



OPERATING & MAINTENANCE MANUAL

for

LOAD BANK

Type

HBN50-220

HILLSTONE HIRE FLEET

PowerBank

Serial number M36365

ISSUE 1

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INTRODUCTION

Description

The Hillstone **HBN50-220** load bank is designed to provide a high power load for manually controlled constant current discharge testing of 48 volt lead acid battery systems.

The unit incorporating light weight, naturally cooled high power resistor elements.

The unit includes shrouded voltmeter and current sockets for direct measurement of the battery voltage and discharge current via external multi-meters.

The load bank incorporates circuit breaker protection and isolation on each load channel.

All units are light weight, robust, portable and come complete with swivel castors and carrying handle and include DC power cables.

The naturally cooled design does not require any auxiliary power supply to operate the load bank.

SAFETY CONSIDERATIONS

1. The equipment is designed for use in a clean, dry, indoor environment and should only be operated by competent electrical engineers who are completely familiar with the operation and specification of the load bank.
2. Operators must ensure that interconnecting cables are correctly rated to carry the required load current and adequately insulated to prevent the possibility of electric shock when operating at high voltages.
3. When in use the load bank should be cordoned off using safety barriers.
4. The load bank should only be operated in an area with adequate ventilation.
5. During operation the top air exhaust outlet grill and outer case may be hot.
6. Operators working with electricity should not wear rings, jewellery or metal watch straps.
7. As with any electrical equipment the load bank should not be used in close proximity to recently charged batteries where a build up of explosive gases may have occurred.
8. Only insulated tools should be used when working on battery connections.
9. Refer to the battery manufacturers operating instructions for additional safety precautions.
10. Ensure all personnel are familiar with the location of the nearest safety kit and eye wash facility.
11. During operation the load bank should not be covered or positioned to restrict air flow.

CONNECTION PROCEDURE

- A. Ensure the power source or battery to be tested is compatible with the load bank operating voltage.
- B. Do not attempt to operate the load bank above the maximum operating voltage.
- C. Check the power source or battery is isolated before connecting to the load bank.
- D. Check all circuit breakers are switch off (DOWN).
- E. Connect a digital multimeter (DC volts range) to the voltage sockets
- F. Connect a digital multimeter (DC mV range) to the shunt sockets
- G. Insert the DC battery cable socket into the load bank. Always connect and disconnect the DC battery cable socket OFF LOAD (all circuit breakers off - DOWN position)
- H. Connect the DC output cable to the power source or battery terminals, ensuring correct polarity.
- I. Check the DC output cable connections are secure.

OPERATING INSTRUCTIONS

Operators should read the SAFETY CONSIDERATIONS and CONNECTION PROCEDURE before carrying out the following operating instructions

1. Ensure all circuit breakers are in the OFF position (DOWN).
2. Switch ON (UP) the appropriate load current channels to the required load current.
3. During battery discharge testing, as the battery voltage falls, the load current can be maintained at a constant current by manual selection of the circuit breakers.
4. At the end of the test switch OFF (DOWN) the load current circuit breakers.
5. The power source or battery may be disconnected while the resistor elements are cooling
6. Always connect and disconnect the DC battery cable socket OFF LOAD.

Specification

Type ref.	HBN50-220	
Max current (see note 1)	220 amps	
Max power dissipated	11440W	
Max constant current at 43 volts	184A	
Switched steps (see note 4)	1 x 1A, 1 x 2A, 1 x 4A, 1 x 8A, 2 x 16A, 5 x 32A	
Nominal battery voltage	48 volts DC	
Current adjustment (see note 1)	Zero to max amps	
Max operating voltage (see note 1)	52 volts DC	
Max number of lead acid cells	24	
Test voltage sockets	4 mm shrouded (DC volts direct reading)	
Test current sockets	4 mm shrouded (DC amps 1mV = 8 amps)	
Protection	Individual circuit breakers	
Auxiliary mains supply	Not required	
DC power cable set	2.5 metres of twin cable via industrial plug and socket	
Case size	Length	700 mm plus 2x40mm for handles
	Width	350 mm
	Height	530 mm
Weight (approx.)	22Kgs	
Finish	Light grey 00A05 textured finish	
Environmental protection rating	IP20	
Movement	Carrying handle and swivel castors	
Operating temperature range	0 – 40 deg C	
Storage temperature range	0 – 80 deg C	

Specification Notes

- 1) The maximum current is stated at the maximum operating voltage and the equipments are designed for discharge testing of 24 lead acid cells, where the terminal voltage will quickly fall to approx. 2.08 volts per cell (50V) at the start of the discharge test. The units are therefore not designed to operate continuously at the maximum operating voltage.
- 2) Discharges can be achieved below 43 volts with proportionally reduced output current (see performance tables)
- 3) Units are designed for indoor use only in a clean, dry and well ventilated environment.
- 4) Approx current rating at 50 volt
- 5) External digital multi-meters are not supplied with the load bank.
- 6) Information is intended to be correct at the time of publication, however, Hillstone Products Ltd bears no responsibility for the accuracy of any information given.
- 7) We reserve the right to make detail changes to specification, components, dimensions or weights at the time of design or manufacture without prior notice.
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Application notes

Lead acid battery discharge testing

All types of lead acid batteries (with the exception of Plante cells) fall in capacity during their service life. The end of life is normally determined when the battery falls to 80% of its original capacity.

This assumes the battery is float charged at the correct voltage and operated in the correct ambient temperature between 20 – 25 degC.

Incorrect charging voltage may reduce service life and high ambient temperature (without adjustment of the charge voltage) will seriously reduce capacity and service life. An increase of 10 deg C ambient could reduce the service life by half.

It is therefore important to determine the actual capacity of a standby battery, periodically during its service life, so that the end of life can be estimated and any premature failure can be detected. This procedure ensures reliability of the emergency system and provides information to allow financial allocation of resources prior to battery replacement.

A general guide to carrying out a full capacity test

Battery capacity tests on lead acid batteries are normally carried out at the 3 hour rate of discharge and should be at a constant current down to 1.8 volts per cell.

When testing 24 lead acid cells this equates to 43.2 volts at the battery terminals, at the end of the discharge test. Ideally a capacity discharge test should be carried out annually.

It is important to perform the discharge until the battery voltage reaches 43.2 volts, this may be greater than three hours. The actual battery capacity is calculated by multiplying the constant discharge current by the time taken to reach 43.2 volts.

This capacity figure should then be recorded and compared during the service life to determine if the capacity is reducing at the expected rate. The fall in capacity is approximately linear, i.e. 90% capacity after 5 years (for a 10 year service life battery)

- Note :
- 1) ensure the battery is fully charged prior to a capacity test.
 - 2) refer to the battery manufacturers performance data to determine the required discharge current.
 - 3) discharge performance should be corrected dependant on temperature
 - 4) Alternative discharge rates can be used to determine capacity, however comparisons should only be made at the same discharge rate and end voltage.

Performance Tables

The **HBN50-220** load banks can be used to discharge test a wide range of lead acid cells at different system voltages. The performance data below details the total current available for manually controlled, constant current loads, during battery discharge testing down to different end voltages.

HBN50-220 Battery discharge performance table

Nominal battery volts	No. of lead acid cells	HBN50-220 maximum constant current available at ;				
		1.9 v.p.c.	1.85 v.p.c.	1.8 v.p.c	1.75 v.p.c.	1.7 v.p.c.
48V	24 LA	193A	188A	183A	178A	172A
36V	18 LA	145A	141A	137A	133A	130A
30V	15 LA	120A	117A	114A	111A	108A
24V	12 LA	96A	94A	91A	89A	86A
12V	6 LA	48A	47A	45A	44A	43A

MAINTENANCE PROCEDURES

The load bank should not require any special maintenance, however as with any electrical equipment periodic checks should be carried out to ensure the equipment is in a safe and satisfactory condition.

The following periodic checks are recommended;

- 1) Check the inlet and outlet grills are free from obstruction.
- 2) Check the controls, battery socket and battery cables are undamaged.
- 3) Check all interconnection cables are undamaged

FAULT FINDING PROCEDURES

The following fault finding procedure is intended to identify simple operational errors as follows;

INSUFFICIENT LOAD FAULT

Check the battery is at the required voltage.

Check the expected discharge current against the performance tables.

Check the operation of the controls.

Note:

Any identified faults should be reported to the manufacturer

Removing the covers is not recommended.

If any covers are removed to inspect internal components, the load bank must be isolated from the battery.

Testing the load bank with the covers removed is not recommended.

Repair or replacement should only be carried out by the manufacturer.