08 APR 14
Roderick.

PROTOTYPE WITHOUT SWITCHING REGULATOR.

RELAXED REQ'TS –

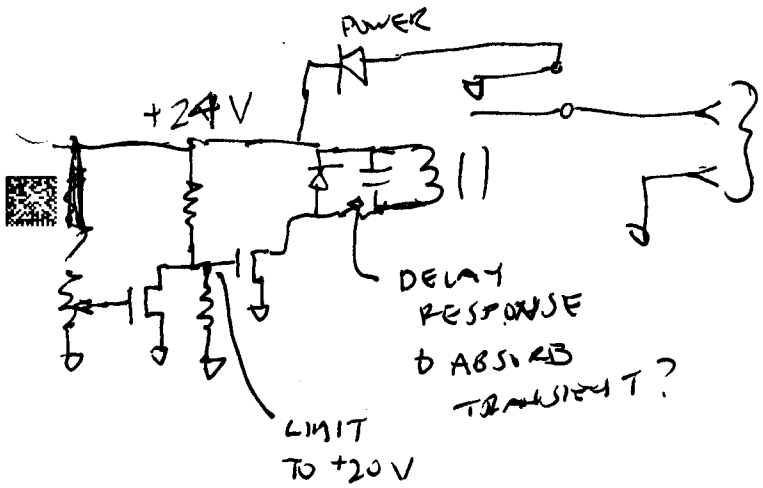
BATTERY ALWAYS PRESENT

VOLTAGE < 24.0V ⇒ MECHANICAL RELAY, CONNECT PANEL

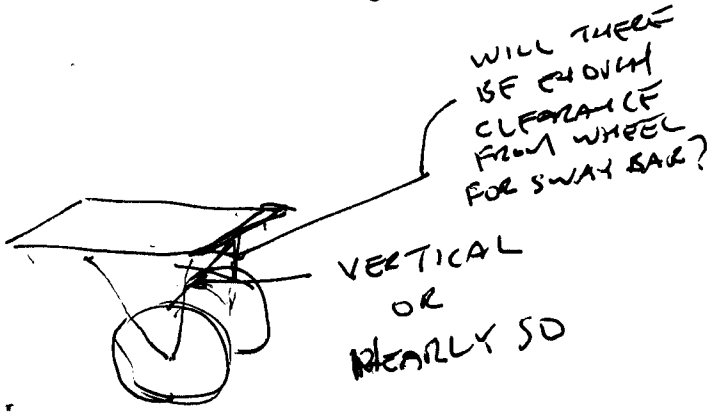
> 27.0V ⇒ DISCONNECT PANEL

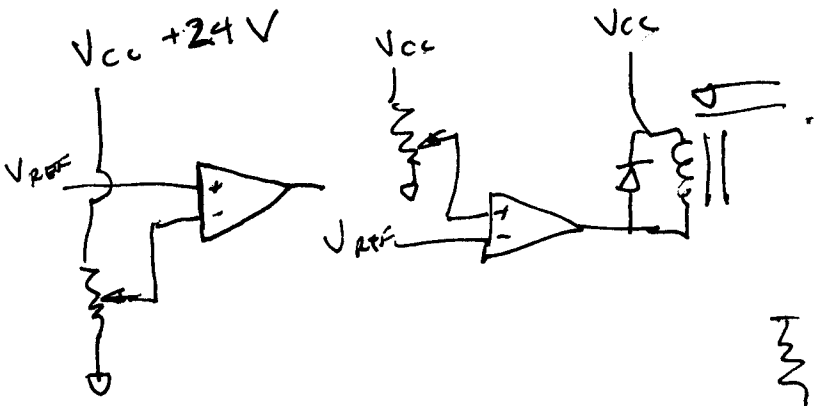
→ NO, DON'T DO HYSTERESIS. SIMPLE DISCONNECT BELOW 26.0V

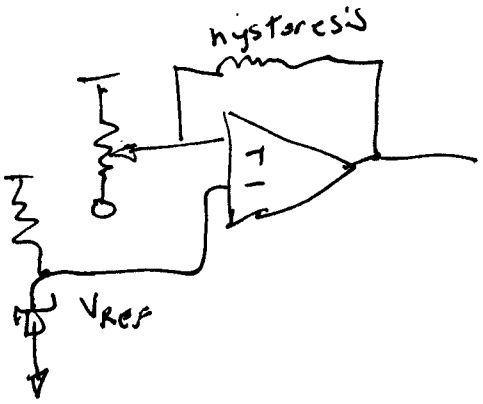
IWME3DHG4002116 004587 0007/0007 00



REAR FLASHERS –
USE OFF-THE SHELF CLIP-ON







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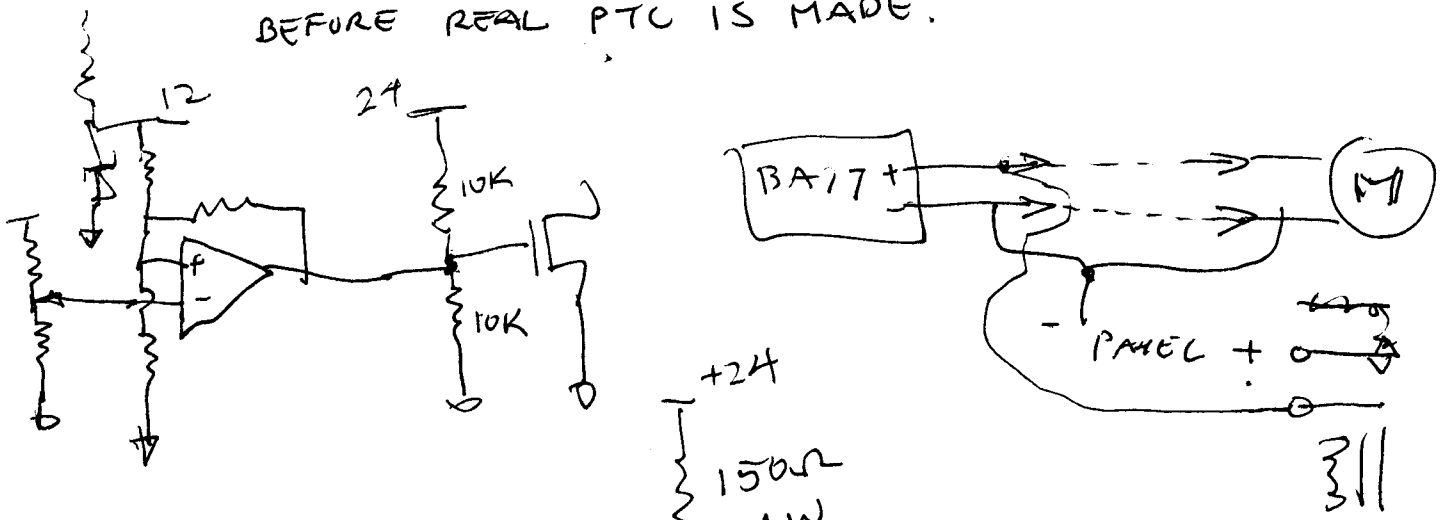
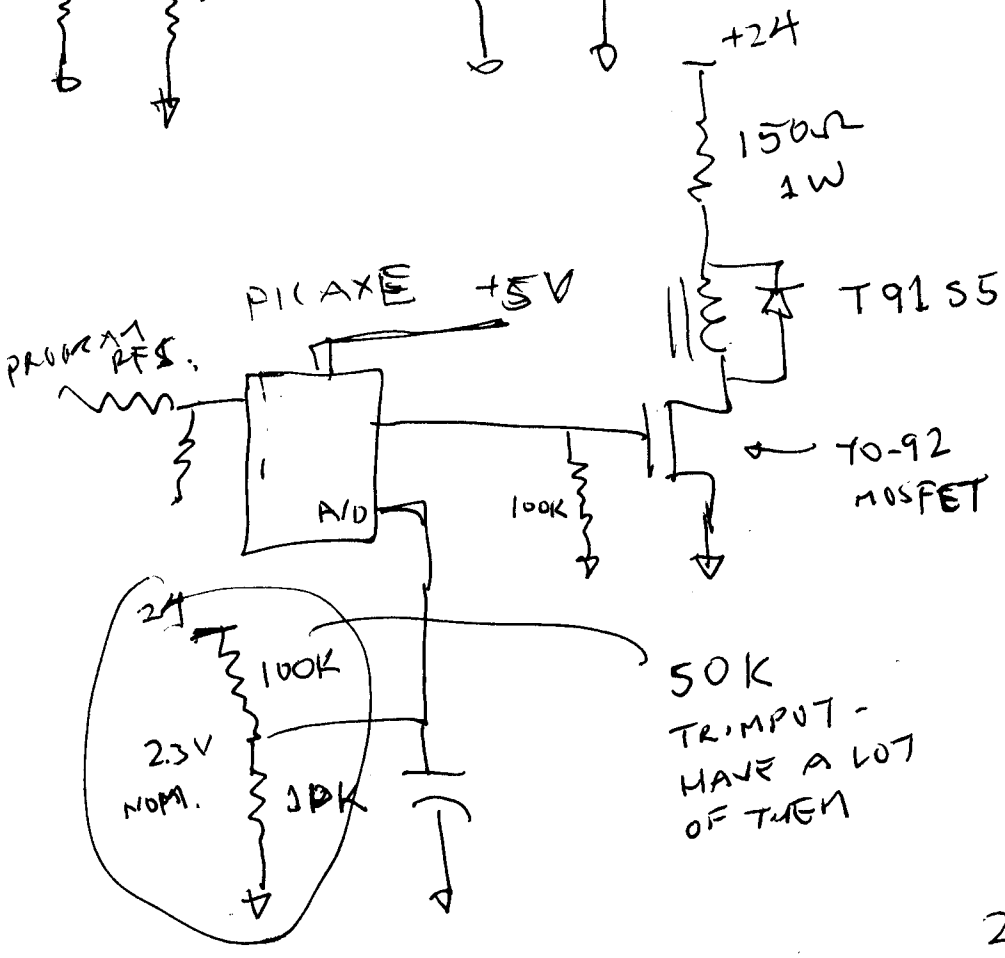
QUICK, CRUDE CIRCUIT BEFORE REAL PTC IS MADE.





T9155022-12

80mA

$P = I^2R$

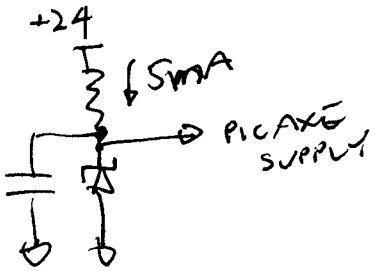
$= (.08)^2 \cdot 5\Omega$

$= .0064 \cdot 5$

$= .032$ WATT

50K TRIMPOT - HAVE A LOT OF THEM

$20V - 5V = 15V$



$R = \frac{E}{I} = \frac{15}{.005} = 3 \times 10^3$

PICAXE APPROACH IS BETTER, EVEN FOR PROTO. SIMILAR COMPONENT COUNT. MORE FLEXIBLE, AND SAIS CLOSER TO FINAL CIRCUIT.

+24 CONNECTIONS
150Ω, ZENER REGULATOR, VOLTAGE DIVIDER

11 APR 2014
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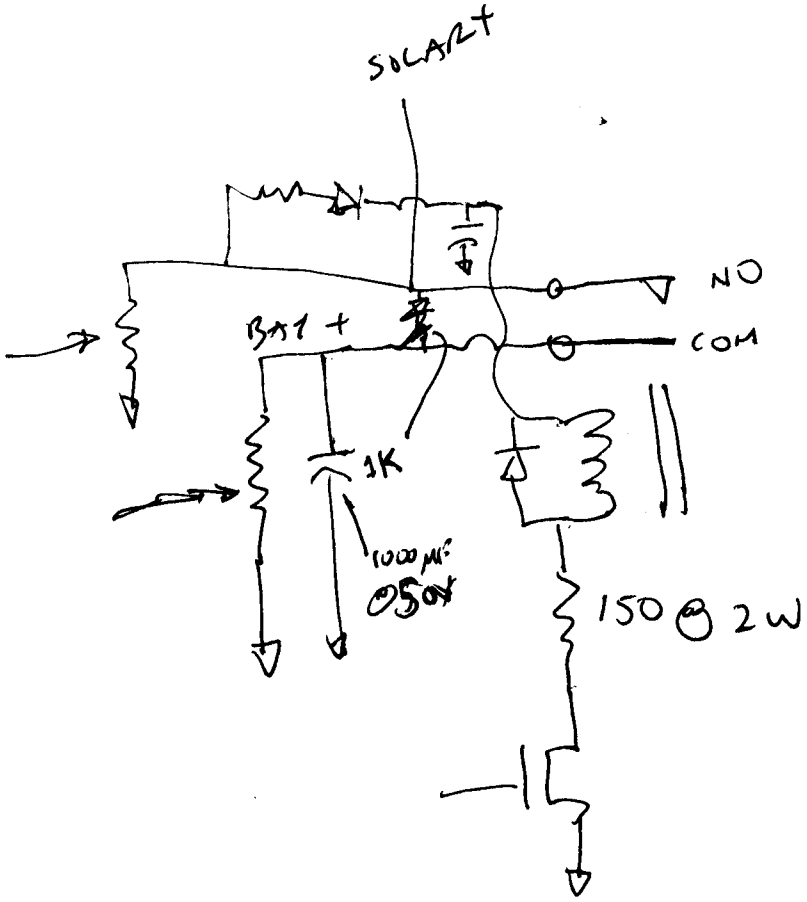
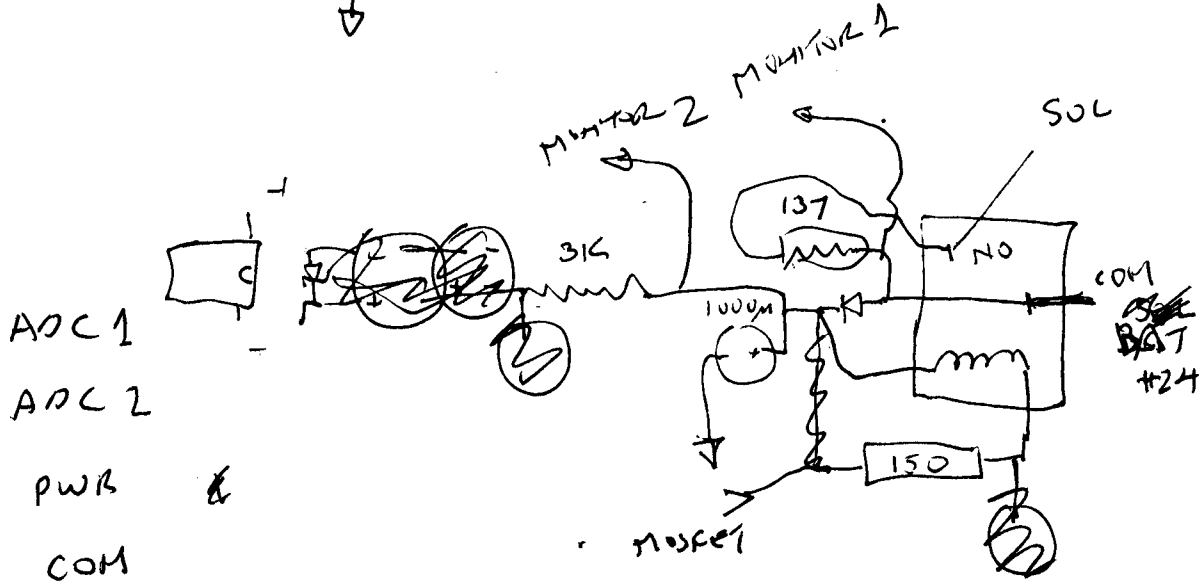




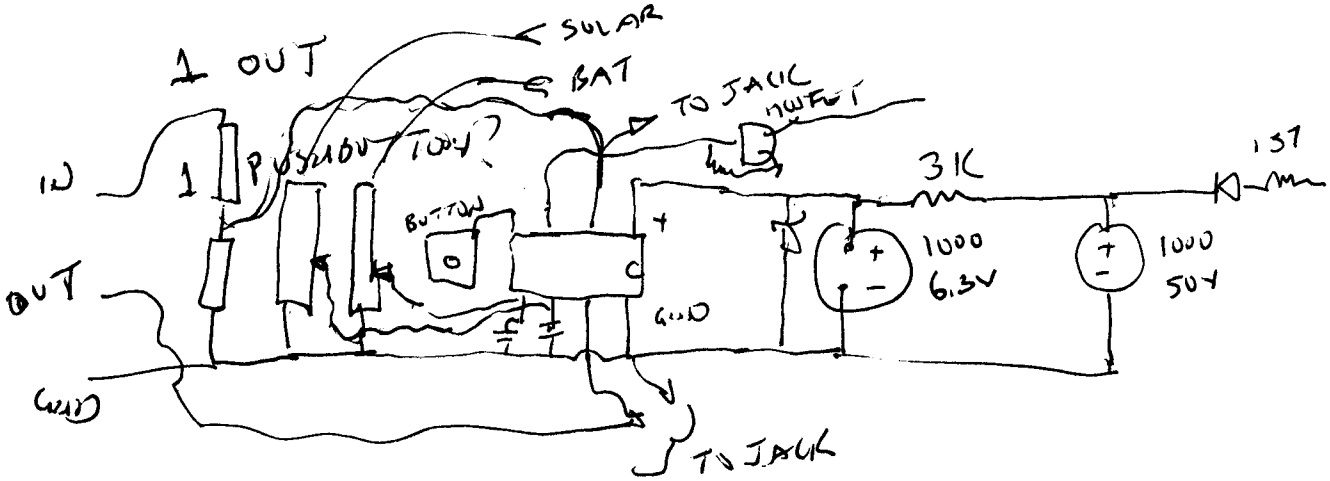
ADC 1

ADC 2

2 PWR

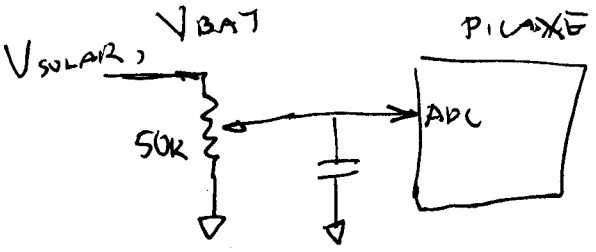
2 COM

1 OUT



15APR14; Roderick.

CALIBRATION OF A/D FOR PTC RELAY PROTO



SET PICAXE A/D FOR 2.048V FULL SCALE INTERNAL REFERENCE.

WANT NOMINAL VOLTAGE OF V_{SOLAR} (OR V_{BAT}) TO BE LARGE AS POSSIBLE, WHILE ACCOMODATING MAXIMUM ~~VALUE~~ POSSIBLE VALUE. ALSO WANT EASY MULTIPLY BY ~~N~~ n/m FACTOR FOR CONVENIENCE IN REPORTING. m MUST BE POWER OF 2 TO AVOID DIVIDE. EVEN BETTER IF m=1

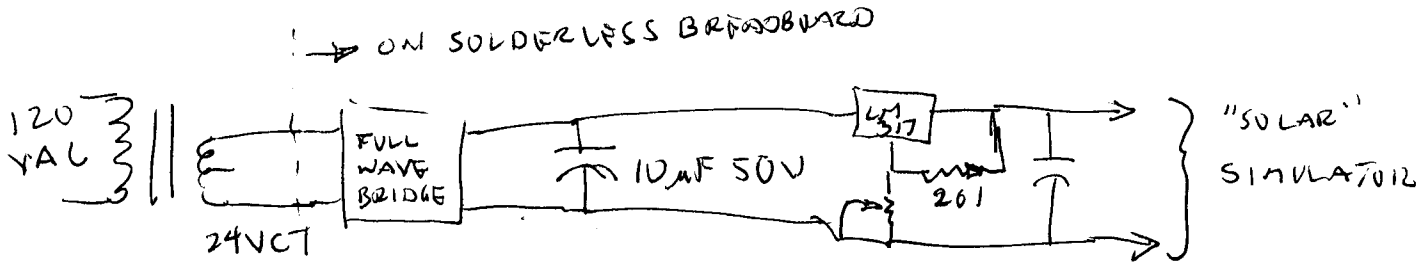
	mV/count	n	m	COUNT @ 24V	FULL SCALE OF A/D
	20mV	10	1	~~OVERFLOW~~	20.48 V
ON RELAY PROTO, USE FOR BOTH	40mV	~~5~~ 20	1		40.96 V
USE FOR BATTERY ON FINAL PTC →	32	~~8~~ 16	1		32.77 V
USE FOR SOLAR PANEL →	50mV	25	1	CANNOT GO MUCH HIGHER, COUNT: $1200mV \leftarrow$ INTEGER SIZE 65535 IN PICAXE	51.20 V

CALIBRATION: PROGRAM READS & PRINTS VOLTAGE EVERY 0.25 SECOND. ATTACH 24V BATTERY, TURN TRIMPOTS FOR DESIRED OUTPUT.

20 APR 2014; Roderick EASTER

UPDATE JOURNAL, PAINTED HALL ORANGE SPICE 19APR, WHICH IS HENRY PAIL'S BIRTHDAY.

EXPERIMENTS WITH PTC PROTO-5.



DEVELOP SOFTWARE TO DETECT MOTOR KICK-IN & RELEASE

100mS SAMPLE RATE

IDLE: PAUSE 100

~~5~~ = 200mV

~~LAST~~ LASTBAT VOLT = BATVOLT - HYSTERESIS

PRINT BATVOLT → READ BATVOLT

IF BATVOLT ~~>~~ >= LASTBATVOLT THEN GOTO IDLE

~~GOTO IDLE~~

ENTER ENGAGE: SERTXD("ENTER ...")

ENGAGED: PAUSE 100 ; LOOK FOR RELEASE

LASTBATVOLT = BATVOLT + 3 ; HYSTERESIS

READ BATVOLT

PRINT BATVOLT

IF BATVOLT <= LASTBATVOLT THEN GOTO ~~ENGAGE~~ ENGAGED

PRINT ("EXIT ENGAGED")

GOTO IDLE

21 APR 14

Roderick

PROTO 5, RELAY PROTO, SHOULD GIVE AN IDEA WHETHER SENSING MOTOR IN/OUT VIA BATTERY VOLTAGE CHANGE IS FEASIBLE.

SIDE THOUGHT: WHEN IS SYNCHRONOUS RECTIFICATION A WIN?

SUPPOSE CURRENT THROUGH MAIN RECTIFIER IS 5A.

VOLTAGE V_F IS 0.5V ACROSS THE SCHOTTKY. EQUIVALENT RESISTANCE $0.1\Omega = 100\,m\Omega$. ~~HIGHER CURRENT~~ MOSFET ~~ON~~ R_{ON} MUST BE LESS. LOWER R_{ON} ~~OR HIGHER CURRENT~~ ONLY MAKES CASE BETTER. WHAT ABOUT AT 10 AMPS?

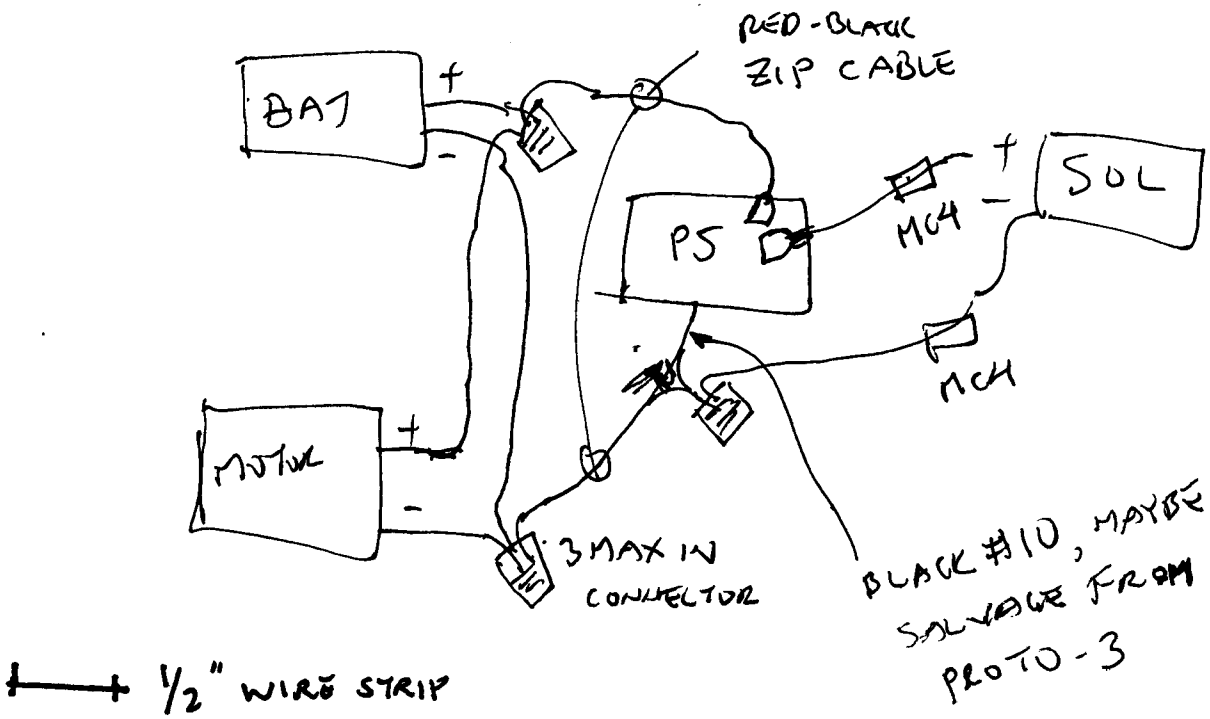
JUST FOR FUN, HOOK UP SOLAR PANEL TO MOTOR WITH NO BATTERY, ENOUGH POWER?

22APR2014
Roderick.

ABOUT 5PM. MEASURED OPEN CIRCUIT VOLTAGE OF SOLAR PANEL, PARTIAL SHADE. 31.2V. GOOD, HIGHER THAN ANY POSSIBLE LEAD ACID BATTERY VOLTAGE.

23APR14. FULL SUN SOLAR PANEL $V_{OC} = 30.0$ $I_{SC} = 7.95A$
FULLY CHARGED BATTERY, CONNECTED TO MOTOR $V_{OC} = 27.1$
START MOTOR, DROPS TO 26.8 WHILE RUNNING ON STAND. 0.3V CAN BE DETECTED.

CONNECTED SOLAR PANEL ONLY TO MOTOR.
MOTOR STARTS FOR A FRACTION OF A SECOND, BUT THEN WON'T GO. VOLTAGE READS 30.0 STILL ON PANEL. I THINK AUTOMATIC SPEED GOVERNOR IS SOMEHOW KICKING IN



23APR14
Roderick.

CHANGES CONSIDERED FOR PTC PILOT-5.

- GET RID OF DIODE TO 1000μF CAP
  SHORT IT. THEN POSSIBLY, CAP CAN HELP RUN MOTOR BATTERYLESS

10^{-3}F, LET'S SAY 10A 8V DROP

$i = C\,dV/dt$ $\quad dt = \frac{C\,dV}{i} = \frac{10^{-3} \cdot 8}{10}$

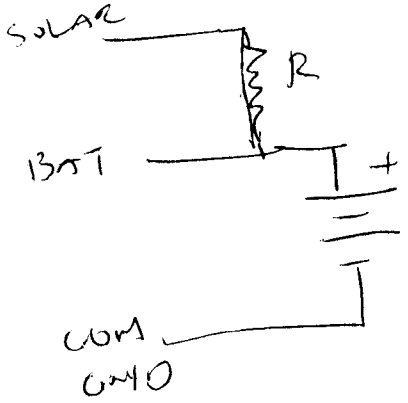
$= 8 \times 10^{-4}$ SEC

1 mS OR SO.

- REDUCE 562 Ω RESISTOR BETWEEN SOLAR & BATTERY FOR DEFAULT CHARGE TRICKLE.

REQUIREMENTS AND PRICING

LET'S SAY



BAT VOLTAGE = 23 MIN (DISCHARGED)

SOLAR VOLTAGE = 30

7 VOLT DIFFERENCE

WILL TAKE 1 WATT RESISTOR.

$P = E I = E^2/R$

$R = E^2/P = 49/1 = 50\,\Omega$

$I = \frac{E}{R} = \frac{7}{50} = \frac{140}{1000}$ 140mA

FULLY CHARGED BATTERY VOLTAGE = 27 V.

$I = \frac{30-27}{50} = \frac{3}{50} = 60$ mA GOOD TRICKLE

25APR14; Roderick.

TRIED PROTOS ON ACTUAL SOLAR PANEL AND BIKE ON STAND.

BEFORE BAT CONNECTED. V_{BAT}: 19560 mV

ON BAT CONNECTION 25960 OR 26000

MOTOR START 22200

ENTER ENGAGE

25400
25360
25440

} CONSIDERABLE VARIATION

KICKED ITSELF BACK INTO IDLE

KICKED ITSELF BACK INTO ENGAGE

→ MUST PUT A SCOPE ON V_{BAT} TO SEE WHAT'S GOING ON. TURN ON PHOSPHOR, TOO.

SCOPE SHOWS DROP FROM 26V TO ALMOST 20V AT MOTOR STARTUP. BUT THEN, NOISE OF ABOUT 3.5V p-p. NEED TEST PROGRAM TO ENGAGE PANEL AND LEAVE CONNECTED FOR 10 SECONDS.

26 APR 14. PROJECT FLEA MKT DAY. HOOKED UP SCOPE TO BIKE SETUP. ON MOTOR START, V_{BAT} DROPS FOR 250 - 450 mS, BUT RETURNS TO NORMAL LEVEL. PROBABLY BECAUSE BIKE IS ON STAND - ONCE WHEEL MAXES OUT ON SPEED, VERY LITTLE CURRENT DRAIN. EXPERIMENT ALSO SHOWS SOLAR PANEL DOES NOT BOOST THE BATTERY VOLTAGE BY DETECTABLE AMOUNT ON THIS HAZY DAY.