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BIC-20400B instructions, Rev -

Congratulations!

You have selected the finest battery isolator/combiner on the market. This Isolator has more features than any standard isolator or any mechanical combiner. This one compact unit is designed for our popular Backup Battery setup.

Installation Instructions:

Caution!

We believe that installation of your new battery isolator/combiner is very simple. However, in the interest of your safety, be warned that working around Batteries can be **hazardous**. They can produce explosive gasses as well as high currents, on metals, capable of producing severe burns and even cause fires. **If you are not experienced with electrical wiring and batteries, you may want to hire a professional to perform the installation.**

Inventory - You should have received the following material with the BIC-20400B:

1 ea.	BIC-20400B Unit
1 ea.	4 AWG Jumper with lugs
1 ea.	4 AWG terminal lug
1 ea.	2 AWG terminal lug
1 ea.	18-22 AWG, 1/4 Stud terminal lug
2 ea.	18-22 AWG, #6 Stud terminal lug
3 ea.	1/4-28, SS hex nut
3 ea.	6-32, SS hex nut
2 ea.	Heat shrink for the large terminal lugs
3 ea.	Tie-Wraps.
4 ea.	Cable Clamps, nylon
8 ea.	Sheet metal screws
1 ea.	Ground wire, black, with #6 terminal lug and fuse holder.
1 ea.	Fuse, 3 Amp
3 ea.	Nylon Nuts, 1/4-20

Hellroaring BIC-20400B Instructions

Step 1

The BIC-20400B is designed for the Basic Backup Battery setup. The Sense is built-in to terminal “B”.

- a) **Basic Backup Battery / Maximum Power.**
(Recommended with winches, snow plows, cold weather starting, etc...)

You will need to determine your planned wiring layout. See our diagrams for the Basic Backup Battery setup. **This “B” version does not use an external Sense resistor, external diode, nor external transient suppressor.** These are built-in to the unit of the “B” model. Should you have a specific application or question not covered here or on our web site, feel free to send an e-mail technical support request. Include as much detail as practical regarding your application and vehicle setup. Send to: support@hellroaring.com or check our web site to verify the most current e-mail address.

This instruction focuses on the **Basic Backup Battery Installation**. If your application is not adequately covered, please request support.

Step 2

You will need the following material not supplied with the BIC-20400B unit.

1. Wire from the **Backup Battery** to the BIC. We suggest one **4 AWG** cable for up to 4 feet. Use two in parallel if longer (one to terminal “A” and one to terminal “C”). A 4 AWG terminal lug is usually the largest size that will fit on terminals “A” & “C”.
2. Wire **from your starter** to the BIC. We suggest you use one **2 AWG** wire for up to 8 feet to the **starter (Same connection point as your main battery) or to your Main Battery (+)** . You can use either two 6 AWG or two 4 AWG wires in parallel if desired.
3. Wire **terminal lug for the starter or battery**. The terminal lug ring size should match the connection you use.
4. Hardware for securing the BIC unit to whatever you mount it to, **if** the sheet metal screws are not sufficient for the material you are attaching to.
5. Backup Battery (recommended 1.2 times the minimum factory CCA rating or higher), battery terminal, and a standard 4 AWG or larger battery negative (-) cable (normally black).

If you did not order the Remote Module and if you want the **Optional Remote Switch and Remote LED** functions, you will need:

- Small wire (18 to 22 awg suggested) for connections to the remote switch and remote LED.
- An ON, OFF, ON micro-switch (or larger if desired). A single ON-OFF switch can be used if you don’t want the ability to disable the automatic feature. **Do not use an illuminated switch** since its internal lamp will cause the circuit to not function correctly.
- A device to mount or hold an LED. This could be as simple as a properly sized hole placed in a panel.
- **Fuse (5 amp or less)**. (If not accessible on your fuse panel)
- Hardware, clamps, and wire tubing as needed.

Obtain everything you need prior to beginning installation.

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Step 3

Choose your mounting location

Determine a location for mounting, giving due consideration to wiring distances, and wire routing. A vertical mounting position in a space not normally accessed would be preferred. Do not install close to fuel lines or exhaust manifolds.

Step 4

Begin Installation

- 1) Measure the lengths of wire needed, then fabricate your connection cables using the terminal lugs supplied or use your own terminal lugs if desired. You should properly crimp the terminals. If you don't have a proper tool, you could improvise by using a bench vise with a "V" notch and a drill bit to compress a crimp. Pull on the terminal to assure a good crimp. In addition to crimping, you may solder the wire to the terminal lugs if desired.
- 2) Ensure that the engine is not operating and that all loads are switched off, then **Disconnect** the battery **negative (-)** cable from **every** battery at the **Battery end**. That means **ALL** of them! (this will ensure that power is not available anywhere on the vehicle which could cause injury or damage.) **Ensure** that no wires are connected to the battery negative terminals before proceeding with the installation!
- 3) Mount the BIC-20400B in your chosen location. Ensure that the mounting is secure and will withstand vibration. The choice of mounting location should be such that normal functions do not allow foreign objects to fall on or otherwise touch the contacts. A vertical position in a space not normally accessed would be preferred.
- 4) **Note:** All current carrying terminal lugs should contact the BIC terminal face directly or directly on top of a previous lug without washers between them. When tightening the nuts, **tighten until snug only. Do not exceed 32 lbf in** (inch pounds of force) or **360 cN·M**. The hex style and material combination will provide a secure grip. The large studs are made of solid brass and can be stripped if over-torqued. Other terminal lugs such as the "Sense connection" or the Remote Module fuse wire can be mounted on top of a previously secured nut. Although the small terminals are made of stainless steel and are relatively strong, **Do NOT over-tighten** to the point of distorting the lug. **See note** at the bottom of **page 4**.

Refer to our connection diagrams for suggestions. For the backup battery setup, refer to the basic backup diagram and image (page 8), then do the following:

- a) **Connect** the 2 AWG wire from terminal "B" on the BIC to the starter at the **same connection point** that your **main battery** is connected through a 150A fuse. Tighten the nut as described above.

CAUTION!

Do not make the connection to the **starter motor itself**. Otherwise, whenever the BIC switches on, power would be applied to the starter motor at an improper time and may cause damage. An alternative is to make the connection at the main battery or other connection point along the main path to the starter solenoid.

An alternative connection point is directly to the Main battery (+) terminal (through a 150A fuse).

If you do not understand the proper connection points, please contact customer service with your questions.

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- b) **Connect** the 4 AWG wire from the backup battery **positive (+)** terminal, through a **150A fuse**, to the BIC at either terminal “A” or “C”. Install the 4 AWG jumper wire from Terminal “A” to “C” then tighten the nuts. **Important! Never** connect a **ground** or negative wire to any of the large, ½” hex terminals! **Never!** (If you did, you could short out a battery when the BIC unit switches ON.) Doing so will void the warranty on the BIC unit.
- c) **Secure** each cable close to the BIC and battery with nylon or rubber cable clamps and/or nylon tie-wraps.

Note: High amp fuses or circuit protection is suggested. Fusible links should be “4” AWG sizes **SMALLER** (bigger number) than the wires being protected. The following table contains recommendations for wire protection values.

Wire Size AWG	Circuit protection
2	200 Amp
4	150 Amp
6	100 A
8	60 A
10	40 A
12	25 A
14	Not Recommended Don't use this size or smaller

For the backup installation, a **150 amp fuse** or circuit breaker will provide good protection and still allow proper starting current and winching applications. Fuses larger than this or no fuse will offer less protection.

The circuit protection listed is for continuous current.

- 7) Connect the **ground terminal** (using the ground wire supplied) to the BIC ground terminal. Install the 3 amp fuse into the holder. Connect the other end to chassis, frame, engine block, or battery ground. **Keep it away from high heat sources such as exhaust.** You may want to obtain a terminal lug that fits an appropriate connection point. The fuse will protect the wire in the event a short develops to the ground terminal.
- 8) If you desire to use the remote switch or remote LED, make those connections at this time. If you purchased the optional **Remote Module**, follow the instructions provided with that package then go to step 9. For reference, the LED “short lead” is the cathode and should be connected to the Remote LED terminal. The long lead is connected to a **fused** 12 volt source. Refer to Figure 1 for the typical connections.
- 9) Install the nylon nuts over the large connections at this time. This should help prevent shorts. Although, not foolproof (just like exposed battery terminals), the nylon nuts are provided simply to give a little extra protection. **The primary influence on safety from shorts is your choice of mounting location and orientation.**
- 10) If you have an ohmmeter, you should **verify** that none of the three large terminals are grounded. Then:
 - A) **Ensure all loads are switched OFF.** This includes shutting the doors to keep the interior lamp off.
 - B) **Ensure all** battery positive (+) cables have already been connected and are secure.
 - C) Place a rag or other protection on your batteries and put on safety glasses, then **Connect the Main Battery** negative (-) cable (other end to the engine block).
 - D) **Connect the Backup Battery** negative (-) cable (other end to the engine block).

Tip: Prior to making the battery negative connections, If you temporarily touch a spare fuse (3 to 10 amp) between your battery negative terminal and negative cable, you can reduce the risk of large sparks if anything was connected improperly. **If you observe any sparks or if the fuse blows, Stop** and investigate for active loads, shorts, proper polarity, or for any other reasons. Then request technical support. If the fuse does not blow, then you should be ok to make your final battery negative (-) connections. **Note:** Both **battery negative (-) cables** should be connected to the engine block or equipment, not the chassis.

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Note:

The terminals “A”, “B”, and “C” have ¼-28 threads on a flat ½” hex. This allows a large surface area on the flat hex. This larger surface contact area results in much less contact resistance for reliable connections. Other types of devices rely on the connection being made through the stud itself where a terminal lug must be sandwiched between nuts. Our ½ inch hex terminals have sharp edges which tend to bite into the terminal lug, maintaining a secure connection without washers. When properly tightened (**with no washers**), they should stay in position and should not turn unless you intentionally handle the cables and force it. We recommend some strain relief (tie down) on any cable within about 1 foot (0.3 Meter) of the unit. You should tighten the nuts only to the point of being **snug and secure**. **24 lbfin** or **270 cN·M** is about right. This is equal to about **only 6 pounds applied to a 4 inch wrench**. **Do not** apply excessive torque! Use of a small nut driver works well. Use of a long handled wrench can exceed torque if not careful.

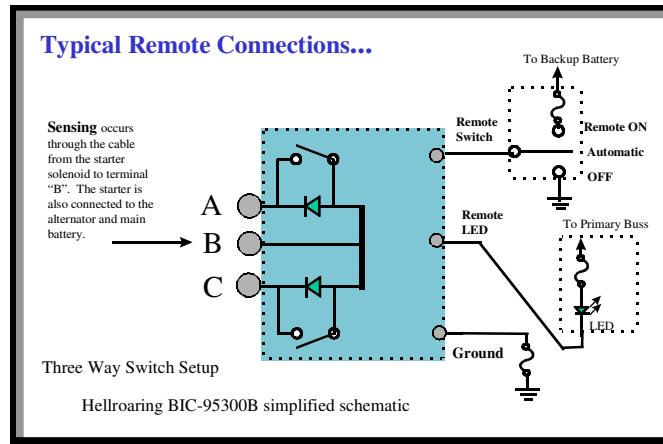


Figure 1

Fuses for the signal wires should be rated for no more than that appropriate for the wire size you use. We suggest a 3 amp fuse. These should be accessible from your primary fuse panel or as provided with the Remote Module.

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The following is an installation suggestion from the many listed on our web site <http://www.hellroaring.com>. Check our web site for other suggestions and updates:

Basic Backup Battery Installation BIC-20400B:

Important!

Do not use a **single** BIC-20400B for a backup system on a **Diesel Engine** that normally requires two main batteries. If you want to use this configuration on a diesel engine system, you must use **two units** wired in parallel and two Backup batteries, or use it for other than full backup starting. Using only one unit for backup starting on such a diesel engine will void the warranty. Also, it is essential to choose a backup battery having a CCA rating of **at least equal** to the vehicle recommended rating for your main battery. **Higher is better.**

You should notice that the backup battery system is a very simple installation. Use the **“Basic Backup Battery Setup”** schematic and the **“Basic Backup Install”** image illustrated below. A full size diagram is near the back of these instructions. Your wiring for your trailer, your alternator, your vehicle loads, and main battery should already exist. Your add-ons such as a Power Audio Amp, Winch, Snow Plow, etc... can all be connected to your **main battery** system. For the backup installation, all you need to do is mount the Hellroaring BIC unit, install your second battery and attach the wires to the **starter solenoid** as shown. The connection at the starter should be to the same terminal as the main battery. The BIC-20400B will function **automatically** to switch ON when your alternator supplies sufficient output, or if an external charge source is applied to your main battery. Because the BIC switching resistance is super low, there is **no need** to fool with your alternator voltage regulator settings. This is one of our most popular setups. Please note that for the backup battery operation there should be **no loads** connected directly to the backup battery since isolation will be in **one polarity only**. If you must have loads on the Backup battery (i.e. for auxiliary use), then you should use a different configuration such as the BIC-95150B or BIC-10200B installation.

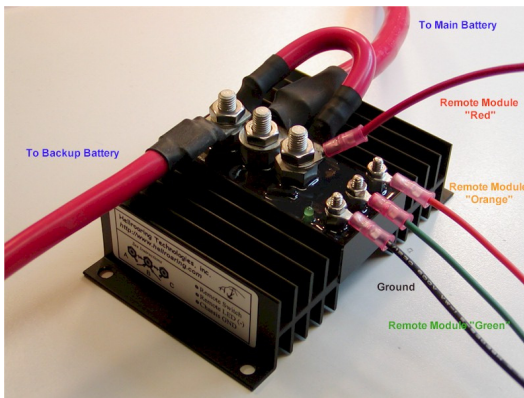


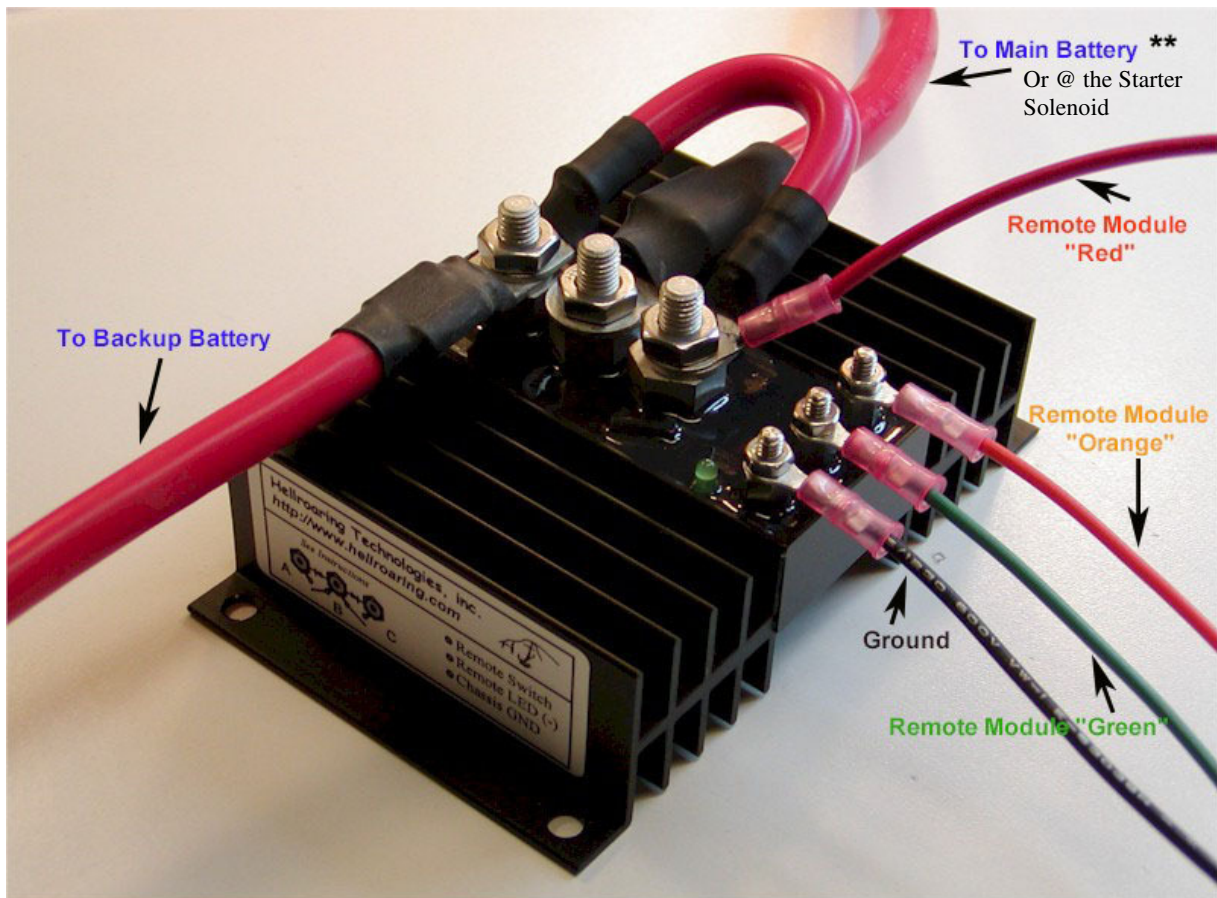
Image of a Basic Backup install
fuses not shown. See larger image for details.

See Diagram on Page 12

Note: The BIC-20400B is identical to the BIC-95300B for configuration in the diagram. The difference is the slightly lower ON resistance for better efficiency, and resulting higher current capability. Where you see the BIC-95300B referenced in the diagram, simply substitute the BIC-20400B.

Basic Backup Battery System

Hellroaring BIC-20400B Instructions



Basic Backup Image

Note 1: The BIC “Ground” wire and Remote Module “Red” wire must be connected through a 3 amp fuse near the BIC end.

**** Note 2:** For vehicles with Auto Start/Stop features and a second factory battery.

Vehicles with a separate smaller battery for an auto start/stop engine function may use the factory second battery as a critical function for starting the vehicle. With some vehicle designs, a main battery is reserved just for cranking, and a second battery is reserved for critical electronic modules and vehicle basic functions. So, it is possible that either one or both of these batteries could become depleted. In the case where the second factory battery is reserved for critical modules, has sufficient wiring to carry the full cranking load, and can actually start the vehicle with just the second battery, it may be better to connect the BIC (terminal B) to this second battery positive (through a 150A fuse) instead of the starter solenoid or main battery positive. This way, when the BIC is switched ON, backup power will be provided to the critical power modules required for starting.

But, cranking current will likely flow through an additional factory relay that may not be designed to handle repeated start/stop cranking load. So, the Backup start function should be used sparingly. That is, switch ON the BIC when necessary to obtain a backup start, but ensure you switch it back to the auto (Remote Center position) after the engine is running. The vehicle alternator should begin charging all depleted batteries. If it doesn't, then disable the engine start/stop feature if able, until you can get the system fixed.

For optimum backup, you can add a second BIC to the Backup battery (third battery). The main battery + would connect to the first BIC (terminal B), and the second battery + would connect to the second BIC (terminal B). And, each BIC backup terminals would connect to the Backup battery + (third battery). For such installation, the Remote terminals of each BIC (orange Remote wire) would need to be connected together. Then, the Remote Module would control both BIC's. Consult with your specific vehicle service manuals when in doubt of its wiring configuration.

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Operating Tips:

The primary function of the backup battery setup is to have a fully charged battery available to start and operate your engine in the event your main battery fails to do the job. The secondary function is to supply additional Power for high power loads such as winching, snow plows, high power audio systems, etc... The following tips will help assure maximum performance and or prevent damage to the BIC.

- 1) If your main battery almost cranks or cranks very slowly or if your starter solenoid chatters, Switch ON the BIC backup system and try again. You should start right away. If it cranks but doesn't start, do not crank for more than a few seconds. Check for other reasons like insufficient fuel, fuel pump, etc...
- 2) If your main battery cranks normally but the engine doesn't start, do not switch on the BIC unless for one short try (this could help if you have a weak ignition system). You may be tempted to crank and crank and crank until your battery dies. Return the BIC to the automatic position to keep the backup fully charged in case your main battery does quit. If it didn't start with the backup energized, you likely have another problem not related to the battery. Check your fuel system, ignition system, etc...
- 3) If your main battery supplies no power at all (e.g. no lights will illuminate). Switch ON the BIC (Remote Switch) and allow a minute or two to transfer some charge (this is not necessary for the Backup configuration, but provides best performance and reduces the risk of damage to the BIC unit). You can check if some charge has transferred by switching Off the BIC and momentarily switching on a light. If it illuminates, then you know that some charge was transferred. If it doesn't, then you likely may have a poor main battery connection. When you are ready, switch the BIC on again, then start your engine. Return the BIC Remote Switch to the Automatic position. If your engine dies, you may have a poor connection on the main battery or you may have a failed alternator. In this case, leave the BIC switched ON until you can get to a place to repair your main battery/charging system.
- 4) **Important!** If you switch ON the BIC and if cranking does not occur immediately when you attempt to start, **Stop** the cranking action! When the starter motor is stalled or turning very slowly, this means that maximum current is being drawn. To minimize risk of damage to the BIC, stop and investigate for poor connections, etc.... When combined, **Do NOT** continue cranking if the engine fails to start after a **few seconds**. Also, if it does not start, do not crank repeatedly with only a few seconds rest between attempts. Doing so may result in damage to the BIC. We suggest you allow a minimum of 5 minutes rest for each 10 seconds of cranking. A properly tuned engine should start in under 2 seconds.
- 5) Use a backup battery with a **CCA rating at least as high as the factory original main battery. A higher rating is better.** The higher the backup battery is rated, the less cranking current is required for the same given load. Therefore, there is less stress applied to the BIC unit. It is possible to damage a BIC unit if you use an under-rated backup battery **and** your main battery is effectively disconnected (due to corrosion, etc...)
- 6) Use the **best battery as your backup.** You want your backup battery to perform when you need it. It only makes sense that you keep your newest or best performing battery in the backup position. When you need to replace the main battery, consider moving the backup battery to the main position and buy a new one for the backup.
- 7) Keep your connections clean! Use an AGM type battery such as Optima. These will significantly reduce incidence of corrosion.
- 8) If you select the Backup Battery Configuration, **do Not** connect any loads to the backup battery.
- 9) Occasionally, check the condition of your backup battery. Do not apply an external load test the backup battery while connected in the vehicle.

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Testing your unit:

Note: When connecting or disconnecting the battery cables, ensure that all loads are OFF including lamps under the hood! After you have installed your unit, you will want to test that it functions. First, observe the LED. If the LED remains ON all the time after installation, check the Remote Switch position. Ensure that it is in the Automatic (center) position.

Basically, you can monitor the voltage of the backup battery. Then add a load to the main battery such as switching on the head lights. The voltage on the main battery will drop slightly. The voltage on the backup will not drop. When running, the voltage of the main battery and backup battery should be near equal. **If you do not have a voltmeter**, disconnect the main battery negative (-) cable. Then switch on the head lights. You will notice that your lights do not illuminate. Then, switch ON the Remote Switch. The LED and your headlights should illuminate. Switch Off the head lights, return the Remote Switch to the automatic position and then re-connect the main battery negative (-) cable.

With the engine OFF, you can monitor the **starting battery voltage**. Start the engine and **note the dip in voltage** and the speed of cranking. Stop the engine, then manually combine the batteries; the LED should illuminate. Crank the engine and you will notice that the dip in voltage does not go as low and that the engine cranks a little faster. If you have a DVM, you can also monitor current by measuring millivolts across the power cable. For a single 6 AWG wire, 0.001 volt across 2.5 feet of cable approximately equals 1 amp. Therefore, 0.150 volts equals about 150 amps. 4 AWG is about .00025 and 2 AWG is about 0.000156 ohm/ft.

Definitions:

Sense: The sense on the "BIC-20400B" model is built in to terminal "B" which is connected to the alternator through the starter solenoid connection. This is where it "senses" the battery and charging voltage to determine when to switch ON or OFF.

Remote Switch: This terminal, when connected to a voltage higher than about 7.2 volts (when the Sense terminal also has >7.2 volts) will cause the terminals A,B, and C to Combine. This terminal, when connected to ground will disable the unit from combining.

Remote LED: This terminal will sink about 12 milli amps (1k ohm internal ON resistance) to the cathode of an LED (this is the short leg) when On. The LED Anode (**long leg**) must be connected to a fused 12V source. The 12 V source for the LED Anode is pre-wired in the optional **Remote Module**. If you wire your own Remote LED function, then you will need to connect the LED Anode to the backup battery (+) through a fuse. This fuse can be the same one used to supply the 12 V source to the Remote Switch connection.

Ground Terminal: This terminal must be connected to the vehicle common or ground reference point. Usually this is the Engine block, Frame, Chassis, or Battery (-) tap. This terminal must be connected through a **3 amp or smaller fuse**.

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Specifications:

<u>BIC-20400B:</u>		Unless specified otherwise ambient temp=20C
Max Current	200 Amps	Continuous "B" to parallel "A & C"
	400 Amps	20 seconds "B" to parallel "A & C" (5 minutes between operations)
	500 Amps	50 mS "B" to parallel "A & C"
Max On Resistance (at 10 amps)	0.0006	Ohms terminal "B" to parallel "A & C"
Max Turn-ON operation current		
	0.012	Amps (most for LED illumination)
Max quiescent current "Off"	0.002	Amps
Max Remote Switch Control Current	0.0005	Amps
Max Power Consumption	0.18	Watts (most for LED illumination)
Switch ON voltage	13.4 volts	Nominal
Switch OFF voltage	13.2 volts	Nominal
Switching delay	0.05 Second	approximate

Note: Specifications are subject to change without notice.

Hellroaring BIC-20400B Instructions

Standard Terms and Conditions of Sale

The sale of Hellroaring Technologies, inc. products shall be governed by the laws of the state of Montana. All sales shall transfer title within the state of Montana via common carrier. Hellroaring Technologies, inc. will not collect sales taxes for any other state. Should the unlikely event, a cause of action arises, buyer agrees that such action shall be held and governed in the state of Montana. The buyer recognizes that there exists inherent risks associated with batteries and installation & operation of battery devices. It is understood that any technical information published by Hellroaring Technologies, inc. including any installation instructions is of a general nature only and it is the user's responsibility to determine the proper application, installation, and operation of products. The buyer assumes all risk and agrees to indemnify Hellroaring Technologies, inc. against any and all causes for injury or damage to third parties that arises from use of such product.

Return Policy

Should any product sold by Hellroaring Technologies, inc. not meet or exceed your expectations, you may, within 30 days of our shipment to you, return such product for a full refund (credit on credit card orders) less a 15% restock charge, provided that:

- a) You obtain an RMA number and provide your shipping address by calling customer service at 406 883-3801 or send an RMA request via e-mail (include the model #, serial number, and your phone number), and
- b) The product, including all accessories, is returned in original and re-saleable condition, and
- c) Units are Shipped (prepaid and insured for damage in transit) in the original or equivalent packaging, and
- d) (optional) You include a simple note as to the reason for dissatisfaction. (This can help us improve our products)

After 30 days, products are covered by our standard Limited Warranty. If you purchased the product through a dealer, that dealer's return policy applies to you. Our standard Limited Warranty will apply if you register by sending your name, a copy of proof of purchase date, model # and serial number to us within 30 days of purchase. This can be via mail or e-mail (warranty@hellroaring.com). Those who purchased direct from us are **automatically** registered.

Limited Warranty

This Limited Warranty is extended to the original purchaser. For a period of one year from the date of purchase (**30 days for industrial switching applications**), Hellroaring Technologies, inc. warrants that our products will be free from defects in materials and workmanship under normal use and service. The sole and exclusive remedy for failure of the product shall be for us, at our option, to repair or replace the product, to whatever extent we deem necessary to restore the product to proper operating condition. We may make replacements with new or functionally equivalent products of equal value. Should Hellroaring Technologies, inc. be unable to repair or replace the product within a reasonable time, we reserve the right, at our option, to issue a refund or credit of the purchase price in lieu of repair or replacement. We reserve the right to assess a \$15 fee for units returned and proven not to be defective. To obtain warranty service you must:

- 1) Call Customer Service at 406-883-3801 for a Return Material Authorization (RMA) number and shipping address. Or send an RMA request via e-mail (include the model #, serial number, and your phone number and your return shipping address)
- 2) Return the product in the original or equivalent packaging (Shipping prepaid and insured for damage in transit), together with the RMA number AND a description of the problem. Include your return shipping address and your phone number.

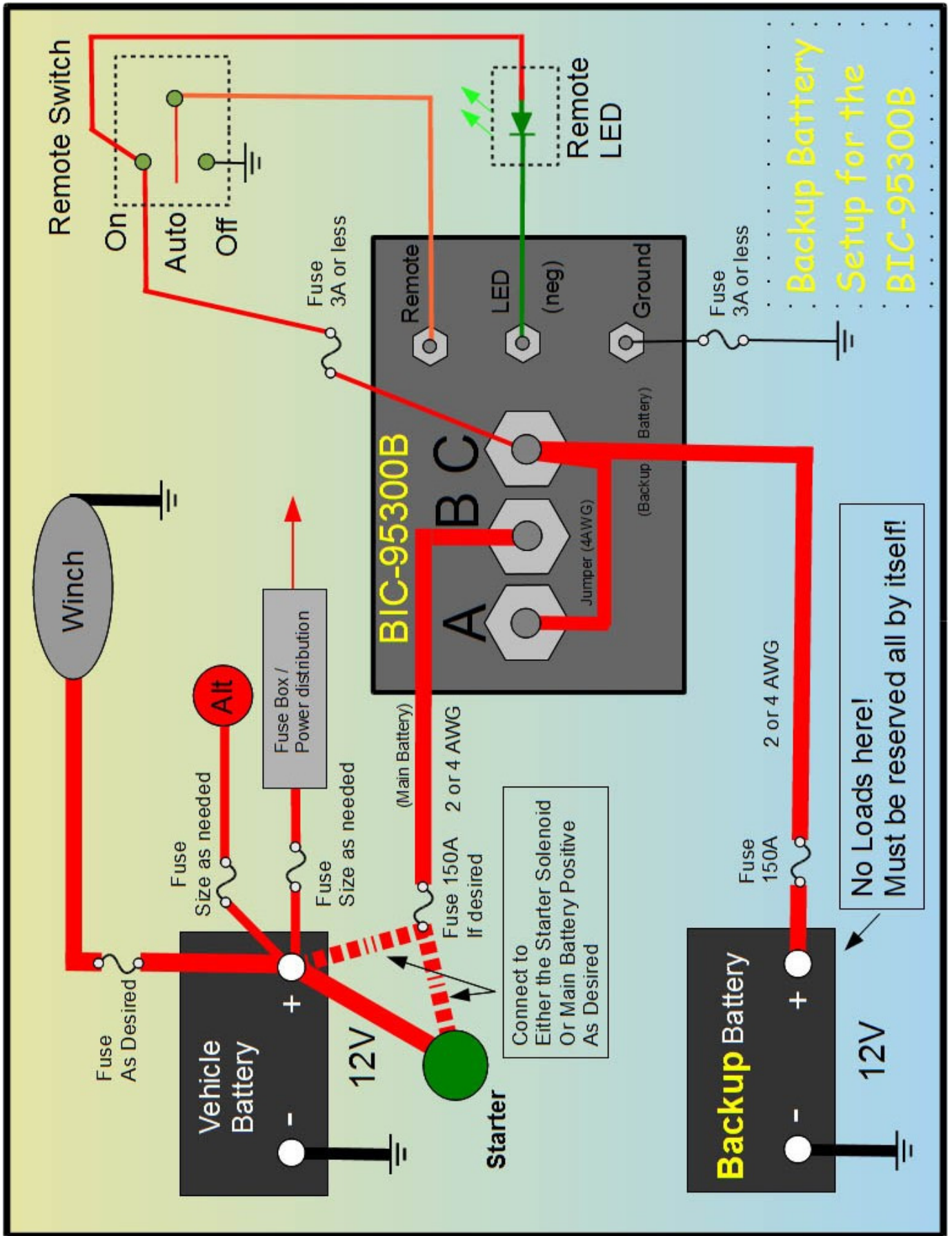
Do not attempt to disassemble, or otherwise tamper with any of the 4 nuts on the bottom of each unit. Doing so will void this limited warranty.

Exclusions

This Limited Warranty is made expressly in lieu of and to the exclusion of any and all warranties, express or implied, oral or written, including, without limitation, any and all implied warranties of merchantability or fitness for a particular purpose, and all such other warranties are expressly disclaimed. This Limited Warranty shall not be applicable to failures of the product that result from accident, abuse, misapplication or alteration, improper installation or maintenance, unauthorized repair attempts, operation or attempts to operate it beyond its mechanical, chemical, thermal, or electrical capacity intentionally or otherwise, and we assume no liability as a consequence of such events under the terms of this warranty. Hellroaring Technologies, inc. shall not be liable for any special, indirect, incidental, consequential, exemplary, or punitive damages for claims in any claim, action, suit or proceeding arising out of the purchase, use or performance of the product, and whether or not it has been advised of the possibility of such damages. The foregoing allocation of risk is reflected in the price of the product. Nor shall there be any liability thereunder for claims of labor, loss, profit, goodwill, repairs or other expenses incidental to the repair or replacement of such product.

Hellroaring Technologies, inc.

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BIC-20400B Troubleshooting & Installation Tips:

After installation, you may find that **The unit does not switch ON even when the engine is running.**

Ensure that the BIC ground wire is making a good connection. It should be connected to a surface that is free of paint so that it can make good electrical contact. If it still does not switch on, verify the alternator voltage is above 13.4 volts when the engine is running.

Backup Battery System Installation tip:

Sometimes, a customer will ask: Can I install the 2 AWG wire from the BIC to the main battery instead of the starter as recommended?

The answer is yes, with qualification. You can, however, please understand that, if you do, then you will add that much more resistance to the starter path from the backup battery. This will result in slightly less power transfer **efficiency** which causes additional current required for cranking (other things remaining the same). This effect can be reduced by increasing the CCA rating of the backup battery. We normally recommend at least a backup battery CCA rating of 1.2 times the stock battery rating. Higher is better.

In addition, with the connection to the main battery, you can lose the backup function **if** the main battery develops a poor connection at the (+) terminal, since the starting current would have to flow through that same connection from either battery. Connecting the wire from the BIC to the starter solenoid will by-pass this possible fault and thereby ensure a better backup function. Therefore, we recommend connection to the starter.

If your backup battery and BIC are close to the main battery and the cable run to the starter is relatively short, and if you use batteries with little risk of corrosion at the terminals (such as AGM type), then connecting at the main battery connection in lieu of the starter should make little difference. And, in some installations, it may be much more difficult to access the starter solenoid connection, so the choice to connect at the main battery positive or its distribution point would be the easiest choice.

Wire size selection:

Can I use larger than 2 AWG or run 2 AWG all around?

The answer is yes, with qualification. The key to selecting a wire size larger than one 2 and one 4 AWG is in the terminal lugs used. We supply one 2 AWG lug and one 4 AWG lug, both with a ¼ inch ring. These terminal lugs fit on the BIC terminals without modification. And, for most installations, if the total length is under 15 feet from the backup battery to the starter solenoid, these are large enough. If you choose to use larger cables, you will likely need to file the edges of the terminal lugs (ones you obtained elsewhere) to ensure they do not short across. For whatever size, be sure to select them with a ¼ inch ring for best fit. And, it is good practice to clamp the large cables to within 2 feet from the BIC. This will relieve any mechanical stress on the terminals due to the weight of the cables and vibration.

Hellroaring BIC-20400B Instructions

Safety Tips:

For a backup battery installation, large heavy gauge wire is needed. The heavy wire can carry much electrical current and batteries are capable of supplying much electrical current. No one intends to create a hazardous situation. But, sometimes people inadvertently do. So, to add some protection for that inadvertent incident, we recommend that you use a circuit protection for the large cable connected to a battery. For a backup battery install on a regular gas engine, we would recommend a 150 amp fuse. For this, you should be able to obtain them at a local auto parts store. If you choose to not use circuit protection, then you should at least consider a battery disconnect switch. These can be connected in line with the battery negative cable. So, if anything ever does go wrong, at least you can quickly disconnect the source of power. By placing a switch in the negative cable line, it can be safely exposed. For example: If a tool shorts to it to the chassis, nothing happens because it is already at ground potential.

Although obvious to the experienced person, this deserves to be emphasized. The following are actions that will likely cause a hazardous situation and therefore **care should be used not allow** the condition to occur.

Do not short the backup battery positive to the chassis or vehicle ground.

Do not reverse the polarity of the backup battery. Doing so will effectively short the two batteries together at twice the normal power (24 volts)! Don't reverse the main battery polarity either!

Do not short the main battery positive to the chassis or vehicle ground.

Installing circuit protection will reduce the hazard associated with inadvertent actions such as these. Avoiding these actions will reduce the need to replace a blown fuse and / or damaged BIC.

Avoiding the above actions will enable you to enjoy many years of service from your vehicle electrical system.