

# ROBOT-I<sup>TM</sup>

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HEURISTICS  
ROBOT I FOR APPLE II

INSTALLATION AND OPERATING MANUAL

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Heuristics, Inc.

Please read this manual before attempting to install the ROBOT I interface card into the Apple II. Incorrect installation can cause damage to both the ROBOT I interface card and the Apple II.

Revision 0 -- 8/78

GETTING STARTED WITH  
HEURISTICS ROBOT I

1. NEVER remove or insert the ROBOT I interface card into an Apple II with the power ON.
2. Read the entire manual before installing the interface card.

HEURISTICS ROBOT I  
FOR APPLE II

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## 1.0 INTRODUCTION

ROBOT I is an exciting new peripheral for the Apple II computer. The compact interface card provides a complete electronic link between the Apple II and a sophisticated radio controlled automobile. From BASIC or the monitor the user can easily control ROBOT I. Simple commands start or stop the robot, turn the wheels left, right, or straight, and move it in the forward or reverse direction. Using these commands ROBOT I can be programmed to run unlimited complex patterns.

Together with Heuristics' Speechlab Model 20A, the robot can be simply programmed to respond to voice commands.

## 2.0 INSTALLING THE INTERFACE CARD

To install the ROBOT I interface card, proceed as follows:

- o Turn the Apple II off.

NOTE: Power should always be OFF when inserting or removing a card. If the power is on, removal or insertion of a card can cause permanent damage to both the card and the Apple II.

- o Insert the 7-pin flat cable connector into the mating connector on the interface card.

- o Take off the lid and look at the row of eight connectors at the rear. Each connector is numbered (0-7) from left to right (front view) just in back of the connector. The numbered connectors are called slots.

- o Plug the interface card into any slot except slot #0.

NOTE: We recommend that you plug the card into slot #1 because the demonstration programs provided assume slot #1.

When you sit at the keyboard, the component side of the ROBOT I interface card will be to your right when you insert it.

- o Direct the cable through a convenient cable opening in the back of the Apple II.
- o Replace the cover on the Apple II.

### 3.0 TESTING ROBOT I TRANSMITTER AND RECEIVER

- o Turn the Apple II OFF.
  - o Place 4 fresh alkaline C (or rechargeable Ni-Cd) cells in the car body.
  - o Place a fresh 9 volt alkaline cell in the transmitter.  
NOTE: The most common reason for the robot failing to run is low batteries.
  - o Carefully screw the antenna to the transmitter.
  - o Turn the transmitter switch ON.
  - o Turn the switch on the bottom of the car body ON.
  - o Turn the steering wheel on the transmitter. The wheels on the car should move.
  - o Move the car forward by pushing the right-hand button on the transmitter.
  - o Move the car backward by pushing the left-hand button on the transmitter.
- NOTE: The car may be run independently of the computer at any time by turning the Apple II power OFF and disconnecting the connector from the interface card.
- o Turn the transmitter switch OFF.

- o Turn the switch on the bottom of the body of the car OFF.

This completes the test of the transmitter and receiver.



#### 4.0 RUNNING ROBOT I UNDER COMPUTER CONTROL

- o Do not proceed unless Section 2.0 and 3.0 have been completed.

- o Turn the Apple II ON.

NOTE: Whenever the Apple II is turned on the transmitter switch and the switch on the body of the car should be OFF.

- o Push the reset button on the Apple II.

NOTE: Reset must always be pushed before turning the transmitter and receiver switches ON. (This assures that the computer will not mistakenly tell the car to run.)

- o Turn transmitter ON.

- o Turn the receiver switch on the car ON.

- o Place the car in the center of an open area.

- o Enter BASIC by typing control B, RETURN.

- o LOAD the demonstration programs on the provided cassette.

- o Select a demonstration program and run it.

## 5.0 WRITING ROBOT I CONTROL PROGRAMS

- o ROBOT I is controlled by storing a single control byte at location  $\$C080+\$N0$  (where N is the slot number).

EXAMPLE: ROBOT I is in slot #4. The control byte is at  $\$C0C0$  ( $\$C080+\$40$ ).

- o From BASIC the control byte is updated by typing:

```
POKE(-16256+N*16),DATA
```

where N is the slot number, and DATA is the control byte.

- o The control byte is formatted as follows:

```
(B7....B1,B0)
```

```
XXXXLRFB
```

```
(MSB) (LSB)
```

### BIT MEANING

### ACTION

X	Don't care bit	
L	1 = turn wheels left relay ON	Turn wheels left
	0 = turn wheels left relay OFF	Do not turn wheels left*
R	1 = turn wheels right relay ON	Turn wheels right
	0 = turn wheels right relay OFF	Do not turn wheels right*
F	1 = turn forward motion relay ON	Car runs forward <u>continuously</u>
	0 = turn forward motion relay OFF	Car stops
B	1 = turn backward motion relay ON	Car runs backward <u>continuously</u>
	0 = turn backware motion relay OFF	Car stops

\*When a "left" or "right" command is reset to 0 (off), the wheels will automatically straighten.

WARNING:

Attempting to make ROBOT I turn both left and right, or go both forward and backwards at the same time (codes \$C or \$3) will cause unpredictable results and may damage the car.

- o From BASIC to make ROBOT I (interface in slot #4) turn the wheels left, type:

SLOT=4

POKE(-16256+SLOT\*16),8

<u>NOTE:</u>	<u>EFFECT</u>	<u>DATA</u>
	LEFT	8
	RIGHT	4
	FORWARD	2
	BACKWARD	1
	STOP	0
	FORWARD LEFT CIRCLE	10 (8+2)
	REVERSE RIGHT CIRCLE	5 (4+1)

- o The robot will stay in its last state until changed.

NOTE: Programming is much easier if the robot is moved in short segments. For example, to program "Move forward 1 ft." in BASIC:

POKE(-16256+SLOT\*16),2           Straight,forward

FOR I = 1, DELAY                Delay

NEXT I

POKE(-16256+SLOT\*16),0        Stop

## 6.0 SPEECH CONTROL OF ROBOT I

ROBOT I has been designed so that it can be used with Heuristics Model 20A Speechlab which permits you to give verbal commands to ROBOT I.

Programming Speechlab is simple from BASIC. Following the usual Apple II peripheral conventions, Speechlab is selected either for input (recognition) or for output (passing parameters to Speechlab), via the IN# and PR# commands. Speechlab is used in two modes; training and recognition.

To train Speechlab on a word like "LEFT", simply select the board with a PR# command and then print the string left to it. For example, with Speechlab in slot #3 the following BASIC program

```
200 PR#3
210 PRINT "LEFT"
```

will cause Speechlab to listen for a word and associate it with the string "LEFT".

After Speechlab has been trained on the desired vocabulary, for instance, Left, Right, Forward, Backward, Straight, it is ready to recognize spoken words. The following program will recognize a spoken word and return the string assigned during training:

```
400 IN#3
410 INPUT W$
```

If W\$="LEFT" the robot can be moved left. In this way you can control ROBOT I by voice commands.

By putting together such sequences ROBOT I can be programmed to move in complex sequences. Appendix B is a listing of the supplied demonstration programs which give some examples of using ROBOT I.

MODEL R-1 ROBOT I

LIMITED WARRANTY

HEURISTICS, INC., in recognition of its responsibility to provide quality components and adequate instruction for their proper assembly, warrants its products as follows:

All components sold by HEURISTICS, INC., are purchased through normal factory distribution and any part which fails because of defects in workmanship or material will be replaced at no charge for a period of one year for assembled modules, following date of purchase. The defective part must be returned postpaid to HEURISTICS, INC., within the warranty period, together with proof of purchase date.

Any modules manufactured by and purchased from HEURISTICS, INC., as assembled units are guaranteed to meet specifications in effect at the time of manufacture for a period of at least one year following purchase. These modules are additionally guaranteed against defects in materials or workmanship for the same one year period. All in-warranty factory assembled units returned to HEURISTICS, INC., postpaid with proof of purchase date will be repaired and returned without charge. Out-of-warranty units will be repaired and returned COD at prevailing repair charges then in effect.

Equipment not manufactured by HEURISTICS, INC., but supplied by HEURISTICS, INC., as part of a system or subsystem, will be warranted according to the terms of the manufacturer by HEURISTICS, INC. Equipment may be returned postpaid to HEURISTICS, INC., with proof of purchase date, for repair and return. All returned in-warranty units will be repaired and returned without charge. Out-of-warranty units will be repaired and returned COD at prevailing repair charges then in effect.

This warranty is made in lieu of all other warranties expressed or implied and is limited in any case to the repair or replacement of the module involved.

September 30, 1978

Appendix "A"

LIMITED WARRANTY REGISTRATION CARD

Name \_\_\_\_\_

Street Address \_\_\_\_\_

City, State, Zip \_\_\_\_\_

Date Purchased \_\_\_\_\_

Purchased From \_\_\_\_\_

Where did you hear of Heuristics?

Magazine (which) \_\_\_\_\_

Word of Mouth \_\_\_\_\_

Store Display \_\_\_\_\_

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Note: When registration card is completed, place in envelope and mail to Heuristics, Inc., 900 N. San Antonio Road, Los Altos, CA 94022.

LISTING OF ROBOT I  
DEMONSTRATION PROGRAMS.

Appendix "B"



LOAD

>LIST

```
1 CALL -936: TAB 2: PRINT "H E U R I S T I C S   S P E E C H L A B": PRINT
: TAB 18: PRINT "D E M O S"
2 VTAB 11: PRINT "1 CONTROL MAP #1": PRINT : PRINT "2 CONTROL MAP #2"
: PRINT : PRINT "3 VOICE CONTROL"
3 VTAB 22: INPUT "WHICH WOULD YOU LIKE ",PN: IF PN=1 THEN 910: IF PN=
2 THEN 1410: IF PN=3 THEN 10: GOTO 3
10 POKE 74,124: POKE 204,124: POKE 75,21: POKE 205,21: GOTO 20: REM AUTO L
OMEM 5500
20 POKE -16238,0: CALL -936: PRINT
30 PRINT "TURN ON CAR AND CONTROLLER"
40 PR#3: PRINT : PR#0
50 DIM W$(10)
60 FOR I=1 TO 5
70 W$="LEFT"
80 GOSUB 250
90 W$="RIGHT"
100 GOSUB 250
110 W$="FORWARD"
120 GOSUB 250
130 W$="REVERSE"
140 GOSUB 250
150 W$="STRAIGHT"
160 GOSUB 250
170 NEXT I
180 IN#3: INPUT W$: IN#0: PR#0
190 IF W$="LEFT" THEN GOSUB 260
200 IF W$="RIGHT" THEN GOSUB 270
210 IF W$="STRAIGHT" THEN GOSUB 280
220 IF W$="REVERSE" THEN GOSUB 290
230 IF W$="FORWARD" THEN GOSUB 300
240 GOTO 180
250 PRINT "SAY",W$: PR#3: PRINT W$: PR#0: RETURN
260 CARD=4: GOSUB 310: RETURN
270 CARD=8: GOSUB 310: RETURN
280 CARD=0: GOSUB 310: RETURN
290 CARM=1: GOSUB 320: RETURN
300 CARM=2: GOSUB 320: RETURN
310 POKE -16238,CARD: RETURN
320 CAROUT=CARD+CARM
330 POKE -16238,CAROUT
340 FOR I=1 TO 600
350 NEXT I
360 POKE -16238,CARD: RETURN
370 POKE -16238,0
380 PRINT "TURN ON CAR AND CONTROLLER"
390 PR#3: PRINT : PR#0
400 DIM W$(10)
410 GOSUB 660
420 GOSUB 750
```

```

430 END
440 FOR I=1 TO 5
450 W$="LEFT"
460 GOSUB 630
470 W$="RIGHT"
480 GOSUB 630
490 W$="FORWARD"
500 GOSUB 630
510 W$="REVERSE"
520 GOSUB 630
530 W$="STRAIGHT"
540 GOSUB 630
550 NEXT I
560 IN#3: INPUT W$: IN#0: PR#0
570 IF W$="LEFT" THEN GOSUB 640
580 IF W$="RIGHT" THEN GOSUB 650
590 IF W$="STRAIGHT" THEN GOSUB 660
600 IF W$="FORWARD" THEN GOSUB 670
610 IF W$="REVERSE" THEN GOSUB 680
620 GOTO 560
630 PRINT "SAY",W$: PR#3: PRINT W$: PR#0: RETURN
640 CARD=4: GOSUB 690: RETURN
650 CARD=8: GOSUB 690: RETURN
660 CARD=0: GOSUB 690: RETURN
670 CARM=1: GOSUB 700: RETURN
680 CARM=2: GOSUB 700: RETURN
690 POKE -16238,CARD: RETURN
700 CAROUT=CARD+CARM
710 POKE -16238,CAROUT
720 FOR I=1 TO TIM
730 NEXT I
740 POKE -16238,CARD: RETURN
750 GOSUB 810
760 FOR I=1 TO 300: NEXT I
770 GOSUB 840
780 GOSUB 840
790 GOSUB 810
800 RETURN
810 GOSUB 640
820 TIM=1700: GOSUB 670
830 RETURN
840 GOSUB 650:
850 TIM=2400: GOSUB 670
860 RETURN
870 POKE -16238,0
880 END
890 GOSUB 660
900 END
910 POKE -16238,0: CALL -936: PRINT
920 PRINT "TURN ON CAR AND CONTROLLER"
930 PR#3: PRINT : PR#0
940 DIM W$(10)

```

```

950 GOSUB 1280
960 END
970 FOR I=1 TO 5
980 W$="LEFT"
990 GOSUB 1160
1000 W$="RIGHT"
1010 GOSUB 1160
1020 W$="FORWARD"
1030 GOSUB 1160
1040 W$="REVERSE"
1050 GOSUB 1160
1060 W$="STRAIGHT"
1070 GOSUB 1160
1080 NEXT I
1090 IN#3: INPUT W$: IN#0: PR#0
1100 IF W$="LEFT" THEN GOSUB 1170
1110 IF W$="RIGHT" THEN GOSUB 1180
1120 IF W$="STRAIGHT" THEN GOSUB 1190
1130 IF W$="FORWARD" THEN GOSUB 1200
1140 IF W$="REVERSE" THEN GOSUB D1210
1150 GOTO 1090
1160 PRINT "SAY",W$: PR#3: PRINT W$: PR#0: RETURN
1170 CARD=4: GOSUB 1220: RETURN
1180 CARD=8: GOSUB 1220: RETURN
1190 CARD=0: GOSUB 1220: RETURN
1200 CARM=2: GOSUB 1230: RETURN
1210 CARM=1: GOSUB 1230: RETURN
1220 POKE -16238,CARD: RETURN
1230 CAROUT=CARD+CARM
1240 POKE -16238,CAROUT
1250 FOR I=1 TO TIM
1260 NEXT I
1270 POKE -16238,CARD: RETURN
1280 GOSUB 1310
1290 GOSUB 1340
1300 RETURN
1310 GOSUB 1170
1320 TIM=1600: GOSUB 1200
1330 RETURN
1340 GOSUB 1180:
1350 TIM=1800: GOSUB 1200
1360 RETURN
1370 POKE -16238,0
1380 END
1390 GOSUB 1190
1400 END
1410 POKE -16238,0: CALL -936
1420 PRINT "TURN ON CAR AND CONTROLLER"
1430 PR#3: PRINT : PR#0
1440 DIM W$(10)
1450 GOSUB 1700
1460 GOSUB 1790

```

```

1470 END
1480 FOR I=1 TO 5
1490 W$="LEFT"
1500 GOSUB 1670
1510 W$="RIGHT"
1520 GOSUB 1670
1530 W$="FORWARD"
1540 GOSUB 1670
1550 W$="REVERSE"
1560 GOSUB 1670
1570 W$="STRAIGHT"
1580 GOSUB 1670
1590 NEXT I
1600 IN#3: INPUT W$: IN#0: PR#0
1610 IF W$="LEFT" THEN GOSUB 1680
1620 IF W$="RIGHT" THEN GOSUB 1690
1630 IF W$="STRAIGHT" THEN GOSUB 1700
1640 IF W$="FORWARD" THEN GOSUB 1710
1650 IF W$="REVERSE" THEN GOSUB 1720
1660 GOTO 1600
1670 PRINT "SAY",W$: PR#3: PRINT W$: PR#0: RETURN
1680 CARD=4: GOSUB 1730: RETURN
1690 CARD=8: GOSUB 1730: RETURN
1700 CARD=0: GOSUB 1730: RETURN
1710 CARM=1: GOSUB 1740: RETURN
1720 CARM=2: GOSUB 1740: RETURN
1730 POKE -16238,CARD: RETURN
1740 CAROUT=CARD+CARM
1750 POKE -16238,CAROUT
1760 FOR I=1 TO TIM
1770 NEXT I
1780 POKE -16238,CARD: RETURN
1790 GOSUB 1850
1800 FOR I=1 TO 300: NEXT I
1810 GOSUB 1880
1820 GOSUB 1890
1830 GOSUB 1850
1840 RETURN
1850 GOSUB 1680
1860 TIM=1700: GOSUB 1710
1870 RETURN
1880 GOSUB 1690:
1890 TIM=2400: GOSUB 1710
1900 RETURN
1910 POKE -16238,0
1920 END
1930 GOSUB 1700
1940 END

```