Auxiliary connector

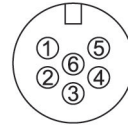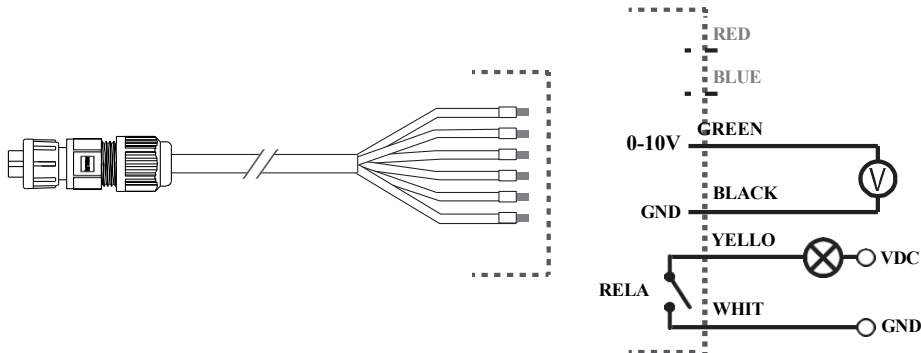| FUNCTION	WIRE COLOR	PIN
Analog SoC output *Max rating: 1mA*	Green (0 – 10V$_{DC}$)	6
	Black (GND)	3
Aux. relay *Max rating: 30V$_{DC}$/1A*	Yellow	4
	White	5
Not used	Red	1
	Blue	2

Figure 7: connector on the MLI Ultra

Figure 8: six wire ferruled auxiliary cable

- **State of Charge (SoC) indication**

    Wire pair 3&6 can be used to monitor the SoC on external equipment, where 10V = 100% and 0V = 0%. To enable this, select the "SOC 0-10V" option in the Configuration tab, see page 21.

- **Auxiliary relay (dry contact)**

    Wire pair 4&5 can be used to control an external device like a switch, relay or lamp. This is done in combination with a MasterBus event command or CZone circuit.

MasterBus DIP switch settings

- Set DIP switches 1 and 2 ON.
- Set DIP switches 3 to 8 to fit your needs. DIP switches 9 and 10 are not used in MasterBus.

DIP switch	3	4	5	6	7	8
Event-based 'stop charge' can be setup per charger:	0					
Automatic 'stop charge' for ALL Mastervolt chargers: (see also section "Stop Charge event" on page 25)	1					
Cluster setting for multi-unit configuration						
Stand-alone:		0	0	0		
Replica unit:		0	0	1		
Primary 12V unit:		0	1	0		
Primary 24V unit:		0	1	1		
Primary 36V unit:		1	0	0		
Primary 48V unit:		1	0	1		
(see section "Configuration of a battery bank" on page 29)						
'Auto switch-on' enabled:					0	
'Auto switch-on' disabled:					1	
'Battery detect' disabled:						0
'Battery detect' enabled:						1

Battery detect: If the battery is switched-off, there will be no voltage at the poles and some chargers will not start charging. By enabling the Battery detect option, this is fixed. Note if a load is connected that this will slowly drain the battery (5-10mA).

CZone DIP switch settings

1. Set DIP switch 1 to the OFF position.
2. Set DIP switch 2 to the OFF position.
3. Set DIP switches 3 to 10 to match the unique 'dipswitch' number, used in the CZone network.

Examples of Stop charge events:

Event # source	Event # target	Event # command	Event # data
Stop charge	Alpha Pro III	Suspend charging	Copy
Stop charge	ChargeMaster	State	Copy invert
Stop charge	ChargeMaster Plus	Suspend charging	Copy
Stop charge	CombiMaster	Charger	Copy invert
Stop charge	Mac Plus	Standby	Copy
Stop charge	Mass charger	On/Standby	Copy invert
Stop charge	Mass Combi Pro/Ultra	Charger	Copy invert
Stop charge	SCM-60 MPPT	On/Off	Copy invert

Configuration in a CZone network

Either do the configuration while connected to the network or use a prepared configuration file (.zcf). Ensure that a Dipswitch is assigned.

> For detailed information on the configuration, please refer to the CZone® Configuration Tool Instruction manual, and section Configuration in a MasterBus network on page 20, which describes the parameters as shown in MasterAdjust.

Precondition: This section assumes that a CZone system is already configured and the CZone Configuration Tool is open.

1. In the CZone Configuration Tool, from the Modules tab, click the **Add** button.
2. Enter an understandable **Module Name**.
3. From the **Module Type** drop-down list, select **Battery (BAT)**.
4. Each device on a CZone network has a unique CZone address; the **Dipswitch**. This number must match the physical DIP switch settings. When connected to the system: either select one from the drop-down list or edit graphically.
5. From the **Battery Type** drop-down list, select the required model.
6. Option: click the **Advanced Settings** button to configure advanced options.
7. **NMEA2000 Instances** are used to differentiate between multiple monitoring sources.
8. To optimize the battery cycle life, the **Depth of Discharge Remaining** (DoD) is set to 80%.

> ⚠ **CAUTION!**
> Changing the DoD to 100% will decrease the cycle life.

9. Tick **Show Battery Temperature** to enable temperature monitoring.
10. Click **OK** to return to the Module Modification window and then click the **Alarm/Switch Settings** button.
11. Set the required alarm levels and Alarm Severities.
    Battery level 1, 2 and 3 can be used for State of Charge switching.
12. Click **OK** to close the Battery Alarm/Switch Settings window.
13. Click **OK** to close the Module Modification window.

The following steps configure the safety behavior. For example, a *Stop Charge* switch that stops a battery charger.

Note: This must be done for all MLI Ultra units and for all charging devices.

14. Click on the **Circuits** tab and **Add** a new circuit (bottom left).
15. Enter the **Circuit Name** (e.g. Stop Charge) and click **OK**.
16. Click the **Add** button in the **Circuit Control** panel.
17. From the **Control Interface** drop-down list, select the required MLI Ultra unit.
18. From the **Input / Throw** drop-down list, select **Stop Charge**.
19. From the **Switch (Output) Function** drop-down list, select **Off/Restore**.
20. Click **OK**.

Return to step 16 until all MLI Ultra units have this switch configured.

21. Click the **Add** button in the **Circuit Loads** panel.
22. From the **Load** drop-down list, select the required charger.
23. Set the **State** to **Off**.
24. Click the **Timer/Advanced Settings** button.
25. 'Stop Charge' circuit switch only: from the **Control Type** drop-down list, select **Set Limit** and click **OK**.
26. Click **OK** to close the Circuit Load Configuration window.

Optionally, return to step 21 to do this for all chargers.

27. Return to step 14 to configure more circuits.
28. Write the configuration to the network to use the new configuration.

Configuration of a battery bank

Several batteries in series and/or parallel is called a cluster. A cluster can contain up to 24 devices in total (up to 48V). One MLI Ultra (it does not matter which one) is the Primary unit, the others are called replica units.

There are two ways to configure a cluster: using DIP switches or using a configuration tool. In a MasterBus network, a series OR a parallel connection can be configured with DIP switches. A combination of series and parallel connections must always be configured with a configuration tool, either MasterAdjust or the CZone Configuration Tool.

Battery bank configuration with DIP switches (MasterBus only)

All replica units must have DIP switches 4, 5 and 6 in this position: 001. Where 0 is OFF and 1 is ON. Their behavior is determined by the setting of the Primary unit. DIP switches cannot be used for series/parallel combinations. See section "How to change the DIP switch settings" on page 18 for how to access the DIP switches.

|	DIP switch		
Model MLI 12/1250	4	5	6
Replica unit	0	0	1
Primary unit 12V system (all batteries in parallel)	0	1	0
Primary unit 24V system (2x batteries in series)	0	1	1
Primary unit 36V system (3x batteries in series)	1	0	0
Primary unit 48V system (4x batteries in series)	1	0	1
	DIP switch		
Model MLI 24/1250	4	5	6
Replica unit	0	0	1
Primary unit 24V system (all batteries in parallel)	0	1	1
Primary unit 48V system (2x batteries in series)	1	0	1

When all batteries are connected, the Primary unit will check the configuration.
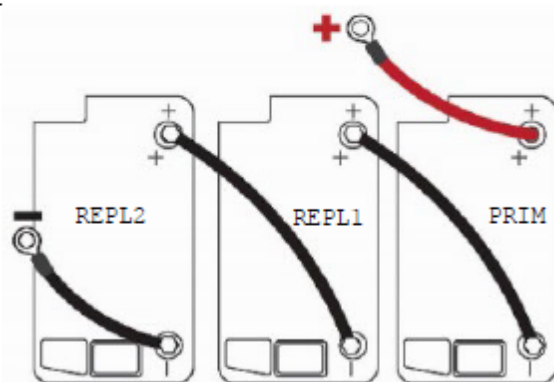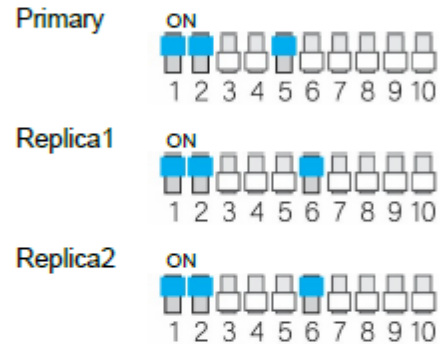
If the cluster is incomplete or incorrect, LED B keeps blinking 3 times. Possible causes:

- Too many replica units
- Too many primary units
- Replica unit missing
- Primary unit missing
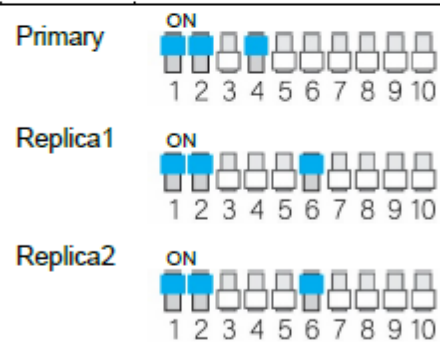- Incorrect system voltage (e.g. 24V model set as 36V system)

Examples:
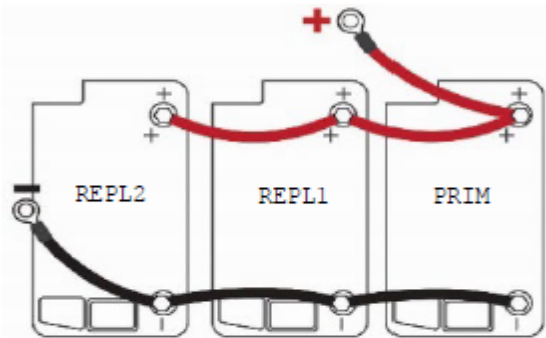
3 x 12V parallel (12V system)

3 x 12V series (36V system)

Battery bank configuration with MasterAdjust

When all batteries are connected to MasterBus, open MasterAdjust. The MLI Ultra will be recognized by the MasterBus network automatically.

1. Right-click USB:MasterBus… and select **Login**.
2. Select **Installer** and enter the installer code.
3. Select the MLI Ultra that will act as Primary and go to the **Configuration** tab.
4. Enter the number of batteries in the **# series (S)** field. If there are no batteries in series, enter 1.
5. Enter the number of batteries in parallel in the **# parallel (P)** field. If there are no batteries in parallel, enter 1.
6. Click the **Confirm topology** button. Notice the status of the cluster topology. It can be:
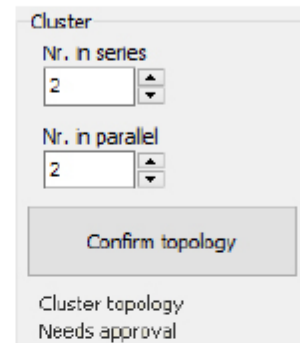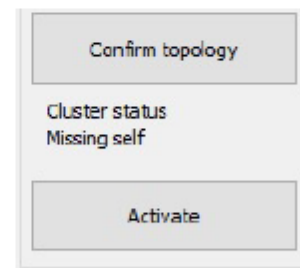   - Approved;
   - Needs approval: the topology was not confirmed;
   - Not activated: the topology still requires activation;
   - Too many devices/Double device/Incomplete/Missing self: the proposed topology is not possible or other units need to be selected.

   After confirmation, the cluster topology is defined and fields to select the other units will appear.
7. In the **S01** field, the Cluster **Primary battery** will be shown.
8. In the following fields, select the other replica batteries.
9. Click the **Activate** button. Now, each battery will show its individual data in the monitoring tab while the Primary battery will show both the individual data and the data of the cluster.

   Activation will fail if the battery is already in another cluster.

To access the individual batteries, unfold the cluster (i.e. click the plus sign) in the left panel of MasterAdjust.

To identify the Primary battery, go to the configuration page of one of the batteries.

To remove a battery from a cluster, click the **Detach** button on the Configuration tab of the battery in question.

To breakdown a cluster, in the configuration of the Primary battery: set the cluster to 1 (series) by 1 (parallel) and click the **Confirm topology** button.

Battery bank configuration with the CZone Configuration Tool
Preconditions: - a CZone system is already configured, including all batteries;
- the CZone Configuration Tool opened the required configuration file.

1. In the CZone Configuration Tool, in the Modules tab, double-click the MLI Ultra that will act as Primary battery.
2. The Module Modifications window appears. Click the **Advanced Settings** button.
3. From the **Cluster Type** drop-down list, select **Cluster Primary**.
4. **Cluster DC Instance** is an NMEA2000 instance that is used to differentiate between multiple monitoring sources.
5. Enter a **Cluster Name**.
6. Click the **Configure Topology** button.
   The Configured Battery Cluster Topology window appears.
7. Enter the number of batteries in series (S). If there are no batteries in series, enter 1.
8. Enter the number of batteries in parallel (P). If there are no batteries in parallel, enter 1.
9. To activate voltage balancing of all cells in series, select ON from the Series Balancing drop-down list.
10. Click the OK button to return to the Advanced Settings window.
11. Click the OK button to return to the Module Modifications window and then click the **Alarm/Switch Settings** button.
12. The Battery Alarm/Switch Settings window appears. To copy these settings from the Primary battery to all secondary batteries, tick **Apply to cluster**.
13. Keep clicking OK until all dialog windows have disappeared.
14. Write the configuration to the network to use the new configuration.

To identify the Primary battery, go to the Meters tab. The battery with two DC instances is the Primary battery.