OPERATING MANUAL

MAXI-T

SINGLE PHASE INPUT / OUTPUT

ON-LINE UPS

CONTENTS

INTRODUCTION

GENERAL DESCRIPTION

The **Maxi-T** range of UPS units utilises a modern innovative design providing many benefits to the user.

A battery is kept charged via the switching circuit and in the event of a mains failure, the battery takes over supplying power to the inverter.

The result is that the UPS supplies an uninterrupted, regulated and controlled supply to the connected load under all conditions including mains failure, load steps and at minimum battery levels.

To provide additional security to the connected load, a static bypass switch will transfer the load to the mains supply under overload or fault condition.

The units are housed in a compact aesthetically pleasing cabinet, which includes a user-friendly digital front panel.

LOCATION

The following should be considered when planning the location of your UPS.

1. Protect against excessive temperature and humidity
2. Protection against elements – especially moisture.
3. Ease of access.
4. Ease of electrical reticulation.
5. Adequate ventilation clearance.
6. Close proximity to the UPS battery.

INSTALLATION

GENERAL

The following information will be of assistance when installing your UPS. Care should be taken to select the correct circuit breakers and cable sizes. Information is provided in TABLE 1 that will assist with the selection.

INPUT AND OUTPUT CABLING AND CIRCUIT BREAKER DATA

The recommended input circuit breaker (in clients' DB board) and cable sizes for the different UPS units are as follows:

NOTE:

- The input circuit breaker must have a D curve rating.
- All cable sizes are rated for a maximum distance of up to 50 meters.

UPS RATING	INPUT AMPS	RECOM I/P ACB	INPUT CABLE	OUTPUT AMPS	OUTPUT CABLE
3kVA	13(1ph)	20A 1 pole	4mm^2 2c+e	13A	4mm^2 2c+e
5kVA	22(1ph)	30A 1 pole	6mm^2 2c+e	22A	4mm^2 2c+e
8kVA	35(1ph)	40A 1 pole	10mm^2 2c+e	35A	6mm^2 2c+e
10kVA	44(1ph)	50A 1plole	10mm^2 2c+e	44A	10mm^2 2c+e
15kVA	67(1ph)	80A 1 pole	16mm^2 2c+e	65A	16mm^2 2c+e
20kVA	87(1ph)	100A 1 pole	20mm^2 2c+e	87A	20mm^2 2c+e

.

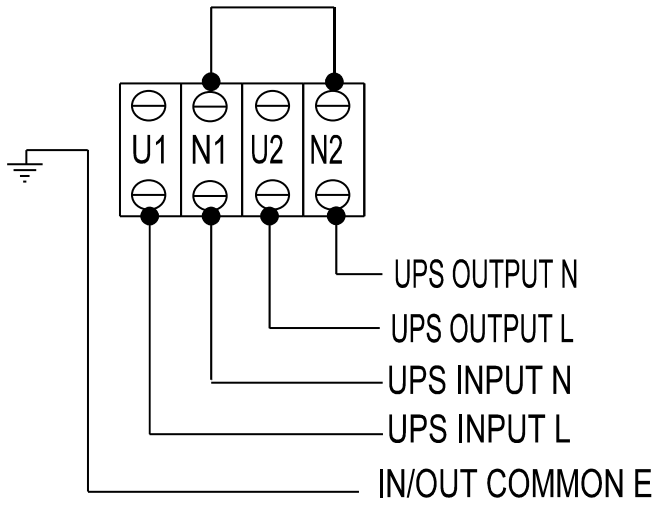

Figure 1: Installation wiring layout.

BATTERY DETAILS

Please take special care when installing the batteries and note the following:

- Batteries should only be installed by a qualified technician.
- Take special care when installing the battery trays
- Do not short out the battery terminals.
- Do not drop the batteries.
- Ensure that the polarity connections are correct.
- Ensure that the battery interconnections are securely fastened.
- DC is dangerous and can be lethal
- Battery life is considerably shortened when operated at temperatures above 25ºC.
- Keep batteries away from direct sunlight and keep the room as cool as possible.

The following battery cables and accessories are supplied with your unit:

- Short inter-battery connectors
- Medium end connector cables
- Long cables for connection to DC terminals F1, F2, F3.

BATTERY CONFIGURATION

A battery tray can house 16 batteries. [32 batteries per bank.]

The UPS cabinet can house a total of 2 or 4 battery trays. [32 or 64 batteries in total.]

An optional external battery cabinet can house an additional 6 trays. [96 batteries extra.]

BATTERY CONNECTION

Open all three battery fuses.

Populate the battery trays, each with 16 x 12V x 7A/h batteries - terminals facing out - see figure 2.

Connect the short interconnecting cables to all the batteries on the LHS and RHS.

Connect the long red and black cables at the front of the tray but **do not** connect the longer link at the back of the tray.

Insert trays into the UPS, starting at the bottom - taking care not to pinch any of the cables that must go through their respective holes (in the front).

BATTERY CONNECTION (cont…)

Connect the lower shelf's black cable (negative) to bottom of F2 and the upper shelf's red cable (positive) to the bottom of F1 (as shown in figure 2).

Connect the remaining long red and black cables to either side of F3.

Slightly open each battery tray and measure the differential between the last two battery terminals (closest to the back of the unit).

If this differential voltage is less than 3VDC, it is safe to insert the medium end connector cables across those links that were just measured.

Take care when re-closing the trays that these medium connecting cables are tucked under the above tray to avoid them being pinched.

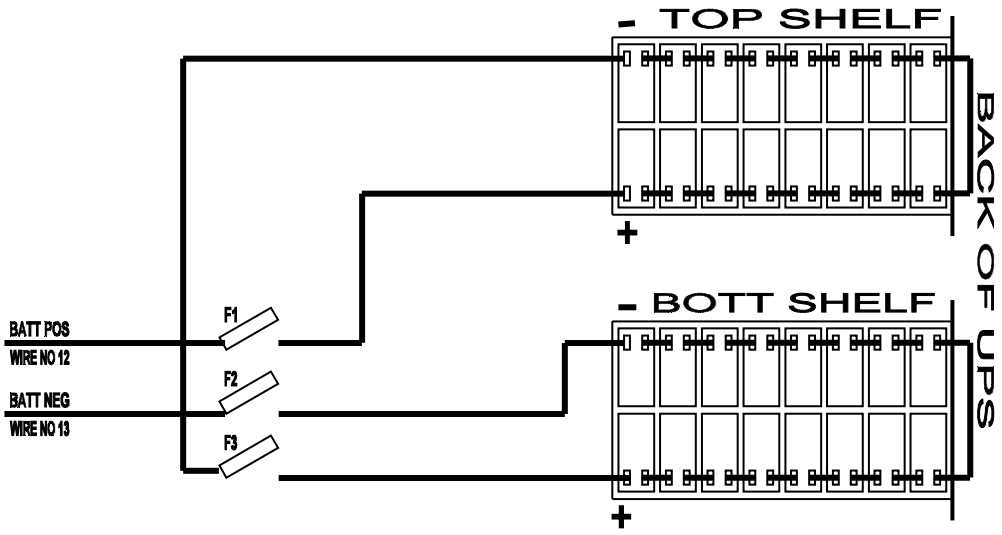

Figure 2: Single battery bank connection diagram.

A second set of 32 batteries (2 trays) can be installed if required.

Install the second battery bank following the procedures outlined for the first battery bank.

The positive and negative of each tray will be connected in parallel to the respective tray of the first bank.

The installation of the batteries in the external battery cabinet is identical to the procedure described above.

The batteries housed in the external battery cabinet are also connected to terminals F1, F2 & F3 in this cabinet and must be connected to terminals F1 & F2 in the UPS cabinet.

SYSTEM OPERATING PROCEDURES

INITIAL START-UP OF UPS UNIT

- Turn the *INVERTER KEY SWITCH* to the off position.
    - For 3 - 5kVA units
        - Place the *ROTARY BYPASS* switch into the *TEST* position.
    - For 8 - 20kVA units
        - Close the *BYPASS ISOLATOR (SW2).*
        - Open the *OUTPUT ISOLATOR (SW1).*
- Close the AC input circuit breaker *(CB1).*
- The LCD will activate.
- After a period of approximately 30 seconds the analogue values and status alarms will be displayed.
- The unit will synchronise to input reserve source.
- Depress *ALARM CANCEL* button to silence alarm.
- Turn the *INVERTER KEY SWITCH* to the *"ON"* position.
- The unit will start up when synchronised to mains (reserve source).
- The UPS output voltage will ramp up to 230VAC.
- Ensure that **NO ACTIVE ALARMS** is displayed in the alarm status block and that the battery voltage is greater than 360VDC (432VDC is the charging value).
- Measure the DC differential voltage across F1 and close this fuse if the voltage is less than 30VDC.
- Repeat for F2 and F3.
- Turn the *INVERTER KEY SWITCH* to the *"OFF"* position and confirm *LOAD ON BYPASS* is displayed on the *LCD DISPLAY.*
    - For 3 - 5kVA units
        - Place the *ROTARY BYPASS* switch into the *NORMAL* position.
    - For 8 - 20kVA units
        - Close the *OUTPUT ISOLATOR (SW1).*
        - Open the *BYPASS ISOLATOR (SW2).*
- Turn the *INVERTER KEY SWITCH* to the "ON" position (CW) and depress *ALARM CANCEL* button to silence alarm.
- Confirm **NO ACTIVE ALARMS** is displayed on the *LCD DISPLAY* within 60 sec.
- The unit is operating normally.

TRANSFER LOAD TO RESERVE

- To transfer to bypass without loosing the load, ensure that *NO ACTIVE ALARMS* is displayed.
- Turn the INVERTER KEY SWITCH to the off position.

  - For 3 - 5kVA units
    - Place the *ROTARY BYPASS* switch into the *TEST* position.
  - For 8 - 20kVA units
    - Close the *BYPASS ISOLATOR (SW2).*
    - Open the *OUTPUT ISOLATOR (SW1).*

- The load is being supplied via the detour supply.
- Open DC Input fuses (F1, F2 andF3).
- Open AC input circuit breaker (CB1).
- Wait 1 min for the internal capacitors to discharge (Electronics will die when discharged.)

- To switch the unit on again, refer to *INITIAL START-UP.*

TROUBLE SHOOTING

The **Maxi-T** range is designed to provide the maximum reliability possible. Provided the equipment is operated within the design specifications and is installed in the correct environment the high-anticipated reliability will be obtained.

In the unlikely event of a failure occurring, it is advisable to seek advice from your local service centre. This will prevent any further damage to the UPS and also prevent any unnecessary expense.

Should any of the system circuit breakers trip, it is advisable to investigate the problem before attempting to close the breakers, otherwise further damage could occur.

The following alarms are considered to be the type that will occur repetitively:

RES VOLTS OUT OF LIMITS
LOSS OF PHASE LOCK
LOW DC SHUTDOWN
INVERTER OVERLOAD

For detailed descriptions see “DESCRIPTION OF ALARMS”.

If any other alarms persist, contact your local service center immediately.

DESCRIPTION OF ALARMS

ALARM	EXPLANATION
HIGH DC SHUTDOWN	Input dc voltage exceeded trip point (+20% of nominal battery voltage). The over-voltage must be active for longer than 15 seconds.
BATTERY DISCHARGING	DC voltage has dropped below nominal battery voltage, indicating that energy is being drained from the battery and not from the rectifier.
DC CRITICAL	DC voltage has dropped to a value close to the inverter switch-off level.
LOW DC SHUTDOWN	DC voltage has dropped below the low dc trip point (-20% of nominal battery voltage).
INVERTER IN STANDBY	The inverter is off. The inverter can restart automatically when the condition that switched it off e.g. LOW DC SHUTDOWN returns too normal.
INV VOLTS OUT LIMITS	The inverter output voltage is out of tolerance. (+10% or –10%).
INVERTER OVERLOADED	The load connected to the output of the inverter exceeded 120% of its full rating. This condition was active for longer than 15 seconds.
OVER-CURRENT STOP	The inverter has switched off due to excessive overload (output current exceeded 300% for longer than 40ms).
INVERTER LOCKOUT	The inverter has failed to start after 5 times attempts within 250 seconds and has switched off. The load will now be supplied from the mains via the Static Switch.

DESCRIPTION OF ALARMS (cont…)

RES V OUT OF LIMITS	The reserve source voltage is out of tolerance. (+/-15%).
LOAD ON BYPASS	The Critical Load is fed from the reserve source via the static switch.
ON/OFF SWITCH OFF	The key switch on the front door is in the OFF position.
FREQ OUT LIMITS	The reserve source frequency is out of tolerance. (+/-2%)
LOSS OF PHASE LOCK	The inverter is unable to phase lock to its reserve source.
SINE ERROR	The instantaneous value of the inverter output voltage deviated by more than 15%. The internal voltage detector has detected this malfunction. Load will be switched to the reserve source if it is available.
CHARGER FAIL	The Rectifier/Charger is off.
OVER-TEMPERATURE	The internal temperature of the unit is excessive.
NO ACTIVE ALARMS	No alarm conditions exist the unit is operating normally.
SUPERVISION STOP	The inverter has stopped operating due to an over-current condition detected in the IGBT Bridge. This could be due to either an external fault e.g. a short circuit or an internal fault. The inverter will not restart.

TECHNICAL SPECIFICATIONS

UPS INPUT

Input rated voltage	230V, 1 Phase +/-15%
Input frequency	50Hz, +/- 5%
Input power factor	>0,9 IND

UPS OUTPUT

Rated output at 0,7 IND PF	3kVA, 5kVA, 8kVA, 10kVA, 15kVA, 20kVA
Rated output voltage	230V, 1Phase
Steady State output voltage regulation from no-load to full load at rated PF and DC voltage variation from maximum to minimum	+/- 1%
Transient voltage regulation with 100% application or removal of load	+/- 5%
Recovery Time	30 Milliseconds
Overload Capability	200% for 15 seconds
Crest Factor Ratio	3 : 1
Total Harmonic Distortion	Less than 5% (typically 3% for linear loads)
Load Power Factor	From 0,6 inductive to unity within kW rating
Waveform	Sinusoidal
Frequency:	
Free Running	50Hz +/- 0,05%
Synchronised with mains	50Hz +/- 2% (adjustable)

GENERAL

Efficiency at full load	Input - Output 95%
Audible noise	Less than 50 DBA at 1 metre
Static Transfer Switch	1000% Overload 5 cycles
Operating Temperature Range at maximum humidity of 90%	0 degrees C to 40 degrees C
Lightning protection	designed to withstand standard test impulses of 6KV and 3KA

BATTERY

Type	Lead acid maintenance free
Anticipated life	3 to 5 years depending on number of discharges and temperature

DIMENSIONS AND WEIGHTS OF UPS CABINET

Rating	3kVA, 5kVA 8kVA, 10kVA, 15kVA, and 20kVA.
UPS cabinet, with standard battery (mm) (SHORT)	370 (W) x 650 (D) x 550 (H)
UPS cabinet, with standard battery (mm) (TALL)	370 (W) x 650 (D) x 850 (H)
Weights of UPS with one set batteries	120kg 150kg 165kg 180kg 215kg 230kg

DIMENSIONS AND WEIGHTS OF OPTIONAL BATTERY CABINET

Extended battery cabinet	370 (W) x 650 (D) x 850 (H)
Weight of battery cabinet with 3 sets batteries	300 kg

DC DATA

5kVA 32 X 12 VOLT BATTERIES: 192 CELLS

V Float	432V
V Min	336V
Max DC discharge current	11.0A
Max DC Power	3.7kW
Maximum charging	1.4A

8kVA 32 X 12 VOLT BATTERIES: 192 CELLS

V Float	432V
V Min	336V
Max DC discharge current	17.5A
Max DC Power	5.9kW
Maximum charging	2.0A

10kVA 32 X 12 VOLT BATTERIES: 192 CELLS

V Float	432V
V Min	336V
Max DC discharge current	21.9A
Max DC Power	7.4kW
Maximum charging	3.0A

15kVA 32 X 12 VOLT BATTERIES: 192 CELLS

V Float	432V
V Min	336V
Max DC discharge current	32.9A
Max DC Power	11.0kW
Maximum charging	5.0A

20kVA 32 X 12 VOLT BATTERIES: 192 CELLS

V Float	432V
V Min	336V
Max DC discharge current	32.9A
Max DC Power	14.8kW
Maximum charging	5.0A

UPS SERVICE HISTORY

INSTALLATION DATE	
INSTALLED BY	
COMMISSIONED DATE	
COMMISSIONED BY	

SERVICE DATE	SERVICED BY	RECOMMENDED NEXT SERVICE