



WINROCK
INTERNATIONAL



*Energy for Sustainable
Development Africa
Limited*
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Installation, Training and Commissioning Of Battery-Inverter Power Backups For Telecenters in Rwanda

September 2004

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1. Tenders and Supply of Equipment

Following the first visit to Rwanda to verify the energy and other technical requirements for the telecenters, ESDA prepared a report detailing hardware and installation requirements for the three telecenters. These guidelines were developed into tender guidelines by Winrock and AED and eventually used to procure inverter-battery based backup equipment for the telecenters. The competitive bid was won by Ultratech (U) Ltd. Who eventually supplied and supported the installation of the three systems in Nyanza, Gitarama and Nyamata.

2. Equipment Inspection

Equipment supplied by Ultratech (U) Ltd, once released from the Customs warehouses in Magerwa Kigali were delivered to the AED office and inspected to verify compliance with the specification with respect to both quality and quantities. Present at the inspection were representatives from ESDA, Ultratech and AED. Once satisfied with the verification, equipment was divided into the 3 systems and dispatched to each of the centers. Each of the systems comprised the components shown in table 1.

Table 1: Components of each installed system

Item	Description	Quantity
1	Outback FX2024E 2000W Inverter Charger Pure Sine wave 24V Inc MATE - Display/Programmer, UTP Cable	1
2	200Ah @ 12 V Deep Cycle Sealed Maintenance Free Batteries	8
3	Class 2 Surge Arrester - Sealed Unit	1
4	Class 3 Surge arrester and Over/under voltage Protector	1
5	DC Cables, Battery Stands, Interconnection Accessories	Lot

While prescribing the systems it had be erroneously assumed that the Rwanda electrical system like most countries had an earth phase installed. This unfortunately was not the case and additional earthing material in terms of earth rods and cables had to be purchased on site. As stated in the initial report, the earth is important in protecting both the inverter and electronic equipment in general.

Based on the final quote from Ultratech (U) Ltd and the additional equipment purchased in Rwanda to ensure that the systems were properly earthed, table 2 shows the final system costs.

Table 2: Final system costs

Item	Description	Qty	Unit Cost (\$)	Amount (\$)
1	Class 2 Surge Arrester - Sealed Unit	3	40.00	120.00
2	Class 3 Surge arrester and Over/under voltage Protector	3	40.00	120.00
3	Deep Cycle Batteries sealed totally Maintenance free	24	280.00	6,720.00
4	DC Cables, Battery Stands, interconnection accessories	3	200.00	600.00
5	Outback FX2024E 2000W Inverter Charger Pure Sine wave 24V Inc MATE - Display/Programmer, UTP Cable	3	2061.00	6,183.00
6	Freight USA to Rwanda	1	1,169.00	1,169.00
7	Installation Labour/Training etc	3	250.00	750.00
8	Transport/Logistics/Subsistence / Contingencies - Provision	3	200.00	600.00
9	Lightning Protection (earth rods, cables, clips etc)	1 lot	53.00	53.00
	Total			16,315.00

The total cost per installed system is therefore US\$ 5,438.33 in terms of hardware and installation costs. These costs exclude any duties, taxes, logistics and local transport of components within Rwanda.

3. Installation and Commissioning of Systems

Installation of the systems was carried out over three days; one day at each site by a team comprising a technician from Ultratech, two technicians from Central Electrical – Kigali- Ultratech’s appointed local agent and two engineers from ESDA. ESDA inspected, tested and commissioned the systems. Annex 1 presents a simplified version of the inverter battery backup, the key indicators and the dos and don’ts. This handout was used extensively during the training.

As indicated in section 2, additional purchases for earthing equipment had to be made to facilitate ‘up-to-spec’ job completion regarding lightning protection for the inverter and electronic equipment used with the power backup.

Coincidentally, the installation of the power backup systems came at a time when the Rwandan electricity supply is facing a hard time, with increased outages and power ration as a result of decreased generation capacity. This means that while the telecenter managers still have to monitor the availability and sufficiency of grid power to charge the battery backups, they may have to bring in generators to supplement the charging sooner than expected. The power backup will however still offer substantial savings in terms of diesel or petrol consumption and ensure availability of telecenter services whenever there is grid or generator power failure.

In the light of potential decreased availability of grid power, additional charging points for use with generators were provided during the installation. AED will need to monitor the developments very closely for the first 2 weeks to facilitate feedback, especially on the impacts of the cost benefits of using the power backups. Annex 2 shows the job completion certificates for the three systems.

4. Training

To facilitate maintenance and day to day trouble shooting in the even of system failure, each telecenter owner had been tasked with the responsibility of identify at least two technicians or technical personnel to be trained on the installation and maintenance of the battery backup system during the installation.

Whereas guidelines for the selection of such technical personnel had been given in the initial report, all telecenter owners ended up nominating themselves and their assistants for training. While this makes business sense, some of those nominated did not meet the requirements outlined in the initial report.

Apart from going through the installation with the trainees, the trainees were taken through the function and the working of each system component. The trainees were nevertheless not taken through the detailed working of each component given that very few of the system components are user serviceable. It was however important for them to understand the system configuration so as to effectively trouble shoot in the event of system failure. They are therefore suited to operate the system, trouble shoot and solve operational problems including changeover from grid to generator and vice versa, while the functioning of the inverter is automatic.

The trainees were also taken through energy management techniques to ensure maximum utilization of stored power. These largely hinged on good housekeeping and management of computer utilization. Key areas included;

- Turning off computers when not in use for long duration especially during off peak periods and overnight.
- Setting computers and monitors to 'powersave' mode.
- Turning on and using the printers only when required
- Shutting down systems at close of business everyday

5. Warranties and Follow-Up

The equipment supplied and by extension the systems carry a warranty for a period of 12 months from date of delivery against manufacturing defects on a back to base basis. The warranty period also ensures that the telecenters have a one year service agreement with the installation company.

The warranty does not cover inadvertent use negligence, power surges and acts of God. Due to the design of the systems surges should be taken care of by the two surge arrestors in the system. It is highly unlikely that surges will get to the inverter or the equipment except in the case of extreme over voltages exceeding 270 V, a scenario that is extremely unlikely.

6. Impacts of the Power Backups on Telecenter Operation

The Gitarama telecenters was visited two days after installation of the systems to review the technical performance of the installed system, the satisfaction of the telecenter owners and the customers. Follow up was also made with the Nyanza operator to establish any issues that may have arisen during the short period of operation.

Both centers reported a higher than usual customer turnout for reportedly for two reasons; availability of electricity and quiet atmosphere. This is because similar facilities which had only backup generators experienced noise levels was uncomfortable compared to the telecenters that used quiet inverter battery backups. This factor that had initially not been considered turned out to be a very important factor in the selection of internet cafes.

Our expectation is that there will be substantial increase in revenues resulting from

- Improved availability of power and reliability of the telecenters
- Improved positive 'modern and hitech' image of the telecenters as a result of the quiet and uninterrupted operation, availability of modern state of the art computers especially in the case of Nyamata where TFT screens and VSAT connections have been installed.
- Improved customer satisfaction resulting from the above improvements

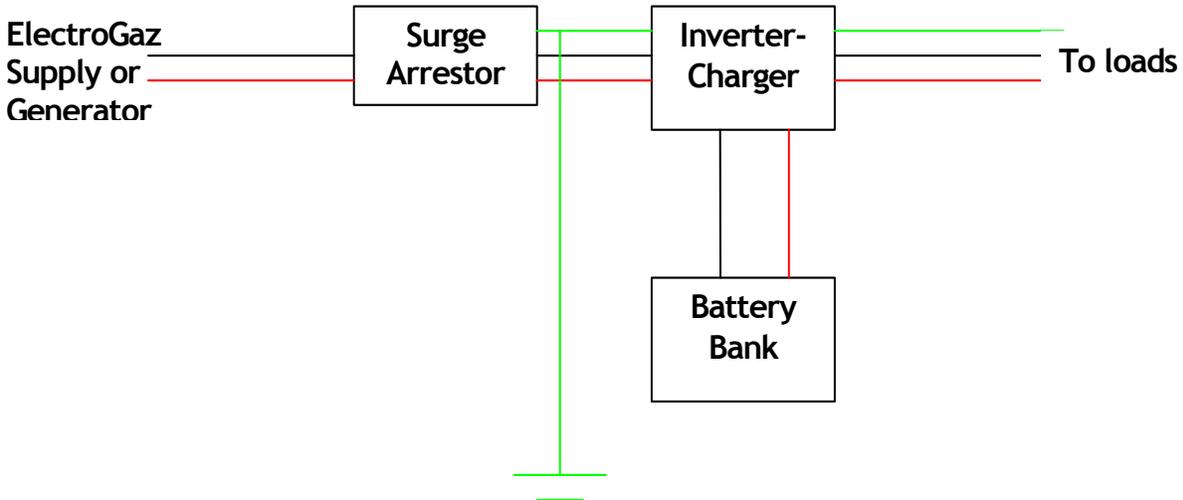
These positive attributes may even allow the telecenter operators to charge a premium fee that is slightly higher than other internet cafes and still remain competitive. This way they may be able to achieve reasonable payback periods for the power backups and set aside monies to replace batteries and extend service agreements with the installation company.

To evaluate the full impacts of the inverter battery backups on the performance of the telecenters, it will be important for AED and the telecenter owners to monitor revenues, customer satisfaction and loyalty through records and interviews with customers.

Annex 1- Your Power Back-Up System

- ✚ Your POWER BACKUP system comprises an OUTBACK inverter-charger (2kW) and a battery bank (800 Ah at 24 V). The battery bank stores power for use when there is no power from the MAINS (ElectroGaz). The system has been designed to power ONLY 10 computers, a printer and network peripherals.
- ✚ Your POWER BACKUP is designed to be charged from the MAINS (ElectroGaz) supply. It requires at least 5 hours of daily mains supply to charge to full capacity. Once fully charged, your POWER BACKUP should give you an estimated 6 hours of power in the absence of electricity from ElectroGaz supply.
- ✚ In the event that ElectroGaz supply is not available, you can charge your POWERBACKUP using a generator. A generator Charging socket has been provided.

Schematic of your POWER BACKUP



- ⚠ DO NOT use any EXTRA appliances other than those prescribed with your system.
- ⚠ Your POWER BACKUP gives a quality AC output of 240 V. This voltage is DANGEROUS and will give LETHAL SHOCKS if SAFETY is not observed. Please observed SAFETY at ALL TIMES around your system.

DISPLAY MATE

- ⚠ The system Controller and Display is used to program your POWER BACKUP. It has been programmed and locked. DO NOT attempt to program the system.
- ⚠ When your system is charging and loads running on ElectroGaz power the display Mate will show AC IN
- ⚠ When the loads are running on your POWERBACKUP the display Mate will show INV.

OUTBACK INVERTER CHARGER

- ⚠ Your inverter charger provides quality power, is fully automatic and very robust. When ElectroGaz power supply fails, the inverter will come on automatically without your loads (computer going OFF).
- ⚠ The inverter has several indicators that show the status of the system. These are:
 - ⚠ INVERTER ON – Light comes on when the inverter is ON and working

- ✚ ERROR – Light comes ON when there is a system overload or short circuit. When this happens, RESET the inverter by switching OFF the inverter and the power supply to the inverter. Switch ON again after 30 seconds. If the inverter fails to RESET Please consult CENTRAL ELECTRICALS or the AED office in Kigali
- ✚ BATTERY OK –Light comes ON when battery status is OK
- ✚ BATTERY FULL – Light comes on when batteries are full. DO NOT switch off the inverter.
- ✚ In the unlikely event of inverter failure a by-pass option has been provided to run your appliances directly from the ElectroGaz mains or from the Generator.

BATTERIES

- ✚ The batteries in your POWER BACKUP are sealed maintenance free batteries. DO NOT attempt to maintain or repair them. KEEP metallic objects AWAY from the battery bank.

LOADS

- ✚ Your POWERBACKUP is designed for 10 computers, a printer and network peripherals. DO NOT add any extra LOADS.
- ✚ NEVER use any LOAD rated 1,500 W or more with the inverter. A separate socket which operates directly from ElectroGaz mains has been provided for loads larger.

General Instructions

- ✚ Protect your POWER BACKUP from any water splashes. Serious short Circuits will occur if water comes into contact with any component of your POWER BACKUP
- ✚ For the smooth operation of your Telecenter, DO NOT TURN the Inverter OFF while the centre is operational.
- ✚ At close of business always TURN OFF the AC LOADs supply OFF. This will ensure that all loads are turned off and the inverter will not consume any of the power stored in the batteries.

Annex 2: Job Completion Certificates



UltraTec (U) Ltd
 Plot 4520
 Kabakigala Close
 P. O. Box 6832
 Kampala
 Uganda

Tel: +256 41 501620
 Fax: +256 41 501619
 mail: ultratecug@usa.net

Job Completion Log Sheet

CLIENT	USAID
ADDRESS	RP 2148, KIGALI - RWANDA
TELEPHONE NO	
SYSTEM DESCRIPTION	POWER BACKUP SYSTEM
SITE NAME	RYAN 2A
SITE CONTACT PERSON	MR. MOHAMED ABDEL AZIZ KAMUNZI
DATE	21/09/04
ARRIVAL TIME	1:30 PM
DEPARTURE TIME	5:05 PM

DETAILS

INVERTER	OUTBACK FX2024 -- OUTBACK INVERTER CHARGER
SERIAL NO	FX 02662
BATTERY BANK	8*200AH FIRST POWER BATTERY AT 24 VOLTS DC
SYSTEM DETAILS AS INSTALLED	Two back up was installed tested with seven computers, more have computers to be added on. All earthing was done ok.

SITE ENGINEER'S REMARKS	The system was installed as designed and working ok, his wiring was checked.
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CLIENT'S REMARKS	It's ok. I will be on site to receive the new set. We need the receipt for the inverter. It is better for the Kigali technicians to send it as soon as possible.
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FOR AND ON BEHALF OF CLIENT USAID-KIGALI	FOR AND ON BEHALF OF ULTRATEC (U) LTD
NAME: Mohamed Abdel Aziz Kamunzi	NAME: MURAMUSU RICHARD
DATE: 21/09/04 TIME: 5:10 PM	DATE: 21/09/04 TIME: 5:05 PM
SIGNATURE: <i>[Signature]</i>	SIGNATURE: <i>[Signature]</i>
MOBILE NUMBER: 08 5176 03 (Kigali)	MOBILE NUMBER: 07198 5301

Ultra Tec (U) Ltd



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 Kabaigala Close
 P. O. Box 6832
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 Uganda

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 mail: ultratec@usa.net

Job Completion Log Sheet

CLIENT	USAID
ADDRESS	B.P.2348, KIGALI - RWANDA
TELEPHONE NO	0946 86 25
SYSTEM DESCRIPTION	POWER BACKUP SYSTEM
SITE NAME	MB. TELECENTER (GITARAMA)
SITE CONTACT PERSON	FELIX NKUSI
DATE	22/09/04
ARRIVAL TIME	9:30 am
DEPARTURE TIME	11:22 am

DETAILS

INVERTER	OUTBACK FX2024 - OUTBACK INVERTER CHARGER
SERIAL NO	EX 01766
BATTERY BANK	1*200AH FIRST POWER BATTERY AT 24 VOLTS DC
SYSTEM DETAILS AS INSTALLED	The system was installed tested with a load, drilling machine etc to the room was new ten computers are to be installed the work shall be done by their technician.

SITE ENGINEER'S REMARKS	The installation was done as designed and new earthing done tested.
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CLIENT'S REMARKS	All are ok, we appreciate
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FOR AND ON BEHALF OF CLIENT USAID - KIGALI	FOR AND ON BEHALF OF ULTRATEC (U) LTD
NAME: <i>Nkusi Felix</i>	NAME: <i>MASANISO RICHARD</i>
DATE: <i>22/09/04</i> TIME:	DATE: <i>22/09/04</i> TIME: <i>11:22 am</i>
SIGNATURE: <i>[Signature]</i>	SIGNATURE: <i>[Signature]</i>
MOBILE NUMBER: <i>08468628</i>	MOBILE NUMBER: <i>07198 5301</i>



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 Uganda

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Job Completion Log Sheet

CLIENT	USAID
ADDRESS	B.P.2348, KIGALI, RWANDA
TELEPHONE NO	0864 37 33
SYSTEM DESCRIPTION	POWER BACKUP SYSTEM
SITE NAME	NYAMATA / KIGALI - NYALI
SITE CONTACT PERSON	BARBARA PAUL
DATE	23rd Sept 2004
ARRIVAL TIME	9:00 a.m.
DEPARTURE TIME	3:10 p.m.

DETAILS

INVERTER	OUTBACK FX2024 - OUTBACK INVERTER CHARGER
SERIAL NO	FX 01761
BATTERY BANK	8*200AH FIRST POWER BATTERY AT 24 VOLTS DC
SYSTEM DETAILS AS INSTALLED	The system was installed as designed tested with 4 computers it works well. UPS/ battery was installed.

SITE ENGINEER'S REMARKS	The installation is working well and everything is ok
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CLIENT'S REMARKS	Please to a mail to stay in touch with you for technical support
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FOR AND ON BEHALF OF CLIENT USAID - KIGALI	FOR AND ON BEHALF OF ULTRATEC (U) LTD
NAME: BARBARA PAUL	NAME: NIBIBANDO RICHARD
DATE: 23/9 TIME: 2:30 pm	DATE: 23/09/04 TIME: 3:10 pm
SIGNATURE: <i>[Signature]</i>	SIGNATURE: <i>[Signature]</i>
MOBILE NUMBER: 0864 3733	MOBILE NUMBER: 071 98 5301