OPERATING & MAINTENANCE

MANUAL

for

TYPE HPB30 – 300

HILLSTONE HIRE

PowerBank

ISSUE 2

CONTENTS

HILLSTONE PRODUCTS

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INTRODUCTION

Description

The Hillstone **HPB30-300** load bank is designed to provide high power load testing of DC generators or for manually controlled constant current discharge testing of 24 volt lead acid battery systems.
The unit incorporating light weight, force cooled high power resistor elements.
The design includes the unique Hillstone *PowerBank* controller which provides accurate manual adjustment of the load current throughout the test with current control over the total current range.
The unit includes shrouded voltmeter and current sockets for direct measurement of the battery voltage and discharge current via external multimeters.
The load bank incorporate contactor isolation which in the event of mains interruption will automatically terminate the test.
All units are light weight, robust, portable and come complete with mains cable swivel castors and carrying handle and include DC power cables.

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
3. When in use the load bank should be cordon off using safety barriers.
4. The load bank should only be operated in an area with adequate ventilation.
5. During operation the rear air exhaust outlet and outer case may be hot.
6. At the end of a test do not switch off the mains supply. Always run the cooling fans for 5 mins with zero load current to cool the resistor elements.
7. Operators working with electricity should not wear rings, jewellery or metal watch straps.
8. 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
9. Only insulated tools should be used when working on battery connections.
10. Refer to the battery manufacturers operating instructions for additional safety precautions.
11. Ensure all personnel are familiar with the location of the nearest safety kit and eye wash facility.
12. 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 the mains supply switch is in the OFF position.
E. Check the control switches are in the OFF position.
F. Connect a digital multimeter (DC volts range) to the voltage sockets
G. Connect a digital multimeter (DC mV range) to the shunt sockets. Note 1mv = 4 amps
H. Turn the variable control to the minimum position (fully anti-clockwise)
I. Connect the load bank to the mains supply.
J. Insert the DC battery cable socket into the front of the load bank.
K. Connect the DC output cable to the power source or battery terminals, ensuring correct polarity.
L. 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 switches are in the OFF position.
2. Turn on the mains switch and ensure the fan rotates correctly.
3. Press the green START push button control.
4. Switch on the appropriate load current channels and adjust the variable control to the required load current.
5. During battery discharge testing, as the battery voltage falls, the load current can be maintained at a constant current by manual adjustment of the variable control and selection of the load current switches.
6. At the end of the test switch off the load current switches and press the red STOP push button.
7. Do not switch off the mains supply
8. Ensure the fan is kept running for 5 mins to cool the resistor elements
9. The power source or battery may be disconnected while the resistor elements are cooling
10. Switch off the mains supply when the resistor elements are cold

Specification

Type ref.	HPB30-300
Max current (see note 1)	297 amps
Max power dissipated	8900W
Max constant current at 21 volts	207A
Variable channel (see note 4)	0 - 49 amps
Switched steps (see note 4)	1 x 49, 1 x 47, 2 x 75 amps
Nominal battery voltage	24 volts DC
Current adjustment (see note 1)	Zero to max amps
Max operating voltage (note 1)	30 volts DC
Min volts at constant amps	21 volts DC
Max number of lead acid cells	13
Test voltage sockets (see note 9) Test current sockets	4 mm shrouded (DC volts direct reading) 4 mm shrouded (DC amps 1mV = 4 amps)
Protection	Isolation contactor Auto test stop on mains interruption Auxiliary mains supply fuse
Auxiliary mains supply	230V single phase 50 Hz (110V optional)
Auxiliary mains connection	IEC fused socket with switch
Mains cable	2 metres with IEC and 13 amp plug (see note 5)
DC power cable set	2.5 metres of twin cable via industrial plug and socket
Case size Length Width Height (+ 50mm handle)	720 mm 330 mm 425 mm
Weight (approx.)	28Kgs
Finish	Light grey RAL 9002 textured finish
Environmental protection rating	IP21
Movement	Carrying handle and swivel castors
Operating temperature range	0 – 30 deg C
Storage temperature range	0 – 80 deg C

Specification Notes

1) The maximum current is stated at the maximum operating voltage.
2) Battery discharges can be achieved below 21 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) Rated at 30 volt maximum
5) The HPB Series load banks are designed for DC generator testing, battery discharge testing and battery charger testing at 30V maximum.
6) External digital multimeters are not supplied with the load bank.
7) Information in technical literature, quotations or data sheets are intended to be correct at the time of publication, however, Hillstone Products Ltd bears no responsibility for the accuracy of any information given.
8) 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 12 lead acid cells this equates to 21.6 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 21.6 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 21.6 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 **HPB30-300** load banks can be used to test DC gen-sets and discharge test a wide range of lead acid cells at different system voltages. The performance data below details the current available for each switch step at different gen-set voltages plus the available constant current load during battery discharge testing down to different end voltages.

Load bank rating table

Channel	Ohms	I @ 30V	W @ 30V	I @ 28V	W @ 28V	I @ 27V	I @ 24V	I @ 21V
1(VAR)	0.6	47.6A	1430W	44.4A	1244.4A	42.9A	38.1A	33.3A
2.0	0.6	50.0A	1500W	46.7A	1306.7A	45.0A	40.0A	35.0A
3.0	0.6	50.0A	1500W	46.7A	1306.7A	45.0A	40.0A	35.0A
4.0	0.4	78.9A	2360W	73.7A	2063.2A	71.1A	63.2A	55.3A
5.0	0.4	76.9A	2300W	71.8A	2010.3A	69.2A	61.5A	53.8A
Total		303.5A	9090W	283.3A	7931.2A	273.1A	242.8A	212.4A

HPB30-300 Battery discharge performance table for lead acid cells

Nominal battery volts	No. of lead acid cells	HPB30-300 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.
25V	13 LA	245A	238A	232A	225A	219A
24V	12 LA	226A	220A	214A	208A	202A
18V	9 LA	169A	165A	160A	156A	151A
12V	6 LA	113A	110A	107A	104A	101A

HPB30-300 Battery discharge performance table for ni-cad cells

Nominal battery volts	No. of lead acid cells	HPB30-300 maximum constant current available at ;				
		1.2 v.p.c.	1.15 v.p.c.	1.1 v.p.c	1.05 v.p.c.	1.0 v.p.c.
26V	22 LA	261A	250A	240A	229A	218A
25V	21 LA	249A	239A	229A	218A	208A
24V	20 LA	238A	228A	218A	208A	198A
24V	19 LA	226A	216A	207A	198A	188A
18V	15 LA	178A	171A	163A	156A	149A
12V	10 LA	119A	114A	109A	104A	99A

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 the fan rotates freely without obstruction.
4) Check all interconnection cables are undamaged

FAULT FINDING PROCEDURES

The following fault finding procedure is intended to identify simple operational errors and has been categorised into four possible problem areas as follows;

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FAN COOLING FAULT

Check the power source is available.
Check the mains switch is in the ON position.
Check the mains fuse in the load banks input socket.
Check the mains fuse in the plug lead.
Check the fan motor operates and is free from obstructions

OUTPUT LOAD FAULT

Check the Control switch is in the ON position.
Check no alarms are present
Check the isolation contactor energises.

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.

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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 mains and battery
Testing the load bank with the covers removed is not recommended.
Repair or replacement should only be carried out by the manufacturer.