

WING ATTACK PLAN 'R':
6.270 IR BEACON BOARD
ASSEMBLY AND USE INSTRUCTIONS

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Please read all directions carefully before proceeding. There are sections marked **CAUTION** which will help keep you from screwing up and making a fool out of yourself. If you are unsure about something please contact a staff member before making a time consuming mistake.

For basic information about how to solder consult the 6.270 course notes. Be careful with hot soldering irons and make sure they're cool before putting them away.

Step 1: Component Identification

If the parts for the beacon board are already kitted for you by the 6.270 staff, check off the parts against Table 1. Otherwise, obtain the necessary quantity of each of the parts in Table 1 and verify that you've done so correctly.

Table 1: Survival Kit Contents

check here	Qty	Part Type	Designator	Description
	1			Blank PCB
	1			IC Socket for U1
	1	100nF	C2	Blue. Nonpolar. 2 leads. Marked "104".
	3	1K	R1, R2, R3	Resistor. Brown-Black-Red-{Gold, Silver}
	1	330	R13	Resistor. Orange-Orange-Brown-{Gold, Silver}
	1	470K	R4	Resistor. Yellow-Violet-Yellow-{Gold, Silver}
	1	47uF	C1	Blue. Polarized. 2 leads. Marked "47u".
	1	4MHz Res	Y1	Orangish. 3 leads. Marked "4.0"
	11	56	R10-12, R14-16, R5-9	Resistor. Green-Blue-Black-{Gold, Silver}
	1	This Manual	MAN1	Miniature combination Russian phrase book and Bible.
	1	Input Header	J1	Connect to Handy Board or Skiff Board
	1	IRLD014	Q1	Power MOSFET. 4 leads, 2 joined together. STATIC SENSITIVE!
	11	IRLED	DS1-8, DS10-12	IR LED. Clear body. Polarized. Short lead is negative end (toward flat side marked on board)

Table 1: Survival Kit Contents

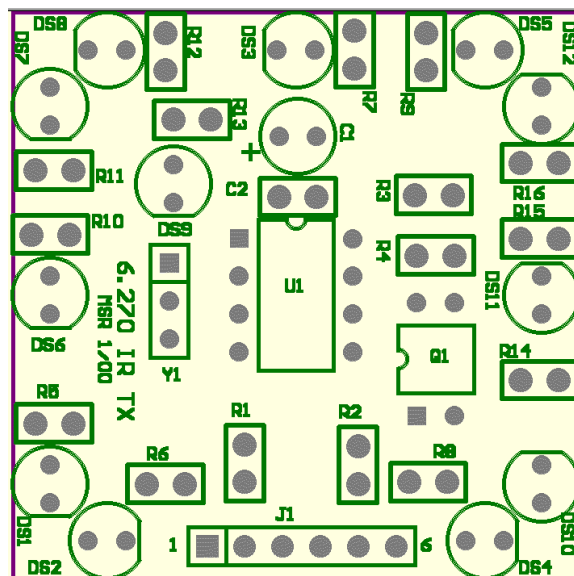
check here	Qty	Part Type	Designator	Description
	1	PIC12C509A	U1	8 pins. STATIC SENSITIVE!. Preprogrammed for your pleasure.
	1	VIS LED	DS9	Red LED. Red body. Polarized. Short lead is negative end (toward flat side marked on board)s

CAUTION: Please note that all the LEDs, C1, U1, and Q1 are POLARIZED. This means that they have a preferred orientation. If they are not installed in the proper orientation they may explode and detach themselves from the board for you while emitting some magic smoke from within. Additionally, U1 and Q1 are STATIC SENSITIVE and HEAT SENSITIVE. They are not horribly fragile but they must be treated carefully. Touch a large grounded metal object (such as the metal part of your lab bench or a metal water faucet) before working with these parts. When soldering them use caution not to overheat them. Only apply the soldering iron to the leads for 5 seconds or less. If for some reason it takes longer than that to solder each lead there is something wrong with either your soldering iron or your soldering technique. If at any time the body of the parts becomes too hot to touch comfortably, take a break and install some other part before returning to the hot one.

Step 2: Board Familiarization

There are two sides to the PCB. One side has a white silkscreened legend on it. This is the “component side” of the board. All components should be mounted on this side. The other side says “IHTFP”. This is the solder side of the board. No components are mounted on this side.

Each component’s holes are marked with a white outline and a part designator corresponding to the table above. For your reference here is a printout of the silkscreened legend in case it gets confusing somehow:

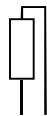


Step 3: Install IC Socket

U1, a PIC12C509 microcontroller, is ORIENTATION SENSITIVE and socketed in case we need to burn new firmware. This is unlikely. But if need be we can control your robot with this micro instead of an overly complicated UNIX machine :) The socket has a u-shaped notch in the middle of one end. This notch lines up with the notch in the drawing and goes “away from you” if you’re holding the board so that the words “6.270 IR TX” are on your left. Solder all 8 pins of the socket on the underside (the solder side) of the board. Do not get any solder in the socket holes on the top of the socket!

Step 4: Install Resistors

All the resistors in this kit are mounted vertically. They are not polarized- there is no positive or negative end to a resistor. To do this, take a resistor and bend one of its leads over and next to the body to make a narrow U shape with the body of the resistor in one leg. The resistor should look like this:



Roughly to scale. Leads should extend about 0.125" past the bottom of the resistor and should fit 0.1" spaced holes in PCB

Solder the resistors in place one by one. Use Table 1 and the white silkscreened markings on the PCB to guide you. Push the resistors all the way down until they touch the board. Make sure they are standing straight up, and are not touching any other components.

Step 4.1: Check Resistors

Be sure that you’ve installed all resistors into the proper holes and that they are all soldered neatly. Check each color code against the designator printed on the board and against Table 1 above. Cut off excess lead length that protrudes beyond the solder on the solder side.

Step 5: Install Capacitors

First place and solder C2, the 100nF or 0.1uF capacitor. It’s not polarized, so you can put it in either way. Then place and solder C1, the 47uF capacitor. It is POLARIZED. On the package one of the leads is marked with a minus sign and is short. The other lead is longer and is diametrically opposed to the minus sign. This lead is the positive lead and goes in the hole nearest the + sign on the board. Solder carefully.

Step 5.1: Check Capacitors

Be sure that you’ve installed both capacitors into the proper holes and that they are all soldered neatly. Cut off excess lead length.

Step 6: Install LEDs

LEDs are POLARIZED and HEAT SENSITIVE. There are two types of LEDs. The IR LEDs are clear. They must also be bent away from the board so their light shines in all directions. The visible LED (designator DS9) is red. DS9 is installed facing straight up, so the user can see it. All the LEDs are polarized. The short lead is the negative lead. This lead goes toward the flat side on the silkscreened legend outline. The long lead is the positive lead and it goes on the rounded side of the outline. Be sure to do this properly as it is difficult to tell if you’ve done it wrong once it’s all

over. Bend the LEDs gently over the side of the board so that they face out around each edge. Only then should you solder the LEDs in. Refer to the lurid picture at the end of this document if necessary.

Step 6.1: Check LEDs

Be sure that all LEDs are installed properly and that the leads are trimmed.

Step 7: Install the ceramic resonator

Install the ceramic resonator Y1. It is not orientation sensitive. Good engineers would put it in so the label can be read easily. You may or may not feel like a good engineer today. That's fine.

Step 8: Install the MOSFET

The MOSFET, Q1, is STATIC SENSITIVE and HEAT SENSITIVE and ORIENTATION SENSITIVE (polarized). It has 4 pins, two of which are joined together. If you're holding the board so that the words "6.270 IR TX" are on your left, the square hole of Q1 is on the lower left of the component outline. This hole and the one to its right receive the two joined-together-pins of Q1. Ground yourself as described earlier, insert Q1, and solder it in carefully. Then cut off the excess leads.

Step 8.1: Check MOSFET

I hope you can put parts in the right way by now. If not, please do not ever ask if I have any UROP positions available in my lab :) Be sure Q1 is soldered neatly and cut off any extra lead length.

Step 9: Install PIC

The PIC12C509 is STATIC SENSITIVE and HEAT SENSITIVE and ORIENTATION SENSITIVE. It has 8 pins. Pin 1 is indicated by a dot embossed into the plastic. It goes into the upper left hand corner of the IC socket, if the board is sitting there with "6.270 IR TX" on the left. Push it into the socket carefully, bending the leads slightly if necessary to make it fit. The white printed part number and the Microchip logo will then be facing left, toward the "6.270 IR TX". Perhaps this goes without saying, but DO NOT solder the PIC into its socket :)

Step 10: Make cable

Find a 4-wire stranded cable, like the ribbon wire you were given in your box. Separate off the four conductors into individual wires. Remove about 1/8" of insulation from each wire. Solder the wires into holes 1, 2, 3, and 5 on the circuit board. Holes 4 and 6 are not used as they are just duplicates. Cut off extra lead length. Then goop a small amount of hot glue all over the wire and circuit board at the attachment point. This will keep the wire from breaking off too easily.

Here is the pinout of the cable:

Table 2: Pinout of Connector

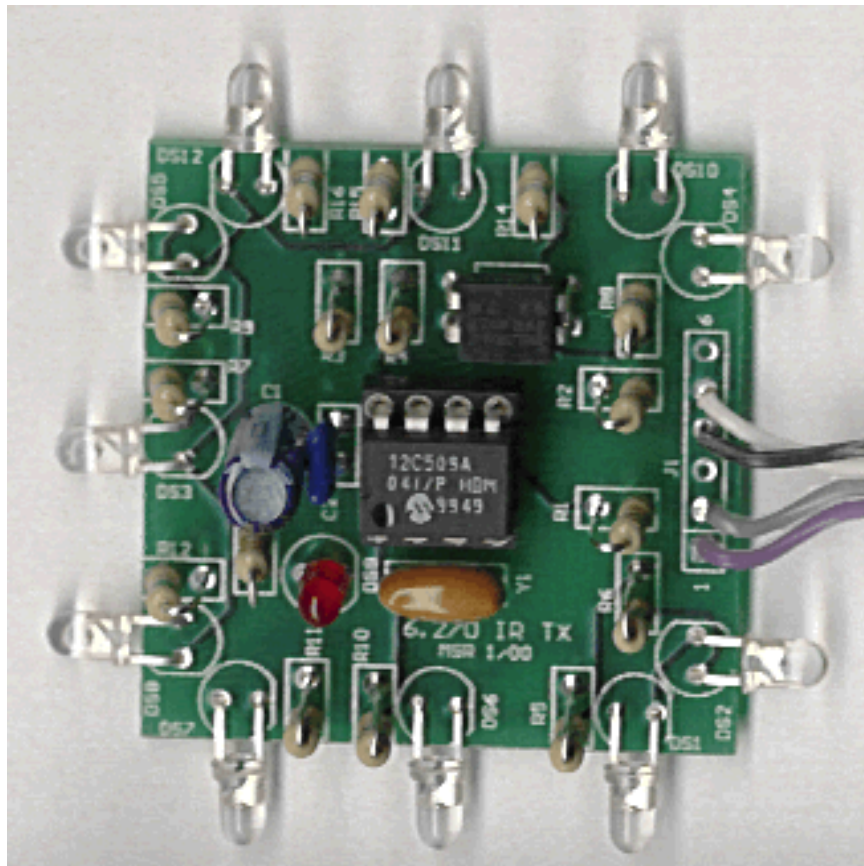
Pin Number	Description
1 (also 6)	+5VDC. This is the power source from the Skiff or Handy Board. Must supply between 4.5 and 6VDC at about 80mA.

Table 2: Pinout of Connector

Pin Number	Description
2	Frequency Select. If this pin is high (5V) the IR is modulated at 125Hz. If the pin is low (0V) the IR is modulated at 100Hz.
3 (also 4)	Ground. Ground to ground of Handy Board or Skiff.
5	LED Enable. If this pin is high (5V) the LEDs are on and the board draws about 80mA. If this pin is low (0V) the LEDs are off but the processor still runs and the board draws 5mA. There is an internal pull-up-resistor on this pin so it may be left unconnected.

Please see the 6.270 Staff or the bulletin board for up-to-the-minute instructions on how to connect these wires to your Skiff or Handy Board. I do not have either type of board so I can't fill in the details right now.

Lurid Photo 1: Picture of the Completed Board:



Ta-Ta For Now! -- Matt