

# **Alternator Charging Circuit and Shore Power Charger Modifications**

While tracing Mainship wiring to understand how the various battery banks were charged I found a few items that I felt were not optimum and decided to modify the MS charging system wiring.

## **Battery Bank Overview**

The MS 34HT DC system contained 4 batteries

1. (2) 8D Batt'ys for Start / House - wired through a 1-2-All-Off Switch in the main Battery Selector Panel (Photo Left)
2. (1) 8D Batt'y for exclusively for bow & stern thrusters – wired through their own on-off switches and fuses
3. (1) Gp 24 Batt'y for generator start – wired through an On-Off Sw in the main Battery Selector Panel (Photo Right)



## **Shore Power 120V / 12V Charger**

The charger is a ProNautic 1250 C3 charger – this is a 3-Bank charger.

MS wired the 3-bank charger to charge all 4 batt'ys by using a diode isolator to split one of the charger banks to charge 2 of the batt'ys. As diode isolators impart a voltage drop I decided to eliminate the diode isolator and charge only the (2) Start / House Batt'ys and the Thruster Batt'y with the shore charger.

The generator battery is charged by the gen alternator when running for emergency can be connected via jumper cables to one of the main start / house batt'ys. A fellow MS owner suggested an improvement on this which I also implemented...

By replacing the existing Gen Batt'y On-Off Sw with a 1-2-All – Off Sw (same size & mounting bolt holes) and adding a jumper to the start-house 1-2-All-Off Sw I have capability to cross connect the main eng start batt'ys w/ the Gen start batty for emergency starting or either and/or “emergency” charging of the gen batt'y.

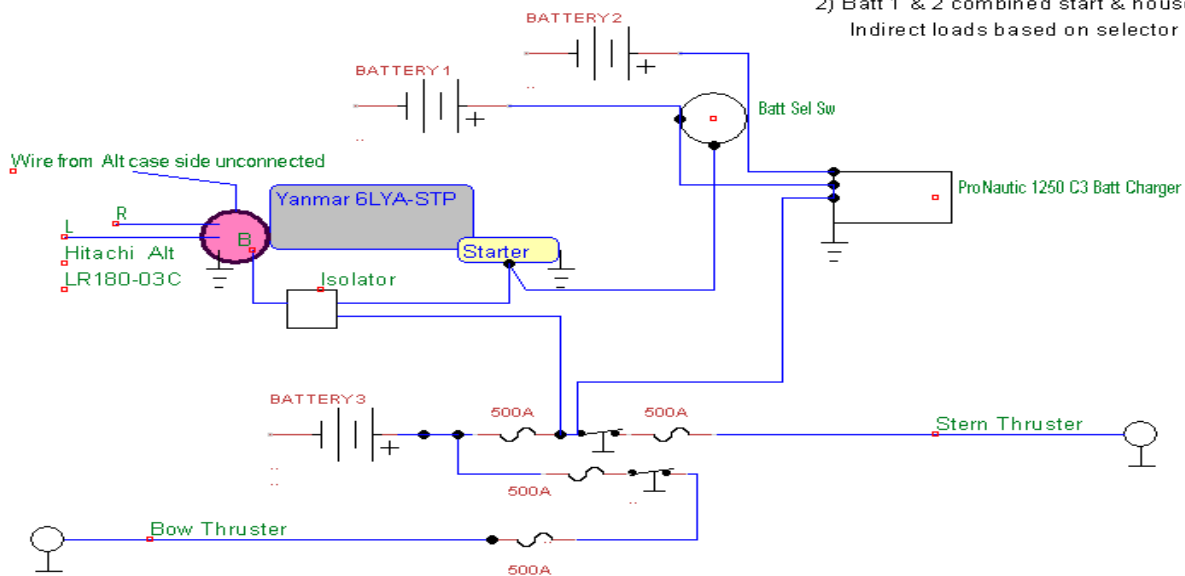
Note: after one season of use I have not had to use the x-connect for Gennie starting – the isolated gen batt'y has worked fine.

## **Main Engine Alternator Charging Circuit**

The main engine (Yanmar 6LYA-STP) has a stock 70A Hitachi alternator which MS wired to charge the Start / House batt'ys (either or both based on Sel Sw) and the thruster batt'y through a diode isolator.

After experiencing some low batt'y issues and researching Hitachi Alternators and diode isolators I found that some Hitachi alternators are not compatible with diode isolators. After understanding the diode voltage drop and issues that creates with battery charging, I decided to eliminate the diode isolator.

## "OLD" MS Factory Wiring Diagram

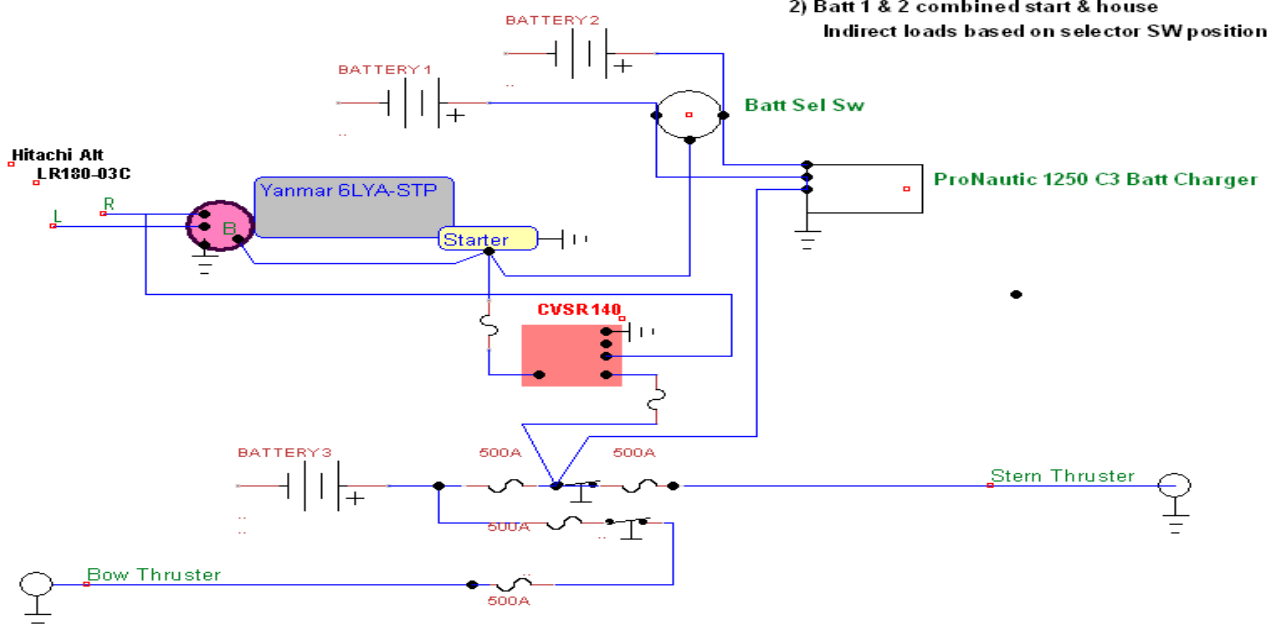


### Notes:

- 1) Battery 1, 2 & 3 East Penn 8A-8D AGM  
Chg / Abs - 13.8v-14.6v  
Float - 13.5v
- 2) Batt 1 & 2 combined start & house  
Indirect loads based on selector SW position

The search for alternatives to diode isolators led me to a [Sailing Today Article – Battery Isolators & Combiners](#) (see [Link on Projects Pg 4](#)) that summarized the pro's & con's of various alternatives. I wanted to retain the ability to charge both the Start / House and Thruster batt'ys via the alternator while underway. After reviewing the various isolator / combiners available and talking to some of the manufacturer's technical help line I decided to use a [Sterling CVSR](#) (see [Link on Projects Pg 4](#)) to replace the diode isolator.

## New CVSR Wiring Diagram



### Notes:

- 1) Battery 1, 2 & 3 East Penn 8A-8D AGM  
Chg / Abs - 13.8v-14.6v  
Float - 13.5v
- 2) Batt 1 & 2 combined start & house  
Indirect loads based on selector SW position

The Sterling CVSR was chosen for the following reasons:

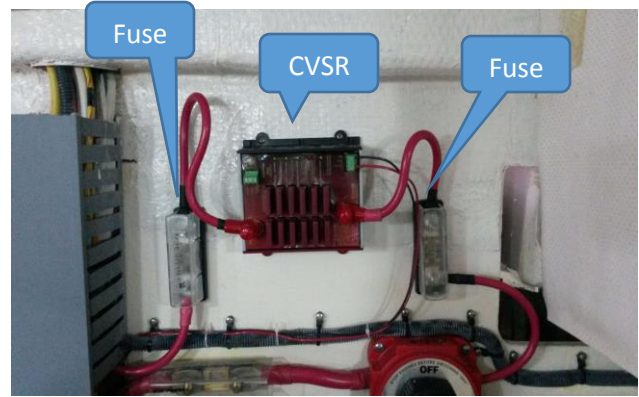
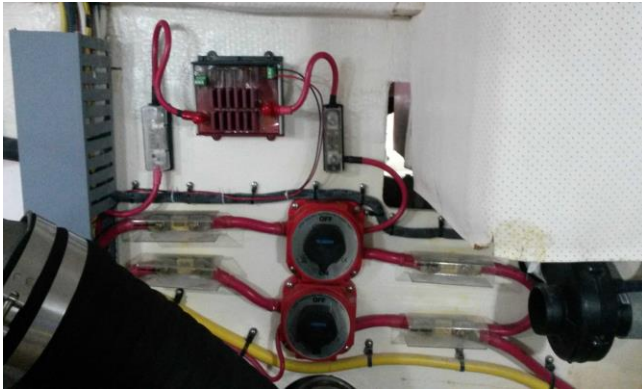
1. I was concerned that if the thrusters were activated when the main engine was running, alternator charging and the combiner relay engaged it might be possible for the thrusters to draw from both the thruster batt'y and the start / house batty's. If so, this could be a high current feed through the combiner / relay. I discussed this point (and shared the above schematic) with the ProMariner tech rep relative to using their ProlsoCharge Unit for this application. The ProMariner tech rep advised against using their ProlsoCharge unit for this application. I ruled out other similar combiners for this same reason as they were not capable of handling high amperages.
2. I considered using a Blue Sea ML-ACR unit as it is capable of handling high current and can be configured with a manual switch or automatic relay to isolate batteries under certain conditions. I thought about dropping out the combine function and isolating batteries when the thrusters were activated. The cost was similar to the Sterling CSVSR unit and would have entailed more wiring to enable the automatic isolate function. I believe this would work as well as the Sterling unit.
3. Sterling was very helpful and after reviewing the proposed schematics they confirmed the CVSR would work well in this application. In addition it can be configured in several different ways taking advantage of various features. I chose to utilize the **Ignition activation mode by** connecting an ignition wire from the alternator. This isolated the batt'ys when the ignition is off and allowed combining only when the ignition was on and appropriate batter voltages were sensed by the CVSR (see the manual for complete description of operating modes).

## Installation – Existing

Area chosen for mounting the Sterling CVSR and fuses & existing thruster battery switches & fuses



## Installation - New Sterling CVSR Installation



## Modified Charging System Operation

The modifications above provide:

1. Charging of 3 separate batt'ys when connected to Shore Power via the 3 bank battery charger.
2. Charging of start / house batt'ys 1, 2 or both and the thruster batt'y while underway via the main engine 70 amp alternator
3. Charging of the Gen start battery whenever the Gen is running via the generator alternator
4. Emergency combining of Gen start with Start / House Batt'ys 1,2 or both for Gen or Main Eng starting  
This also permits "emergency" connection of the 110V battery charger to the Gen start batt'y to "top it off" or bring it back if discharged. (this acts essentially like a "jumper cable" that permits cross connecting the Gen start and main Start / Souse batteries if and when needed)

Note: after operating for a full season that included an extended (5 wk) cruise, this feature was not necessary.

