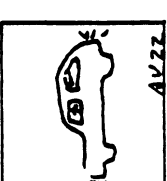
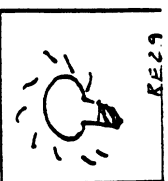
									
									
									
									
									
									
									

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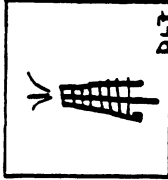
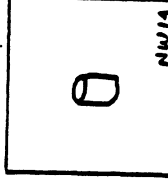
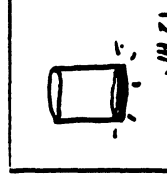
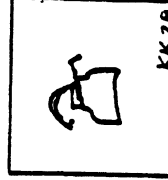
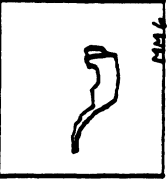

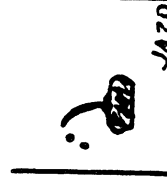
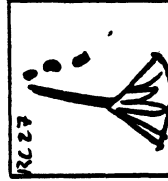
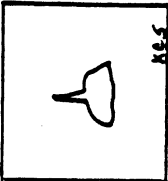
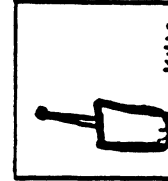

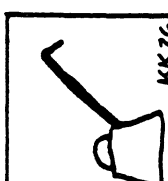
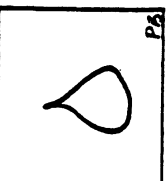

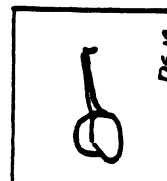
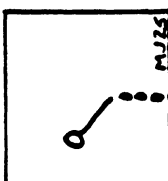
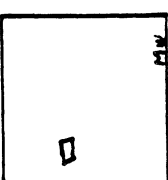
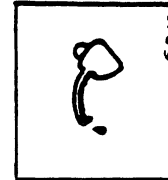
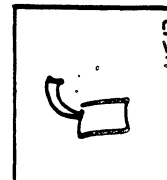
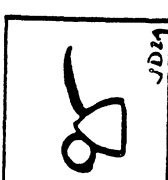
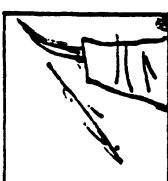
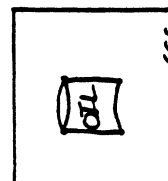
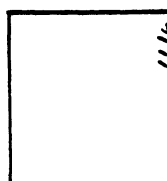
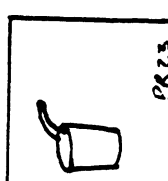
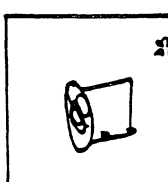
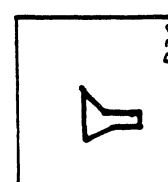
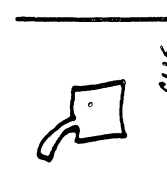
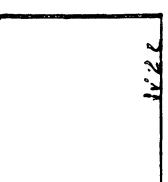


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 NML	 SH 18	 JA 20	 RL 27	
 KE 5	 KH 12	 JH 19	 KK 26	
 PS	 BK 11	 SS 18	 MJ 25	
 NML	 SH 18	 HE 17	 JD 24	 JG 32
 KL	 GS 9	 ...	 PA 23	 KD 31
 PB	 PA 8	 CL 16	 JV 22	 RE 19

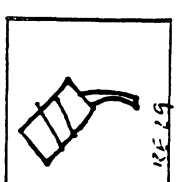
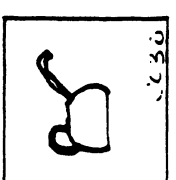
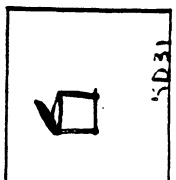
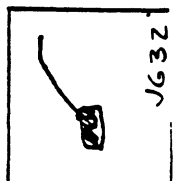
 DL7	 NML4		 KALP	<b>LOW BEAM HEADLIGHTS</b>					
 NML6	 SM13	 JAR20	 RC27						
 RGS1	 RMTL	 J119	 KK26						
 RA	 ar1	 BS18	 MJ25						 JG32 Gains high beam on handle
 MW		 HELP	 JD24						 KD31
 BK	 LST	 LL16	 PR23						 JC30
 BA	 PB8	 CL15	 AV22						 BE29

 DL3	 NM14	 JM21	 KK28	
 MM6	 SM13	 YH20	 GL27	
 KE5	 KH12	 JJ19	 KK24	
 PA	 BE11	 BS10	 MJ25	 JG32
 MV	 SR18	 HE17	 JD24	 KD29
 BK	 GS9	 LL16	 PR23	 JL30
 PA	 PA21	 GL5	 AV22	 KE29

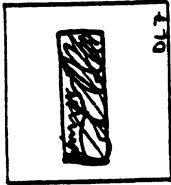
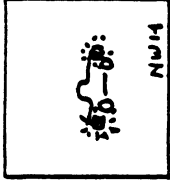
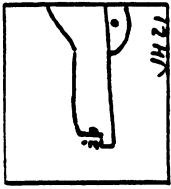
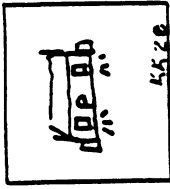
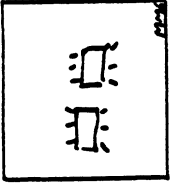
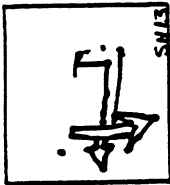
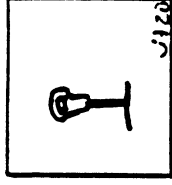
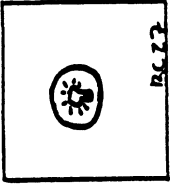


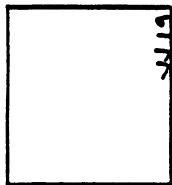
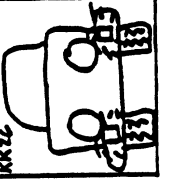
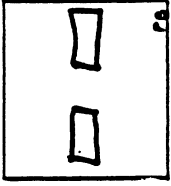
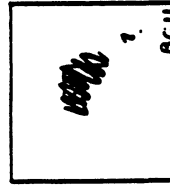
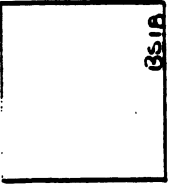
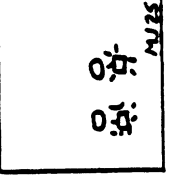
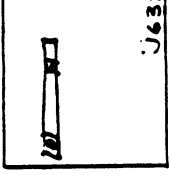

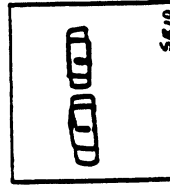
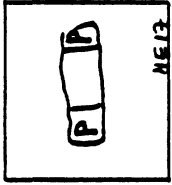
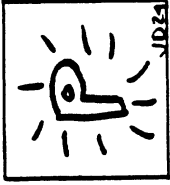
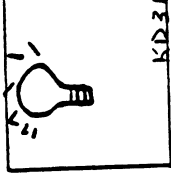
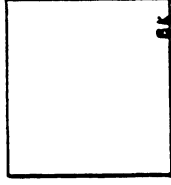
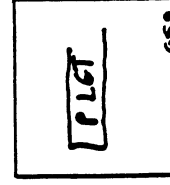
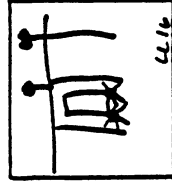
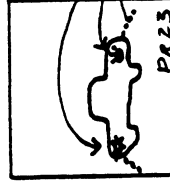
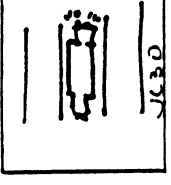
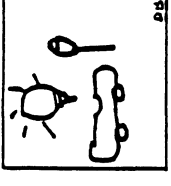

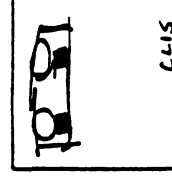
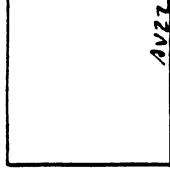
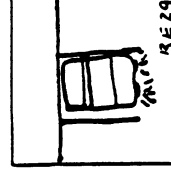
MASTER LIGHTING SWITCH

 DLZ	 NWJ4	 JHLE	 KKZB						
 NML	 SH13	 JAZD	 LZZV						
 KES	 KH12	 JJJ9	 KKZG						
 PA	 BC11	 DS14	 MJ35						
 MW	 S910	 4E12	 JD29						
 25	 G55	 LL16	 PK23						
 25	 PBR1	 CL15	 1V22						


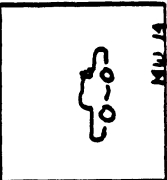
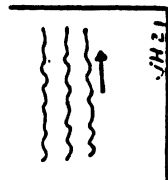
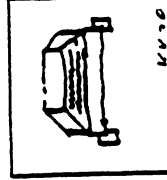
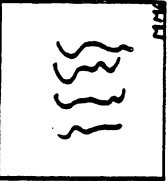

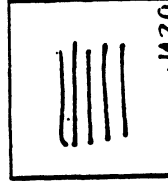
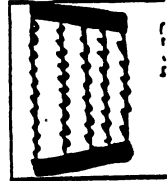
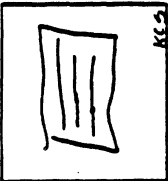

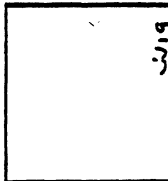
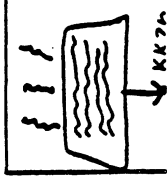
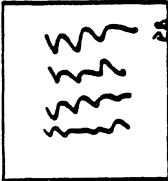
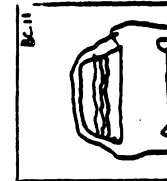
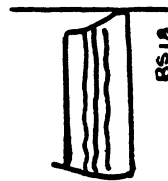
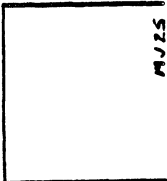
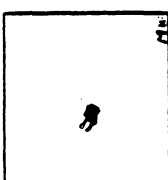


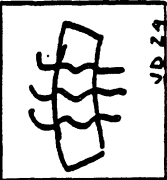
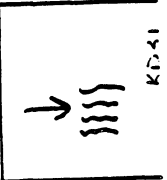
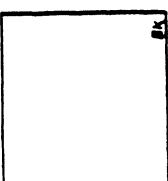
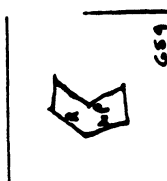
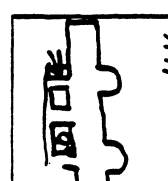
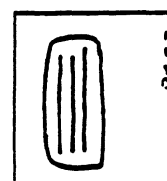
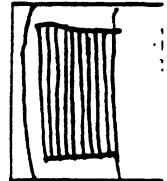
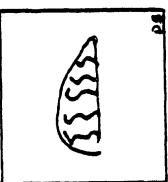
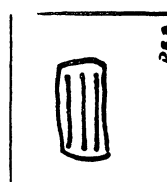
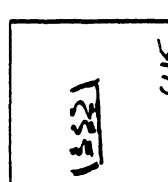
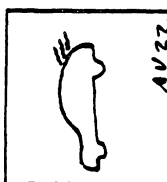
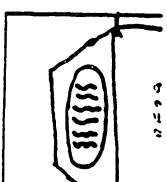
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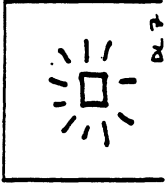
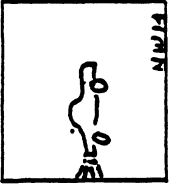
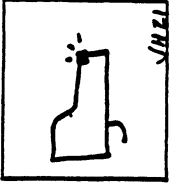
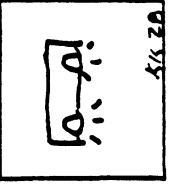
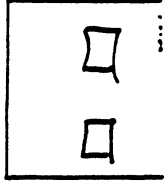
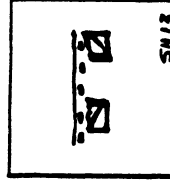
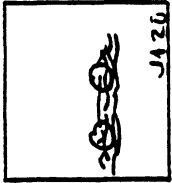
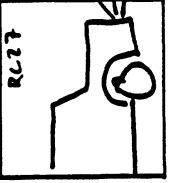
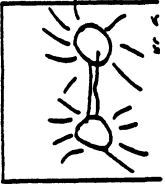
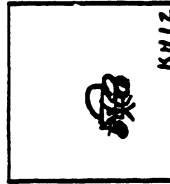
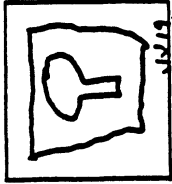
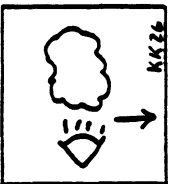
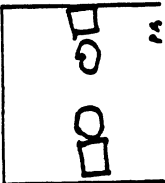

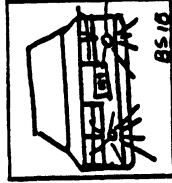
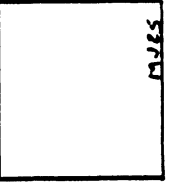
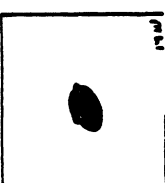


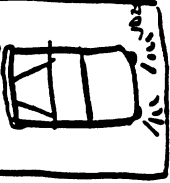
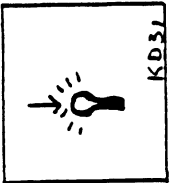
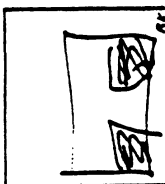
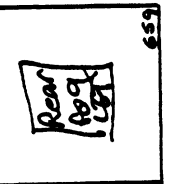
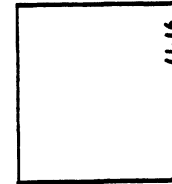
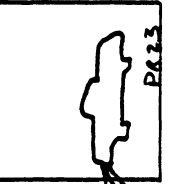
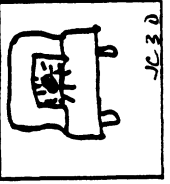
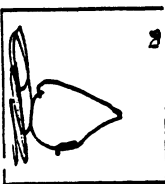
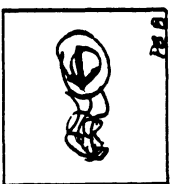
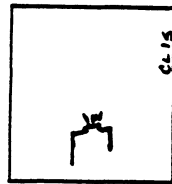
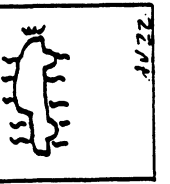
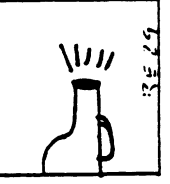


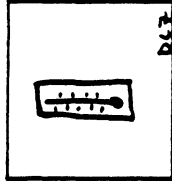
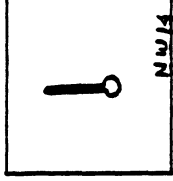
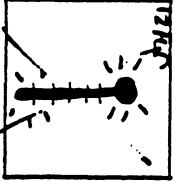
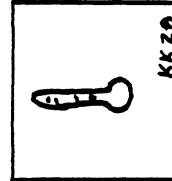
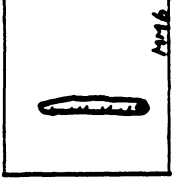
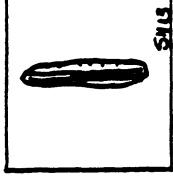
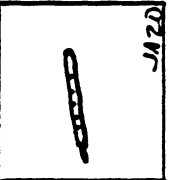
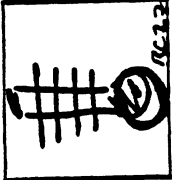
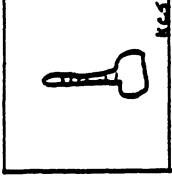
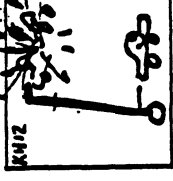
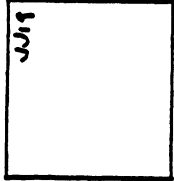
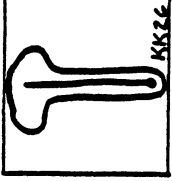
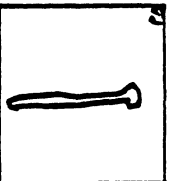
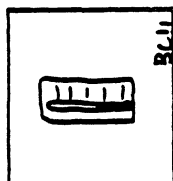
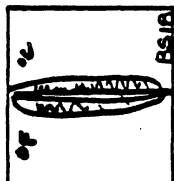
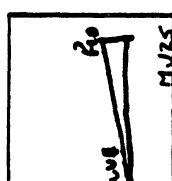
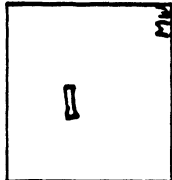
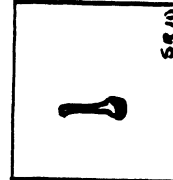
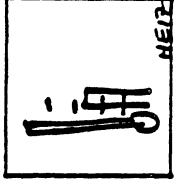
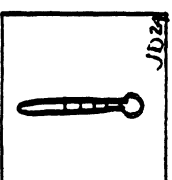
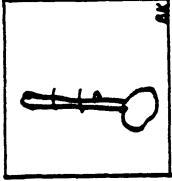
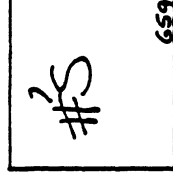
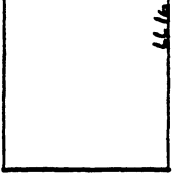
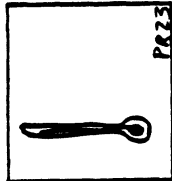
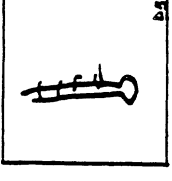
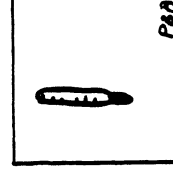
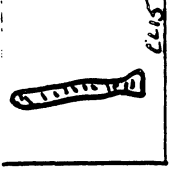
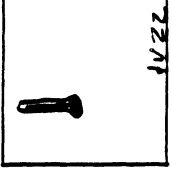
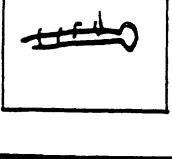
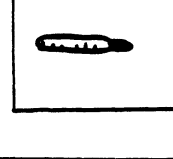




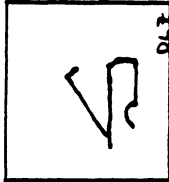
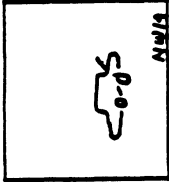
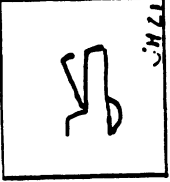
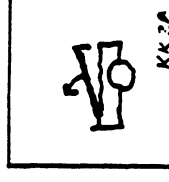
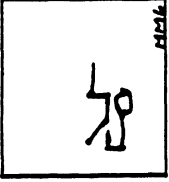
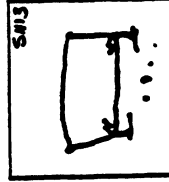
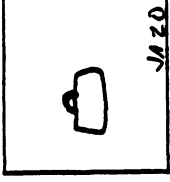
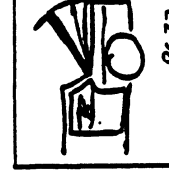
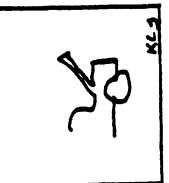
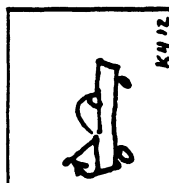
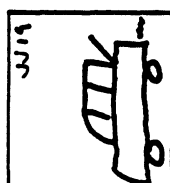
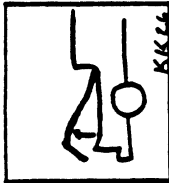
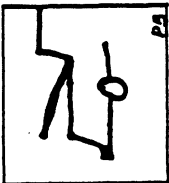
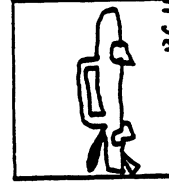
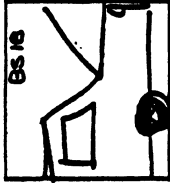
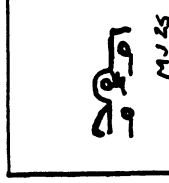
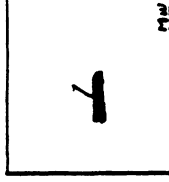
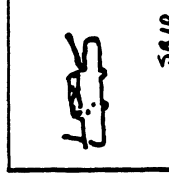
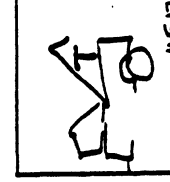
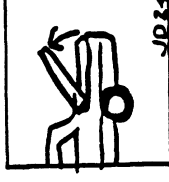


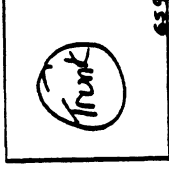
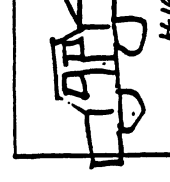
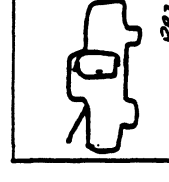
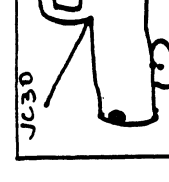
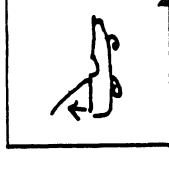
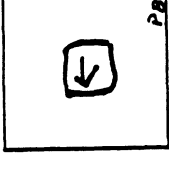


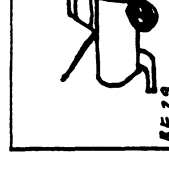
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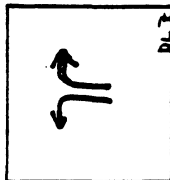
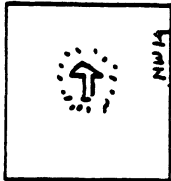
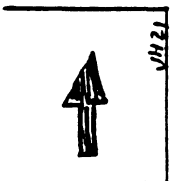

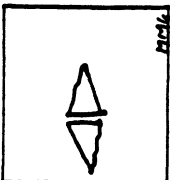
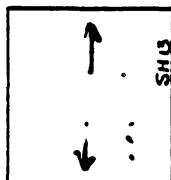
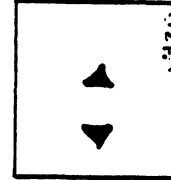
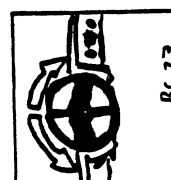
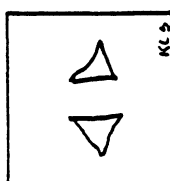
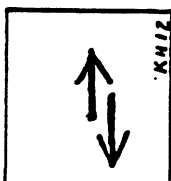
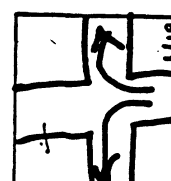
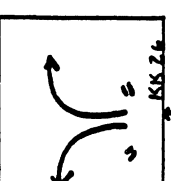
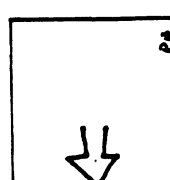
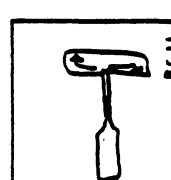
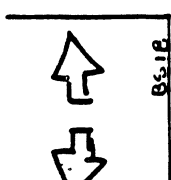
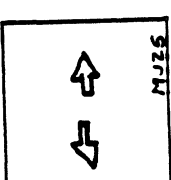
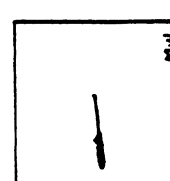
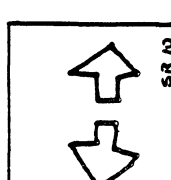
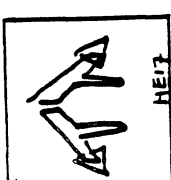
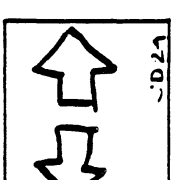
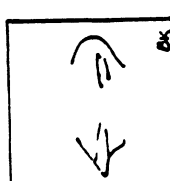
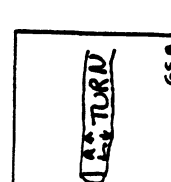
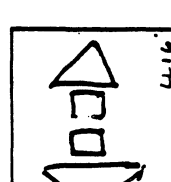
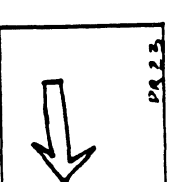
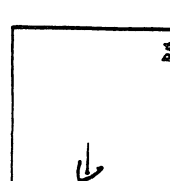
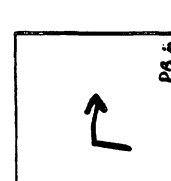
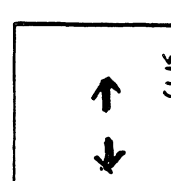
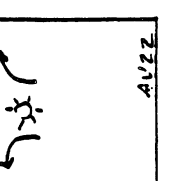
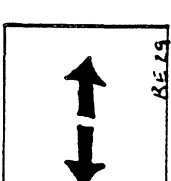
PARKING LIGHTS

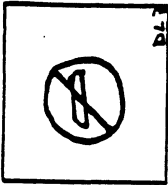
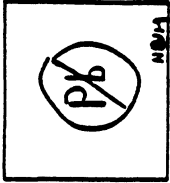
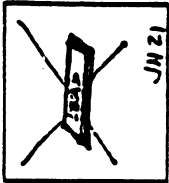
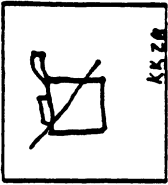


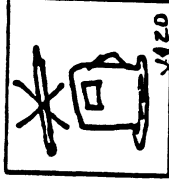
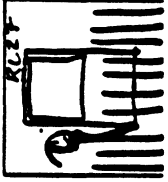
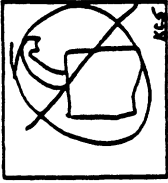
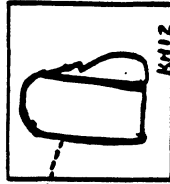
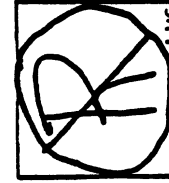
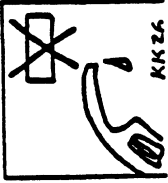
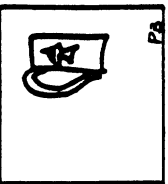
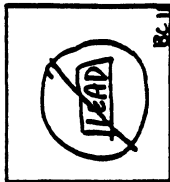
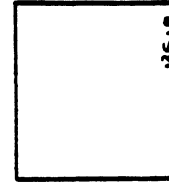
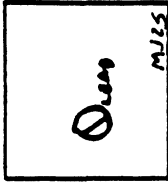
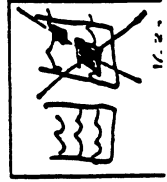
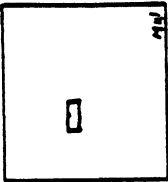
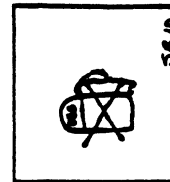
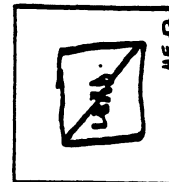

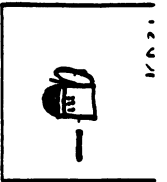

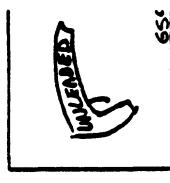
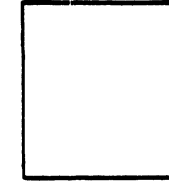
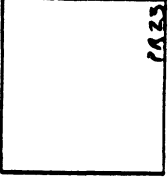
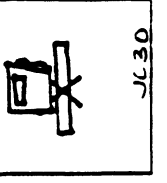
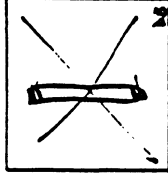
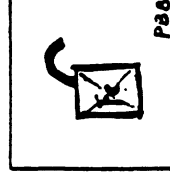
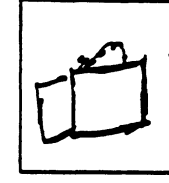
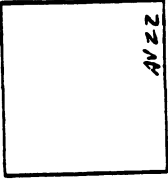
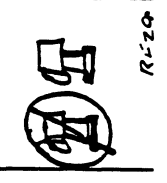
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 MW	 SH15	 JAZO	 ...		
 KES	 KH12	 J19	 KK74		
 PA	 B11	 BS18	 MJ25		
 ME	 SR18	 NE17	 VR24	 KD41	
 BK	 G59	 LL16	 DR22	 ...	
 PA	 PBA	 1321	 AV22	 ...	

 DL 7	 NM14	 JH21	 SK2A	<b>REAR FOG LIGHTS</b>			
 .....	 SN12	 JA26	 RL27				
 ..	 KM12	 JN19	 KK26				
 PA	 BC 11	 BS18	 MJ25				
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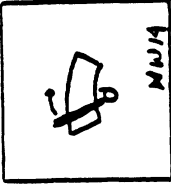
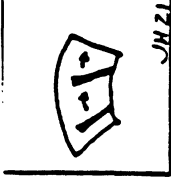
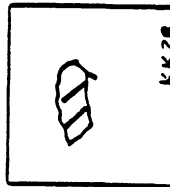
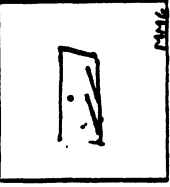


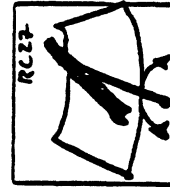

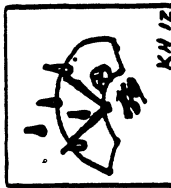
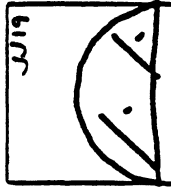
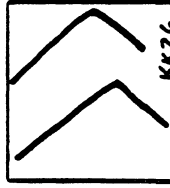
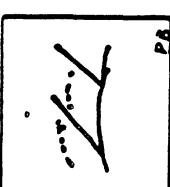
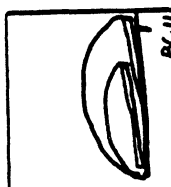

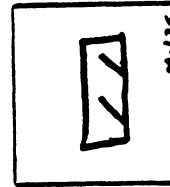
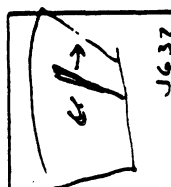
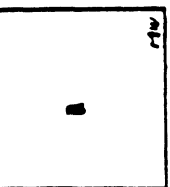
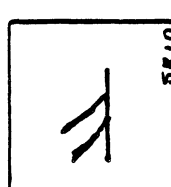

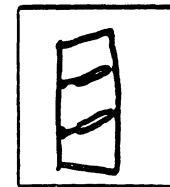
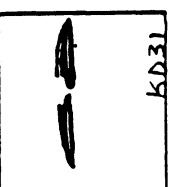
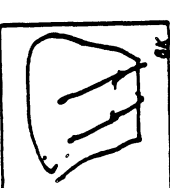
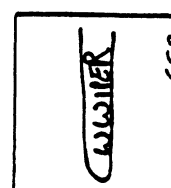
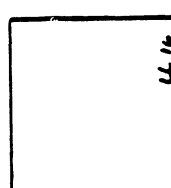
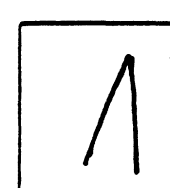
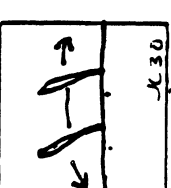
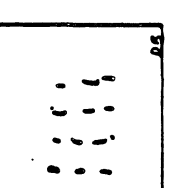
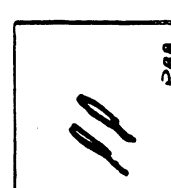
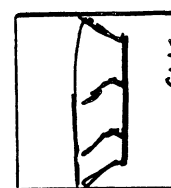
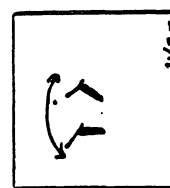
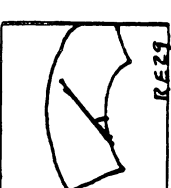
				<b>TEMPERATURE</b>
				
				
				
				
				
				
				

 DLZ	 NW1A	 JH71	 KK2A	<b>TRUNK</b>
 HM4	 SM3	 JAZO	 RC27	
 KE9	 KH2E	 J19	 KK24	
 PA	 HC1E	 BS1B	 MJ2S	
 MW	 SB1D	 HE1E	 JD24	 KD31
 BK	 659	 4416	 PR23	 JC30
 PA	 PBA	 CL1S	 AV2Z	 RE29

				<b>TURN SIGNALS</b>
				
				
				
				
				
				
				


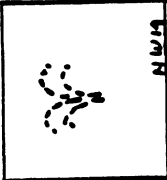

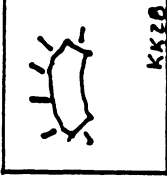
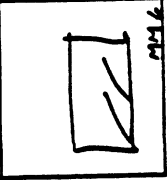

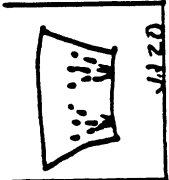


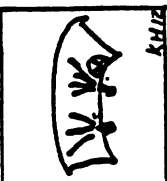
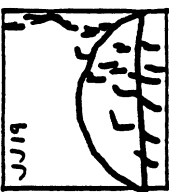

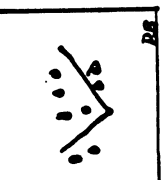

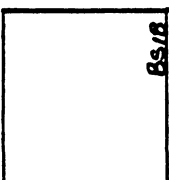
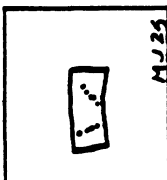
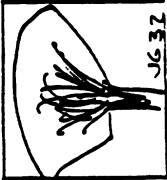
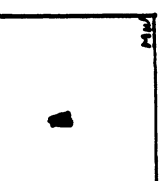
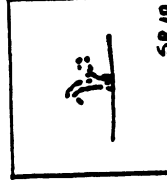
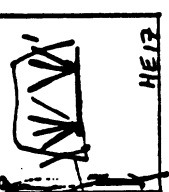
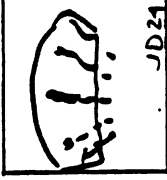
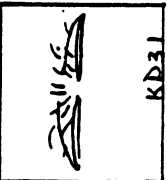

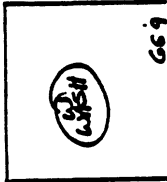
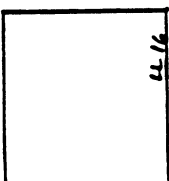
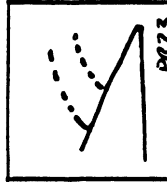

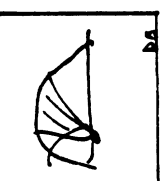

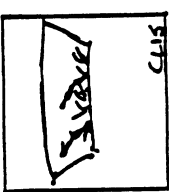
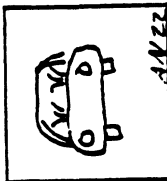
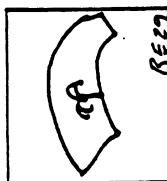
 DL7	 NP14	 JH21	 KS28						
 MP6	 SH13	 V420	 R227						
 KS5	 KH12	 SH15	 KK26						
 PA	 RC11	 AS18	 MJ25	 V.2.					
 MH	 SR16	 HE22	 JD24	 V.2.1					
 RC	 GS5	 LL17	 RA23	 JL30					
 NS	 PB8	 CL16	 AV22	 R229					

UNLEADED FUEL ONLY


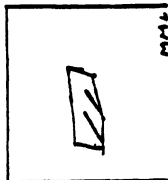
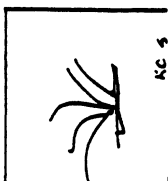
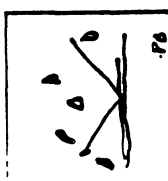
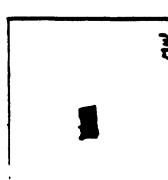
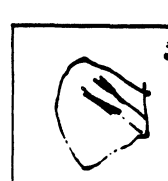
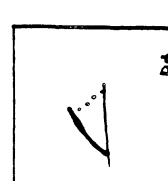

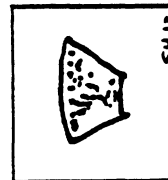
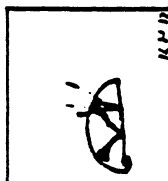
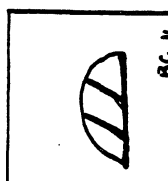
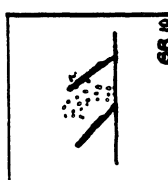
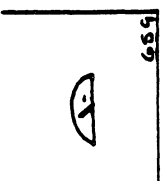
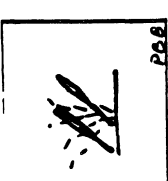
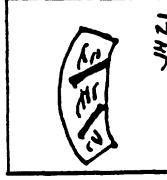
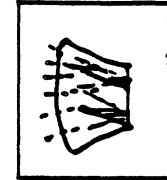
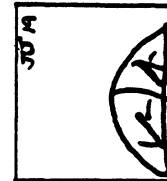



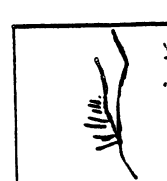
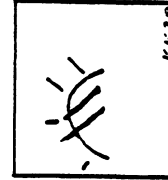
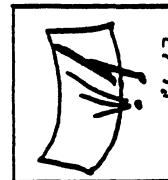
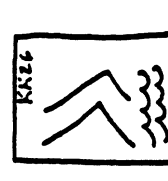

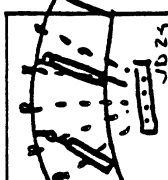
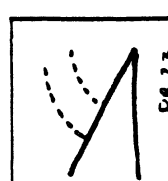
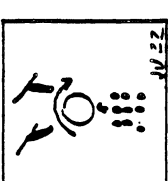
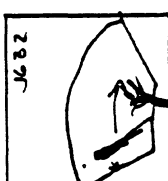
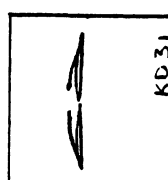
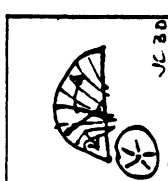
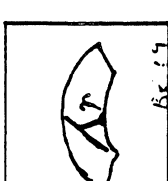
 DLZ	 MJ14	 JH21	 KK28						
 MM6	 SH15	 JAZD	 RC27						
 KC5	 KH12	 JJ19	 KK26						
 PB	 BC11	 BS18	 MV25	 JG32					
 MV	 SK10	 HE17	 JD24	 KD31					
 BK	 GS9	 LL16	 PR23	 K30					
 AS	 PB8	 CL15	 AV22	 RE29					

WINDSHIELD WIPER



 DL3	 NM19	 JH21	 KK28						
 PM16	 SH15	 JH20	 RC17						
 MS1	 KH12	 JJ19	 KK16						
 RB	 RN	 BS18	 MJ23	 JG32					
 MM	 SR10	 HE17	 JD24	 KD31					
 EK	 GS9	 LL16	 PR23	 JC30					
 BA	 PB8	 CL15	 AN22	 BE27					

WINDSHIELD WASHER

 DL 7	 MM 6	 KC 5	 PB	 MW	 BL	 DS
 MM 14	 SH 13	 KM 12	 BC 11	 GR 10	 GS 9	 PS 8
 JM 21	 JA 20	 JM 19	 BS 18	 HE 17	 LL 16	 LL 15
 KK 22	 KL 21	 KK 20	 MJ 25	 JB 24	 PA 23	 JV 22
<b>WINDSHIELD WASHER/WIPER</b>						
 JK 32	 KD 31	 JK 30	 KC 29			

## **APPENDIX C**

- APPENDIX C -



The University of Michigan  
Transportation Research Institute  
2901 Baxter Road, Ann Arbor, Michigan 48109-2150

AUTOMOTIVE INSTRUMENTATION SYMBOLS RATING TASK

SUBJECT CONSENT FORM

The purpose of this experiment is to determine how well the symbols presently used for automotive instruments are understood by drivers, and if there are symbols that might be better understood than those already in use. It is hoped this data will provide car manufactures with alternative ideas to some symbols which are not well understood by drivers.

You will be shown a collection of symbols that could be used to label a control or display on a car's dash. Then you are asked to choose the symbol that is the most meaningful to you relative to the instrument panel control or display it is intended to represent.

This experiment will take about 20 minutes to complete, and you will be asked to fill out a biographical data sheet (name, age, etc.). You can withdraw from this experiment at any time. We can not think of any hazards this experiment might expose you to.

-----  
I have read and understand the information above.

\_\_\_\_\_  
print your name

\_\_\_\_\_  
date

\_\_\_\_\_  
sign your name

Jim Sayer  
experimenter(witness)

## AUTOMOTIVE INSTRUMENTATION SYMBOLS RATING TASK

### INSTRUCTIONS

This study is concerned with evaluating symbols (pictures) that are used to identify automobile instrument panel controls (i.e. horn) and displays (i.e. fuel). Clearly if you do not understand a warning light or can not find a control, because you do not recognize it's symbol, this could result in a dangerous situation. Since you will be driving the cars of the future, your opinion of these symbols is important.

On the following pages you will be asked to rank the symbols shown by numbering them in the order of their meaningfulness to you. Label the most meaningful with the number 1, and the second most meaningful with the number 2 (etc.) until all possible choices have been ranked.



**BIOGRAPHICAL DATA SHEET  
SYMBOL RATING TASK**

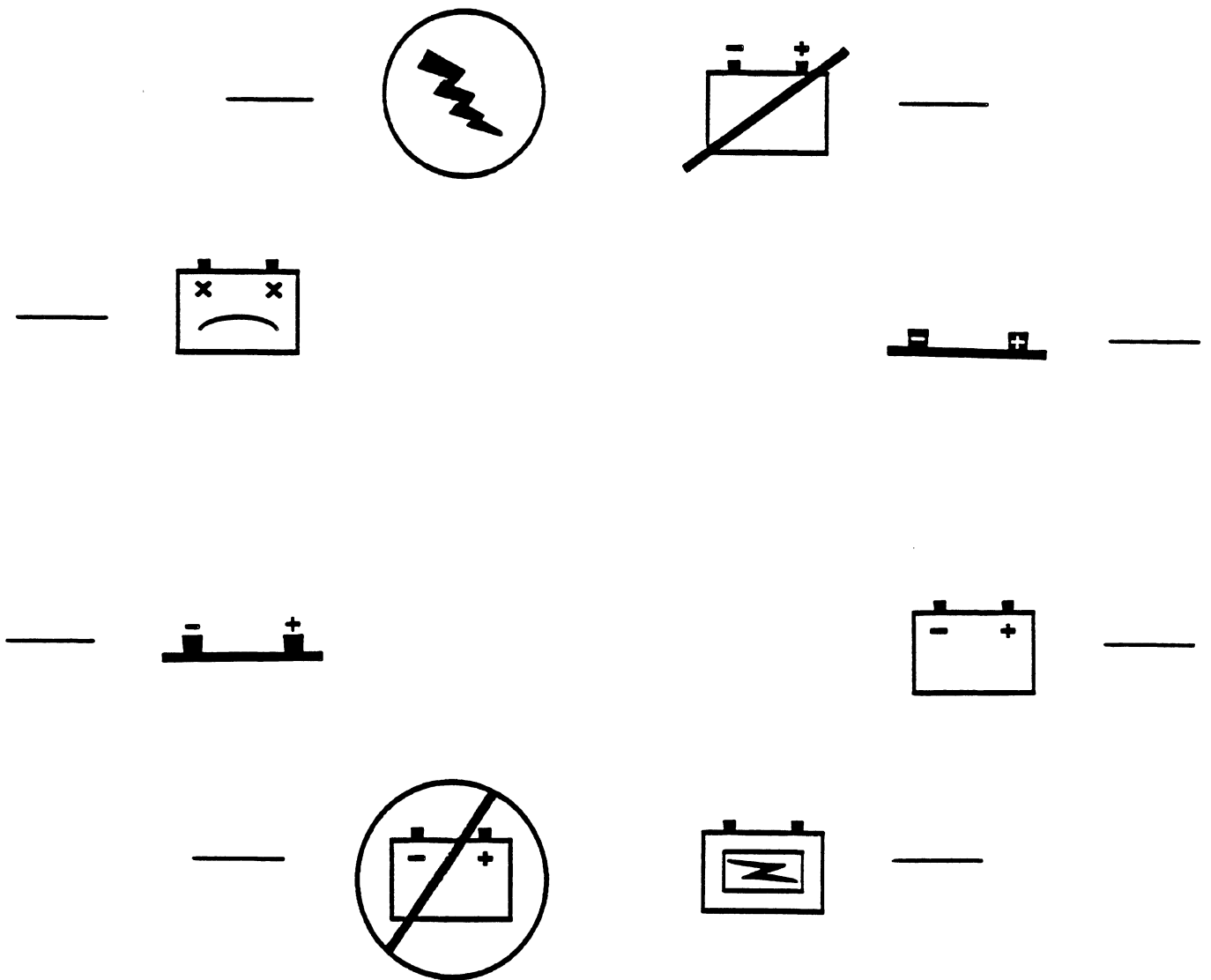
1. Name: \_\_\_\_\_
2. Sex:    male            female    (circle one)
3. Age: \_\_\_\_\_
4. In what country were you born? (USA, Can., etc.) \_\_\_\_\_
5. Current citizenship? (USA, Canada, etc.) \_\_\_\_\_
6. How long have you lived in the U.S.A.? \_\_\_\_\_
7. What is your native language? (English, Spanish, etc.) \_\_\_\_\_
8. What is your occupation? (student, engineer, etc.)  
\_\_\_\_\_
9. Are you a licensed driver?    Yes    No    (circle one)  
    If yes, for how long? \_\_\_\_\_
10. What type of car do you drive most often?  
    Make:(Ford, Dodge, etc.) \_\_\_\_\_  
    Model:(Escort, Omni, etc.) \_\_\_\_\_  
    Year: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
This portion will be filled out by the experimenter.

Date & Time \_\_\_\_\_ Subject # \_\_\_\_\_

**BATTERY CHARGING CONDITION**

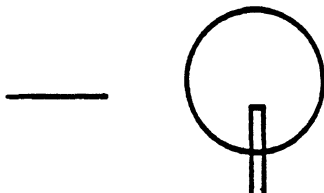
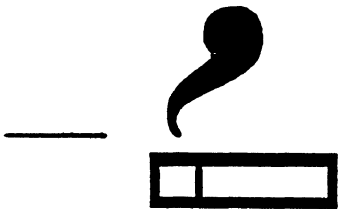
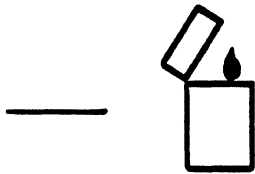
Suppose that there is a malfunctioning of your car's electrical system . The symbols shown below might be used to label the battery charging condition display. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you.





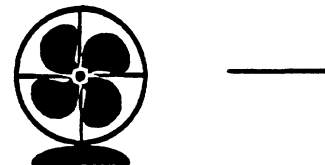
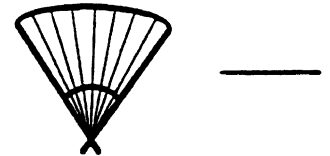
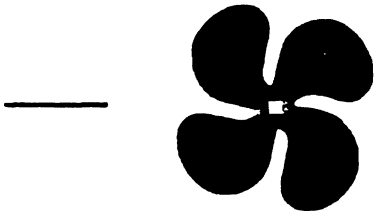
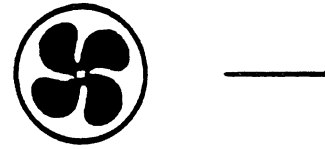
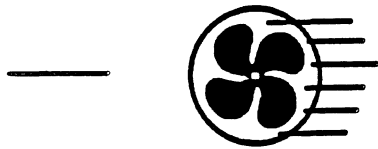
**CIGARETTE LIGHTER**

The symbols shown below might be used to label the cigarette lighter. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you.



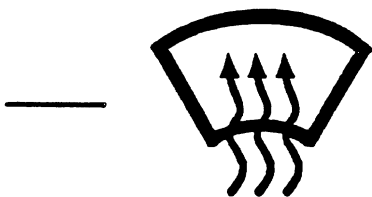
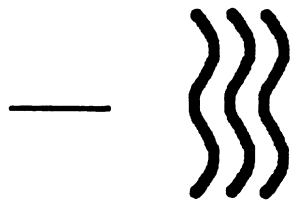
**FAN**

Suppose you would like to blow warm air from your car's heater inside your car. The symbols shown below might be used to label the fan control. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you.



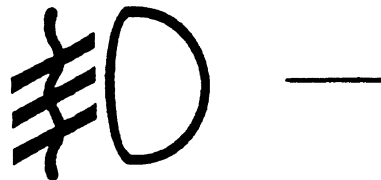
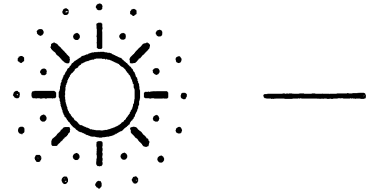
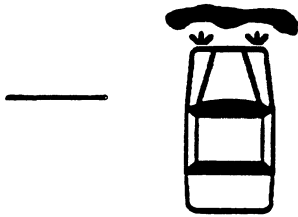
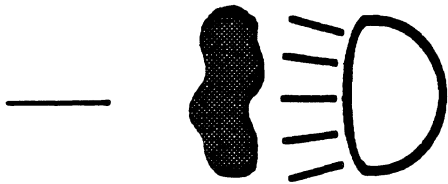
**FRONT WINDSHIELD DEFROST**

Suppose that your front windshield has frost on it one cold morning. The symbols shown below might be used to label the front windshield defrost control. Rank these symbols from 1 (best) to 9 (worst) in the order of their meaningfulness to you.



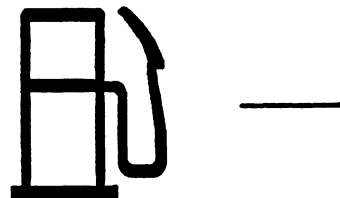
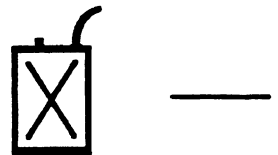
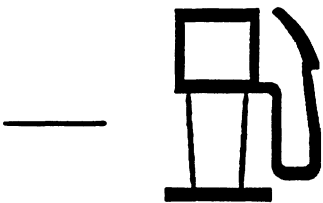
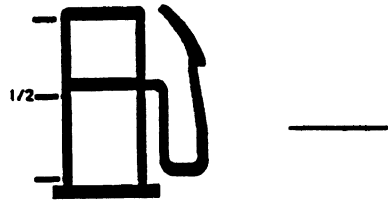
**FRONT FOG LIGHTS**

As you are driving, you drive into an area covered with dense fog and can hardly see the road. The symbols below might be used to label the front fog lights control. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you. You may not have seen front fog lights before, but they are currently available on some european cars.



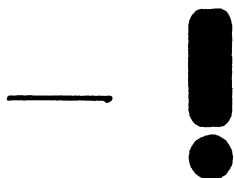
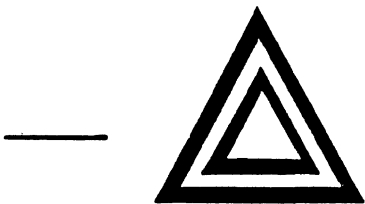
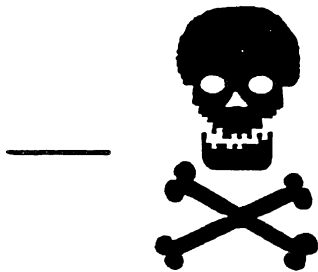
**FUEL**

As you are driving, you look at your fuel gauge and notice that you need fuel. The symbols below might be used to label the fuel display. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you.



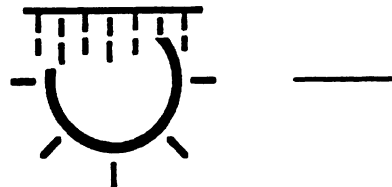
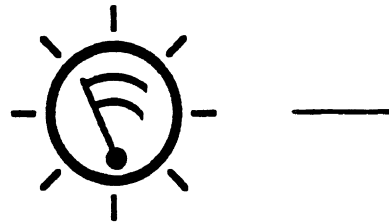
**HAZARD WARNING**

Suppose yor car is broken down on the side of the road, and you need to turn on the hazard warning lights (flashers). The symbols shown below might be used to label the hazard warning lights control. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you.



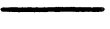
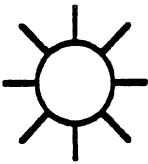
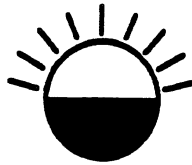
**HEADLAMP CLEANER**

Suppose your headlights have become partially covered with dirt and mud. The symbols shown below might be used to label the headlamp cleaner. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you. You may not have seen headlamp cleaners before, but they are available on some european cars.



**HIGH BEAM HEADLIGHTS**

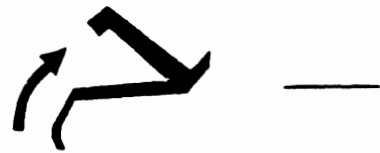
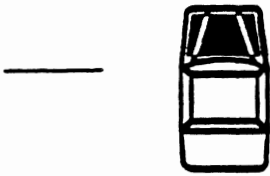
Suppose you are driving down a dark country road late at night and want to turn on your car's high beam headlights. The symbols shown below might be used to label the high beam headlight control. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you.





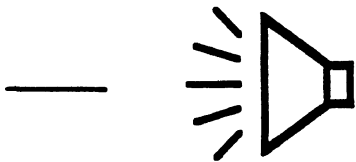
**HOOD RELEASE**

Suppose you want to raise the hood of the car from inside of the car. The symbols shown below might be used to label the hood release control. Rank these symbols from 1 (best) to 4 (worst) in the order of their meaningfulness to you.



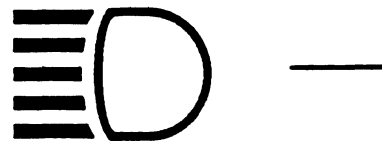
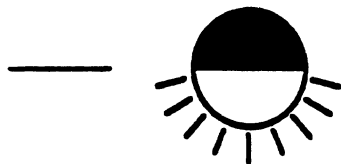
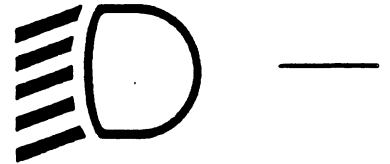
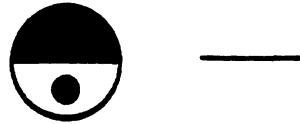
**HORN**

Suppose you are stopped at a red traffic light and the light has just turned green. The car in front of you does not move, so you want to honk your horn. The symbols shown below might be used to label the horn control. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you.



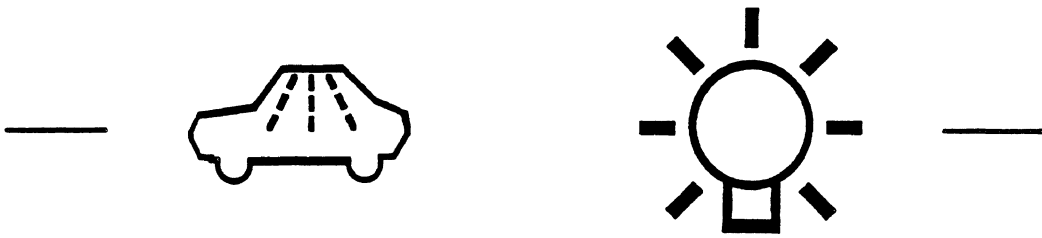
**LOW BEAM HEADLIGHTS**

As you are driving, you want to turn on your car's low beam headlights (normal driving lights). The symbols shown below might be used to label the low beam headlight control. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you.



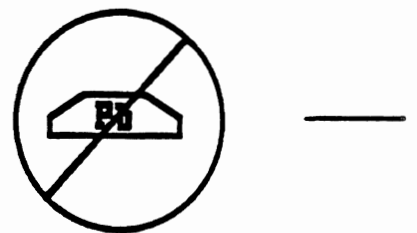
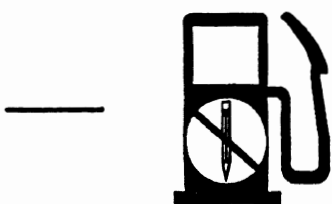
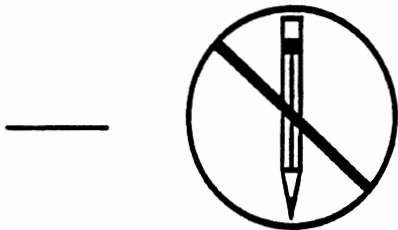
**MASTER LIGHTING SWITCH**

Suppose that all of the controls for your car's headlights and instrument lights were located on one switch with various different positions. The symbols shown below might be used to label the master lighting switch. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you.



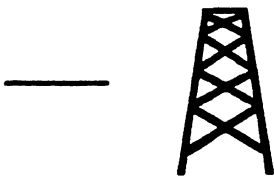
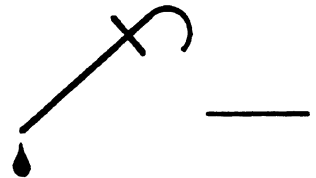
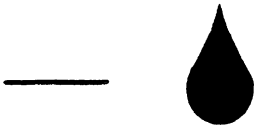
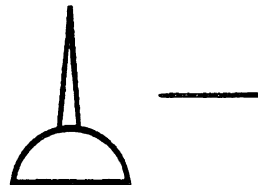
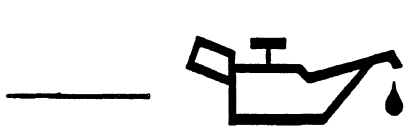
**UNLEADED FUEL ONLY**

As you are about to fill your car's fuel tank, you find it will only take unleaded fuel. The symbols below might be used to label the unleaded fuel only display. Rank these symbols from 1 (best) to 5 (worst) in the order of their meaningfulness to you.



OIL

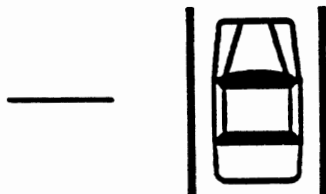
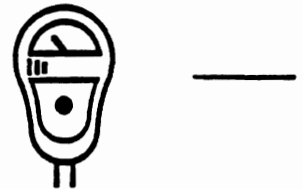
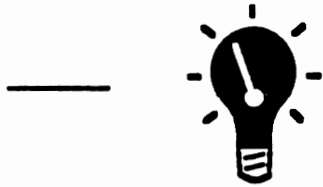
Suppose that when you are driving the oil light on your dash comes on. The symbols below might be used to label the oil display. Rank these symbols from 1 (best) to 7 (worst) in the order of their meaningfulness to you.



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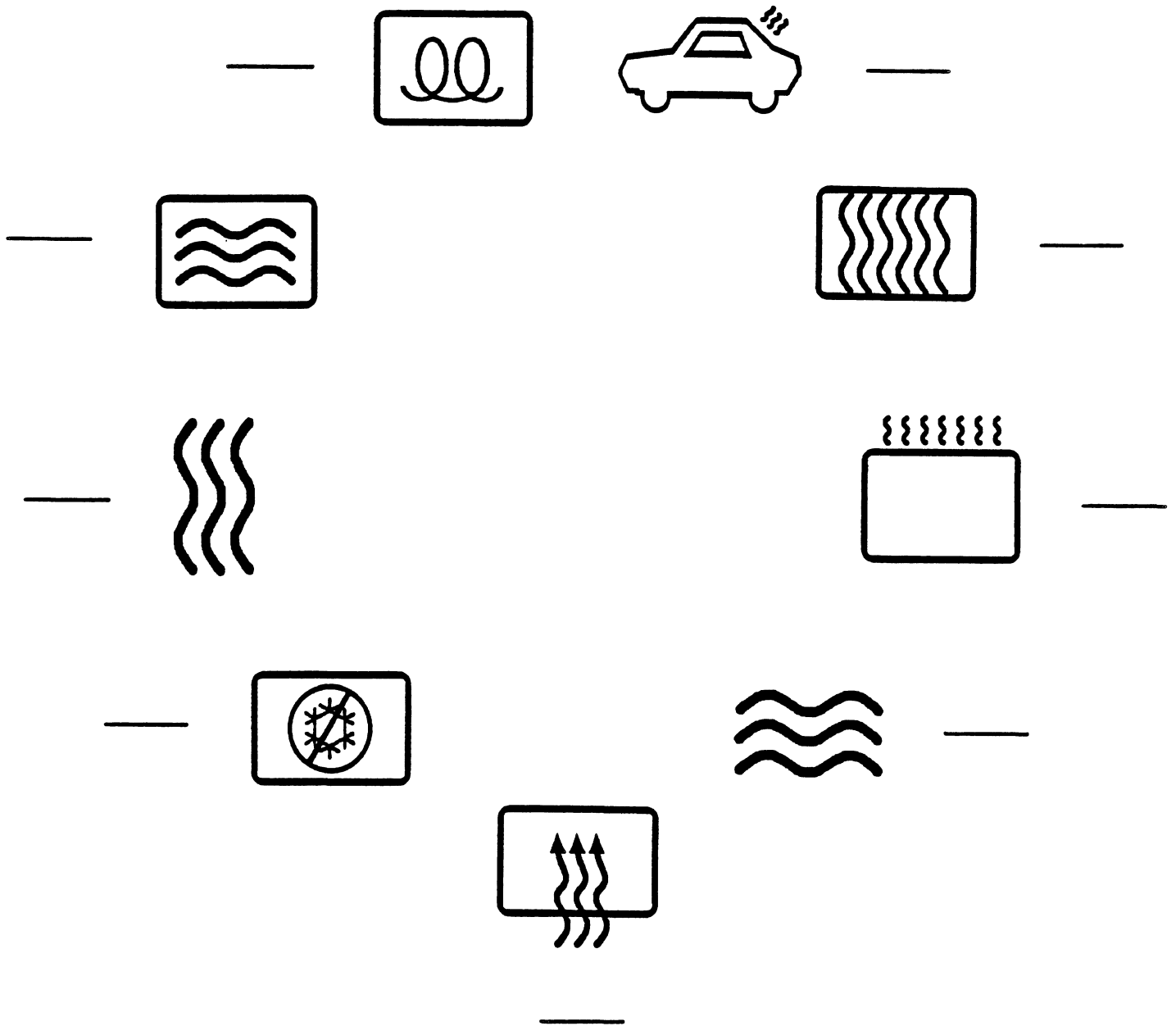
**PARKING LIGHTS**

Suppose you want to turn on your parking lights. The symbols shown below might be used to label the parking light control. Rank these symbols from 1 (best) to 6 (worst) in the order of their meaningfulness to you.



**REAR DEFROST**

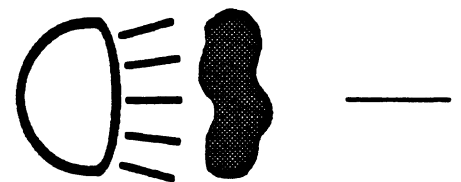
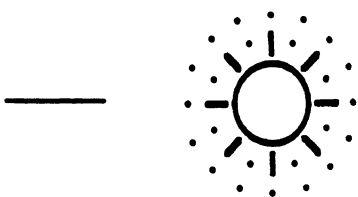
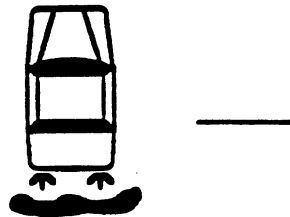
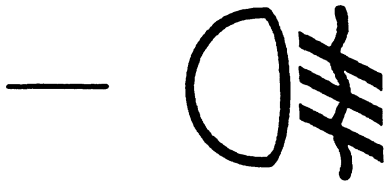
Suppose it's a cold morning and there is a build-up of frost on the rear windshield. The symbols shown below might be used to label the rear defrost control. Rank these symbols from 1 (best) to 9 (worst) in the order of their meaningfulness to you.





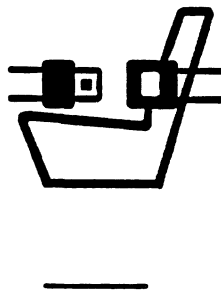
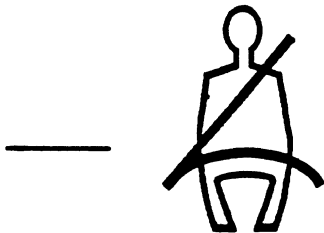
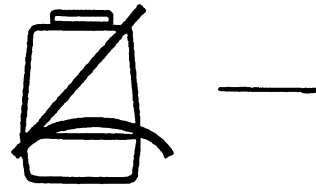
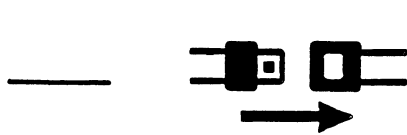
**REAR FOG LIGHTS**

Imagine you are driving on the highway in a dense fog and want to turn on your rear fog lights to avoid being struck from behind. The symbols shown below might be used to label the rear fog light control. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you. You may not have seen rear fog lights before, but they are currently available on some european cars.



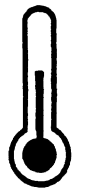
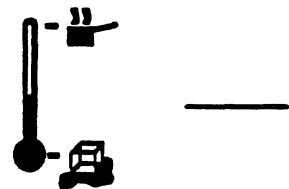
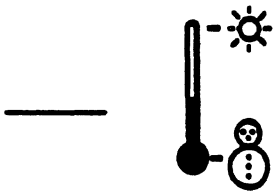
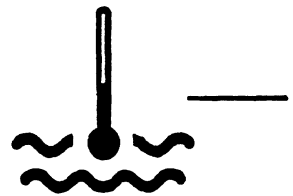
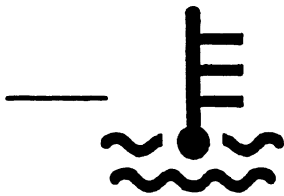
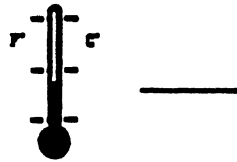
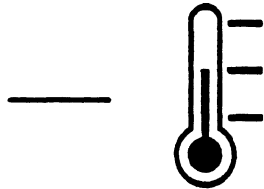
**SEATBELT**

As you turn on the ignition of your car, you notice the seatbelt symbol lit on the car's dashboard. The symbols below might be used to label the seatbelt display. Rank these symbols from 1 (best) to 5 (worst) in the order of their meaningfulness to you.



**TEMPERATURE**

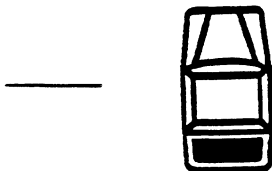
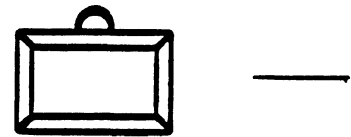
As you are driving, you glance at the temperature gauge to see if your car's engine is overheating. The symbols below might be used to label the temperature display. Rank these symbols from 1 (best) to 7 (worst) in the order of their meaningfulness to you.



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TRUNK

Suppose you want to open your car trunk from inside of the car. The symbols below might be used to label the trunk release control. Rank these symbols from 1 (best) to 4 (worst) in the order of their meaningfulness to you.



**TURN SIGNALS**

Suppose your car is approaching a corner at which you would like to turn (left or right). The symbols shown below might be used to label the turn signal control. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you.



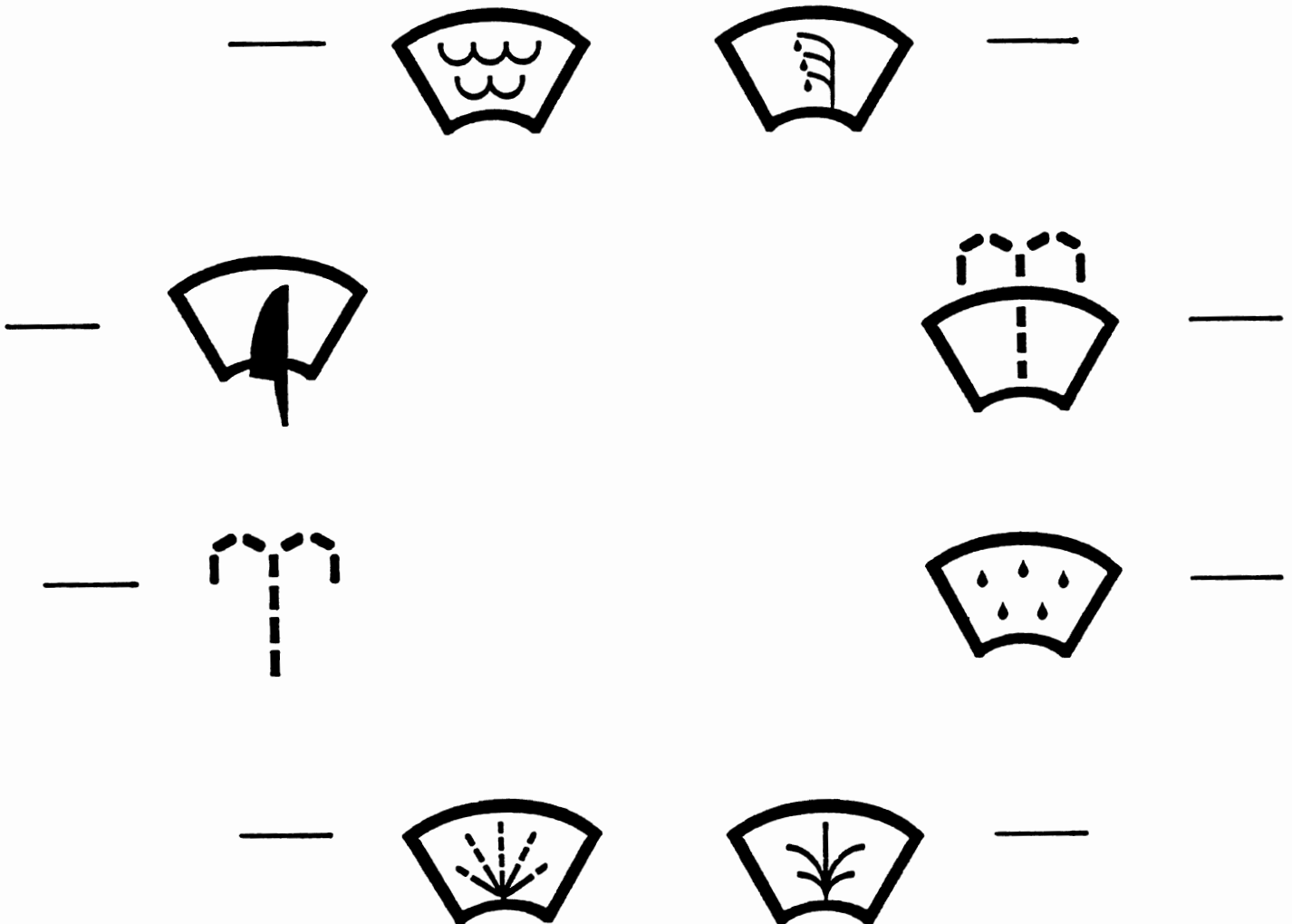
WINDSHIELD WIPER

As you are driving, it begins to rain. The symbols shown below might be used to label the windshield wiper control. Rank these symbols from 1 (best) to 5 (worst) in the order of their meaningfulness to you.



**WINDSHIELD WASHER**

Suppose that you are driving in a light rain and your windshield is becoming smeared with dirt and oil from the road. The symbols shown below might be used to label the windshield washer control. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you.



WINDSHIELD WASHER/WIPER

Suppose you are driving on a dusty road and want to clean the windshield of your car. The symbols shown below might be used to label the windshield washer/wiper control. Rank these symbols from 1 (best) to 8 (worst) in the order of their meaningfulness to you.

