



## Installation of an SP PRO Powerchain System

### Introduction

This installation note will demonstrate how to install and configure SP PRO units in a Powerchain system, either as a single phase, three phase or split phase system with up to three worker units per phase (four SP PRO inverters per phase – one manager, with three worker units).

### Preparation

- This document needs to be read in conjunction with the SP PRO Instruction Manual and SP LINK instruction manual (both found in the SP LINK Help menu)

### Powerchain Definitions

- System Manager – Must be connected to L1 – all configuration, control and interaction is via this SP PRO
- Phase Manager – Main SP PRO on L2, L3 and/or Split(180°)
- Worker – any other SP PRO within system on any phase.

### Summary of steps

The following is a summary of the steps required to complete the installation. Once the installation is completed, use the outline below as a check list:

Installation step		Pages
1	Install the SP PROs, including the DC and AC wiring.	2 - 6
2	Install and Configure the Batteries (DC Power to the SP PROs is required to complete the process)	
3	Connect the SP PRO SYNC connections and terminators	7
4	Verify Firmware	8
5	Create the configuration for the SP PRO Powerchain system, using the Site Configuration Wizard in SP LINK	9
6	Connect to the SP PRO System Manager via SP LINK, assign the SP PROs in the Powerchain system and save the configuration	11
7	Test the system function	12



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### Installation

The SP PROs must be installed as per the installation instructions in the user manual.

It is a good idea to place a label on the top right-hand corner of each SP PRO. This will help to identify each inverter in the Powerchain system during system commissioning and testing.

### AC Wiring

All Neutral connections from inverters must be connected together at the same common point as required.

The neutral conductor connecting to the loads must be maintained such that operation of any external SP PRO isolators cannot sever the link between Neutral and Earth.

All of the AC wiring linking the Load L and N circuits between any particular phase manager and its workers complies with the following:

1. The L and N cables either run in the same conduit or a twin cable is used. It is important that the cable pairs run in parallel and do not separate.
2. Minimise the cable length between an SP PRO and the sub board where it is connected to the other SP PROs on the same phase. The maximum allowable cable run is 10 metres from SP PRO to sub board.

### SINGLE PHASE TWO WORKERS EXTERNAL CONTACTOR (OPTION 1)

Figure 1 shows the SP PRO Single Phase Powerchain AC wiring schematic with two workers and an external CT & AC source contactor.

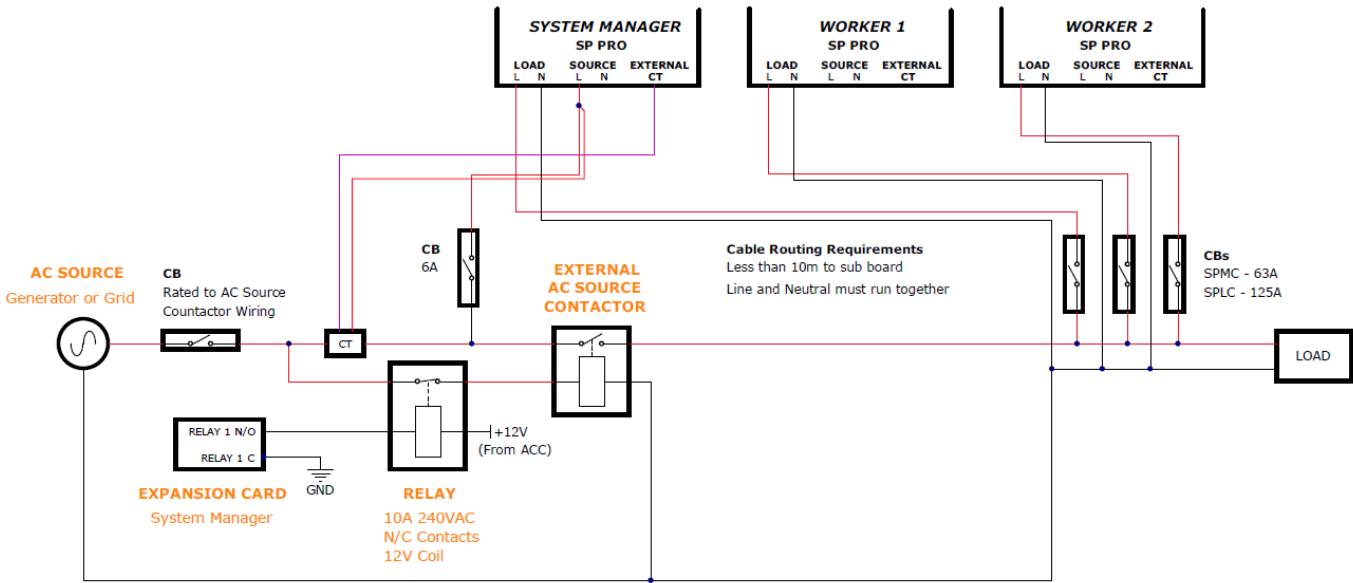


Figure 1: Single Phase AC wiring schematic with external contactor/CT and two workers  
AC Source Power > 15 kW for SPMC or 30 kW for SPLC models

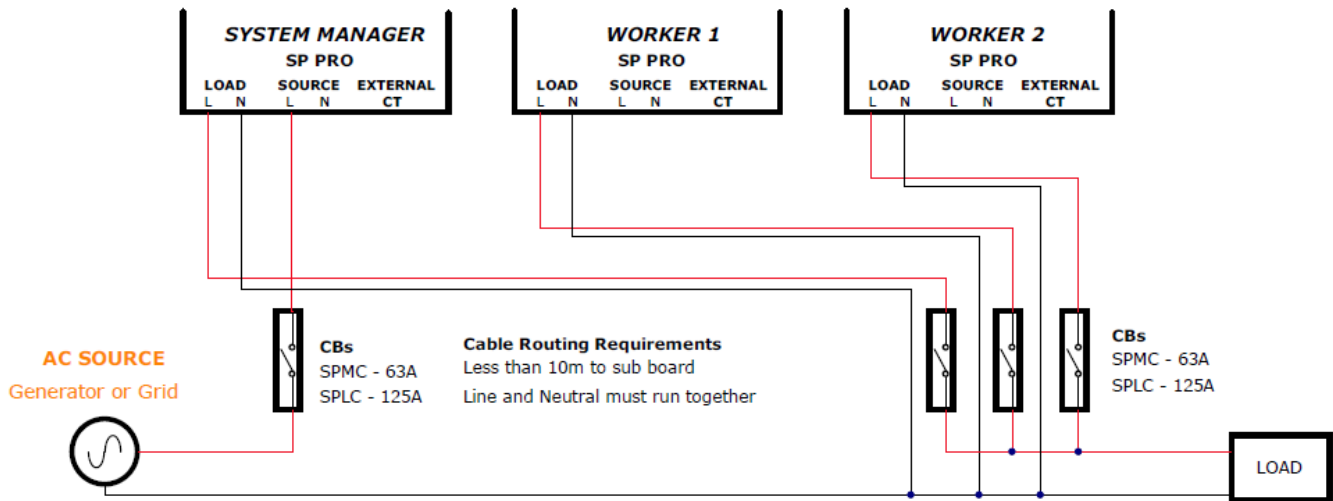
# SP PRO Powerchain

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### SINGLE PHASE TWO WORKERS INTERNAL CONTACTOR (OPTION 2)

Figure 2 shows the Single Phase Powerchain AC wiring where no external contactor and CT is installed. This configuration can be used when the AC source capacity is no more than 15kW per phase for the SPMC models, or 30kW per phase for the SPLC models.



*Figure 2: Single Phase AC Wiring Schematic with 2 Workers  
AC Source Power < 15 kW for SPMC or 30 kW for SPLC models*

### THREE PHASE TWO WORKERS PER PHASE

Figure 3 (following page) shows a Three Phase Powerchain system with two workers per phase. An external three phase AC source contactor is required with external CTs for each phase.

**NOTE:** A three phase Powerchain system with one or more workers per phase MUST have external CTs and an external AC Source contactor fitted.

**NOTE:** Three phase circuits which have loads that cannot tolerate a phase failure must be protected by a Phase Failure Relay (not supplied).

# SP PRO Powerchain Installation Note

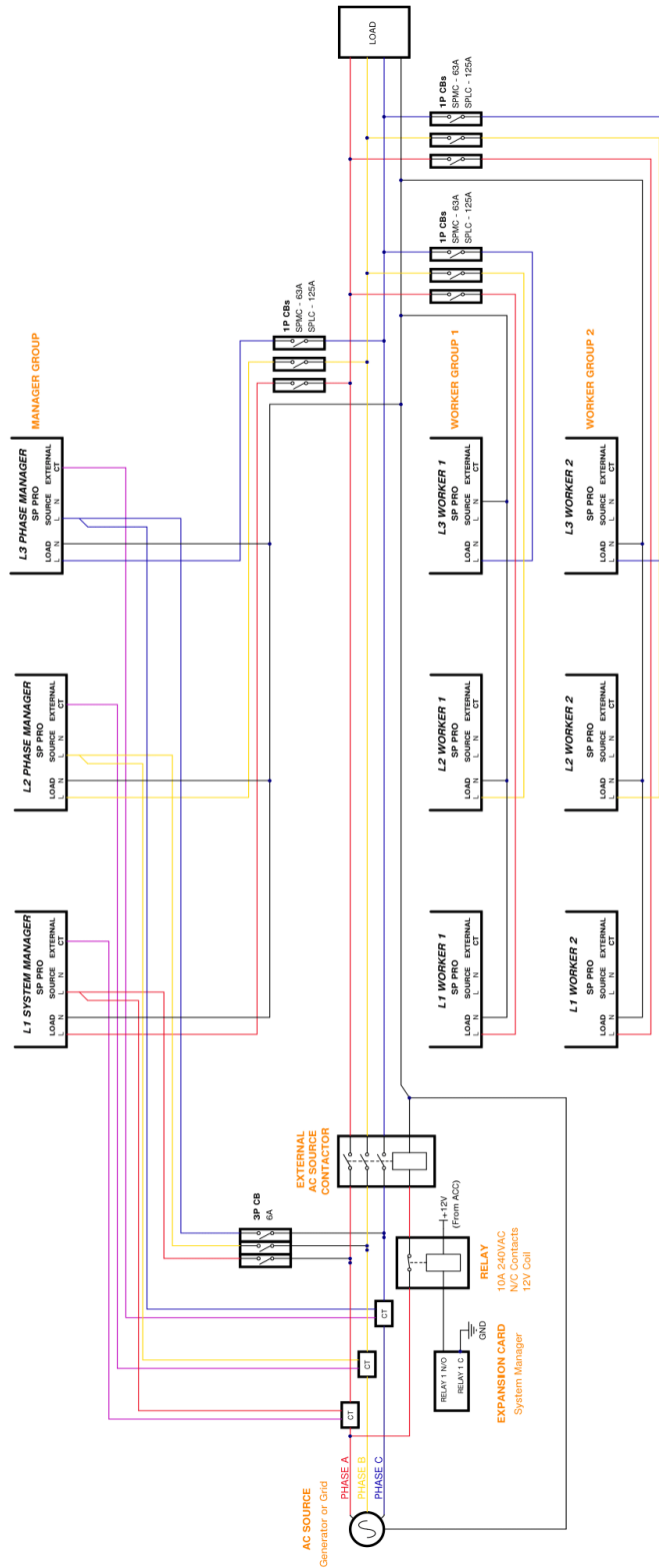


Figure 3: Three Phase AC wiring schematic, external contactor, two workers per phase

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### Main DC Wiring

The SP PRO Powerchain main DC wiring diagram is illustrated in Figure 4.

Battery protection must be a minimum of 630A per group. After the DC battery protection, the cables can be split into one circuit per SP PRO, each supplied by minimum 70mm<sup>2</sup> V90HT cables. Each circuit is protected by a 250A HRC fuse or DC circuit breaker.

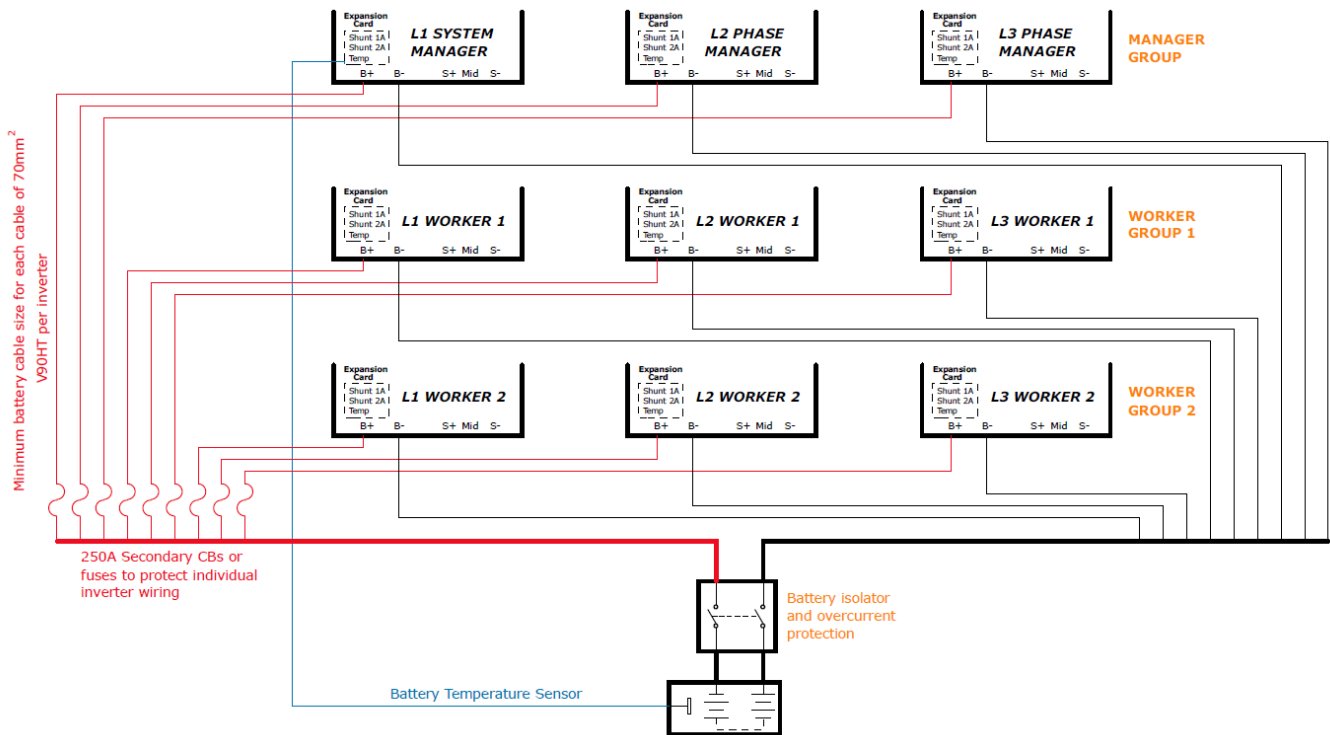


Figure 4: Main DC wiring schematic showing nine SP PROs.

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### Pre-charge and Midpoint Wiring

The SP PRO Powerchain DC pre-charge and midpoint wiring layout is shown in Figure 5.

The pre-charge wiring is wired as a bus arrangement and connected to the battery via a common connection for all SP PROs. This will allow all SP PROs to be pre-charged together.

The Midpoint wiring need only be connected to the System Manager (L1). The System Manager carries out the battery sense and midpoint readings for the system.

The pre-charge and midpoint wiring must be protected by suitable fuses or a three pole circuit breaker rated at least 2A DC per SP PRO. For the system below (Fig. 5) the pre-charge circuit breaker rating is 18A or more.

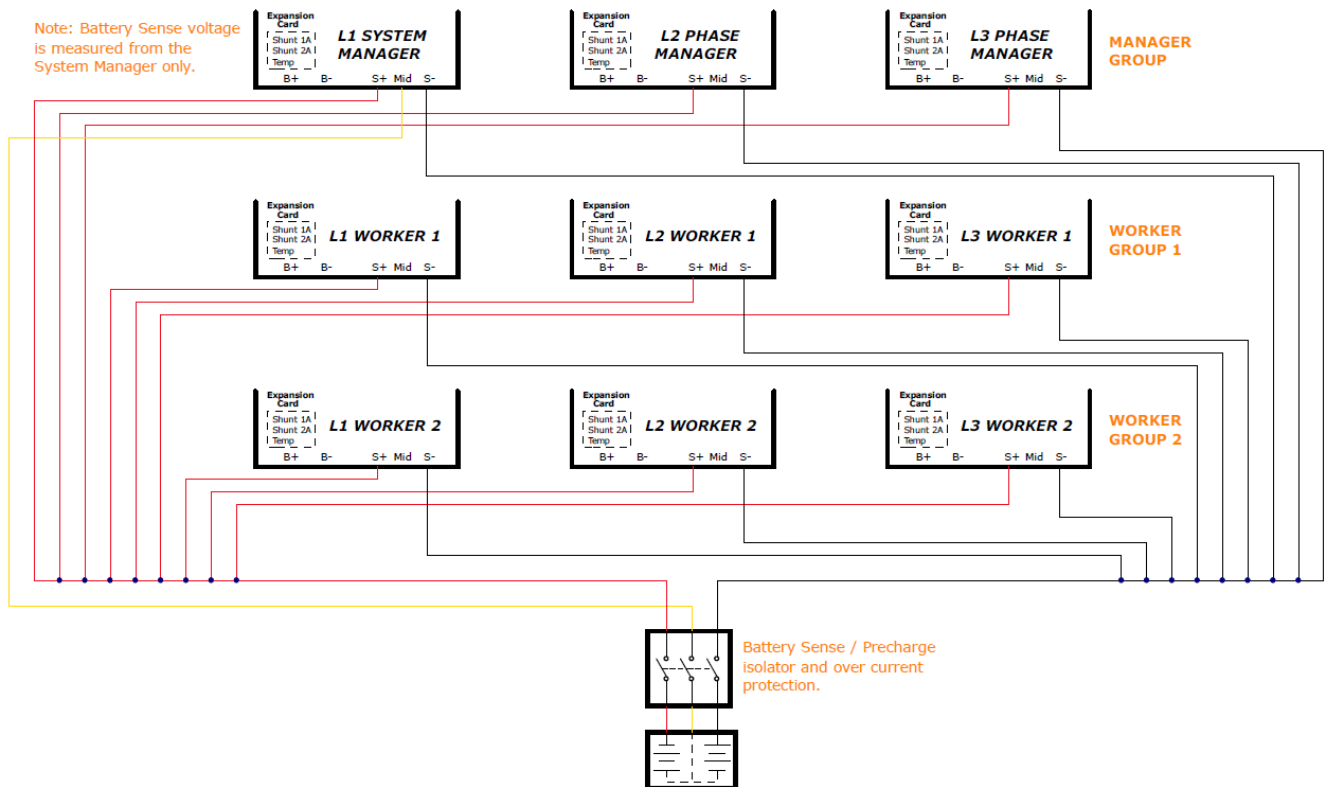


Figure 5: DC pre-charge and midpoint schematic showing nine SP PROs

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### SP PRO SYNC Interconnection

Every SP PRO in a Powerchain system must be interconnected via its SYNC interface. Connect every SP PRO together via the SYNC-1 or SYNC-2 connection, using the supplied cat5 cables.

The SYNC-1 and SYNC-2 connection points are identical, so either may be used for each connection.

Each SP PRO can be connected together in any sequence, with the most logical sequence being connections between adjacent SP PROs. Ensure that all SP PROs in the Powerchain system are linked into one single SYNC chain.

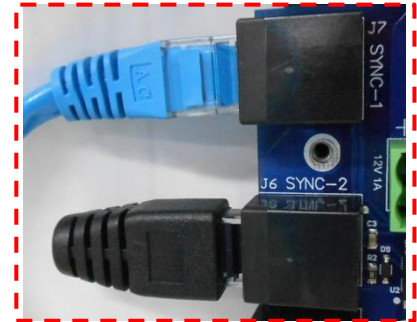
**Note:** Termination connectors **MUST** be fitted to the two unused SYNC connectors.



**Start**



**All Others**



**End**

### SYNC interconnection of the SP PROs

# SP PRO Powerchain

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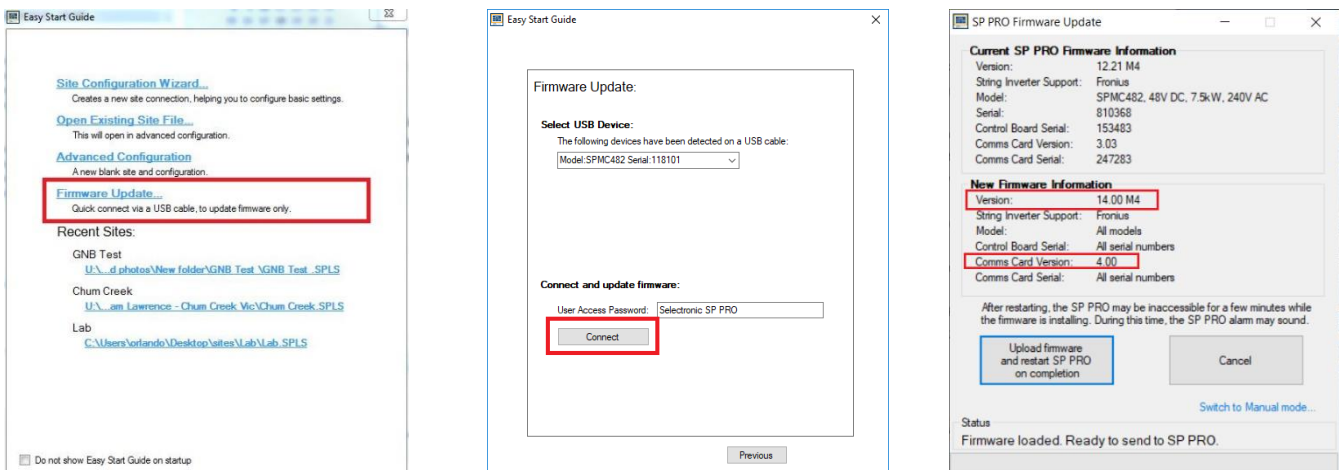
### Update Firmware and reset to factory defaults

Download the latest SP LINK (version 14.0 or higher) from the Selectronic web site. This will contain the latest SP PRO firmware 14.00 or higher and the Communications Card firmware 4.00 or higher.

Apply DC power to all the SP PROs in the Powerchain system and wait until they start.

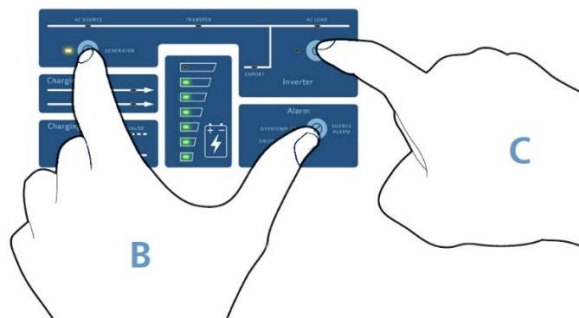
Connect the SP LINK PC to the USB port on the SP PRO that will be assigned as the System Manager (the Manager on L1 phase).

Select Firmware Update from the Easy Start Guide and update all of the SP PROs in the Powerchain system to latest version of firmware (Version 14.00 or higher and Comm Card version 4.00 or higher, if not already updated). All SP PROs in the Powerchain system will be updated via the System Manager.



Each SP PRO is shipped with a factory default configuration. If any of the SP PROs in the Powerchain have been configured then they must be set back to factory defaults before proceeding. If in doubt, it is best to revert each unit to factory defaults.

To set an SP PRO to factory defaults: Apply battery power to the SP PRO and leave in Idle. Press and Hold the Alarm and Generator buttons (B) then press the ON button (C) until all LEDs go green. Release all buttons.



For more detailed instructions on how to update firmware and reset an SP PRO to factory defaults, please refer to Appendix I on page 14.



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### SP PRO Configuration

The Site Configuration Wizard is used to create the configuration for the Powerchain system. All communications and system configuration are carried out by connecting to the System Manager (L1).

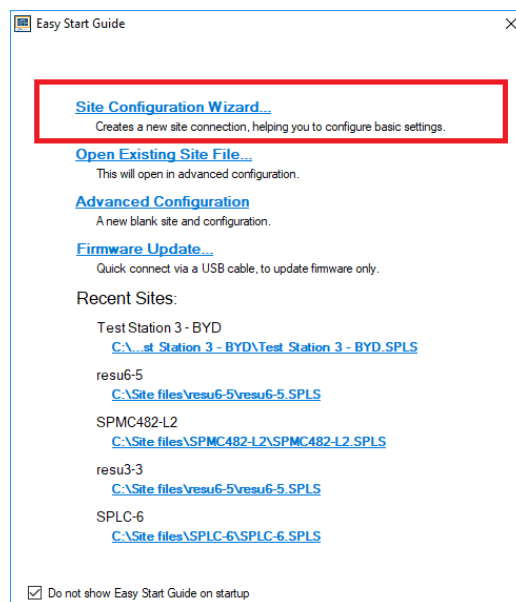
Once the system is configured, communications to other SP PROs in the Powerchain system is via the System Manager. The data communications ports on the other SP PROs are disabled.

1. Make sure the USB lead is connected between the System Manager and PC.
2. Make sure the DC power is present at all of the SP PROs.  
Wait until the front panel LEDs are stable.
3. Start Selectronic SP LINK.



Selectronic  
SP LINK

4. Select "Site Configuration Wizard" and step through the wizard to setup the system to suite the Powerchain system application.

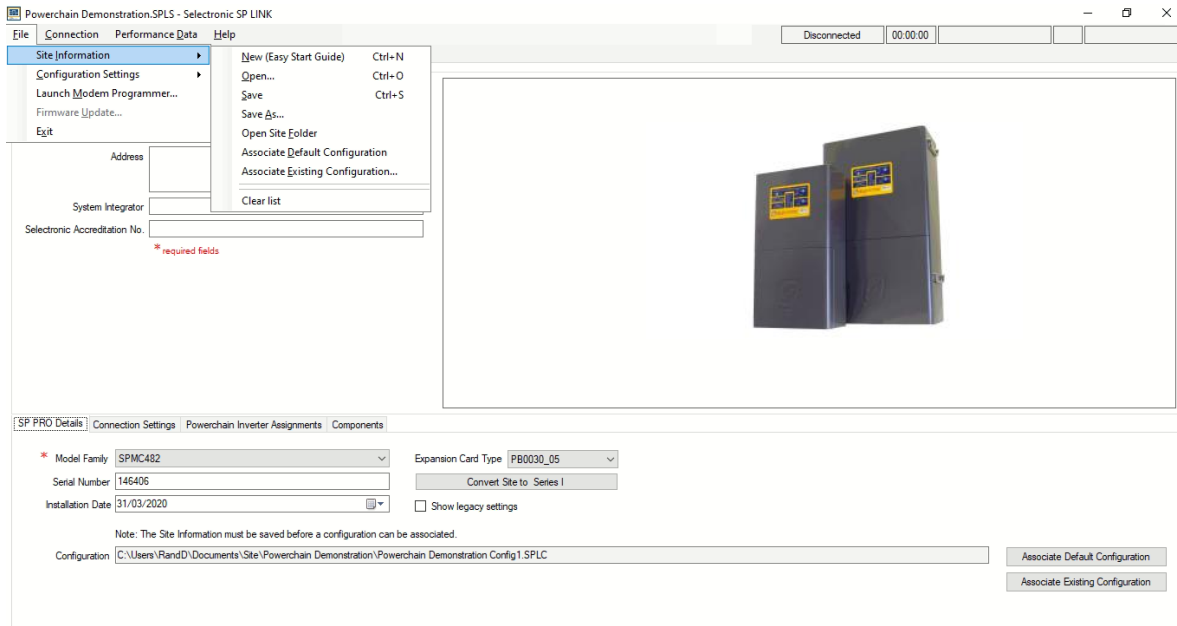


**Hint:** For information on how to use the "Site Configuration Wizard", right click on the page in SP LINK and a help guide will appear.

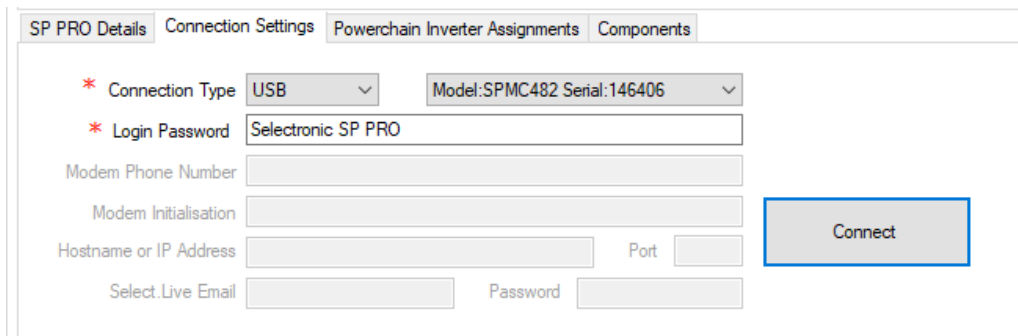
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When all settings have been configured in "Site Configuration Wizard", from the menu bar, select File > Site Information > Save.



5. SP LINK will automatically detect when the System Manager SP PRO is ON and the USB cable is connected. Click "Connect" to connect to the SP PRO.



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- Go to the Powerchain Inverter Assignments tab. Drag and drop the serial numbers of the Unassigned Inverters box into L2 or L3 Managers or L1, L2 and L3 Workers as appropriate.

**Hint:** To identify an SP PRO, double click on a serial number and the battery LEDs on the associated SP PRO will flash RED for 3 seconds.

- Once all SP PROs are assigned, click "Save Assignments". The default settings passcode is 74.

- At the Configuration Settings tab, click the "Configure SP PRO" button.

**SP PRO Powerchain Configuration is now complete**

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### Operation of the SP PRO

Once the SP PROs are installed and configured correctly, the system is controlled by the System Manager (the first SP PRO on L1). All other SP PROs will follow the operational mode of the System Manager automatically.

#### Start-up

- Turn on the Battery Sense / Pre-charge isolator (See Fig 3). Wait until the SP PROs turn on.
- Turn on the Battery Isolator

Note: All buttons and battery LEDs are disabled on the Phase Managers and the Workers.

1. After the SP PRO has powered up and the front panel LEDs are stable.
2. Connect to the System Manager via SP LINK.
3. In SP LINK navigate to "Data view > Powerchain". Verify that all the real time readings from each of the phases is correct.

The screenshot displays the SP LINK software interface for a Powerchain demonstration. The window title is "Powerchain Demonstration.SPLS - Selectronic SP LINK". The interface includes a menu bar (File, Connection, Performance Data, Help) and a toolbar with phase selection (L1, L2, L3) and a "Manager" dropdown. The main data grid is organized into several columns and rows, showing real-time readings for phase L1. Key metrics include:

- System:** Battery Voltage (55.3 V), Battery SoC (81.2%), Battery Charger Stage (Bulk), AC Load Frequency (0.0 Hz), AC Source Frequency (0.0 Hz), Output Mode (Idle).
- DC Total:** Battery Current Total (-1.3 A), DC Coupled Solar Total.
- AC Total:** Load Power Total (0.00 kW), AC Source Power Total (0.00 kW), AC Inverter Power Total (0.00 kW).
- DC on L1:** Inverter DC Current L1 (-0.5 A), AC on L1 (AC Source Status L1: AC Source Not Present, Load Power L1: 0.00 kW, Load Voltage L1: 0.0 V, AC Source Power L1: 0.00 kW, AC Source Voltage L1: 0.5 V, AC Inverter Power L1: 0.00 kW).
- DC on L2:** Inverter DC Current L2 (-0.4 A), AC on L2 (AC Source Status L2: AC Source Not Present, Load Power L2: 0.00 kW, Load Voltage L2: 0.0 V, AC Source Power L2: 0.00 kW, AC Source Voltage L2: 0.5 V, AC Inverter Power L2: 0.00 kW).
- DC on L3:** Inverter DC Current L3 (-0.4 A), AC on L3 (AC Source Status L3: AC Source Not Present, Load Power L3: 0.00 kW, Load Voltage L3: 0.0 V, AC Source Power L3: 0.00 kW, AC Source Voltage L3: 0.5 V, AC Inverter Power L3: 0.00 kW).
- DC on Split:** Inverter DC Current Split, AC Source Status Split, Load Power Split, Load Voltage Split, AC Source Power Split, AC Source Voltage Split, AC Inverter Power Split.
- AC Coupled Solar:** AC Coupled Solar Total Power, AC Coupled Solar on L1, L2, L3, and Split, along with Target Power for each phase.

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- SP LINK can also provide individual information for each of the SP PROs in the Powerchain. Select "L1 or L2 or L3" in SP LINK, then Manager or Worker to display the SP PRO's distinct information.

Select the DataView > Now screen and check that there are no faults displayed in the Attention Required box.

The screenshot shows the SP LINK software interface for a Powerchain Demonstration. The top navigation bar includes 'File', 'Connection', 'Performance Data', and 'Help'. Below this, there are tabs for 'Site Information', 'Configuration Settings', 'QuickView', and 'DataView'. The 'DataView' tab is active, and a dropdown menu shows 'L1', 'L2', 'L3', and 'Manager'. The 'Manager' option is selected. The main display area is divided into several panels:

- Status:** Output Mode (Idle), AC Load Power (0.00 kW), AC Source Status (AC Source Not Present), AC Load Voltage (0 V), Generator Status (Not Running), AC Load Frequency (0.0 Hz), Generator Started by (Impending Inverter Shutoff), Generator Running Reason (Minimum Runtime).
- DC:** Battery SoC % (81.2%), Battery Voltage (49.4 V), Battery Current (-0.5 A), Inverter Current (0.2 A), Shunt 1 (Disabled), Shunt 2 (Disabled), 5 min Battery Load (0.00 kW), 15 min Battery Load (0.00 kW), Charging Mode (Initial).
- AC Source:** Power (0.00 kW), Power (5 min Average) (-0.01 kW), Voltage (0 V), Current (1.1 A), Frequency (0.0 Hz), Available Power (0.00 kW), Network Power Meter (Not Present), Inverter AC Power (0.00 kW), Current (0.1 A).
- System Regulation Status:** Solar Hybrid Active (None), AC Source Input Limit (10.00 kW), Grid Export Limit (0.00 kW), Charge Limit (9.00 kW), AC Load Support Limit (18.00 kW), Battery Charging (Normal charge), Inverter Shutdown Status (Inverter active), Grid Disconnect Status (Grid allowed), Power Overtide Target (Inactive).
- DC Coupled Solar:** Total Power (8291.53 kW), Total Capacity (0.00 kW), and a table of solar panels with columns for ID, Power, and Capacity.

A red box highlights the 'Attention Required' section, which is currently empty.

### Shutdown

- Turn off the Battery Isolator
- Turn off the Battery Sense / Pre-charge isolator

### Additional information

Selectronic web site – <http://www.selectronic.com.au> or contact the Selectronic Sales Team.



### Appendix I: Instructions on How to Update Firmware

#### Reset each SP PRO back to factory defaults

Each SP PRO must be set back to factory defaults before setting up Powerchain. This process clears out the current configuration in the SP PRO so it is ready to accept a new Powerchain configuration.

To reset to factory default, on the front panel of the SP PRO:

1. Press and hold the **Generator** and **Alarm** buttons (B),
2. Whilst still holding these buttons, when the SP PRO beeps do a short press on the **On** button (C),
3. All Green front panel LEDs will come on. Let go of the **Generator** and **Alarm** buttons,
4. The SP PRO will now reset and go through the start-up sequence.



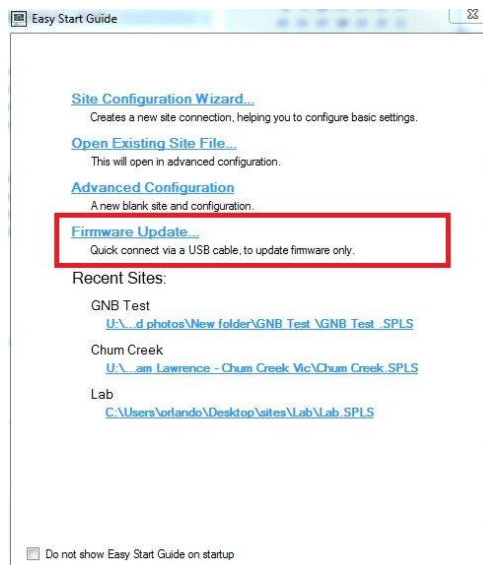
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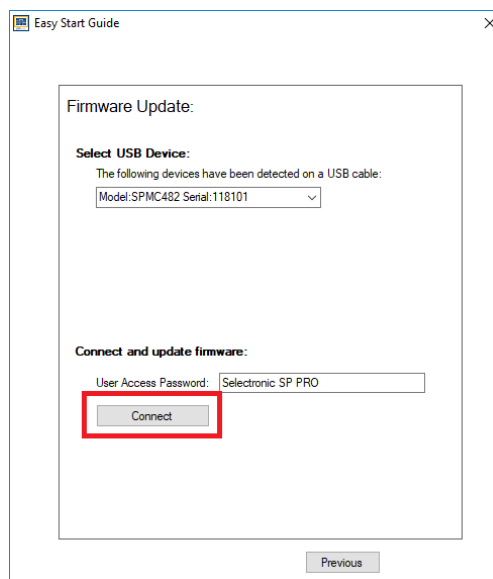


### Update Firmware

1. Install the latest version of SP LINK on your computer. Start Selectronic SP LINK.
2. Make sure all of the SP PROs in the Powerchain are connected via the Sync lead.
3. Apply battery power to all of the SP PROs in the Powerchain.
4. Connect the SP LINK PC to the System Manager via a USB lead.
5. In the Easy Start Guide, select "Firmware Update...".



6. The Easy Start Guide will automatically detect when the SP PRO is ON and USB cable is plugged into the SP PRO and computer. Click "Connect" to start the Firmware Update process.



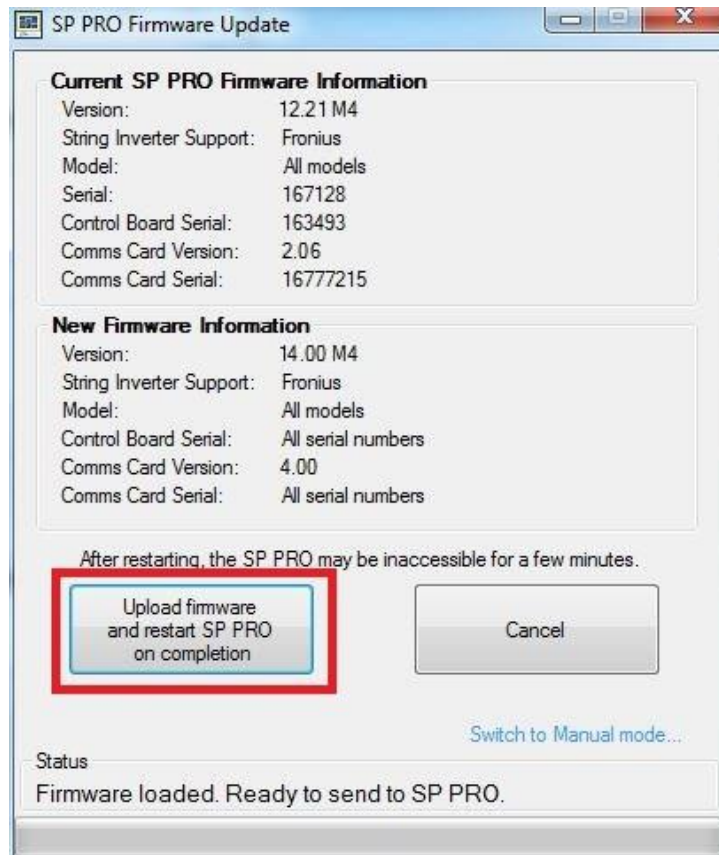
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7. In the SP PRO Firmware update screen click **Update firmware and restart SP PRO on completion** button.

**Note: If firmware is already up to date then the “Update firmware and restart SP PRO on completion” button will be disabled.**



### Important:

- a. Managed batteries may turn OFF during the firmware update. If this occurs, turn the batteries ON, close the SP PRO Firmware Update window. Reconnect to the SP PRO and continue Firmware update (step 7 and 8). Repeat the process until the firmware is updated.
  - b. In the case where the SP PRO firmware upload is complete and the batteries turn OFF while the SP PRO is performing a firmware upgrade, turn the batteries ON and wait until the front panel LEDs are stable. This may take a few minutes.
8. After the firmware is uploaded to all the SP PROs in the Powerchain system, they will automatically restart. You will need to wait about 5 minutes for the restart to complete. A wait time will be displayed in the firmware update screen. Communications with the SP PRO will be lost during this time.
  9. Once the restart timer times out, SP LINK will display the Connection screen.



Figure 1 - SP Pro Single Phase AC Wiring Layout with External AC Source Contactor and 2 Workers

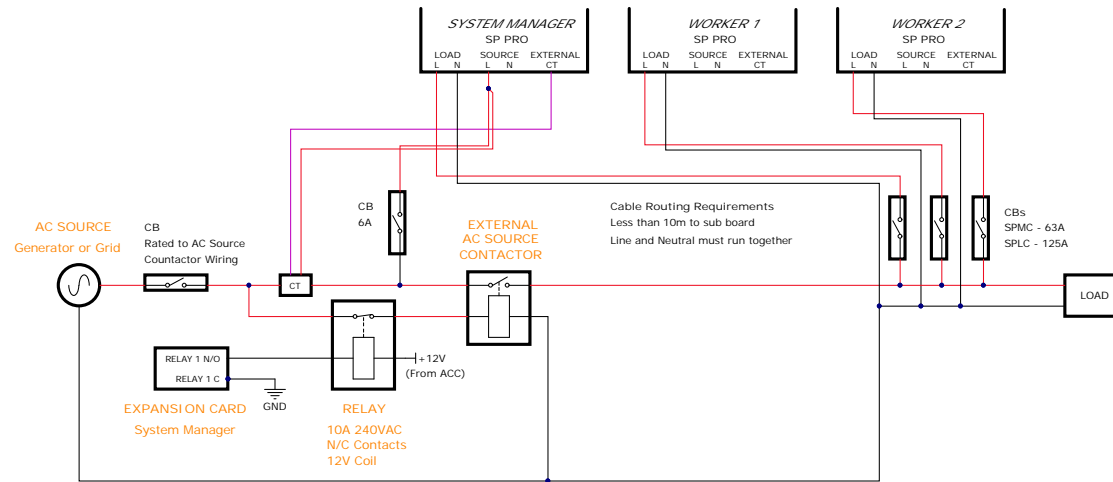
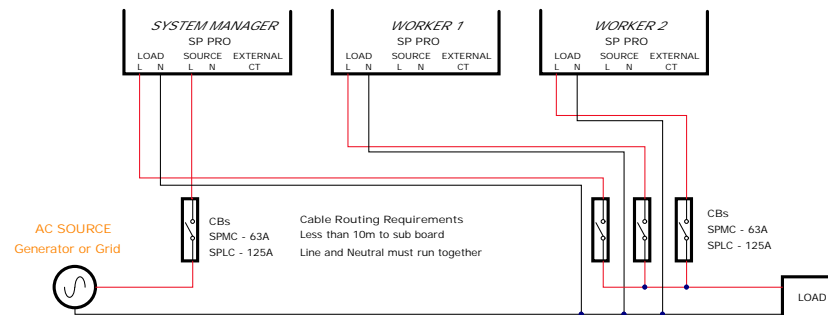
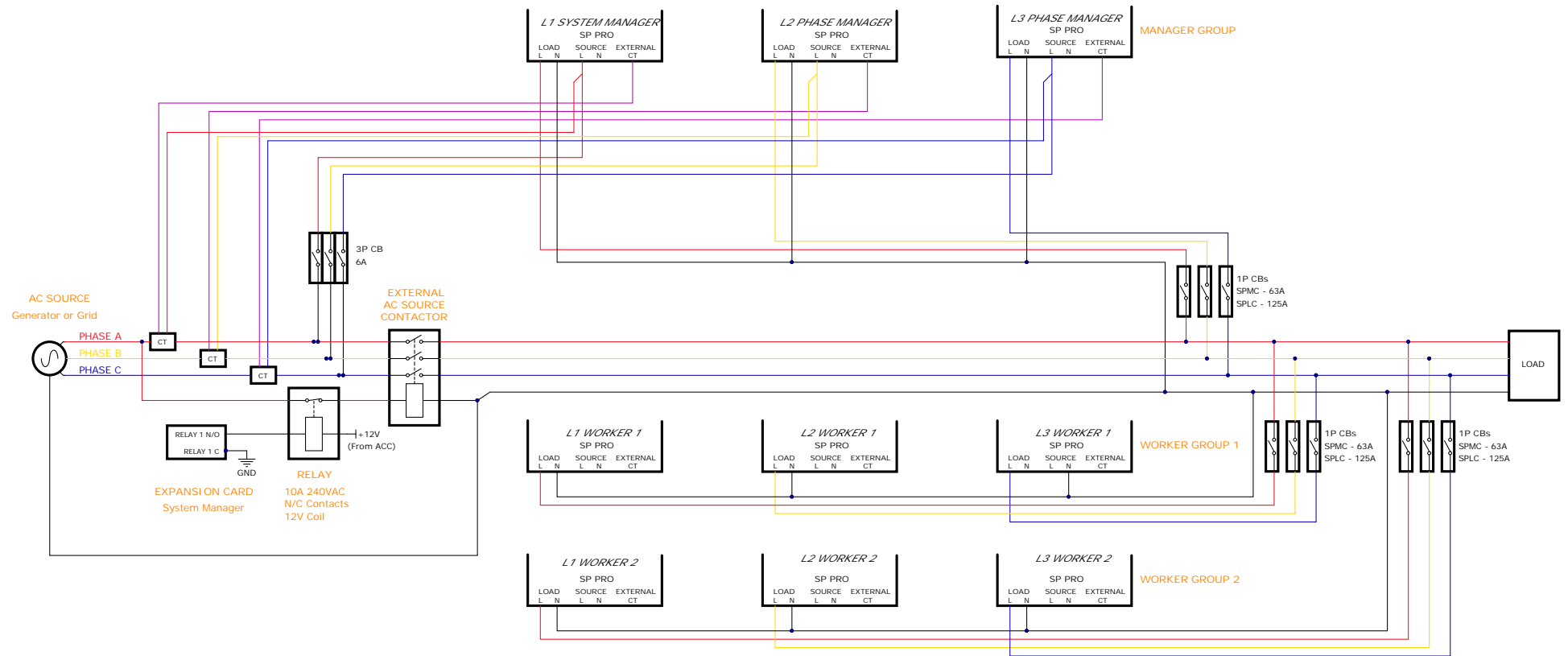


Figure 2 - SP PRO Single Phase AC Wiring Layout with 2 Workers



Title			
SP PRO Powerchain Wiring Diagram			
Size	Number	Revision	
c	Prepared for IN0057	2	
Date:	7/15/2020	Sheet 1 of 3	
File:	112R&D_1ph_2W_SchDoc	Drawn By:	Pat Graham

Figure 3 - SP Pro Three Phase AC Wiring Layout with External AC Source Contactor and 2 Workers Per Phase



Title				SP PRO Powerchain Wiring Diagram	
Size	Number	Prepared for IN0057		Revision	2
Date:	7/15/2020	Sheet 2 of 3			
File:	112R&D_3ph_2W_SchDoc	Drawn By: Pat Graham			

Figure 4 - SP PRO Main DC Wiring Layout Showing 9 Units

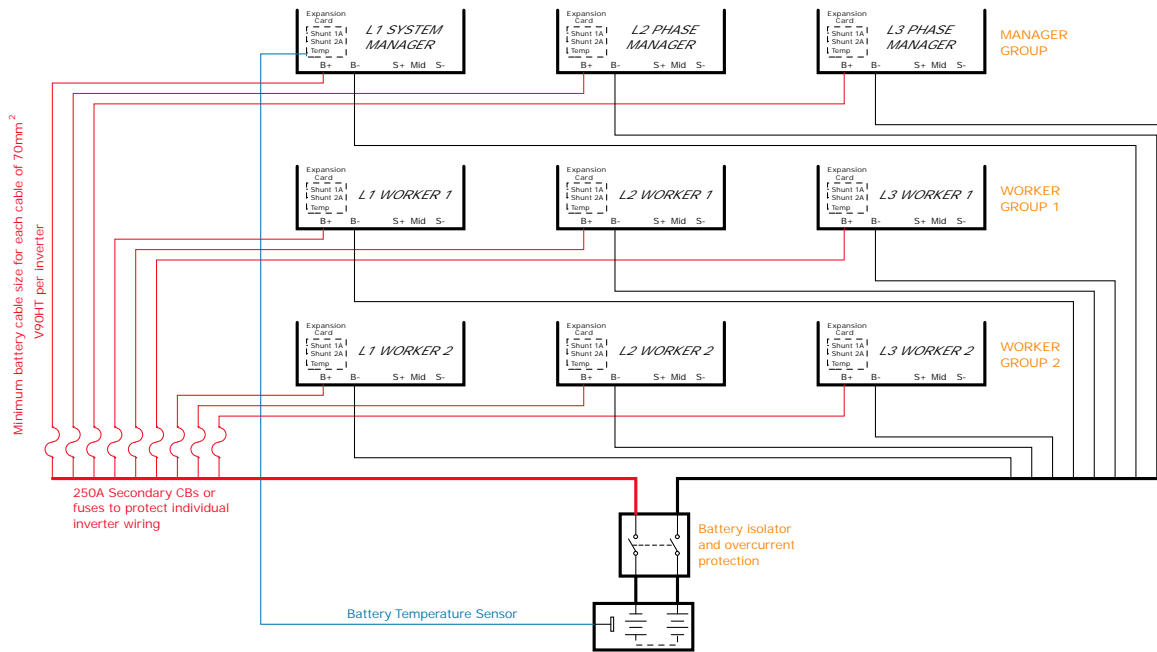
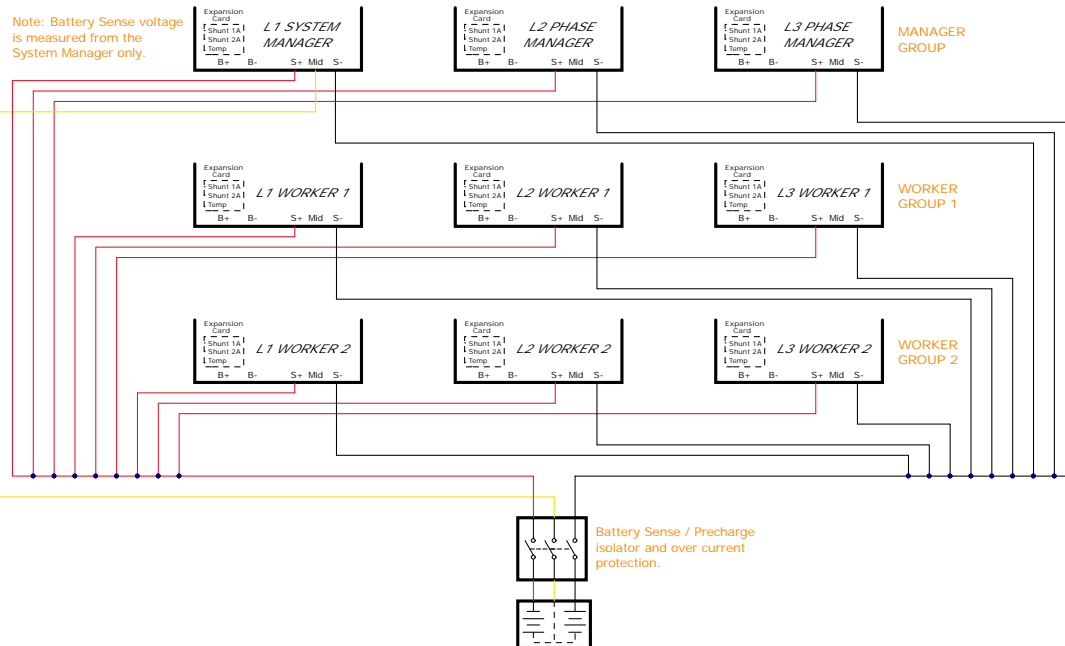


Figure 5 - SP PRO Precharge & Midpoint Wiring Layout Showing 9 Units



Title			
SP PRO Powerchain Wiring Diagram			
Size	Number	Prepared for	Revision
C		IN0057	2
Date:	7/05/2020	Sheet	3 of 3
File:	U3R&D_DC_Wiring_SchDoc	Drawn By:	Pat Graham