Station management

- The station operates under the supervision of Prof. T. O. Aro as Station Scientist, and Dr. C.O. Akoshile, as Station Manager. The general guidelines for operating such station have been established in the BSRN manuals, which are to serve as guidelines.

- Two technical assistants as designated by the Department of Physics, University of Ilorin, do the day-to-day operation of the station.

- An academic staff member is to assist in data reduction, quality control, and eventual data transfer to the Radiation Data Center, Zurich, Switzerland Dr. A. Willoughby, was selected by the Department of Physics, and spent part of the Fall of 1998 at the University of Maryland, training.

- The station is to be supervised each day of the week according to a set time schedule. The technicians are to report directly to the Station Scientist or to the Station Manager. In case of absence of both the station Scientist and the Station Manager from Ilorin, a person should be designated to fill-in.

- An academic staff member is to assist with the instrumentation to ensure continuity in the operation of the station. Dr. C.O Akoshile spent four months (April-August 2002) at the University of Maryland during his sabbatical in training.

- A status report to the UMD should be provided stating the status of the weekly download and the status of the batteries, on a weekly basis by one of the technicians, through email. In case of any major breakdown in the system or instruments, an immediate fax or e-mail message should be sent to the UMD containing the detailed description of the problem. Changes to current configuration should be discussed with the University of Maryland.

- An effort should be made to locate additional synoptic information, as recommended by the BSRN protocol, and add it to the weekly reports. Possible sources of such information are close-by airports, or the GAW station. Inquiries should be made with the Nigerian Meteorological service if there is a possibility to launch a radiosonde at Ilorin, at least once a month. Ozone data from Lagos are also of interest.

The new BSRN Laboratory

A new room to house BSRN related activities has been constructed under the roof of the Physics Building, where observations are made. It was done with the support of the University of Ilorin to accommodate:

- The placing of the CR10 data logger in a controlled and weather protected environment.
- The computer, permanently connected to the to the CR10 communication

interface, and to the solar tracker's serial port.

- Uninterrupted Power Supply (UPS) permanently connected to the computer.
- Solar tracker batteries and the charging unit.
- The supplies and tools necessary to run the BSRN station.

Station Safety and Security

Security and safety measures should be set up and enforced by the Station Manager, such as:

1.*Keys:*
Four sets of keys to the station should be distributed as follows:
1. Professor T. O. Aro, Station Scientist.
2. Dr C.O. Akoshile, Head, Physics Department and Station Manager.
3. Secretary of the Physics Department to keep track of the use of the room.
4. Security Department, in case of emergency.

2.*Safety:*
Only qualified staff should perform operations. The local fire and electricity codes should be strictly observed.

3.*Duty periods:*
The designated technicians who are responsible for the day-by-day operation of the station should do all routine station work. Duty should be assumed early in the morning, at noon, and in the late afternoon, seven days a week. All instruments should be checked and cleaned, including the checking of the CIMEL sun photometer, according to the maintenance instructions. Once a week a download from the data logger should be performed, and once a month, the original data files without any pre-processing, should be sent to the UMD.

The Station Scientist will provide a copy of the weekly download to Dr. A. Willoughby on a diskette, for preliminary quality control. Dr. A. Willoughby will be responsible for the weekly check of the measurements. This includes splitting of the data, preparation of daily plots of all of the measured components for visual inspection, using software provided for this purpose. Dr. Willoughby would also prepare an attachment text files for each download, indicating the beginning and the end of the data stream and the date and time of any inconsistencies with an explanations, based on discussions with the Station Scientist. The computer in the BSRN Laboratory is permanently connected to the measuring system and the solar tracker, and should not be used for any other purpose. Ultimate goal is the direct transfer of the data from Ilorin to the Zurich Data Archive. The personnel performing
station duties are under the direct supervision of the station Manager and Station

Scientist. The Station Scientist in cooperation with the Station Manager should set up a detailed schedule.

4.*Technical notes:*
The UPS should be always off, unless there is a person using the computer. In case of power break, the computer and the monitor should be shut down immediately, to be followed by switching off the UPS. Once a month the UPS should be fully charged in the continuous presence of a technician. In case of power break, the charging should be postponed and continued at another time. Full charge of the UPS is indicated by numbers of 90.00 or 99.99 on the front display (without load). Once a week the CR10 storage module should be downloaded to the hard disk of the PC. In case of power failure, the download should be completed before switching off the PC and the monitor and the UPS.

Three times a day (early morning, noon, and late afternoon) the technicians should check the sensors, the signal cables, and status of the batteries, perform necessary instrument maintenance, and report in writing to the Station Scientist, any unusual situations.

Batteries are numbered (from 1 to 12) and the charging conditions of each battery should be recorded regularly. Battery status should be logged daily. Stand-by batteries are kept at 12.8 - 13.2 V nominal full charge. DO NOT LET ANY BATTERY TO DISCHARGE BELOW 11 V. During prolonged power failures, use the stand-by batteries. After running out of the stand-by batteries, use the generator. If still there is no power, then SHUT DOWN THE SOLAR TRACKER. This is a last resort to save the batteries, even if measurements are not taken.

The CR10 data logger should not be left without power at any time. Data logger stand-by batteries may be alternatively charged by the 20 W spare solar panel of the CIMEL, through the spare charge controller.

Frequent cleaning of instruments is required. The PAR sensor surface should be checked more frequently during daytime, and if necessary, the dust deposit should be blown off. During the transition between the Harmattan and the rainy seasons, the sensor surfaces should be checked for the residuals of the rain and cleaned if necessary. After each heavy tropical storm the functionality of all sensors should be checked (leveling, connectors, cables, desiccants, etc.).

The collimator tube of the CIMEL sun photometer and the Teflon filter of the temperature-humidity probe (and it's shield) should be checked once a week for obstacles created by spiders and other insects. Before checking the collimator tube, the sun photometer should be set to 'park' position in manual mode. With one hand, keep firmly the optical head and loosen the locking belt. Next, loosen the collimator locking screw at the opposite end. After checking or cleaning the tube, restore the original setup.

The locking belt should be at the end of the optical head on the collimator side.

Check also the aiming, activating the 'go sun' sequence. When finished, check the time and restore the 'auto' mode. The continuity of the operation of the station is highly dependant on the conditions of the batteries. The batteries must be kept in excellent conditions.

The CIMEL instrument was designed for stand-alone operation based on solar cells, charging circuits and batteries. Out of the four CIMEL batteries, only the 5 Volt internal CIMEL battery status is reported in almost real-time via the METEOSAT satellite. The status of the transmitter battery is not reported. Therefore, the 12 Volt transmitter batteries should be checked at the site, and maintained at or above 12 Volts. The two external CIMEL batteries should be at 5.5 Volts or above (each). In case of decreased voltage, the solar panels and the charge controller should be checked and replaced if necessary. A very slow decrease of the transmitter battery may be anticipated due to the more frequent communication with the satellite. In such case, the 10 or 20 W spare solar panel may be connected parallel to the two solar panels that are already installed. If the transmitter battery still drops below 11.0 Volts, stop the transmitter and the DCP by disconnecting the battery cable, replace the transmitter battery temporally with a 7 Ah back-up battery and reconnect the battery cable. After this, set the DCP clock to match the CIMEL clock and activate the unit. In two-three days the solar panel of the CR10 back-up battery will fully charge the 12 Volt transmitter batteries. Put back the transmitter battery into the CIMEL control boxes in the same way as the CR10 back-up battery was installed.

The CR10 data logger may operate for two or three days without charging. After this time period, connect a fully charged back-up battery to the 'ext' terminal and then disconnect the 'int' terminal and remove the discharged battery. Set this battery for charging, using the 20 W solar panel. The switch in the CR10 power supply compartment should always be kept in ?on' position, independently of the status of the charge indicator (red LED). If the switch is turned into the ?off' position, the CR10 will be cleared Therefore, never disconnect both the internal and external batteries simultaneously, if the charge indicator is off and the switch is in ?on' position. Once the CR10 is reset, all information on the collected data and the processing program will be lost without a chance to restore them.

The solar tracker is very sensitive to the battery status. This unit operates with two big12 Volt 75 Ah car batteries. The series connection of this two batteries supply 24 Volts needed for the tracker's operation. The 2-3 A current drain during daytime allows two days of continuous operation of the unit without battery charging. In case of longer power break, either disconnect the batteries to protect them from permanent damage or connect the battery charger to generator, until they are fully charged. After sunset, the tracker returns to its home position and enters ?sleeping' mode with minimal current drain.