

clayton_Gatewood

NOTEBOOK NO. 1
ISSUED TO Clayton Gatewood
ON 10-5-07
DEPARTMENT UNCC, Electrical Eng., Charlotte Robotics Team.
RETURNED _____

Contact information:
e-mail: cgatewood@uncc.edu
phone: ~~XXXXXXXXXX~~

Project: UNCC IEEE Robot Project
Fall 2007 - Spring 2008



EUREKA LAB BOOK, INC.

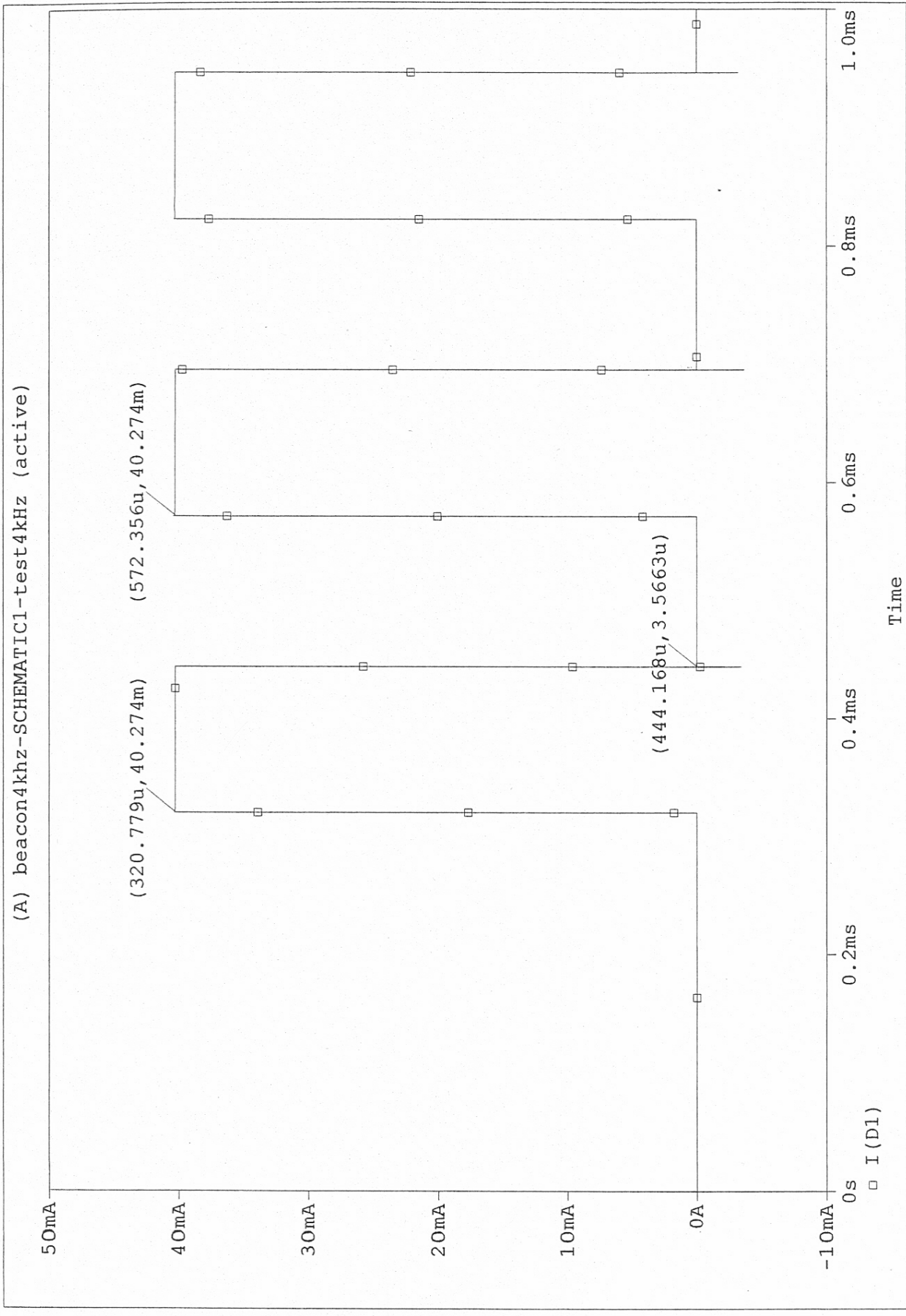
P.O. Box 150 • 110 Winter Street • Holyoke, Massachusetts 01041

Phone 413-534-5671 Fax 413-534-5672 Web www.eurekalabbook.com

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Beacon Circuit with Timer
(f = 4 kHz)

UNCC Robot Project (IEEE)
Temperature: -27.0



Date: January 22, 2008

Time: 09:43:53

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1-24-08-1445 Performed lab analysis of Beacon ckt designs.

Initial measurement of 4kHz ckt were:

U2p3 $f = 4.717 \text{ kHz}$ % Error = -17.9%
 $t_h = 112 \mu\text{s}$ % Error = 10.4%
 $t_L = 100 \mu\text{s}$ % Error = 25%
 $T = 212 \mu\text{s}$ % Error = 15.2%

~~Due to the large error
~~the ckt was not used~~~~

U1p3

$t_h = 168 \mu\text{s}$ % Error = 16.0%
 $t_L = 44 \mu\text{s}$ % Error = 12.0%

The large percent error experienced in the observations were attributed to the tolerance of the capacitors used (Ceramic type, tolerance = 20%). Capacitors were added in parallel with C_1 and C_3 to adjust the parameters to fit targeted values as shown on pg. 10 insert. Results are as follows:

4kHz Beacon Ckt.

IEEE

U2p3

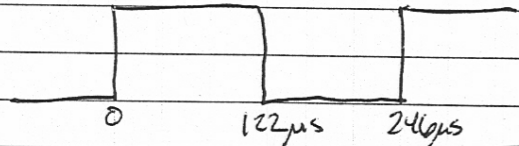
$f = 4.065 \text{ kHz}$ % Error = -1.625%
 $t_h = 122 \mu\text{s}$ % Error = 2.4%
 $t_L = 24 \mu\text{s}$ 124 μs % Error = 0.8%
 $T = 246 \mu\text{s}$ % Error = 1.6%

U1p3

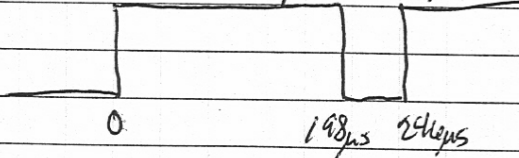
$t_h = 198 \mu\text{s}$ % Error = 1.0%
 $t_L = 48 \mu\text{s}$ % Error = 4.0%

IEEE

U2p3



U1p3



IEEE

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1-24-08-1445 continued

4 kHz Beacon Ckt.

NFE ~~ck~~

U2p3 DC = 50.4%

NFE ~~ck~~

Modifications: 1- 200pF capacitor added in parallel with C3
1- 470pF and 2- 120pF capacitors added in parallel with C1

Total capacitance at C1 as indicated by the marked values would be 5.41 nF (all capacitors added together). The calculated value was 4.7 nF. ~~It~~ ^{cap} capacitance range with 20% tolerance is 6.49 to 4.33 nF. Better tolerance capacitors were not thought to be important since the Beacon ckt design purpose was and is for testing the Robot.

NFE ~~ck~~

2.5 kHz Beacon Ckt lab. measurements ^{cal} ~~with same~~ ^{type of} ~~components~~

NFE ~~ck~~

Circuit required modification for same reasons as the 4 kHz Beacon ckt.

NFE ~~ck~~

U2p3

f = 2.427 kHz

% Error

2.92%

t_n = 200 μs

0%

t_L = 212 μs

-6.0%

T = 412 μs

-3.0%

U1p3

t_n = 344 μs

-4.24%

t_L = 68 μs

2.86%

NFE ~~ck~~

U2p3 DC = 48.5%

NFE ~~ck~~

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1-24-08-1445 continued

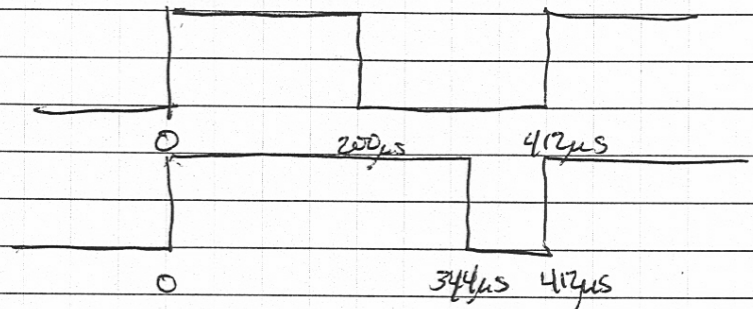
~~IEEE~~ 2.5 kHz Beacon Ckt.

NFE ~~etc~~

U2p3

U1p3

NFE ~~etc~~



Modifications: 1-470 pF, 1-500 pF, and 1-1nF capacitors added in parallel with C3. C1 was replaced with a 6.8 nF and a 1nF capacitors placed in parallel.
 * Since all ~~simulation~~ ^{lab} measurements were performed on a breadboard, these capacitances may change when a more permanent board is made.

For 2.5 kHz Beacon Ckt.

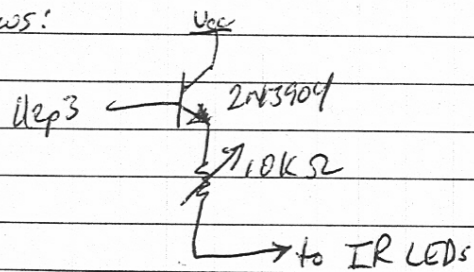
Effective C1 = 7.8 nF } both are the total
 Effective C3 = 6.67 nF } capacitance per label

1-25-08-1700

Went to Radio Shack and purchased materials to place Beacon circuits on a permanent board.

1-25-08-1730

Manufactured two circuit boards with the Beacon circuits on them. Need to go test them out and verify they work and that no additional capacitors are needed. Also, incorporated a 2N3904 BJT and a 10KΩ potentiometer on each board as follows:



The potentiometer controls the current through the LEDs.
 IR LED characteristics: 25°C
 100mA 1.2V I_{max} = 62A
 20mA 1.6V λ 940nm

NFE ~~etc~~

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1-26-08 - 0130 Late Entry for 1-24-08-2300

Updated Project Status Report #1 due on 1-25-08. Added Cap. and Requirement references and made minor changes to wording. Suggested that a section be added for software design.

1-26-08-0133 Late Entry for 1-25-08-1200

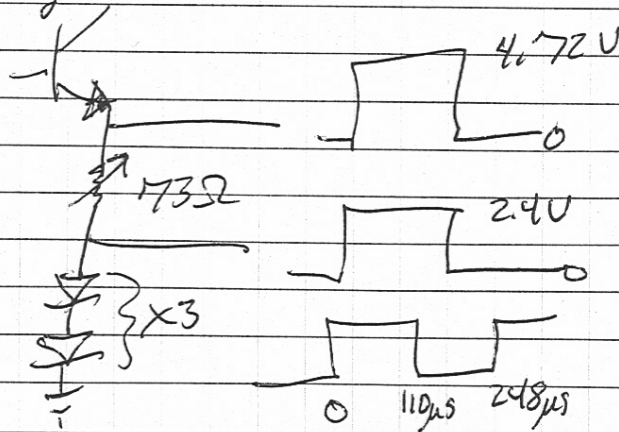
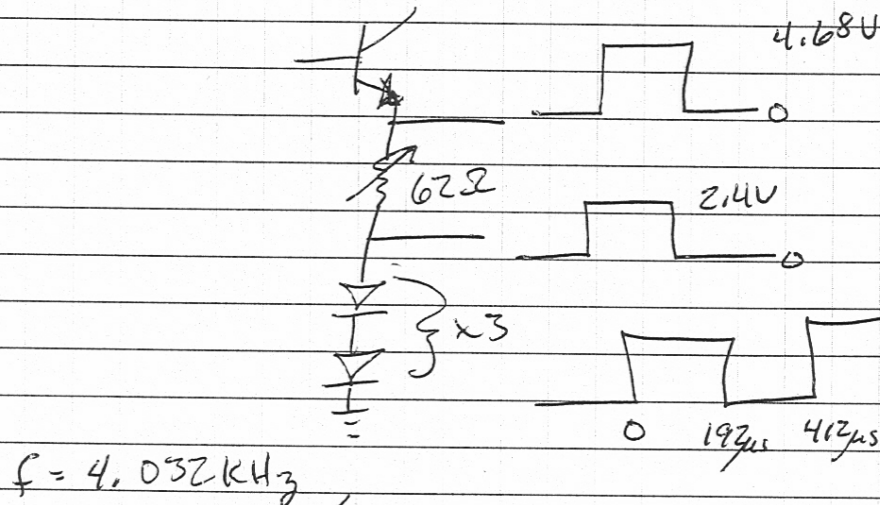
Updated Gantt Chart for input into Project Status Report #1.

1-26-08-1546

Tested both circuits (beacon ckt) and had to replace some capacitors as expected. Noticed large change in freq. when pinching capacitor between fingers (change temperature). May need to abandon the 555 IC ckt concept and just use function generators to drive the LEDs through a BIT. At least that way we can vary the frequency during testing.

Lab measurement results:

$f = 2.427 \text{ kHz}$



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1-27-08-1600

Built two circuit cards with 2N3904 BJTs on them for use as the beacon ckts where the base will be driven by a function generator.

1-28-08-2300

Built boxes to contain circuit cards for beacon ckts. Need 1 BNC connector, 1-DC connector, 1-hole each (for wire to connect to IR LEDs), in order to complete boxes. Found a 9V 1A power adapter which should work as a power source. Need to look at output voltage waveform to verify it is DC. Also, need 2 potentiometers > 100Ω ea.

1-29-08-1000

Purchased 2-10KΩ potentiometers, 1-DC connector. Need 1 panel mount BNC connector.

1-29-08-2200

Finished building one beacon ckt enclosure. Located BNC connector needed on Digikey. Info is:

Digikey Pt. # ~~ACX1047~~ ⁹²⁶ ACX1046-ND

Mfg Pt. # ~~112424R1~~ 112424

Desc. Conn. BNC Bulkhead Female Jack ~~AT~~

Vendor: Amphenol Connex

Conn. Type: BNC - Female Socket Jack

Contact Type: Panel Mount solder

Body style: Bulkhead

Freq.: 4 GHz

Min Qty: 1

Price: \$2.23

2-1-08-1100

Tested beacon circuit in Woodward Hall Lab and picked-up 2-100Ω potentiometers. Dr. Sheppard mentioned that resistors could be placed in parallel with the pot. to shunt the power. Circuit is temporarily using 33Ω 5W resistors.

Took the circuits to PARC Lab and tested/configured beacon circuits for use with assembled IR LED / Home base beacons. Circuits work fine.

NFEES

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Clyde Astor

2-1-08

From Page No. 18

2-1-08-1500

Team meeting.

Things appear to be coming together nicely. I am to look into the block loading mechanism concept while awaiting parts from Digkey (BNC panel mount connector).

2-2-08-0400

Made a scale drawing of the BOE-BOT gripper assembly and placed on pgs. 20-21. This is a "Ferris Wheel" concept where a rotatable wheel, mounted ~~vertically~~ ~~vertical~~ in a verticle position, has grippers attached to it. Servos will be mounted in the center of the wheel to actuate the grippers. A servo will be mounted to raise and lower the wheel. A final servo will rotate the wheel.

Raising and lowering will be aided by a spring that pushes the wheel upward to prevent battery drain while in the up position.

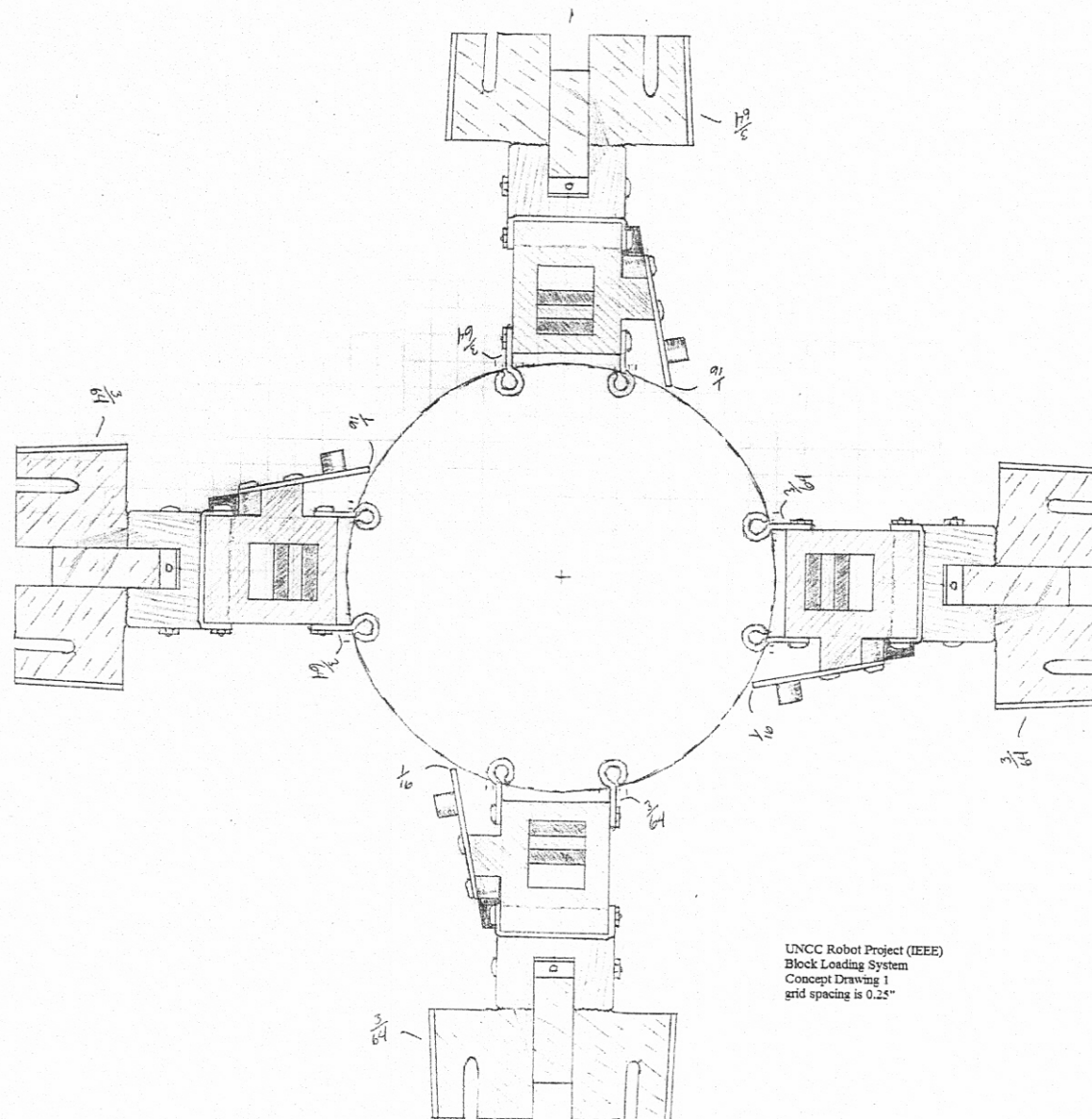
Gripping will be aided by a spring to prevent battery drain once a block is acquired.

ALFE *[Signature]*

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UNCC Robot Project (IEEE)
Block Loading System
Concept Drawing 1
grid spacing is 0.25"

2-2-08-1200 - Concept 1 drawing.
NFE EGM

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<i>Clyde Starnes</i>	<i>2-2-08</i>		