

INVERTEK®

Combi 3

PURE SINE WAVE INVERTER /
ATS / BATTERY CHARGER



USER MANUAL



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Introduction

General

- Multi-functional Feature

The “Combi 3” is a powerful true sine wave inverter, a sophisticated battery charger that features adaptive charge technology and a high-speed AC Auto Transfer Switch (ATS) in a single compact enclosure. Besides these primary functions, however, the Combi 3 has several advanced features that provide a range of new applications as outlined below:

- Uninterrupted AC Power

In the event of a grid failure, or shore or generator power being disconnected, the inverter within the Combi 3 is automatically activated and takes over supply to the connected loads. This happens so fast (less than 10 milliseconds) that computers and other electronic equipment will continue to operate without disruption.

- Power Control-Dealing with limited generator or shore side power

The “Combi 3” is a very powerful battery charger. It will therefore draw a lot of current from the generator or shore side power. A maximum generator or shore current can be set (B2-05). The “Combi 3” will then take account of other AC loads and use whatever is extra for charging thus preventing the generator or shore supply from overload.

- Power Assist-Boosting the capacity of shore or generator power

This feature takes the principle of Power Control to a farther dimension allowing the “Combi 3” to supplement the capacity of the alternative source. Where peak power is so often required only for a limited period; it is possible to reduce the size of generator needed or conversely enable more to be achieved from typically limited shore connection. When the load reduces, the spare power is used to recharge the battery.

Battery Charger

- Adaptive 4-stage charge characteristic: Bulk-Absorption-Float-Equalize

The “Combi 3” features a microprocessor controlled “adaptive” battery management system that can be preset to suit different types of batteries. The “adaptive” feature will automatically optimize the process relative to the way the battery is being used.

- The right amount of charge: Variable Absorption Time

When only shallow discharges occur (a yacht connected to shore power for example), the absorption time is kept in order to prevent overcharging of the battery. After a deep discharge, the absorption time is automatically increased to make sure that the battery is completely

recharged.

- **Preventing damage due to excessive gassing: The Battery Safe Mode**
If, in order to quickly charge a battery, a high charge current in combination with a high absorption voltage has been chosen. The “Combi 3” will prevent damage due to excessive gassing by automatically limiting the rate of voltage increase once the gassing voltage has been reached.
- **Less maintenance and aging when the battery is not in use: The Equalize Mode**
The equalize mode kicks in whenever the battery has not been subjected to discharge during 24 hours. In the equalize mode, float voltage is reduced to 2.2V/cell (13.2V for 12V battery) to minimize gassing and corrosion of the positive plate. Once a week, the voltage is raised back to absorption level to “equalize” the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.
- **2 outputs to charge 2 battery banks**
The “Combi 3” features 2 outputs, of which 1 can carry the full output current. The second output, limited to approximately 4A and with a slightly lower output voltage, is intended to top up a starter battery.
- **To increase battery life: Temperature Compensation**
Every “Combi 3” can come with an optional battery temperature sensor (BTS-3) when connected, charge voltage will automatically decrease with increasing battery temperature. This feature is especially recommended for sealed batteries and/or when important fluctuation of battery temperature is expected.
- **Battery Voltage Sense**
In order to compensate for voltage loss due to cable resistance, the “Combi 3” is provided with a voltage sense facility so that the battery always receives the correct charge voltage.

Specification

MODEL	12 Volt System 24 Volt System 48 Volt System	C3-1500-12X (1) C3-1500-24X C3-1500-48X	C3-3000-12X (1) C3-3000-24X C3-3000-48X
GENERAL			
Ventilation		Forced cooling	Forced cooling
Temperature – Operation		-20 ~ +70	-20 ~ +70
– Storage		-25 ~ +80	-25 ~ +80
Protection			
a. Output short circuit		✓	✓
b. Over load		✓	✓
c. Battery voltage too high		✓	✓
d. Battery voltage too low		✓	✓
e. DC voltage ripple too high		✓	✓
f. Temperature Sensor			
Transformer		✓ (105)	✓ (105)
Electronic & Powerstage		✓ (70)	✓ (70)
BTS-3		✓ (50)	✓ (50)
Humidity		0~95% (non condensing)	0~95% (non condensing)
Power control Function		✓	✓
Power assist Function		✓	✓
Uninterrupted AC power		✓ (less than 10 msec)	✓ (less than 10 msec)
Adaptive 4-stage charge		✓	✓
Two output to charge 2 battery banks		✓	✓
Auxiliary Relay		X 3	X 3
Battery voltage sensor		✓	✓
Battery Temperature sensor (BTS-3)		✓	✓
Remote control port		✓	✓
INVERTER			
Input Voltage Range (VDC)		9.5 -16V / 19-32V / 38-64V	
Output Voltage (VAC)		185~240 VAC / 90~120 VAC	
Output Frequency		50Hz /60Hz ± 0.1%	
Output Waveform		Pure sinewave	
Output Voltage THD		< 5%	
Power Factor (All Loads)		✓	

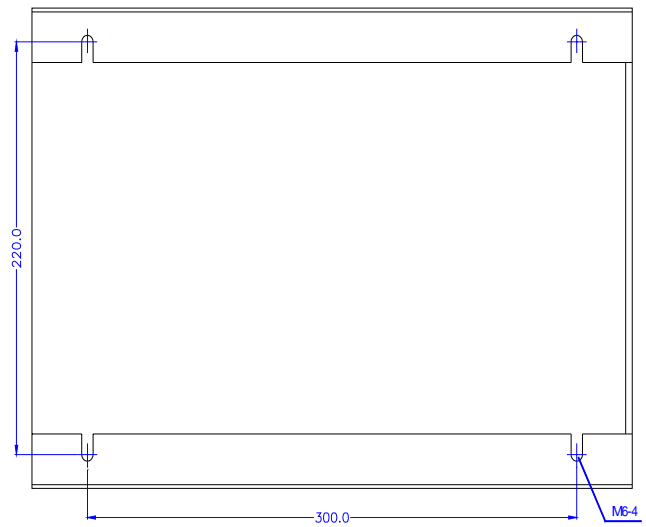
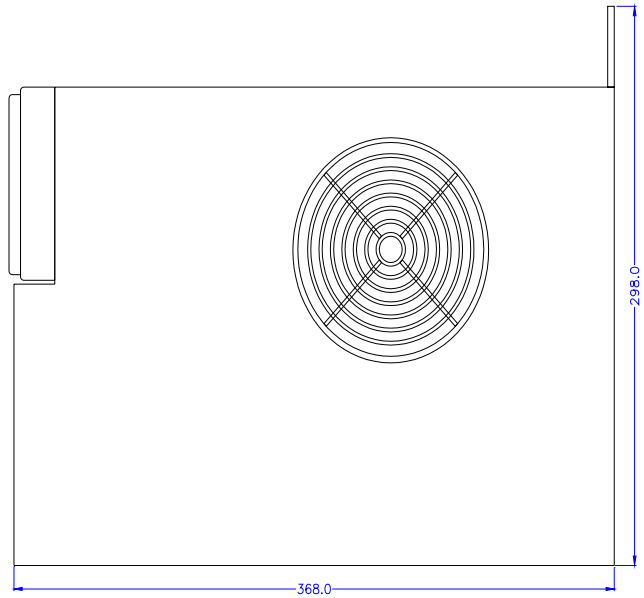
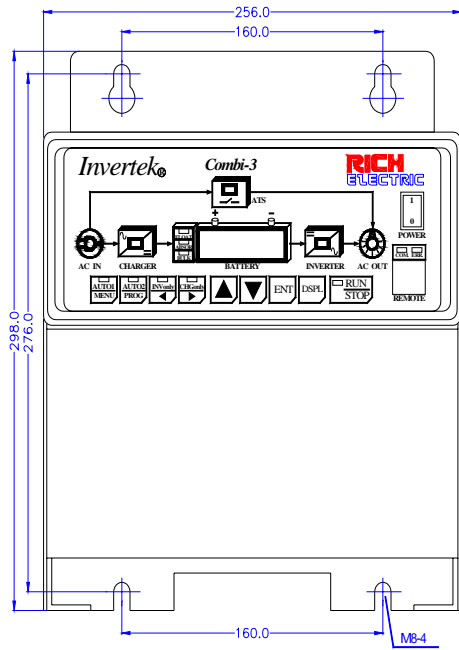
No linger load, crest factor	3: 1	
Cont. Power Output (W) Under 70 (cos =1.0)	1500W (No derate)	3000W (No derate)
Cont. Power Output (W) Over 70 (cos =1.0)	0W (Shutdown)	0W (Shutdown)
Maximum Power (W)	3000W	6000W
Maximum Efficiency (%)	82/84/85	84/86/89
Zero-load Power (W)	12W	18W
CHARGER		
Input Voltage Range (VAC)	200~250 VAC / 100~125 VAC	
Input Frequency	45-55Hz /55-65 Hz	
Power Factor	1	
Charge Characteristic	4-stage adaptive / Bulk-Absorption-Float-Equalize	
Maximum DC Voltage Ripple (Vrms)	< 1.25 V	
Charge Current House Battery (A)	70A/40A/20A	140A/70A/40A
Charge Current Starter Battery (A)	4A	
Absorption Voltage Default (VDC)	14.4V / 28.8V / 57.6V	
Float voltage Default (VDC)	13.8V / 27.6V / 55.2V	
Equalize Voltage default (VDC)	13.2V / 26.4V / 52.8V	
Output Charge Voltage (min ~ max)	8V~16V / 11V~32V / 22V~64V	
Battery Temperature sensor	BTS-3	
AC INPUT SWITCH		
AC IN Terminal Circuit Breaker	30A (110V) /15A (220V)	60A (110V) /30A (220V)
Switch-over Time		
a. inverter to AC input	0 msec.	
b. AC input to inverter	0 msec.	
Detection Time AC Input Fault	4 ~10 msec.	
Trip Level AC Input to Inverter	90 VAC / 180 VAC	
Trip Level Inverter to AC Input	94 VAC / 187 VAC	
Min.~ Max. Frequency Range	45-55 Hz / 55-65 Hz	
MECHANICAL		
Cabinet / Protecting Class	Aluminum / IP20	
Dimension (HXWXD)	Wall: 298 x 256 x 368 mm Table: 189 x 285 x 494 mm	Wall: 355 x 256 x 368 mm Table: 189 x 285 x 708 mm
Weight (kgs)	30 kgs	35 kgs

(1) X should be 1, output voltage = 90~120 VAC or 2, output voltage = 185~240 VAC

Dimension for Wall Mounting/Vertical Combi 3 1500W

C3-1500W-12/24

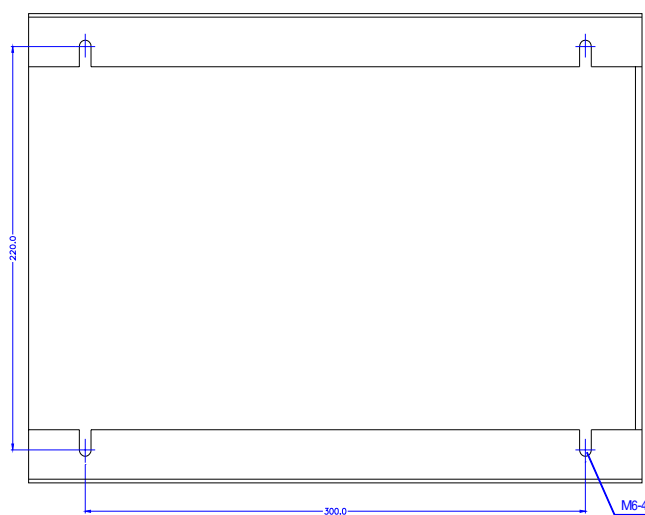
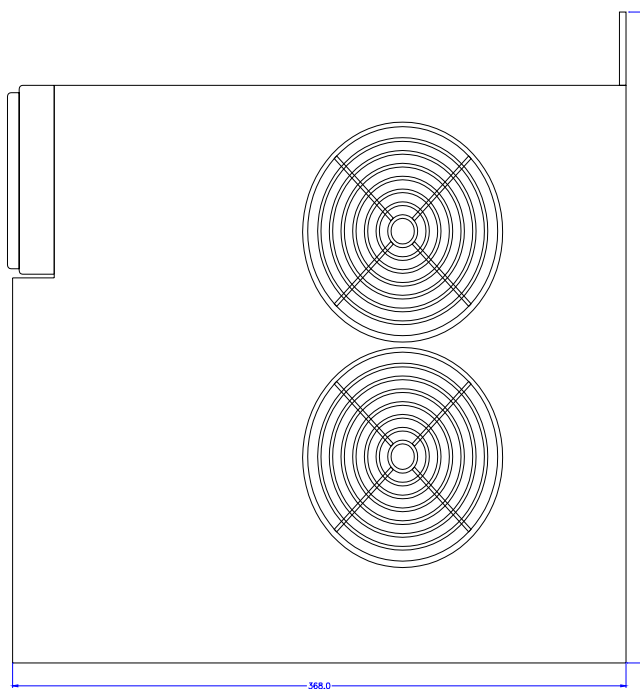
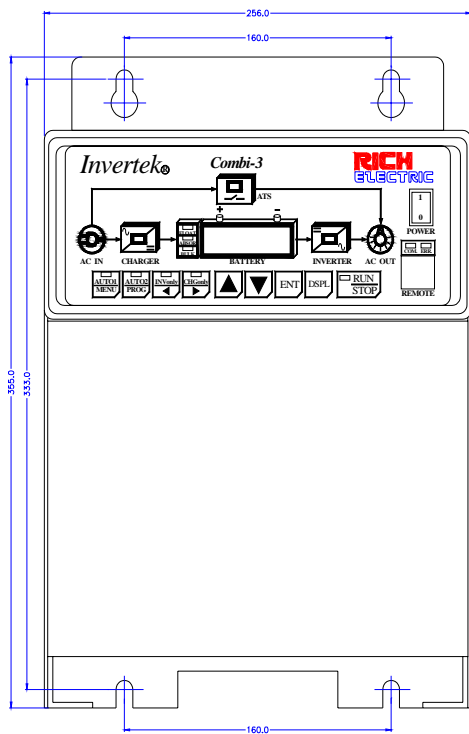
Unit: mm



Dimension for Wall Mounting/Vertical Combi 3 3000W

C3-3000W-12/24

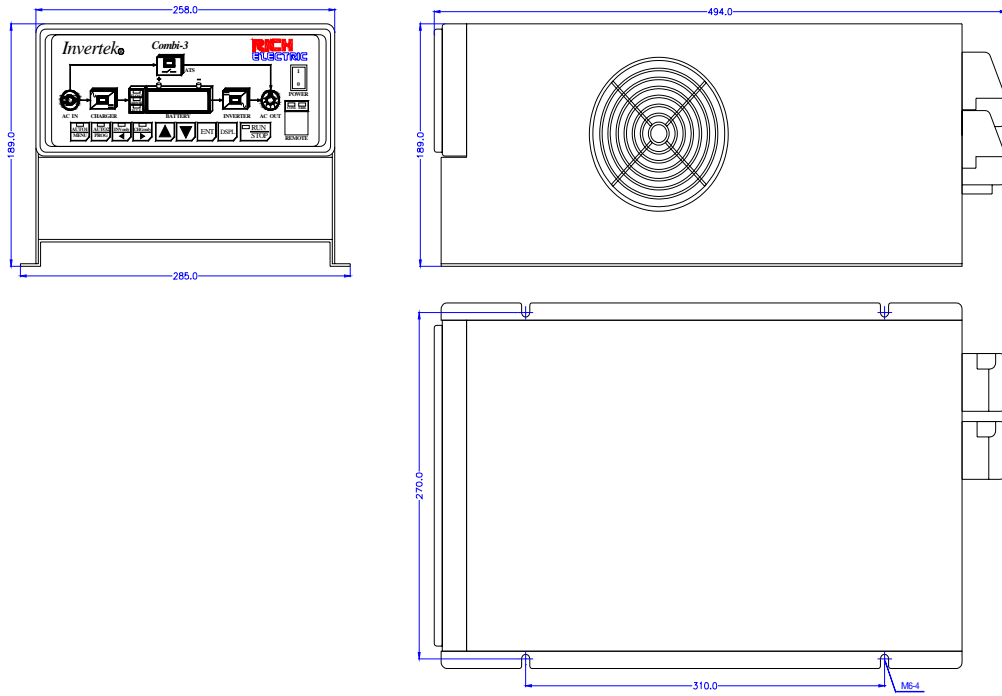
Unit: mm



Dimension for Table Mounting/Horizontal Combi 3 1500W

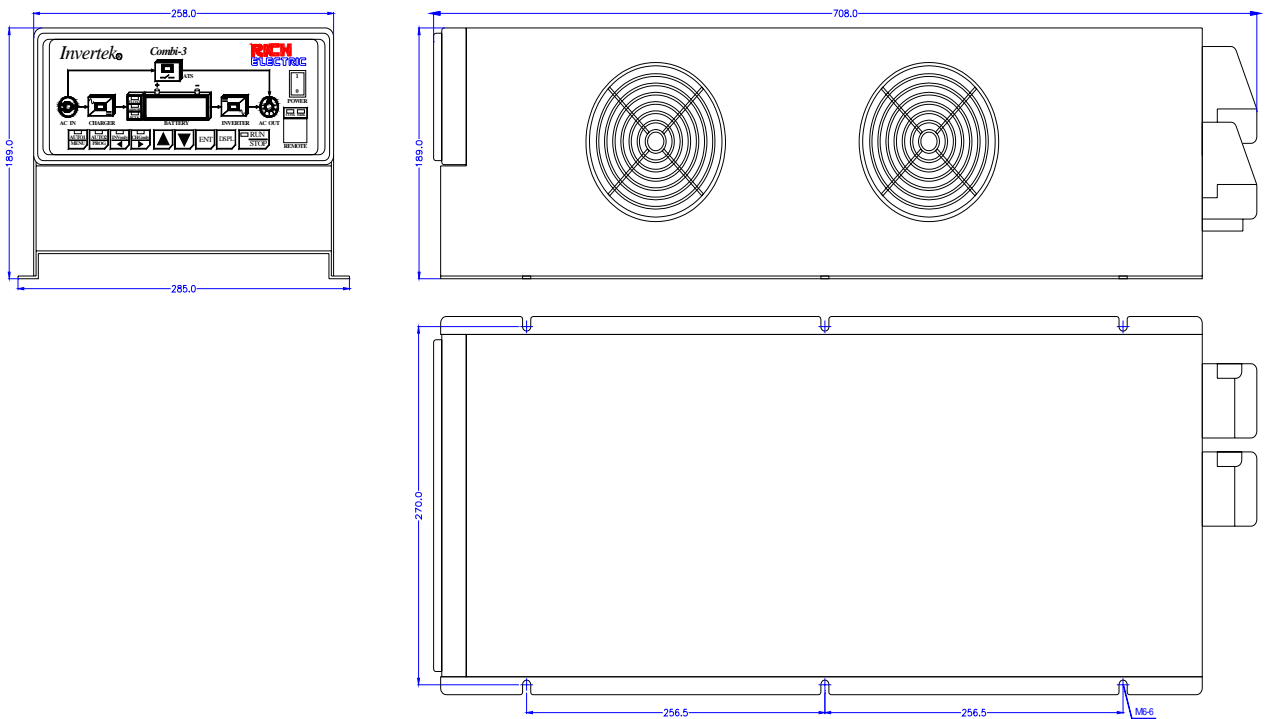
C3-1500W-12/24

Unit: mm



Dimension for Table Mounting/Horizontal Combi 3 3000W

C3-3000W-12/24



Chapter 1 Installation


 This product should be installed by a qualified electrician.

1.1 Box Contents

- Combi 3
- USER MANUAL
- Bag Containing connection items, ie:
 - Four M8 nuts (including spring washers)
 - Four terminals and casing

1.2 Location

The product must be installed in a dry and well-ventilated area, as close as possible to batteries. There should be a clear space of at least 20 cm around the appliance for cooling.


 Excessively high ambient temperature will result in the following


- Reduced service life
- Reduced charge current
- Reduced peak capacity or shutdown of the inverter

Never position the appliance directly above the batteries.

Vertical Combi 3 is suitable for wall mounting. The back and the bottom of the enclosure has holes for wall mounting purposes, read page VIII and IX. Horizontal Combi 3 is suitable for table mounting. The bottom of the enclosure has the holes for table mounting purposes, read page X.

The appliance can be mounted horizontally as well as vertically; vertical mounting is preferable. The vertical position offers optimum cooling.

 The interior of the product must remain accessible after installation. Ensure the AC and DC input cables are fitted with fuses and circuit breakers. Try and keep the distance between the product and battery to a minimum in order to minimize cable voltage losses.

 For safety purpose, this product should be installed in a heat-resistant environment if it is used with equipment where a substantial amount of power is to be converted. You should prevent the presence of e.g. chemicals, synthetic components, curtains or textiles, etc. in the immediate vicinity.

1.3 Requirements

- Screwdrivers for removing the lower-front panel and connecting AC loads.

- 2 battery cables (maximum length 6 meters)
- Including battery terminals and cable ends.
- Insulated box spanner (13 mm) for securing the DC terminal nuts.
- Three-wire cable for AC cabling.

1.4 Connection of Battery Cables

In order to fully utilize the full capacity of the product, batteries with sufficient capacity and battery cables with sufficient cross section should be used, please see table:

Model Item	C3-1500-12X	C3-1500-24X	C3-3000-12X	C3-3000-24X
Recommended battery capacity (Ah)	200~700	100~400	400~1200	200~700
Recommended cross section (mm ²)(0~6m)	50 mm ²	38 mm ²	80 mm ²	50 mm ²

Remark: Internal resistance is the important factor when working with low capacity batteries. Consult your supplier.

Procedure:

Proceed as follows to connect the battery cables:



Use an insulated box spanner in order to avoid shorting the battery.

Avoid shorting the battery cables:

- Undo the four screws at the lower-front panel of the enclosure and remove the panel.
- Connect the battery cable: the + (red) on the right and the – (black) on the left. Please see page 3-4 and 3-5.
- Don't reverse the (+) and (-) of the battery. This may cause internal damage.
- Tighten the connections after positioning the fastening items supplied with product.
- Secure the nuts tightly in order to reduce the contact resistance as much as possible.

1.5 Connection of AC Cabling



The enclosure must be grounded for safety purpose. An earth screw has been fitted at the bottom side of the enclosure.

The terminal block can be found at lower-front panel of the enclosure: The shore or mains (AC IN) cable must be connected to AC IN terminals, use a three-wire cable and a cross section of 4~10 mm².

Procedure:

Proceed as follows to connect the AC cables.

- The AC output cable can be connected directly to terminal block containing the word “AC OUT”. The terminal points are indicated clearly. From left to right: “G” (earth), “N” (neutral), and “L” (phase).
- The AC input cable can be connected to the terminal block containing the word “AC IN”, the terminal points are indicated clearly from left to right “L” (phase), “N” (neutral), and “G” (earth).



The current which is switched through to the output (AC OUT) is not fused. External fuses or current limiters have to be installed.

1.6 Optional Connections

A number of operational connections are possible:

1.6.1 Second Battery

The “Combi 3” has a connection for charging a starter battery.

For connection, see page 3-4 and 3-5.

1.6.2 Voltage Sense

Two sense wires may be connected to compensate possible battery cable losses during charging. Use wires of at least 0.75 mm². For connection, see page 3-4 and 3-5.

1.6.3 Battery Temperature Sensor (BTS-3)

The battery temperature sensor supplied with the product may be used for temperature compensated charging, see page 3-4 and 3-5.

The sensor is insulated and must be mounted on the batteries minus pole.

1.6.4 3 Sets of Auxiliary Relay (RY1, RY2, RY3) Output

The “Combi 3” provides 3 sets of Auxiliary Relays for users to connect to other appliances or to output the alarm signals. 3 sets of relays can be programmed for respective function. (E Group Constants) and can be practically applied which is one of the greatest features.

1.7 Grounding

When the input voltage of the Combi 3 is not switched through, the neutral of “AC OUT” is connected to ground by means of a relay. This function can be disabled by constant B2-07 (B2-07=0 Disconnect)

1.8 Remote Control Panel (RCP-3)

The product can be operated remotely from remote port with the aid of a remote control panel. For connection of a remote control panel, see page 3-1.

Note: The display panel and operation flow of the remote control panel is exactly the same as the upper-front display panel.

Chapter 2 Settings

- Settings may only be changed by a qualified engineer.
- Carefully read the user manual before any change is made.
- When setting the charger, all connections to the battery must be disconnected from the Combi 3.
- Do not use non-rechargeable batteries.
- Batteries should be placed in a dry and well-ventilated area during charging.
- The product default settings are for charging gel batteries. For the recommended battery voltage initial settings, see D1 (Charger) Group parameters.

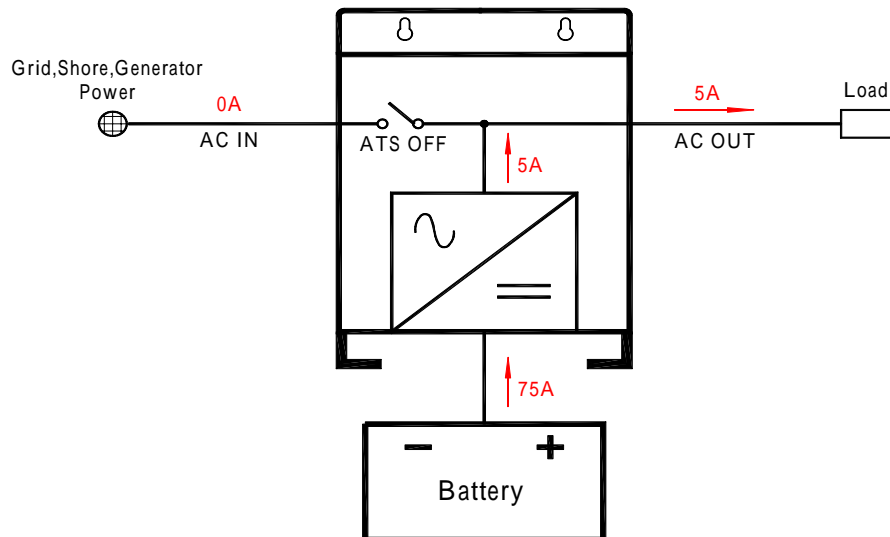
2.1 Four Control Modes Applications

AUTO 1: AC Power as Priority Support (Example of C3-3000-242)

When Combi 3 enters to AUTO 1, B2-09 (AC IN DynaCur Limit)=0 (Disable) and the value of B2-18 (AUTO 1: ACINCurrent Lmt) will be loaded to B2-05.

1. INVERTER Mode:

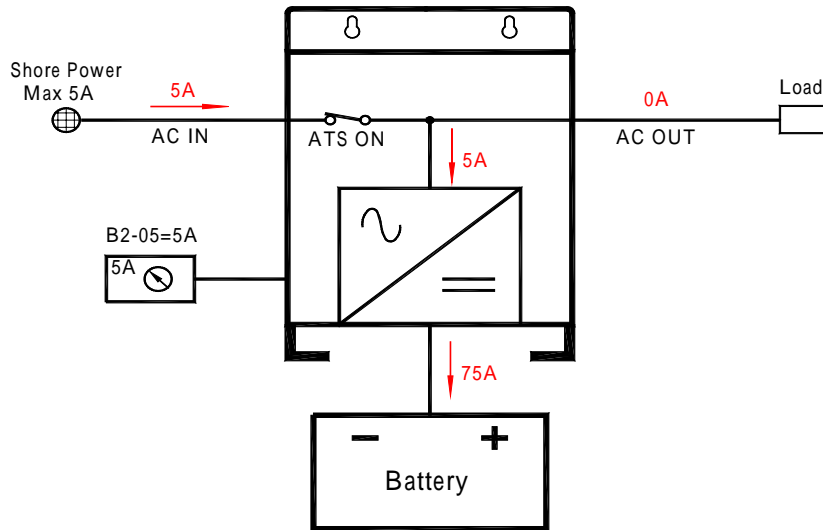
- When AC IN=0 A, AC OUT load is completely supplied by INVERTER. It goes to the inverter mode.



2. Power Control Mode (a)

- In this example:

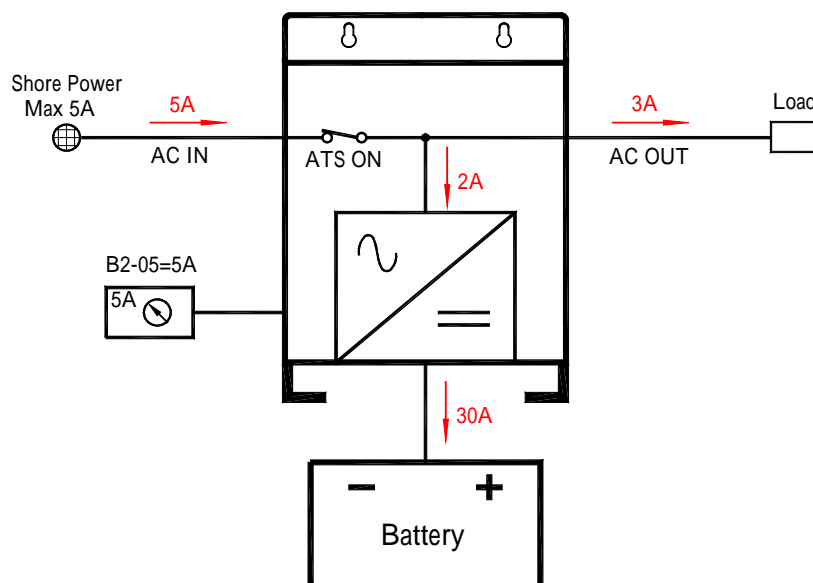
All AC loads are off, with the “Combi 3” constant B2-05=5A (AC IN Current Limit), the AC CHARGER will not take more than 5A with limits to battery charge current to 75A.



3. Power Control Mode (b)

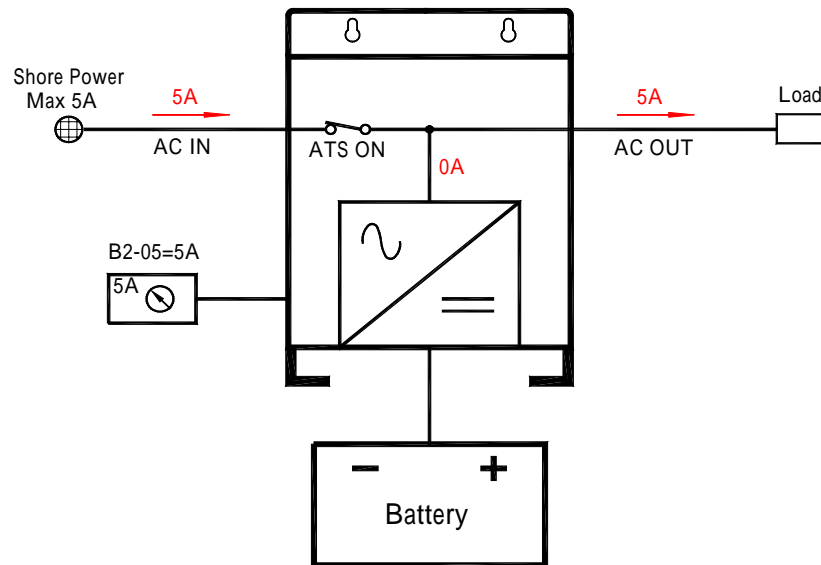
- Now some small loads are switched on and load increase to 3A. Only $5-3=2A$ is left to charge the batteries and charge current is reduced to about 30A.

Note: Shore current is automatically limited to 5A and the AC input circuit breaker will not trip!



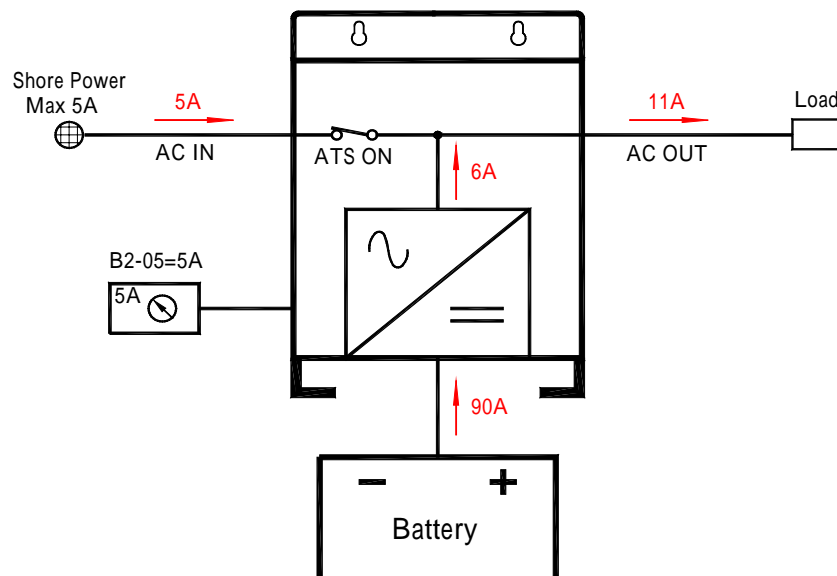
4. Power Control Mode (c)

- The load is switched on and current consumption increase to 5A. Nothing is left to charge the battery.
- The charge current is automatically reduced to 0A, and the AC input circuit breaker does not trip!



5. Power Assist Mode

- And now the other load adds and switches on and the current increases to 11A. This is where Power Assist is needed.
- The bidirectional converter starts operating as inverter to add 6A to the 5A that is available from the shore-side: Total $6+5=11A$, and no overload on the AC supply.
- As soon as the load reduces to less than 5A, any current that is left over will be used to recharge the battery.



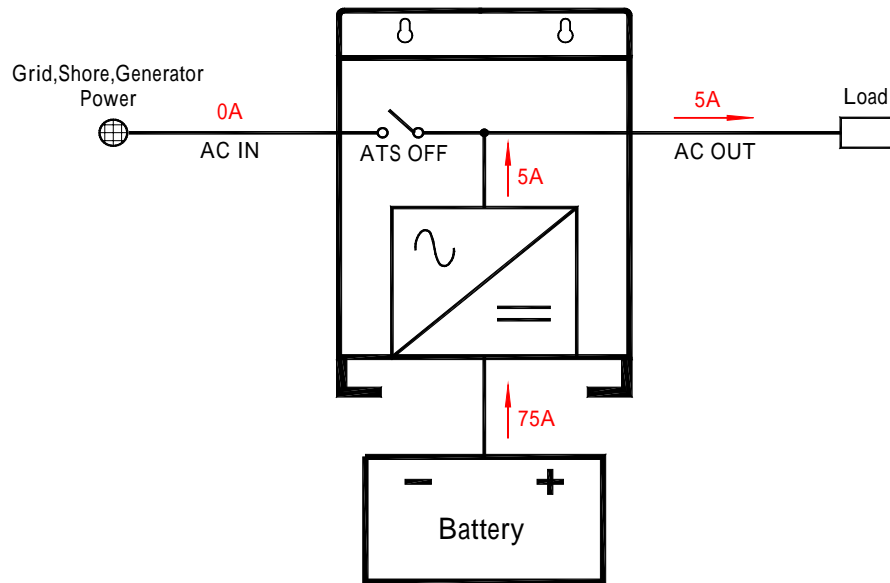
AUTO 2: AC Generator Support with Dynamic Power Shifting

(Example of C3-3000-242)

When Combi 3 enters to AUTO 2, B2-09(AC IN DynaCur Limit)=1 (Enable) and the value of B2-19 (AUTO 2: ACINCurrent Lmt) will be loaded to B2-05.

1. INVERTER Mode:

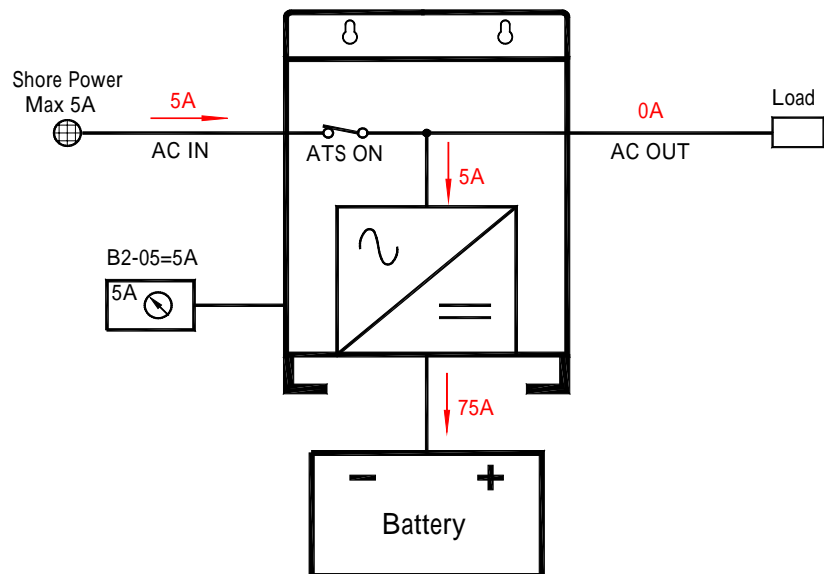
- When AC IN=0 A, AC OUT load is completely supplied by INVERTER. It goes to the inverter mode.



2. Power Control Mode (a)

- In this example:

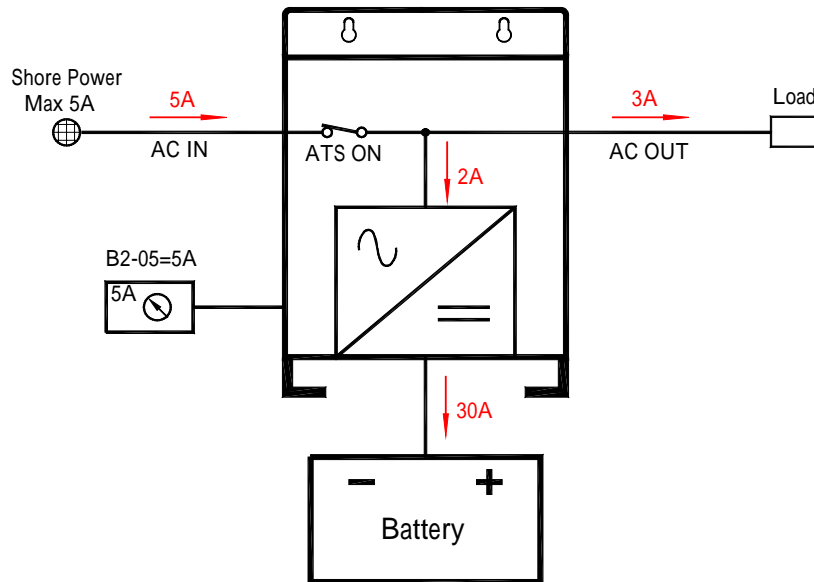
All AC loads are off, with the “Combi 3” constant B2-05=5A (AC IN Current Limit), the AC CHARGER will not take more than 5A with limits to battery charge current to 75A.



3. Power Control Mode (b)

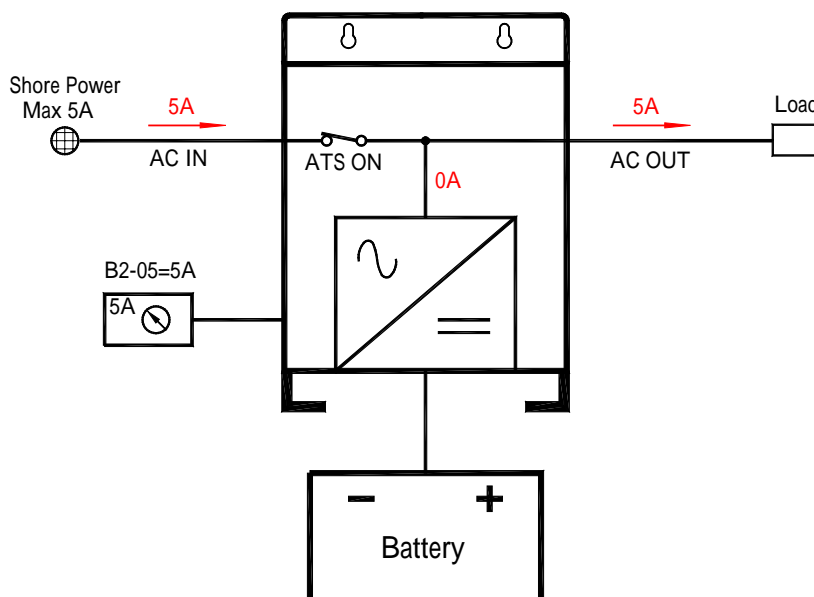
- Now some small loads are switched on and load increase to 3A. Only $5-3=2A$ is left to charge the batteries and charge current is reduced to about 30A.

Note: Shore current is automatically limited to 5A and the AC input circuit breaker will not trip!



4. Power Control Mode (c)

- The load is switched on and current consumption increase to 5A. Nothing is left to charge the battery.
- The charge current is automatically reduced to 0A, and the AC input circuit breaker does not trip!



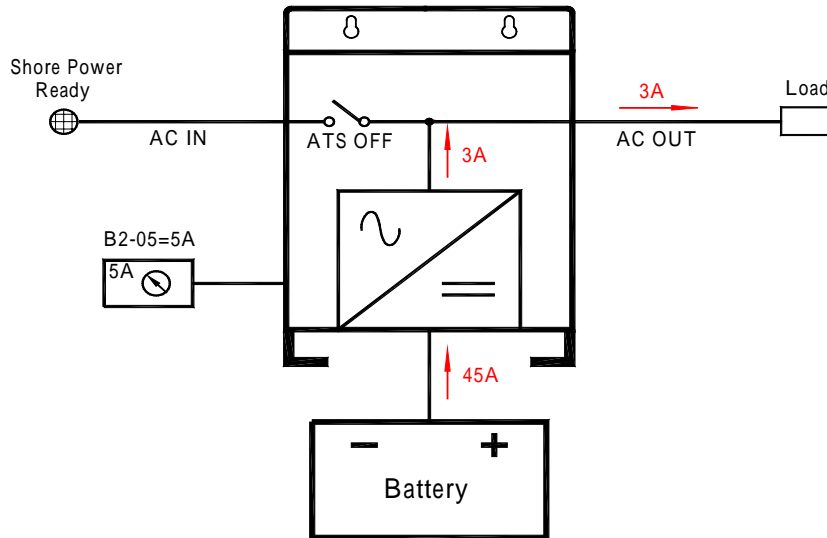
INVERTER ONLY

When Combi 3 enters to INVERTER ONLY, B2-09(AC IN DynaCur Limit)=0 (Disable) and the value of B2-20 (INV M: ACINCurrent Lmt) will be loaded to B2-05.

1. INVERTER Mode:

- When the battery voltage is not lower than (B2-14) voltage value, inverter mode takes priority to supply voltage to AC OUT for load consumption.

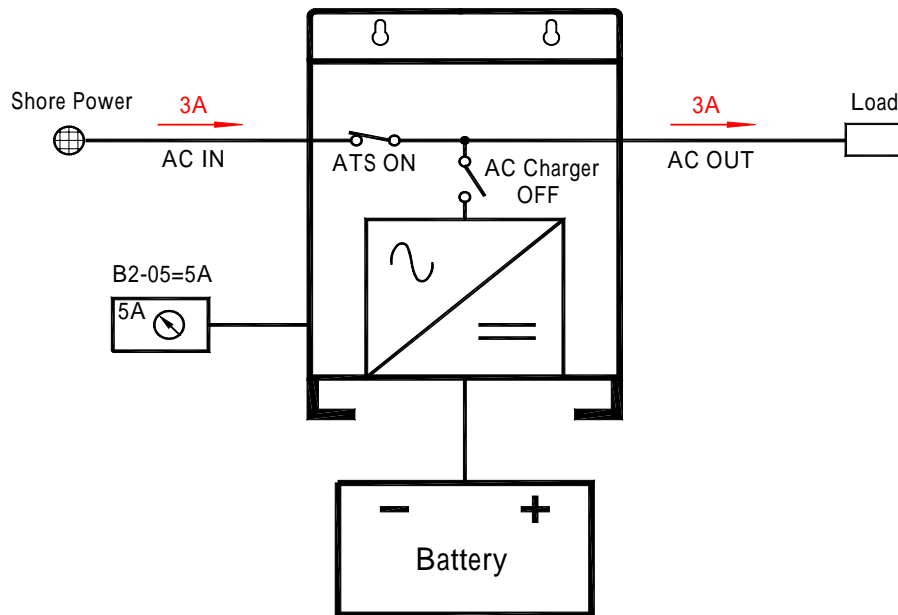
(INVERTER ON+ ATS OFF + AC CHARGER OFF)



2. Power Control Mode

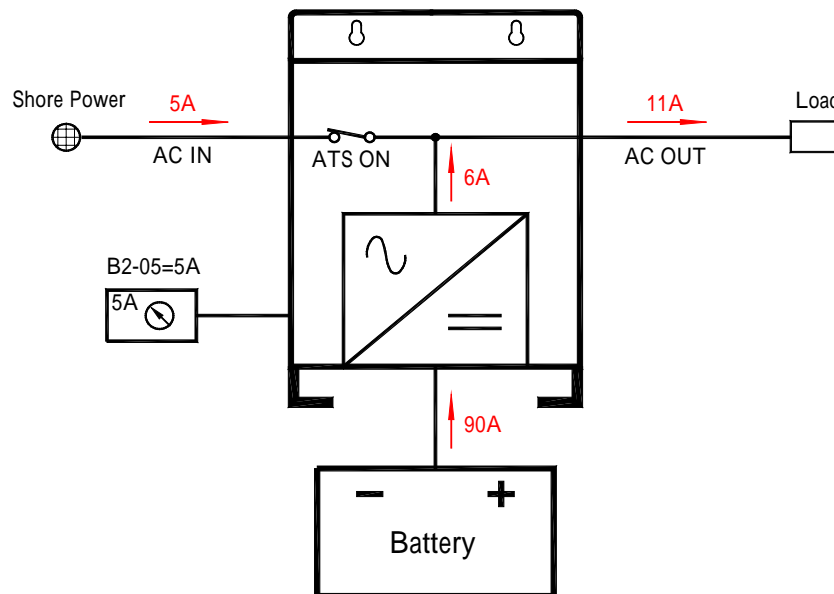
- When AC IN power is ready, INVERTER is active and battery voltage is lower than B2-14 voltage value and longer than the second time set in B2-15, ATS will be switched on to ensure AC OUT to continuously supply the load. At the moment, AC OUT will be supplied by AC IN power.
- When AC IN power is ready, it is only used to supply to the load, not to charge the battery.

(INVERTER OFF+ ATS ON + AC CHARGER OFF)



3. Power Assist Mode

- And now the other load adds and the current increases to 11A. This is where Power Assist function is needed!
(ATS ON + AC CHARGER OFF + INVERTER ON + Power Assist Mode ON)
- As soon as the load reduces to less than 5A, power assist function stops.

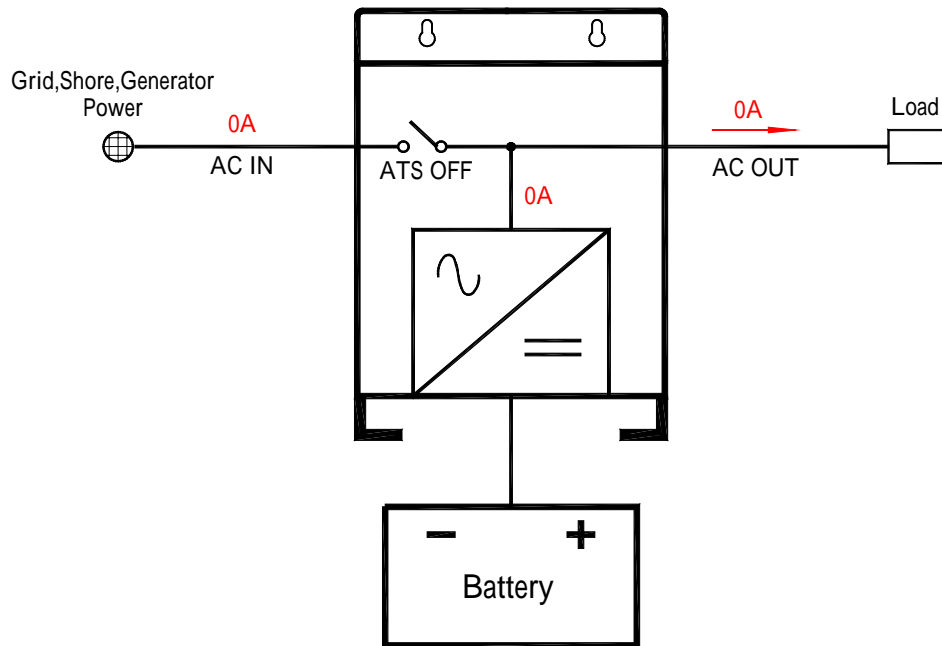


CHARGER ONLY

When Combi 3 enters to CHARGER ONLY, B2-09 (AC IN DynaCur Limit)=0 (Disable) and the value of B2-21 (CHG M: ACINCurrent Lmt) will be loaded to B2-05.

1. NO AC IN Power:

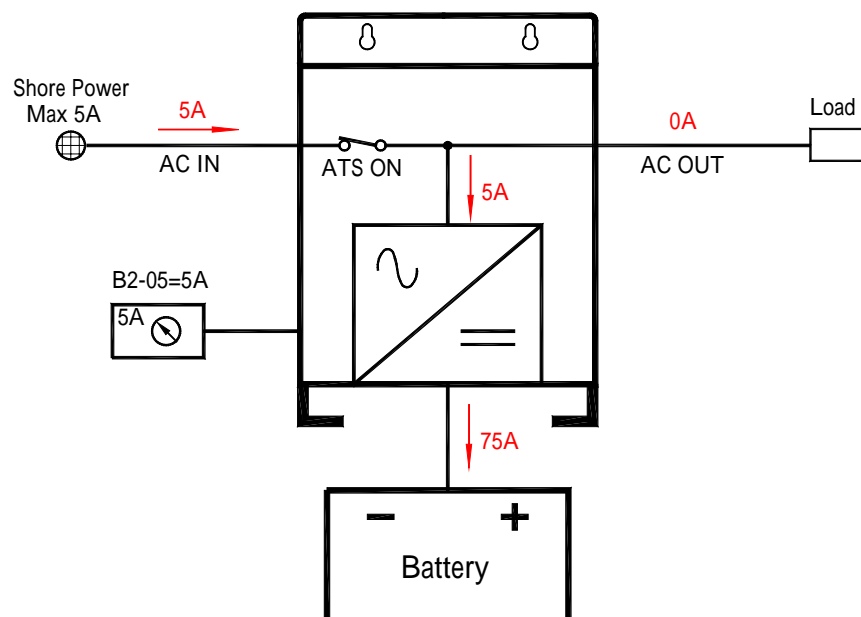
- When AC IN=0 A, AC OUT load is not supplied and the AC Charger is not working.



2. Power Control Mode (a)

- In this example:

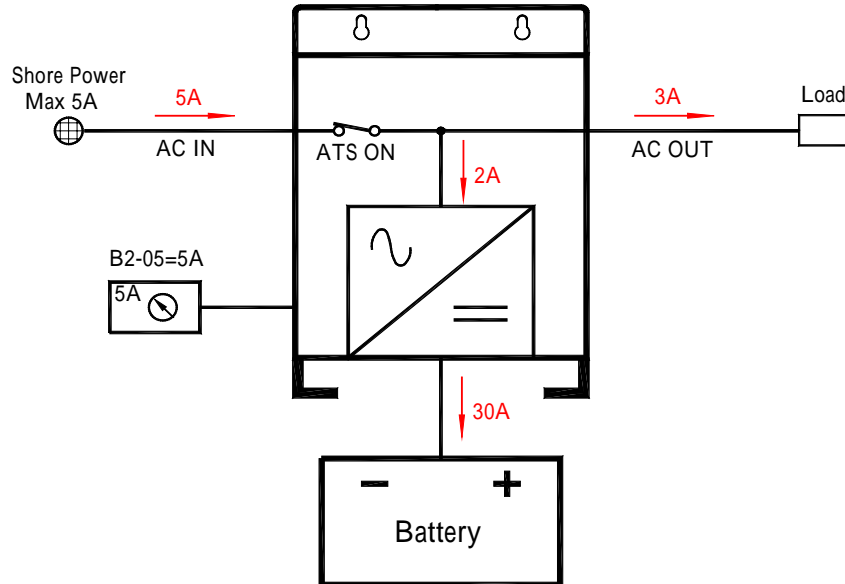
All AC loads are off, with the “Combi 3” constant B2-05=5A (AC IN Current Limit), the AC CHARGER will not take more than 5A with limits to battery charge current to 75A.



3. Power Control Mode (b)

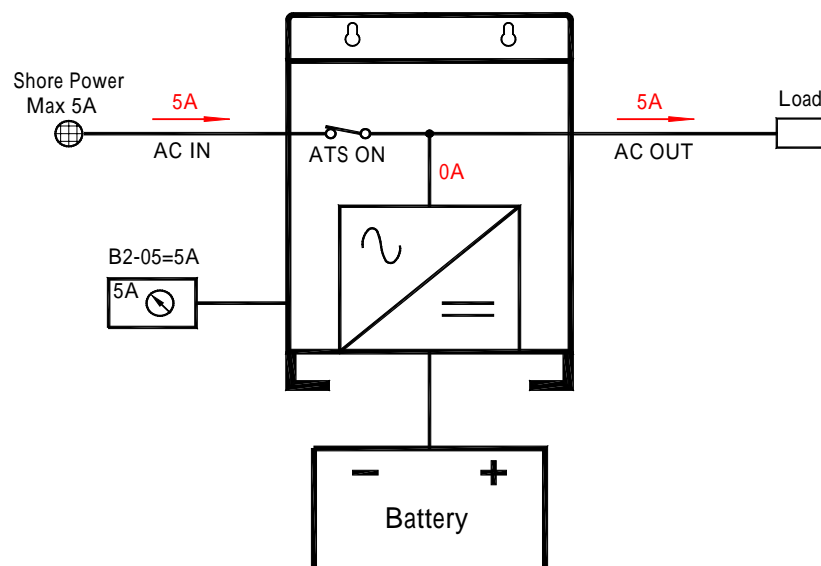
- Now some small loads are switched on and load increase to 3A. Only $5-3=2A$ is left to charge the batteries and charge current is reduced to about 30A.

Note: Shore current is automatically limited to 5A and the AC input circuit breaker will not trip!



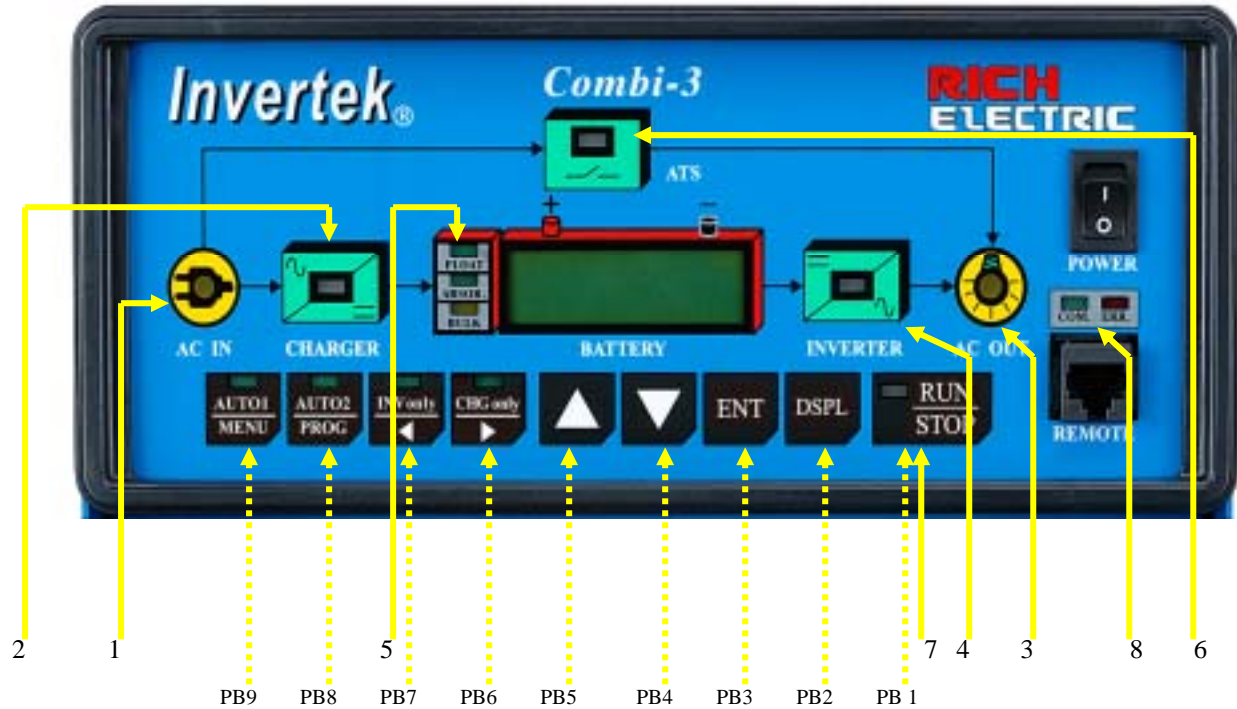
4. Power Control Mode (c)

- The load is switched on and current consumption increase to 5A. Nothing is left to charge the battery.
- The charge current is automatically reduced to 0A, and the AC input circuit breaker does not trip!







Chapter 3 Wiring

3.1 Front Panel Display







Push Buttons

Push buttons	Name	Description	
PB1	RUN/STOP	Combi 3 RUN/STOP key	
PB2	DSPL	Multi-display select key	
PB3	ENTER	Data write-in key	
PB4	DOWN ()	Decrement key	
PB5	UP ()	Increment key	
PB6		AC Input power to charge the battery. Function Key to move Cursor to the right digit at Parameter Edit.	Before changing from one mode to another, it has to stop running and be in STOP mode.
PB7		DC power from battery to supply to AC loads. Function Key to move Cursor to the left digit at Parameter Edit.	
PB8		AC Generator Support with Dynamic Power Shifting. Function Key to return to Main Menu “Programming”	

PB9		AC Power as Priority Support. Function Key to return to Main Menu “Operation”.	
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Note:

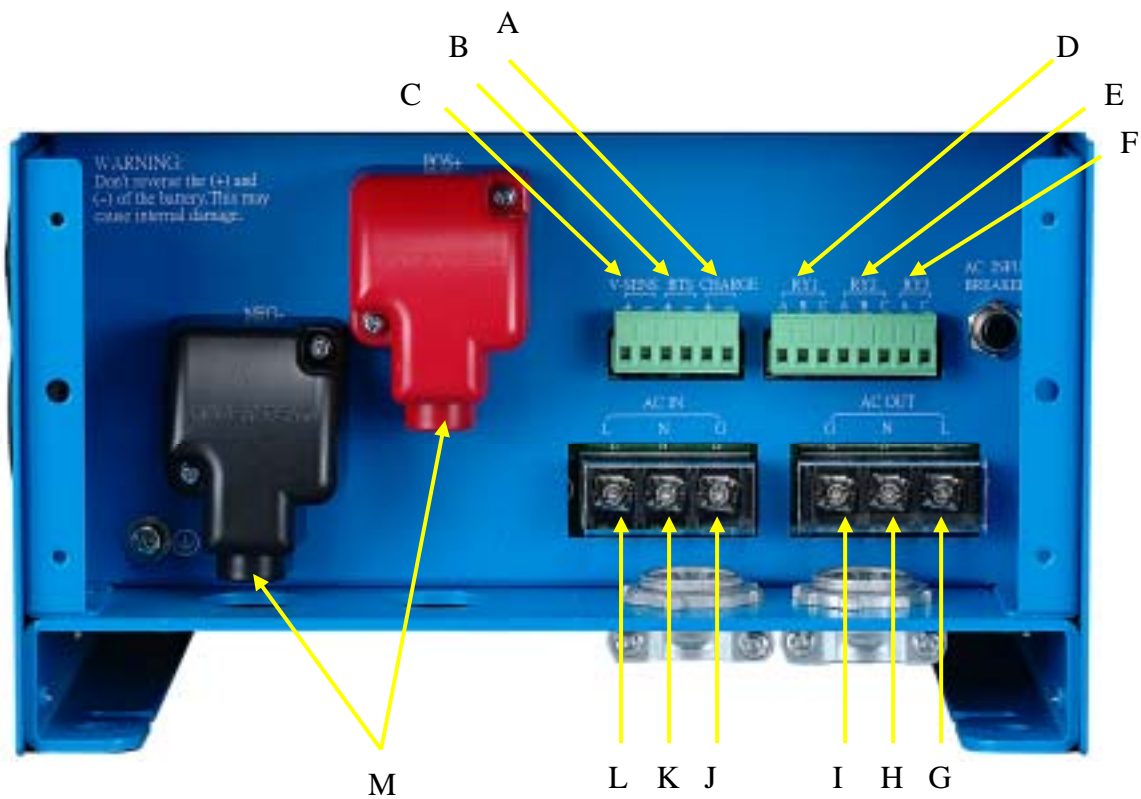
1. When pressing RUN/STOP key, the holding time to remain on the key has to be at least 2 seconds (initial setting) to activate the RUN or STOP function in order to avoid any accidental pressing on the RUN/STOP key. The second time can be adjusted in RUN/STOP KeyHoldTime (O2-07).
2. When changing any of four modes to another mode, Combi 3 has to STOP and then press the desired mode key. When pressing AUTO 1 key or AUTO 2 key or INV only key or CHG only key, the holding time remaining on the key has to be at least 5 seconds (initial setting) to activate the mode change in order to avoid any accidental pressing on the mode keys. The second time can be adjusted in MODE Key Hold Time (O2-06).
3. The beep sound of key pressing can be selected to be enabled or disabled in Key Pressed Beep Sel (O2-01)
4. When all the keys are not pressed at all for a certain time (O1-02), it goes to idle mode. Once any key is pressed, the display will return to the LCD monitor selection value set in constant O1-01.
5. When all the keys are not pressed at all for a certain time (O2-09), all the LCD Display and LED Indicators are not active but RUN/STOP indicator remains active. The display idle function can save the display power.
6. When users are programming under any level of Groups or Function or Parameters or Parameters Edit, press  key for 1 second to return to Main Menu “Operation” immediately.
7. When users are programming under any level of Groups or Function or Parameters or Parameters Edit, press  key for 1 second to return to Main Menu “Programming” immediately.
8. When adjusting the parameters values, press  key to enable cursor to move left for one digit and press  key to enable cursor to move right for one digit.

LED Indicators

LED	Name	L ED ON	LED OFF
1	AC IN	1. Input voltage normal, and position > "transfer Voltage Level" (150VAC~240VAC) 2. Input voltage frequency range in between(45~65Hz)	No input power
2	AC CHARGER	Green : Battery charger is working.	-----
3	AC OUT	There is voltage at the "AC OUT" terminal.	-----
4	INVERTER	Green : Inverter is working.	-----
5	BATTERY	FLOAT or ABSOR. Or BULK charge state of battery.	-----
6	ATS	Green : ATS switch is active AC IN voltage is being sent directly to AC OUT terminal	-----
7	RUN/STOP	Green : Combi 3 turn on. Red : Combi 3 turn off.	-----
		NOTE: Green Blink : Auto-Restart is in use	
8	COM./ERR.	Remote control port in communication/in error	

3.2 Panel Connection

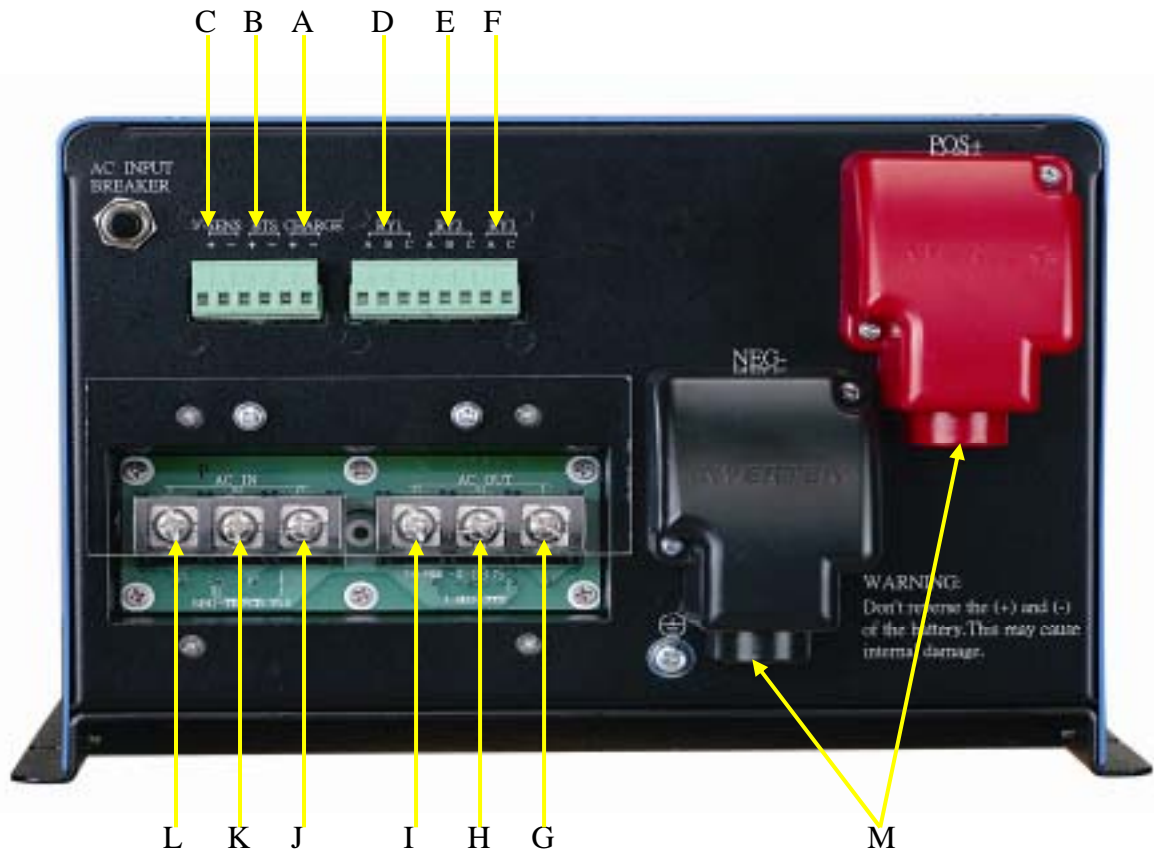
3.2.1 Lower-Front Panel Connection for Wall-Mounting/Vertical Combi 3



Connections / Lower-Front side for wall mounting

A CHARGE	Connecting terminal for starting battery of 4A
B BTS (Battery temp. sensor)	Connecting terminal for temperature sensor
C V _{sens} +/- (Battery Voltage Sense)	Connecting terminal for Battery Voltage feedback
D RY1 contact	Connecting terminal for auxiliary contact 1
E RY2 contact	Connecting terminal for auxiliary contact 2
F RY3 contact	Connecting terminal for auxiliary contact 3
G AC OUT L	Connecting terminal for AC output Line
H AC OUT N	Connecting terminal for AC output Neutral
I AC OUT G	Connecting terminal for AC output Ground
J AC IN G	Connecting terminal for AC input Ground
K AC IN N	Connecting terminal for AC input Neutral
L AC IN L	Connecting terminal for AC input Line
M Battery POS+ / NEG-	Battery cables

3.2.2 Rear Panel Connection for Table-Mounting/Horizontal Combi 3

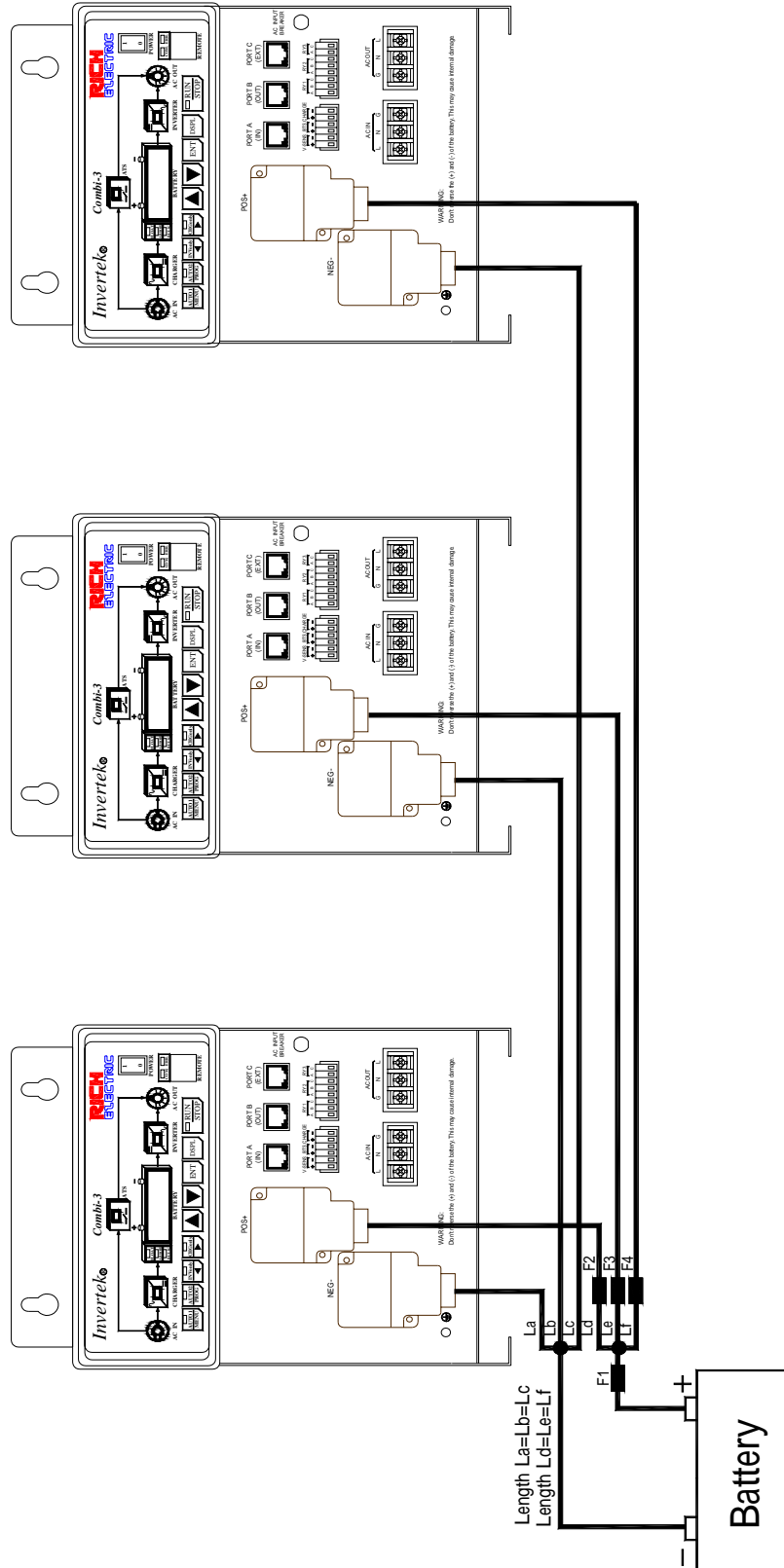


Connections / Rear side for table mounting

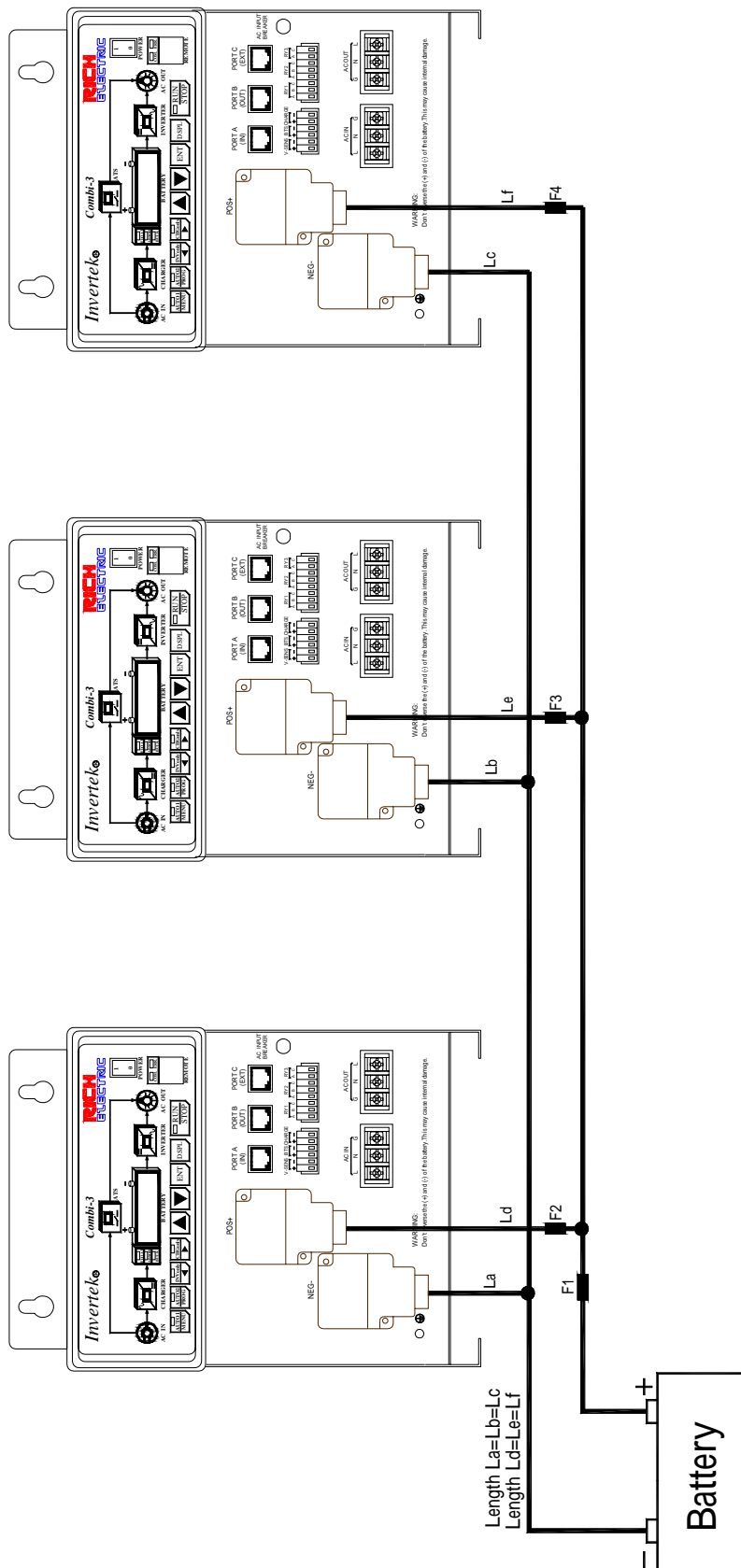
A CHARGE	Connecting terminal for starting battery of 4A
B BTS (Battery temp. sensor)	Connecting terminal for temperature sensor
C Vsens +/- (Battery Voltage Sense)	Connecting terminal for Battery Voltage feedback
D RY1 contact	Connecting terminal for auxiliary contact 1
E RY2 contact	Connecting terminal for auxiliary contact 2
F RY3 contact	Connecting terminal for auxiliary contact 3
G AC OUT L	Connecting terminal for AC output Line
H AC OUT N	Connecting terminal for AC output Neutral
I AC OUT G	Connecting terminal for AC output Ground
J AC IN G	Connecting terminal for AC input Ground
K AC IN N	Connecting terminal for AC input Neutral
L AC IN L	Connecting terminal for AC input Line
M Battery POS+ / NEG-	Battery cables

3.3 Battery Connection

3.3.1 Star Connection Schematic



3.3.2 Rail Connection Schematic



Chapter 4 User Constants

There are four “Macro Function” under the main menu of the “Combi 3” and they are “Operation”, “Initialize”, “Programming” and “Modified Constants”. The functions and their contents are as below.

Function	Content
Operation	“Combi 3” can monitor AC IN voltage and current, AC OUT voltage and current, battery voltage, battery current and ripple voltage in charging and discharging battery and other extension modules status. This is U (Monitor Group) constants.
Initialize	Operation Condition Setting Group A (Initialize) Group: Multi-language setting, constants initialization setting and constants modification allowed/prohibited setting.
Programming	Constant groups to program (modify) all the constants: B (General) Group, C (INVERTER) Group, D (AC CHARGER) Group, E (Aux-relay) Group, and O (Operator) Group
Modified Constants	Operating the read-out and modification of the constants group setting which are different from initial setting. Users can program and modify constants

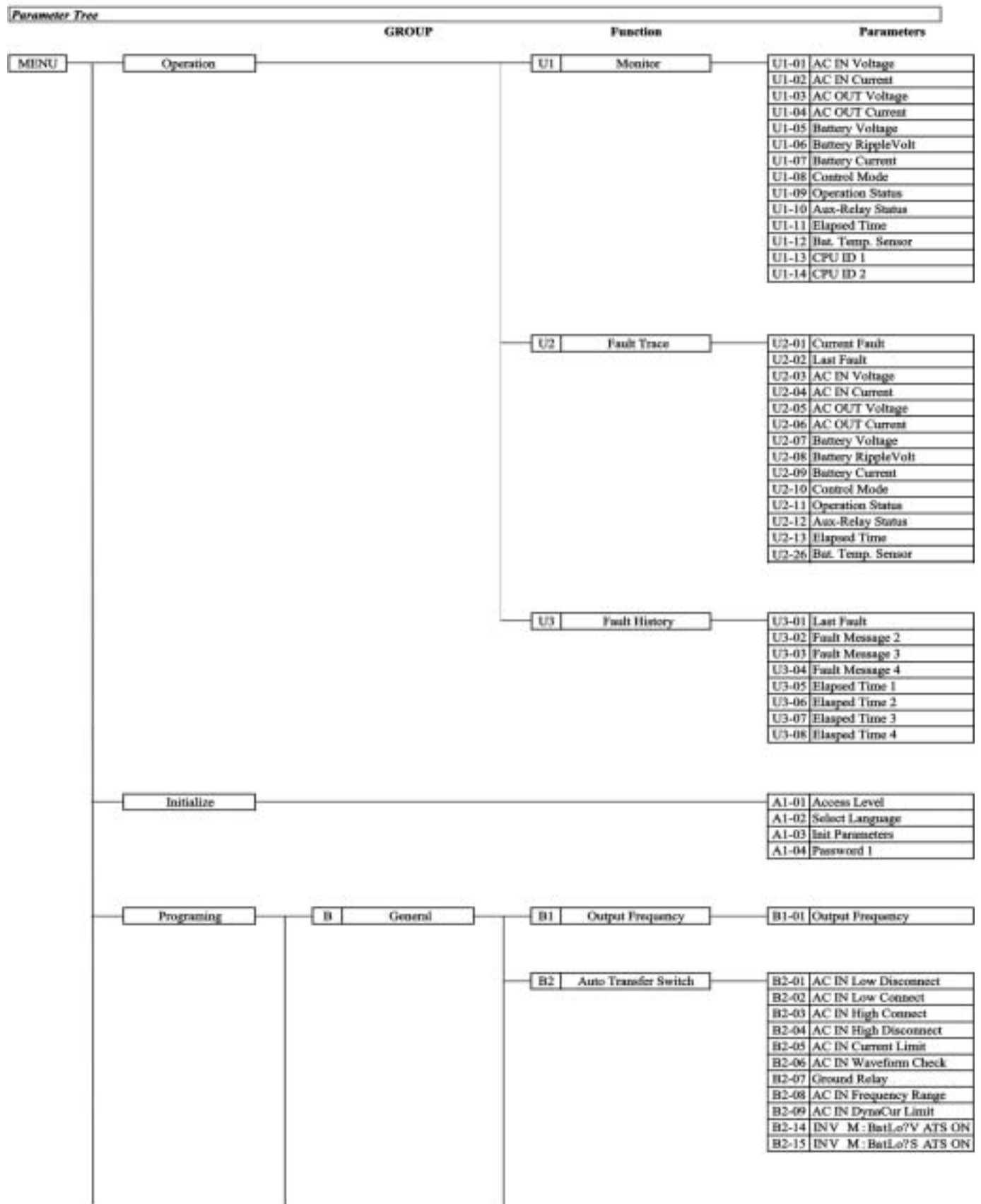
Operation of “Macro Function”

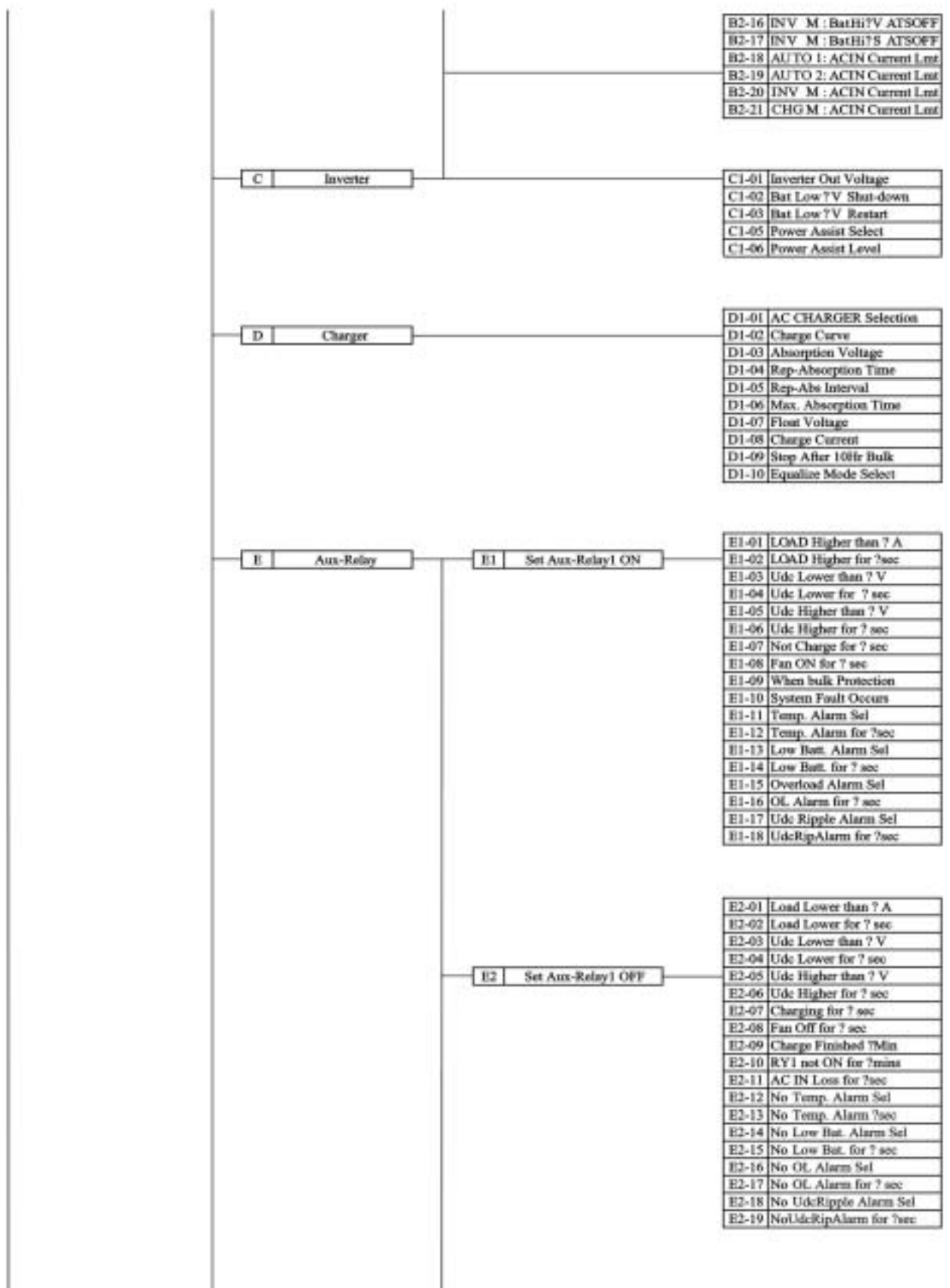
On any display screen, pressing DSPL key could have the effect just like ESC key to enable the display screen go back to previous any of four “Macro Function”

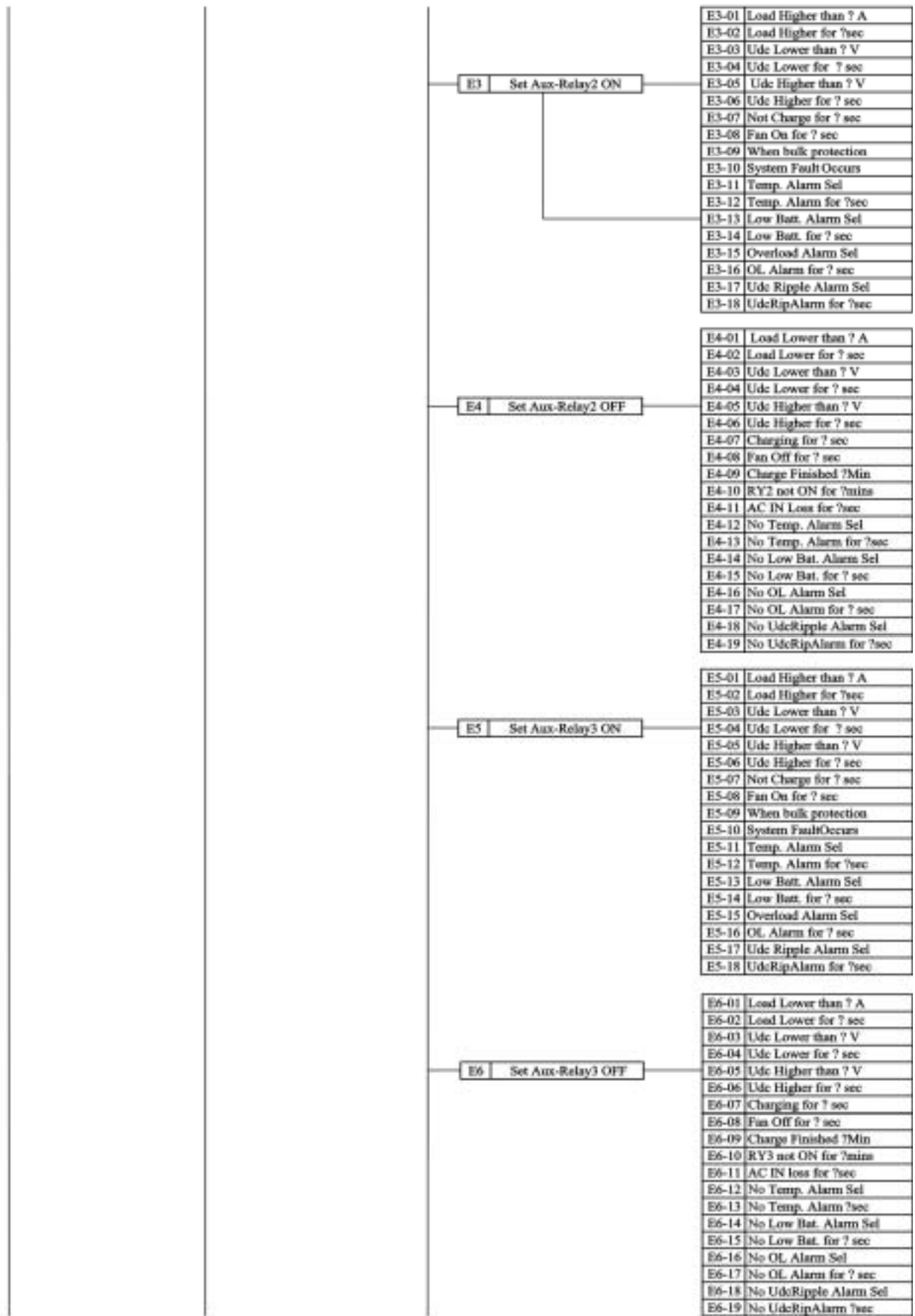
*** Main Menu *** XXXXXXXXXX

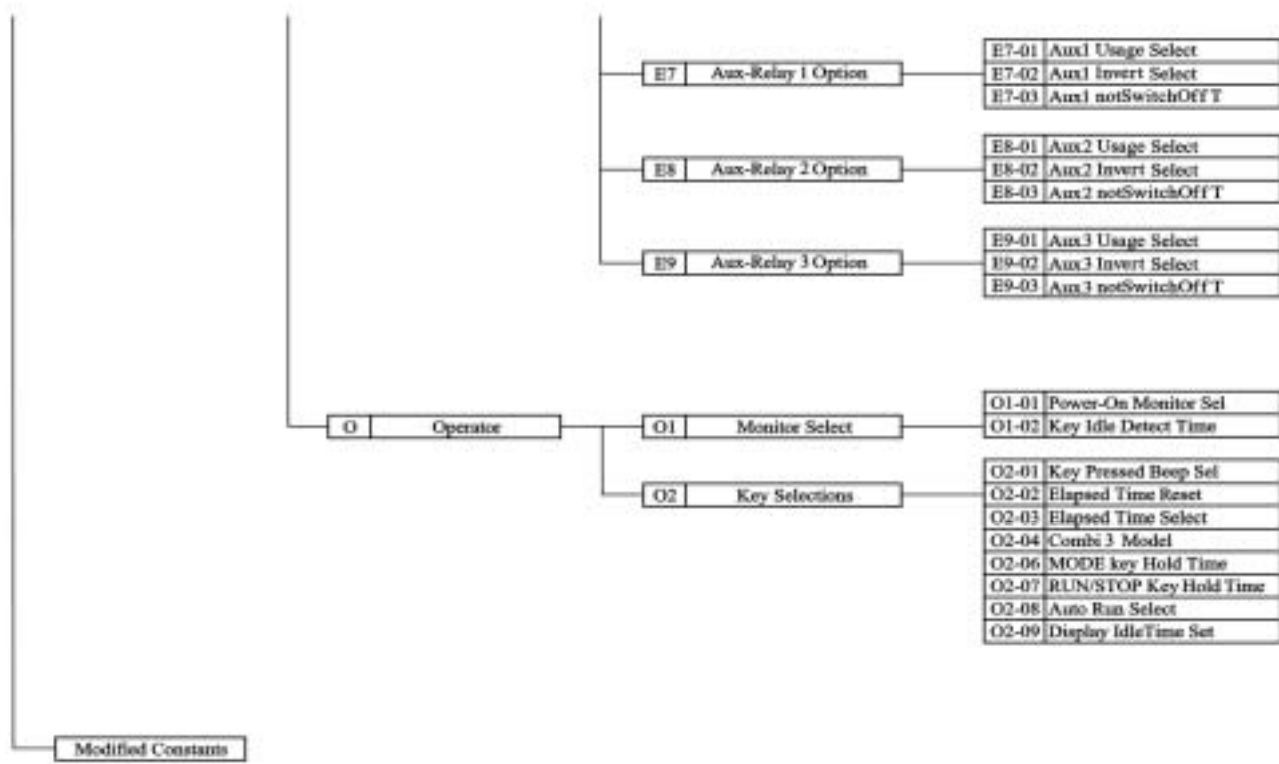
(XXXXXXXXXX can be either Operation or Initialize or Programming or Modified Constants.)
And continue to press DSPL key to select “Macro Function”

4.1 The following is the structure of user constants.







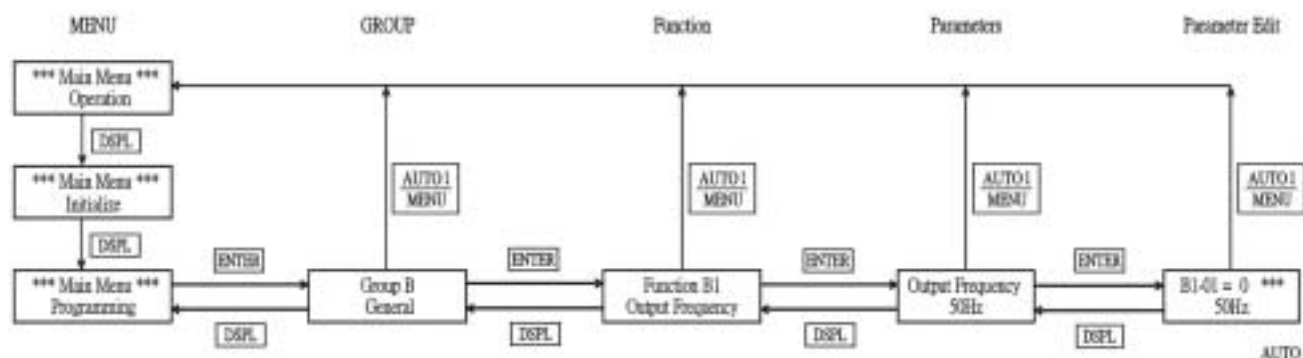


4.2 The following is the operation flow.

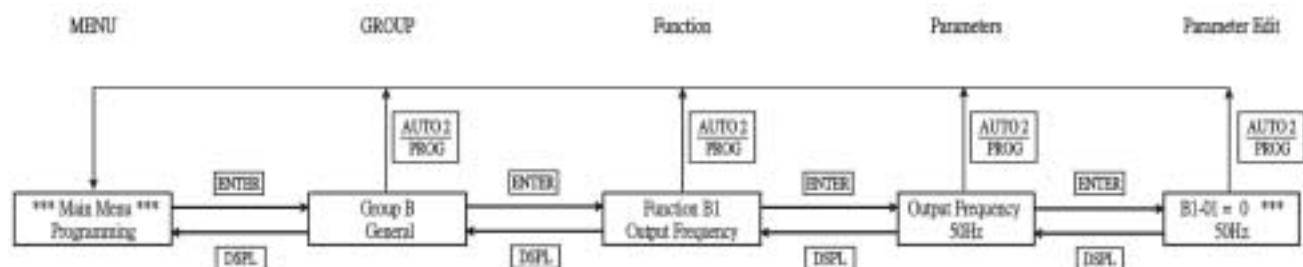
Main Menu



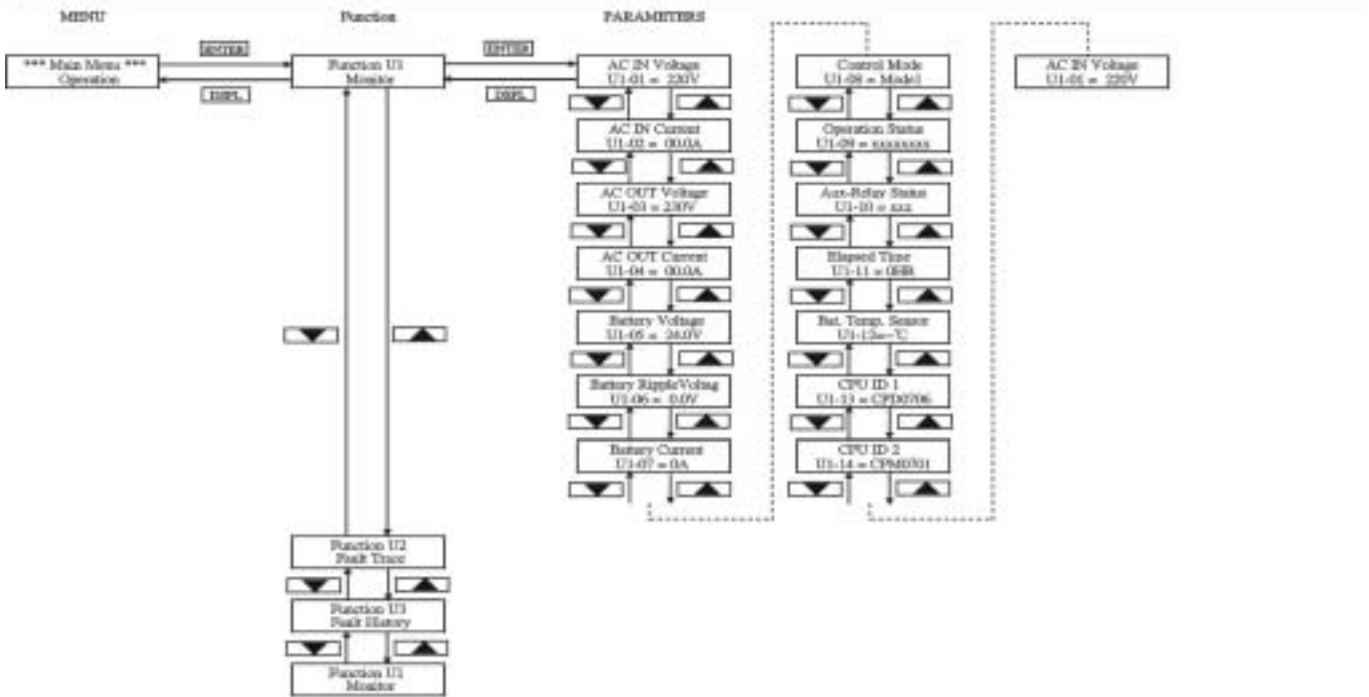
Quick Return Main Menu-Operation



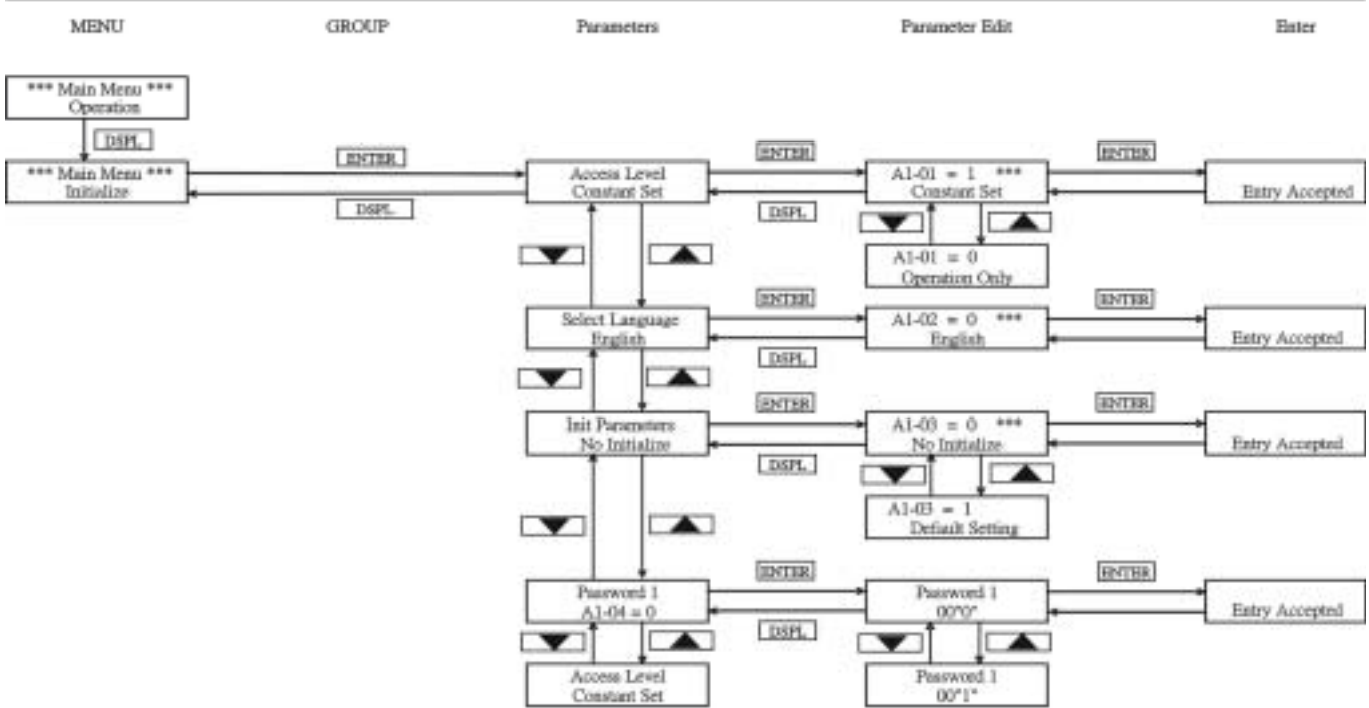
Quick Return Main Menu-Programming



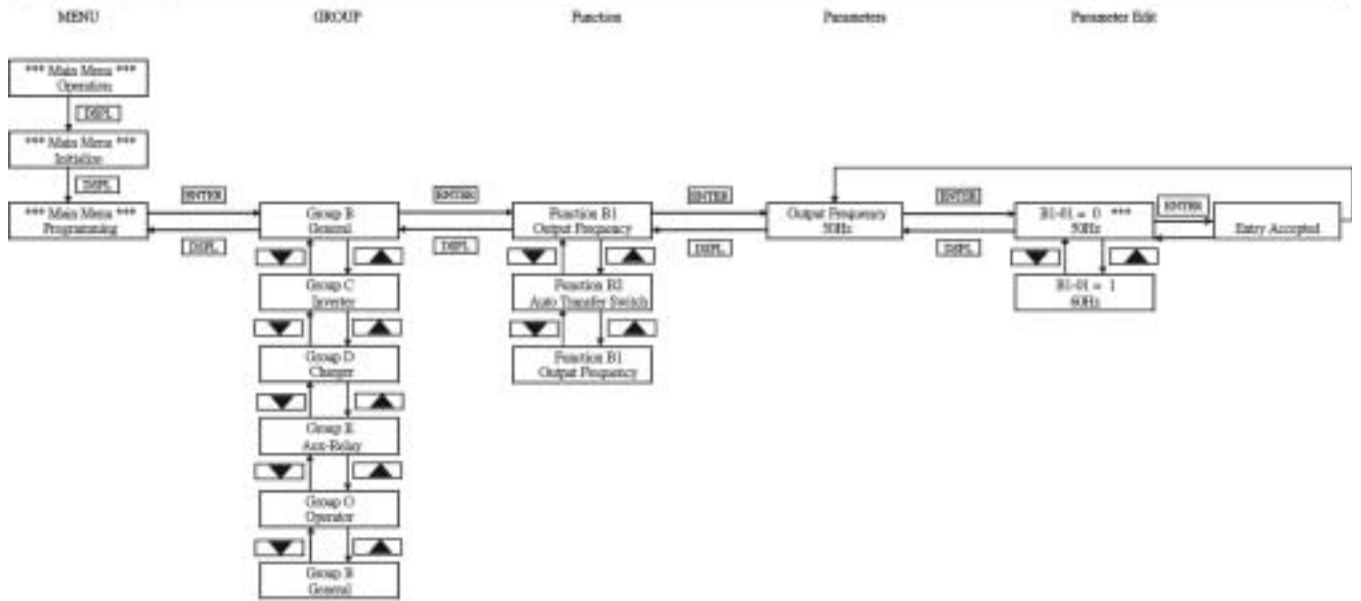
Main Menu : Operation



Main Menu : Initialize



Main Menu : Programming - Function B1 - B1-01



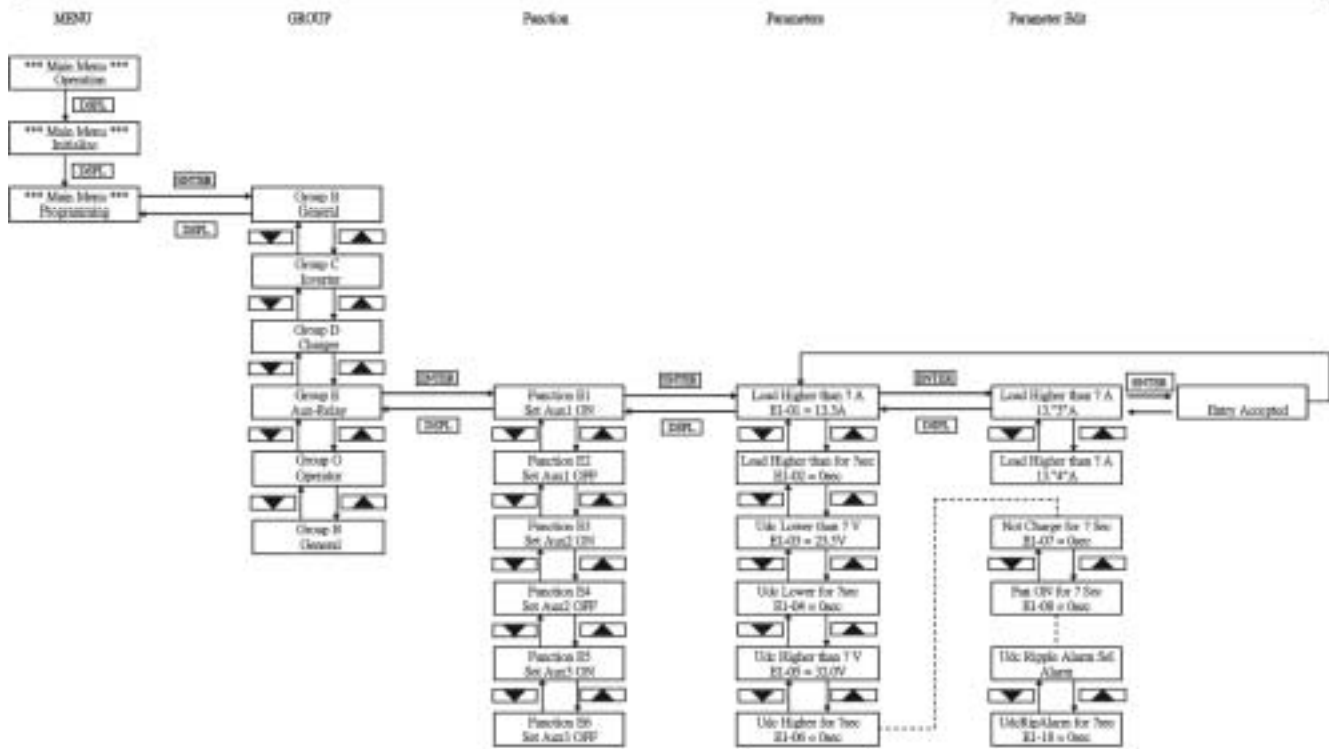
Main Menu - Programming - Function C1 - C1-01



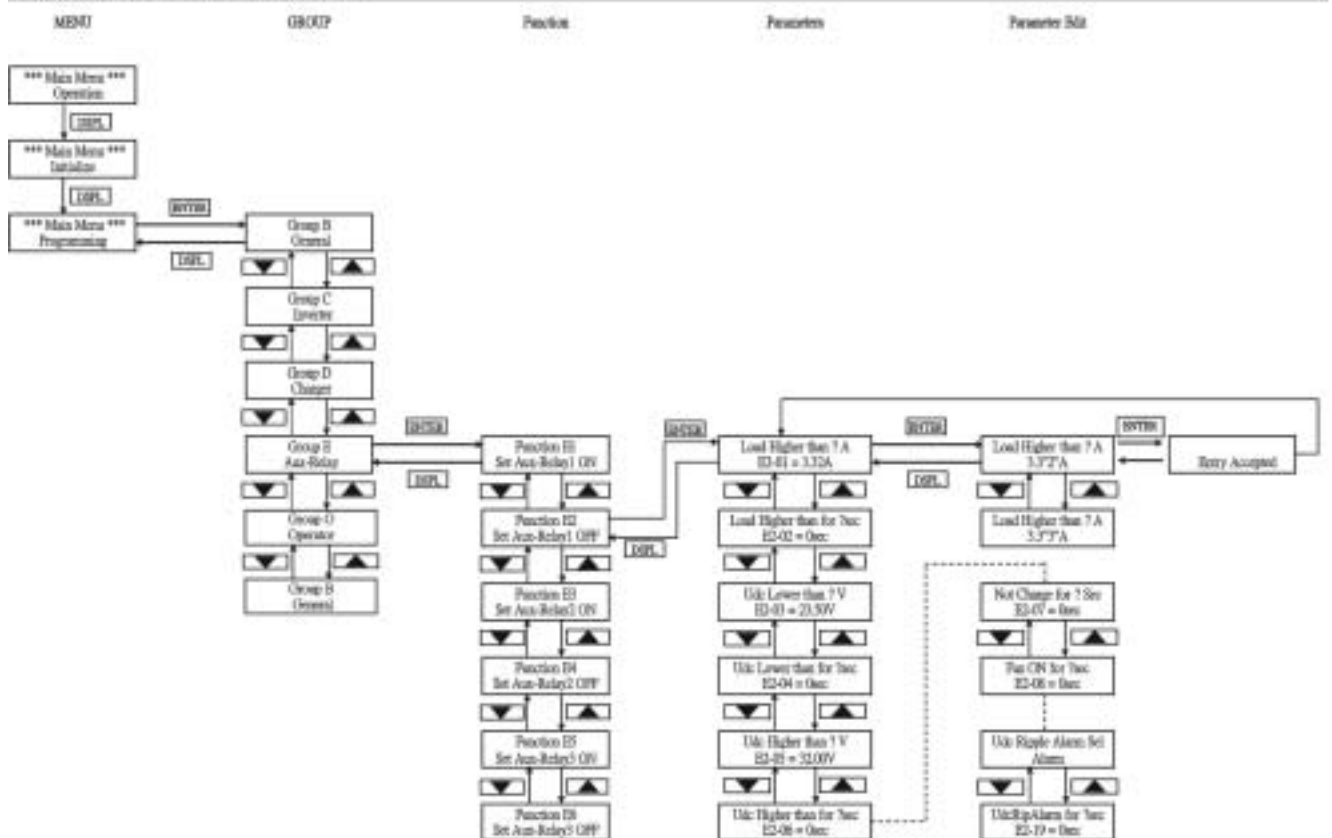
Main Menu - Programming - Function D1 - D1-01



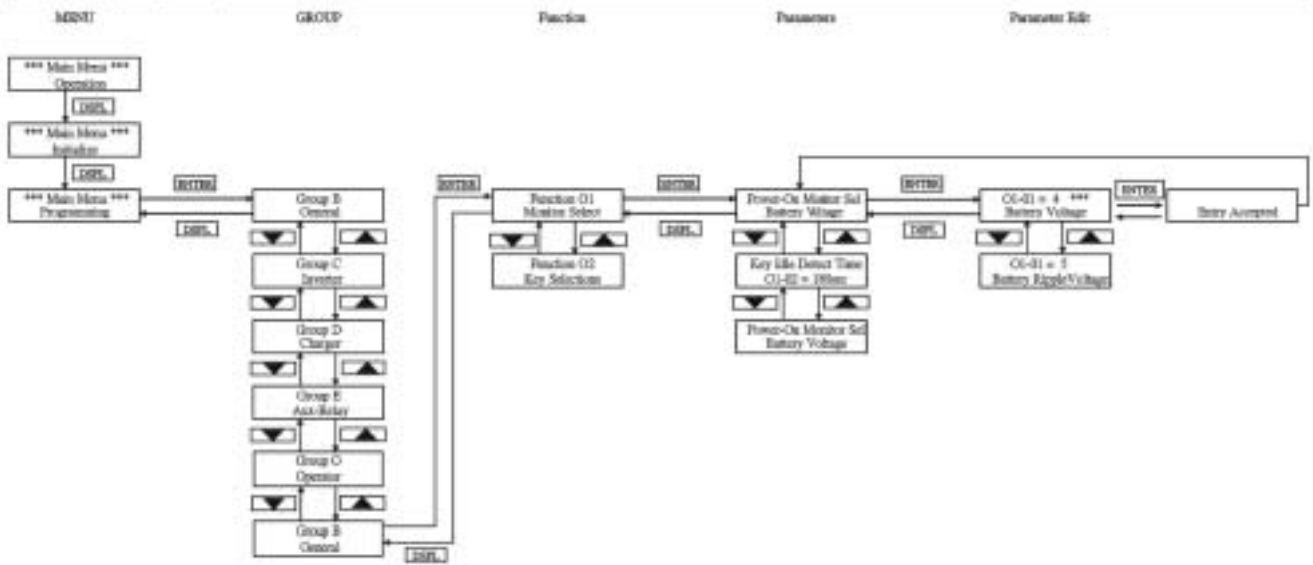
Main Menu : Programming - Group E - Function E1 - E1-01



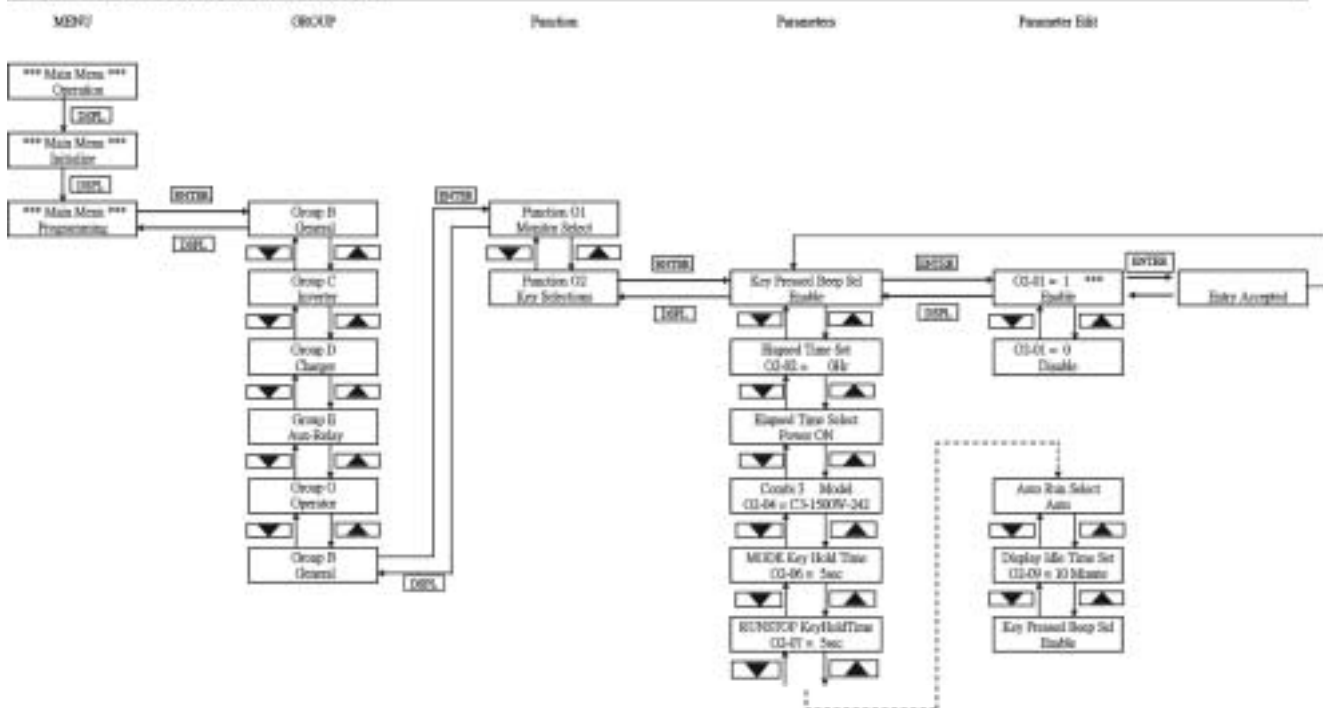
Main Menu : Programming - Group E - Function E2 - E2-01



Main Menu / Programming - Group 0 - Function 01 - 01-01



Main Menu / Programming - Group 0 - Function 02 - 02-01



Chapter 5 Constants List

Menu	Group		Function		Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page				
Operation	U	Monitor	U1	Monitor	U1-01	AC IN Voltage	-	0.1V	-		6-21				
					U1-02	AC IN Current	-	0.1A	-		6-21				
					U1-03	AC OUT Voltage	-	0.1V	-		6-21				
					U1-04	AC OUT Current	-	0.1A	-		6-21				
					U1-05	Battery Voltage	-	0.1V	-		6-21				
					U1-06	Battery Ripple Volt	-	0.1V	-		6-21				
					U1-07	Battery Current	-	0.1A	-		6-21				
					U1-08	Control Mode	-	-	-		6-21				
					U1-09	Operation Status	-	-	-	NOTE 1	6-22				
					U1-10	Aux-Relay Status	-	-	-	NOTE 2	6-22				
					U1-11	Elapsed Time	-	1hour	-		6-22				
					U1-12	Bat.Temp.Sensor	-	1°C	-		6-22				
					U1-13	CPU ID 1	-	-	-		6-22				
					U1-14	CPU ID 2	-	-	-		6-22				
						U2	Fault Trace	U2-01	Current Fault	-	-	-		6-23	
								U2-02	Last Fault	-	-	-	-		6-23
								U2-03	AC IN Voltage	-	0.1V	-	-		6-23
								U2-04	AC IN Current	-	0.1A	-	-		6-23
								U2-05	AC OUT Voltage	-	0.1V	-	-		6-23
								U2-06	AC OUT Current	-	0.1A	-	-		6-23
								U2-07	Battery Voltage	-	0.1V	-	-		6-23
								U2-08	Battery Ripple Volt	-	0.1V	-	-		6-23
								U2-09	Battery Current	-	0.1A	-	-		6-24
								U2-10	Control Mode	-	-	-	-		6-24
								U2-11	Operation Status	-	-	-	-	NOTE 1	6-24
								U2-12	Aux-Relay Status	-	-	-	-	NOTE 2	6-24
								U2-13	Elapsed Time	-	1hour	-	-		6-24
								U2-26	Bat.Temp. Sensor	-	1°C	-	-		6-24
						U3	Fault History	U3-01	Last Fault	-	-	-		6-25	
								U3-02	Fault Message 2	-	-	-	-		6-25
								U3-03	Fault Message 3	-	-	-	-		6-25
								U3-04	Fault Message 4	-	-	-	-		6-25
								U3-05	Elapsed Time 1	-	1hour	-	-		6-25

Menu	Group		Function		Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page
Operation	U	Monitor	U3	Fault History	U3-06	Elapsed Time 2	-	1hour	-		6-25
					U3-07	Elapsed Time 3	-	1hour	-		6-25
					U3-08	Elapsed Time 4	-	1hour	-		6-25
Initialize	A	Initialize	A1	Initialize	A1-01	Access Level	0~1	1	1	0: Operation Only 1: Constant Set	6-1
					A1-02	Select Language	-	-	0	0:English	6-1
					A1-03	Init Parameters	0~1	1	0	0: No Initialize 1:Default Setting	6-1
					A1-04	Password 1	0~999	1	0		6-2
Programm- ing	B	General	B1	Output Frequency	B1-01	Output Frequency	0~1	1	0	0: 50 Hz 1:60 Hz	6-3
					B2	Auto Transfer Switch	B2-01	AC IN Low Disconnect	NOTE 3	1V	NOTE 3
			B2-02	AC IN Low Connect			NOTE 3	1V	NOTE 3		6-3
			B2-03	AC IN High Connect			NOTE 3	1V	NOTE 3		6-4
			B2-04	AC IN High Disconnect			NOTE 3	1V	NOTE 3		6-4
			B2-05	AC IN Current Limit			NOTE 3	0.1A	NOTE 3		6-4
			B2-06	AC IN Waveform Check			0~1	1	1	0: Ignore 1: Active	6-4
			B2-07	Ground Relay			0~1	1	1	0: Disconnect 1: Connect	6-5
			B2-08	ACIN Frequency Range			0~1	1	1	0:50/60Hz+-5Hz 1:45Hz~65Hz	6-5
			B2-09	AC IN DynaCur Limit			0~1	1	0	0: Normal 1:Dynamic	6-5
			B2-14	INV M: BatLo?V ATSON			0~32.0 0~16.0	0.01V	23.5V 11.75V		6-6
			B2-15	INV M: BatLo?S ATSON			0~255	1 sec	10 sec		6-6
			B2-16	INV M: BatHi?V ATSOFF			0~32.0 0~16.0	0.01V	28.8V 14.4V		6-6
			B2-17	INV M: BatHi?S ATSOFF			0~255	1 sec	60 sec		6-6
			B2-18	AUTO1:ACINCurrent Lmt	NOTE 3	0.1A	NOTE 3		6-7		
B2-19	AUTO2:ACINCurrent Lmt	NOTE 3	0.1A	NOTE 3		6-7					

Menu	Group		Function		Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page
Programm- ing	B	General	B2	Auto Transfer Switch	B2-20	INV M:ACINCurrent Lmt	NOTE 3	0.1A	NOTE 3		6-7
					B2-21	CHG M:ACINCurrent Lmt	NOTE 3	0.1A	NOTE 3		6-7
	C	Inverter	C1	Inverter	C1-01	Inverter Out Voltage	NOTE 3	1V	NOTE 3		6-8
					C1-02	Bat Low ? V Shut-down	NOTE 3	0.01V	NOTE 3		6-8
					C1-03	Bat Low ? V Restart	NOTE 3	0.01V	NOTE 3		6-8
					C1-04	Auto Power Saving	0~1	1	1	0: Disable 1: Enable	6-8
					C1-05	Power Assist Select	0~1	1	1	0: Disable 1: Enable	6-8
					C1-06	Power Assist Level	1.0~3.5	0.1	2.0		6-9
	D	Charger	D1	Charger	D1-02	Charge Curve	1~3	1	3	1: Fixed 2: Adaptive 3: Adaptive+safe	6-10
					D1-03	Absorption Voltage	NOTE 3	0.01V	NOTE 3		6-11
					D1-04	Rep-Absorption Time	1~72	0.25 hour	4	4x0.25=1 hour	6-11
					D1-05	Rep-Abs Interval	1~180	0.25 day	28	28x0.25=7day	6-11
					D1-06	Max. Absorption Time	1~8	1hour	4hour		6-11
					D1-07	Float Voltage	NOTE 3	0.01V	NOTE 3		6-11
					D1-08	Charge Current	NOTE 3	1A	NOTE 3		6-11
					D1-09	Stop After 10Hr Bulk	0~1	1	1	0:Disable 1:Enable	6-11
					D1-10	Equalize Mode Select	0~1	1	1	0:Disable 1:Enable	6-12
					E	Aux-Relay	E1	Set Aux-Relay 1 ON	E1-01	LOAD Higher than ? A	NOTE 3
	E1-02	LOAD Higher for ? sec	0~255	1sec					0sec		6-13
	E1-03	Udc Lower than ? V	NOTE 3	0.01V					NOTE 3		6-13
	E1-04	Udc Lower for ? sec	0~255	1sec					0sec		6-13
	E1-05	Udc Higher than ? V	NOTE 3	0.01V					NOTE 3		6-13
	E1-06	Udc Higher for ? sec	0~255	1sec					0sec		6-13
	E1-07	Not Charge for ? sec	0~255	1sec					0sec		6-13
	E1-08	Fan On for ? sec	0~255	1sec					0sec		6-13

Menu	Group		Function		Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page		
Programm- ing	E	Aux-Relay	E1	Set Aux- Relay 1 ON	E1-09	When bulk Protection	0~1	1	0	0:Disable 1:Enable	6-14		
					E1-10	System Fault Occurs	0~1	1	0	0:Disable 1:Enable	6-14		
					E1-11	Temp. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-14		
					E1-12	Temp. Alarm for ?sec	0~255	1sec	0sec		6-14		
					E1-13	Low Batt. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-14		
					E1-14	Low Batt. for ? sec	0~255	1sec	0sec		6-14		
					E1-15	Overload Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-14		
					E1-16	OL Alarm for ? sec	0~255	1sec	0sec		6-14		
					E1-17	Udc Ripple Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-14		
					E1-18	UdcRipAlarm for ? sec	0~255	1sec	0sec		6-14		
				E2	Set Aux- Relay 1 OFF	E2-01	Load Lower than ? A	NOTE 3	0.01A	NOTE 3		6-15	
						E2-02	Load Lower for ? sec	0~255	1sec	0sec			6-15
						E2-03	Udc Lower than ? V	NOTE 3	0.01V	NOTE 3			6-15
						E2-04	Udc Lower for ? sec	0~255	1sec	0sec			6-15
						E2-05	Udc Higher than ? V	NOTE 3	0.01V	NOTE 3			6-15
						E2-06	Udc Higher for ? sec	0~255	1sec	0sec			6-15
						E2-07	Charging for ? sec	0~255	1sec	0sec			6-15
						E2-08	Fan Off for ? sec	0~255	1sec	0sec			6-16
						E2-09	Charge Finished ? Min	0~1000	1min	0			6-16
						E2-10	RY1 not ON for ? mins	0~1000	1min	0			6-16
						E2-11	AC IN Loss for ? sec	0~255	1sec	0sec			6-16
						E2-12	No Temp. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm		6-16
						E2-13	No Temp. Alarm ? sec	0~255	1sec	0sec			6-16
						E2-14	No Low Bat. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm		6-17
						E2-15	No Low Bat for ? sec	0~255	1sec	0sec			6-17

Menu	Group		Function	Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page	
Programm- ing	E	Aux-Relay	E2	Set Aux- Relay 1 OFF	E2-16	No OL Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E2-17	No OL Alarm for ? sec	0~255	1sec	0sec		6-17
					E2-18	No UdcRipple Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E2-19	No UdcRipple Alarm ?sec	0~255	1sec	0sec		6-17
			E3	Set Aux- Relay 2 ON	E3-01	Load Higher than ? A	NOTE 3	0.01A	NOTE 3		6-17
					E3-02	Load Higher for ?sec	0~255	1sec	0sec		6-17
					E3-03	Udc Lower than ? V	NOTE 3	0.01V	NOTE 3		6-17
					E3-04	Udc Lower for ? sec	0~255	1sec	0sec		6-17
					E3-05	Udc Higher than ? V	NOTE 3	0.01V	NOTE 3		6-17
					E3-06	Udc Higher for ? sec	0~255	1sec	0sec		6-17
					E3-07	Not Charge for ? sec	0~255	1sec	0sec		6-17
					E3-08	Fan On for ? sec	0~255	1sec	0sec		6-17
					E3-09	When bulk Protection	0~1	1	0	0:Disable 1:Enable	6-17
					E3-10	System Fault Occurs	0~1	1	0	0:Disable 1:Enable	6-17
					E3-11	Temp. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E3-12	Temp. Alarm for ?sec	0~255	1sec	0sec		6-17
					E3-13	Low Batt. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E3-14	Low Batt. for ? sec	0~255	1sec	0sec		6-17
			E4	Set Aux- Relay 2 OFF	E4-01	Load Lower than ? A	NOTE 3	0.01A	NOTE 3		6-17
					E4-02	Load Lower for ? sec	0~255	1sec	0sec		6-17
					E4-03	Udc Lower than ? V	NOTE 3	0.01V	NOTE 3		6-17
					E3-15	Overload Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E3-16	OL Alarm for ? sec	0~255	1sec	0sec		6-17
					E3-17	Udc Ripple Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E3-18	UdcRipAlarm for ?sec	0~255	1sec	0sec		6-17

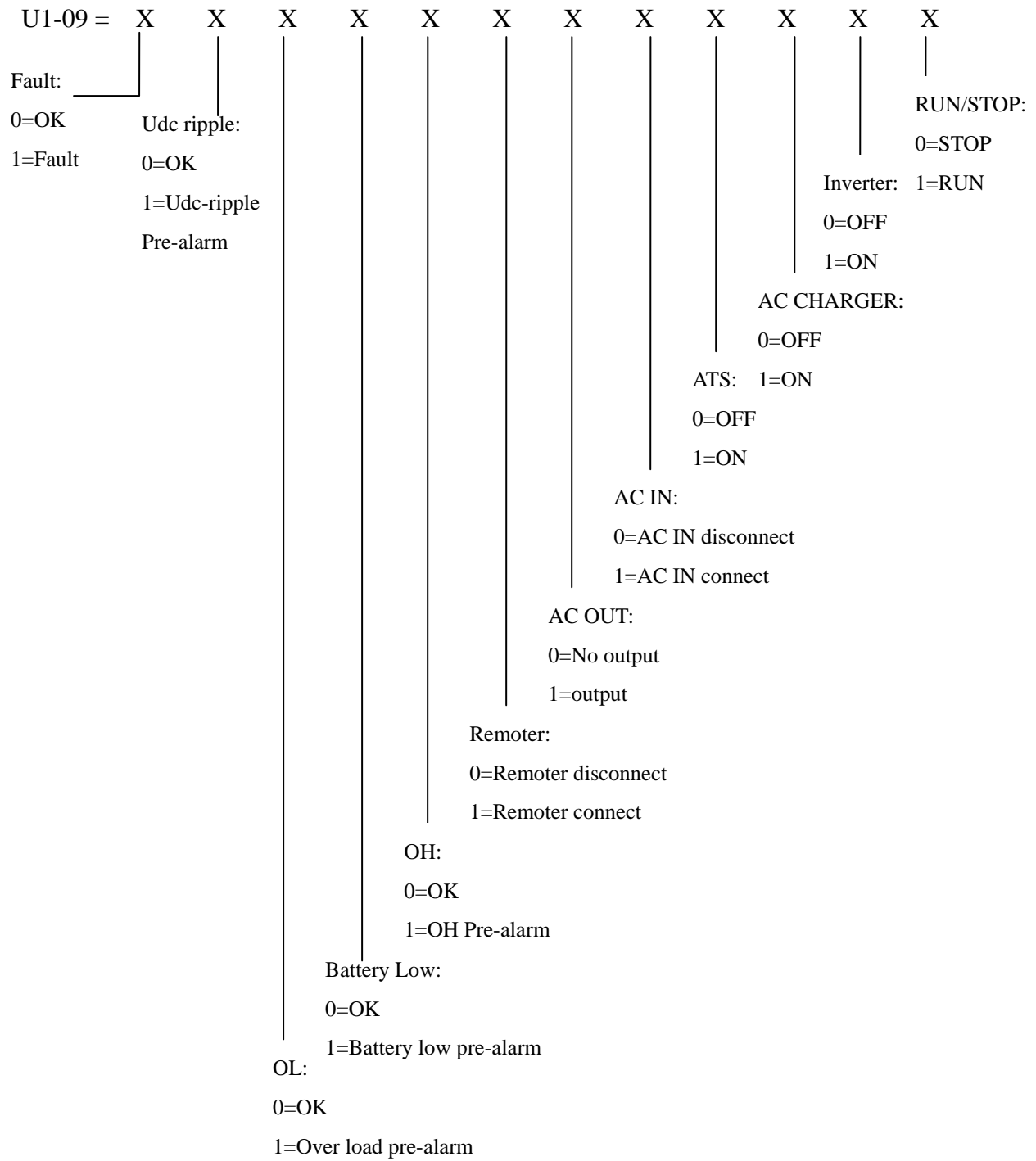
Menu	Group		Function	Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page			
Programm- ing	E	Aux-Relay	E4	Set Aux- Relay 2 OFF	E4-04	Udc Lower for ? sec	0~255	1sec	0sec		6-17		
					E4-05	Udc Higher than ? V	NOTE 3	0.01V	NOTE 3		6-17		
					E4-06	Udc Higher for ? sec	0~255	1sec	0sec		6-17		
					E4-07	Charging for ? sec	0~255	1sec	0sec		6-17		
					E4-08	Fan OFF for ? sec	0~255	1sec	0sec		6-17		
					E4-09	Charge Finished ?Min	0~1000	1min	0		6-17		
					E4-10	RY2 not ON for ?mins	0~1000	1min	0		6-17		
					E4-11	AC IN Loss for ?sec	0~255	1sec	0sec		6-17		
					E4-12	No Temp. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17		
					E4-13	No Temp. Alarm ? sec	0~255	1sec	0sec		6-17		
					E4-14	No Low Bat. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17		
					E4-15	No Low Bat for ? sec	0~255	1sec	0sec		6-17		
					E4-16	No OL Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17		
					E4-17	No OL Alarm for ? sec	0~255	1sec	0sec		6-17		
					E4-18	No UdcRipple Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17		
					E4-19	No UdcRipple Alarm ?sec	0~255	1sec	0sec		6-17		
					E5	Set Aux- Relay 3 ON	E5-01	Load Higher than ? A	NOTE 3	0.01A	NOTE 3		6-17
							E5-02	Load Higher for ?sec	0~255	1sec	0sec		6-17
							E5-03	Udc Lower than ? V	NOTE 3	0.01V	NOTE 3		6-17
			E5-04	Udc Lower for ? sec			0~255	1sec	0sec		6-17		
			E5-05	Udc Higher than ? V			NOTE 3	0.01V	NOTE 3		6-17		
			E5-06	Udc Higher for ? sec			0~255	1sec	0sec		6-17		
			E5-07	Not Charge for ? sec			0~255	1sec	0sec		6-17		
			E5-08	Fan ON for ? sec			0~255	1sec	0sec		6-17		
			E5-09	When bulk Protection			0~1	1	0	0:Disable 1:Enable	6-17		
			E5-10	System Fault Occurs			0~1	1	0	0:Disable 1:Enable	6-17		

Menu	Group		Function	Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page	
Programm- ing	E	Aux-Relay	E5	Set Aux- Relay 3 ON	E5-11	Temp. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E5-12	Temp. Alarm for ?sec	0~255	1sec	0sec		6-17
					E5-13	Low Batt. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E5-14	Low Batt. for ? sec	0~255	1sec	0sec		6-17
					E5-15	Overload Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E5-16	OL Alarm for ? sec	0~255	1sec	0sec		6-17
					E5-17	Udc Ripple Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E5-18	UdcRipAlarm for ?sec	0~255	1sec	0sec		6-17
			E6	Set Aux- Relay 3 OFF	E6-01	Load Lower than ? A	NOTE 3	0.01A	NOTE 3		6-17
					E6-02	Load Lower for ? sec	0~255	1sec	0sec		6-17
					E6-03	Udc Lower than ? V	NOTE 3	0.01V	NOTE 3		6-17
					E6-04	Udc Lower for ? sec	0~255	1sec	0sec		6-17
					E6-05	Udc Higher than ? V	NOTE 3	0.01V	NOTE 3		6-17
					E6-06	Udc Higher for ? sec	0~255	1sec	0sec		6-17
					E6-07	Charging for ? sec	0~255	1sec	0sec		6-17
					E6-08	Fan OFF for ? sec	0~255	1sec	0sec		6-17
					E6-09	Charge Finished ?Min	0~1000	1min	0		6-17
					E6-10	RY3 not ON for ?mins	0~1000	1min	0		6-17
					E6-11	AC IN Loss for ?sec	0~255	1sec	0sec		6-17
					E6-12	No Temp. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E6-13	No Temp. Alarm ? sec	0~255	1sec	0sec		6-17
					E6-14	No Low Bat. Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E6-15	No Low Bat for ? sec	0~255	1sec	0sec		6-17
					E6-16	No OL Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
			E6-17	No OL Alarm for ? sec	0~255	1sec	0sec		6-17		

Menu	Group		Function	Constant	LCD Display	Range	Unit	Factory Setting	Remark	Page	
Programm- ing	E	Aux-Relay	E6	Set Aux-Relay 3 OFF	E6-18	No UdcRipple Alarm Sel	0~1	1	0	0:Alarm 1:Pre-alarm	6-17
					E6-19	No UdcRipple Alarm ?sec	0~255	1sec	0sec		6-17
			E7	Aux-Relay 1 Option	E7-01	Aux1 Usage Select	0~1	1	0	0:Do not use Aux 1: Use Aux	6-18
					E7-02	Aux1 Invert Select	0~1	1	0	0: Normal 1: Invert switch	6-18
					E7-03	Aux1 notSwitchOff T	0~1000	1 min	0		6-18
			E8	Aux-Relay 2 Option	E8-01	Aux2 Usage Select	0~1	1	0	0:Do not use Aux 1: Use Aux	6-18
					E8-02	Aux2 Invert Select	0~1	1	0	0: Normal 1: Invert switch	6-18
					E8-03	Aux2 notSwitchOff T	0~1000	1 min	0		6-18
			E9	Aux-Relay 3 Option	E9-01	Aux3 Usage Select	0~1	1	0	0:Do not use Aux 1: Use Aux	6-18
					E9-02	Aux3 Invert Select	0~1	1	0	0: Normal 1: Invert switch	6-18
					E9-03	Aux3 notSwitchOff T	0~1000	1 min	0		6-18
			O	Operator	O1	Monitor Select	O1-01	Power-ON Monitor Sel	0~13	1	4
	O1-02	Key Idle Detect Time					10~600	1sec	180 sec		6-19
	O2	Key Selections			O2-01	Key Pressed Beep Sel	0~1	1	1	0:Disable 1:Enable	6-19
					O2-02	Elapsed Time Reset	0~60000	1hour	0		6-19
					O2-03	Elapsed Time Select	0~1	1	0	0:Power ON 1: Run Time	6-19
					O2-04	Combi 3 Model	-	-	-		6-19
					O2-06	MODE Key Hold Time	2~10	1sec	5 sec		6-20
					O2-07	RUN/STOP KeyHoldTime	2~10	1sec	2 sec		6-20
					O2-08	Auto Run Select	0~1	1	1	0: Manual 1: Auto	6-20
	O2-09	Display IdleTime Set	0~60	1min	10 min		6-20				

NOTE 1:

Operation Status



Constant Model	D1-03			D1-07			D1-08			E1-01,E3-01,E5-01		
	Range	Unit	Factory Setting	Range	Unit	Factory Setting	Range	Unit	Factory Setting	Range	Unit	Factory Setting
C3-1500-122	12.0~16.0	0.01V	14.40V	12.0~16.0	0.01V	13.80V	0~70	1A	35A	0~29.3	0.01A	6.65A
C3-3000-122	12.0~16.0	0.01V	14.40V	12.0~16.0	0.01V	13.80V	0~140	1A	70A	0~42.6	0.01A	13.30A
C3-1500-242	24.0~32.0	0.01V	28.80V	24.0~32.0	0.01V	27.60V	0~35	1A	17A	0~29.3	0.01A	6.65A
C3-3000-242	24.0~32.0	0.01V	28.80V	24.0~32.0	0.01V	27.60V	0~70	1A	35A	0~42.6	0.01A	13.30A
C3-1500-121	12.0~16.0	0.01V	14.40V	12.0~16.0	0.01V	13.80V	0~70	1A	35A	0~44.7	0.01A	12.75A
C3-3000-121	12.0~16.0	0.01V	14.40V	12.0~16.0	0.01V	13.80V	0~140	1A	70A	0~83.0	0.01A	25.5A
C3-1500-241	24.0~32.0	0.01V	28.80V	24.0~32.0	0.01V	27.60V	0~35	1A	17A	0~44.7	0.01A	12.75A
C3-3000-241	24.0~32.0	0.01V	28.80V	24.0~32.0	0.01V	27.60V	0~70	1A	35A	0~83.0	0.01A	25.5A

Constant Model	E1-03,E3-03,E5-03			E1-05,E3-05,E5-05			E2-01,E4-01,E6-01			E2-03,E4-03,E6-03		
	Range	Unit	Factory Setting	Range	Unit	Factory Setting	Range	Unit	Factory Setting	Range	Unit	Factory Setting
C3-1500-122	0~17.5	0.01V	11.75V	0~17.5	0.01V	16.0V	0~29.3	0.01A	1.66A	0~17.5	0.01V	11.75V
C3-3000-122	0~17.5	0.01V	11.75V	0~17.5	0.01V	16.0V	0~42.6	0.01A	3.32A	0~17.5	0.01V	11.75V
C3-1500-242	0~35.0	0.01V	23.5V	0~35.0	0.01V	32.0V	0~29.3	0.01A	1.66A	0~35.0	0.01V	23.5V
C3-3000-242	0~35.0	0.01V	23.5V	0~35.0	0.01V	32.0V	0~42.6	0.01A	3.32A	0~35.0	0.01V	23.5V
C3-1500-121	0~17.5	0.01V	11.75V	0~17.5	0.01V	16.0V	0~44.75	0.01A	3.18A	0~17.5	0.01V	11.75V
C3-3000-121	0~17.5	0.01V	11.75V	0~17.5	0.01V	16.0V	0~83.0	0.01A	6.37A	0~17.5	0.01V	11.75V
C3-1500-241	0~35.0	0.01V	23.5V	0~35.0	0.01V	32.0V	0~44.75	0.01A	3.18A	0~35.0	0.01V	23.5V
C3-3000-241	0~35.0	0.01V	23.5V	0~35.0	0.01V	32.0V	0~83.0	0.01A	6.37A	0~35.0	0.01V	23.5V

Constant Model	E2-05,E4-05,E6-05		
	Range	Unit	Factory Setting
C3-1500-122	0~17.5	0.01V	16.0V
C3-3000-122	0~17.5	0.01V	16.0V
C3-1500-242	0~35.0	0.01V	32.0V
C3-3000-242	0~35.0	0.01V	32.0V
C3-1500-121	0~17.5	0.01V	16.0V
C3-3000-121	0~17.5	0.01V	16.0V
C3-1500-241	0~35.0	0.01V	32.0V
C3-3000-241	0~35.0	0.01V	32.0V

NOTE 4:

Parameter	Setting	LCD Display
O1-01=	0	AC IN Voltage
	1	AC IN Current
	2	AC OUT Voltage
	3	AC OUT Current
	4	Battery Voltage
	5	Battery Ripple Volt
	6	Battery Current
	7	Control Mode
	8	Operation Status
	9	Aux-Relay Status
	10	Elapsed Time
	11	Bat.Temp.Sensor
	12	CPU ID 1
13	CPU ID 2	

A1-04=Password 1

Lock the constants setting (A1-01=1)

1. Finish setting all the programmable parameters to desired values.
2. Change A1-01=0 (Operation only), factory setting is A1-01=1 (Constants set).
3. Go to A1-04 and press RUN/STOP key and UP key at the same time till A1-05 parameter occurs.
4. Enter the desired password (max. 4 digits)
5. Press UP key to leave A1-05

Above procedure completes locking the constants setting and no more programming selection would appear. A1-01 would only display 0 (Operation only) and would not display 1 (Constants set).

Unlock the constants setting

1. Enter the password in A1-04 to be exactly the same as the one earlier set in A1-05
2. When the password in A1-04 matches the one earlier set in A1-05, the unlocking is completed. A1-01=1 (Constants set) would appear again for programming.

Chapter 6 Programming Constants

A Group (Initialize):

A1 Group (Initialize)

A1-01: Access level

- Use constant A1-01 to select the user constant access level.
This level determines which user constants can be changed and displayed.

Setting	Function
A1-01=0	This setting allows the “operation” and “initialize” to be changed or displayed. Use this setting to prevent user constant settings from being changed.
A1-01=1 (Initial setting)	This setting allows all user constants to be changed or displayed.

A1-02: Select Language

- Use constant A1-02 to select the language displayed by the Combi 3. A value of 0 set English and values of others set other language.
- This user constant is not returned to factory setting when constants are initialized. It must be manually reset to factory setting.

Setting	Function
A1-02=0 (Initial setting)	English language
A1-02=1	Reserved, under development
A1-02=2	Reserved, under development
A1-02=3	Reserved, under development
A1-02=4	Reserved, under development
A1-02=5	Reserved, under development
A1-02=6	Reserved, under development

A1-03: Init Parameters

- Use constant A1-03 to initialize the user constants.
- When initialized, the user constants will return to their factory preset values. You should normally record the setting of any constants that are changed from factory presets.

Setting	Function
A1-03=0 (Initial setting)	Returns to initialize Display without initializing any user constants.
A1-03=1	Initializes the user constants to factory settings.

A1-04: Init Password 1

- This constant is reserved for the factory to test and set the functions.
- Users are not allowed to set this constant.

Lock the constants setting (A1-01=1)

1. Finish setting all the programmable parameters to desired values.
2. Change A1-01=0 (Operation only), factory setting is A1-01=1 (Constants set).
3. Go to A1-04 and press RUN/STOP key and UP key at the same time till A1-05 parameter occurs.
4. Enter the desired password (max. 4 digits)
5. Press UP key to leave A1-05

Above procedure completes locking the constants setting and no more programming selection would appear. A1-01 would only display 0 (Operation only) and would not display 1 (Constants set).

Unlock the constants setting

1. Enter the password in A1-04 to be exactly the same as the one earlier set in A1-05
2. When the password in A1-04 matches the one earlier set in A1-05, the unlocking is completed. A1-01=1 (Constants set) would appear again for programming.

B Group (General):

B1 Group (Output Frequency)

B1-01: Output frequency

- B1-01 is used to set the output frequency at INVERTER AC output

Setting	Function
B1-01=0 (Initial setting)	50Hz at INVERTER AC output
B1-01=1	60Hz at INVERTER AC output

- B2-08: AC IN Frequency Range

Setting	Function
B2-08=0	When B1-01=0: Acceptable AC input frequency is 50Hz \pm 5Hz (45~55Hz)
	When B1-01=1: Acceptable AC input frequency is 60Hz \pm 5Hz (55~65Hz)
B2-08=1 (Initial setting)	Accept wide AC input frequency range between 45~65Hz

B2 Group (Auto Transfer Switch)

B2-01: AC IN Low Disconnect

- Use constant B2-01 to determine the AC IN voltage below which level the ATS (Auto Transfer Switch) will switch off.
- This voltage level will always lie below the AC IN Low Connect (B2-02) level. In fact, changing this level will also change the AC IN Low Connect (B2-02) level.

B2-02: AC IN Low Connect

- This setting forms a pair with AC IN Low Disconnect (B2-01). With this setting, one determines the AC IN low voltage at which level the ATS will switch on. This should lie above AC IN Low Disconnect (B2-01) level to prevent continuous switching off the ATS when the voltage is fluctuating around the level.
- In fact, the parameter which is changed is the difference between AC IN Low Disconnect (B2-01) and AC IN Low Connect (B2-02).
- The result of this is that when changing B2-01 level, this level (B2-02) also changes.
Note: B2-02 can be ignored for a short time when AC IN Waveform Check (B2-06) is

disabled (B2-06=0)

- When the AC IN voltage drops due to the increasing charge current, the AC CHARGER will take care that the voltage does not drop below this level.
- $B2-02=B2-01+\text{offset voltage}$
For example: C3-1500-122, when $B2-01=180V$, $B2-02=187V$, $\text{offset voltage}=7V$ ($187-180$), $B2-02$ will automatically go to $197V(190+7)$ after $B2-01$ is changed to $190V$.

B2-03: AC IN High Connect

- This setting forms a pair with AC IN High Disconnect (B2-04). With this setting, one determines the AC IN high voltage at which level the ATS will switch on. This should lie below the AC IN High Disconnect (B2-04) level to prevent continuous switching of the ATS when the voltage is fluctuating around that level.
- In fact, the parameter which is changed is the difference between AC IN High Disconnect (B2-04) and AC IN High Connect (B2-03).
- The result of this is that when changing B2-04 level, this level (B2-03) also changes.
- $B2-03=B2-04 - \text{offset voltage}$
For example: C3-1500-122, when $B2-03=265V$, $B2-04=270V$, $\text{offset voltage}=5V$ ($270-265$), $B2-03$ will automatically go to $255V(260 - 5)$ after $B2-04$ is changed to $260V$.

B2-04: AC IN High Disconnect

- Use constant B2-04 to determine the AC IN voltage above which level the ATS will switch off.
- This voltage level will always lie above the AC IN High Connect (B2-03) level. In fact, changing this level will also change the AC IN High Connect (B2-03) level.

B2-05: AC IN Current Limit

- Use constant B2-05 to set the set the specific maximum AC input current. This value is very important for both battery charger and inverter output power assist.
- When using constant B2-05, the values determine the actual AC current limit.

Note: With Power Support enabled, there is a minimum value for the AC input current limit.

Please see the note at Power Support (page 6-9).

B2-06: AC IN Waveform Check

- Use constant B2-06 to enable/disable the fast detection of input voltage wave shape.

Setting	Function
B2-06=0 (Ignore)	<ul style="list-style-type: none"> ● By disabling AC IN waveform check, <u>AC IN Low Disconnect</u> (B2-01) is ignored. When the load current is higher 1.5 times than <u>AC In Current Limit</u> (B2-05), this is used to prevent unnecessary switching to INVERTER due to voltage drop when a high load is connected.
B2-06=1 (Initial setting) (Active)	<ul style="list-style-type: none"> ● This detection checks the wave shape, if it is not sinusoidal within certain limits, the AC input voltage is rejected. ● However, certain generator or very weak mains supply have an ill shaped sinusoidal output especially when the load suddenly changes. The fast detection will detect a failure in such a case. ● This will result in a slightly longer transfer time.

B2-07: Ground Relay

- Used to enable/disable the internal ground relay functionality. The ground relay is useful when an earth-leakage circuit-breaker is part of the installation.
- When ATS (Auto Transfer Switch) is open (INVERTER mode), the Neutral of the inverter is connected to “G” terminal.
- When ATS closes (AC IN is transferred to AC OUT), the Neutral is first disconnected from “G” terminal.

Setting	Function
B2-07=0	The internal ground relay is open with “G” terminal.
B2-07=1 (Initial setting)	The internal ground relay is closed with “G” terminal.

B2-08: AC IN Frequency Range

Refer to page 6-3 (B1-01)

B2-09: AC IN Dynamic Current Limit

- This setting is an expansion of the AC IN Current Limit (B2-05) mechanism.

Setting	Function
B2-09=0 (Initial setting)	<ul style="list-style-type: none"> ● The AC current limit is specified by the <u>AC IN Current Limit</u> (B2-05) setting

B2-09=1	<ul style="list-style-type: none"> ● The effective AC input current limit depends on the load history. When the load is lower than the <u>AC IN Current Limit</u> (B2-05), the effective AC input current limit is also lower but slightly above the load. ● When the load increase, the effective current limit also increases with a delay. The thought behind this is that when a generator is running at a low load, it can't switch to full load immediately and it needs some time to increase the power.
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An example:

- We have a 2KVA generator.
We adjust the AC IN Current Limit (B2-05) setting to 8A and we enable Power Assist (C1-05=1). We have no load connected and the batteries are fully charged. Therefore, no current from generator is drawn.
- At this moment, we connect a load of 7A to the Combi 3 with this setting (B2-09) disabled, the Combi 3 would not react because the load is below the AC IN Current Limit (B2-05) setting. The result is that the full load is connected to generator which will drop in voltage because it can't deliver that current instantly which could result in switching to INVERTER.
- If however we had this setting (Dynamic Current Limit) enabled, the effective AC input current limit would be far lower than 8A because the load was zero. So connecting a load of 7A will result in Combi 3 starting to power assist and no voltage drop is being examined on the AC OUT. The generator starts to supply the load and the effective AC input current limit will increase to 8A slowly. At the moment, the Combi 3 will stop Power Assist and the full load is on the generator.
- This is powerful option in combination with Power Assist but even without Power Assist, it can prevent unnecessary switching to INVERTER because the charge current will reduce when AC input current becomes higher than the effective AC input current limit.

B2-14: INV only: Bat Lo?V ATS ON
B2-15: INV only: Bat Lo?S ATS ON
B2-16: INV only: Bat Hi?V ATSOFF
B2-17: INV only: Bat Lo?S ATSOFF

- B2-14~B2-17 are used to set the condition of ATS to be ON/OFF in INVERTER Only mode.
- When Combi 3 is in INVERTER Only mode, INVERTER mode takes priority to supply voltage to AC OUT for load consumption. When AC IN power is ready, INVERTER is active and battery is about to be exhausted, ATS will be switched on to ensure AC OUT to

continuously supply the load. At the moment, AC OUT will be supplied by AC IN power.

- B2-14 and B2-15 are used to set ATS to be “ON” to supply AC IN power to the AC OUT load when the battery voltage is lower than B2-14 voltage value and longer than the second time set in B2-15 in INVERTER Only mode.
(ATS ON+INVERTER OFF+AC CHARGER OFF)
- B2-16 and B2-17 are used to set ATS to be “OFF” when the battery voltage is higher than B2-16 voltage value and longer than the second time set in B2-17 in INVERTER Only mode.
(INVERTER ON+ATS OFF+ AC CHARGER OFF)

B2-18: AUTO1: ACIN Current Lmt

- Use constant B2-18 to set the specific maximum AC input current in AUTO 1. This value is very important for both battery charger and inverter output power assist.
- When using constant B2-18, the values determine the actual AC current limit.

B2-19: AUTO2: ACIN Current Lmt

- Use constant B2-19 to set the specific maximum AC input current in AUTO 2. This value is very important for both battery charger and inverter output power assist.
- When using constant B2-19, the values determine the actual AC current limit.

B2-20: INV only: ACIN Current Lmt

- Use constant B2-20 to set the set the specific maximum AC input current in INVERTER ONLY. This value is very important for both battery charger and inverter output power assist.
- When using constant B2-20, the values determine the actual AC current limit.

B2-21: CHG only: ACIN Current Lmt

- Use constant B2-21 to set the set the specific maximum AC input current in CHARGER ONLY. This value is very important for both battery charger and inverter output power assist.
- When using constant B2-21, the values determine the actual AC current limit.

C Group (INVERTER):
C1 Group (INVERTER)

C1-01: INVERTER Output Voltage

- Use constant C1-01 to change the RMS output voltage of the INVERTER.

C1-02: Bat Low ?V Shut-down

- With this setting, one can determine the battery voltage at which level the INVERTER will switch off. This can be useful to prevent drawing too much current from an exhausted battery.
- This voltage level will always lie below the Bat Low ? V Restart (C1-03) level. In fact, changing this level will also change the Bat Low ? V Restart (C1-03) level.
- $C1-03 = C1-02 + \text{offset voltage}$
For example: C3-1500-122, when $C1-02 = 9.3V$, $C1-03 = 10.9V$, $\text{offset voltage} = 1.6V$ ($10.9 - 9.3$), $C1-03$ will automatically go to $11.6V(10.0 + 1.6)$ after $C1-02$ is changed to $10.0V$.

C1-03: Battery Low ? V Restart

- This setting forms a pair with Bat Low ? V Shut-down (C1-02). With this setting, one determines the battery voltage at which level the INVERTER will switch on.
- In fact, the parameter which is changed is the difference between Bat Low ? V Shut-down (C1-02) and Bat Low ? V Restart (C1-03). The result of this is that when changing the Bat Low ? V Shut-down (C1-02) level, this level also changes.

C1-04: Auto Power Saving

- When there is no load connected, set $C1-04 = 1$ (Initial setting) to active the power saving function by reducing the output voltage to be 144V for 220V model and to be 72 for 110V model.
- Setting $C1-04 = 0$ can disable the auto power saving and the output voltage would be continuously supplied as the same default voltage even when there is no load connected.

C1-05: Power Assist Select

- Using this constant C1-05, the Power Assist feature can be enabled or disabled. Use Power Assist to prevent an external circuit breaker to trip when the load on the Combi 3 is too high.

- If the load exceeds the AC IN Current Limit (B2-05), the Combi 3 will start inverting and will provide the extra current needed.

Note: When Power Assist is enabled. C1-05=1 (Initial setting), there is a minimum AC input current limit of approximate 2-3 Amps. Setting a lower limit (B2-05) than this minimum value will result in the minimum limit.

Setting	Function
C1-05=0	Power Assist Function is disabled.
C1-05=1 (Initial setting)	Power Assist Function is enabled.

C1-06: Power Assist Level

- This setting is a special setting for power assist mode when the Combi 3 is charging and due to a sudden load, the AC IN current exceeds the AC IN Current Limit (B2-05), the Combi 3 will switch to power assist mode (when C1-05=1)
- At that moment, the current need is unknown. The Combi 3 makes an assumption of the magnitude of this current. This assumption is equal to AC IN Current Limit (B2-05) multiplied by this Power Assist Level (C1-06). The default factor is two.
- This will prevent the circuit breaker from tripping because current provided by the INVERTER minus the current drawn by the load is always lower than the rating of the circuit breaker. This happens, of course, when the AC IN Current Limit (B2-05) is correctly adjusted to the circuit breaker.
- If for instance in a generator application, the circuit breaker has a higher value than the AC IN Current Limit (B2-05)(Normal load of generator is lower than maximum peak load) and one knows that the load which is switched on always draws a certain current, one can consider to increase this factor (C1-06) to achieve better results with sudden load changes.

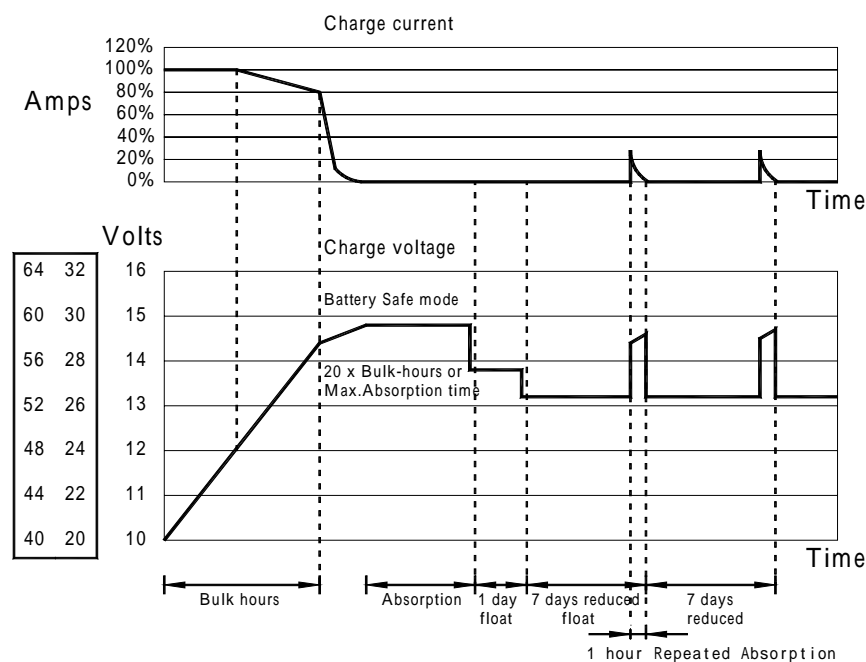
D Group (AC CHARGER):

D1 Group (Charger)

D1-02: Charge Curve

Setting	Function
D1-02=1	Fixed
D1-02=2	Adaptive
D1-02=3 (Initial setting)	Adaptive + Battery safe

- The Fixed (D1-02=1) charge curve will have a fixed Absorption Time (D1-06).
- The Adaptive (D1-02=2) and Adaptive + Battery safe (D1-02=3) curve derive the Absorption time from the Bulk time. The maximum Absorption time of these charge curves is determined by Absorption Time (D1-06) setting.
- The Adaptive + Battery safe (D1-02=3) curve has a special regulation in the absorption phase. The absorption phase will start when the battery voltage reaches 14.4V(for 12V batteries) regardless of the specified Absorption Voltage (D1-03). During the absorption phase, the voltage will increase with a fixed ramp until the voltage reaches the absorption voltage or the calculated absorption time is over in the latter case, the absorption phase will end before the absorption voltage is reached.



D1-03: Absorption Voltage

- Use this setting to specify the absorption voltage.

D1-04: Repeated Absorption Time

- Use this setting to specify the duration of the repeated absorption “pulses”.

D1-05: Repeated Absorption Interval

- Use this setting to specify the interval between repeated absorptions.

D1-06: Maximum Absorption Time

- If the Charge Curve is fixed (D1-02=1), then this setting is used to determine the absorption time.
- In all other cases, this setting determines the maximum absorption time.

D1-07: Float Voltage

- Use this setting to specify the float voltage.

D1-08: Charge Current

- Use this setting to specify the current with which the battery is charged in the bulk phase.
Note: The actual charge current depends on other conditions also. Therefore, under certain circumstances, it is possible that the actual charge current is lower than this setting. This can, among others, be due to:
 - A low AC IN Current Limit (B2-05) in combination with a high load.
 - A high environmental temperature
 - A too high ripple voltage due to improper cabling.

D1-09: Stop After 10Hr Bulk

- This is a safety setting. When the bulk phase lasts more than 10 hours, this can be indication that a battery cell is damaged.
- The absorption voltage (or the 14.4V for battery when Battery Safe (D1-02=3) mode is used) will never be reached in that case and the other cells will be over-charged resulting in the

production of an explosive gas.

- Therefore, the charger is disabled if the bulk phase lasts more than 10 hours.
- This setting can be disabled because it does not always indicate a problem when the bulk phase lasts very long. The charge current can be very low due to limited AC input current and/or AC loads. Also, DC loads can “steal away” part of the charge current. In that case, the bulk phase will need more time to complete and this setting must be disabled.

Note: When this setting is disabled, there is no safety check against over-charging.

Setting	Function
D1-09=0	<u>Stop After 10Hr Bulk</u> setting is disabled
D1-09=1 (Initial setting)	<u>Stop After 10Hr Bulk</u> setting is enabled

D1-10: Equalize Mode Select (Storage Mode Select)

- This setting is used for enabling/disabling the Equalize Mode.
- In this mode, the voltage setpoint is 13.2V (for 12V battery). If Equalize mode is disabled, then the normal float voltage will be used.

Setting	Function
D1-10=0	Equalize mode is disabled
D1-10=1 (Initial setting)	Equalize mode is enabled

E Group (Auxiliary Relay):

E1 Group (Setting Aux-Relay 1 ON Condition)

E1-01: LOAD Higher than ? Amps

E1-02: LOAD Higher for ? sec

- Use these settings to switch the Aux-Relay 1 ON. When the actual AC OUT load is above a certain value (E1-01) for a certain time (E1-02).
- The corresponding Aux-Relay 1 OFF condition is
E2-01: Load Lower than ? Amps and
E2-02: Load Lower for ? sec.

Note: If setting E1-02=0 sec (Initial setting). Then the E1-01 is ignored.

Note: If setting E2-02=0 sec (Initial setting). Then the E2-01 is ignored.

E1-03: Udc Lower than ? Voltage

E1-04: Udc Lower for ? sec

- Use these settings to switch the Aux-Relay 1 ON. When battery voltage becomes lower than a certain limit (E1-03) for a certain time (E1-04).

Note: If E1-04=0 sec (Initial setting), then E1-03 is ignored.

E1-05: Udc Higher than ? Voltage

E1-06: Udc Higher for ? sec

- Use these settings to switch the Aux-Relay 1 ON when battery voltage becomes higher than a certain limit (E1-05) for a certain time (E1-06).

Note: If E1-06=0 sec (Initial setting), then E1-05 is ignored.

E1-07: Not Charge for ? sec

- Use this setting to switch on the Aux-Relay 1 when the AC CHARGER is not charging for a certain time (E1-07).
- Normally used for generating an alarm situation.

E1-08: Fan ON for ? sec

- This will switch the Aux-Relay 1 ON when the internal fan switches on. This can be used together with the E2-08: Fan OFF for ? sec setting to drive an external fan.

E1-09: When bulk protection is activated.

- This will set the Aux-Relay1 ON when the “bulk protection” (D1-09=1) is activated. This condition will remain valid as long as the AC CHARGER is disabled due to that safety mechanism. One can use this setting to generate an alarm.

E1-10: System Fault Occurs

- This will switch on the Aux-Relay 1 when the Combi 3 switches off due to an internal alarm situation.

E1-11: Temp. Alarm Select (When E1-12=0, ignore this setting)**E1-12: Temp. Alarm for ? sec**

- If you want to switch on the Aux-Relay 1 when there is a over temperature alarm, this setting (E1-11) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 1 settings, a delay value (E1-12) must be specified also. This can be done with Delay value for set Aux-Relay 1 ON when over temperature alarm (E1-12) setting.

E1-13: Low Batt. Alarm Select (When E1-14=0, ignore this setting)**E1-14: Low Batt. Alarm for ? sec**

- If you want to switch on the Aux-Relay 1 when there is a low battery alarm, this setting (E1-13) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 1 settings, a delay value (E1-14) must be specified also. This can be done with Delay value for set Aux-relay 1 ON when low battery alarm (E1-14) setting.

E1-15: OverLoad Alarm Select (When E1-16=0, ignore this setting)**E1-16: OverLoad Alarm for ? sec**

- If you want to switch on the Aux-Relay 1 when there is a overLoad alarm, this setting (E1-15) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 1 setting, a delay value (E1-16) must be specified also. This can be done with Delay value for set Aux-Relay 1 ON when overload alarm (E1-16) setting.

E1-17: Udc Ripple Alarm Select (When E1-18=0, ignore this setting)**E1-18: Udc Ripple Alarm for ? sec**

- If you want to switch on the Aux-Relay 1 when there is a battery voltage ripple alarm. This setting (E1-17) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 2, setting a delay value (E1-18) must be specified also. This can be done with Delay value for set Aux-Relay 1 ON when battery voltage ripple alarm (E1-18) setting.

E2 Group (Setting Aux-Relay 1 OFF Condition)

E2-01: Load Lower than ? Amps

E2-02: Load Lower for ? sec

- Use these settings to switch Aux-Relay 1 OFF. When the actual AC OUT Load is below a certain value (E2-01) for a certain time (E2-02).
- The corresponding Aux-Relay ON condition is
E1-01: Load Higher than ? Amps and
E1-02: Load Higher for ? sec.

Note: If setting E2-02 (E1-02)=0 sec (Initial setting), then the E2-01 (E1-01) is ignored.

E2-03: Udc Lower than ? Voltage

E2-04: Udc Lower for ? sec

- Use these settings to switch off the Aux-Relay 1 when battery voltage becomes lower than a certain limit (E2-03) for a certain time (E2-04)

Note: If E2-04=0 sec (Initial Setting), then E2-03 is ignored.

E2-05: Udc Higher than ? Voltage

E2-06: Udc Higher for ? sec

- Use these settings to switch off the Aux-Relay 1 when battery voltage becomes higher than a certain limit (E2-05) for a certain time (E2-06)

Note: If E2-06=0 sec (Initial setting), then E2-05 is ignored.

E2-07: Charging for ? sec

- This setting switches the Aux-Relay 1 OFF when the AC CHARGER started for a certain time (E2-07). This can be useful when the Aux-Relay 1 is for instance used a low battery alarm.
- Use the Set Udc Lower than ? Voltage (E1-03) setting to start the alarm and use this setting (E2-07) to stop it.

Note: As long as the battery voltage is lower than the specified limit (E1-03), the alarm will be active.

E2-08: Fan OFF for ? sec

- This will switch the Aux-Relay 1 OFF when the internal fan switches off. This can be used together with the E1-08: Fan ON for ? sec setting to drive an external fan.

E2-09: Charge finished for ? Min (When E2-09=0, ignore this setting)

- This condition becomes active when the charge bulk phase is finished for a certain time (E2-09).
- For the charge curve, take a look at for instance the Charge Current (D1-08) setting.
- This is useful when the Aux-Relay 1 is used to start a generator. Once started, one might want to keep the generator on until the batteries are more or less charged.

E2-10: Aux-Relay 1 not ON for ? minutes (When E2-10=0, ignore this setting)

- If one does not need special off condition, one can use this setting and the Aux-Relay 1 will switch off automatically when there has been no ON condition for a certain time (E2-10).

E2-11: AC IN loss for ? sec (When E2-11=0, ignore this setting)

- This setting will switch off Aux-Relay1 if the RMS value of AC IN voltage is too low for a certain time (E2-11).
- This AC level is determined by the AC IN Low Disconnect (B2-01) setting.
- Use this setting (E2-11) to disable re-starting of a generator which is switched off by hand when the Aux-Relay 1 is used to generate a start signal for that generator.

E2-12: No Temp. Alarm Select (When E2-13=0, ignore this setting)

E2-13: No Temp. Alarm for ? sec

- If you want to switch off the Aux-Relay 1 when there is no over temperature alarm, this setting (E2-12) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 1 setting, a delay value must be specified also. This can be done with the Delay value for set Aux-Relay 1 OFF when No Overtemperature Alarm (E2-13) setting.

E2-14: No Low Batt. Alarm Select (When E2-15=0, ignore this setting)

E2-15: No Low Batt Alarm for ? sec

- If you want to switch off the Aux-Relay 1 when there is no low battery alarm, this setting (E2-14) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 1 setting, a delay must be specified also. This can be done with the Delay value for set Aux-Relay 1 OFF when No Low Battery Alarm (E2-15) setting.

E2-16: No OverLoad Alarm Select (When E2-17=0, ignore this setting)

E2-17: No OverLoad Alarm for ? sec

- If you want to switch off the Aux-Relay 1 when there is no OverLoad alarm, this setting (E2-16) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 1 setting, a delay must be specified also. This can be done with the Delay value for set Aux-Relay 1 OFF when No OverLoad Alarm (E2-17) setting.

E2-18: No Udc Ripple Alarm Select (When E2-19=0, ignore this setting)

E2-19: No Udc Ripple Alarm for ? sec

- If you want to switch off the Aux-Relay 1 when there is no battery voltage ripple alarm, this setting (E2-18) can be used to choose between pre-alarm or normal alarm.
- As with other Aux-Relay 1 setting, a delay must be specified also. This can be done with the Delay value for set Aux-Relay 1 OFF when No Battery voltage Ripple Alarm (E2-19) setting.

E3 Group (Setting Aux-Relay 2 ON Condition)

E4 Group (Setting Aux-Relay 2 OFF Condition)

E5 Group (Setting Aux-Relay 3 ON Condition)

E6 Group (Setting Aux-Relay 3 OFF Condition)

Note: The functions and the settings of E3, E4, E5 and E6 Groups are exactly the same as those of E1 and E2 Group so please refer to above E1 and E2 Group description and setting for E3, E4, E5 and E6 Groups.

E7 Group (Aux-Relay 1 Option)

E7-01: Aux-Relay 1 Usage Select

Setting	Function
E7-01=0 (Initial setting)	Auxiliary Relay 1 is not allowed to be active (Idle).
E7-01=1	Auxiliary Relay 1 is allowed to be active.

E7-02: Aux-Relay 1 Invert Select

Setting	Function
E7-02=0 (Initial setting)	Auxiliary Relay 1 is normal.
E7-02=1	Auxiliary Relay 1 is Invert switch and that is ON becomes off and OFF becomes ON.

- This is used to invert the Aux-Relay 1 So ON becomes OFF and OFF becomes ON. In the program, the labels are adapted to reflect this inversion.

E7-03: Aux1 not Switch Off Time (Aux-Relay 1 do not switch off with certain period)

- Use constant E7-03 to determine the minimum ON time.
- The Aux-Relay 1 will not be switched off within the time specified here measured from the moment that all on condition are inactive.

Note: OFF conditions with a delay of 0 minute, ignore this setting.

E8 Group (Aux-Relay 2 Option)

E9 Group (Aux-Relay 3 Option)

The functions and the settings of E8 and E9 Groups are exactly the same as those of E7 Group so please refer to above E7 Group description and setting for E8 and E9 Groups.

O Group (Operator):

O1 Group (Monitor Select)

O1-01: Power ON LCD Monitor Select

- After power of the Combi 3 is on, the monitor selections will be showed on LCD Display, U1-05 Battery Voltage is the initial display shown.
- All the constants in U1 Group (U1-01~U1-14) can be monitored.

O1-02: Key Idle Detect Time

- Use constant O1-02 to set the idle time when the keyboard is not operated and once any key is pressed, the display will return to the LCD monitor selection value set in constant O1-01.
- Initial Setting=180 sec, setting range: 10~600 sec.

O2 Group (Key Selections)

O2-01: Key Pressed Beep Select

Setting	Function
O2-01=0	When keys are pressed, beep sound will not be heard.
O2-01=1 (Initial setting)	When keys are pressed, beep sound will be heard.

O2-02: Elapsed Time Reset

- Use constant O2-02 to reset elapsed time.

O2-03: Elapsed Time Select

Setting	Function
O2-03=0 (Initial setting)	The elapsed time started to be counted after power is on.
O2-03=1	The elapsed time started to be counted after RUN.

O2-04: Combi 3 Model

- This is the model number to be displayed.

O2-06: MODE Key Hold Time

- Use constant O2-06 to set the time it takes to press MODE key to transfer from one of four modes to another mode. (This has to be done in STOP mode)
- Initial setting=5 sec, setting range: 2~10 sec.

O2-07: RUN/STOP Key Hold Time

- Use constant O2-07 to set the time it takes to press RUN/STOP key to activate its function.
- Initial setting=2 sec, setting range: 2~10 sec.

O2-08: Power ON Auto Run Select

- Use constant O2-08 to select to auto run manually or automatically.

Setting	Function
O2-08=0	Auto Run is active when pressing Run/STOP key
O2-08=1 (Initial setting)	Auto Run is active when the power is on.

O2-09: LCD Display Idle Time Set

- When O2-09=0, Display Idle Function is disabled.
- Use constant O2-09 to set the idle time when the keypad is not operated and all the LCD Display and LED Indicators of the Combi 3 entering the idle mode which only RUN/STOP indicator is active.
- Once any key on the panel is pressed, it will return to the display before Idle status.
- Initial setting=10 min, setting range: 0~60 min.

U Group (Monitor):
U1 Group (Monitor)

U1-01: AC IN Voltage

- Use U1-01 to monitor the current voltage value of AC IN power in unit of 0.1V.

U1-02: AC IN Current

- Use U1-02 to monitor the current value of AC IN power in unit of 0.1A.

U1-03: AC OUT Voltage

- Use constant U1-03 to monitor AC OUT voltage value in unit of 0.1V.

U1-04: AC OUT Current

- Use constant U1-04 to monitor AC OUT current value in unit of 0.1A.

U1-05: Battery Voltage

- Use constant U1-05 to monitor the battery voltage in unit of 0.1V.

U1-06: Battery Ripple Voltage

- Use constant U1-06 to monitor the battery ripple voltage in unit of 0.1V.

U1-07: Battery Current

- Use constant U1-07 to monitor battery current value in unit of 0.1A.

U1-08: Control Mode

- Use constant U1-08 to monitor the current control mode (AUTO 1, AUTO 2, Inverter Only or Charger Only)

U1-09: Operation Status

- There are 12 digits to account for each operation status. Please see NOTE 1 in Chapter 5.

U1-10: Aux-Relay Status

- Use constant U1-10 to monitor the ON/OFF status of 3 sets of Aux-Relay (RY1, RY2, RY3). Please see NOTE 2 in Chapter 5.

U1-11: Elapsed Time

- Use constant U1-11 to monitor the elapsed time after power ON (O2-03=0) or after RUN (O2-03=1) in unit of 1 hour.

U1-12: Battery Temperature Sensor

- Use constant U1-12 to monitor the temperature that has been detected by Battery Temperature Sensor (BTS-3) in unit of 1 .

U1-13: CPU ID1

- Use constant U1-13 to check the software version 1.

U1-14: CPU ID2

- Use constant U1-14 to check the software version 2.

U2 Group (Fault Trace)

U2-01: Current Fault

- Use constant U2-01 to monitor the current fault that results in “Combi 3” stopping operating.

U2-02: Last Fault

- Use constant U2-02 to monitor the last fault that has been recorded.

U2-03: AC IN Voltage

- Use constant U2-03 to monitor the AC input voltage value in unit of 0.1V when the current fault occurs.

U2-04: AC IN Current

- Use constant U2-04 to monitor the AC input current value in unit of 0.1A when the current fault occurs.

U2-05: AC OUT Voltage

- Use constant U2-05 to monitor the AC output voltage value in unit of 0.1V when the current fault occurs.

U2-06: AC OUT Current

- Use constant U2-06 to monitor the AC output current value in unit of 0.1A when the current fault occurs.

U2-07: Battery Voltage

- Use constant U2-07 to monitor the battery voltage value in unit of 0.1V when the current fault occurs.

U2-08: Battery Ripple Volt

- Use constant U2-08 to monitor the battery ripple voltage in unit of 0.1V when the current fault occurs.

U2-09: Battery Current

- Use constant U2-09 to monitor the battery current value in unit of 0.1A when the current fault occurs.

U2-10: Control Mode

- Use constant U2-10 to monitor what the control mode (AUTO 1, AUTO 2, Inverter Only or Charger Only) is when the current fault occurs.

U2-11: Operation Status

- Use constant U2-11 to monitor 12 digits which account for each operation status when the current fault occurs. Please see NOTE 1 in Chapter 5.

U2-12: Aux-Relay Status

- Use constant U2-12 to monitor the ON/OFF status of 3 sets of Aux-Relay (RY1, RY2, RY3) when the current fault occurs. Please see NOTE 2 in Chapter 5.

U2-13: Elapsed Time

- Use constant U2-13 to monitor the elapsed time after power ON (O2-03=0) or after RUN (O2-03=1) in unit of 1 hour when the current fault occurs.

U2-26: Battery Temperature Sensor

- Use constant U2-26 to monitor the current temperature that has been detected by Battery Temperature Sensor (BTS-3) in unit of 1 when the current fault occurs.

U3 Group (Fault History)

U3-01: Last Fault

- Use constant U3-01 to monitor the latest fault stored in the software.

U3-02: Fault Message 2

- Use constant U3-02 to monitor the most recent second fault stored in the software.

U3-03: Fault Message 3

- Use constant U3-03 to monitor the most recent third fault stored in the software.

U3-04: Fault Message 4

- Use constant U3-04 to monitor the most recent fourth fault stored in the software.

U3-05: Elapsed Time 1

- Use constant U3-05 to monitor the elapsed time before the latest fault occurs.

U3-06: Elapsed Time 2

- Use constant U3-06 to monitor the elapsed time before the most recent second fault occurs.

U3-07: Elapsed Time 3

- Use constant U3-07 to monitor the elapsed time before the most recent third fault occurs.

U3-08: Elapsed Time 4

- Use constant U3-08 to monitor the elapsed time before the most recent fourth fault occurs.

Chapter 7 Trouble Shooting Table

- Proceed as follows for a quick detection of common faults.
- DC loads must be disconnected from the batteries and the AC loads must be disconnected from the INVERTER before the INVERTER and/or battery charger (AC CHARGER) is tested.
- Consult your Rich Electric dealer if the fault cannot be resolved.

Problem or Error message	Cause	Solution
The “Combi 3” fails to operate when power on.	The battery voltage is too high or too low.	Ensure that the battery voltage is within the correct value range.
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> ‘Udc-UV’ Battery under volt </div> ‘ ’: blink	The battery voltage is low.	Charge the battery or check the battery connections.
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> Udc-UV Battery under volt </div>	The “Combi 3” cuts out because the battery voltage is too low.	Charge the battery or check the battery connections.
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> ‘OL’ Inverter OverLoad </div> ‘ ’: blink	The load on the inverter of “Combi 3” is higher than the normal load.	Reduce the load.
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> OL Inverter OverLoad </div>	The INVERTER of “Combi 3” cuts out due to excessive load.	Reduce the load.
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;"> ‘OH’ Heatsink Max Temp. </div> ‘ ’: blink	The ambient temperature is too high, or the load is excessive.	Place the “Combi 3” in a cool and well-ventilated room, or reduce the load.

<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>OH Heatsink Max Temp.</p> </div>	<p>The ambient temperature is too high, or the load is excessive.</p>	<p>Place the “Combi 3” in a cool and well-ventilated room, or reduce the load.</p>
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>‘Udc-ripple’ Volt Ripple Exceeds</p> </div> <p>‘ ’: blink</p>	<p>Voltage ripple on the DC input exceeds 1.25Vrms</p>	<p>Check the battery cables and terminals. Check the battery capacity; increase it if necessary.</p>
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>Udc-ripple Volt Ripple Exceeds</p> </div>	<p>The INVERTER of “Combi 3” cuts out as a result of excessive voltage ripple on the DC input</p>	<p>Install batteries with a higher capacity. Use shorter and/or thicker battery cables and reset the Combi 3 (Power OFF and ON again).</p>
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>‘Udc-OV’ Battery over voltage.</p> </div> <p>‘ ’: blink</p>	<p>Battery charger is not in normal charging status to cause battery voltage too high.</p>	<p>Replace the “Combi 3”.</p>
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>Udc-OV Battery over voltage.</p> </div>	<p>Incorrect battery voltage connection (12V system but connected to 24V battery)</p>	<p>Recheck if the Combi 3 and the battery voltage is matched.</p>
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>‘Idc-OC’ Over current.</p> </div> <p>‘ ’: blink</p>	<p>The actual charge current is 1.5 times larger than the set current value (D1-08) when AC CHARGER is operating.</p>	<p>Stop the Charge mode of the “Combi 3”.</p>
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>Idc-OC Over current.</p> </div>		<p>Repair or replace the “Combi 3”.</p>

<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>‘Bat-NG’ Battery Fault</p> </div> <p style="text-align: center;">‘ ’: blink</p>		
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>Bat-NG Battery Fault</p> </div>	<p>The charging time of <u>AC CHARGER</u> has been over 10 hours and remains in Bulk Charge mode. (D1-09=1) shows the battery is at fault.</p>	<p>Replace the battery banks.</p>
<p>The charger is not functioning</p>	<p>The AC IN voltage or frequency is out of range.</p>	<p>Ensure that the AC IN voltage is within the range 220V system: 180VAC~260VAC 110V system: 90VAC~130VAC And that the frequency matches the setting.</p>
	<p>“Combi 3” internal circuit breaker has tripped.</p>	<p>Reset the internal circuit breaker.</p>
<p>The battery is not being charged fully.</p>	<p>Incorrect charging current.</p>	<p>Set the charging current at between $(0.1\sim0.2) \times$ battery capacity.</p>
	<p>A defective battery connection.</p>	<p>Check the battery terminals.</p>
	<p>The absorption voltage has been set an incorrect value.</p>	<p>Adjust the absorption voltage to the correct value.</p>
	<p>The float voltage has been set to an incorrect value.</p>	<p>Adjust the float voltage to the correct value.</p>
	<p>The internal DC fuse is defective</p>	<p>“Combi 3” is damaged.</p>
<p>The battery is overcharged.</p>	<p>The absorption voltage has been set to an incorrect value.</p>	<p>Adjust the absorption voltage to the correct value.</p>
	<p>The float voltage has been set to an incorrect value.</p>	<p>Adjust the float voltage to the correct value.</p>

The battery is overcharged.	The battery is too small.	Reduce the charging current or use a battery with a higher capacity.
	A defective battery.	Replace the battery.
	The battery is too hot.	Connect a Battery Temperature Sensor (BTS-3)
Battery charge current drop to 0 A when the absorption voltage is reached.	Battery overtemperature (> 50 °C)	<ol style="list-style-type: none"> 1. Allow battery to cool down. 2. Place battery in a cool environment. 3. Check for shorted cells.
	Battery Temperature Sensor (BTS-3) is faulty	<ol style="list-style-type: none"> 1. Unplug Battery Temperature Sensor (BTS-3) from “Combi 3” and power off the “Combi 3” then wait 5 seconds and power on again. 2. If the “Combi 3” AC CHARGE normally, the BTS-3 is faulty and needs to be replaced.

Appendix A: EMC for Wall-Mounting/Vertical Combi 3



Report No.: ED/2008/30017-2
Page : 1 of 31

EMC ONSITE TEST REPORT

Test Report No: ED/2008/30017-2

Head Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : 11F-4, 54, CHUNG CHENG N. ROAD, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Factory Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : NO. 163, CHUNG CHENG 5 STREET, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Equipment Under Test (EUT):

Name : Combi-3

Model No.: C3-ABCD-XXX

(ABCD=3000,2000,1500,1000,0600)

(XXX=121,122,241,242,481,482)

Test(s) Required : SGS Onsite Test Standard: 2002

EN 61000-6-2: 2001, EN 61000-6-4: 2001

IEC/CISPR 11/EN55011 CLASS A, EN61000-4-2, EN61000-4-4, EN61000-4-6, Mobile Phone Test

Date of Tests: March 19, 2008

Date of Issue: March 25, 2008

Test Result :	PASS
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Remarks :

This report detail the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Authorized Signatory:

SGS TAIWAN LTD.

Jason Lin

Technical Manager

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台灣檢驗科技股份有限公司 電話: (886-2) 2259-2939 傳真: (886-2) 2259-2998 網址: www.tw.sgs.com

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Appendix C: C-tick for Wall-Mounting/Vertical Combi 3



Report No.: ED/2008/30021

Page :1 of 20

C-TICK CLASS A COMPLIANCE REPORT

Test Report No. : ED/2008/30021

Head Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : 11F-4, 54, CHUNG CHENG N. ROAD, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Factory Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : NO. 163, CHUNG CHENG 5 STREET, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Equipment Under Test (EUT) :

Name : Combi-3

Model No.: C3-ABCD-XXX

(ABCD=3000,2000,1500,1000,0600)

(XXX=121,122,241,242,481,482)

Standard : AS/NZS CISPR 22: 2004

IEC/CISPR 22 : 2004 CLASS A

EN55022 : 2004 CLASS A

Date of Tests: March 19, 2008

Date of Issue: March 27, 2008

Test Result :	PASS
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In the configuration tested, the EUT complied with the standards specified above.

NOTE: The test standards also meet the CISPR 11 & EN55011 Class A rules.

Remarks :

This report detail the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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with all relevant standards. Any mention of SGS E&C Laboratory or testing done by SGS E&C Laboratory in connection with distribution or use of the product described in this report must be approved by SGS E&C Laboratory in writing.

Authorized Signatory:

SGS TAIWAN LTD.

Jason Lin

Technical Manager

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Appendix D: EMC for Table-Mounting/Horizontal Combi 3



Report No.: ED/2008/40051

Page : 1 of 31

EMC ONSITE TEST REPORT

Test Report No: ED/2008/40051

Head Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : 11F-4, 54, CHUNG CHENG N. ROAD, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Factory Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : NO. 163, CHUNG CHENG 5 STREET, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Equipment Under Test (EUT):

Name : Combi-3

Model No.: C3-ABCD-XXX-1

(ABCD=3000,2000,1500,1000,0600)

(XXX=121,122,241,242,481,482)

Test(s) Required : SGS Onsite Test Standard: 2002

EN 61000-6-2: 2001, EN 61000-6-4: 2001

IEC/CISPR 11/EN55011 CLASS A, EN61000-4-2, EN61000-4-4, EN61000-4-6, Mobile Phone Test

Date of Tests: March 19, 2008

Date of Issue: March 25, 2008

Test Result :	PASS
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Remarks :

This report detail the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Authorized Signatory:

SGS TAIWAN LTD.

Jason Lin

Technical Manager

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台灣檢驗科技股份有限公司 | 電話: (886-2) 2789-2039 | 傳真: (886-2) 2789-2038 | 網址: www.tw.sgs.com

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Appendix E: LVD for Table-Mounting/Horizontal Combi 3



Report NO.:EZ/2008/40025
Page : 1 of 25

Test Report / Electrical & Performance Safety

Product: Combi-3
Trade Name: RICH ELECTRIC
Model No.: C3-ABCD-XXX-1
(ABCD=3000, 2000, 1500, 1000, 0600)
(XXX=121, 122, 241, 242, 481, 482)

Applicant : Rich Electric Co., Ltd.
Address: 11F-4, 54 Chung Cheng North Road, Yung Kang City,
Tainan 710, Taiwan R.O.C.

Reference Standards: EN 50178: 1997: Electronic equipment for use in power installations.

ASP TECHNOLOGY CORPORATION
No. 439, Jhen Cian St., Shulin City, Taipei Hsien, Taiwan 238, R.O.C.

Received Date: March 03, 2008
Report Issue Date: March 03, 2008

Compiled by:

Signature

Reviewed by:

Signature

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Appendix F: C-tick for Table-Mounting/Horizontal Combi 3



Report No.: ED/2008/40049

Page :1 of 20

C-TICK CLASS A COMPLIANCE REPORT

Test Report No. : ED/2008/40049

Head Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : 11F-4, 54, CHUNG CHENG N. ROAD, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Factory Applicant : RICH ELECTRIC CO., LTD.

Address of Applicant : NO. 163, CHUNG CHENG 5 STREET, YUNG KANG CITY,
TAINAN, TAIWAN R.O.C.

Equipment Under Test (EUT) :

Name : Combi-3

Model No.: C3-ABCD-XXX-1

(ABCD=3000,2000,1500,1000,0600)

(XXX=121,122,241,242,481,482)

Standard : AS/NZS CISPR 22: 2004

IEC/CISPR 22 : 2004 CLASS A

EN55022 : 2004 CLASS A

Date of Tests: March 19, 2008

Date of Issue: March 27, 2008

Test Result :	PASS
---------------	------

In the configuration tested, the EUT complied with the standards specified above.

NOTE: The test standards also meet the CISPR 11 & EN55011 Class A rules.

Remarks :

This report detail the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Authorized Signatory:

SGS TAIWAN LTD.

Jason Lin

Technical Manager

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