

nova-tech  Portable Direction Finder



GENERAL DESCRIPTION:

The Nova-Tech Nova Pal is a modern compact fully transistorized combination Radio Direction Finder especially designed for service on Airplanes and small craft or for portable use. This unit is cased in a high impact durable plastic cabinet. The detachable carrying handle may be used for permanent installation or it can be removed so that the unit can be put in the genuine leather Eveready Carrying Case.

The Leather Case has long leather adjustable shoulder straps for easy carrying from the shoulder or strap may be removed for hand carrying.

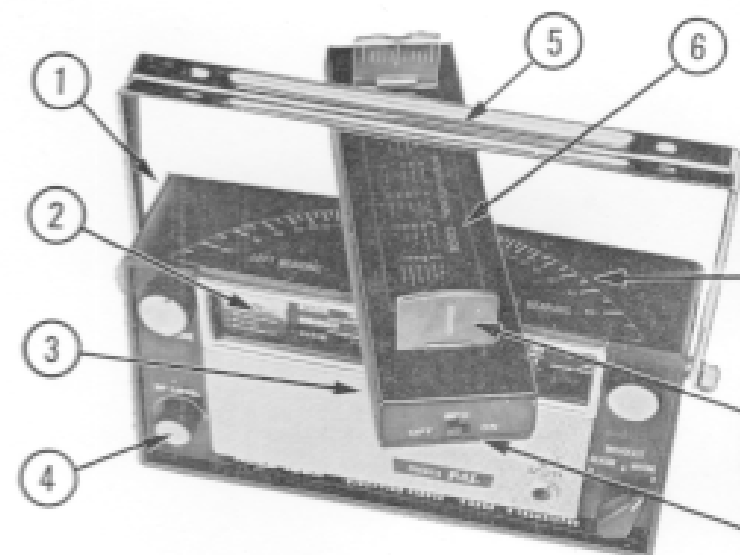
This unit covers three frequency bands including Radio-Beacon, Broadcast and Marine-Radiotelephone frequencies.

Power is derived from the self contained batteries cased in the cabinet of the unit or from EXTERNAL Source.

The Nova Pal may be used to take bearings on signals from regular known beacons, or broadcast stations. Two or more bearings will give a "fix" for determining your position. Other uses are reception of weather reports and as a standby receiver.

FEATURES OF THE NOVA PAL:

1. Battery Saver Plug With this exclusive feature external power can be connected to Nova Pal, allowing use of any 6 volt power source. When external source is connected internal batteries are disconnected automatically so that they will last for many months.
2. Null Meter Enables you to steer by needle, homing direct to transmitting station on any band.
3. Rotating Antenna Gives clean sharp nulls. No need to rotate entire set.
4. D. F. Level Control Adjusts signal strength. Without this feature a strong signal could overload set and prevent sharp null.
5. Removeable Bracket Adjustable for horizontal or vertical mounting and can be used as carrying handle.
6. International Morse Code A handy guide to identify Beacon Signals.
7. 180° Left-Right Bearing Scale Unique design gives accuracy of 10" diameter compass rose even though set is only 2½" thick.
8. Calibrated Optical Sights on Rotating Antenna Flip up to take accurate visual bearings. Use as an accurate pelorus.
9. B. F. O. Switch Allows long range use of Consol Stations for greatest navigational accuracy.



ELECTRICAL SPECIFICATION:

- | | | | |
|-----------------------------------|---|---------------------|--------------|
| 1. Frequency Range | LF (Beacon) | 190 KC - 400 KC | |
| | Broadcast | 550 KC - 1,600 KC | |
| | MF (Marine) | 1,600 KC - 4,500 KC | |
| 2. Sensitivity (5 mw above noise) | LF (Beacon) | 300 KC | 47 μ V/M |
| | Broadcast | 1,000 KC | 35 μ V/M |
| | MF (Marine) | 3 MC | 35 μ V/M |
| 3. Image Interference Ratio | LF (Beacon) | 300 KC | 66 db. |
| | Broadcast | 1,000 KC | 82 db. |
| | MF (Marine) | 3 MC | 58 db. |
| 4. S/N (Signal to Noise Ratio) | LF (Beacon) | 300 KC (2 mV/M) | 30 db. |
| | Broadcast | 1,000 KC (1 mV/M) | 29 db. |
| | MF (Marine) | 3 MC (1 mV/M) | 33 db. |
| 5. Output Power | 2 1/2" Speaker 150 MW | | |
| 6. Power Supply | 4 Penlite Batteries (Eveready 915 or equivalent) or external 6 volt DC power source | | |

GENERAL OPERATING INSTRUCTION:

Prior to putting the Nova Pal into operation open the back cover of the unit by using a coin to turn the slotted screw in the center of the back cover. Remove the cover and insert the batteries packed with the unit. Make sure that the batteries are inserted with the proper polarity as marked on the battery case. Replace back cover and follow the instructions for operation.

1. Turn band selector switch to the conventional Broadcast Band or the Beacon Band (LF).
2. Set D. F. Level Control to Radio Position.
3. Rotate volume control clockwise halfway.
4. Turn tuning control knob to desired station frequency and tune to maximum volume.
5. Rotate antenna.
6. Readjust volume control to desired volume.
7. Standard or accessory earphone may be used by inserting earphone plug into the front panel jack for individual reception. Loudspeaker is cut out when earphone is plugged into the jack.

THEORY OF OPERATION:

When the incoming signal strikes the broad side of the antenna the antenna has maximum pick-up strength and the reception is loudest. When either end of the antenna is aimed toward the transmitting station the reception is weakest. With the antenna in this position it will be observed that a small change in the antenna angle provides a relatively large change in signal. For this reason radio bearings are always taken at a minimum signal position (null) for greatest accuracy.

LEFT AND RIGHT BEARING SCALE:

The Left and Right Bearing Scale is calibrated in degrees 0 to 90 both Left and Right from the side of the rotating antenna and is located on the top side of the radio under the rotating antenna housing. This scale is used for locating stations or objects in relative position to the broadside of the radio. The view and sight finders are snapped up into the vertical position. Sighting through the slit of the black piece and viewing through the calibrated clear view finder the exact number of degrees Left or Right may be determined on the Left and Right Bearing Scale.

PROCEDURE FOR DIRECTION FINDING:

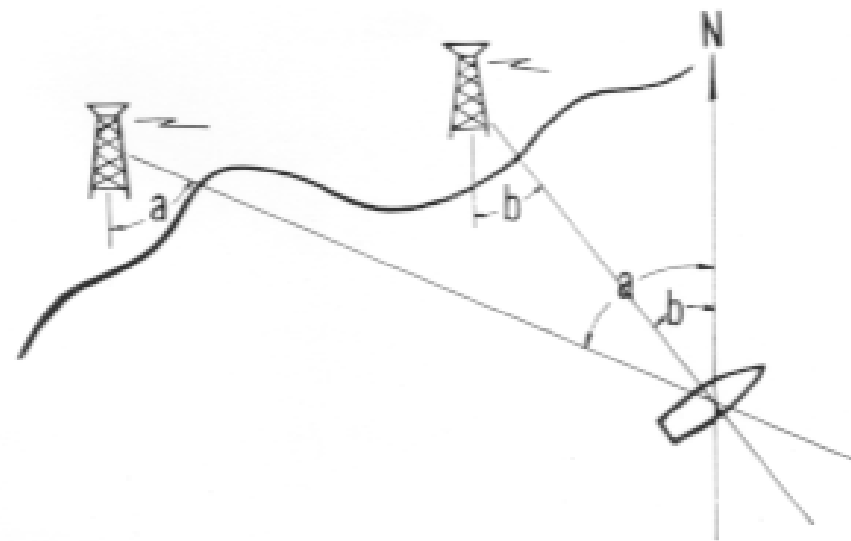
- a. Turn volume control clockwise to turn power on and increase to halfway position.
- b. Select station on the desired band (LF, Broadcast or MF) and tune in signal for maximum volume. Push BFO switch to ON position; the switch in the ON position is indicated by a constant tone from the speaker.
- c. Turn DF LEVEL control knob and set NULL METER to DF LEVEL.
- d. Re-tune TUNING knob control for maximum deflection on the meter. Turn up or down DF LEVEL knob and re-set meter indicator at the DF LEVEL mark. Rotate antenna for maximum deflection and re-set meter to DF LEVEL.
- e. Rotate antenna Left or Right for minimum reading on the meter.

(This is the "null" point of the signal.)

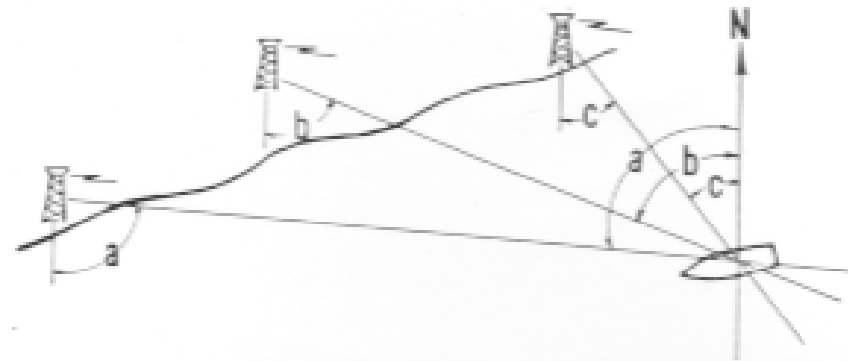
CAUTION: Do not grasp the antenna housing, just lightly push or pull one end of the antenna as the hand will cause error in meter deflection. The Rotating Antenna on the Nova Pal moves only 180° . Do not force the antenna past 180° or damage will be done to the antenna housing.

- f. When the rotating antenna reaches the "null" or bearing position the meter deflection will get weaker and at this null point it is generally desirable to increase D. F. Level so that, when the antenna is rotated a few degrees either side of the null, there will be a noticeable increase in meter deflection. When doing this, it is desirable to adjust D. F. Level to get the sharpest "null" on the meter.

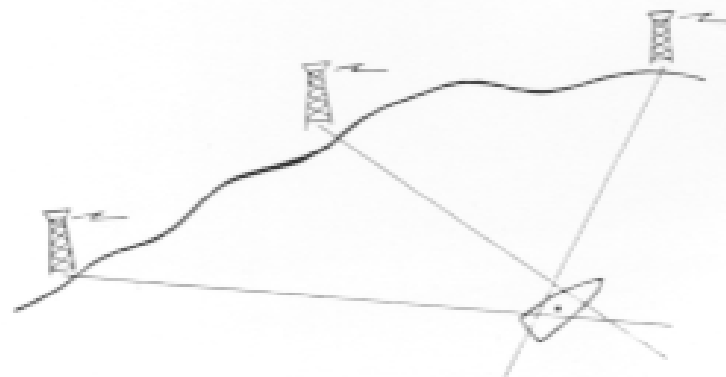
- g. To determine the general direction of the incoming signal, an understanding of the following procedure is essential. The rotating antenna gives two nulls, on any signal, each 180 degrees apart. To eliminate this 180 degree ambiguity, when the general direction of the signal is not known but the station is identifiable it is necessary to use the azimuth scale in conjunction with a magnetic compass. Read the number of degrees on the Left Bearing Scale if the null point should be on the Left side or the opposite side if the null is on the Right. Correlate this angle to the magnetic compass magnetic North. Take another signal and determine its direction by obtaining the null point and read the azimuth Bearing Scale, the two readings must be in the same quadrant; identify these two stations on the marine chart or map and draw lines with the angle readings taken at the null points. SEE FIGURE.



A third station may be also plotted to obtain a more exact position. SEE FIGURE.



In case where a slight error is made in plotting the position or there is a slight error in reading of the bearings from the scale, the intersection of the three line forms a triangle the center of the formed triangle would be the true position. SEE FIGURE.

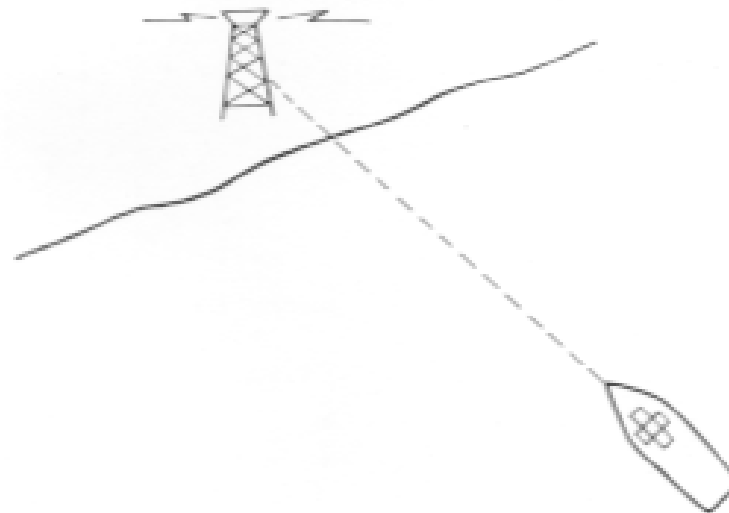


HOMING:

The Nova Pal is an ideal instrument for use as a "homing" device.

The rotating antenna is set to the null point of the signal and by watching the D.F. Level meter and by following the course set on the Bearing Scale, one will be directed toward the transmitting station.

For aural use the earphone or the loudspeaker can be used in conjunction with the meter. The null is evidenced by the position of minimum volume as well as smallest meter reading. SEE FIGURE.



PERMANENT INSTALLATION:

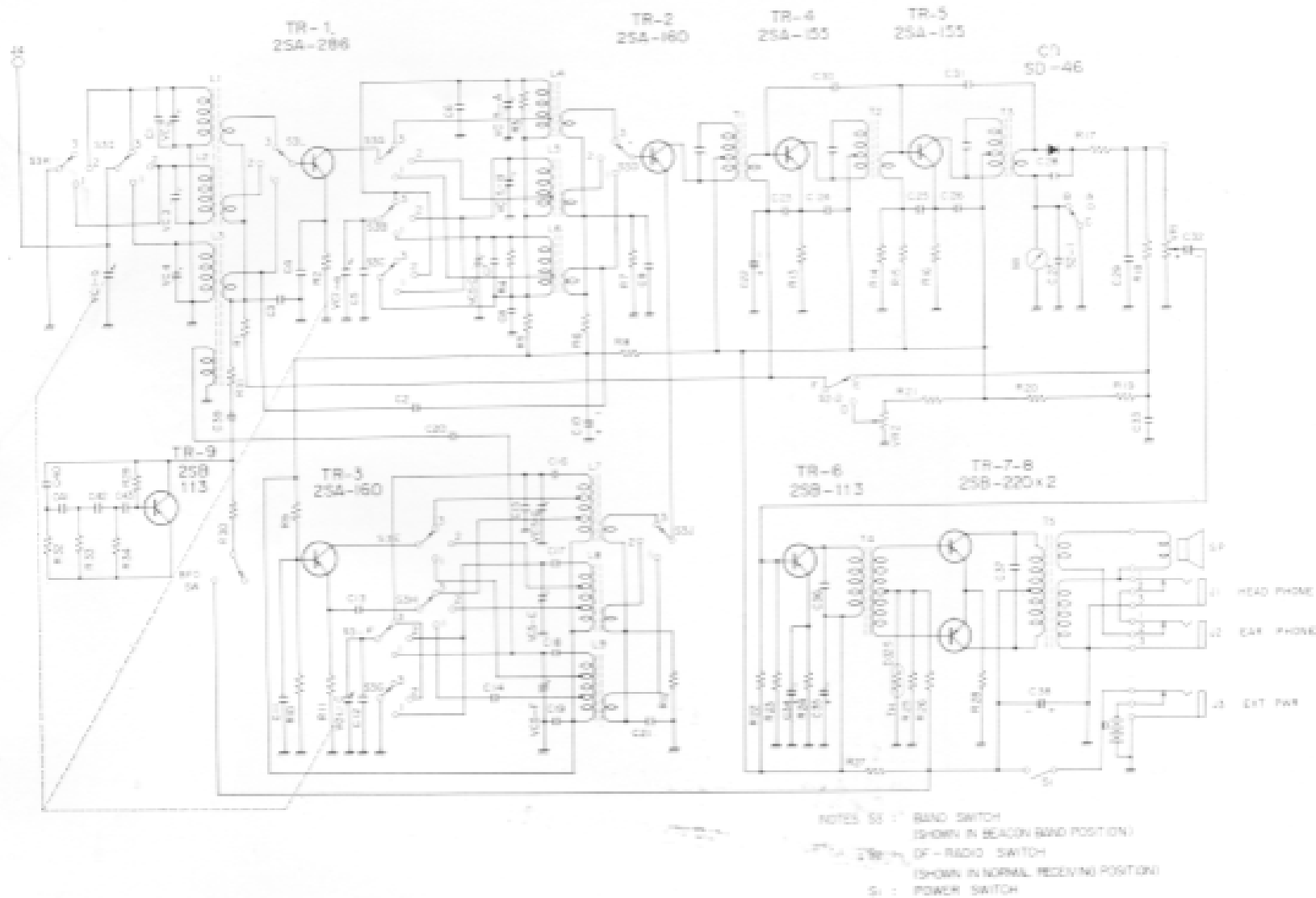
The radio must be so located that the incoming signals are not shielded from the Rotating Antenna.

Loosen and remove the two knurled thumb screws holding the radio. Spread the handle to the stops and fasten with wood or machine screws through the holes in the handle.

Replace radio to the installed handle and tighten thumbscrew so that the radio is in vertical position. SEE FIGURE.



SCHEMATIC DIAGRAM



PARTS LIST

TR1	Transistor	2SA-286				
TR2	"	2SA-160				
TR3	"	"				
TR4	"	2SA-155				
TR5	"	"				
TR6	"	2SB-111				
TR7	"	2SB-221				
TR8	"	"				
TH	Thermistor	D32S				
CD1	Diode	SD-46				
L1	ANT coil					
L2	"					
L3	"					
L4	RF coil					
L5	"					
L6	"					
L7	OSC coil					
L8	"					
L9	"					
T1	IF Transformer					
T2	"					
T3	"					
T4	Input Transformer					
T5	Output Transformer					
C1	Capacitor ceramic	43PF	50V	$\pm 5\%$		
C2	"	3PF	"	$\pm 0.5PF$		
C3	"	0.05 μF	"	+100%	-0	
C4	"	"	"	"	"	
C5	"	5PF	"	$\pm 0.5PF$		
C6	"	47PF	"	$\pm 5\%$		
C7	"	5PF	"	$\pm 0.5PF$		
C8	"	0.05 μF	"	+100%	-0	
C9	"	0.05 μF	50V	"		
C10	"	chemical	30 μF	6V		
C11	"	ceramic	0.05 μF	50V	+100%	-0
C12	"	"	15PF	"	$\pm 5\%$	
C13	"	"	0.01 μF	"	+100%	-0
C14	"	Mylar	0.002 μF	"	$\pm 20\%$	

C15	"	"	70PF	"	$\pm 5\%$
C16	"	"	180PF	"	"
C17	"	"	350PF	"	"
C18	"	Styrene	1.000PF	"	"
C19	Capacitor	ceramic	0.05 μ F	50V	+100% -0
C20	"	"	2PF	"	$\pm 0.5\%$
C21	"	"	0.05 μ F	"	+100% -0
C22	"	chemical	10 μ F	3V	
C23	"	ceramic	0.01 μ F	50V	+100% -0
C24	"	"	"	"	"
C25	"	"	"	"	"
C26	"	"	"	"	"
C28	"	"	"	"	"
C29	"	"	"	"	"
C30	"	"	5PF	"	$\pm 0.5\%$
C31	"	"	3PF	"	"
C32	"	chemical	1 μ F	3V	
C33	"	ceramic	0.002 μ F	50V	+100% -0
C34	"	chemical	30 μ F	3V	
C35	"	"	100 μ F	6V	

C36	"	Mylar	0.01 μ F	50V	$\pm 20\%$
C37	"	"	0.1 μ F	"	"
C38	"	chemical	100 μ F	6V	
R1	Resistor	fixed	RC $\frac{1}{8}$ BZ	2.2K Ω	
R2	"	"	$\frac{1}{8}$ BZ	1K Ω	
R3	"	"	$\frac{1}{8}$ BZ	220K Ω	
R4	"	"	$\frac{1}{8}$ BZ	15K Ω	
R5	"	"	$\frac{1}{8}$ BZ	2.2K Ω	
R6	"	"	$\frac{1}{8}$ BZ	47K Ω	
R7	"	"	$\frac{1}{8}$ BZ	12K Ω	
R8	"	"	$\frac{1}{8}$ BZ	330 Ω	
R9	"	"	$\frac{1}{8}$ BZ	22K Ω	
R10	"	"	$\frac{1}{8}$ BZ	5.6K Ω	
R11	"	"	$\frac{1}{8}$ BZ	1K Ω	
R12	"	"	$\frac{1}{8}$ BZ	2.2K Ω	
R13	"	"	$\frac{1}{8}$ BZ	680 Ω	
R14	"	"	$\frac{1}{8}$ BZ	2.7K Ω	
R15	"	"	$\frac{1}{8}$ BZ	15K Ω	
R16	"	"	$\frac{1}{8}$ BZ	470 Ω	
R17	"	"	$\frac{1}{8}$ BZ	330 Ω	
R18	"	"	$\frac{1}{8}$ BZ	6.8K Ω	

R19	Resistor	fixed	RC1 $\frac{1}{8}$ BZ	27K Ω
R20	"	"	$\frac{1}{8}$ BZ	33K Ω
R21	"	"	$\frac{1}{8}$ BZ	62K Ω
R22	"	"	$\frac{1}{8}$ BZ	22K Ω
R23	"	"	$\frac{1}{8}$ BZ	4.7K Ω
R24	"	"	$\frac{1}{8}$ BZ	470 Ω
R25	"	"	$\frac{1}{8}$ BZ	330 Ω
R26	"	"	$\frac{1}{8}$ BZ	6.2K Ω
R27	"	"	$\frac{1}{8}$ BZ	100 Ω
R28	"	"	$\frac{1}{8}$ BZ	4.7 Ω
VR1	"	variable	3K Ω	(DI)
VR2	"	"	10K Ω	(BI)
VC1	Capacitor	variable		
VC2	"	trimmer		
VC3	"	"		
VC4	"	"		
VC5	"	"		
J1	Head phone	Jack		
J2	Ear phone	Jack		
M1	Signal level	meter		
SP	Speaker			
J3	EXT. POWER			

EXTERNAL ANTENNA

For long range reception on the Marine, BC, Beacon Bands, connect from 25' to 50' (depending on the location and distance from transmitter) of wire to the external antenna terminal located on the back lower right corner of receiver.

When the external antenna is connected, the rotating antenna loses its directional ability, therefore the set cannot be used for direction finding when external antenna is attached.

With the external antenna connected you can take long range bearings from CONSOL stations and Pin Point your exact location by triangulation from two or more CONSOL stations.

BATTERY REPLACEMENT

Replacement batteries should be 1.5 volts each. Batteries with lower rating will reduce less than maximum signal reception.

BATTERY SAVER PLUG and CORD

The end of the cord terminates in 2 bare wires that can be attached to any 6 volt DC source or other 6 volt batteries.

Copper colored wire to positive (+), Silver colored wire to negative (-).

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