robots, code, and the basic stamp microcontroller by humanoido

The Humanizer Penguin Robot!

Never before, in the history of Penguin robot, has anyone seen the elusive *Humanizer Penguin Robot*. Now introducing, a Penguin unlike anything you've seen before!

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It fits like a glove, wears like a hat, and works like a dream! It's the all new Humanizer: PIR Human Detector, for Penguin Robot. The Humanizer Penguin Robot will detect humans and their motions. It's made from one part – the PIR sensor from Parallax (part #555-28027). It's only about ten bucks for the part. Software for this project is free. Here's the most amazing thing about Humanizer. By pure coincidence of electronic labeling, design and manufacturing, the sensor plugs exactly into Penguin's expansion slot, AUX 5. There's no added wiring or circuits. This is the ultimate simplicity. Just plug in, code load, and go! The software is extensively documented to explain all the PIR details and how the code functions. Two working models were built, one is for Penguin Robot and the Basic Stamp 2px, and the other is for the Basic Stamp 2 found on the HomeWork board. For each, the code is identical, except for the stamp directives: {$STAMP BS2px} or {$STAMP BS2}. Be sure to use the correct stamp directive in the code. The posted program, available for free download, is created for Penguin Robot and its Basic Stamp 2px. To plug in the sensor, face the front of Penguin Robot, and insert the 3 PIR pins into the AUX5 connnector, noting that the PIR board has jumper pins on the left hand side. You will see the Penguin board marked with +, -, and S. This will match the PIR which is labeled as +, -, OUT. Note, the PIR will set on top of Penguin like a top hat and overhang above two IR emitters (see photos).

The PIR sensor (hat) is extremely simple to connect to Penguin Robot because it's plug in compatible with the AUX 5 expansion port. Connect the PIR sensor to Penguin Robot. Face the front of Penguin and locate the 3-pin connector (AUX 5). Plug in the PIR so that the PIR board jumper pins are on the left side. For reference, the AUX 5 connector, from left to right, is -, +, and signal. The Penguin main board is appropriately labeled. Note, when properly connected, the hat will be located towards the top of the two IR emitters. The code will function with or without the Debug screen. With the program loaded, the start up tune will play and a warm up delay will take place. Avoid all motion at this time. Each of the seconds warmup will have a tic sound. When human motion is detected, an audible alarm will sound and a short delay will take place as the detector will reset and loop. The reset time is a function of the sensor and not user selectable. The warmup time can be user set to another value through the reset key. The full software is available for download at the Toddler and Penguin Robot Tech Group and the Parallax Forum, at the following internet links:

http://tech.groups.yahoo.com/group/toddler_robot/ and http://forums.parallax.com/forums/

Facing Front of Penguin

```
'              '  '  '
'          '          '         '          <=== PIR Sensor
'        '              '        '          <=== Fresnel Lens
'      '                  '      '
'     '                    '     '
'      |----------------|                   
'      ====================          <=== Sensor Board
'      ||    |- + S|              <=== Jumper Pins on Left Side
'      ||    |*****|              <=== AUX 5 Expansion Connector
'    ( * ) |*****| ( * )          <=== 2 IR Emitters
'    (=)================(=)        <=== Penguin Board & 2 CdS Cells
```
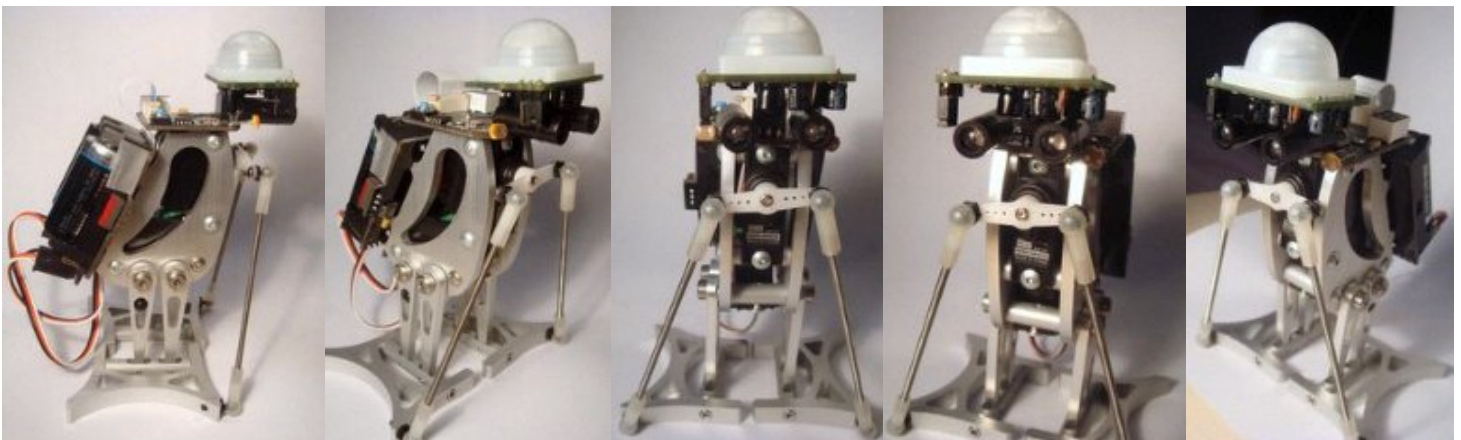
H U M A N I Z E R

Top Left - The Top Hat (Humanizer) uses a Parallax HomeWork board for the first prototype. Wiring is clearly visible and this photo can be used as an assembly guide. Top Right – the PIR detector is plugged into the top most four sockets on the breadboard's right side. ●

Penguin On LCD – Upgrade for Text

Connect a green screen Liquid Crystal Display to Penguin Robot. It's a great evening project. Text reporting capability is one of the most useful add-on functions.

Penguin Robot already has a display, a single digit blue LED segment display which can show numbers and graphics. What about text? Adding a serial, BPI-216 or similar, is easy. It plugs into port AUX5 with a simple connector. We'll show how and provide cool software to make interesting text and reporting capabilities!

By humanoido

Right, Penguin Robot with a new add-on LCD and typing software.
Right Below, angle brackets are used to attach the LCD.
Below, Penguin is displaying a text message using BS2px code.
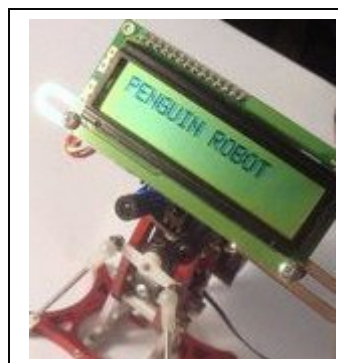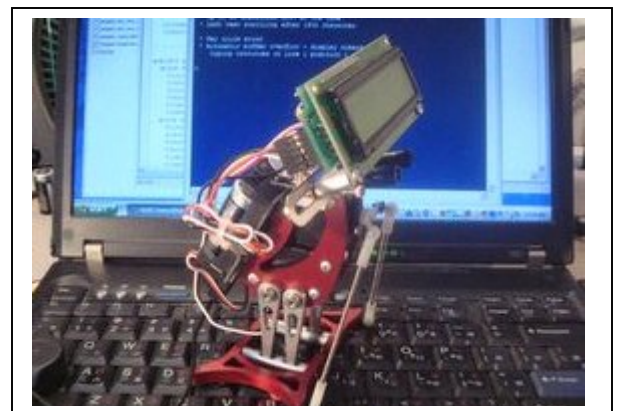
Penguin On LCD cont.

There are only 2 simple steps for electrical installation.

( ) *Set the LCD DIP switch to 9600 bps*

( ) *From front Penguin, left to right, insert three wires from LCD into the AUX port.*

```
   Connection Diagram
 Penguin AUX Connector
       1  2  3
       _____
      |        |
      |        |
(**)  |_____|  (**)
 ----------------------
       front view

        Pinout
 1 - Black    Ground
 2 - Red      5 Volts
 3 - White    SG Signal
```
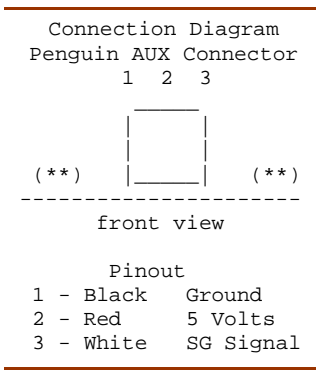
Software
The provided code is named penguin_on_lcd.bpx and can be downloaded at the Yahoo Toddler & Penguin Tech Group. It may also be posted at the Parallax Forum and available upon request from the Penguin Robot Society. (see links on page 8)

LCD Balance
The LCD can mechanically center balance directly above the motherboard so no significant modifications are needed to walking software or motion control code. When positioning the LCD farther out to to the front, in a more face-like appearance, some tweaking of the walking code may be beneficial, such as taking smaller and slower steps to maintain a better balance.

Serial LCD
The reason a serial LCD is chosen, is due to Penguin Robot having one available port. Since the mounting doesn't require any modifi-cations, this is a total project that does not harm any cute Penguins!

Cost
Project cost, depending on which LCD is chosen, can range from $25 to $50, so the LCD is cost effective compared to a uOLED or other displays.

Circuit Connection
The article and code include all details necessary to attach a BPI-216 LCD Display (purchased from Parallax, although alternate models may be available).

Program Function
This program displays two lines at the full LCD speed of 9600 baud. The first line prints as:
Hi, I'm Penguin!
The second line prints as:
BPI-216 LCD
More LCD Code is listed on page 7.

Penguin LCD Uses
There are many uses for a green screen LCD such as:
1) Self contained debugging tool, 2) Reporting sensor values, 3) Battery level indicatory, 4) AI text com-munications, 5) Program menu, 6) School projects, and 7) Robotic text chatting.

LCD to Penguin Cable
The wire cable is from Parallax. It has a female connector, and pins on the other end: *red* +5 volts, *black* ground and *white* signal. Connect these according to the diagram and photos.

Parts List
1 – LCD BPI-216
2 – Short Brackets
2 – Short Bracket Nuts/Bolts
2 – Long Brackets
2 – Cut Slips of Paper
1 – Wire Cable RWB
2 – Standoffs w/hardware

The LCD can use a 3 or 5 pins con-nector. Only 3 pins are needed. Wires are color coded. This photo shows the backpack side of the BPI-216 serial LCD.
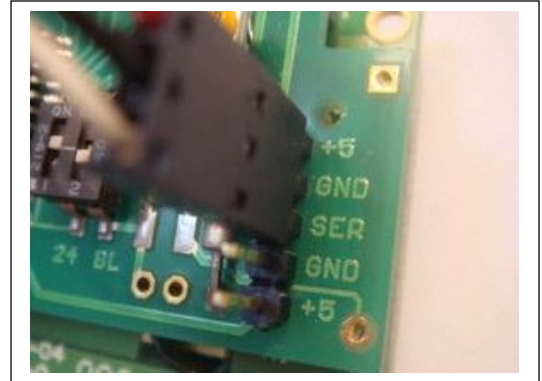
These two angle brackets are held in place with existing board bolts. A piece of paper is folded around the bracket bottom to prevent the metal from short circuiting the board. Punch a hole in the paper for the board bolt to pass through.
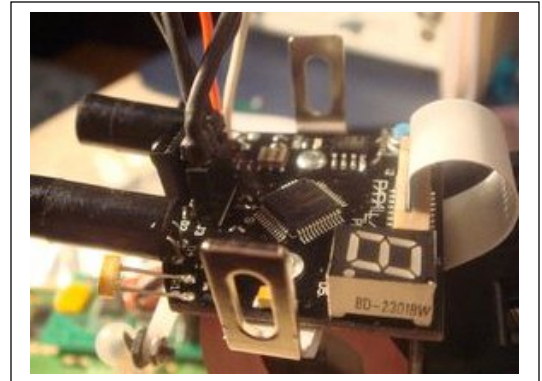
Larger angle brackets connect to the smaller brackets. These are variable angle adjustable. Two stand-offs are used to connect the LCD directly to the brackets. This allows cable /board clearance for the LCD serial backpack.
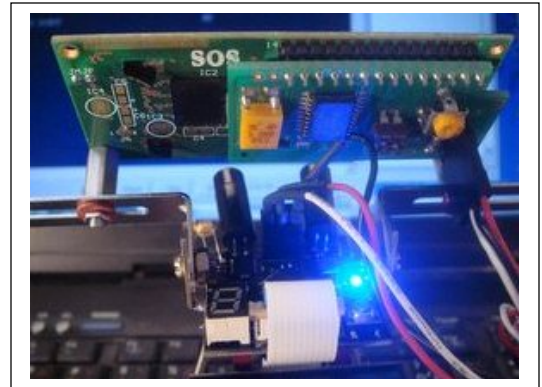

The AUX5 connector has these 3 wires connected as shown. Note the color code. Refer to the Connection Diagram at upper left in the text, to determine the color code.
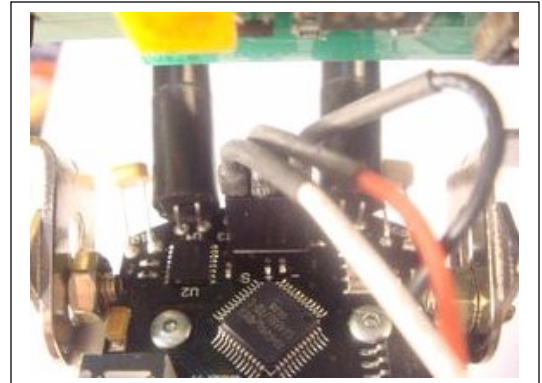
The Future? What's in store for the future you ask? You probably guessed it, Penguin with an LCD emoticon face, full of various emotions and expressions made with customized characters. Who will be the first to make one? ●

Breadboard Projects
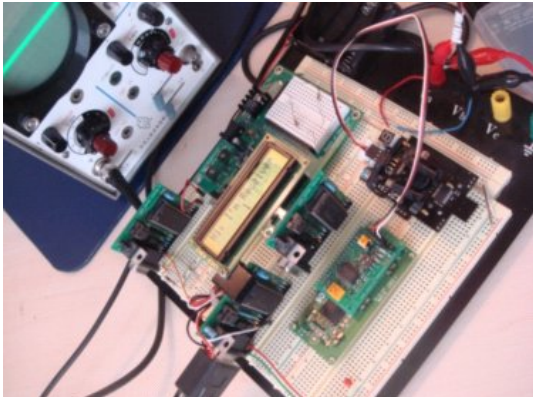
Deals as low as 10 dollars can be found for prudent shoppers of electronic circuit breadboards. These are outstanding for rapid circuit development. Completed circuits from other projects can plug into these large boards, such as the Board of Education shown here.

Creating, designing and testing circuit projects can be faster and more easy by using one of these large breadboards. In the example at left, a beginning multiproject includes five Basic Stamps: three BS2 OEMs, one BOE SX, one BS2px on Penguin board, and two LCDs. This breadboard was found at an electronics surplus store in Taiwan. A power supply connects to the jacks and is wired to distribute power and ground to the bus strips. There's space for other project boards that can set on top. Single projects can be more powerful and complex, or one board can hold multiple projects. ●

ASCII Penguin
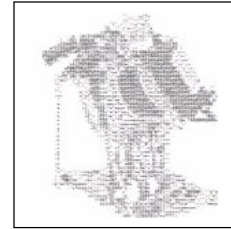
Create this ASCII art penguin photo made up of text characters, which can be emailed using text only, or inserted into PBASIC code remarks for various illustrations. The program takes an existing photo and converts the image into text. For example code, refer to the information on page 7. Download MultiAsciiArt.exe. ●
http://3d2f.com/tags/multiasciiart/

PBASIC Grab Bag — Guidelines, Sample Code, Techniques

When you're ready to program in PBASIC, you'll want access to all the methods, tips, even tricks of programming. Save space, squeeze out extra lines, make code run faster, create more efficient organization, or just find the example you're looking for.

Standard IF-THEN and a Label/Subroutine

```
IF 100 < 200 THEN Main        ' Main is a label
```

Using IF-THEN with ELSE and ELSEIF

```
IF (value > 1000) THEN
          DEBUG "Value greater than 1000"
          ELSEIF (value = 1000) THEN
          DEBUG "Value equal to 1000"
          ELSE
          DEBUG "Value less than 1000"
          ENDIF
```

IF-THEN with Multiple Statements

```
IF n>40 THEN
      SEROUT 5,Baud,[I,1]    ' erase lcd
      SEROUT 5,Baud,[I,128]  ' move to 1st line
      n=0
      ENDIF
```

IF-THEN-OR Example

```
IF chips > 2500 OR chips < 1250 THEN chips = Default_Value
```

IF-THEN with AND Logical Operator

```
IF (value1 = 5) AND (value2 = 10) THEN Is_True
```

IF-THEN with NOT Logical Operator

```
IF (value1 = 5) AND (value2 = 10) THEN Is_True
```

IF-THEN with Expression Solving

```
IF ((value / 50) < 10) THEN Main
```

IF-THEN with Condition

```
IF (flag = 1) THEN Is_True
```

END-IF and DO-LOOP-UNTIL

```
DO
PULSIN 5, 1, time0
LOOP UNTIL time0 > 1000
ELSEIF (time1 > 500) AND (time0 > 500) THEN
                          PULSOUT 12, 650
ENDIF
```

Have fun with this little tune program. It's Penguin Tune Creator (Do Ray Mi Fa So La Ti Do)

```
' penguin_tune_creator.bpx Plays "Do Ray Mi Fa So La Ti Do" up & down
' Vary octave, note length, time between notes, last note length.
' Speaker on pin 12

' {$STAMP BS2px}
' {$PBASIC 2.5}
o         CON 4          ' octave creator
L         CON 2000       ' note length
p         CON 10         ' time between notes in ms
Ln        CON 4000       ' last note length

PAUSE 1000:DO            ' play musical scale
DEBUG CLS,CR, "Do", CR: FREQOUT 12,L,  1047/o,1047/o: PAUSE p ' C6
DEBUG "Re", CR:        FREQOUT 12,L,  1175/o,1175/o: PAUSE p ' D6
DEBUG "Mi", CR:        FREQOUT 12,L,  1319/o,1319/o: PAUSE p ' E6
DEBUG "Fa", CR:        FREQOUT 12,L,  1396/o,1396/o: PAUSE p ' F6
DEBUG "So", CR:        FREQOUT 12,L,  1568/o,1567/o: PAUSE p ' G6
DEBUG "La", CR:        FREQOUT 12,L,  1760/o,1760/o: PAUSE p ' A6
DEBUG "Ti", CR:        FREQOUT 12,L,  1976/o,1976/o: PAUSE p ' B6
DEBUG "Do", CR,CR: FREQOUT 12,Ln, 2093/o,2093/o: PAUSE p+1000 ' C7
DEBUG "Do", CR:        FREQOUT 12,L,  2093/o,2093/o: PAUSE p
DEBUG "Ti", CR:        FREQOUT 12,L,  1976/o,1976/o: PAUSE p
DEBUG "La", CR:        FREQOUT 12,L,  1760/o,1760/o: PAUSE p
DEBUG "So", CR:        FREQOUT 12,L,  1568/o,1567/o: PAUSE p
DEBUG "Fa", CR:        FREQOUT 12,L,  1396/o,1396/o: PAUSE p
DEBUG "Mi", CR:        FREQOUT 12,L,  1319/o,1319/o: PAUSE p
DEBUG "Re", CR:        FREQOUT 12,L,  1175/o,1175/o: PAUSE p
DEBUG "Do", CR:        FREQOUT 12,Ln, 1047/o,1047/o: PAUSE p+1000:LOOP
```

Code to Turn Off the Segment Display

```
                       ' penguin_off_display.bpx
LEDDisplay    VAR    OUTC    ' The LED display mirrors OUTC
DIRC          =      %1111   ' Set LED
LEDDisplay    = 15:STOP      ' Turn off display
```

How I Got Started in Robotics   by **David Buckley**

David Buckley is the master of the tilt/stride walking robot design. When Parallax began plans for Toddler Robot, they consulted with David Buckley, adapting one of the most unique and servo simplified walking mechanisms in the history of hobby robotics!

David Buckley's robot creations. From left to right: Quester, Teal480, MM3, and Zeaker.

When I was very young, two of my Birthday/Christmas presents were books with robot stories. One had huge robot warriors with death rays shooting from their eyes. They were tied in with 3-inch high robot toys on sale which I could never persuade my mother to buy; and the other was much more exciting. The robots were what we would call exoskeletons. Humans climbed inside and the 'robots enabled them to do heavy lifting. The story was called *Creakyfoot*, a boy had his own worn out *robot* which eventually won a race and was refurbished. Shortly after, in a comic, there was a picture story with a giant steam powered humanoid robot attacking a castle. This enthused me to build my first meccano robot - no motors, no gears, it didn't move! But it looked like a humanoid robot and I remember telling them at school that if I had a few gears and a motor I could make it walk. I was about 9. Later in my teens I made a two-electric-motor meccano robot which walked by shuffling its feet along the floor and then a meccano robot arm with electric motors operated by a set of switches. I didn't have enough money to buy good motors or radio control. One small transistor was the price of an electronics magazine! In the mid 70s I built a walking machine named *Teal,* based on a design by Peter Holland and

published in the *Model Maker* in the mid 50s. Wow, it walked! http://davidbuckley.net/DB/Teal.htm In about 1980, I went to a *Micromouse Competition* and thought "I can do that," so I started on *Quester*. http://davidbuckley.net/DB/Quester.htm I made a chassis driven by two motors from a *Minic Raceway* set I bought second hand in *Portobello Market* and mounted a small 6-volt lead acid battery [the mice I had seen were always out of action with flat batteries]. I then learned about H-bridges and made two so I could control the chassis with switches. I bought an *Acorn System 1* with a 6502 processor, LED display, hex keypad, tape interface and 16 bits of I/O and learned how to program in 6502 machine code (no assembler!!). I mounted it on the chassis and learned how to drive Quester about, under program control. I learned about ultrasonics and how to drive the transmitters and read the sensors directly with the computer and found it was hard to get them to work over the short distances in the maze (7-inch square cells). I built bump sensors all around Quester's chassis (mice I had seen would become lost because often they bumped into the walls of the maze but didn't know it). I experimented with analog artificial neurons, actually a collection of CMOS gates interlinked with capacitors, high value resistors and diodes and driving the Hbridges so Quester could sense and

avoid the walls. Once it nearly got to the center without the computer connected, just using the reactions built into the neuron circuitry. This was in 1981 and the way the circuit worked was very similar to what Rodney Brooks later described as *Subsumption Architecture*. I built an optosensor which adjusted to ambient light levels and which looked out the walls of the maze like simple eyes. This I couldn't get to work reliably - was it a white wall in shadow or was it the black baseboard with light shining on it? It was easy for me to see which-was-which but I couldn't get the electronics to different-tiate the two. I was busy with learning and programming in APL at work and completing a Post Graduate Diploma in Computing. Quester was too hard to use as a course project and in any case was way beyond the course level so I made MM-3 (M^2-3): a simple Turtle http://davidbuckley.net/DB/MM3.htm controlled over an infra-red link from a personal computer, first a *UK101* and later a *Sinclair ZX-81*. After I had finished the Diploma, I started on *Zeaker*. http://davidbuckley.net/DB/Zeaker/Zeaker.htm controlled from a ZX-81 Zeaker had compre-hensive segmented bump sensors all around, lights, a two tone horn and a pen so it could perform as the simpler Turtles. Andrew Leonard from *Colne Robotics* saw it and they asked me if they could make it. I pro-

duced all the engineering lay-outs, manual, introductory articles in *Practical Electronics* and Zeaker went on sale. It was the first personal robot vehicle on sale in the UK. Following the success of Zeaker, Robin Bradbeer who had founded the country's first *Computer Club*, written the Manual for the *Sinclair Spectrum* and was Consultant editor for *Sinclair Projects magazine*, among other things, suggested we form a robot company. One other person who Robin knew was mad on robots was Richard Greenhill who joined us in starting *Intergalactic Robots* and I designed the *Zero2 robot vehicle*. http://davidbuckley.net/DB/Zero2/Z2-Manual.htm Richard went on to found the *Shadow Robot Group*, now the *Shadow Robot Company*, which I was in from the begining. Richard wanted the group to work on the various parts of a domestic robot and I suggested that a high profile project would attract members so why didn't we just go ahead and start building a humanoid robot. So I designed the *Shadow Biped* and we started building it. I believe the Shadow Biped http://davidbuckley.net/DB/ShadBiped.htm was the most famous robot biped in the world, until *Honda* announced its *Humanoid Robot P2*; it has been *NASA's Cool Robot of the Week*, and was included on their *Robonaught* pages. ●

Penguin Ideas, Tips, Techniques

Free Ping))) Bracket
When plugged into the AUX5, ultrasonic PING))) may wobble when Penguin is moving. To stabilize it, use a spare rubber band as shown in the photo. Use a black rubber band to make it more invis-ible.

Save Batteries Make a battery eliminator for programming to save on batteries. Clip small gator clips to the end feed (+) and (-) battery terminals on Penguin and connect to the 6-volts DC side of a battery eliminator. Do not exceed Penguin ratings and remem-ber that any power supply needs to deliver peak amps.

Protect the Power Switch
The tiny On/Off power switch is exposed and may accidently switch on when bumped. Add a piece of tape as protective covering.

Socket the Penguin Board
It really pays to socket the Penguin board to get extra ports. Use tiny standard socket arrays that can be broken apart. They will look and act like tiny breadboards and fit thin single strand wire or components. With the segment display removed, this socket can give four expansion ports for numerous sensors and circuits. Remember, this display is wired with a multiplexor and not straight through ports. You may want to use the photodetectors or IR emitter ports instead. In this example, remember that the CdS cells are on resistor-capacitor r/c circuits and

work with PBASIC rctime code.

Application Ideas include attaching more Basic Stamp 2px microcontrollers, connecting a one wire serial LCD, establishing an I2C interface, adding an inclinometer and acceler-ometer, connecting a tiny keyboard, doing a port expansion to add more ports, connect a clock, and add more memory…

Photocell Protector Place a protective sleeve and bracket on the two photocell (CdS) light detectors to prevent bending.

Accomodating Add-Ons
Drill some extra screw holes in the side plates to accomodate expansion sensors, boards, peripherals. Use existing bolts to hold extra sensors. Back out these

bolts slightly and fit in various thin brackets.

IR LED Light Shields Place a small piece of clear tape on the two light shields to prevent them from flying off and becoming lost.

Create **Big Toe Sensors** using two microswitches wired together in parallel and share the ping input. In this configuration the ping is off when walking.

Transporting Penguin safely is accomplished with a rigid carry case with padding inside to surround Penguin's shape. There's a perfect fit using a rectangular 1.1 liter plastic container by *Thermos*.

Shut Off the Display to Conserve Battery Power. See page 4 to find code that will turn off the display. ●

Kit Tips for Building Penguin Robots

Keeping Track of Servo Connectors

We're adding to Penguin Robot's Assembly Manual, and providing some useful tips and techniques to streamline the process. Clip & keep these pages with the assembly manual.

There are two tips for keeping track of the servo connectors, knowing which is tilt and which is stride.

In the last issue, a way was illustrated for leading a servo wire alongside the chassis closest to J2. This time, we

can recommend unplugging both cables and determining which is the longest. The longest cable is the stride servo cable, because this servo is located closest to the bottom side of Penguin Robot. Plug the stride cable to the left connector J1 as seen from the back of Penguin. Plug the short tilt servo cable to the right connector J2. This appears to be the most simple method of attaching cables after Penguin Robot is built. You might ask what are some

reasons for unplugging servos. Saving power is one reason, especially during code development. When running programs not involving motion control, unplugging servos avoids servo startup twitch. However this twitch is useful – unplug one servo cable. Turn on Penguin. You can see if the cable is tilt or stride because that action will take place. ●

Keeping track of servo cables is accomplished by connecting the long cable to the left connector and the short cable to the right connector as seen from Penguin's back side.

Humanoido's Penguin Robot Code

PT issue #1 included the complete index to part 1 of over 290 Penguin Robot programs. This time, in Part 2, we'll add 7 "new" to this list and a brief discussion for each. Most new code will focus on added hardware.

Here's some new posted Penguin code. The first issue of Penguin Tech Magazine introduced BS2 software **Finger.bs2** to create a single robot hand finger using the low cost Vibra Tab Mass. Open up the posted code **penguin_ascii.bpx** to see the ascii Penguin – no need to run this code. Issue #2: **penguin_humanizer.bpx** is humanizer code, which can recognize humans and their motion using a PIR sensor. In issue #2, **penguin_on_lcd.bpx** code will interface a serial LCD display. This is code to match the LCD project in PT#2 and shows a two line display of text on Penguin Robot at 9600 baud.

Hi, I'm Penguin!
BPI-216 LCD

New posted code also includes a Penguin Robot LCD fast counter. This program **penguin_fast_lcd.bpx** counts a full word from 0 to 65,535 at the full speed of 9600 baud and displays the counting numbers on the LCD screen at a working screen rate. **penguin _lcd_ascii.bpx** will display the decimal number followed by its ascii character – including special graphics. **penguin_tune_creator.bpx** plays a musical scale up and down. Stay tuned as each PT issue will attempt to add more Penguin programs to the growing collection. ●
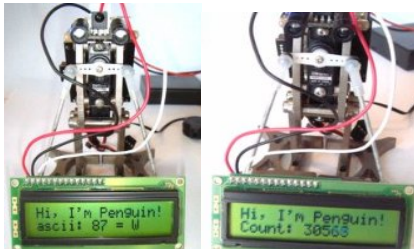
Code for LCDs in action shows ascii number representations and fast counting. Ascii can also show special characters for special effects. Note the LCD is simply plugged into the AUX5 port on top of Penguin for these projects and experiments.

Penguin Builder Power!

This is a new contest and quest to built the most unique and powerful Penguin Robots using add-on hardware and software. The winners will have their stories featured in Penguin Tech Magazine. Here's a list of completed projects so far, and where the information appears.

Roller Skate Penguin
Tiny skates on Penguin
(youtube movie with assembly guide)

Penguin Seeing Eye Dog
Watch Dog for Visually Impaired
(posted at Parallax Forum)

Finger Penguin
Has one big vibra tab mass finger
(PT issue #1)

Pocket Penguin
Fits into shirt pocket (PT issue #1)

Humanizer Penguin
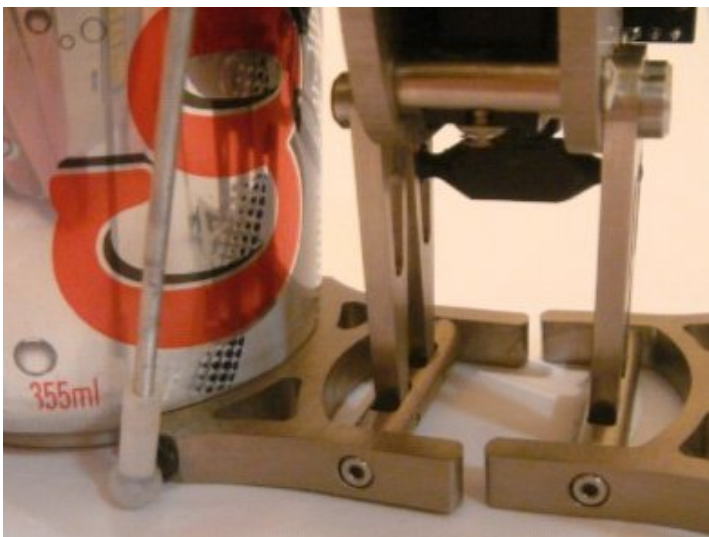PIR sensor, detects humans and their motion
(PT issue #2)

ASCII Penguin
Made from all ascii characters (PT#2)

Penguin on LCD
Has LCD for text (PT#2)

Penguin Easter Eggs – Beer Can Feet!

Penguin Easter Egg #1 Did Penguin designer Ken Gracey use an aluminum beer can or a coke can to trace out Penguin's famous "footprint?" As seen in the photo, the can is a perfect fit. Some may think it cannot be coincidence to have such a perfect radii of curvature fit. This may be one of the greatest Easter Egg mysteries of all time!

Beer Can Feet? Take a look at this picture! Notice the Penguin Foot? It fits exactly around a beer can, and the fit is snug and perfect! Well, as the conjectured rumor goes, Ken Gracey was sitting there in his laboratory late one night with a beer in one hand and the Penguin design sheet in another. It came time to draw out the foot and he slapped down the beer can, took the tracing pencil, and well, the rest is history! Our version is a little different as we think Ken maybe used a can of CocoCola to stay awake during those long hours, and to keep a clear thinking mind. We used our digital camera to prove it. ●
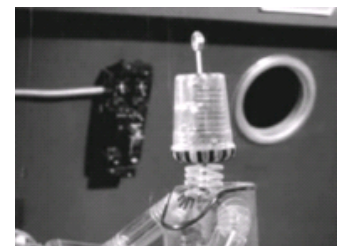
Retro World
Can you identify this famous humanoid robot?

CALL FOR AUTHORS Penguin Tech Magazine is calling for authors to contribute articles about Penguin Robot and related projects for publication. This can include short stories, assembly info, new add-ons, hacks, programs, added functions, cosmetic alterations (exoskeleton) and ideas related to Penguin Robot. For more information, questions, or to send articles, email Humanoido at penguin(dot)robot(at)yahoo.com.

Talk About Penguin Robot

2-Servo Biped Design by Ken Gracey

The original design concept for these two-servo bipeds came from David Buckley, a creative animatronics roboticist in the United Kingdom. The supposed simplicity of this design caught my interest as one which could be optimized for faster and more stable walking. Two-servo bipeds use one servo to tilt and hold the robot on either foot, while the other servo moves a leg forward or backward. Turns are done by sliding the feet in opposite directions. The ideal terrain for this type of robot is free of features, such as an office desk or lowpile carpeting. ●

This is a rare photo of a pre-production Penguin Robot shown assembled with feet pins on the outside. Can you put upper leg pins into the feet?
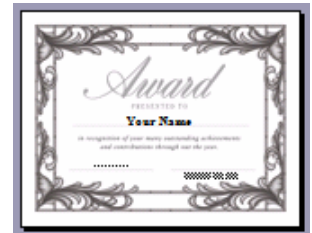
About Penguin Robot Society

Penguin Robot Society was born by humanoido. A handful of die-hard Penguin Robot enthusiasts followed. Before Parallax decided that Penguin Robot would be a full scale production robot, members had either received test bed models or sample units, decided to build their own DIY Penguins, or entered a wish list. For years, enthusiasts followed the Parallax Forum postings that detailed the progress of Penguin Robot. Many who were inspired had the grace and support of Penguin Designer Ken Gracey. Membership is free and open. To join, send an email describing your Penguin interests, an idea or two, or what you're working on. ●


Enter the Penguin Tech Builder's Contest and collect your certificate award. See page 7 for more details.

Useful Links and References…

Penguin Tech Magazine — penguin.robot@yahoo.com
Penguin Robot Society — penguin.robot@yahoo.com
Toddler & Penguin Tech Group — http://tech.groups.yahoo.com/group/toddler_robot/
Parallax Inc. — http://www.parallax.com/
Parallax Forums — http://forums.parallax.com/forums/
Robot Magazine — http://www.botmag.com/
David Buckley — http://www.davidbuckley.net/DB/inspired/KenGracey/KenGracey.htm#MiniToddler/

We want your letters and mail. Write to Penguin Tech Magazine at the above email address. Let's hear what you think about the first issues of Penguin Tech Magazine! If you like what you see, let us know so we can continue.
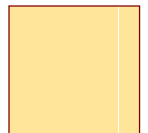
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