



KBi KSM Kompact™ KAPower Starting Module

Installation-Operation Manual



Rev. A1

KBI® KAPower® © 2023 KBI Form #131523





Safety Information

WARNING and CAUTION symbols are used in this document to alert the reader of possible safety hazards. The reader is responsible for reading and following these alerts.



indicates a hazardous situation which, if not avoided, will result in death or serious injury.



indicates a hazardous situation which, if not avoided, could result in equipment damage and/or equipment failure.

KBI/Kold-Ban International, Ltd. accepts no responsibility or liability for any of its products that are improperly used. The safety information in this manual is provided as a guide for the user and is not a substitute for proper training and usage.

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The KBI KSM Kompact module is a supercapacitor engine starting device designed for recreational boats, Class B & C RVs, paratransit buses, and other smaller, commercial & non-commercial watercraft and vehicles.



KBi KSM Kompact™ Module Product Description

The KBi KSM Kompact module is an engine starting device designed for recreational boats, Class B & C RVs, paratransit buses and other smaller, commercial & non-commercial watercraft and vehicles. It is an auxiliary power source that is installed in conjunction with traditional cranking batteries and derives its power from those batteries or an engine charging system. The KBi KSM Kompact module is also compatible for use with lithium batteries.



The KBi KSM Kompact module enclosure houses a KAPower supercapacitor module, contactor, PCB controller, circuit breaker, cables, conductors, and connectors. The KAPower supercapacitor module is an energy storage device designed to reliably crank and start internal combustion engines.



KAPower is not a high voltage device. It simply supplies the same amount of voltage as it was charged up to. A charged module should be treated as a fully charged battery.



Do not short circuit KAPower module terminals. The burning or igniting combustible materials near the point of short circuit could result. Do not place any conductive objects or materials across the device's terminals. In case of accidental short circuiting of the KAPower module, immediately remove the object causing the short.



Noncompliance with the requirements set forth in this manual may result in KAPower module failure. Review and follow all directions and requirements during KAPower module operation and installation.



The KAPower module is polarity sensitive: current only flows in one direction. Polarity shall be strictly observed when connecting the KAPower module; the positive terminal should be connected to the positive terminal on the battery and the negative terminal should be connected to the negative terminal on the battery



How the KBI KSM Kompact™ Module Works

Every time your engine is started, The KSM Kompact module's KAPower supercapacitor releases energy in short, powerful bursts to crank your engine and then fully recharges in about 30 seconds. Recharging can be accomplished from virtually any 12-volt DC electrical power source. Charging and discharging events, cycles will not wear out the device.

The advantages of the KBI KSM Kompact module

- Stores cranking power until needed
- Long service life – upwards of a million cycles
- Performance virtually unaffected by temperatures
- Increases the life of starting batteries
- Requires NO maintenance
- Safe and easy to install
- Engine starting support for Lithium Battery Systems

Ensure confidence in the ability to start your engine with the KBI KSM Kompact supercapacitor module.





Parts List



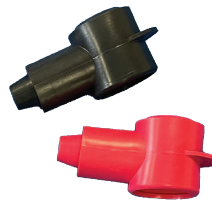
Pre-wired harness
(May be OEM supplied)



KBi KSM Kompact™ module



Emergency start button
(May be OEM supplied)



Protective boots



Terminal grease

Items needed for installation

1. Our recommended range for battery cables is 2 or 4 gauge. Use the heavier cable for longer runs.
2. Terminals for battery cables
3. Torque wrench with 13mm socket
4. Minimum 18-gauge wire for any wire-harnesses created or extended



Installation Instructions

Visually inspect the external case of the KBI KSM Kompact™ module prior to mounting the module, and make sure that no traces of physical damage are present. Before installation, review the KBI KSM Kompact module specifications (See Table 1).

CAUTION

Electrical resistance in a circuit consumes electrical energy. When installing a KBI KSM Kompact module, keep electrical resistance to a minimum. Short, heavy cables and clean cable connections are essential to reducing the amount of resistance in a circuit.

Mounting the KBI KSM Kompact module

Referencing the dimensions shown in Figure 2, use appropriate screws or bolts, nuts, and lock washers (not supplied) to mount the KBI KSM Kompact module to your vehicle, vessel, or equipment chassis. If mounting on a solid bulkhead or other location without backside access, fasteners, such as self tapping screws, can be used.

When selecting a location for installation, make sure that the KBI KSM Kompact module and cables will clear any lids and other movable parts. Install as close to the engine's starting batteries or starter as possible. Avoid locations that are subject to extreme heat, humidity, dripping water (under deck ventilation systems aboard boats, for example), road dirt, ice, and snow.

Table 1: Specifications

ELECTRICAL PROPERTIES (@ 77°F / 25°C)	
OPERATING VOLTAGE WINDOW	7 – 14.5 VOLTS
INTERNAL RESISTANCE	0.0026 OHMS
ULTIMATE MAXIMUM VOLTAGE	15 VOLTS
ULTIMATE MINIMUM VOLTAGE	0 VOLTS
CAPACITANCE	240 F
MAXIMUM POWER	42.05 KW
CURRENT LEAKAGE @ 15V	4.5mA
CYCLE LIFE	>1,000,000 CYCLES
ENERGY WITHIN OPERATION VOLTAGE WINDOW	19.5 kJ
ENERGY STORED AT MAXIMUM VOLTAGE	27 kJ
OPERATING TEMPERATURE RANGE	-40° to 149°F (65°C)

Length 14.25" (361.95 mm)
 Width 10.25" (260.35 mm)
 Height 6.25" (158.75 mm)
 Weight 8 lb. (3.62 kg)



Electrical Cable Selection

1. Maintain the integrity of the circuit to the highest possible standards. Use a high strand count cable that is abrasion resistant.
2. 2 or 4 gauge battery cable is recommended. The heavier cable is recommended for longer runs.
3. Keep cable length to an absolute minimum. The circuit resistance increases the longer the cable is.
4. Ensure that the terminal is properly crimped on the cable, and that the holes in ring terminals match the size of the studs they are placed over. Marine applications should utilize tinned cable and dielectric grease. Heat shrink between all cable and terminal connections.
5. The quality of the cable connections from the KBI KSM Kompact™ module to the vehicle or vessel's battery/ starter circuit is critical. Make sure to provide good, clean, tight cable connections. The cables between the KBI KSM Kompact module and the battery are cranking motor conductors, and, therefore, are typically not equipped with a fuse or circuit breaker. If a short circuit occurs, the cable will overheat, and it may catch fire or ignite nearby combustible materials. To help prevent that from happening, make sure the cable is well secured using insulated fasteners at least every 18 inches, and that it is protected from wear or damage caused by rubbing.
6. The 6 Pin Deutsch connector has been supplied with a mating connector. Be sure to follow proper wire schemes as identified in the diagrams.
7. Install the supplied Emergency start button in a convenient location relative to the existing vehicle or vessel's engine starting key or switch.



KBi KSM Kompact™ Module Wiring, Components and Operation

The KBi KSM Kompact module consists of multiple components configured together to store and deliver power to start your engine. It has a capacitor module (where the power storage cells are located), charge timer, starter input, ignition signal input, emergency start button input, and an auxiliary contactor output. All of these components work together to ensure the flow of power and keep the power cells in optimal condition, providing engine starting power, even when the vehicle's or vessel's starting battery is "dead".

The KAPower capacitor module—An array of five 1200F cells to store power in the device

Charge controller—Ensures the cells stay properly and optimally balanced and charged.

Buck boost charger—Part of the charge controller, the buck boost charger helps accurately charge the power cells, even when the primary engine starting battery power is insufficient to start the engine.

Charge timer—The charge controller has an integrated timer circuit that will activate the buck booster when the batteries are connected, and the vehicle or vessel battery switch is turned "on". The buck boost will stay on for approximately 10-12 minutes. When the timer expires, the device will enter low power mode (Deep Sleep). The purpose of this feature is to ensure your device is always fully charged, even when your Boat or RV is taken out of storage.

The input interface—Includes the starter signal input, ignition signal input, and the emergency start switch input.

Starter input—Receives the signal from the engine starter circuit to activate the device. It only needs about 5-6 volts from the engine starter circuit to activate the capacitor contactor, perfect for low battery conditions.

Ignition signal input—When an ignition signal is received (vehicle or vessel is in operation), it activates the charge controller and buck booster, which will remain active the entire time the ignition is active and the vehicle or vessel is in service. This process ensures the capacitor is fully charged for the next engine starting event.

Emergency start button—If the vehicle or vessel's batteries are too deeply discharged (<7 volts) to activate the capacitor module through the starter input, the ESB (Emergency Start Button) can be used to bring the capacitor system online.

NOTE: This ESB is a momentary type of switch. Engine start attempt must be made quickly while the switch is closed and Emergency Start is active.

Auxiliary contactor (not supplied) —This contactor may be required in some lithium battery applications. The contactor is a normally closed (NC) type and paralleled with the capacitor relay contactor when connected to the KBi KSM Kompact™ module wire-harness orange (+) and black (-) wires. The purpose of the auxiliary contactor is to bypass the power from a lithium battery through a power resistor in order to limit the lithium battery output current in the engine starting circuit. Contact KBI for additional information.

View figures 5, 5A, and 5B to see how these components fit together in typical boat or RV engines.



Operation and Storage

1. Before activation, confirm all wires are properly configured using the wiring diagrams on Figure 1, 4, & 5, 5A or 5B.
2. Start your engine. The KBI KSM Kompact™ module will automatically engage if installed properly.
3. By using power from the KAPower capacitor, the KBI KSM Kompact module contactor will close and stay closed during engine starting.
4. Whenever the KBI KSM Kompact module KAPower contactor is closed, the LED on the End-Faceplate should be illuminated green and the power studs on the KBI KSM Kompact module will be live with supercapacitor power.
5. The engine should begin to crank over with power being supplied from both the KBI KSM Kompact supercapacitor module and the standard battery or batteries.
6. Once the engine starts, the KBI KSM Kompact module internal PCB module will be active, allowing the KAPower module to recharge.

CAUTION

Do not attempt to bypass the PCB functionality. Charge voltage and temperature should never exceed the Maximum Voltage and Temperature as specified in Table 1. It is important to monitor the voltage when charging the KAPower module to its Maximum Voltage. This is the main purpose and function of the PCB. If the voltage exceeds these ranges, contact KBI for further troubleshooting instructions. Failure to adhere to these specifications will result in premature module failure.

NOTE: If the vehicle, vessel, or equipment's batteries are completely dead (<7 volts), it may be necessary to keep the Emergency start button pressed until the vehicle's electrical (charging/alternator) system has become active. The dead batteries, on their own, may not support all the engine's electrical power requirements to keep it running. In this case, keep the button pressed until the vehicle's or vessel's charging system is active. This can be noted by watching the engine's volt or amp meter. The KAPower module will have enough power to keep the engine running until the engine's charging system becomes active.

Storage

When not installed, the KBI KSM Kompact module can be stored within an enclosed, heated or unheated space. Climate control is not required, as the required storage temperature range is -76° to 158°F (-60° to 70°C)

Transportation

The KSM Kompact module can be shipped in approved corrugated cardboard, wooden, or plastic containers. For more information on transportation, contact KBI.



Wiring and Installation Diagrams

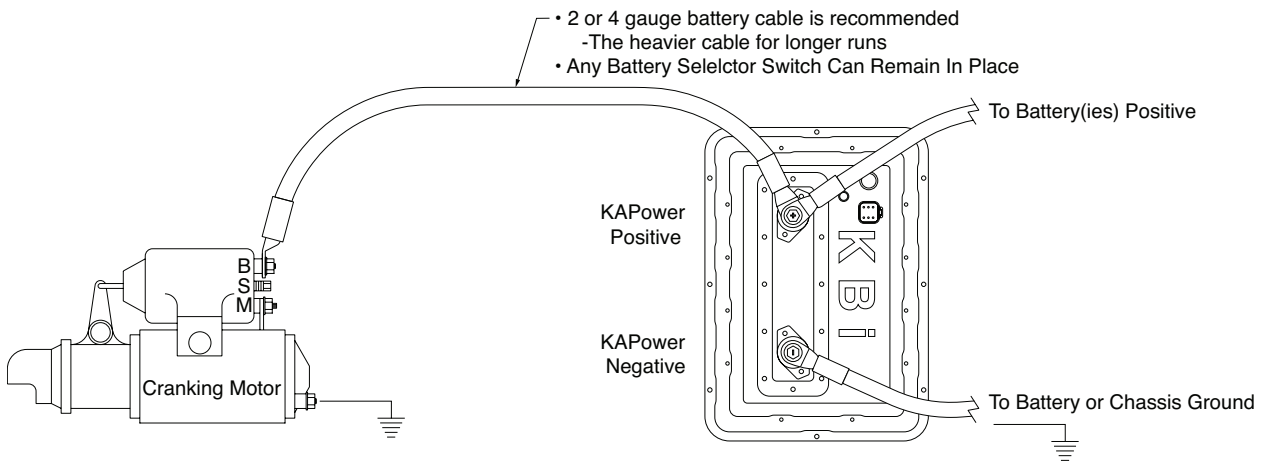
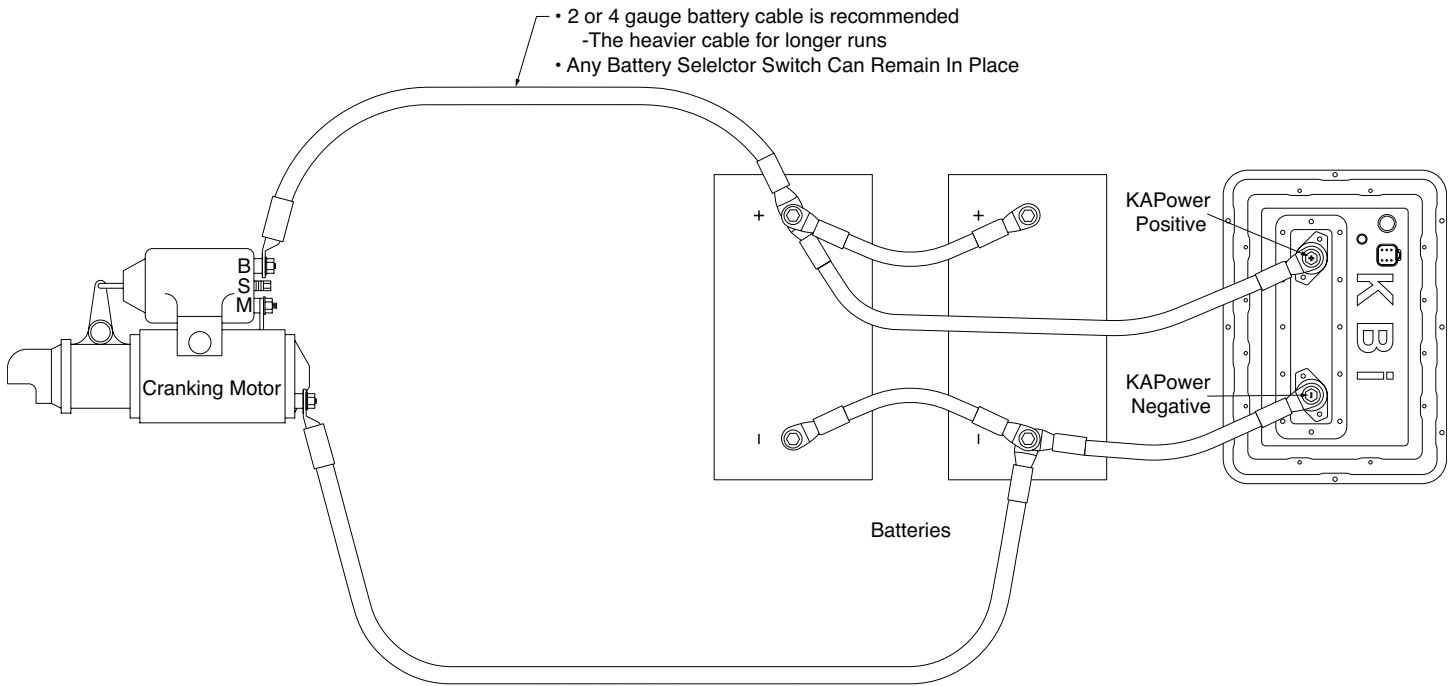


Figure 1: Typical Cable Installations



Wiring and Installation Diagrams

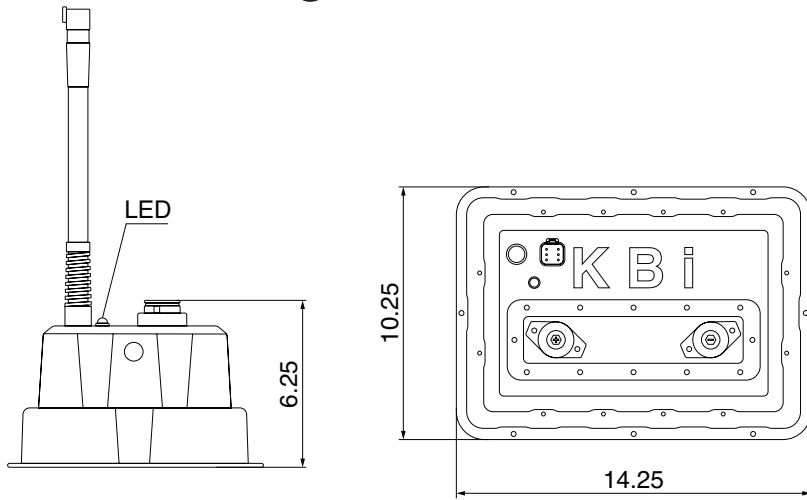


Figure 2

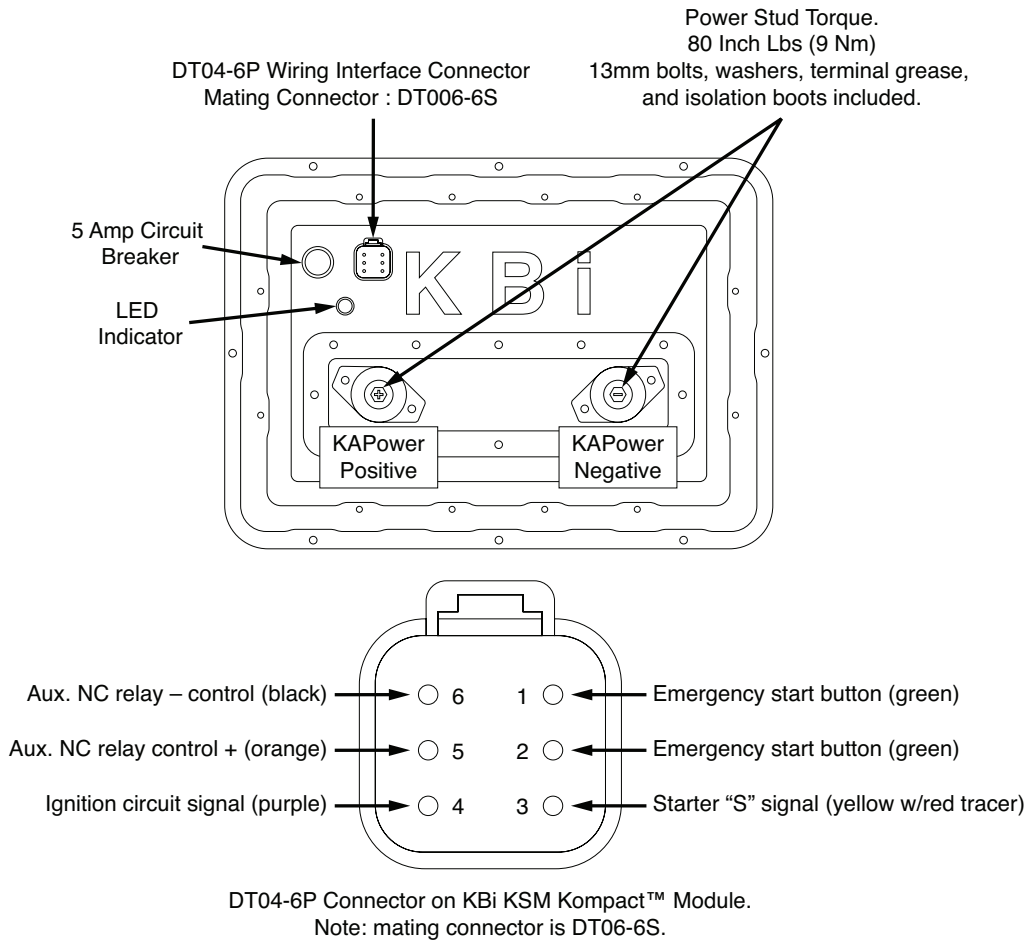


Figure 3: General Wiring Installation



Wiring and Installation Diagrams

Pin-Out Color Code		
#1	Emergency Start Button	Green
#2	Emergency Start Button	Green
#3	Starter Signal	Yellow W/Red Tracer
#4	Ignition Signal	Purple
#5	NC Relay Control +	Orange
#6	NC Relay Control-	Black

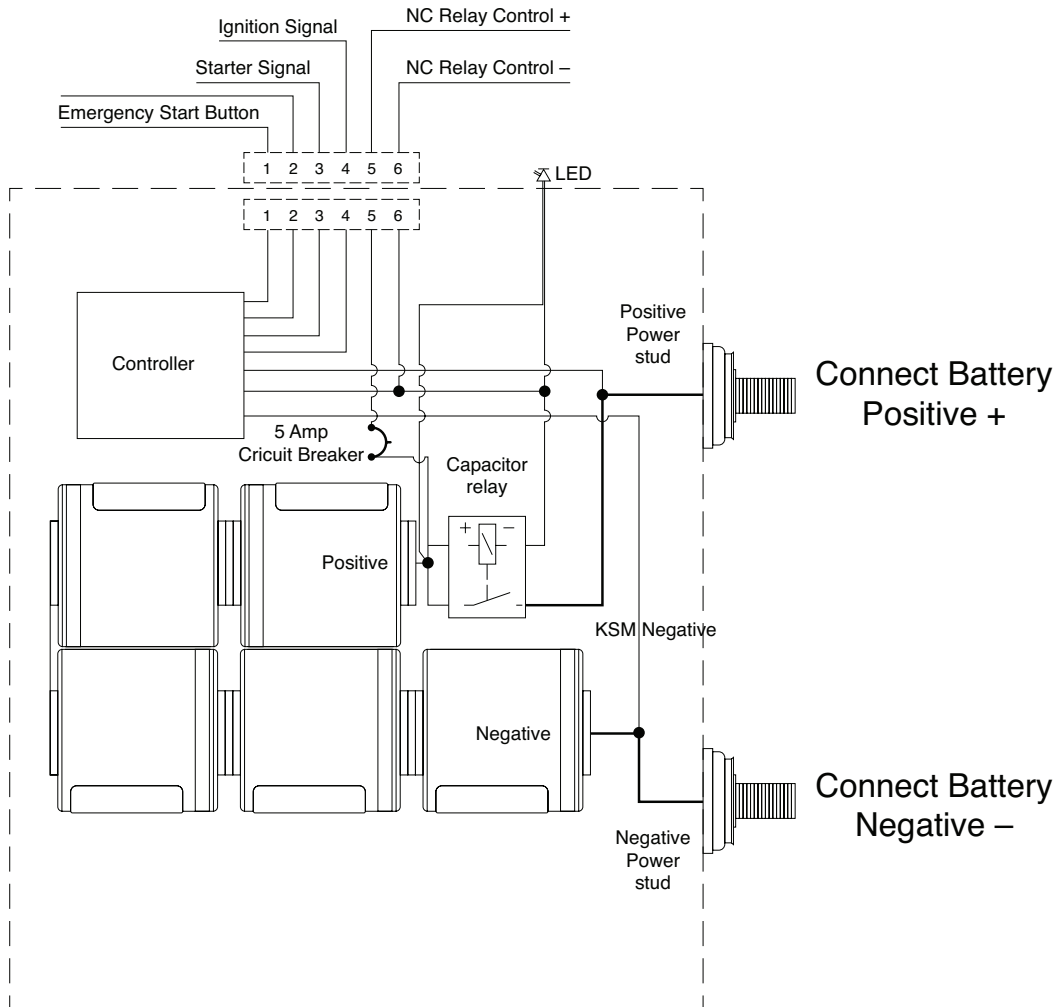


Figure 4: KBI KSM Kompact™ Module Schematic



Battery Cable Installation Diagrams

The PCB inside the KBI KSM Kompact™ module needs power at pin four from a source, such as the key switch, that provides power only when the boat is in operation. See Figure 4.



Example of existing key switch. The needed KSM connections can tap into the existing key switch circuits.

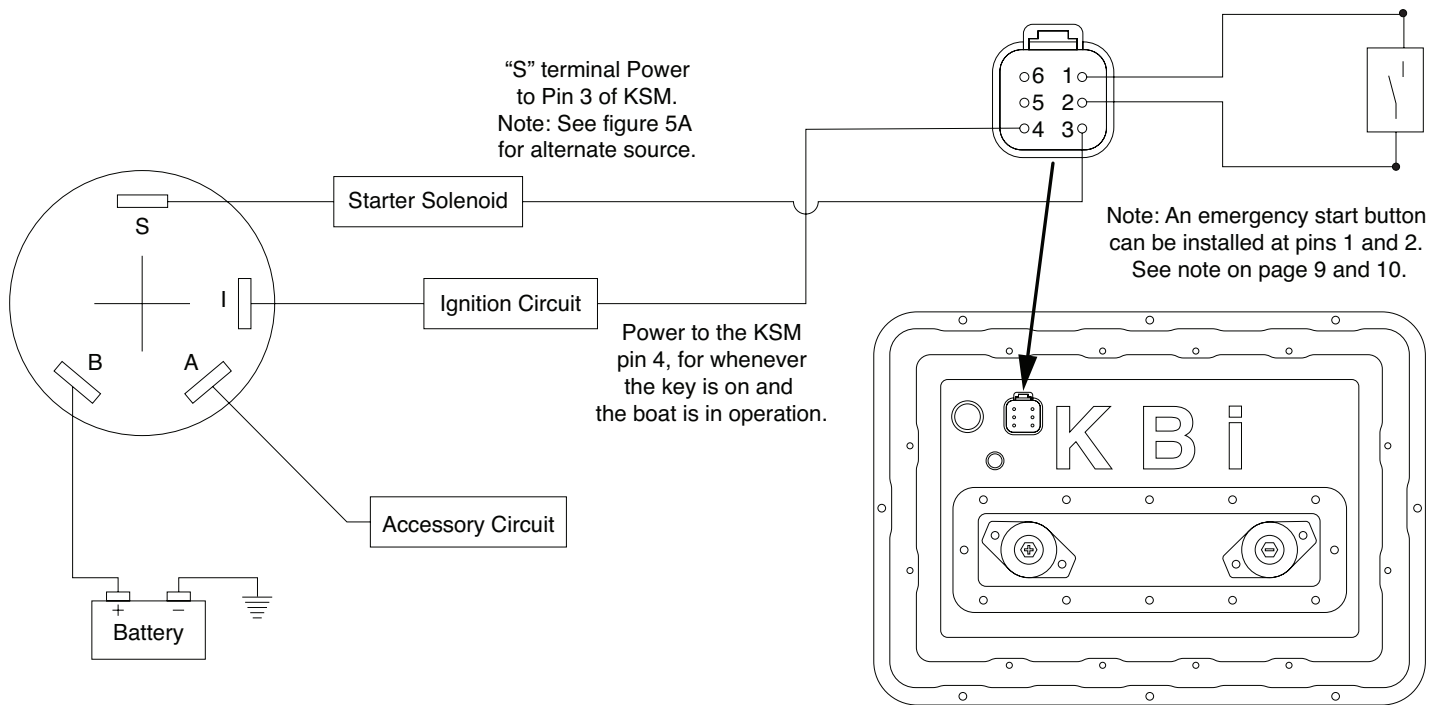


Figure 5: Key Switch Starter Operation



Battery Cable Installation Diagrams, continued

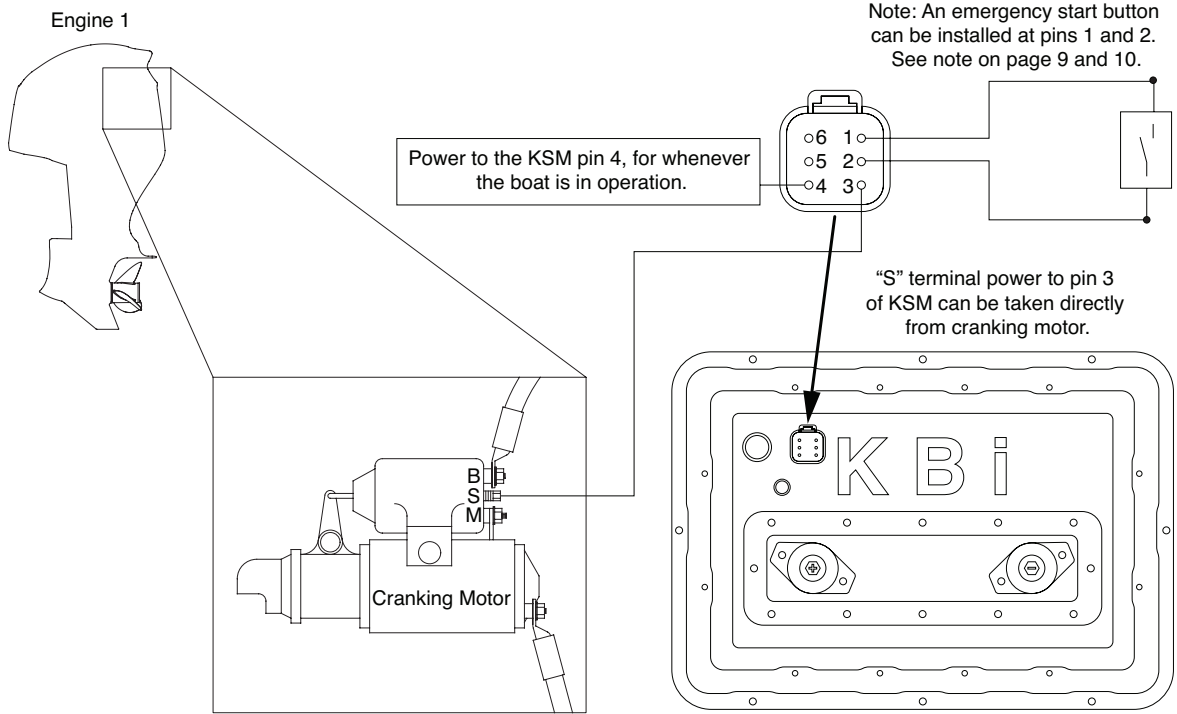


Figure 5A: Boat Operation

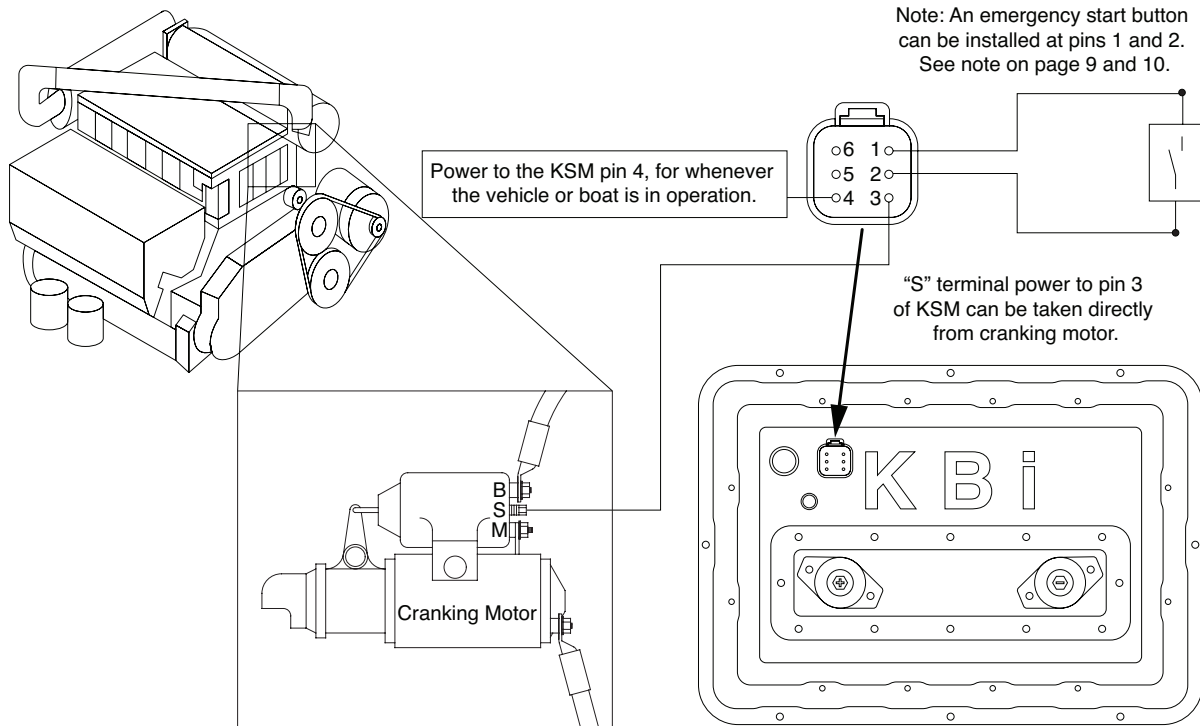


Figure 5B: RV or Inboard Boat Operation



Limited Warranty

The KAPower supercapacitor module itself, inside of the KBI KSM Kompact™ module, is guaranteed against defects in material and workmanship for three (3) years from date of purchase. All other KBI KSM Kompact module components are guaranteed against defects in material and workmanship for one (1) year from the date of purchase.

The KAPower supercapacitor module is a sealed unit; do not tamper with this unit. If the KBI KSM Kompact module does not operate properly within the warranty period, it must be returned to the factory, prepaid, in order to determine warranty disposition. If factory inspection determines the product to be defective under the terms of this warranty, it will be replaced without charge.

Failure due to accident, abuse, neglect, use other than in the intended application specified in this manual, improper installation or maintenance, mishandling, and repairs or attempted repairs which have been made by others, are not covered under the terms of this warranty.

Kold-Ban International, Ltd. shall not be liable for loss of use of the KBI KSM Kompact module or other incidental or consequential costs, expenses, or damages incurred by the purchaser or user. This warranty does not include labor for repair or replacement.

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