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GENERAL

XP500C resistive load is the answer to the request of providing suitable equipment to check battery discharge, for verifying power equipments such as rectifiers, generators or UPS. The equipments in use in the past for such purpose were mostly produced using heavy air cooled resistors which, for high power rates, were of big dimensions, heavy and difficult to transport. The solution in use for our resistive load includes Nickel-Chrome resistor featuring high powers and light weight, forced ventilation cooled. All this has allowed the manufacturing of devices having low weight and reduced dimensions maintaining high dissipation rates. A CPU control board is also combined with the equipment suitable for preset by keyboard, all commands requested by the discharging test (discharging current, final voltage, test duration). Together with measurements and display, the same board provides control of all protections and alarms. All the functions will be described in the following specific paragraph.

On the top side of the panel you can see the connectors for the connection to the batteries, a large color graphic display with touch-screen and the cover for the access to the battery, necessary to keep powered the inside clock.

On the frontal side of the panel there are the fuse holder, the connector for the possible external power (36 - 48V 100-150W), a USB port, a serial port RS232 and the slot for the SD memory card.

WARNINGS

Considering the high power involved with the use of the resistive load caution is requested.

- Avoid having your test done inside small rooms where the temperature may reach easily high values.
- Avoid dusty places which could reduce the ventilation efficiency.
- Don't dispose the equipment and particularly the display to direct sunlight in order to avoid the display to come totally black. Just in case move it away from sunlight and wait it to move back to original conditions.
- If in use with generators or not stabilized power supplies, make sure not to exceed the maximum voltage allowed by the equipment. As it's possible such equipments have wide excursions between no load and full load conditions, avoid to increase output voltage while performing tests and particularly with high currents. In fact in this case if the test should be interrupted, the voltage could increase sharply and exceed the maximum voltage allowed by the resistive load.
- Keep input and output air grill always clean and free from outside objects. Don't limit the fans operation covering the grill or turning the air flow opposite the wind flow or towards walls or too close obstacles. Don't turn the inspiration grill in front of air blow coming from other resistive load or heating sources.

MEMORY CARD

The load bank allows memorizing the data of the discharge on a SD memory card. You must use a card already formatted with the system FAT32 (the operation can be made on a PC). Normally there is a formatted memory card inserted in the slot. To remove the card from the slot (for example to transmit the data to a PC through an adapter) to slightly press the edge of the card up to that it doesn't release, therefore to extract it. To insert again to position it as from sketch brought

on the panel (contacts in lower part and orientation to the right), to verify the correct alignment with the slot and to press up to that it doesn't lock. You can use SD of capacity max 2 GB.

CLOCK BACKUP BATTERY

On the control board there is a clock that is used for recording the date and the time of the measures, the date of the files and for other functions. There's a not rechargeable lithium 3 Volt battery backup, size AA. For replacement battery act the cover on the superior panel, marked "BATTERY 3V". Rotate the cover up to unlock it then remove the battery, replace it with one of the same type, watching out for to respect the polarity. Press therefore the cover and rotate it up to lock it.

EXTERNAL POWER

The load bank is self powered for the range of tension that goes from 36 to 70 Volts DC. If the test tension is inside this range it isn't necessary any external power. The services are powered by the same test tension. If you want use a lower tension of 36 Vs DC it is necessary the external power. On the panel it is present a jack for this purpose. The connector is the circular type with inside diameter 2.5 mm, the inside contact it is for the positive polarity. Is necessary an external power 36 - 48VDC 100-150 Watt.
Maximum discharge current is 500 Ampere and it can be maintained in the range of tension that goes from about 44 Volts to 70 Volts. For lower tension, maximum current linearly decreases (to see graphic) therefore, despite the load bank can be used to very low tensions with the employment of the

external power, the maximum current will be reduced. i.e. about 140 Amperes to 12 Volts.

CONNECTIONS

Use supplied cables to connect the load. Don't use twisted cables but align them completely in order to improve the thermal dissipation. Insert the connectors respecting the polarity to respective inputs on the load; for the connection insert the female terminal of the cable to male connector on the load bank following the marks on both sides. Rotate the cable connector clockwise in order to reach a tight fastening. **WARNING: Don't disconnect or loose cable during test!!** Connect cables to the equipment or to the batteries always respecting the polarity and better without voltage (through circuit breaker). If the connection is correct and if the voltage is present, fans operate immediately and display light on.

MAIN MENU

On main menu there are all the icons that allow the operative mode, load bank model, firmware version and the indication of date and time current. If you want select a mode tap on the right icon. This operation can be made both with the fingers and a special pen. Use a pen to have a more precise control and keep the display clean.
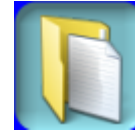
SETUP

Tap on this icon to enter in setup menu, where is possible to modify some setting of the load bank. These changes are memorized and also use to the following lighting of the load bank. Tap on the EXIT key to return to main menu.

CLOCK

Tap on this icon to enter in date and time menu. Here you can see fields related to the year, month, day, hours and minutes. To move through the fields tap the arrow keys. To change the value of a field tap on keypad. When the changes have been effected tap on the key OK and the new date it will be recorded in the inside clock. If it is desired to go out without the changes have effect tap on the EXIT key.

LANGUAGE

It is possible to choose in which language will be shown the indications on the display. To select the wanted language tap on the relative icon and this will automatically be refreshed.

FIRMWARE UPGRADE

The firmware, the inside program of the load bank, is upgradeable from the outside through the use of the serial port and a PC with special program. This allows to modify the program in the case of corrections is made, or for release of up-to-date versions. Such operation must be effects only in case of real necessity and however according to the procedures of the producer, exclusively using the programs and the suitable files. Some instructions are writing on the display. Further indications are furnished in the case of release of updating.

SERVICE

This function is reserved to the technical support and isn't accessible to the end user.

CONSTANT CURRENT

This modality is specific to effect tests of batteries discharge. It's possible set all the necessary parameters for a test of the kind. From the keyboard on the display you can set batteries current, stop discharge tension, test duration, voltage drop on the connections and the number (name) of the test to memorize the data of discharge. Adjustments aren't necessary

of the current during the discharge, since this is constant even if the tension of battery decreases. The discharge automatically ends if the batteries reach the set tension or if the planned time is over; you can interrupt the discharge manually or because of the automatic intervention of the control for an alarm or a malfunction.

During the discharge the time, the tension and the current are visualized.

When you choose modality "CONSTANT CURRENT" it appears setup screen.

If you want return to main menu tap the "EXIT" key

There are five fields to set the parameters of the test. To pass from a field to another use the "ENTER" key or the arrow keys. If the values written in a field are not correct the buzzer beep and the cursor doesn't move to the following field.

Insert in the "Current" field the test current, tapping on numerical keys, from a minimum of 1 A to a maximum of 500A.

NOTE: the maximum current (500 A) can be maintained only with tension over about 44 Volts (measured to power connections, therefore without voltage drop on the cables). For lower tensions the maximum current linearly decreases, check the relative graph to avoid planning current too much high for test tension.

In the "Minimum Voltage" field insert the stop test tension (it's possible to also insert a decimal using the key ". " ex. 46.5V).

The "Test time" field it allows to set the time of discharge. The time is express in minutes; you can insert values from a minimum of 1' to a maximum of 999' (about 16 hours). If you insert "999" value, you obtain time infinitely.

In the "Cables drop" field it's possible to insert the tension drop on the connections (cables, etc.) between the batteries and the load bank.

If this value is not known to follow the following procedure:

- insert in the previous menu the value of current that is wanted to use for the discharge
- insert as value of cables drop 0 Volts
- start the discharge, measure the tension on the batteries and to verify the tension on the display
- the difference among the tension on the batteries and that read on the display is the drop of tension on the connections
- interrupt the discharge and start it again inserting in the menu the drop voltage value,
Insert 0 Volts if you don't care the voltage drop.
The last field is "ID test". The load bank stores on the memory card the data related to the discharge. The ID is in practice the filename that will be stored. When you enter in screen it's automatically assigned and proposed a number. This number is drawn by the last two numbers of the year, from the month, from the day and from the time current. This should allow to always having a name (number) different for every test of discharge. However the ID can be, as the other fields, rewrite with another number. You can insert only numerical characters. In the case that the assigned number be already present on the memory card, you will see message:

FILE EXIST
1 Append
2 Replace
3 Exit

If you tap the "1" key the data of the discharge will be stored in append to those recorded in the old file. This can be useful in the case a discharge previously interrupted or in the case of more tests related to the same battery done in different times.
Tapping instead "2" the old file is eliminated and a new one is created with the same name, in this case the old data will be lost.

Tapping "3" you can exit and change the number of the ID before starting test.

When you finish inserting the data, to start the discharge test tap on "ENABLE"
On the screen you can see:
- Time countdown in hours, minutes, seconds;
- Voltage measured in Volt.
- Current measured in Ampere.
NOTE: When current set value is blinking an updating procedure of same current is in progress. This condition is regular for little time, when the load bank updates current. If this condition is continuous, the buzzer is on and the blinking current value on LCD is smaller than you set, maybe you have set a value too high for the actual operating voltage.
Discharge stops automatically when minimum voltage value is reached or the preset time is exhausted. In this case the LCD displays:

END OF DISCHARGE
TIME XX:XX:XX
FINAL VOLTAGE XX.X V
Tap EXIT to end

Time (in hrs, min and sec) left to the end (00:00:00 just in case discharge has been ended because of exhausted time) and final voltage at the end of the test are indicated.
The discharge can also be interrupted manually tapping on ENABLE key and in this case the following indication will appear:

BREAK DISCHARGE ON DEMAND
TIME XX:XX:XX
FINAL VOLTAGE XX.X V
Tap ENABLE to restart Tap EXIT to end

If you tap on ENABLE key the test go on with previous setting and time left. Tap EXIT to stop test.

If during the test an alarm is detected, enable is immediately excluded, loads disconnected and relative alarm message displayed (see alarms and signal section); if the alarm recover tap on OK and the LCD will display:

> **BREAK DISCHARGE FOR ALARM**
> **TIME XX:XX:XX**
> **FINAL VOLTAGE XX.X V**
> **Tap ENABLE to restart Tap EXIT to end**

If you tap on ENABLE key the test resume with previous setting and time left. Tap EXIT to stop test.

CONSTANT POWER

In this mode adjustment isn't requested during test as the power value will remain constant even if the voltage will decrease. The discharge terminates automatically when batteries reach the minimum preset voltage or if preset time is exhausted; the operation can also be manually interrupted or because of an automatic stop by the control for an alarm. During discharging test, the time, the voltage and the current are displayed.

This modality is very similar to that "CONSTANT CURRENT"; difference is that the power is set instead of the current. So if the voltage decreases the current increases to maintain the constant power.

Setting fields are the same of "CONSTANT CURRENT" modality except the first one, where you set power instead current.

In this field you can set the discharge power in Kilowatt (to insert the decimal ones to use the key ". "); the admitted values are 0.1 KW to 35 KW.

NOTE: the maximum current (500 A) can be maintained only with tension over about 44 Volts (measured to power connections, therefore without voltage drop on the cables). For lower tensions the maximum current linearly decreases, check the relative graph to avoid planning current too much high for test tension. Set the correct power. If you want to finish the discharge to 44 Volts, the maximum power you can set will be 44 Volts x 500 Ampere = 22 KW.

DATA STORE

The load bank stores data during the discharge test. Date and set current of the test are stored. Then, with intervals of 1 minute the values of tension and current are stored with the relative time. At the end of the test the final tension and the result of the test are stored (end of discharge, break discharge on request or for alarm, etc.). The file is recorded on memory card with the test name and the extension "TXT". The data are stored in text format and every field it is separate from a semicolon. This type of memorization makes possible to use the file inside the most common software for the management of the spreadsheets, as for example Excell. It will be therefore possible, once imported the file, to realize graphic related to the course of the discharge, to elaborate the data, to print etc. To import the file in Excell, open it as text files TXT. It will open some screens that they ask for file format. Choose as type of data "delimited" and continue. Choose then as delimiter the character "semicolon". In following screen click on "advanced" and choose as decimal separator the character

"." (dot), leave the format of the cells on "general" and continue. It opens now the sheet that brings all the data already tabulated. You can modify if necessary the width of the columns, the font, the spacing etc., according to your own necessities.

BROWSE DATA

Tap on this icon to enter management files screen.
The recorded files are listed in a window. If these are more than ten the visualization it's made to pages. To flow among the various pages tap on the keys PGUP and PGDOWN. The files can be selected (underlined) tapping on the arrow keys or on the file's name. When a file is underlined you can delete it tapping on the "DELETE" key. This operation is definitive, therefore place attention to avoid of losing data. If you want go out from screen tap on "EXIT."

CONSTANT LOAD

On the contrary of discharge mode, in this mode the load don't correct automatically the current but limit its performance to calculate resistors to be inserted in order to reach preset current as a function of read voltage. The value can increase or decreased during the test. This is the most suitable operation mode using the load to check power supplies or more in general where there is no need to have

constant current In this case both the time and final voltage are not available. When selecting the "constant load" mode you'll see only one setting field "Set Load".
Here you can digit the current value you want to use tapping on the numerical keyboard and than confirming by ENTER.
To activate the load press ENABLE.
The control logic will decide the resistors to be inserted as a function of read voltage and current setting. Automatic adjustments aren't included and it's possible that some differences are detected between preset current and read current (the actual current to the load is indicated on display).
Just in case you want to adjust the current to desired value, tap on arrows keys; the current will increase or decrease of the minimum step (about 1 Amp) for any single tap.
Please note that the value preset on the 'LOAD' field remain the same value preset initially.
If you want to change the value in a faster way you need to re-type it and confirm it by ENTER restarting the calculation procedure as a voltage function. As a result, any time you tap ENTER key, the control tries to set the current to the value noted on 'LOAD' field while the arrow keys allow to increase or decrease the load independently from the voltage applied.
Maximum adjustable current for continuous operation is 500 Amps. Tap on ENABLE key to disconnect the load.
NOTE: Like the discharge mode, the maximum current (500 A) can be maintained only with tension over about 44 Volts.

TRANSMIT DATA

When you want transfer the data from the memory card to the PC you can use memory card reader. These instruments

result economic and simple to use. Removing from the load bank the card and inserting it in the reader, this is seen by the operating system of the PC as a data folder and it is possible to copy, to eliminate or to insert files.

However you can connect the load bank, emulating the same functionality, via USB port to a PC with Windows XP.

The load bank has to be power on and therefore you need connect the power or use the external power.

Tap on "TRANSMIT DATA" icon. On the display you can see memory card size indication and the state of the USB port. Connect a USB cable between the PC and the load bank. The indication on the display changes (USB connect) and on the PC it is possible to visualize the data of the card as if it were an external disk. It is possible therefore to use the files as in the case of the card reader.

CONNECT UNIT

Tapping on this icon is possible to connect the load bank to a PC or other device to allow the remote control of the instrument. This function is not activates on the model XP500C.

ALARMS AND SIGNALS

Many controls and protections are available on the load in order to achieve a correct and reliable operation. All parameters related to applied voltage, fans rotation, internal temperature are kept under control. Any active protection will determine an alarm on LCD and buzzer. In the same time the enable is removed and loads disconnected. Almost all alarms

comprise two conditions: active alarm when the alarm is present at the time of display and recovered alarm remaining displayed till it's not acquired. This way allows the operator to realize what's happened to the equipment just in case he was not present when the alarm occurred. The following are the messages and alarms which may appear on the display and related description:

--- WARNING! ---
VOLTAGE ABOVE MAX
LIMIT (70.0 V)

You're supplying the load with a too high voltage. Reduce it or disconnect.

MAXIMUM VOLTAGE
ALARM RECOVERED

It's the feedback condition of previous alarm. Tap on "OK" key to go back to active menu before alarm occurred

--- WARNING! ---
FANS ALARM
PLEASE WAIT

Fans are not working properly or aspiration grills are obstructed by reverse winds or obstacles. Check it or switch off.

FANS ALARM
RECOVERED

It's the feedback condition of previous alarm. Tap on "OK" key to go back to active menu before alarm occurred

--- WARNING! ---
THERMALS ALARM
PLEASE WAIT

The temperature inside the equipment may be too high. The cause may be the ventilation (see also fans alarm) or you may be using the load bank inside a small room and ambient temperature has increase sharply. If the alarm doesn't return it's necessary to switch off the load.

THERMALS ALARM
RECOVERED

It's the feedback condition of previous alarm. Tap on "OK" key to go back to active menu before alarm occurred

MAINTENANCE

The load doesn't require special maintenance operation. Check periodically that the air grills are clean and not obstructed. Check also that fans and resistors are not covered with dust, wires or other objects. Check also that leaves or pollens don't cover internal parts. No user serviceable parts are inside the load. Protection fuse is located on front panel side identified by FUSE. The type is 5 x 20 mm 3,15 Amps fast. Just in case the fuse requires to be replaced, remove the fuse holder acting anticlockwise, replace the fuse and lock it clockwise.

WARRANTY CONDITIONS

XP500C load bank is covered by total warranty for a two year period. (The warranty covers manufacturing defects and is related to spares and workmanship) All damages due to improper or incorrect use of the load are excluded from the warranty. Damages due to everything else not directly connected to the proper use of the load as much as failures due to the presence of extraneous objects or misuse or not observing electrical parameters are determining the warranty to be void. The warranty will be void even in case of tampering by not authorized personal.

ELECTRICAL CHARACTERISTICS

Operating Voltage
36-70 Volt DC
0.5-36 Volt DC with external power
Maximum Current
500 Ampere range 44 – 70 Volt DC
(See diagram for different operative voltage)
Operating Temperature
0°C to 40°C ambient temperature
Current setting resolution
1 Ampere
Set/obtained Current precision
± 1 Ampere
Power setting resolution
100 W
Set/obtained power precision
± 100 W
Voltmeter or Ampermeter Precision
1% ± 1 digit
Clock backup battery
Size AA lithium 3 Volt
Weight
Load bank Kg. 16
Cables Kg. 22
Dimensions
Max dimensions of closed load equipment cm. 55 × 20 × 37
Cables Length m 10 × 4
Cables section 50 mm²

Maximum discharge current vs operating voltage