

Amalgen

Model 7001-7008

DC Backup UPS

Manual Revision 1



Model 7000 Series

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1 Introduction

The Amalgen 700x series DC backup unit is an un-interruptible power supply, designed for situations where only 24VDC is required. The 700x series is efficient and simple, allowing the equipment to be protected in a cost-effective way, and with high reliability. They provide the following functions:

- Supply when AC mains is available
- Supply when AC mains has failed
- No-break changeover of power when mains fails or returns
- Recharge of battery when AC returns (Amalgen battery management system)

The above functions are provided in a single unit designed to fit on the gear-plate in switchboards.

Importantly, the unit forms a complete solution to the power and backup power needs. Therefore, there are advantages to the installer and user. These are:

- No need to do separately mount batteries
- No need to for external components to compensate temperature for battery charging
- No need to for any external components
- No need for any wiring other than load connection

2 Product range

The 700x series comprises 4 units. Each unit is available in 2 versions, base model and LCD model. The main features are shown in the table below.

Model number	Backup capacity	Features	Load current Norm (surge 20ms)	Operating range
7001	4.5AH	Analog control, full featured, basic telemetry	1A (2A)	0C-55C
7003	7AH		2A (4A)	0C-55C
7005	17AH		4A (6A)	0C-55C
7007	40AH		8A (15A)	0C-55C
7002	4.5AH	Processor control, 2x16 character LCD display, enhanced telemetry	1A (2A)	0C-55C
7004	7AH		2A (4A)	0C-55C
7006	17AH		4A (6A)	0C-55C
7008	40AH		8A (15A)	0C-55C

The base model offers reliable power with all product features. The processor-monitored models offer all the basic features, with the addition of an LCD display and more telemetry features. The LCD shows useful information about battery condition and operating conditions.

3 Application

Most equipment uses DC power, even if it is connected to the AC mains. Certain types of equipment used in process control, use only 24VDC, which is usually supplied by the AC main via a transformer. The 700x series allows users of this type of equipment to have “no-break” power no matter what the condition of the AC main. The use of the DC backup unit is shown below.

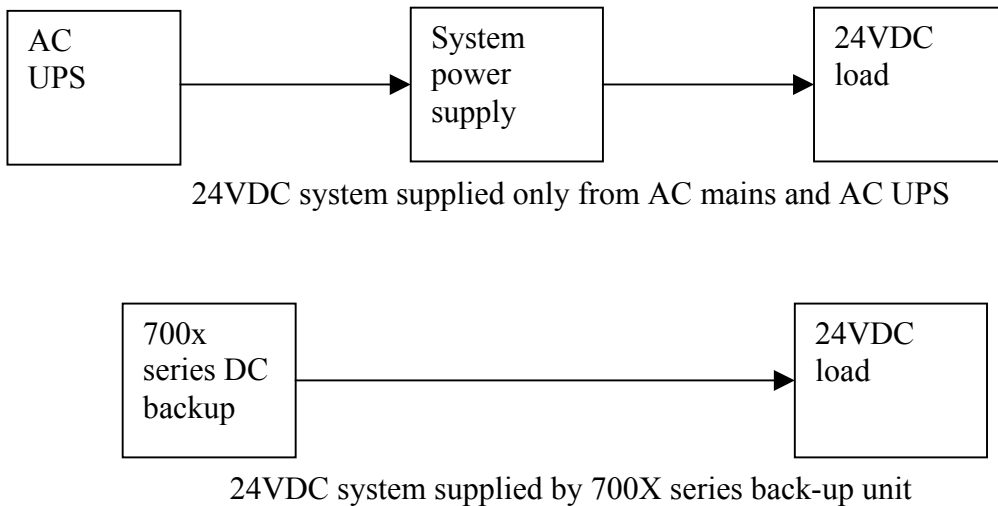


Figure 3

Figure 3 (AC only supply) shows a load, which is supported by a traditional UPS. Inrush current and power factor of the load needs to be factored into the choice of UPS size. Getting the UPS matched to the load (particularly in the small, price sensitive categories) is not straightforward. Then there are power spikes and load transients to consider. A DC back-up system is a good alternative.

The 700x back-up system provides answers for all the above:

- Rugged AC supply, rated to 55C ambient
- Load transient tolerant design

3.1 Sizing of UPS

Batteries do not give their full capacity at higher loads, higher temperatures or as they age. As discharge time gets smaller the available capacity is reduced. The main requirements are Amps required and backup time.

- **Amps:** The current required by the load in Amps.
- **Time:** The amount of time required for the power to be supplied to the load so that it can function well. Number of hours or part there of. Use the typical, Battery Available Ahr Output chart (figure 3.1) Please consult battery manufactures specifications as data may vary from this chart.

Calculation example: 2 Amps backup is required for 8 hours.

- Multiply Amp x Hours ($8 \times 2 = 16$). This gives 16Ahrs. Nearest size DCUPS would be 17Ahrs.
- Look at Figure 3.1. The discharge time, in this case 8 Hrs, shows that approx. 90% of the 17Ah will be available from a fully charged battery
- Check: $17 * 0.9 = 16$ approximately so this unit will just satisfy the load

The curve above shows the probable available Ampere-hour capacity for varying time periods over which the battery is drained. This is fairly indicative of commercially available sealed lead acid batteries.

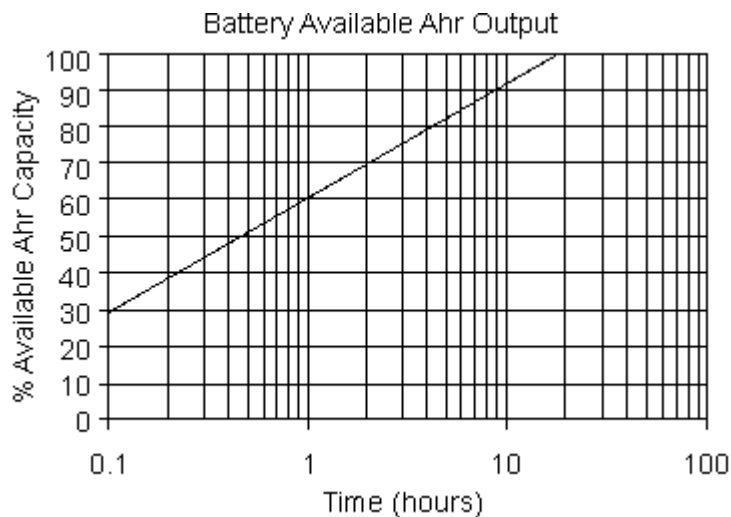


Figure 3.1

4 Technical description

Model 700x is a 24volt (nominal) DC power-supply with battery backup. An AC rectifier supplies power to the load and doubles as a battery charger. There are 3 modes of operation:

- AC power available. In this mode, the load is supplied from the AC rectifier. The battery is charged at a constant voltage but with controlled current. Thermal compensation is provided to ensure that the battery receives optimum charge.
- AC fail condition. In this mode, the internal 24volt lead acid battery supplies the load. Battery voltage and unbalance are monitored. Low battery is flagged as an alarm.
- Over-current condition. In this mode, the internal battery can supply peak currents to the load for short periods. The battery fuse limits the amount of over-current. Sustained high current will cause the fuse to open.

Changeover from AC to DC is done electronically without break in supply to the load. In AC available mode, the battery is charged automatically.

The main components of the 700x series are shown in the following block diagram.

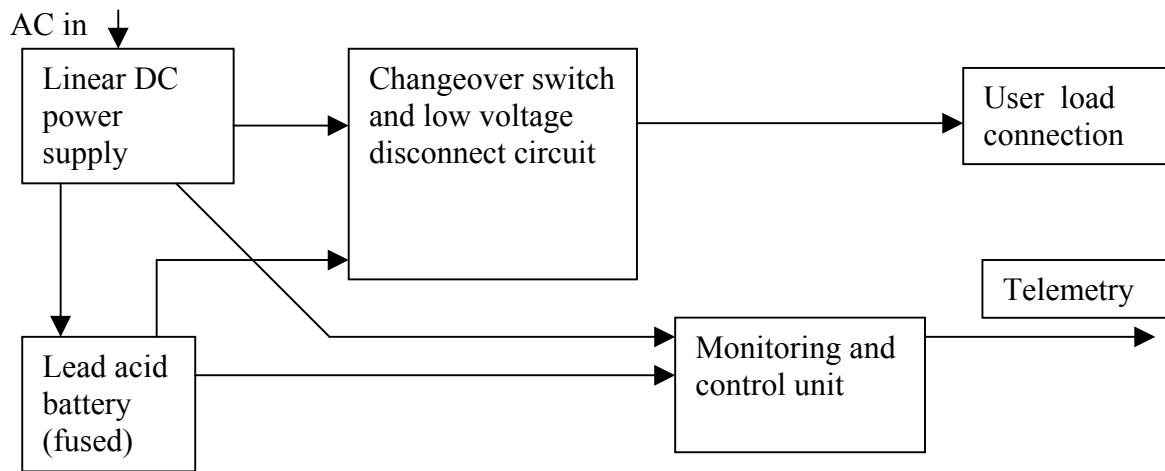


Figure 4
700x series Block diagram

5 Monitoring

Analog monitoring

The status of the unit is indicated on the front panel, and remotely, via voltage-free contacts. The following table shows the details.

CONDITION	LOCAL (LEDs)	REMOTE (RELAYs)
Charger OK	Green light if OK	N/O contact closes if OK
DC available	Green light if V_{load} over 18VDC	-
Low Voltage alarm	Red light if V_{batt} is under 20VDC	N/O contact opens on low battery
Battery differential alarm	Red light if batteries are not same	N/O contact opens on fault

Digital monitoring

The digital model has a 2x16 display to provide messages to the user. The general arrangement of messages is given below:


Message	Options	Meaning
Greeting message	AC supply, On battery Low battery, Charger not OK, trickle charge	Indicates overall state of UPS. Condition is transmitted to remote equipment via open collector O/Ps
Battery voltage and condition	10VDC to 30VDC reading Batteries OK, check batteries	Shows general condition Shows differential fault or low level
Output voltage	10VDC to 30VDC reading	Can show load condition
Output current, charge current	0 to max load A, 0 to 3A	Can show charge and load condition
Disconnecting	none	UPS is shutting down due to low battery and low AC mains voltage

6 Installation

Fit this unit in locations where personnel access is restricted. Personnel with access must be trained in electrical safety and be familiar with procedures for avoiding electrical shock.

Mount to gear plate such that airflow around unit is not obstructed. Keep 50mm clear from sides and top.

Wiring

AC input	Unit must be connected to mains earth. Provide external protection, as there is no AC fusing inside unit. Connect mains AC to terminals marked A-E-N.
DC output	DC output wiring size should comply with wiring codes. We recommend 1.5mm up to 17Ah, 2.5mm for 40Ah. (keep wiring short) Connection of the output is from terminal block, marked + E --. To install as earthed supply connect output + or – to earth. To install as a floating supply, connect two 10k/1/2W resistors external to the unit(see diagram). Fit one resistor from ground to + terminal and the other from ground to the – terminal. 
Batteries	Units are shipped without batteries. On commissioning, check that the fuse is removed and connect the batteries as follows: 1/ connect RED wire to +ve terminal of battery 1. 2/ connect BLACK wire to –ve terminal of battery 2. 3/ connect WHITE wire to –ve of battery 1 and +ve of battery 2. Fit fuse. Replacement of batteries follows the same procedure.
Remote monitoring	Remote wiring should be 0.75mm sq. Wiring plugs into front of unit. The voltage-free contacts are clearly labelled.

Connections for remote monitoring are given in the table below.

Connector pin number	Function - <u>Analog version</u> Relay contacts	Function - <u>Digital version</u> Open collector (need ext pullup)
6 connector top	Common charger monitor	V+ clamp
5	Closed for charger OK, opens on fail	Pulls to com for Battery low
4	Open for OK, closes on fail	Pulls to com for Charger OK
3	Common battery low/fault	Pulls to com for Batt. Low/fault
2	Closed for batt OK, opens on low/fault	Pulls to com if DC not avail.
1	Open for OK, closes when low/faulty	Com connection

Mounting dimensions for the 700x range of DCUPS are given in the attached drawing.

7 Maintenance

WARNING: Take care when inserting batteries, as the batteries contain hazardous energy levels
Do not allow battery terminals to connect in a short circuit..

There is no routine maintenance required on the 700x series DC backup units. However, it is recommended that the battery capacity be verified yearly with a non-critical load, to ensure adequate performance during power outages.

Battery life depends on battery type, actual use and average temperature. Long life batteries will last 10 years, whilst standard batteries will last 3-5 years. End of battery life will usually show as very short backup capacity (50% of nominal) or as differential alarm. Note that differential alarm may occur at the end of discharge, just before system shutdown. This imbalance in the battery indicates that battery matching is not perfect and is not a fault. If the alarm comes up as soon as mains fail, then replace the 2 batteries. For battery types other than those listed, consult Amalgen.

Battery sizes and types are given below:

UPS capacity (batt weight each)	Battery dimensions (HxWxD)	Battery types Powersonic/Powerblock
4.5Amp-hour (1.8kg)	105x 90x 70mm	PS1242 / PB1245
7.0Amp-hour (2.8kg)	95x 152x 65mm	PS1270 / PB1270
17Amp-hour (6.3kg)	167x 181x 76mm	PS12170 / PB12170
40Amp-hour (14kg)	170x 197x 165mm	PS12400 /PB12380

8 Specification

Design type	DC UPS with integral charger and electronic changeover.				
AC input	Voltage 240VAC Nominal Rated Current See Below AC Fusing To be provided external to unit IP rating IP20				
DC Voltage	24VDC Nominal (18V to 27.5) Output is floating from earth				
Current	The current ratings of different models given below				
	Model	Output Current	Battery fuse rating	AC line	
	7001,2 4.5Ah	1A	2A	0.5A	
	7003,4 7.0Ah	2A	5A	1A	
	7005,6 17Ah	4A	10A	1.5A	
7007,8 40Ah	8A	20A	2A		
Charger	Type Constant voltage (temp. compensated) Recharge time 10 hours				
Physical	Model	Wide	High	Deep	Weight*
	7001/2 4.5Ah	155mm	240mm	112mm	8 kg
	7003,4 7Ah	180mm	240mm	145mm	10 kg
	7005,6 17Ah	196mm	347mm	176mm	20 kg
	7007,8 40Ah	340mm	385mm	210mm	50 kg
Thermal	Natural convection, 55C max ambient Allow 100mm around sides				
Monitoring For details see table	Local LEDs Charger OK (DC supply is OK) DC Available Battery low alarm Battery differential alarm Contacts for Remote alarm Charger OK (AC on and charger OK) Battery voltage low when battery is 20VDC Stays ON until cut-off (18VDC) is reached (contacts rated 50VDC/1A, 120VAC/0.5A)				
EMC Compliance	Radiated AS1044:1995 (amds 1,2) C-tick approved				