

COMBINER 160 12 Volt Model C160 FOR ALTERNATORS UP TO 200 AMPS.

SUMMARY

The Combiner 160 is a precision voltage-sensing relay (13.0 volts) which connects two batteries together when either is receiving a charge. When the charging ceases, it disconnects so that each battery operates independently and prevents accidental discharge of the starting battery. Supplemental battery banks can be added by using an additional Combiner for each bank. It eliminates manual switching every time you start the engine to parallel batteries for charging. Never again forget to switch it back. No diodes so no voltage drop, and batteries get a full charge.

FEATURES

Suitable for alternators up to 200 amps, up to 18 volts.
160 amps continuous rating, 400 amps closing current,
Nearly UNLIMITED warranty*
Waterproof
Ignition rated for explosive atmospheres
No voltage drop so batteries reach full charge
Electronic thermal monitoring with shutdown & restart
Minimal wasted power, no heat sink or cooling required
Can be used on alternators with internal regulators
Protects alternator against overload from low batteries
No special wiring for alternators with external sense
Simple basic installation, two battery wires and ground
Comes with 6 gauge crimp terminals
Green LED indicates when combined
Red LED indicates thermal overload or low voltage.
Draws no current when batteries are not being charged
Draws 1/4 amp from the alternator when charging is in progress
No diodes to burn out if accidentally shorted
Optional external remote for **off, automatic, on**
Remote "ON" can be used for assisted engine starting
Withstands ambient temperature to over 175 F (80 C) for exposed or engine compartment mounting

SAFETY CONSIDERATIONS

DANGER: On all alternator/regulator circuits with an external sense wire it is critical that the sense wire can never be disconnected from the alternator output.

WARNING: If there are switches which can disconnect the alternator output from the battery this should be avoided when the engine is running.

Since the connections made in the battery circuits can carry hundreds of amps, it is imperative that you have low

resistance connections. This means having clean metal to metal contact, the right size ring terminals, properly crimped terminals, and secure mechanical fastenings.

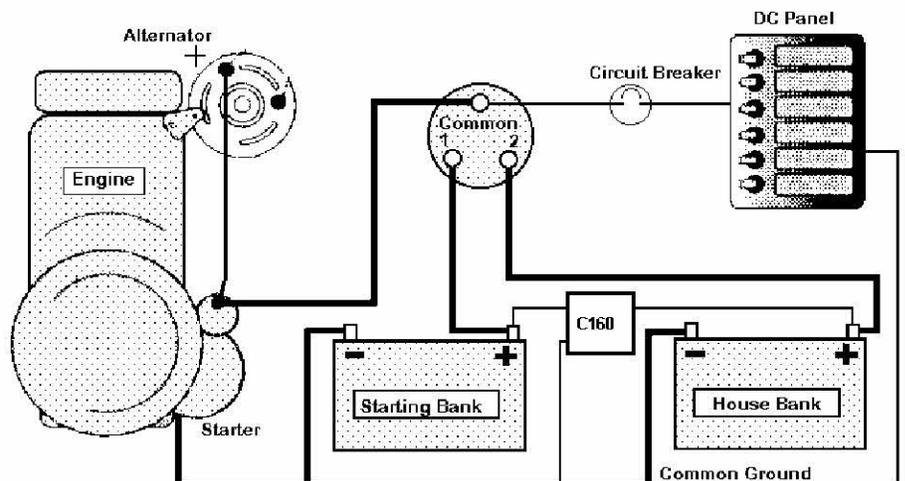
BASIC INSTALLATION

1. Connect the **BLACK** ground wire to either battery negative or any convenient negative terminal block.
2. Connect two 6 gauge or smaller **RED** cables to the positive terminals of the batteries. **Use a MINIMUM of 6 feet. 3+3, 5+1, any combination.** Longer is OK. Gauge heavier than 6 can be used on runs over 12 feet.

The connections do not have to be made right on the battery terminals but any wire or cables between the battery and the combiner must be heavy enough to carry the combiner current in addition to any existing loads. Make sure the second red lead is not touching ground when you connect the first since the Combiner sometimes closes momentarily when initially connected.

2. That completes the basic installation. Any other wires are not normally used and should be secured and the ends insulated. See Appendix

SAMPLE INSTALLATION INSTRUCTIONS



1. Single engine powerboats:

With the Combiner 160 you can use an (optional) **OFF-1-BOTH-2** switch to select the engine power source and leave the DC loads permanently on battery 2. Starting power is normally supplied from the starting battery in position 1 but battery 2 or both can be selected in an emergency. In all cases, both batteries are being charged when the engine is running.

WARNING: If you use this circuit, turning the switch to "OFF" while the engine is running may damage your alternator. If not using a switch, the motor connects directly to the starting battery.

2. Auxiliary battery for commercial vehicles or mobile sound systems.

Make sure the alternator is rated for 200 amps or less. If it is greater than 200 you need to upgrade to the Combiner 600.

The auxiliary battery must be securely mounted in a convenient location. If mounted in the passenger compartment it should be separately enclosed and vented outside the compartment, or you can purchase batteries with built-in vents to which tubing can be attached. Both batteries must have their negative terminals connected together, either by a heavy cable or through the vehicle chassis.

If the batteries are close to each other, just connect one red wire to each positive terminal and the black wire to ground.

If the batteries are separated by more than a few feet, the Combiner can mount at either end and you need to consider some protection for the positive cable between the batteries. See the section on FUSES & CIRCUIT BREAKERS. 6 gauge wire is adequate but if you are concerned about voltage drop, upgrade to 4 gauge on runs over 12 feet. Always use a MINIMUM of 6 feet no heavier than 6 gauge.

3. Travel trailers and motor homes.

These vehicles typically have a "house" battery already installed. Make sure the alternator is rated for 200 amps or less. By connecting the Combiner 160 between the starting battery and the house battery, the unused capacity of the alternator will be automatically directed to the house battery while underway. Since the Combiner 160 is bi-directional, a shore power charger on the house battery will also make sure the starting battery is at full charge. Neither system will draw power from the other battery through the Combiner so there is no risk of discharging the starting battery.

4. BATTERY CHARGERS

A single output shore power charger can be directly connected to the house battery. Multi-bank chargers are no longer required but can be connected to each of the battery banks if already installed.

OPERATION

The green "Combined" light will come on some time after charging has commenced. The time delay depends on how much current is being delivered to the bank being charged and its initial state of charge. When the initial bank reaches 13 volts ($\pm 1\%$) the other bank(s) will be placed in parallel by the Combiner 160. If one bank is very low, the Combiner 160 may turn off and on a number of times as it brings it up to voltage. After charging has ceased, the green light may remain on for quite some additional time if there is no load on the batteries, due to the "float" voltage above 13 volts left over from the charging.

If the internal temperature of the Combiner 160 rises too high, the red "Overload" light will come on and the Combiner will turn off to protect itself. After it cools by about 10 F (6 C), it will turn back on automatically. The overload condition should not be permitted as a regular occurrence as charging capacity is being lost.

FUSES & CIRCUIT BREAKERS

Accepted wiring practice guidelines dictate that all 12 volt circuits except starter motor leads should be fused, however there is no path to ground inside a battery combiner that can carry any significant current should it suffer an internal failure. Fuses in the battery leads to the combiner only provide protection from a short to ground on the battery cables themselves which must pierce the insulation. Conduit covering can reduce this risk.

If it is a metal vehicle and the unprotected cables are close to grounded metal the risk of a short is much higher and fuses may be a good protection. The size of the fuses has to be much higher than the charging current available because when the Combiner first closes quite large currents can flow from one battery to another. These battery to battery currents are limited by the wire gauge and length of the red wires **which must be at least 6 feet total**. A slow blow fuse of approximately 30% to 50% of the total Cold Cranking Amp capacity of the batteries in the smaller bank is a guide to value. Although the risks are minimal without a fuse, the results of an accident can be catastrophic and even life threatening.

A disconnect switch located close to the positive battery terminal to allow isolation for emergencies and regular maintenance is good design.

APPENDIX

REMOTE CONTROL

This feature is very rarely needed. We suggest you run without it for a while to see if there are any situations where you would use it.

The **GREEN REMOTE** wire is left unconnected for automatic operation. It may be cut short if desired.

It can be connected through a single pole, center off, double throw switch for remote control. Switching it to ground forces the Combiner 160 off, switching it to +12 forces it on. **The response of the Combiner 160 to remote operations is delayed by turn on and turn off timers.** When disconnected in the center position you are in automatic. If you only need one function, a simple on/off switch will do. The remote control input is purely voltage sensing so a light gauge wire is sufficient.

The **BLUE WIRE** is rarely used. If connected to the battery to be charged it will limit that battery to 14.2 volts maximum. The red OVERLOAD LED will flash when it is regulating voltage.

The red LED may flash and the combiner turn off during engine starting if the battery voltage gets less than 10 volts.

* WARRANTY

WARRANTY VOID IF WIRE GAUGE GUIDELINES ARE IGNORED otherwise we offer an unlimited warranty. Check at <http://www.yandina.com/AboutUs.htm> to get the return address.

INSTALLATION HELP www.yandina.com/combinfo

TECHNICAL EMAIL QUERY tech@yandina.com

or call 877 355 2184 toll free or 843 524 2282 direct.