

Battery Control Center
Trouble Shooting Guide

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General

The Battery Control Center provides five functions:

1. Connects and Disconnects both chassis and coach batteries from their loads.
2. Controls ignition switch loads.
3. Controls fog lights.
4. Allows paralleling of chassis and coach batteries for auxiliary starting and charging.
5. Protects various circuits with fuses and circuit breakers.

Two basic applications exist: gasoline powered coaches and diesel powered coaches. The basic difference is that diesel coaches have their auxiliary starting relay mounted externally from the disconnects. This is because of the heavier cranking current required for the diesel engines. For each class, several revisions have been made:

Gas (electronic board)

- CB-200 rev. A - initial release
- CB-200 rev. B - added source power to disconnect switches from both chassis and coach batteries
- CB-200 rev. C - added dual voltage dropout of charging relay-improved relay driver circuits-added charging of chassis battery from shore power
- CB-200 rev. D - improved voltage sensing accuracy-mechanical changes
- CB-200 rev. E - part value changes-corrected silk screen
- CB-200 rev. F - moved ignition relay onto circuit board
- CB-115 rev. A - added two circuits on auxiliary BD-mechanical changes to fit smaller box-removed P1 and pigtailed relay wires directly to board
- CB-115 rev. B - unknown.
- CB-115 rev. C - revised fuse description (F12, F14, F21)
- CB-115 rev. D - added electronic disconnect driver to turn on disconnects when ignition key is turned on - changed F19 to 7.5A
- CB-115 rev. E - added P18 and F23, minor silk screen changes
- CB-115 rev. F - skipped
- CB-115 rev. G - changed F23 from 7.5A to 10A-added diodes D71 and D81

CB-115 rev. H and I - skipped
CB-115 rev. J - F19 changed to 5A
CB-115 rev. K - moved wire from drain of Q3 to relay side of F22 to protect transistor-F1 and F2 changed to circuit breakers-F23 changed to 15A
CB-115 rev. L - added missing trace from anode of D15 to ground
CB-115 rev. M - replaced electronic disconnect driver with pilot relay for transient immunity. Auxiliary start switch now uses the electronic aux start relay driver to introduce a 10sec. turn off delay.
CB-115 rev. N - minor mechanical and part value changes. Operation same as rev. M.
CB-115 rev. P - source power for auxiliary start switch and relay moved to both Chassis Bat and Coach Bat. Changed F18 to 5A. Changed voltage trip points.

Diesel (electronic board)

CB-300D rev. A - initial release
CB-300D rev. B - added coach battery as second power source
CB-300D rev. C - incorporated gasoline board changes:
 1. Dual voltage dropout of charging relay
 2. Charging of chassis battery from shore power
 3. Ignition relay moved to electronic board.
CB-300D rev. D - revised fuse description
CB-300D rev. E - minor silk screen changes
CB-300D rev. F - added electronic disconnect driver to turn on disconnects when ignition key is turned on - changed F19 to 7.5A
CB-300D rev. G - added P18 and F23, minor silk screen changes-added D71 and D81
CB-300D rev. H - changed F23 from 7.5A to 10A
CB-300D rev. I - skipped
CB-300D rev. J - changed F19 to 5A
CB-300D rev. K - moved wire from drain of Q3 to relay side of F22 to protect transistor-F1 and F2 changed to circuit breakers
CB-300D rev. L - added missing trace from anode of D15 to ground
CB-300D rev. M - replaced electronic disconnect driver with pilot relay for transient immunity. Auxiliary start switch now uses the electronic aux start relay driver to introduce a 10sec. Turn off delay.
CB-300D rev. N - minor mechanical and part value changes. Operation same a rev. M.
CB-300D rev. P - source power for auxiliary start switch and relay moved to both Chassis Bat and Coach Bat. Changed F18 to 5A. Changed voltage trip points.

It is necessary to keep these differences in mind when troubleshooting the various models of battery control center. The various revisions of the electronic circuit boards are backward compatible. For example, a rev. D board will replace revs. A through D boards. However, the revision levels are not upward compatible. In the preceding example, a rev. D board will not directly replace a rev. E or later board.

Battery Disconnect Function

Refer to Fig. 1, "Battery Disconnects - Partial Schematic" to aid in troubleshooting. Each battery disconnect is a magnetically latched relay. Hence power is applied to its coil only momentarily to actuate the relay. Unlatching is caused by reversing the direction of current through the coil. On a panel over the coach door are two battery disconnect control switches. Each switch is double pole, double throw (DPDT) with center off (momentary action). Pushing the top of a switch engages its relay while pushing the bottom of the rocker disengages the relay. An ignition lock out relay is provided on the circuit board to prevent the chassis battery disconnect from being disengaged while the vehicle ignition switch is on.

For CB115 rev. D, CB300D ref F and above (models with electronic disconnect driver), both disconnects are engaged when the ignition switch is turned on. See Fig. 2. The electronic driver is not used to disengage the disconnects. Hence, the ignition lockout relay is still functional.

Troubleshooting

Both batteries must be charged and the ignition key turned off so that there is no voltage present on fuses F6 through F12. First, test the unit using the operator switches (applies to all models). Possible failures are:

Neither relay operates:

Check and replace fuse F19 if necessary. If fuse F19 is good and there is no voltage on it, replace the board.

Chassis battery disconnect fails to operate:

Battery voltage must exist on p2 #8. If not and fuse F19 is good, replace board.

There should be continuity between P2 #1 and the purple wire terminal on the disconnect relay and continuity between P2 #2 and the gray wire relay terminal. If not, check wiring and connectors P1 and P2. P2 was replaced with pigtailed to the disconnect in CB-300 rev. C.

Pressing the top of the chassis battery disconnect rocker switch should produce battery voltage on the purple wire terminal of the chassis battery relay and ground on the other. Pressing the bottom of the rocker produces battery voltage on the gray wire terminal and ground on the first. If so, the relay is defective. If not, check and repair coach wiring and/or switch panel.

Coach battery disconnect fails to operate:

Battery voltage must exist on p2 #7. If not and fuse F19 is good, replace board.

There should be continuity between P2 #3 and the white wire terminal on the disconnect relay and continuity between P2 #6 and the brown wire relay terminal. If not, check wiring and connectors P1 and P2. P2 was replaced with pigtailed to the disconnect in CB-115 rev.A.

Pressing the top of the coach battery disconnect rocker switch should produce battery voltage on the white wire terminal of the coach battery relay and ground on the other. Pressing the bottom of the rocker produces battery voltage on the brown wire terminal and ground on the first. If so, the relay is defective. If not, check and repair coach wiring and/or switch panel.

For CB115 rev. D, CB300D rev. F and above models (electronic disconnect driver), make sure that the disconnects operate properly with the manual switches as above. See fig. 2. Leave the disconnects disengaged. Turn on the vehicle ignition switch. Both disconnects should engage. If not, replace the circuit board.

Ignition Relay Functions

The vehicle ignition switch cannot carry the additional loads added by the coach. An ignition relay, actuated by turning on the ignition key (with chassis battery disconnect relay engaged), is provide to supply the necessary current. Refer to fig. 3(Gasoline) and fig. 4(Diesel), "Ignition Relay-partial schematic", for details. There are 2 cases, ignition relay mounted on the box and relay mounted on the board.

Troubleshooting

No voltage on fuses F6 through F12.

It is assumed that the chassis battery disconnect relay is engaged and the ignition switch is on.

Box mounted relay:

There must be battery voltage on P4 #11, P1 #7 and one terminal of the ignition relay. There should be ground

on P1 #8 and the other terminal of the relay. If so, the relay is defective. If not, check wiring.

Board mounted relay:

There must be battery voltage on P4 #11 and P13. If so, replace the board.

Fog Light Relay Function

The fog light relay allows heavy lamp loads to be controlled by a small dash mounted switch. Refer to fig. 5, "Fog Light Relay-Partial Schematic", for details. The dash mounted fog light switch applies power to the coil of the fog light relay, closing its contacts. This allows power to flow through fuse F13 to P4 #9.

Troubleshooting Fog Lights

It is assumed that the chassis battery disconnect is engaged, the ignition switch is on and the fog light switch is on.

If battery voltage is present on P4 #9, check the vehicle fog light wiring and lamps.

If no voltage is present on P4 #12, check wiring to the dash mounted fog light switch.

If battery voltage is present on P4 #12 and fuse F13 is good, replace the circuit board.

Auxiliary Start and Charging Relay Functions

The auxiliary start relay parallels the coach and chassis batteries in the event it is desired to start the vehicle with a dead chassis battery. In addition, the relay controls charging of the batteries as a set. Refer to fig. 6(Gasoline) and fig. 7(Diesel), "Auxiliary Start Relay-Partial Schematic", for particulars.

The relay is actuated manually from the driver's console by pushing the auxiliary start switch button. Coach battery power appears at P4 #2 after passing through fuse F17 and is applied to the dash mounted auxiliary start switch. The other side of the switch is connected to P4 #10. On gasoline models, P4 #10 is wired to P1 #5 and thence to the Auxiliary Start Relay. For Diesel models, P4 #10 is routed through fuse F20 (F22 for rev. C and up) to P3 #1 before being wired to the Auxiliary Start Relay. The relay is

mounted externally from the Battery Control Center on Diesel coaches.

For battery charging service, relay behavior depends upon revision level:

	Rev A,B	Rev C-N	Rev P
Relay pull-in	13.2VDC	13.2VDC	12.2VDC
Relay drop-out (ignition on)	12.2VDC	12.2VDC	12.6VDC
Relay drop-out (ignition off)	12.2VDC	12.6VDC	12.8VDC

Thus, with later revision boards and with ignition off, the Auxiliary Start/Charging Relay will drop out sooner (at 12.6VDC or 12.8VDC) to retain a greater amount of charge in the chassis battery. It is normal for the charging relay to remain pulled in after the engine is turned off. Coil current is approx. ½ amp for both models. The Diesel model has a heavier, intermittent duty coil. To enable the coil to be continuously energized, full voltage is applied for ½ second and then the coil is pulsed at approx. 50% duty cycle. Thus, a voltmeter will read about 6VDC when the Diesel relay is operating normally in closed position.

Gasoline and Diesel models of rev B and later sense voltage from both the ignition terminal and coach battery disconnect terminal. This allows the chassis battery to be charged from the converter when on shore power. Necessary conditions are: coach battery disconnect engaged, shore power on, converter operating, and coach battery charged above 13.2VDC. When these conditions are met, the auxiliary charging relay will pull in and both batteries will be charged in parallel.

Troubleshooting Auxiliary Start/Charging Relay

Normally, one can hear the Auxiliary Start/Charging Relay pull in when the auxiliary start switch is pressed. Battery voltage must appear at P4 #2. If not, replace fuse F17. Pressing the auxiliary start switch energizes P4 #10. Check for a faulty switch or wiring in the coach if not. For Diesel coaches, check fuse F20. Also, by removing the plug from P3 (Diesel), one can measure coil resistance between pins 1 and 2 to ensure that the coach wiring and relay coil is undamaged. With the relay pulled in, there should be zero volts across the load (large) terminals of the relay. On Diesel coaches, this checks that the relay is making contact under charging conditions (relay coil being pulsed).

Once the auxiliary start function is verified, any deviation from proper charging operation requires replacement of the electronic circuit board.

Load Center Functions

Chassis battery disconnect functions:

P9	F1	Power Seat
P10	F2	Pass Power Seat
P5 #1	F3	Step Motor
P5 #2	F4	Step Switch
P5 #3	F5	LP Det (Chassis)

Ignition functions:

P5 #4	F6	Ignition Signal
P5 #5	F7	Power Seat
P5 #6	F8	Rear Heater (Spare-CB115 rev. E, CB300D rev.G)
P5 #7	F9	Power Window (Power Mirror-CB115 rev. E, CB300D rev.G)
P5 #8	F10	Horn
P11	F11	Level Jacks
P12	F12	Dash Fan

Coach (Auxiliary) Battery Functions:

P4 #2	F17	Auxiliary Start Switch
P4 #3	F18	Solar Panel
P18	F23	Memory keep alive/Coach hot

2-30a circuit breakers to coach panel (total 60a)

Coach Battery Disconnect Functions:

P4 #1	F16	Radio Switch
P4 #4	f15	LP det (Coach)
P6	F14	Luglt
P16	F20	Slide Out (Gas CB-115 Rev A and Diesel Rev C only), Spare (CB115 rev. E, CB300D rev. G), Awning
P17	F21	Utly Lt/Spare (Gas CB-115 Rev A and Diesel Rev C only)

Troubleshooting

Check the fuse of the affected circuit. If good, the coach wiring must be checked.