

# NINE STEPS TO SOLAR SUCCESS

MARK BREAKKEY

KB7RHI

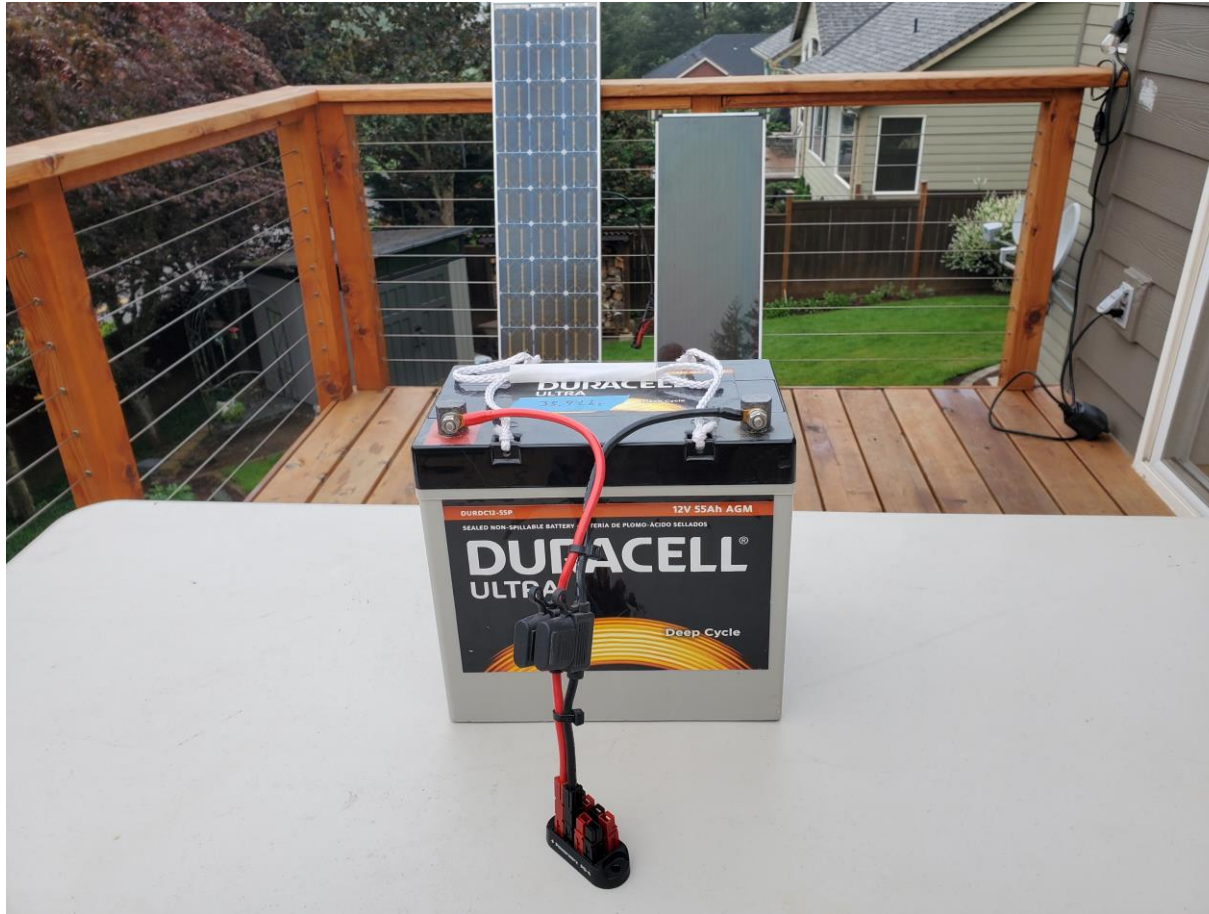
# PLEASE NOTE

- THIS PPT IS A HIGH LEVEL OVER VIEW OF DIFFERENT SOLAR POWER CONFIGURATIONS FOR YOUR RADIO STATION
- FOR A MORE IN DEPTH INFORMATION ABOUT BATTERIES, SOLAR PANELS AND CHARGE CONTROLLERS, PLEASE REFER TO THE SLIDES I PROVIDED ON THE SEAPAC WEBSITE IN 2019
- GO TO THE SEAPAC WEBSITE
- THEN GO TO WORKSHOPS, GO TO PAST WORKSHOPS, GO TO SLIDE PRESENTATIONS
- GO THE WORKSHOP PPTS SHOWING THE TOPIC YOU ARE WANTING MORE INFO ABOUT...THERE IS ABOUT 3 HOURS OF INFO REGARDING PORTABLE OPERATIONS WITH SOLAR POWER...THANK YOU

STEPS TO TAKE WHEN HOOKING UP SOLAR TO  
YOUR AGM BATTERY...HAVE AN INLINE FUSE  
CLOSE TO THE BATTERY...RGH-10



# NEXT STEP, CONNECT YOUR BATTERY TO A DISTRIBUTION BLOCK

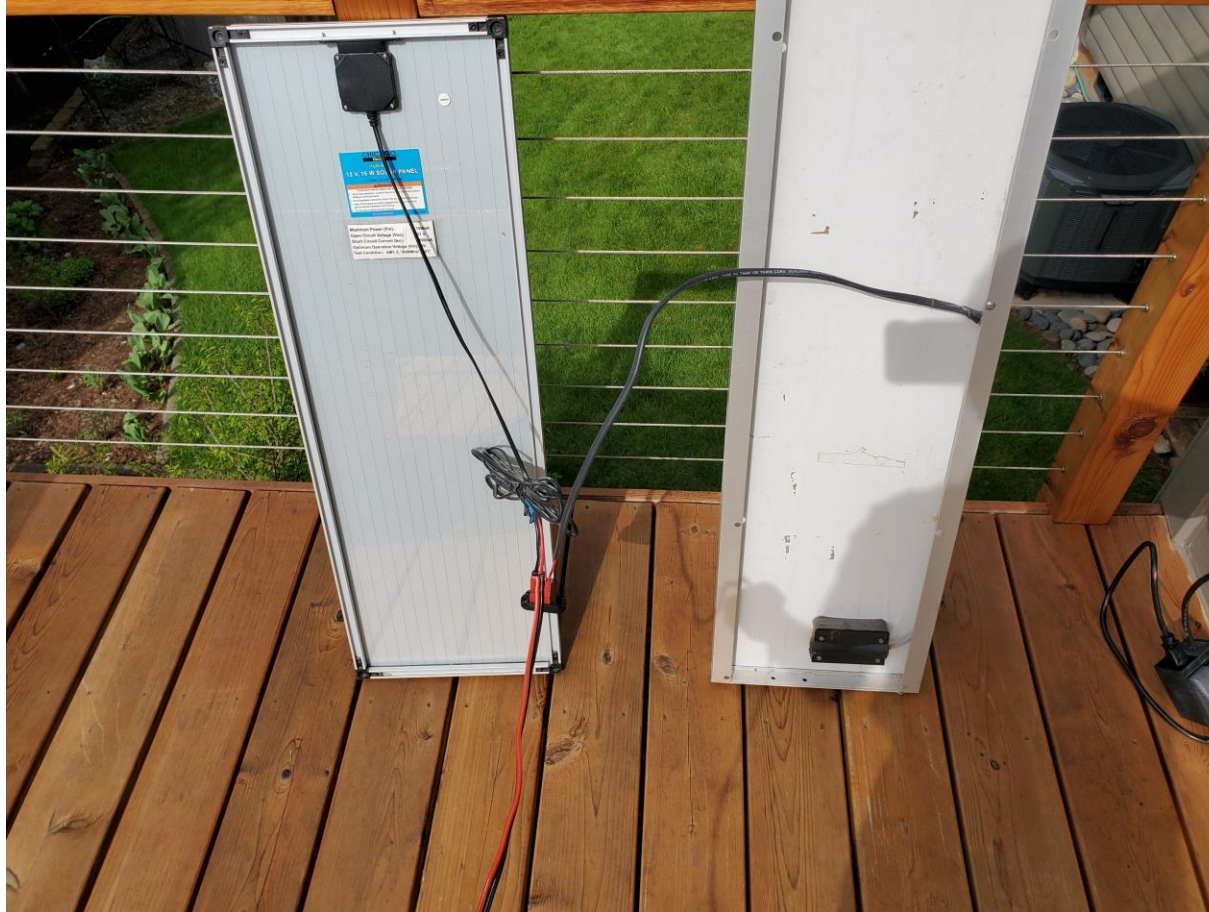




CONNECT THE CHARGE CONTROLLER TO THE BATTERY FIRST, IN LINE METER BETWEEN THE CC AND YOUR BATTERY WILL SHOW TOTAL SOLAR INPUT



YOU CAN PARALLEL CONNECT SOLAR PANELS  
WITH THE ~ SAME VOLTAGE OUTPUT, 40 WATT  
AND 15 WATT SOLAR PANELS

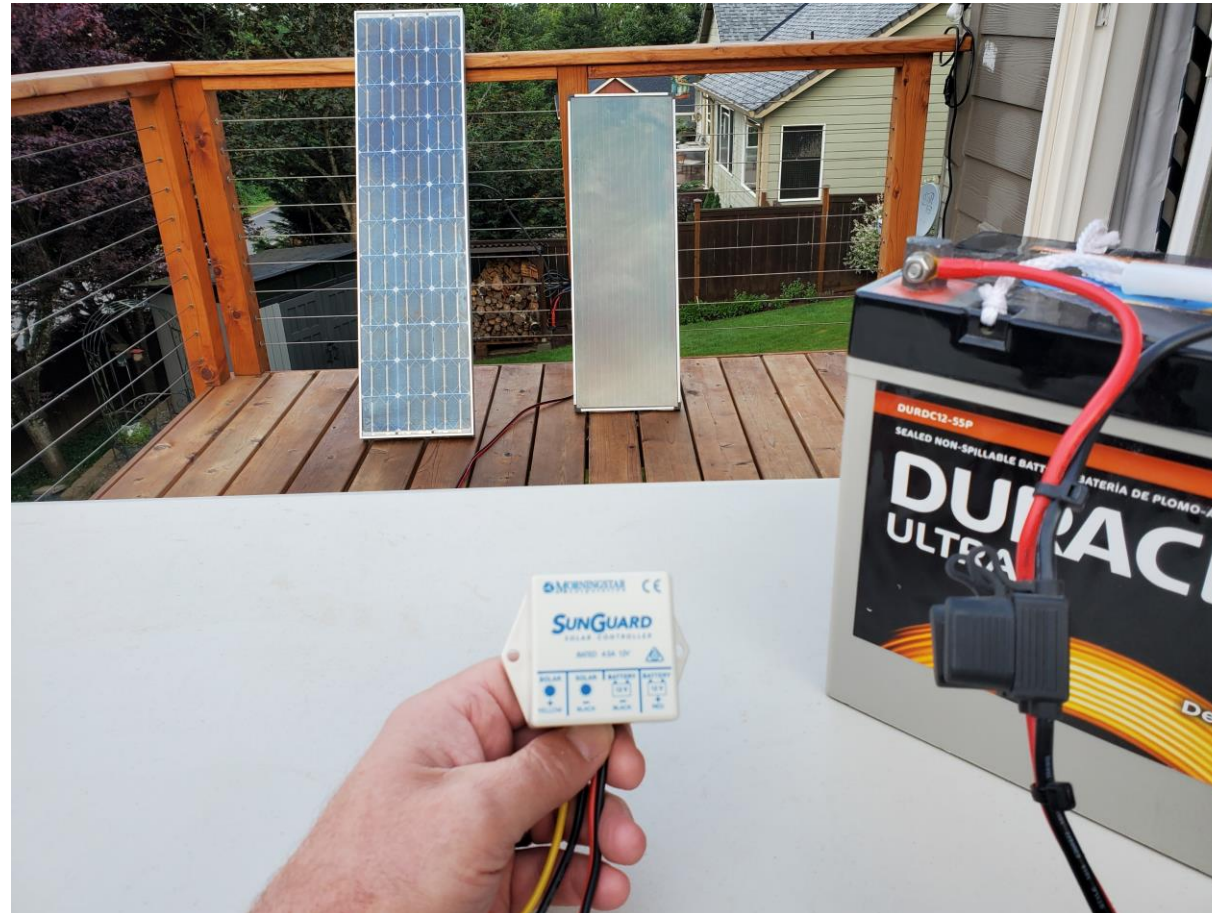




NEXT CONNECT THE SOLAR POWER CABLE TO THE  
CHARGE CONTROLLER AND ADD YOUR RADIO

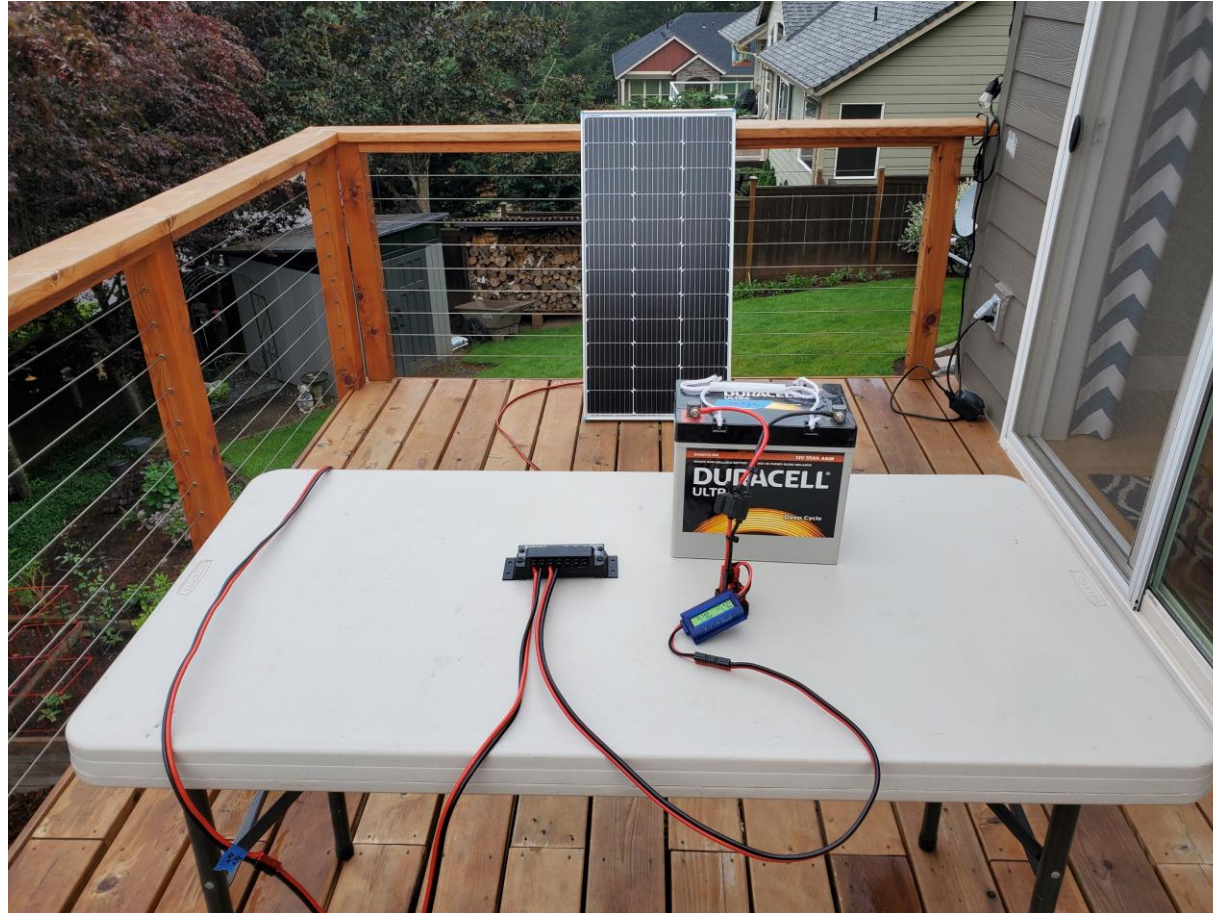


MORNINGSTAR 4.5 AMP SUNGUARD PWM  
CHARGE CONTROLLER FOR 12 VOLT LEAD ACID  
BATTERIES...MAX "Voc" IS 30 VOLTS...(NO SERIES  
SOLAR PANEL CONNECTIONS)...PARALLEL ONLY

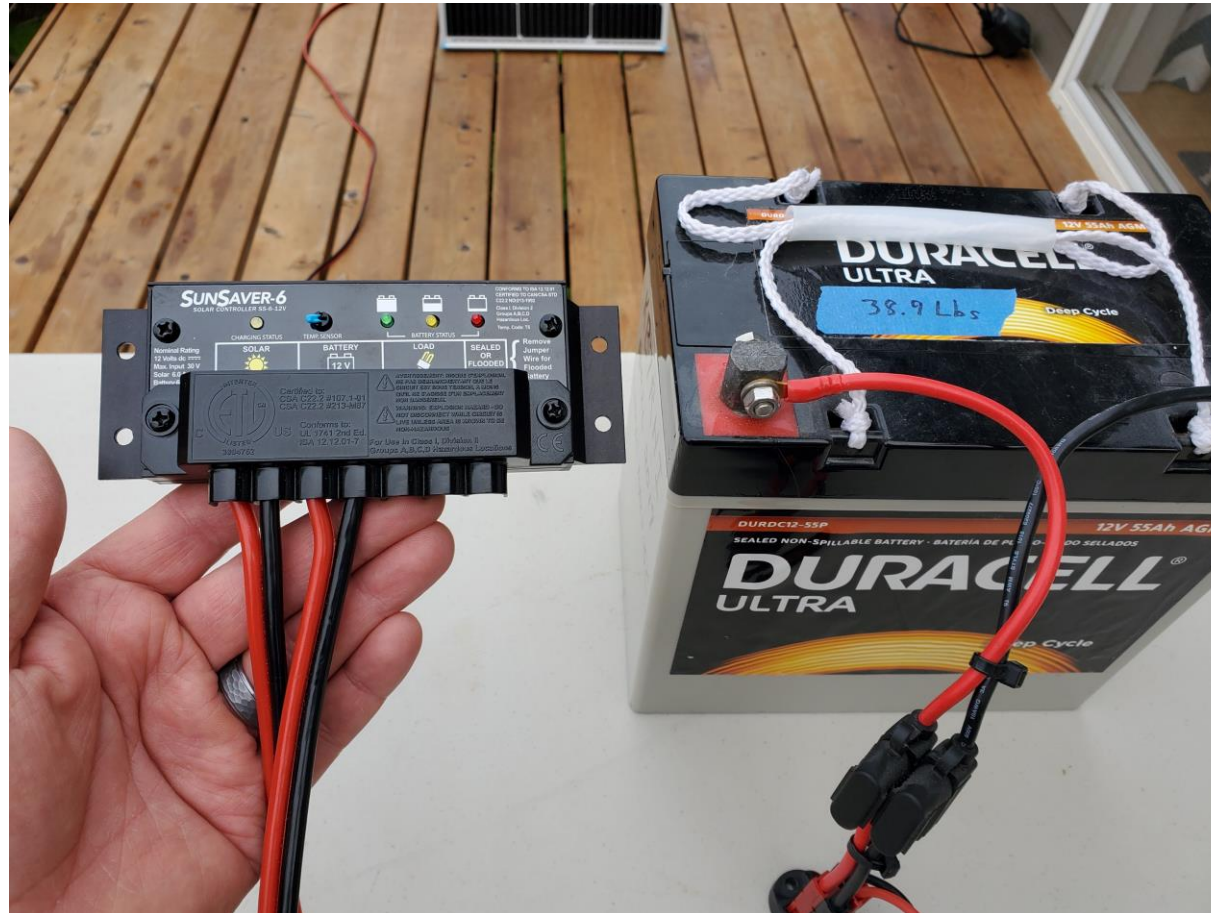




6 AMP MORNINGSTAR "SUNSAVER 6" CHARGE CONTROLLER...CAN CONNECT TO A 100 WATT SOLAR PANEL...YOU NEED A CC RATED FOR  $> 5.5$  AMPS WITH 100 WATT SOLAR PANEL



# CLOSER LOOK AT THE “SUNSAVER 6”...ONLY FOR LEAD ACID BATTERIES





NATURE POWER 1<sup>st</sup> GENERATION SOLAR CHARGE  
CONTROLLER...CUT-OUT VOLTAGE IS 14.2v AND  
CUT-IN VOLTAGE IS 13v...8 AMP  
CONTROLLER...WILL “PROTECT” YOUR BATTERY



# MC-4 CONNECTORS VERSUS ANDERSON POWER POLE CONNECTORS

- THE ANDERSON POWER POLE CONNECTOR CAN BE “HOT CONNECTED” OR DISCONNECTED ABOUT 200 TIMES
- IS IDEAL IF YOU MAKE PP CONNECTIONS WITHOUT CURRENT FLOWING
- THE MC-4 CONNECTOR IS NOT MADE TO BE CONNECTED OR DISCONNECTED UNDER LOAD. YOU WILL NEED TO SHADE YOUR PANEL WHEN CONNECTING OR DISCONNECTING WITH MC-4s

GAME CHANGER...LIGHT WEIGHT LITHIUM  
IRON(Fe) PHOSPHATE (LFP) BATTERIES...LOTS OF  
POWER AND SOME CAN EASILY FIT IN YOUR  
BACKPACK 😊



# LEAD ACID VERSUS LFP BATTERIES

## LEAD ACID BATTERIES

- HEAVY
- CAN ACCEPT A CHARGE CURRENT OF ABOUT 20-25% OF RATED AH
- CAN OUTPUT ABOUT 20% OF RATED AH, ADD SOLAR AND MORE TOTAL POWER IS AVAILABLE
- CAN “FAST CHARGE” UP TO 80% OF SOC, THEN SLOW CHARGE FINAL 20%
- HAS A “SLOPING” DISCHARGE CURVE..VOLTAGE DROPS WITH LOWER SOC
- CAN SAFELY DISCHARGE DOWN TO ABOUT 50% OF SOC, <50% SOC CAN SHORTEN BATTERY LIFE
- MUST BE CHARGED BACK UP SOON AFTER USE OR SULFATION OCCURS
- LASTS ABOUT 500 CYCLES, ~ 3-5 YEARS

## LFP BATTERIES (Lithium Fe Phosphate)

- LIGHT WEIGHT
- CAN ACCEPT A CHARGE CURRENT UP TO 40% OF RATED AH
- CAN OUTPUT UP TO 100% OF RATED AH, SOME CAN EVEN EXCEED THE RATED AH AS A PEAK LOAD
- CAN “FAST CHARGE” TO NEARLY 100%
- HAS A FAIRLY “FLAT” DISCHARGE VOLTAGE CURVE
- CAN SAFELY DISCHARGE DOWN TO ALMOST 0% SOC, BMS WILL “TURN OFF” OUTPUT IF SOC = 0%
- NO SULFATION, DOES NOT NEED TO BE CHARGED BACK UP FULLY AFTER USE
- LASTS ABOUT 2,000 CYCLES
- A NUMBER ARE BACKPACK SIZED 😊

WHEN SETTING UP THE LFP BATTERY, BEST PRACTICE IS TO HAVE AN INLINE FUSE CLOSE TO THE BATTERY



# NEXT CONNECT A DISTRIBUTION BLOCK

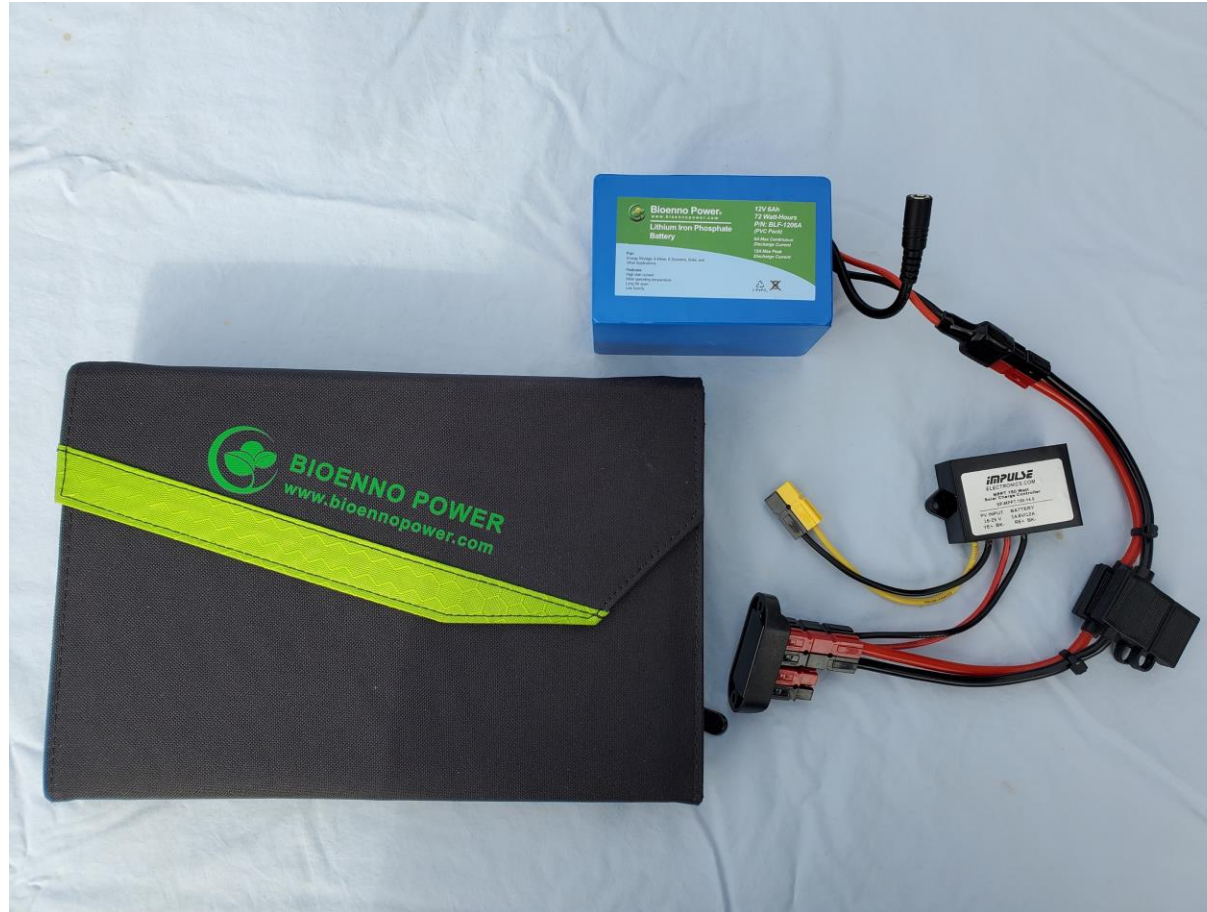




# CONNECT YOUR CHARGE CONTROLLER TO THE BATTERY FIRST...IMPULSE ELECTRONICS 150 WATT “MPPT-150” CHARGE CONTROLLER FOR THIS EXAMPLE



# SMALL FOLDABLE SOLAR PANEL THAT WILL FIT IN A BACKPACK...BIOENNO POWER BSP-28

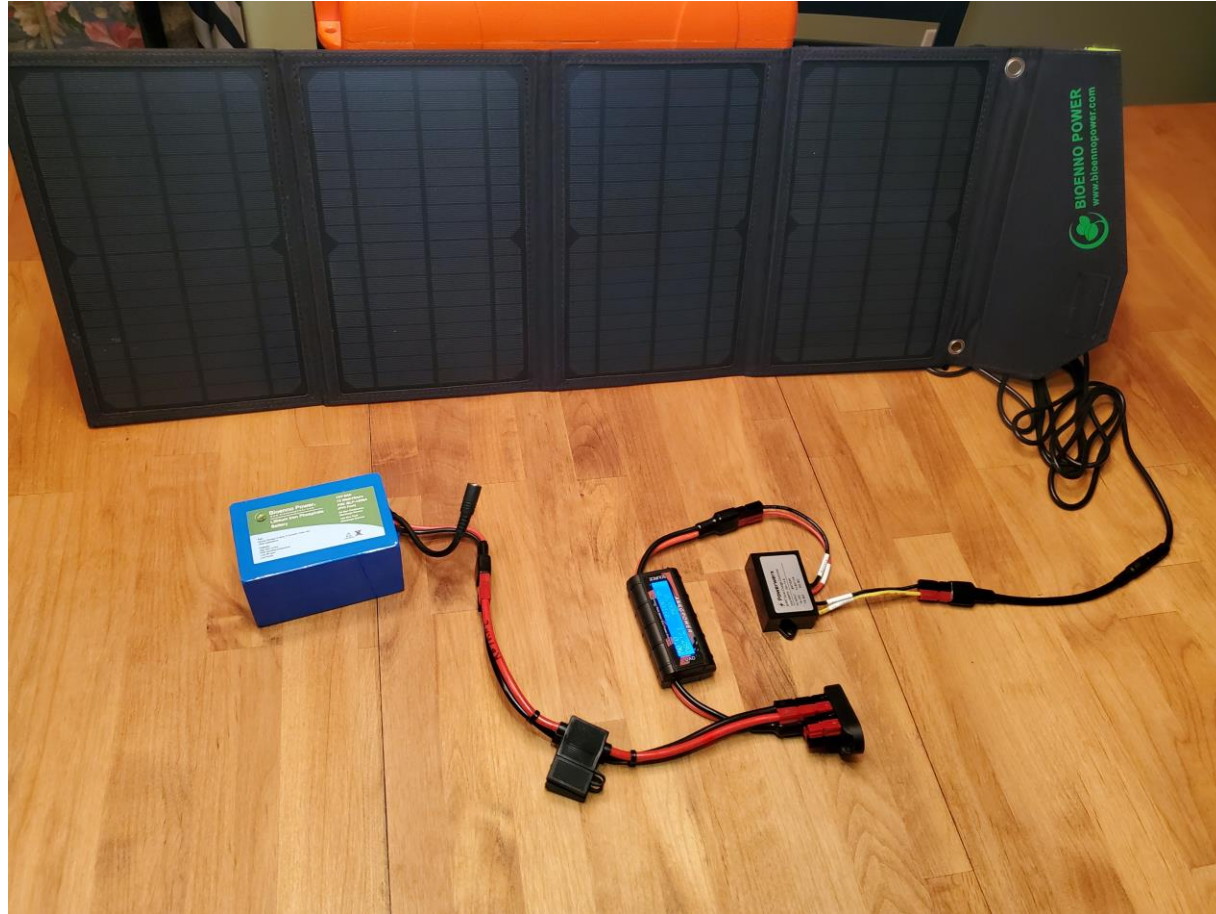


# BIOENNO POWER 28 WATT FOLDABLE SOLAR PANEL WITH ONE USB OUTPUT AND 12V OUTPUT





# BIOENNO POWER 28 WATT SOLAR PANEL OPENED UP AND CONNECTED TO THE CHARGE CONTROLLER WITH INLINE DC METER IN USE



PORTABLE POWER SET UP, NOW ADD YOUR  
RADIO 😊



# BACKPACK SIZE PORTABLE SOLAR POWER FOR CHARGING YOUR HT RADIO





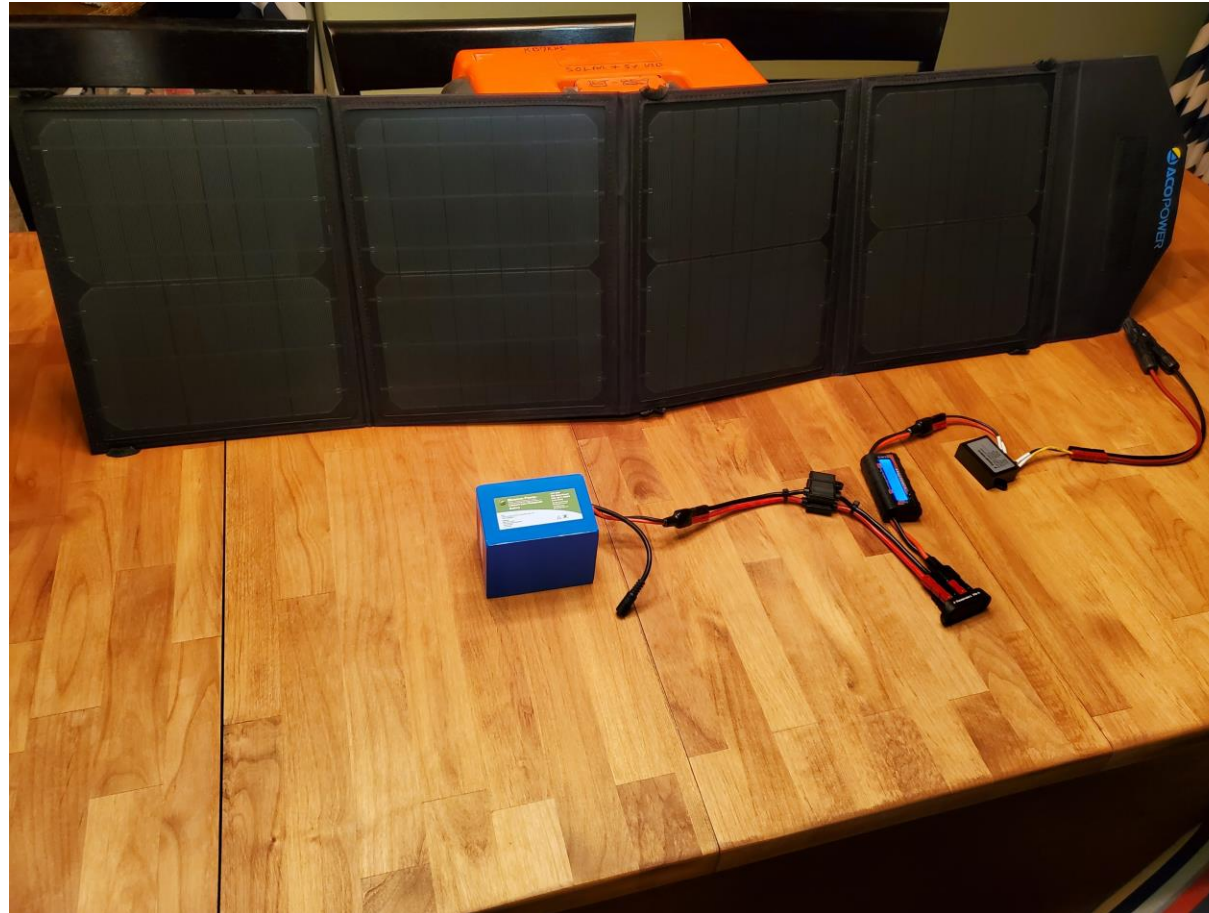
ADDING A HIGHER GAIN ANTENNA WILL BE A BIG HELP, STILL SMALL ENOUGH TO FIT IN A BACKPACK



# ANOTHER BACKPACK SIZED BATTERY, THE BIOENNO POWER 9AH LFP BATTERY



# BIOENNO POWER 9AH LFP BATTERY WITH ACOPOWER 50 WATT FOLDABLE SOLAR PANEL





# BACKPACK SIZED BATTERY WITH 20 AMP MAX LOAD PER THE INSTALLED BMS, THE BIOENNO POWER 12AH LFP BATTERY



# BIOENNO POWER BSP-60-LITE PORTABLE SOLAR PANEL READY TO BE CONNECTED WITH GENASUN GV-5 MPPT CHARGE CONTROLLER



# BIOENNO POWER BSP-60-LITE SOLAR PANEL WITH THE CABLE ACCESS POCKET OPENED UP

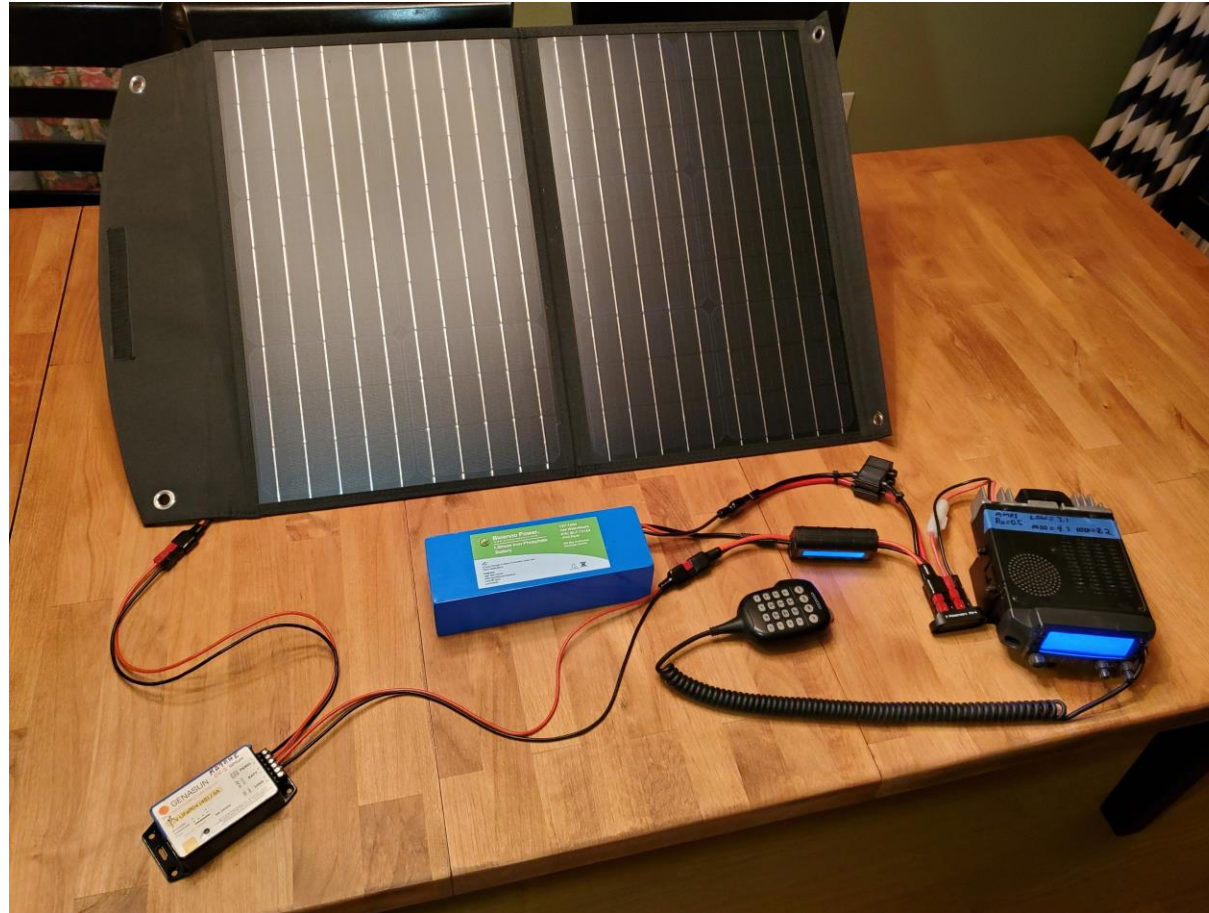




# BIOENNO POWER BSP-60-LITE FOLDABLE SOLAR PANEL HAS BUILT IN SUPPORT LEGS



FOLDABLE SOLAR PANEL, CHARGE CONTROLLER, IN  
LINE DC METER, DISTRIBUTION BLOCK, IN LINE  
FUSE, LFP BATTERY, AND JUST ADD YOUR RADIO



GAME CHANGER...A SMALL IN SIZE POWER BOX  
THAT HOLDS A 20AH LFP BATTERY, WHICH IS THE  
PERFECT SIZE FOR A 100 WATT SOLAR PANEL



# SOLAR PANEL SIZING IN FULL SUN WITH YOUR BIOENNO LFP BATTERY USING AN MPPT CC

LFP BATTERY SIZE	MAX CHARGING INPUT AMPS	MAX SOLAR PANEL WITH MPPT CC
10AH	4 AMPS	50 WATTS
20AH	8 AMPS	100 WATTS
30AH	12 AMPS	150 WATTS
40AH	16 AMPS	200 WATTS
50AH	20 AMPS	250 WATTS
70AH	28 AMPS	350 WATTS



# BIOENNO POWER LFP BATTERY MAX CONTINUOUS DISCHARGE CURRENT AND MAX CHARGING CURRENT INFO

LFP BATTERY SIZE	MAX CONTINUOUS DISCHARGE CURRENT...IS BMS DEPENDENT	MAX CHARGING CURRENT...40% OF THE RATED LFP AH
6AH	12 AMPS	2.4 AMPS
9AH	12 AMPS	3.6 AMPS
12AH	20 AMPS...NOT FOR HIGH PWR HF	4.8 AMPS
20AH	40 AMPS...OK FOR HIGH PWR HF 😊	8.0 AMPS
30AH	30 AMPS	12 AMPS
40AH	40 AMPS	16 AMPS
50AH	50 AMPS	20 AMPS

MITY GO-BOX T300/320 WITH TWO ANDERSON  
PPs, AUTOMOTIVE 12 V SOCKET, AND DVM WITH  
USB A + PD QC 3.0, AND BUILT IN 30 AMP FUSE



# IMPULSE ELECTRONICS DC12 MITY GO-BOX T300 WITH 20AH BIOENNO POWER LFP BATTERY AND SOME ACCESSORIES THAT YOU CAN ADD





MITY GO-BOX WITH SHORT 10G WIRE WITH PP,  
PD-8 DISTRIBUTION BLOCK, MPPT-150 CC, PHONE  
CHARGING CORD, 15W USB C AND 12W USB A  
ADAPTER



MITY GO-BOX BEING CHARGED WITH A 100 WATT  
SOLAR PANEL, READY TO CHARGE TWO PHONES  
AND ADD IN YOUR RADIO 😊

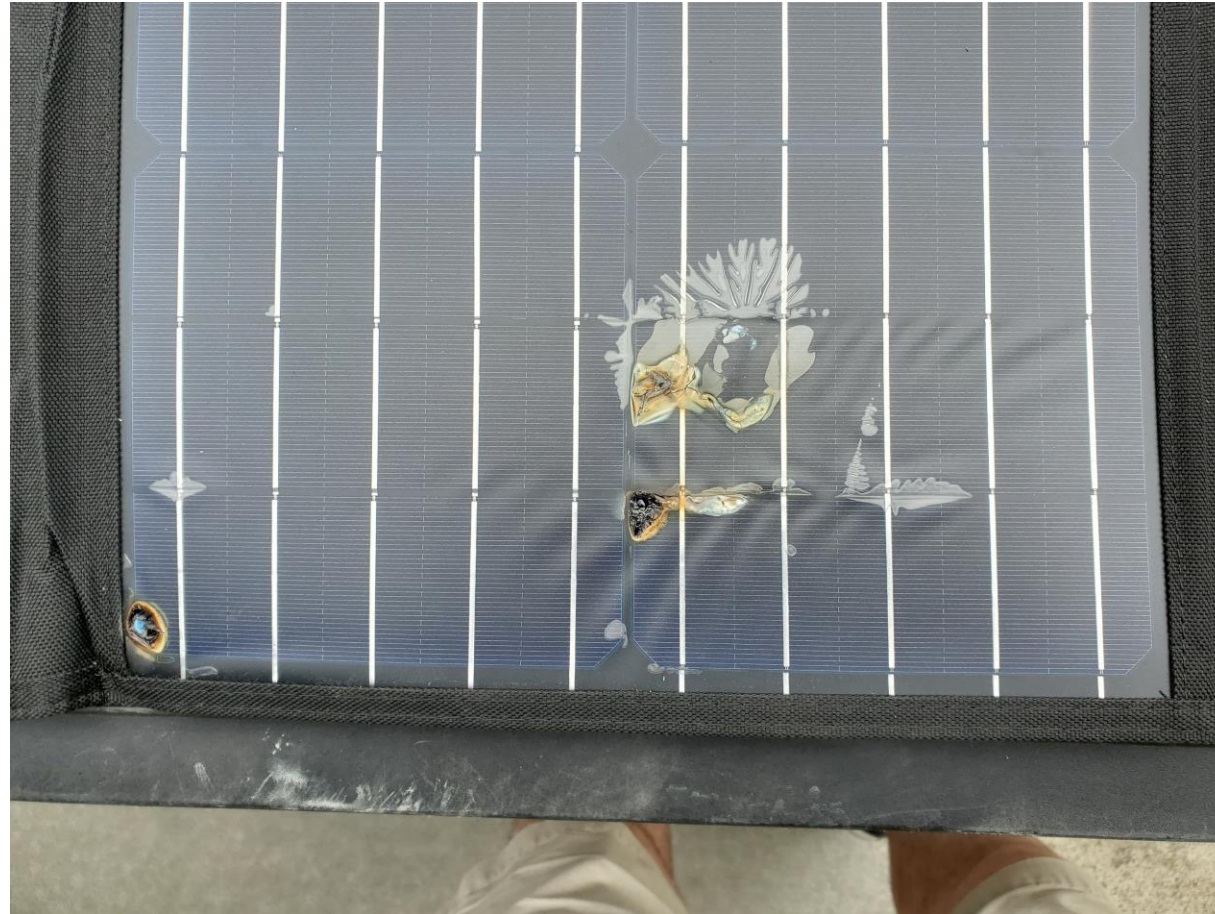


# MITY GO-BOX HOOKED UP TO A BIOENNO POWER BSP-100-LITE FOLDABLE 100 WATT SOLAR PANEL





ONE NOTE OF CAUTION...THE FOLDABLE DRY  
WEATHER SOLAR PANELS CAN GET **VERY HOT** IN  
DIRECT SUN...LET THEM COOL DOWN A MOMENT  
BEFORE YOU FOLD THEM BACK UP OR THIS COULD  
HAPPEN



# MITY GO-BOX HOOKED UP TO TWO SUNPOWER 50 WATT FLEX PANELS CONNECTED IN PARALLEL



DOUBLE YOUR JOY AND CONNECT TWO MITY GO-BOXES TOGETHER...OK IF BOTH FULLY CHARGED AND SAME SIZE BATTERY IN BOTH, USING A DIYSOLAR4U SOL 20 AMP MPPT CC...MORE RF QUIET





# TWO 100 WATT SOLAR PANELS AND TWO MPPT-150 CC CONNECTED TO YOUR 40AH BATTERY BANK...FLEXIBLE CHARGING SOLUTIONS

- TWO MITY GO-BOXES CONNECTED IN PARALLEL CAN ALSO BE CHARGED WITH TWO SEPARATE CHARGE CONTROLLERS, EACH CONNECTED TO THEIR OWN SOLAR PANEL
- EXAMPLE
- A **FIRST** MPPT-150 CC CAN BE CONNECTED TO THE DISTRIBUTION BLOCK, AND THEN CONNECTED TO A 100 WATT SOLAR PANEL
- A **SECOND** MPPT CHARGE CONTROLLER CAN BE ALSO CONNECTED TO THE SAME DISTRIBUTION BLOCK, AND THEN HOOKED UP TO A SECOND 100 WATT SOLAR PANEL
- BOTH CHARGE CONTROLLERS CAN NOW PROVIDE UP TO 200 WATTS OF SOLAR TO THE TWO 20 AH LFP MITY GO-BOX BATTERIES...YOU NOW HAVE A **40AH** BATTERY BANK BEING CHARGED WITH **200** WATTS OF SOLAR 😊

POWERWERX “PWRBOX” WITH BUILT IN 30 AMP FUSE, HAS SEVERAL POWER ACCESS PORTS



POWERWERX "PWRBOX" WITH ANDERSON PP X 2,  
DVM, USB-A X 2, AUTOMOTIVE POWER SOCKET,  
AND M6 BINDING POSTS FOR 1/4" RING  
TERMINALS...THIS IS AN OLDER MODEL PWRBOX



# “PWRBOX” WITH 30AH BATTERY AND ROOM FOR EXTRA ITEMS YOU CAN ADD

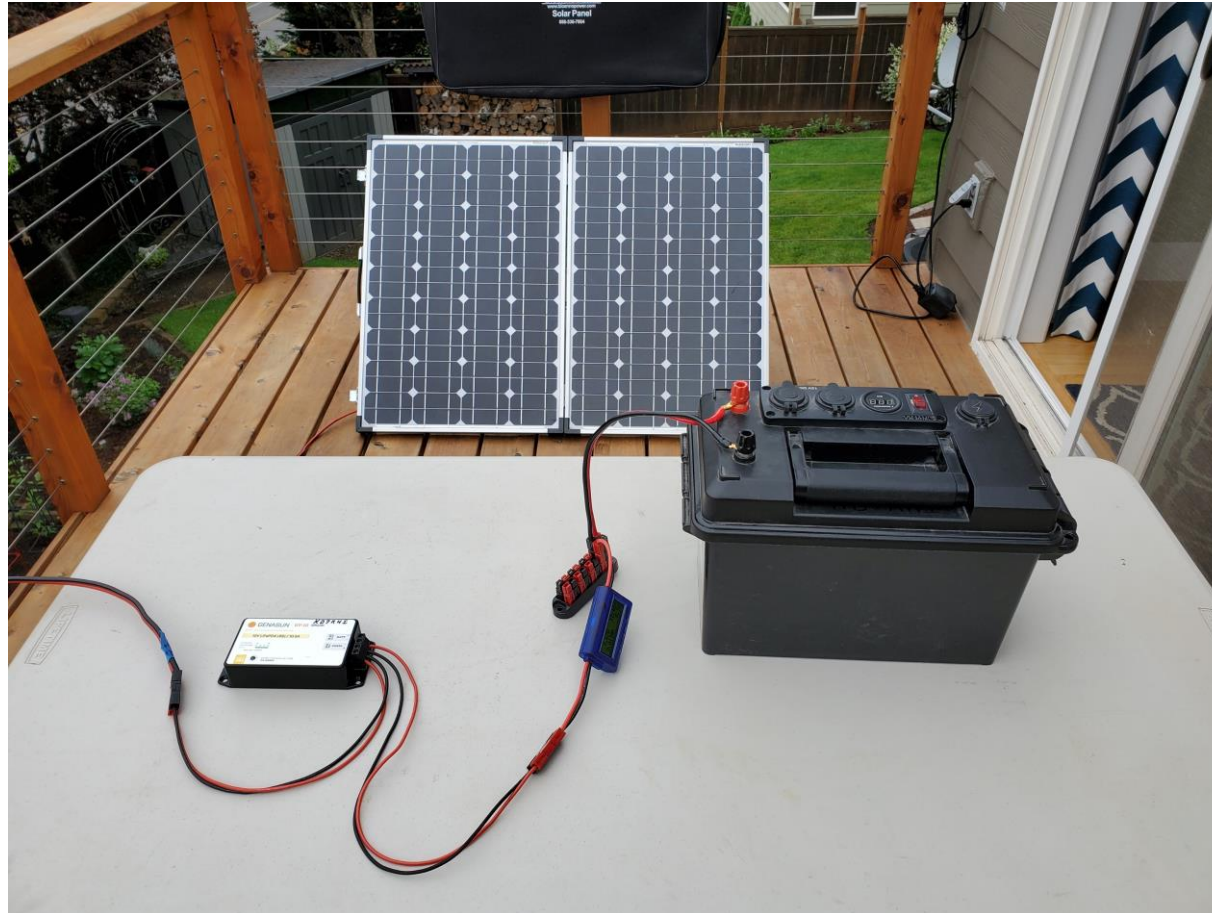




“PWRBOX” WITH A SOLAR PANEL POWER CABLE,  
CC, DISTRIBUTION BLOCKS, INLINE METER, EXTRA  
FUSE, HEADLAMP, PHONE CHARGING CABLE, USB  
CAR ADAPTER



“PWRBOX” WITH SHORT CONNECTOR FROM  
BINDING POST TO PD-8, GENASUN GV-10, IN LINE  
METER, CONNECTED TO BIOENNO POWER 120  
WATT “ALL WEATHER” FOLDABLE SOLAR PANEL



“PWRBOX” CONNECTED TO BIOENNO POWER 120 WATT FOLDABLE SOLAR PANEL WITH A POWERWERX MPPT-150 CC, GREAT FOR VHF/UHF





# BIOENNO POWER 120 WATT FOLDABLE SOLAR PANEL WITH A COVER



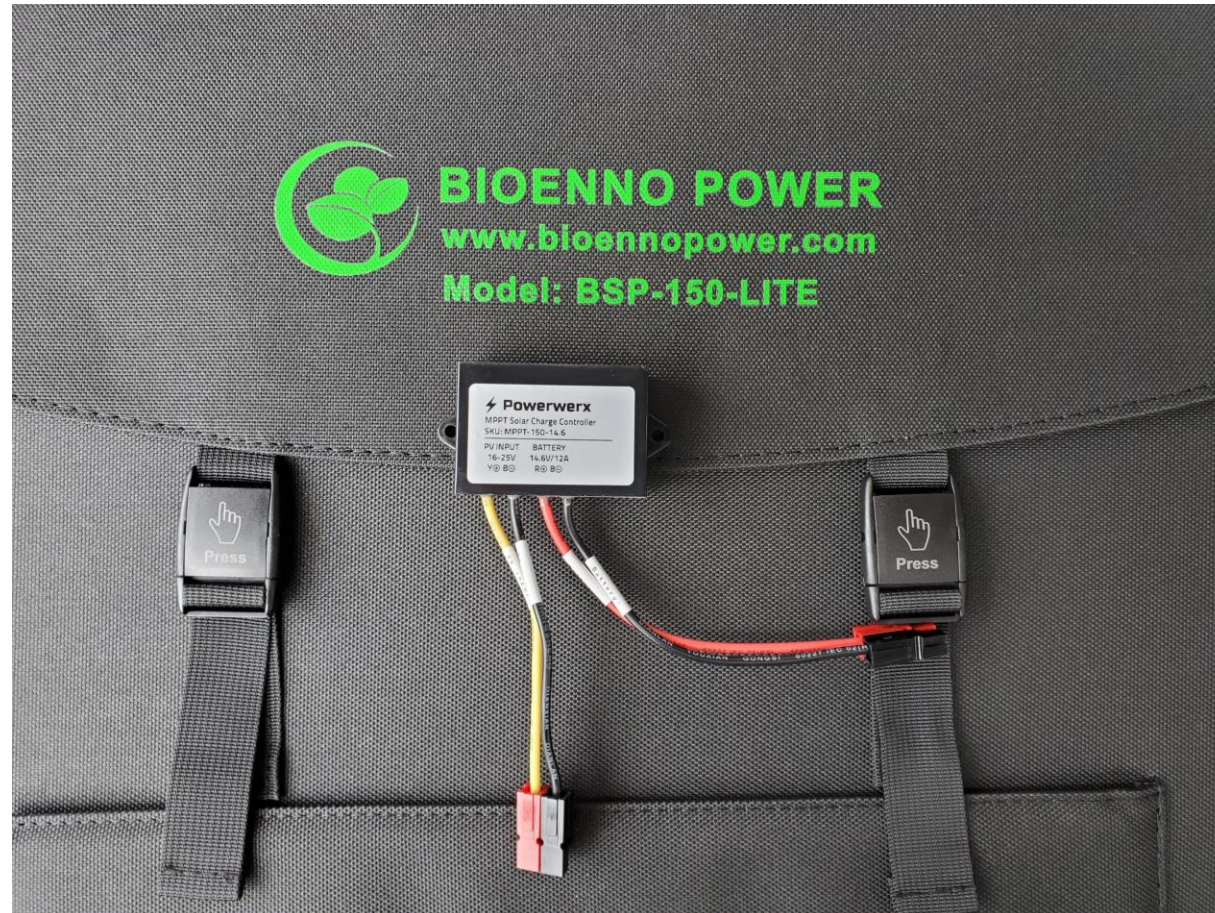


“PWRBOX” WITH 30AH LFP BATTERY AND 120 WATT SOLAR PANEL CONNECTED TO 400W TRUE SINE WAVE INVERTER RUNNING A BOX FAN

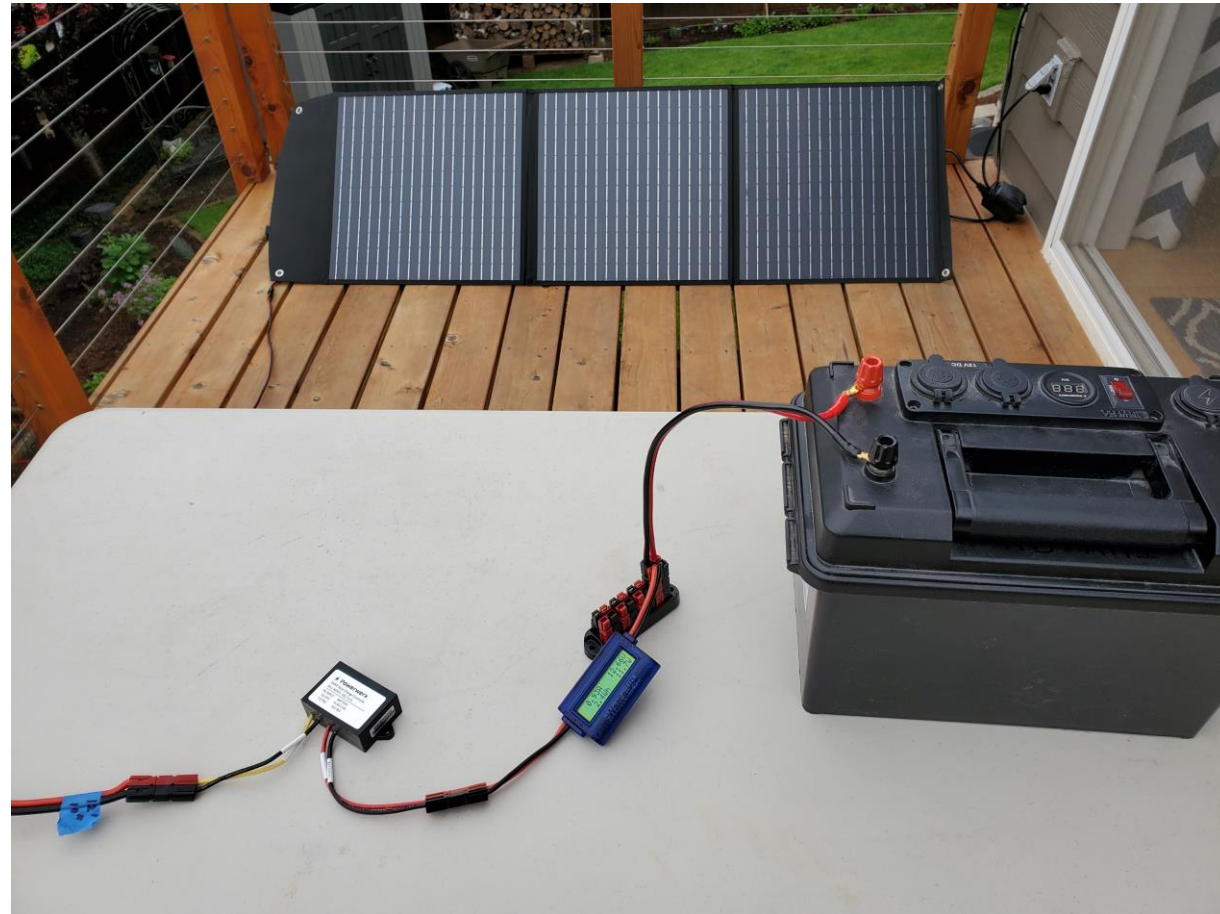




# THE PERFECT COMBO FOR YOUR 30AH LFP BATTERY...THE BSP-150-LITE FOLDABLE SOLAR PANEL AND THE MPPT-150 CHARGE CONTROLLER



LIGHT WEIGHT, "DRY WEATHER" BIOENNO POWER  
BSP-150-LITE SOLAR PANEL AND THE MPPT-150  
CC, MAX INPUT FOR YOUR 30AH LFP BATTERY





RENOGY 200 WATT FOLDABLE RIGID SOLAR PANEL  
WITH BUILT IN 20 AMP PWM CC...CAN BE  
DIRECTLY CONNECTED TO YOUR 30AH LFP  
BATTERY USING THE BUILT IN CC



BACK SIDE OF THE RENOGY 200 WATT FOLDABLE SOLAR PANEL...THE ATTACHED PWM CHARGE CONTROLLER IS BEING USED...MAX OUTPUT ~ 11 AMPS...UNDER THE 12 AMP MAX FOR 30AH LFP





# RENOGY 200 WATT FOLDABLE SOLAR PANEL...WIRED UP FOR DIRECT ACCESS TO 200 WATTS BY BYPASSING THE BUILT IN CHARGE CONTROLLER





LOTS OF POWER, BUT STILL PORTABLE IN SIZE, IS  
THE POWERWERX MEGABOX WITH A “GAME  
CHANGER” INSIDE



# POWERWERX MEGABOX WITH USB PORTS, DVM, AUTOMOTIVE SOCKET, ANDERSON PPS, LIGHT, M6 BINDING POSTS 😊



# POWERWERX MEGABOX WITH 70AH LFP BATTERY WITH ROOM INSIDE FOR SOME ADDITIONAL ITEMS

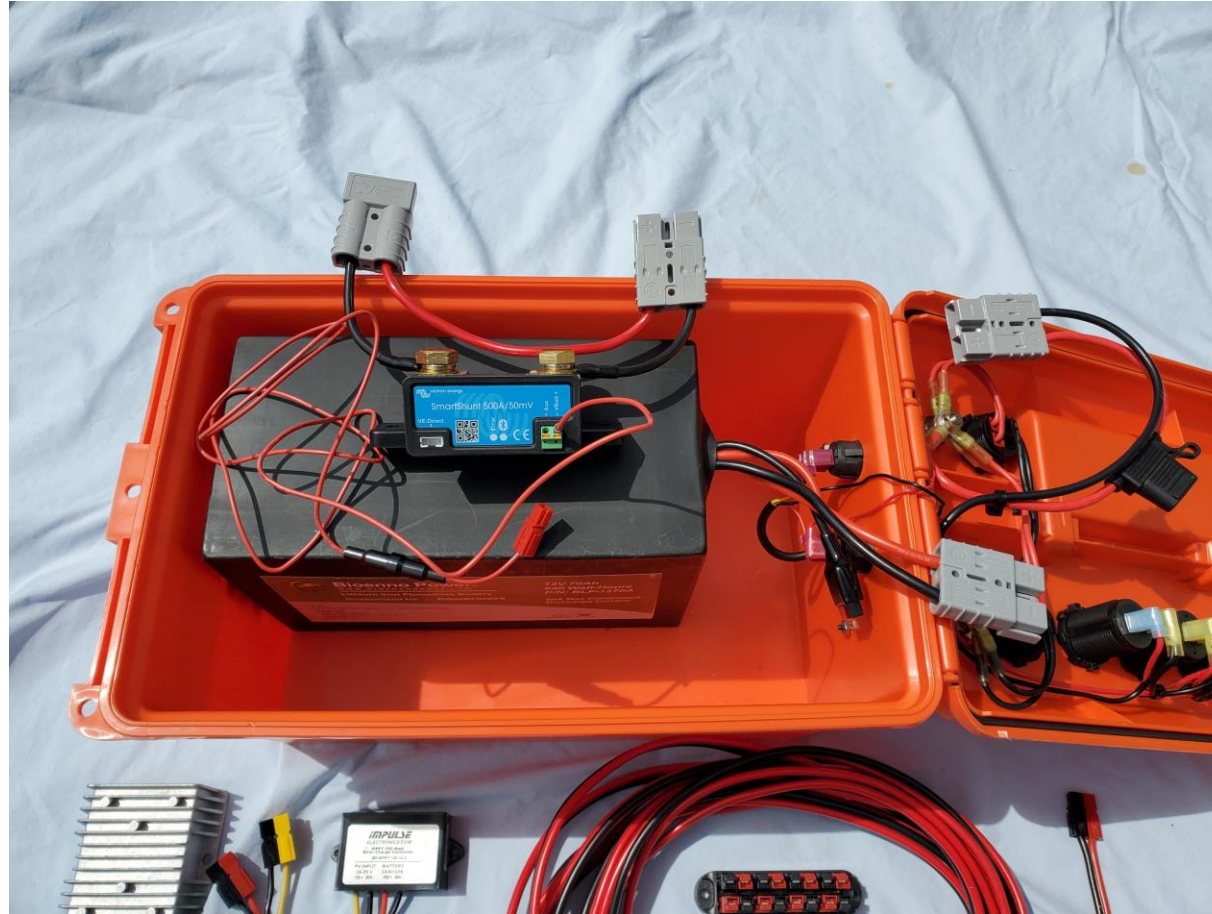




# MEGABOX WITH CCs, SOLAR PANEL POWER CABLE, DISTRIBUTION BLOCK, PHONE CABLES, INLINE METER, AND SERIES CONNECTION ADAPTERS



MEGABOX “GAME CHANGER”, VICTRON  
SMARTSHUNT 500 AMP, HAS BT TO CONNECT TO  
YOUR VICTRON PHONE APP

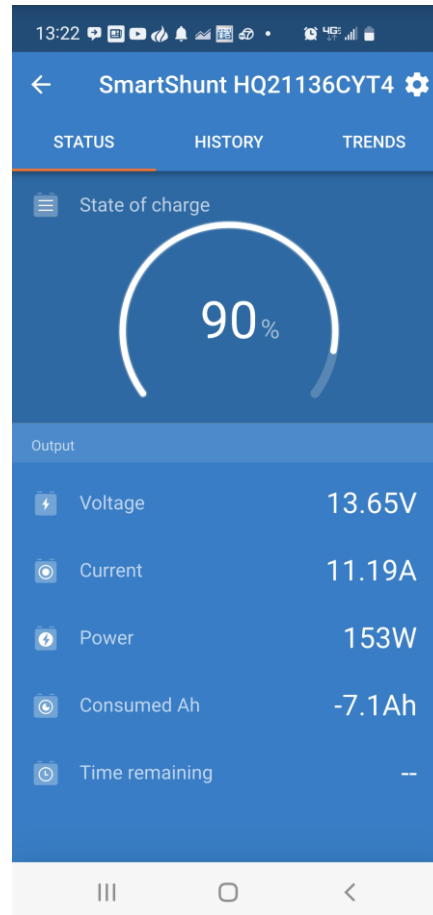


# VICTRON SMARTSHUNT IS A “GAS GAUGE” FOR LFP BATTERY

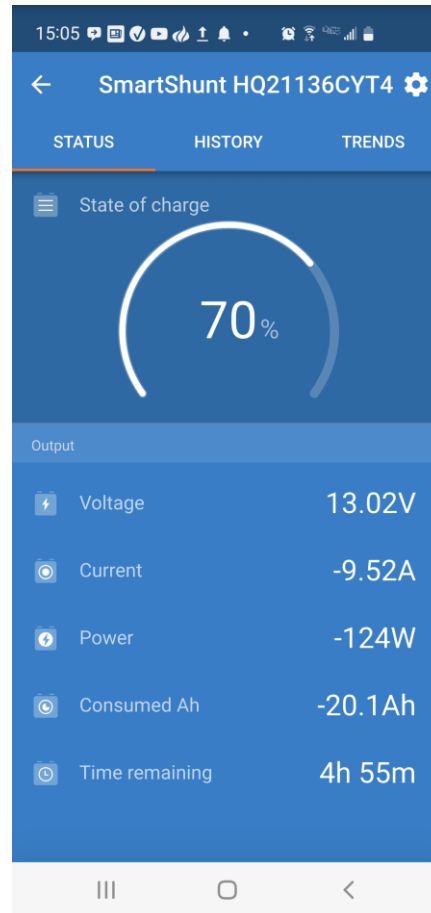
- YOU SEE EXACTLY HOW MUCH POWER IS GOING INTO OR OUT OF YOUR BATTERY IN THE MOMENT AND YOU SEE THE BATTERY SOC AS A PERCENTAGE
- HAS BUILT IN BT FOR CONNECTION TO YOUR PHONE
- THE VICTRON ECOSYSTEM USES A PHONE APP TO MONITOR AND INTERACT WITH VICTRON COMPONENTS
- THE MEGABOX HAS SEVERAL 5 VOLT AND 12 VOLT ACCESS PORTS AND WITH SOLAR POWER COMING IN AND MULTIPLE DEVICES BEING HOOKED UP, IT CAN BE A CHALLENGE TO MANAGE YOUR BATTERY USE...NOT ANY MORE...THIS IS HUGE “GAME CHANGER”



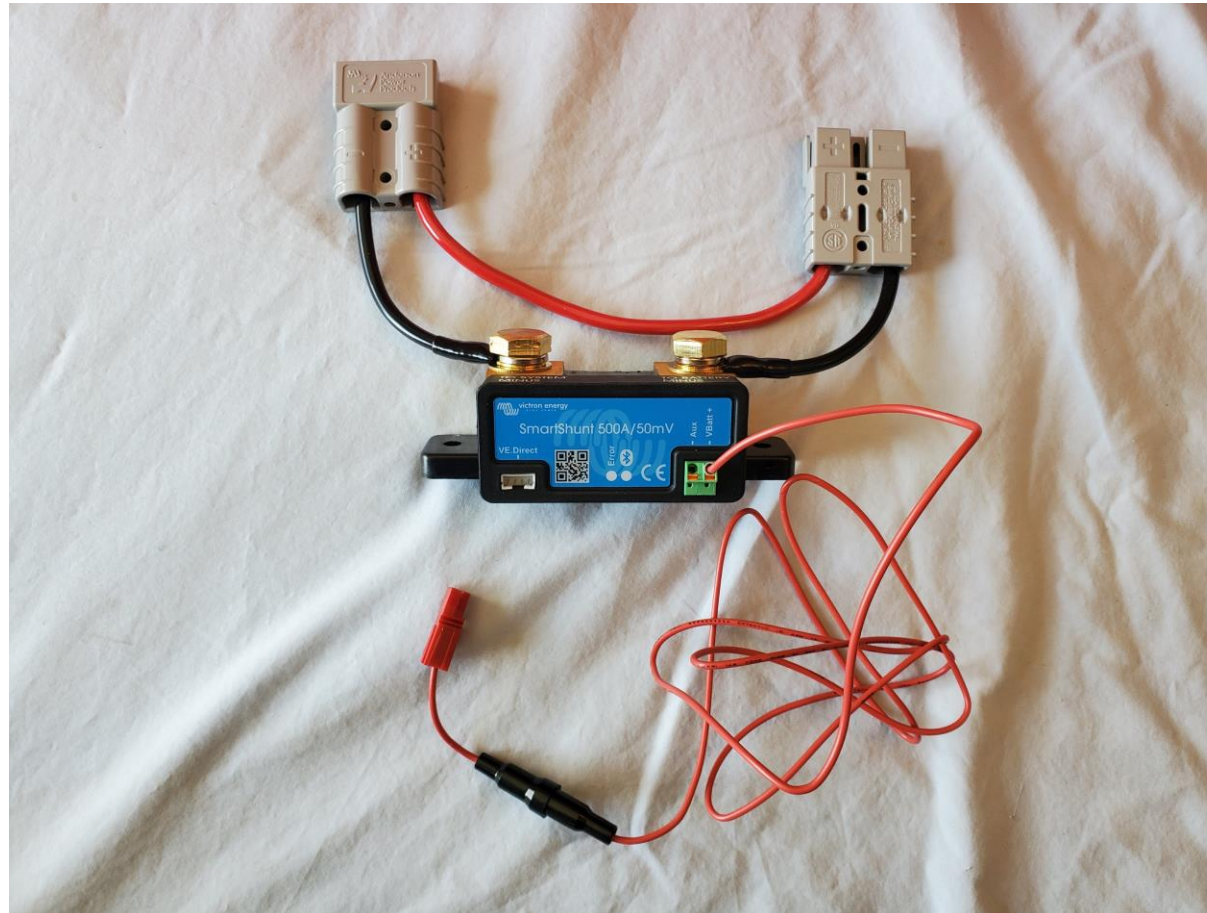
EXAMPLE OF A “VICTRON SMARTSHUNT” PHONE APP SCREEN SHOT SHOWING 200 WATTS OF SOLAR INPUT ONLY... NO LOAD ATTACHED TO THE MEGABOX



EXAMPLE OF A SCREEN SHOT OF THE “VICTRON  
SMARTSHUNT”...NO SOLAR INPUT THIS TIME...  
JUST SHOWING A CONSTANT LOAD USING A 400  
WATT INVERTER RUNNING A BOX FAN



VICTRON SHUNT CONNECTED TO TWO  
SB50s...THIS IS 10G WIRE, RECOMMEND USING 8G  
WIRE, VERY HARD TO CRIMP USING SMALLER 10G  
WIRE

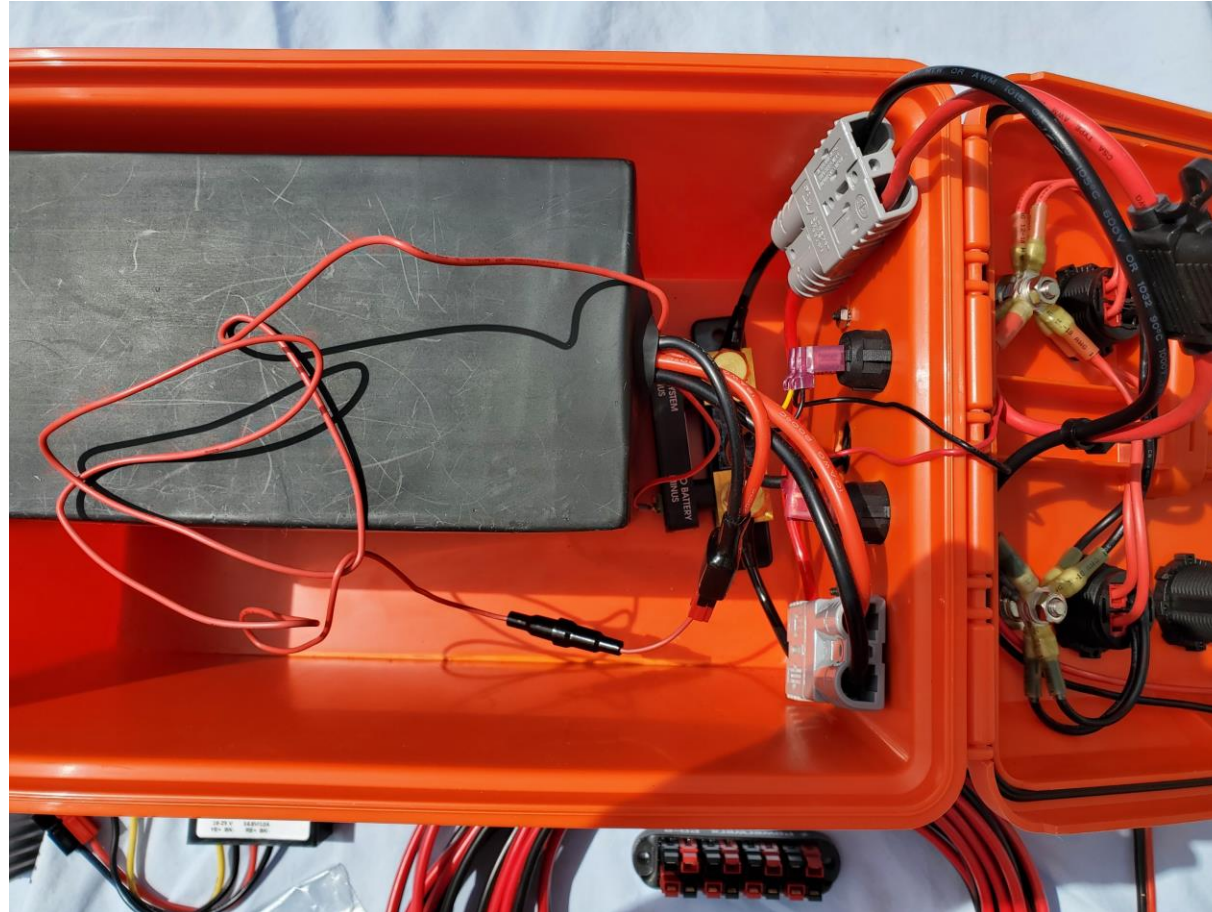




# HOW TO DIY YOUR “VICTRON SMARTSHUNT” 500A/50mV TO CONNECT TO YOUR MEGABOX

- USING 8 GAUGE WIRE, CUT ABOUT 7” OF THE RED WIRE AND CONNECT EACH END TO THE POSITIVE TERMINAL OF TWO SB50 ANDERSON POWER POLE CONNECTORS
- NEXT CUT TWO SECTIONS OF BLACK 8 GAUGE WIRE TO ABOUT 3.5”
- CONNECT ONE END EACH TO THE NEGATIVE TERMINAL OF AN SB50 PP
- ON THE OTHER END, ATTACH A 3/8” LUG FOR CONNECT TO THE VICTRON SHUNT
- THE VICTRON SHUNT ONLY CONNECTS TO THE BLACK NEGATIVE WIRE COMING FROM YOUR BATTERY
- THE SMALL RED POWER WIRE CONNECTS TO “BATT +” TERMINAL ON THE SHUNT AND REMOVE THE RING TERMINAL AND REPLACE WITH A RED 15A PP...CONNECT THAT TO THE SECOND PP CABLE COMING FROM YOUR LFP BATTERY TO TURN ON THE SHUNT

# VICTRON SHUNT IN THE MEGABOX



THE SMALL VICTRON SHUNT RED WIRE GIVES  
POWER TO THE SHUNT FOR BT USE...CONNECT  
THE WIRE TO THE OTHER POWER CABLE COMING  
FROM YOUR LFP BATTERY





# MEGABOX WITH POWERWERX FSP-300W SOLAR PANEL AND MPPT-300 CC, WITH 400W INVERTER RUNNING A BOX FAN



# TWO RENOGY 200 WATT FOLDABLE RIGID SOLAR PANELS CONNECTED IN SERIES WITH A VICTRON 100/30 "SMARTSOLAR" MPPT CC



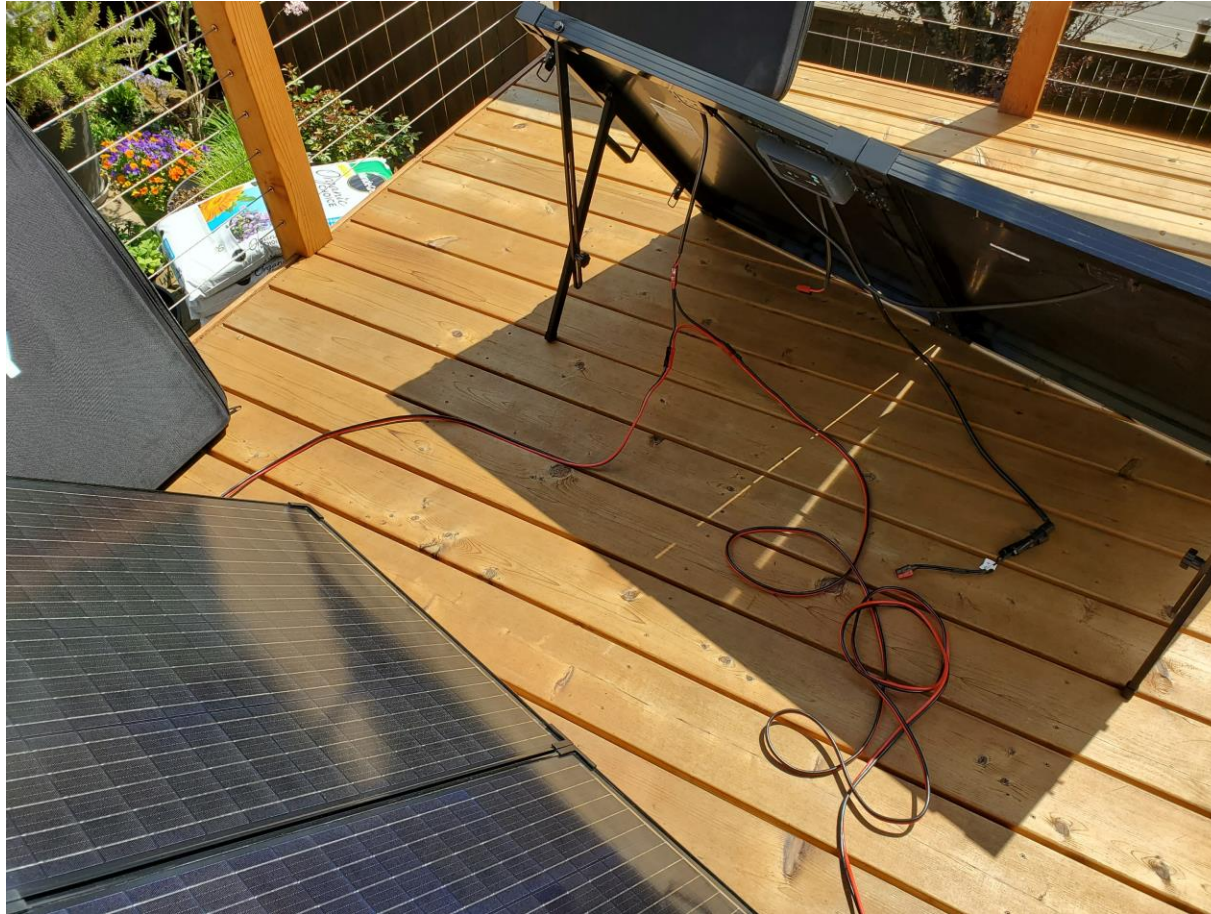


# CLOSER LOOK AT THE MULTI BATTERY CHEMISTRY VICTRON “SMARTSOLAR” MPPT CHARGE CONTROLLER WITH BUILT-IN BT





# TWO 200 WATT FOLDABLE RENOGY SOLAR PANELS CONNECTED IN SERIES



# MEGABOX CONNECTED TO VICTRON “SMARTSOLAR” CHARGE CONTROLLER

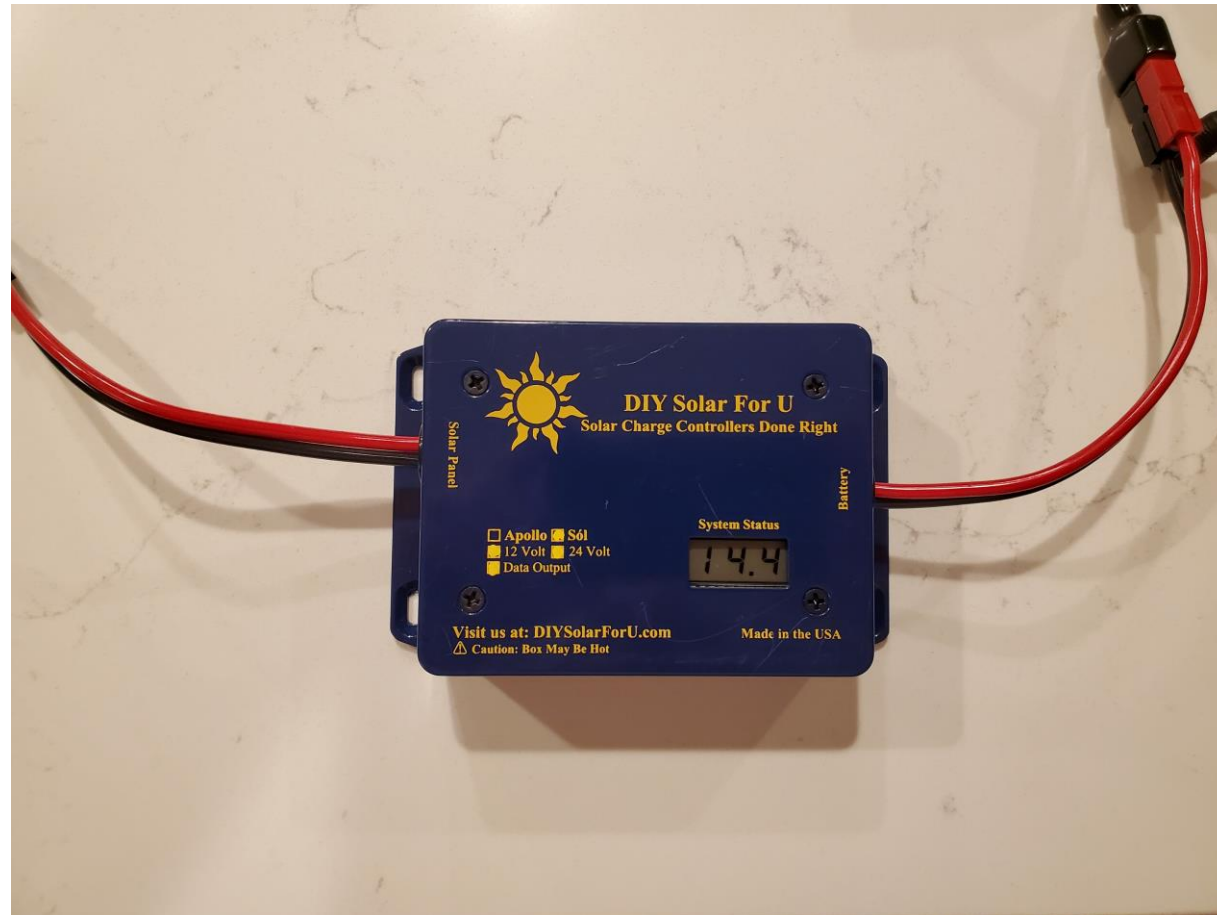


RENOGY “ROVER” 40 AMP MPPT CHARGE CONTROLLER...A WIDE BAND TRANSMITTER, OK FOR VHF/UHF FM, LOUD BIRDIES ON HF SSB





# DIY SOLAR FOR U “SOL” 20 AMP MPPT CHARGE CONTROLLER...BY DESIGN IS MADE TO BE MORE RF QUIET



# MPPT CHARGE CONTROLLER NOISE NOTED ON MY TESTING...NO SCOPE USED, JUST LISTENED BY EAR

- THE MPPT CC WITH THE MOST RF INTERFERENCE AND NOISE IS THE RENOGY “ROVER” 40 AMP MODEL... A WIDE BAND TRANSMITTER ☹️
- NOISY MPPT CHARGE CC CATEGORY INCLUDES MPPT-150, MPPT-300, BIOENNO POWER 30 AMP MPPT CC (SC-122430NE)
- SLIGHTLY LESS NOISY ON MY EARLY TESTING IS THE VICTRON 100/30 MPPT CC
- MORE RF QUIET, STILL SOME NOISE IS THE DIYSOLAR4U MPPT CC AND THE GENASUN GV-5 AND GV-10 MPPT CC

# MPPT CC TESTING RESULTS

- ALL THE MPPT CCs I TESTED APPEARED TO BE OK FOR VHF/UHF **FM** OPERATION, JUST NOISY ON **SSB HF**...YOU CAN STILL OPERATE IN THE AREAS ON THE BAND WITHOUT HARMONIC NOISE
- THE CLEAR COST WINNER FOR **FM** OPS IS THE MPPT-150 AND MPPT-300
- NOTE...THE MPPT-300 CC IS FOR 20-50 VOLTS SOLAR ARRAY INPUT, IT IS DESIGNED FOR A HIGHER VOLTAGE SOLAR PANEL/ARRAY...SUCH AS THE FSP-200 WATT AND FSP-300 WATT FOLDABLE SOLAR PANELS FROM POWERWERX, WILL WORK FINE WITH TWO 18 VOLT PANELS CONNECTED IN SERIES
- THE GO TO HIGHER AMP CC FOR HF **SSB** IS THE DIYSOLAR4U "SOL" IN MY LIMITED TESTING...NOT SCIENTIFICALLY DONE WITH A SCOPE OR "WATERFALL" VIEW



# MPPT CC TESTING RESULTS

- FOR A “NO NOISE” SERIOUS HF CC EXPERIENCE, USE A PWM CC AND ACCEPT A BIT LESS POWER OUTPUT HARVESTED FROM YOUR SOLAR
- IN AN EMERGENCY, HAVING THE MAXIMUM POWER HARVESTED FROM YOUR SOLAR PANEL WHILE IT IS DAYLIGHT, MAY MAKE A DIFFERENCE?
- MY GOAL IS, THAT YOUR “FIRST STEP” IN STARTING WITH SOLAR POWER NOT LOOK TOO EXPENSIVE
- IT IS AN INVESTMENT IN PEACE OF MIND HAVING BACK UP POWER
- BUILD YOUR SYSTEM STEP BY STEP 😊

# MPPT ILLUSTRATION USING TWO 100 WATT SOLAR PANELS AND A VICTRON SMARTSOLAR CHARGE CONTROLLER

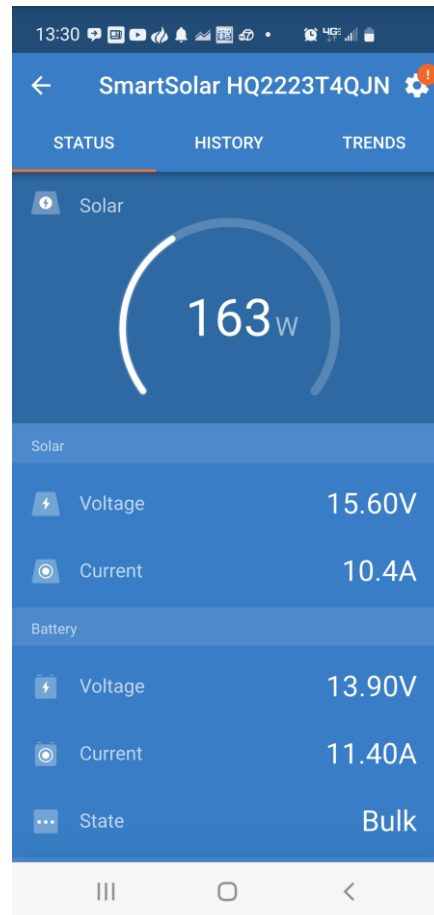


# MPPT CHARGE CONTROLLER NOTE

- WHEN CONNECTING TWO SOLAR PANELS IN **SERIES** AND USING AN **MPPT** CHARGE CONTROLLER...USE THE SAME SOLAR PANEL WATTAGE SIZE AND TYPE OF SOLAR PANELS
- PREVIOUS PIC SHOWS A RENOGY 100 WATT **MONOCRYSTALLINE** SOLAR PANEL AND A 100 WATT **POLYCRYSTALLINE** SOLAR PANEL, THIS CAN IMPACT YOUR MPPT POINTS THAT THE CC IS LOOKING FOR
- POLYCRYSTALLINE PANELS ARE SLIGHTLY LESS EFFICIENT AND THE VOLTAGE OUTPUTS FROM BOTH PANELS COULD BE SLIGHTLY DIFFERENT
- CONNECTING TWO DIFFERENT TYPE 100 WATT PANELS IS OK, BUT THE POWER OUTPUT WILL BE SLIGHTLY LESS THAN IF BOTH PANELS WERE THE SAME
- CONNECTING SOLAR PANELS IN PARALLEL, THE PANELS CAN BE DIFFERENT FOR THE PWM CC



# ILLUSTRATION OF HOW THE MPPT CHARGE CONTROLLER WORKS...SCREEN SHOT OF VICTRON SMARTSOLAR CC WITH TWO RENOGY 100 WATT SOLAR PANELS CONNECTED IN **PARALLEL**

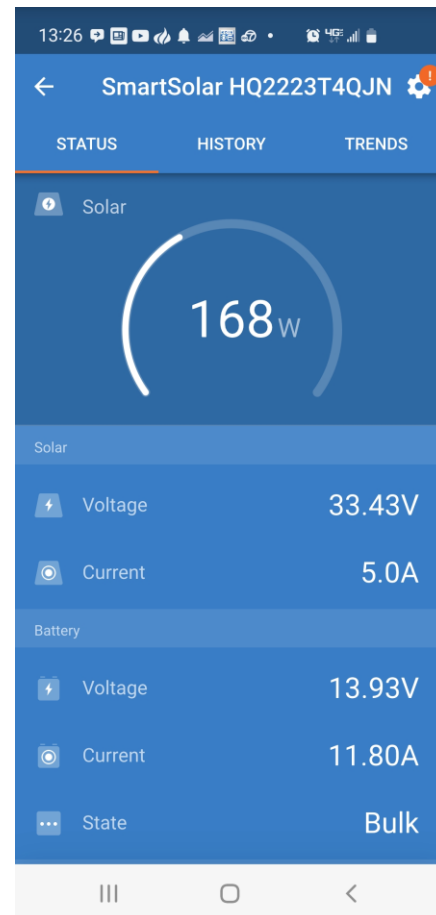


TWO 100 WATT SOLAR PANELS NOW CONNECTED  
IN **SERIES**, THIS PIC SHOWS THE “V<sub>oc</sub>” OR OPEN  
CIRCUIT VOLTAGE...NO LOAD CONNECTED YET



SCREEN SHOT OF “VICTRON SMARTSOLAR” CC  
WITH TWO 100 WATT SOLAR PANELS CONNECTED  
IN **SERIES**...NOTE SOLAR SIDE AND BATTERY SIDE  
VALUES...SOLAR INPUT VOLTAGE WENT FROM  
42.1v TO 33.43v  
HAS BEGUN

BATTERY CHARGING





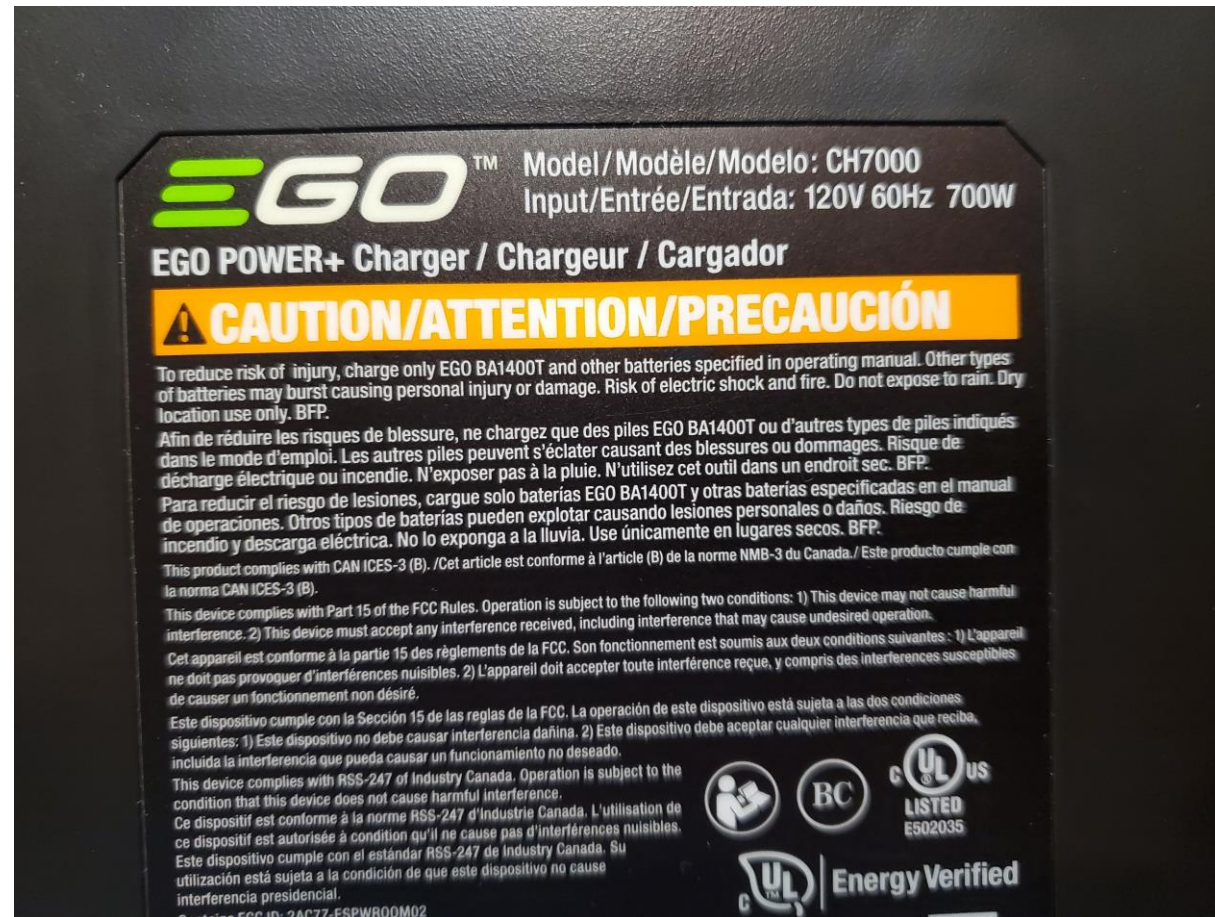
THE ABILITY TO CHARGE CORDLESS TOOL BATTERIES IN A GRID DOWN SITUATION IS VERY HELPFUL...DEWALT DCB-119 "CAR CHARGER"



“EGO” MOWER PACKAGE INCLUDES 10AH BATTERY AND THIS HIGH POWER AC TO DC CHARGER...HIGHER WATTAGE NEEDED TO CHARGE YOUR 10AH BATTERY WITH THIS BIG BOY?



“EGO SYSTEM” 700 WATT AC TO DC CHARGER...I  
CAN CHARGE MY 56 VOLT BATTERY WITH A  
LOWER WATTAGE CHARGER





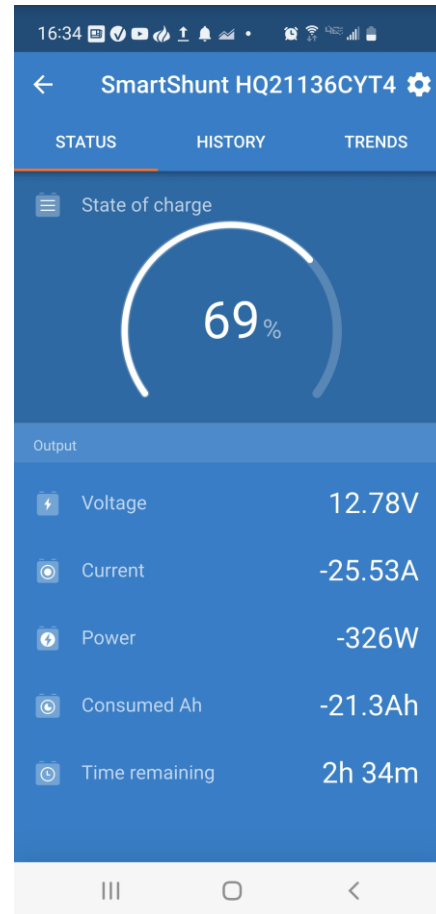
# CHARGE YOUR CORDLESS MOWER BATTERY WITH A TRUE SINE WAVE INVERTER USING A LOWER POWER AC TO DC CHARGER



# “EGO POWER” MAKES A 320 WATT AC CHARGER...MODEL CH3200



# OFF GRID CHARGING OF THE “EGO” 56 VOLT BATTERY USING A 700 WATT TRUE SINE WAVE INVERTER CONNECTED TO THE “EGO” 320 WATT AC CHARGER, NO SOLAR ADDED YET





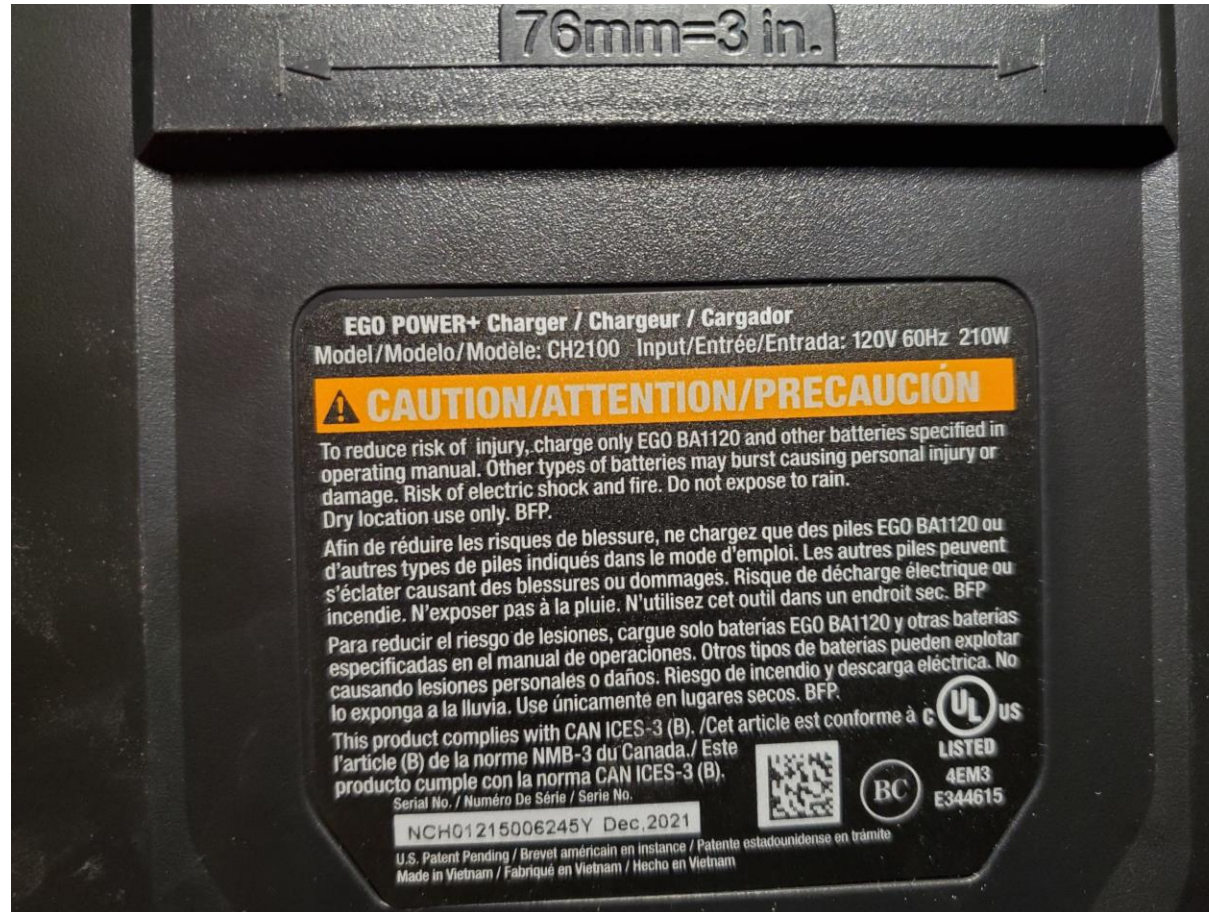
“EGO” 56 VOLT, 10AH BATTERY WITH 320 WATT  
AC TO DC CHARGER AND A 700 WATT TRUE SINE  
WAVE INVERTER READY TO BE HOOKED UP



“EGO” SYSTEM 210 WATT AC CHARGER AND 700 WATT INVERTER READY TO BE HOOKED UP TO YOUR 56v LFP BATTERY



# EGO 210 WATT AC CHARGER SPECS





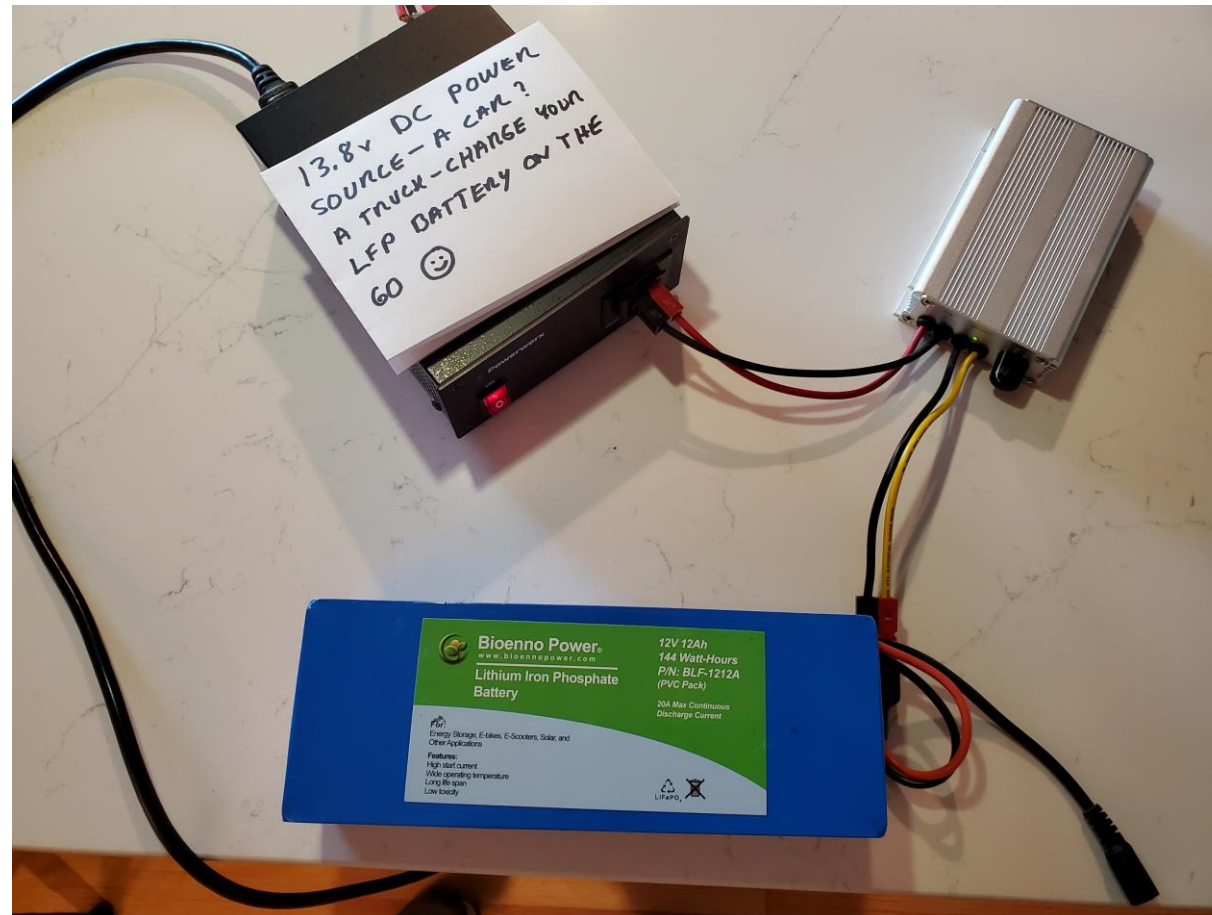
# “EGO SYSTEM” 10,000 LUMEN MULTI INTENSITY PORTABLE DC LIGHT



56 VOLT "EGO" BATTERY FITS RIGHT ON THE  
BASE...YOUR CORDLESS BATTERY POWERING A  
TASK LIGHT...EMERGENCIES CAN HAPPEN AT  
NIGHT AND THE GRID COULD BE DOWN FOR DAYS



# DC TO DC CAR CHARGER, CHARGE YOUR LFP BATTERIES WHILE DRIVING TO YOUR DESTINATION AND RETURNING HOME





# DC TO DC CHARGER

- OUTPUTS ABOUT 14.6 VOLTS, SO NO CC NEEDED
- ADJUSTABLE AMPERAGE OUTPUT SETTINGS, PICK THE AMPERAGE SETTING THAT MATCHES THE BATTERY YOU ARE CHARGING
- CAN OUTPUT 2 AMPS, 4 AMPS, OR 8 AMPS
- CHARGE YOUR LFP BATTERY “ON THE GO”

# NINE STEPS TO SOLAR SUCCESS

- 1) TRY TO USE A BATTERY THAT IS IN SOME TYPE OF POWER BOX FOR PORTABLE OPS
- 2) FOR PORTABLE OPERATIONS, IF POSSIBLE, USE LFP BATTERIES
- 3) IF POSSIBLE, USE MPPT CHARGE CONTROLLERS WHEN THE GRID IS DOWN TO MAXIMIZE SOLAR ENERGY FROM YOUR SOLAR PANELS
- 4) USE SOME TYPE OF INLINE DC METER OR SHUNT TO MEASURE ENERGY COLLECTED AND USED

# NINE STEPS TO SOLAR SUCCESS

- 5) USE MONOCRYSTALLINE SOLAR PANELS, THEY HAVE THE HIGHEST EFFICIENCY
- 6) HAVE “ALL WEATHER” AND “DRY WEATHER” SOLAR PANELS IF POSSIBLE, THE DRY WEATHER SOLAR PANELS HAVE SMALLER TOTAL SIZE AND WEIGHT
- 7) USE ANDERSON POWER POLE CONNECTORS...UNIVERSAL FOR PORTABLE OPERATIONS
- 8) KEEP GOOD AIR FLOW BEHIND YOUR SOLAR PANELS, COOLER SOLARS PANELS OUTPUT MORE ENERGY
- 9) USE HEAVIER GAUGE 10G VERSUS 14G WIRE FOR LONGER RUNS, LESS POWER LOSS



SOLAR POWER IS FUN ☺  
MAY YOU HAVE PLENTY OF  
ELECTRONS TO KEEP YOUR  
RADIO(S) ON THE AIR

KB7RHI