

## INTRODUCTION

The GSK-1110 robot navigates its way around obstacles through the use of its photo sensors. The microprocessor directs evasive action by reversing and turning the robot until it finds its way around the obstacle blocking its path.

## ASSEMBLY INSTRUCTIONS

The PCB is divided into two boards, the AVR2 and the Sensor 3-1. Please follow the Diagram (Figure 2) below and the printed silkscreen on the PCB for component placement. Please follow the printed silkscreen on the PCB for component placement. It is best to add the lowest height components to the board first: the low resistant components first and then the higher. It is important to note the direction of polarity of the diodes, capacitors, and transistors. Please arrange them carefully according to polarity before mounting them on board. Care must be taken when bending any of the leads. Hold the leads in needle nose pliers when you bend the leads. Do not bend them against the case by pushing them over with your fingers as this can easily break the case. For the IDE port, press the pin of IDE port to be level with the black plastic before soldering. Use a 40 W solder and solder tin with a tin and lead ratio of 60/40 together with a joint solution inside. Recheck the assembled circuit for proper solder joints. The Body set is explained in more detail below with step-by-step instructions with pictures.

### Sensor Board

#### 0.125 W Resistors

R1	500 $\Omega$	-gr,blk,br,gd
R2, R5, R7	1 k $\Omega$	-br,blk,rd,gd
R4, R6	3 k $\Omega$	-or,blk,rd,gd

#### 0.25 W Resistors

R3	10 $\Omega$	-br,blk,blk,gd
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#### Transistors

TR1-TR3	=	C9013
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### Control Board

#### 0.25 W Resistors

R1, R2, R4	150 $\Omega$	-br,gr,br,gd
R3	50 $\Omega$	-gr,blk,blk,gd
R5, R14	1 k $\Omega$	-br,blk,rd,gd
R6- R13	500 $\Omega$	-gr,blk,br,gd

#### Transistors

TR1,TR2,TR5,TR8	=	C9012
TR3,TR4,TR6,TR7	=	C9013

#### Diode

D1	=	1N4007
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#### IC

IC1	=	ATTINY2313
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## CIRCUIT DESCRIPTION

The circuit is composed of 2 major parts, the sensor board and control board.

The Sensor board consists of a transmitter and a receiver circuit. The transmitter is composed of TR2 and LED (INF). Variable Resistor (VR3) functions as an infrared light level adjuster. At the receiver portion, the phototransistor receives infrared light from the LED (INF) and allows voltage to pass. The more light is reflected, the smaller the

internal resistance, which allows a larger voltage to pass through. Less light reflected means a greater resistance, which allows a smaller voltage across. TR1 and TR3 will be used when the phototransistor receives infrared light.

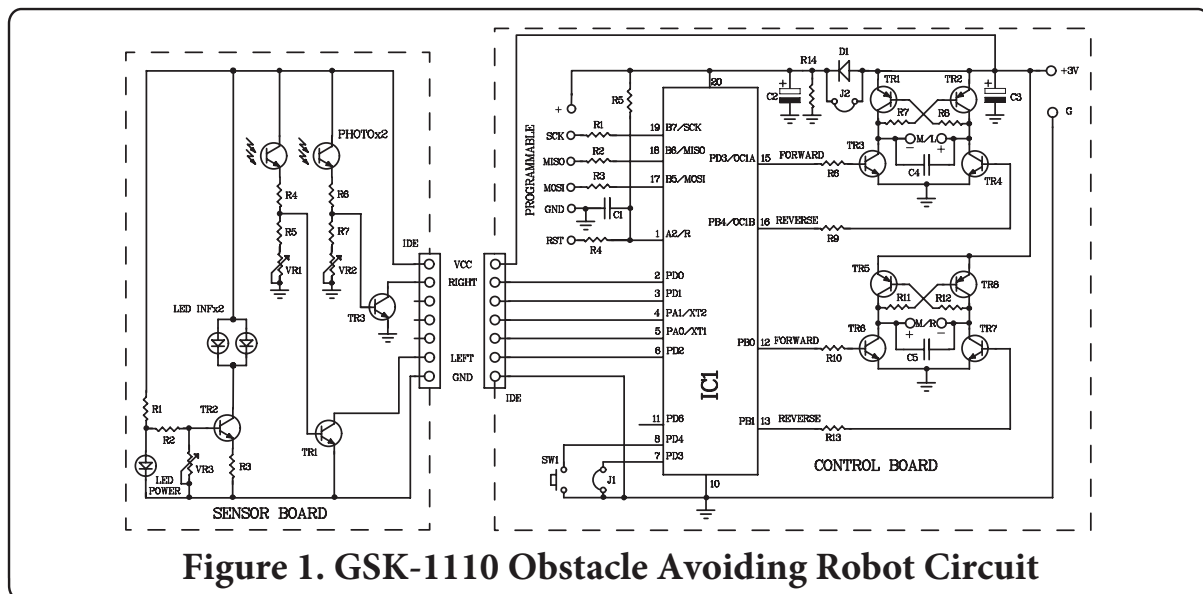
The control board contains the microcontroller IC1. When the photo-transistor is not receiving any infrared light, IC1 will send the voltage to pin 12 and pin 15 which drives both the motors forward. If light is received by the photo-transistor, the motor will run in reverse. The IDE port is used to connect the AVR to a programmer.

## TESTING

For testing purposes, put the jumper at J2 instead of J1. Insert two AA batteries into the battery holder. Adjust VR1, VR2, and VR3 to the middle position and slide the switch (SW) to the "ON" position. The LED on the sensor board should light up. Put the robot down and test the sensors by putting something in front of the robot. This should cause the robot to avoid this object and turn the other direction.

VR1 and VR2 can vary the sensitivity of the phototransistors. Adjust them counter clockwise for decreasing sensitivity and clockwise for increasing sensitivity

Note: If the jumper is placed at J1, it is using only the left and right sensors. If the jumper is not at J1, then all three sensors are being used (left, right, and center).



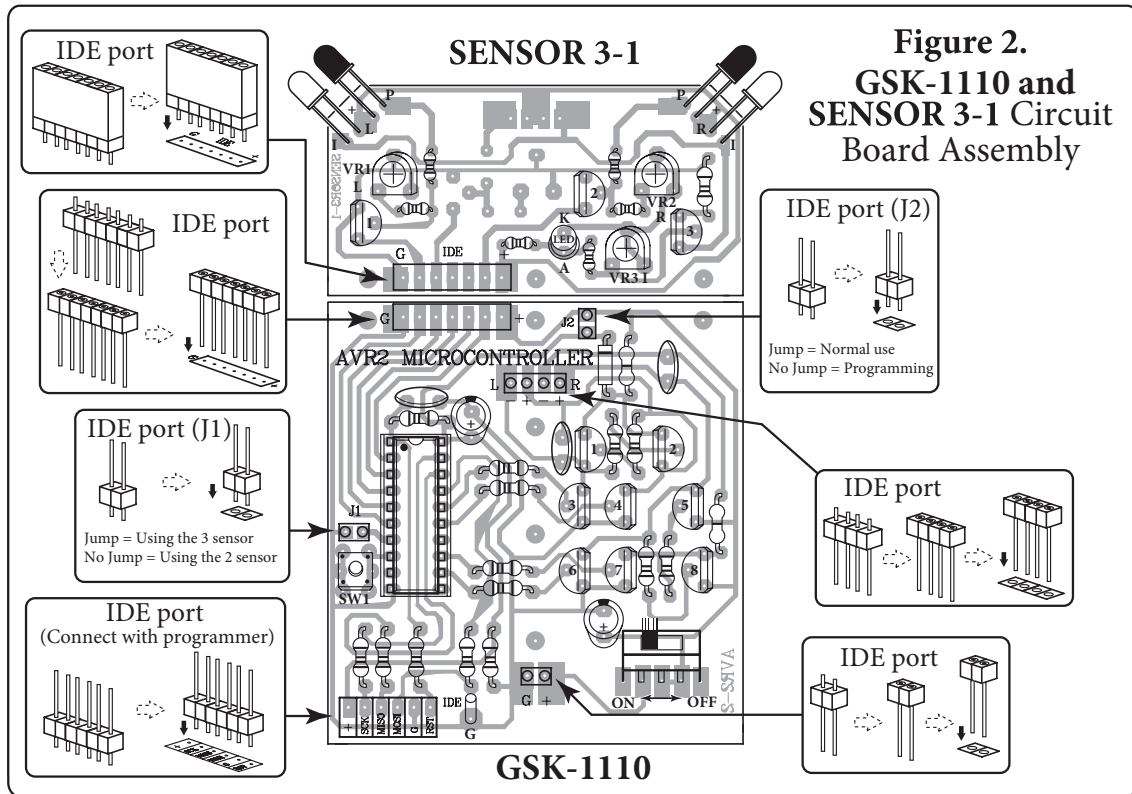
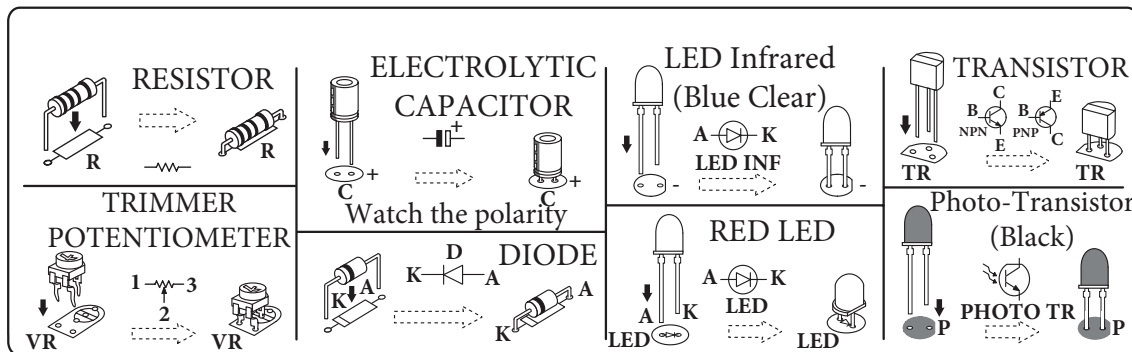

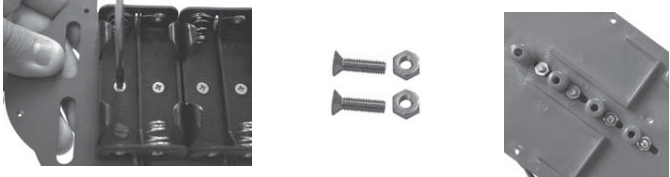

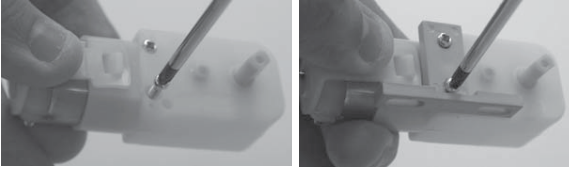
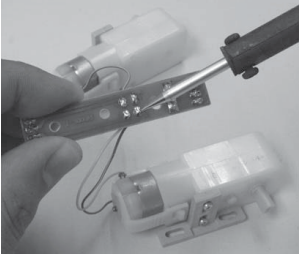
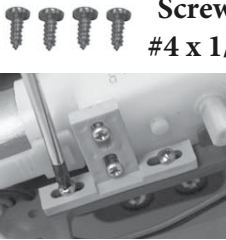
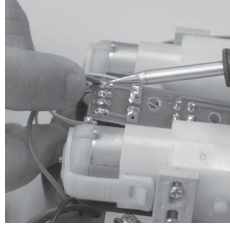


Figure 3. Installing the Components



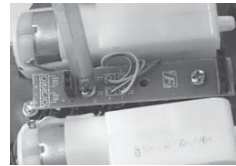
## ROBOT BODY Assembly Procedure

<b>①</b>	 <p style="text-align: center;"><b>Mini Caster</b></p>	<p>Fix a mini caster wheel set to the body set using a 12 mm bolt. The caster will be on the bottom (flat side).</p>
<b>②</b>		<p>Install battery holder to bottom of body (flat side) of robot with flat head bolt 2.5 x 10 and nut M2.5</p>
<b>③</b>		<p>Insert the electric wire battery holder into body of robot</p>
<b>④</b>		<p>Take off both screws on the motor and then mount the motor lock. Secure with the screws from the motor. (Be sure to note the left and right motors at this point - mount the motor in opposite orientations)</p>
<b>⑤</b>		<p>Solder motor wire to BR002-1 PCB. Red wire goes to positive pole and the black wire goes to negative. The "L" is the left motor gear and the "R" is the right.</p>
<b>⑥</b>		<p>Screws #4 x 1/4</p> <p>Mount motors, each with two #4 x 1/4 in. screws</p>



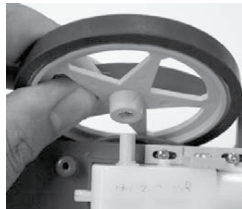
⑦

Solder the battery holder wire to BR002 PCB at B1 and B2. The red wire goes to positive and the black goes to negative poles.



#2 x 1/4

Solder the remaining IDE ports to the BR002 PCB and mount to robot body

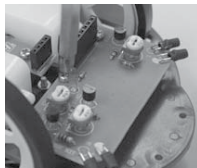


⑨

Install the wheels onto the shaft of the gear motors by securing them with the final two #4 x 1/4 in. screws



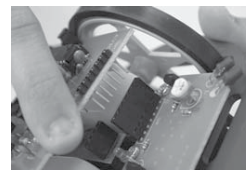
Screws  
#4 x 1/4



Screws  
#2 x 1/4

Mount the sensor board onto the robot body with three #2 x 1/4 in screws

⑩



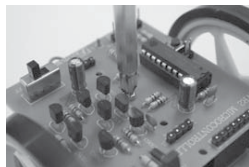
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Install the control board into the robot body, making sure to line up all IDE ports



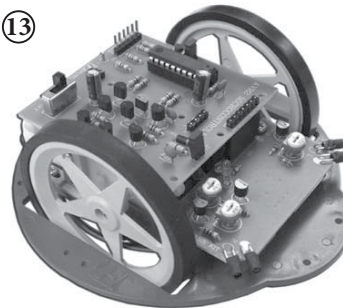
⑫

Screw  
#4 x 3/4



Secure the control board with one #4 x 3/4 in screw

⑬



The robot is now assembled and ready to use