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MANUAL DE OPERAÇÃO DOS PROGRAMAS
PARA ANÁLISE DE DADOS DO SISTEMA
DE RADIOMETROS

RUC - CETUC SES-01/87. ✓

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**MANUAL DE OPERAÇÃO DOS PROGRAMAS PARA
ANALISE DE DADOS DO SISTEMA DE RADIOMETROS
CETUC - SES-01/87**

PROJETO SES - ATIVIDADE 2

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CETUC

**CENTRO DE ESTUDOS EM TELECOMUNICAÇÕES
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I - INTRODUCTION

This manual describes how to use the software to retrieve and analyse data from radiometer systems and raingauges used in the 12 GHz PROPAGATION MEASUREMENTS/CANADA - TELEBRAS COOPERATION PROGRAM. The data retrieval and analysis is being carried out by CETUC, as part of the activities of the project Simulação de Enlaces Satélite (SES). The software for these tasks has been supplied by the Canadian Research Centre (CRC), together with the measurement equipment.

The two following sections describe the use of the data retrieval routines and the data analysis routines of program ATTEN. Also, a quick reference guide for commands that can be used when a microcomputer is local or remotely connected to a radiometer indoor unit is included as a last section. A more detailed description of these commands, their objectives and cautions that should be taken when using them can be found in the manual "12 GHz Propagation Measurement System - Volume 1 - Dual Slope Radiometer and Data Acquisition System", supplied by Diversitel Communications Inc.

II - DATA RETRIEVAL ROUTINES

The data retrieval routines are stored in directory ATTEN.

The program name is also ATTEN.

Run the program. The main menu is displayed, as follows

```
Retrieve data
Plot data
Plot cumulative distribution
Replot last cumulative distribution to screen
Replot last cumulative distribution to plotter
Print last cumulative distribution report
Exit program
```

Select Retrieve data and ENTER.

Displays

```
Manual data retrieval
Main menu
```

Select Manual data retrieval and ENTER.

Displays

```
Radiometer Data Acquisition Program
Hit any key
```

Hit any key

Displays

Connect Radiometer
Configure
Collect files
Exit

Select Connect Radiometer and ENTER.

Displays a list of sites:

RIO	CJMI:
BELEM	<TELEPHONE NUMBER>
MANAUS	<TELEPHONE NUMBER>
PONTA DAS LAGES	<TELEPHONE NUMBER>

Select a site and ENTER.

The screen now displays the fact that a connection has been made and that the computer is now connected as a terminal. It is possible at this point to transfer data as they will be received to the printer for a permanent record. This is advisable for the Summary Block.

Hit ESCAPE.

Displays

Get summary block
Get radiometer block
Get raingauge data
Return to main menu

Select Get summary block and ENTER.

Enter date as YY MM DD and press ENTER

The program will retrieve the summary block for the selected date, and save it in a file named YMMDD.SSN (SN is site number).

Displays

Get summary block
Get radiometer block
Get raingauge data
Return to main menu

Select Get radiometer block and ENTER.

Displays the summary block and highlights each block for which the variance exceeds the value set in the configuration file. Additional hour blocks may be added to or deleted from this list by moving the pointer to the desired hour block and pressing INSERT. When the list is correct, press ENTER.

The program will retrieve each radiometer data block and save it in a file named YMMDDHH.RSN. The pointer indicates the data block which is being retrieved. The number of bytes transferred is displayed in the upper right corner of the screen.

Displays

- Get summary block
- Get radiometer block
- Get raingauge data
- Return to main menu

Select Get raingauge data and ENTER.

The program will retrieve the raingauge data for the selected date and save it in a file named YMMDD.GSN.

Press ENTER

Displays

- Get summary block
- Get radiometer block
- Get raingauge data
- Return to main menu

Select Return to main menu and ENTER.

All data for the selected date have been retrieved and are stored in separate data files. It is necessary to merge these files into a single file for the data analysis program.

Displays

- Connect Radiometer
- Configure
- Collect files
- Exit

Select Collect files and press ENTER.

The source directory is displayed. ENTER.

The destination directory is displayed: select proper directory and press ENTER.

Enter date as YMMDD and press ENTER.

Enter the radiometer number (13 for Rio de Janeiro, 12 for Belem, 11 for Manaus and 10 for Ponta das Lages) and press ENTER.

The screen will display whether or not a file exists for the selected date. Normally, no file will exist, or, if one exists, the data blocks just retrieved are current. Hence, enter 0 for Overwrite and press ENTER.

The program will select data files in turn and create a new file. The source files are not destroyed at this time. They will be erased by entering Y for yes, pressing ENTER for no.

For safety, the program responds with Are you sure? If so, enter Y for yes. The source files will disappear one by one.

Displays

- Connect Radiometer
- Configure
- Collect files
- Exit

Select Exit and ENTER.

For safety, the program responds with Are you sure? If so, enter Y for yes.

Displays

- Manual data retrieval
- Main menu

Select Main menu and ENTER.

This will transfer control to the data analysis program.

II - DATA ANALISYS ROUTINES

The data analisys routines are stored in directory ATTEN.

The program name is also ATTEN.

Run the program. The main menu is displayed, as follows

- Retrieve data
- Plot data
- Plot cumulative distribution
- Replot last cumulative distribution to screen
- Replot last cumulative distribution to plotter
- Print last cumulative distribution report
- Exit program

1. TO PLOT RAW DATA RECORDS:

Select Plot data and ENTER.

Displays

Plot Raw Data Menu

Sites	Year	Month	Day	Hour	Data
Ponta das Lages Manaus Belem Rio de Janeiro					
					Select site

Select site and ENTER.

Select year and ENTER.

Select day and ENTER.

Select starting hour and ENTER.

Select finishing hour and ENTER. The menu is displayed as shown below.

Plot Raw Data Menu

Sites	Year	Month	Day	Hour	Data
Rio de Janeiro	1987	DEC	21	00 12 01 13 02 14 03 15 04 16 05 17 06 18 07 19 08 20 09 21 10 22 11 23	Radiometer A Radiometer B Raingauge Next Site Plot to screen Plot to plotter Main Menu
					First Site
					Select item/activity.

Select data to be plotted. Either radiometer data, raingauge data or both can be selected. Also, two sites data can be plotted simultaneously using the Next Site option. Press ENTER after each choice.

Select Plot to Screen and ENTER or

Select Plot to Plotter and ENTER.

After the plotting is finished, press ENTER to return to the Plot Raw Data Menu.

Select another plot or Main Menu to leave raw data plotting routine.

2. TO PLOT OR PRINT CUMULATIVE DISTRIBUTIONS

Select Plot cumulative distribution and ENTER.

Displays

Plot Cumulative Distribution Menu

Sites	Start date	Stop date	Hour	Data
Ponta das Lages Manaus Belem Rio de Janeiro				
				Select site

Select site and ENTER.

Select Start Date:

Start date is selected by moving the pointer to the year and using the up and down arrow keys to move forward or back in time and pressing ENTER; repeat this procedure for the month and the day.

Select Stop Date:

Stop Date is selected in the same way as Start Date.

The menu is displayed as shown bellow.

Plot Cumulative Distribution Menu

Sites	Start date	Stop date	Hour	Data
Rio de Janeiro	87 DEC 01	B7 DEC 31 Invalid	00 12	Radiometer A
			01 13	Radiometer B
			02 14	Raingauge
			03 15	Joint distribution
			04 16	Next Site
			05 17	Plot to screen
			06 18	Plot to plotter
			07 19	Main Menu
			08 20	
			09 21	First Site
			10 22	
11 23	Select item/activity			

Select Radiometer and ENTER or

Select Raingauge and ENTER.

If plotting a joint distribution,

Select Joint Distribution and ENTER

Select Next Site and ENTER

Repeat the procedure from selecting site on.

Select Plot to screen and ENTER or

Select Plot to plotter and ENTER.

While loading the files, the screen will display the percentage of files loaded. After finishing the plot press ENTER to return to the Plot Cumulative Distribution Menu.

Select Main Menu and ENTER.

The last calculated and plotted cumulative distribution can be replotted either to screen or to plotter by selecting the proper option in the main menu and pressing ENTER. This distribution is also saved in a file named LCMUL42.TMP, after calculated. To have a printed output of the contents of this file,

Select Print last cumulative distribution report and ENTER.

IV - COMMAND REPERTOIRE

Communication between the indoor unit and a terminal or remote computer is controlled by a series of commands, some of which include one or more optional parameters. The commands are not case-sensitive. A complete list is given below.

SUMMARY OF COMMANDS

CALL [(A or B)]	Start <u>C</u> ALibration
CLR [(A or B)] [=X]	Set or read <u>C</u> LEAR sky temperature
DATE [=YY/MM/DD]	Set or read <u>D</u> ATE
END	<u>E</u> ND communications
HELP [command name]	Display <u>H</u> ELP file
? [command name]	Display <u>H</u> ELP file
ID	<u>I</u> Dentify equipment
MD (C or V)	Set <u>M</u> oDe
ND [(A or B)] (ON or OFF)	Turn <u>N</u> oise <u>D</u> iode on or off
NAV [(A or B)] [=X]	Set or read <u>N</u> umber of <u>A</u> VERAGES
OS	<u>O</u> utput <u>S</u> tatus to terminal
PASSWORD	Change <u>P</u> ASSWORD
PROMPT	Change <u>P</u> ROMPT string
RA [YY/MM/DD HH [MM]]	Read <u>R</u> adiometer <u>A</u> data block
RB [YY/MM/DD HH [MM]]	Read <u>R</u> adiometer <u>B</u> data block
RG [YY/MM/DD]	Read <u>R</u> ain <u>G</u> auge data block
RDT	Read <u>D</u> ate and <u>T</u> ime



RM [YY/MM/DD]	Read <u>M</u> essage
SB [YY/MM/DD]	Read <u>S</u> ummary <u>B</u> lock
SM	<u>S</u> tore <u>M</u> essage
TIME [=HH/MM/SS]	Set or read <u>T</u> IME
VL [=X]	Set or read <u>V</u> ariance <u>L</u> imit

Where applicable, the [] brackets indicate an optional parameter. For example, [YY/MM/DD HH [MM]] indicates that specification of the date is optional. If the date is specified, they default to their current values.

The () brackets indicate that either one or the other of the parameters must be specified. If the () brackets are enclosed within [] brackets, the specification of one or the other parameter is optional.

For convenience, additional editing keys are provided. The reverse slash key copies the previous command character by character into the current command. The broken vertical bar (upper case reverse slash) copies the remainder of the previous command into the current command. The backspace key deletes the previous character in the current command.

Data transmission is affected by three control characters. The <CTRL>C character terminates the data transmission and returns control to the command prompt. The XON/XOFF protocol is implemented. Data transmission is temporarily halted by the <CTRL>S character. The unit resumes data transmission on receipt of the <CTRL>Q character.

DESCRIPTION OF COMMANDS

1. CALibrate [(A) or (B)]

The CALibrate command initiates a calibration procedure for each radiometer connected to the indoor unit. Each radiometer may be calibrated separately by specifying the optional suffix (A or B).

Calibration during precipitation is undesirable. At the beginning of each hour, the mean and variance of the preceding hour's data are calculated. If the variance does not exceed the variance limit, it is assumed that no precipitation has occurred and each radiometer is calibrated automatically.

2. CLeaR sky antenna temperature [ex]

The CLeaR command sets the temperature assumed for the clear sky and used in the radiometer calibration. If no temperature is specified, the current value of clear sky antenna temperature is returned.

3. DATE [=YY/MM/DD]

The DATE command sets the current date to the specified date. Each parameter may be one or two digits (ie., leading zeroes are not required). The delimiter may be any non-digit printing character. Invalid dates are rejected. If no date is specified, the current date is returned. It is inadvisable to set the date or time during a precipitation event.

4. END

The END command transmits the message DISCONNECT and terminates the connection by dropping the DTR line.

5. HELP [command name]

The HELP command returns the command repertoire and a compressed description of some additional features. Additional information concerning specific commands is available by including the name of the command in the request. The command string 'HELP' and '?' are equivalent.

6. IDentify

The ID command returns the identifying data, including the serial number of the indoor unit and the serial number and operating frequency of the radiometer(s).

7. MoDe (C or V)

The MoDe command determines the format of the response to the Radiometer A, Radiometer B, RainGauge, Summary Block, END and MoDe commands.

The MoDe Verbose command provides responses in a form suitable for display in a normal terminal.

The MoDe Compressed command provides responses in a binary format suitable for storage as data files. Since no parity is transmitted, all 256 codes are possible, and a reasonable transmission efficiency results.

The END command sets the mode to verbose.

8. Number of AVGrages [n]

The NAVG=n command sets the length of the running average used in the computation of the antenna temperature displayed on the front panel and stored in memory. Permitted values of n lie between 1 and 30 inclusive.

9. Noise Diode [(A or B)] (OFF or ON)

The ND command turns the noise diode on (ND ON) or off (ND OFF). To prevent inadvertent corruption of radiometer data, the noise diode is turned off automatically after 10 minutes.

10. Output Status

The OS command returns additional information concerning the radiometer at the time the command is executed.

11. PASSWORD

The PASSWORD command allows the log-in password to be changed. To reduce the probability of storing an incorrect password, the new password must be entered twice.

12. PROMPT

The PROMPT=<string expression> command sets the prompt (the string which is transmitted following completion of each command) to the <string expression>. The prompt is specific to the serial channel in use. Special characters can be included in the string using a pair of characters beginning with the \$ symbol according to the following list.

newline	\$n
horizontal tab	\$t
backspace	\$b
carriage return	\$r
form feed	\$f
dollar sign	\$\$
equal sign	=\$
any 8 bit character	\$\$\$xx

where xxx is the character code in decimal

13. Read Date and Time

The RDT command transmits the location identifier and the current date and time. The location identifier, stored in read-only memory, is unique to the indoor unit.

14. Radiometer A [YY/MM/DD] HH [MM]

The RA [YY/MM/DD HH [MM]] command returns data from radiometer A in a format determined by the mode and optional parameters.

Command format	Response
RA	Current mode, current date and time
RA YY/MM/DD HH	Current mode, specified date and time
RA YY/MM/DD HH MM	Current mode, specified date, hour and minute (valid only in verbose mode)

In compressed mode, a one-hour data block consisting of 1810 bytes is transmitted.

In verbose mode, a six-minute data block is transmitted in an easily-readable form. If the time is not specified, the data block begins five minutes before the current minute, except that the block must lie within the current hour.

15. Radiometer B [YY/MM/DD] HH [MM]

The RB [YY/MM/DD HH [MM]] command returns data from radiometer B in the format described above for radiometer A.

16. RainGauge [YY/MM/DD]

The RG [YY/MM/DD] command returns rain gauge data in a format determined by the mode and optional parameters.

Command format	Response
RG	Current mode, current date
RG YY/MM/DD	Current mode, specified date

In compressed mode, a one-day block is transmitted.

In verbose mode, the time of each rain gauge tip is transmitted in easily-readable form, provided fewer than 100 tips occurred. Complete rain gauge data can always be obtained in compressed mode.

17. Read Message [YY/MM/DD]

The Read Message command returns messages previously stored in memory on the specified date by the Store Message command. If no date is specified, all messages stored on the current date are returned. Messages can be retrieved through either the internal modem or serial port 1. In conjunction with the Store Message command, the indoor unit may be used as a mailbox to record meteorological data for subsequent retrieval by the central location.

18. Summary Block [YY/MM/DD]

The Summary Block command returns the mean and variance of the antenna temperature stored for each clock hour and the number of raingauge tips recorded on the specified date. If no date is specified, the summary block for the current date is returned. The format is determined by the current mode (verbose or compressed).

In the verbose mode, the summary block is transmitted in an easily-readable form consisting of four columns of the mean temperature and variance with each row identified by the hour of the first column.

In the compressed mode, a summary block consisting of 204 bytes is transmitted.

In compressed mode, the mean and variance of both radiometer A and radiometer B are always transmitted. If no data are available, both mean and variance are returned as zero. Thus, the block length is fixed at 204 bytes.

19. Store Message

The Store Message command transfers data received from either the internal modem or serial port 1 into the memory of the indoor unit. Since the message is terminated by two consecutive <cr>, a single <cr> may be inserted at any point in the message. Each message is identified by date and time.

Messages are retrieved from memory with the Read Message command.

20. TIME [=HH:MM:SS]

The TIME command sets the current time to the specified time. Each parameter may be one or two digits (ie., leading zeroes are not required). The delimiter may be any non-digit printing character. Invalid times are rejected. If no time is specified, the current time is returned.

It is inadvisable to set the date or time during a precipitation event.

21. Variance Limit [=x]

At the beginning of each hour, the mean and variance of the preceding hour's data are calculated. If the variance is less than the limit specified by the VL=x command, it is assumed that no precipitation has occurred and each radiometer is calibrated automatically.