ADCON TELEMETRY

A75*x* addWAVE Series 4 A753/A755/A757

User Guide

SMART WIRELESS SOLUTIONS

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Contents

Chapter 1. Introduction

This manual explains the hardware aspects of Adcon's A753 addWAVE Series 4 remote telemetry units, including installation issues and certain parameter configurations. The manual is divided as follows:

- *Introduction*, which gives some general information and document conventions.
- *Using the addWAVE*, which details the installation and use of the remote telemetry unit.
- *Performing Advanced Functions*, which discusses connectors and controllers and provides other information for advanced users.
- *Specifications*, which describes operating parameters for the devices.

About the A753 addWAVE Series 4

The A753 addWAVE Series 4 remote telemetry unit (RTU) is a low-power telemetry device with four digital
I/O ports, twelve analog inputs, and four counter inputs.

The A753 is a ruggedized RTU, complying with the IP65 ingress protection class (NEMA 4). Depending on topography, it ensures a reliable wireless connection to other A73x RTUs or an A840/A850 Telemetry Gateway over a distance of up to 20km (12 miles).

Due to its construction as well as to the software controlling it, the power consumption is extremely low. The unit operates off an internal 6.2 Volt rechargeable battery, which is charged either by a solar panel or an external power adapter.

Compliance Statement and Warnings

The A73x must not be used with an antenna other than the one supplied by Adcon (or an antenna with identical technical specifications).

Conventions

Certain conventions apply in this document.

Italics	Indicate that the text is variable and must be substituted for something specific, as indicated in the explanation. Italics can also be used to emphasize words as words or letters as letters.
Bold	Indicates special emphasis of the text. Also indicates menu names and items in a window.
`fixed font`	Indicates characters you must type or system messages.
File ⏩ Save	Indicates menu selection. For example, select the **File** menu, then the **Save** option.
Note	Indicates information of interest. Notes appear **after** the information they apply to.
CAUTION	Indicates that you may get unexpected results if you don't follow the instructions. Cautions appear **before** the information they apply to.
WARNING	Indicates danger to yourself or damage to the device if you don't follow the instructions. Warnings appear **before** the information they apply to.

Chapter 2. Using the addWAVE

The A753 addWAVE remote telemetry unit (RTU) is part of the A7*xx* series. For testing purposes, you should have an A840 or A850 Telemetry Gateway with access to the internet installed before you install the A753 RTU. For information about installing the A840 or A850, refer to device's user's guide.

Opening the packages

The addWAVE RTU package contains the following items:

- A753UHF Series 4 RTU (or A752 or A751)
- an antenna including a mounting bracket and a 3 m (9 ft.) cable
- three ring clamps (one for tightening the mounting bracket of the antenna)

If ordered, the following items come in separate packaging:

- solar panel with ring clamp
- set of aluminum poles
- LED tool

Make sure you have received all the equipment and read through the instructions that follow. When you are sure you understand them, you are ready to install your RTU.

Figure 1 shows the front view of an addWAVE RTU.

Figure 1. addWAVE RTU (A753)

Installing the RTU

In general, the typical "line-of sight" distance the RTU can communicate is 10km (6 miles). This is valid if both the RTU and its partner device are mounted on a 3 m mast (9ft.); the results may vary under different conditions, and you can sometimes achieve greater distances.

As with all wireless communication devices, the higher the transmitter is installed, the better the communication will be.

All A75x devices accept the standard Adcon sensors (A751 excluded).

Field Installation

Installing a preset A753 in the field is a fairly simple process. By performing a connectivity check using an LED tool (not included in the delivery of a A753, but available from Adcon), you will be able to prove connectivity to your current radio network.

The LED tool is shown in Figure 2.

Figure 2. LED tool

Note: *The LED tool is a blind plug to be connected to the SOLAR connector.*

Follow these steps to install an A753 in the field:

1. Review the installation area and choose the best site.
2. Assemble the pole set.
3. Put an Adcon plastic cap into the top of the pole and secure it with a pipe clamp to protect the top of the pole from damage.
4. Using a hammer, drive the 80 cm aluminum rod into the ground.
5. Using the pipe clamp supplied, fasten the solar panel onto the pole. Make sure that the panel is facing south (north if you are located in the southern hemisphere) and out of the way of the A753 RTU.

Note: *The solar panel can be mounted under or behind the A75x RTU, but make sure that the RTU does not shadow the panel.*

6. Fasten the A75x RTU to the top of the pole with a pipe clamp. Adcon recommends that you perform a connectivity test, if you can, to check the positioning of the device.

WARNING *If you turn the fastening screws too tightly, you could damage the connectors.*

7. Attach the sensors to the I/O connectors and the solar panel to the POWER connector by turning the plugs' fastening screws clockwise until secure.
8. If you have SDI-12 sensors, attach the respective sensors.

This completes the installation of your A753. If the SOLAR CELL connector or the DC INPUT connector is left unused, use the cap provided to protect it against moisture and dust. Be sure to keep the following information in a place you can remember:

- Serial number of the A753 (printed on the type plate)
- Location of the A753

Note: *This information will be necessary during the configuration of the device at the A850 Gateway.*

More about the LED Tool

The LED tool allows you to rapidly check the status of an A753. See Table 1 on page 10 which describes the LED blinking codes for the A753.

A broadcast is sent to other stations when you plug in the LED tool. Wait approx. 30 seconds for completion of this broadcast, but look at the LED tool.

If the A753 is heard by another RTU, it will receive an answer from that station. When the broadcast is completed, the LED tool will make a long flash to signal this event. Then, for every other received RTU, the LED tool will make a short flash. Simply count the flashes and you know how many station can be reached from this RTU (we call it connectivity test).

After this connectivity test, the unit flashes rapidly to let you know the unit is alive. These flashes occur every half second.

If the internal battery level drops below 5.6 volts, the unit will enter the *misery* state. In this state the unit reduces its activities to a minimum. Communication over the serial communication cable is not possible. Only the internal real-time clock is maintained and the power management functions are performed.

Furthermore, when the internal battery level drops below 5.2 volts, the system switches completely off, effectively decoupling itself from the battery in order to protect it.

Note: *If the LED tool was connected to the A753 when the unit shut down, the LED tool will restart the A753, which will initiate a shutdown again. If this happens to you, disconnect the LED tool and replace/recharge the battery. (This does not apply if a solar panel is connected to the SOLAR connector.)*

Table 1. LED Tool Blink Codes

State	Blink Code	Description
Misery mode	Short flash every second	Battery voltage below 5.5V but above 5.0V. Sensors are not sampled.
Normal mode	Short flash every 1/2 second	RTU voltage is > 5.5V. RTU is up and running.
Broadcast	Long flash and then one short flash for every heard station	Connectivity test

Configuring an A753 in the Telemetry Gateway

To configure the A753 with an A850 Telemetry Gateway, refer to the *A850 Telemetry Gateway User's Guide*.

Maintaining and servicing the RTU

An A753 Series 4 addWAVE needs virtually no maintenance. It is waterproof and designed to withstand harsh environmental conditions (-30 to +70 °C, or -22 to 158 °F), high RH values, water, and other non-corrosive liquids. It conforms to the European protection class IP65. This applies also to the connectors, as long as they are mated. Don't let unmated connectors on either the addWAVE RTU or the sensors be exposed to the environment for extended periods of time as this will seriously degrade their functionality.

The RTU battery

- The internal battery supplies 6.2 volts and consists of a NiMH pack. The internal electronics manage the battery's charging/discharging process, ensuring it a long life time. This approach, coupled with a remarkably low average power consumption, allows an addWAVE RTU to operate at least two weeks on a fully charged battery, as long as the analog and the counter values are stored in the internal memory every 15 minutes.

Table 2 shows the addWAVE device's expected operation time on a fully charged battery under various conditions.

Table 2. addWAVE Device Operation Time

Radio Activity	Sampling Rate	Average Consumption (mA)	Estimated Operation (days)
No	no sensors	0.85	132
Low	no sensors	2.8	40
Heavy	no sensors	5	22
Low	900/3	4.2	26
Low	900/15	6.3	17
Heavy	900/15	9	12

However, if for some reason (wear-out or accident) the battery loses its capacity (noted in the software with repeated "Battery low" messages), it must be replaced. Make sure though, that the problem is really due to the battery and not to a defective or dirty solar panel.

Adcon highly recommends that you frequently check and clean your solar panels. Rain and dust can cover the solar panel's surface with a thin layer of dirt, effectively reducing its power output. Surrounding vegetation can also lower panel efficiency.

Replacing the battery

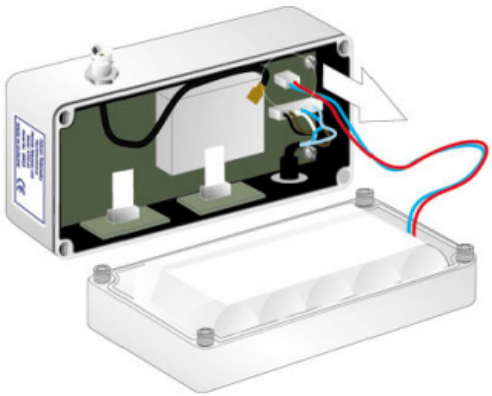
If you have verified that the battery needs to be replaced, follow these steps to do so:

1. Open the lid by unscrewing the four screws in the corners of the A75x RTU, then remove the lid as shown in Figure 3.

Figure 3. Removing the A75x Lid

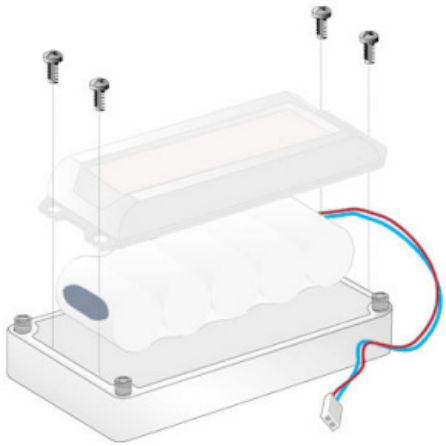
2. The battery pack is connected to the electronics board by means of a PCB connector. Remove the battery pack's plug from the PCB connector, as shown in Figure 4.

Figure 4. Unplugging the PCB Connector



3. Unscrew the four screws of the plastic cover that holds the battery pack in place, then remove the cover. Figure 5 shows this step, revealing the A753 battery pack inside the RTU.

Figure 5. A753 Battery Pack



4. Remove the battery pack and replace it with a new one (obtainable from Adcon).
5. Put the plastic cover back into position and fasten the four screws.
6. Insert the battery plug into the PCB connector.

WARNING *Be sure to mount the rubber gasket of the lid properly e.g. not twisted, so that the unit's IP65 environmental protection is not affected. You must also be sure to not squeeze the battery cable.*

7. Mount the lid back, taking care that the rubber gasket sealing the box is correctly in place, not twisted and free of dirt and soil.
8. Screw the four cover screws back in, applying a moderate force.

Chapter 3. Performing Advanced Functions

With the appropriate knowledge, you can configure A753 remote wireless units in the field by using a hyperterminal window. To configure the devices, you will need a special serial cable adapter (not supplied, but available from your Adcon distributor).

CAUTION *Do not try to configure your devices if you are not sure what to do—the unit might not communicate with the base station or function with the addVANTAGE software.*

WARNING *Tampering with parameters for the devices may void your warranty or damage the device. In general, the commands described in this chapter are intended for technical support staff and users with a great deal of highly technical hardware and software experience.*

Understanding Connectors

The devices have cable attachments called *connectors*. The connector type determines how the device communicates with the sensors or the computer.

The POWER Connector

The A753 RTU has a Power connector used to interact with the device. The connector features the following pins:

- Solar Input, which enables charging the internal batteries.

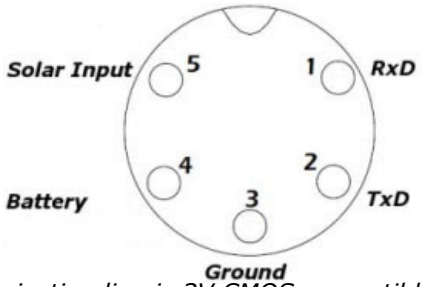
CAUTION *To charge the unit without causing damage to the batteries or the charging circuit, the electrical characteristics in Table 3 on page 14 must be maintained.*

Table 3. Charger Requirements

Parameter	Value
Output voltage	9-10VDC
Output current (limitting is required)	100-300mA

- Battery, which enables powering external circuits. The maximum current drawn by the attached circuit must not exceed 500 mA.
- RxD and TxD, which are used for serial communication (19200 baud) with the A753. The pinout of the POWER connector is shown in Figure 6.

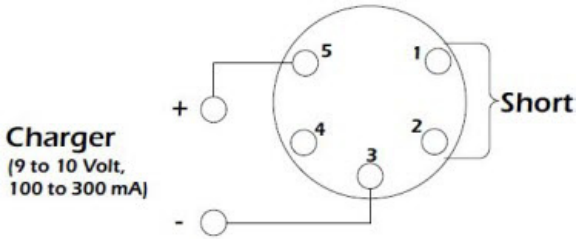
Figure 6. The POWER connector



WARNING *The serial communication line is 3V CMOS compatible. Therefore, a special adapter cable must be used to reach the RS-232 levels.*

You might want to charge the A753 with something other than the standard solar panel. In this case you must provide the electrical characteristics and configuration shown in Figure 7.

Figure 7. Configuration for charging the A753



Note: *The Charger must have a current limited output of 300mA max! A standard wall adapter will not fit this need! See also Table 3 on page 14.*

Communicating with the RTU

You can use a terminal program (like Windows Hyperterm) to connect to the A753 RTU. After you have installed the system, follow these steps to configure the device and set the default parameters:

Note: *To configure the A753, you must have a special adapter cable (item number 200.720.542 from your Adcon distributor).*

1. Plug the round connector into the POWER connector of the RTU.
2. Plug the USB connector into your PC's USB jack.
3. If you are using the serial cable the first time, please follow the instructions to install the driver.

4. Open a Hyperterminal or similar terminal application.
5. Select the appropriate serial port and click **OK**.
6. Configure your terminal as follows:
   - 19200 baud
   - 1 stop bit
   - 8 data bits
   - No parity
   - No protocol (neither hardware nor software)
7. Select **OK** to open the terminal window.
8. Press **Enter** to generate a response in the window.

Note: *The A753 has two command line modes, **bootloader** and **firmware**. The RTU won't respond to any command during the boot process (this can take up to 2 minutes after connecting the battery).*

Booting the A753

This section is included for informational purposes. You will rarely need to boot the A753. However, when you do need to do so, you will work within a Windows Hyperterminal window or similar terminal program on your computer.

Bootloader Mode

When the A753 starts from a power-up reset (such as when you connect the battery to the unit), it enters the bootloader mode. If you press no keys in the interim, the A753 enters the firmware mode in five seconds.

If you want to work with commands in the bootloader rather than continuing to the firmware mode, press the ESC button within five seconds after seeing the following sign-on message:

```
A753 with Bootloader V2.1, Firmware V2.1, Coprocessor V2.1

Copyright (C) 2011 Adcon Telemetry GmbH

Press <ESC> within 5 seconds to start the commandline interface...
```

You are in the command line interface of the bootloader. This interface enables you to perform certain commands such as upgrading to a new firmware.

Note: *If you press no keys within 60 seconds, the bootloader command line interface will start firmware mode automatically.*

The bootloaders's prompt is the character >. Therefore, when you see this prompt, you'll know you are in the bootloader mode.

Commands available in Bootloader Mode

For a list of the available commands, type `HELP` at the > prompt.

Note: Square brackets (like "[arg]" or "[arg1 arg2]") enclose optional arguments,which may be omitted

```
HELP
Available commands:
upgrade [type] [baudrate] ... upgrade (firmware/
coprocessor, 19200/115200)
version ... show the version of the bootloader
state ... show the board state
reboot [id] ... reboot the RTU
firmware ... start the firmware
help ... display this helptext
0
>
```

Note: The output of the HELP command may differ depending on the RTU type.

The STATE command can be used to check the battery level, solar charger state and the RTU's current temperature.

```
STATE
Battery: 6.2 V (full charge)
Temperature: 26 degree Celsius
0
>
```

Firmware Mode

When you enter firmware mode by typing the command FIRMWARE, the following message is displayed in the Hyperterminal window:

```
FIRMWARE
Checking firmware ..... found!
Checking storage ..... ok!
46339 0
#
```

The bootloader scans the program memory for a valid firmware by testing the checksum, which takes a moment. If everything is correct, the "firmware found!" message appears.

After checking the storage is done, which may take a moment, the device's identification number (for example, 46339) and error code (in this example, 0) are displayed. After another moment, the firmware mode's command line interface prompt is displayed (#).

If you need to return to bootloader mode when you're in firmware mode, enter the `REBOOT` command at the prompt.

See "Using Terminal Commands" on page 21 for commands available in firmware mode.

Upgrading the Firmware

Before upgrading the firmware, you must reboot the A753 to access the bootloader mode's command line interface. Follow the procedure described under *Booting the A753* to get into the bootloader.

Before you start the upgrade, it is very important that you copy the new firmware image to the hard drive of the computer you use in the field or store it on your USB memory stick.

You also need to know which version of the bootloader you are running. You can determine the version any of the following ways:

- Look at the bootloader's sign-on message when you start it.
- At the bootloader mode's prompt '>', enter the `VERSION` command.
- In firmware mode, enter the `Reboot <ID>` command and look at the sign-on message.
- In firmware mode, enter `VER` at the # prompt.

Now you're ready for the upgrade.

1. At the '>' prompt, enter the following command:

   `upgrade 115200`

   The upgrade process starts.

For pre-1.7 versions of the bootloader, omit the speed parameter (115200 used to be the default). For 1.7 and later versions, include the 115200 baudrate parameter. If you do not specify a baudrate, the upload runs at the default 19200 baudrate.

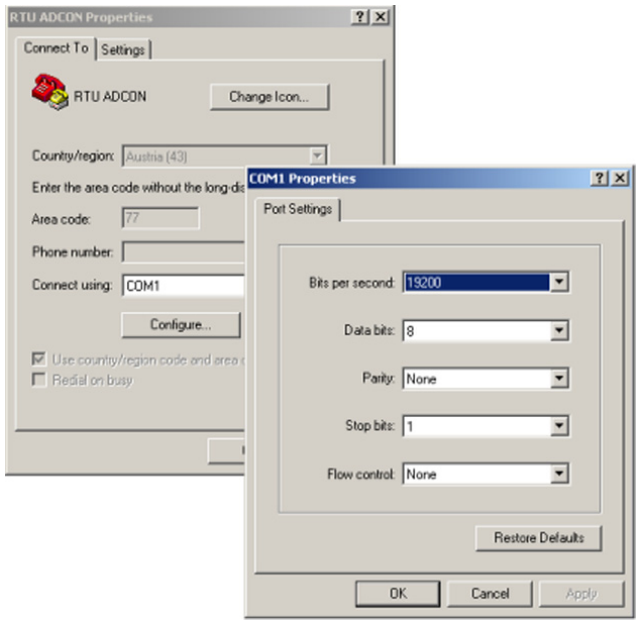
```
Change the baudrate of your terminal to '115200' and
hit <Return> to start flashing.
```

2. Select **File ⏩ Properties** to open the hyperterminal's Properties dialog.
3. Select a com port for the **Connect using** field.

Note: *If your bootloader is version 1.7 or later and you used the* `> update` *command rather than the* `> update 115200` *command, you can skip Step 4 through Step 6. The bootloader will use a baud rate of 19200.*

4. Click the **Configure** button to display the com port's Properties dialog (Figure 8 shows a COM1 com port).

Figure 8. Hyperterminal and com port properties dialogs



5. In the **Bits per second** field, select **115200**.
6. Select **OK** in the com port's Properties dialog to close it.
7. Select **OK** in the hyperterminal's Properties dialog to close it.
8. Back in the hyperterminal window, press `Enter` to continue the upgrade.

```
-------------------------------------------------

The current firmware image must be erased for the
upload.

If you continue now, you *MUST* upload a valid
firmware image for an A753!


Continue? [y/n]:
```

WARNING *When you continue with the upgrade process, any existing firmware image in the A753's flash memory will be erased! You must supply a valid image for upload or the A753 will have only bootloader capabilities (that is, it will have no radio capabilities).*

9. Enter `Y` to continue the upgrade.

   The bootloader starts sending the letter C (for connect)

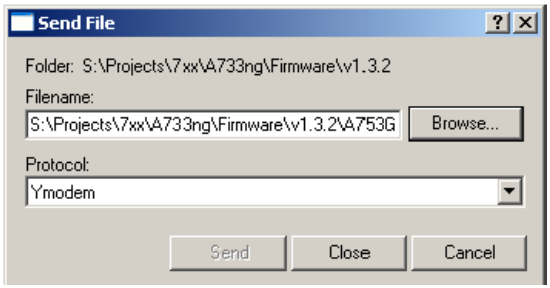
```
Starting flash blankcheck and erase process. . . done
-------------------------------------------------

Start the Y-modem upload now!

Starting CCCCC
```

10. From the hyperterminal window's menu bar, select **Transfer ▸▸ Send File** to display the dialog shown in Figure 9.

Note: *You must start the image upload within 60 seconds or a timeout will occur.*

11. Browse to and select the firmware image.
12. Select the **Ymodem Protocol** and click **Send**.

Figure 9. Dialog to upload firmware image



13. To start the new firmware, enter the following command:

```
firmware
```

Serial Communication Protocol

This protocol is based on a master sending commands and a node answering. The whole communication is conducted in plain ASCII, as strings, and numbers are represented in decimal format. All commands are terminated with a CR/LF combination. All responses (answers) are terminated with the **#** character.

General Format of a Command

The commands have the following format:

ID Command Param1 Param2 ... ParamN

- `ID` is the destination device. If you include an ID as part of a command, the node checks whether `ID=ownID`. If it does, the node executes the command on itself. If the ID is not the node's ID, the node executes the command on a remote device, if such an ID exists. If the ID is missing, this implies that the command is addressed locally.

Note: *Not all the commands can be relayed remotely.*

- `Command` is the command proper, which can be composed of a variable string of characters (for example, `SLOT`). Each node can implement a set of commands depending on the functionality of the node itself. However, as a minimum requirement, a node recognizes the `CMDS` command, which returns a list with the commands accepted by the node.
- `Param1 Param2 ... ParamN` represent the parameters, which are command dependent. If you type no parameters when you issue a command, it is the equivalent of querying for information (the **GET** version of a command). If you type parameters, you are issuing the **SET** version of a command and are setting the command to the parameters you typed.

General Format of an Answer

The answers have the following format:

ID Command Result1 Result2 ... ResultN ErrResult `#`

- `ID` is the answering device. If a command was further routed, it is the ID of the end device. The answer must always contain the ID on return.
- `Command` is the string representing the original command. It is supplied so that a master can distinguish between the answers it is waiting for, and out-of-band notifications (which may come, for example, over the radio port of a node). As with the ID, the command name must always be supplied.
- `Result1 Result2 ... ResultN` are the result values returned by the remote node. If the *`ErrResult`* is not zero, all other possible characters and/or strings until the end of the line might be ignored.
- `ErrResult` shows whether the command was successfully executed. If this value is 0, the command was successfully executed. If this value is other than 0, the command failed. The number may further indicate the error type. (See also "Returned Errors List" on page 32.)

The answer string may contain any number of spaces or CR/LF characters between its components. However, after the terminator (#), no other characters are allowed.

Using Terminal Commands

Following is an excerpt of available commands and an explanation of their use. A complete list of all Series 4 commands is available upon request.

Note: You can type uppercase or lowercase characters because the commands are not case sensitive.

CMDS

DESCRIPTION Returns a list of supported commands.

PARAMETERS None.

REMARKS **GET** only.

RETURNS A list of strings separated by spaces.

REMOTE Yes.

EXAMPLE

```
# cmds
42914 cmds ANLG ANLGTHRESHOLD AUTH CALC CNTRTHRESHOLD DPE
DYNSLOT FDEV ID INFO LVA LT LTNOTIFYTMOUT NOTIFY PMP PORT
RGE SBAT SBATC SDI SLOT SMSCHECK SST TEDS TIME TYPE VER VERB
WPEAK WVEC T XCONF XDATA XIMME 0
#
```

DATA

DESCRIPTION Retrieves data frames from RTUs earlier than Series 4.

PARAMETERS See the manual for the appropriate pre Series 4 RTU.

REMARKS Remote only. Support for pre Series 4 RTUs.

RETURNS A pre Series 4 data frame.

REMOTE Yes.

EXAMPLE

```
# 9999 DATA
9999 DATA
13 9 1999 19 26 36 21 37 255 255 79 0 0 0 0 87 148 149 15 0
0 0 0 0 0 0 0 0 3148 0
#
# 9999 DATA 9999 30/9/1999 14:50:00
9999 DATA 30 9 1999 14 54 55 21 37 255 255 77 0 0 0 0 89
156 126 20 0 0 0 0 0 0 0 0 0 3197 0
#
```

DATASDI

DESCRIPTION Retrieves SDI-12 data frames from RTUs earlier than Series 4.

PARAMETERS See the manual for the appropriate pre Series 4 RTU.

REMARKS Remote only. Support for pre Series 4 RTUs.

RETURNS A pre Series 4 data frame.

REMOTE Yes.

EXAMPLE

```
# 12800 DATASDI
12800 DATASDI
16 5 2003 20 14 49 44 60 255 255 127 87 9 0 9 3 0 0
74.379401 3 0 1 68.117003 3 0 2 58.832397 3 0 3 51.611795 3
0 4 38.346400 3 0 5 19.800799 3 0 6 14.895999 3 0 7 3.553500
3 0 8 0.037200 2953 0
#
```

FDEV

DESCRIPTION

Formats the internal memory (might destroy all the data).

WARNING

The chip configuration setting (first parameter of the command) depends on the current hardware version and must not be altered.

Please contact our support team for further information.

PARAMETERS

If the parameters are missing, the command will show the current settings. To format the internal memory (all data will be lost) with the current settings, use 0 as the first parameter. The storage organization (the index size only), can be optimized for your specific application. The first parameter for this command is the chip configuration and second parameter is the index size. The A753 factory setting is:

- 1st parameter: 2
- 2nd parameter: 25600

REMARKS

GET/SET.

RETURNS

Current memory setting.

REMOTE

Yes.

EXAMPLE

```
# 42914 FDEV
42914 FDEV 2 1024+1204 256..32768 25600/0 1888256/0 0
#
# 42914 FDEV 2 25600
42914 FDEV 0
#
```

LT

DESCRIPTION

This command is used to configure powersave settings for the radio and GSMmodules. Up to 4 time ranges where the module is on can be configured (outside these times, the modules are only turned on to deliver notifications).

PARAMETERS

The start time (when to turn on the radio/GSM module) in hh:mm (00:00 to 24:00), the end time (when to turn off the radio/GSM module) in hh:mm (00:00 to 24:00) and which entry to modify (0..3, default is 0).

REMARKS **GET/SET**.

Time ranges may overlap or wrap around midnight (for example, 23:30 to 00:30). To delete an LT range entry, the from_time and the to_time must be set to the same value (for example, 00:00 to 00:00).

The following power save modes exist:

- no LT setting: the radio/GSM module is always turned off. This mode is equivalent to turning on the GSM power saving on an A733 Series 3.
- the listen times configured for 00:00..24.00: the radio/GSM module is always turned on. This mode is equivalent to turning off the GSM power saving on an A733 Series 4.
- the listen times configured for some time ranges. The radio/GSM module is turned on during that times, and off otherwise.

Note: for outbound connections/commands (getting the initial RTC setting after powering up, delivering notifications, connecting to the gateway over GPRS, remote commands to a different device), the radio/GSM module is turned on independent of the LT settings and stays on until the time specified by LTNOTIFYTIMEOUT is over!

RETURNS The current settings

REMOTE Yes.

EXAMPLE

```
# lt 15:00 18:00 0
5 lt 0
#
# lt 08:00 10:00 1
5 lt 0
#
# lt
5 lt
15:00 18:00 0
08:00 10:00 1
0
#
```

LTNOTIFYTMOUT

DESCRIPTION This command is used to configure how long the RTU disables power saving after a notification is sent.

PARAMETERS The new timeout setting in seconds (0..65535).

REMARKS **GET/SET**.

After the RTU has sent a notification, the radio/GSM module will stay on for at least that time independent on the LT settings.

RETURNS The current setting.

REMOTE Yes.

EXAMPLE

```
# ltnotifytmout
5 ltnotifytmout 300 0
#
# ltnotifytmout 3600
5 ltnotifytmout 0
#
```

NOTIFY

DESCRIPTION This command is used to query or set the target for notifications.

PARAMETERS The phone number where to send notifications as SMS.

REMARKS **GET/SET**.

Use an empty string (“”) for the phone number to disable sending notifications.

Note: For GSM based devices, sending SMS must be enabled for the given SIM card.

RETURNS The current settings.

REMOTE Yes, **SET** only.

EXAMPLE

```
# NOTIFY 19695 46333 33922
# 5 NOTIFY 0
#
# NOTIFY
5 NOTIFY 19695 46333 33922 0
#
# NOTIFY
48012 NOTIFY 0043-2243-38280-6
#
# NOTIFY “”
48012 NOTIFY 0
#
```

ID

DESCRIPTION Sets/returns the node's ID.

PARAMETERS The node ID.

REMARKS **GET/SET**.

RETURNS The node ID.

REMOTE Yes, **SET** only.

EXAMPLE

```
# ID 445
42914 ID 0
#
# ID
445 ID 445 0
#
```

INFO

DESCRIPTION Returns various status information.

PARAMETERS None.

REMARKS **GET** only.

RETURNS A list of a device's internal variables:

ID INFO rf_in rf_out date time ver clk stack cop batt temp days_uptime hr:min_uptime rssi pmp_low pmp_high type slot samples po err_level
#

The formats for the above parameters are as follows:

- *rf_in* and *rf_out* as a decimal.
- *date* as dd/mm/yyyy.
- *time* as hh:mm:ss.
- *ver* as x.x.
- *clk*, *stack*, and *cop* as decimal. They represent internal housekeeping parameters: the A753 uses *cop* to number watchdog occurrences, but *clk* and *stack* are currently undefined.
- *batt* as battery level, using the standard voltage conversion equation (0 is 0 volts, 255 is 20 volts).
- *temp* as internal temperature in the housing, which is device dependent. The precision of the sensing element is low (±2°C), but it is sufficient for battery power management (charge/

discharge). To compute the actual value (in °C), the following equation must be used:

$$Temp_{[°C]} = \frac{internalTemp \cdot 400}{255} - 68$$

- *days_uptime* in days; with *hr:min_uptime*, it represents the amount of time the device is up without a reset or watchdog.
- *hr:min_uptime* in hours:minutes format.
- *rssi* as decimal; it is the programmed value with the RSSI command.
- *pmp_low* and *pmp_high* are the programmed values with the PMP command.
- *type* is used to represent the device type. The following types are assigned currently:
  — 0 for A730MD
  — 1 for A720
  — 2 for A730SD
  — 3 for A720B
  — 4 for A733
  — 5 for A723
  — 6 for A440
  — 7 for A733 GSM
  — 8 for A731
  — 9 for A732
  — 10 for A740
  — 11 for A740 GSM
  — 12 for A724
  — 15 for A723_Series 4
  — 16 for A724_Series 4
  — 21 for A753GSM

- *slot* and *samples* are the actual values programmed by means of the SLOT command.
- po is the relative output power of the device.
- *err_level* is the error value; 0 means no error.

REMOTE — Yes, **GET** only.

EXAMPLE

```
# 42914 info
42914 info 0 31 01/01/1970 00:00:00 1.2 0 0 0 83 60 0 00:40
0 65 72 24 900 0 0 0
#
```

PMP

DESCRIPTION — Sets/returns the node's Power Management Parameters (switches the battery charge on/off).

PARAMETERS — The lower (switch on) and the higher limit (switch off), both in volts x 10. Standard Values are 65 (for 6.5 volts) for switch on and 72 (for

7.2 volts) for switch off, for a standard 6.2 volt NiMH battery. From these values, other thresholds are internally computed.

REMARKS **GET/SET**.

RETURNS The lower (switch on) and the higher limit (switch odd), both in volts x 10.

REMOTE Yes, **SET** only.

EXAMPLE
```
# PMP 65 72
42914 PMP 0
#
# PMP
42914 PMP 65 72 0
#
```

TIME

DESCRIPTION Sets/returns the real time clock.

PARAMETERS The actual time, or none in the **GET** version.

REMARKS **GET/SET**.

RETURNS The actual time as *dd/mm/yyyy hh:mm:ss*.

REMOTE Yes.

EXAMPLE
```
# TIME 20/06/2009 12:10:10
42914 TIME 0
#
# TIME
42914 TIME 20/06/2009 12:10:10 0
#
```

TYPE

DESCRIPTION Requests the hardware type information of the device.

PARAMETERS None.

REMARKS **GET** only.

RETURNS The hardware type.

REMOTE Yes.

EXAMPLE
```
# TYPE
42914 TYPE A753 0
#
```

VER

DESCRIPTION Requests the firmware version of the device.

PARAMETERS None.

REMARKS **GET** only.

RETURNS The current version.

REMOTE Yes.

EXAMPLE
```
# VER
42914 VER 1.3.2 0
#
```

VERB

DESCRIPTION Sets the verbosity level of the device. This command is used for debugging only.

WARNING *The device will consume a lot more power when the verbosity level is greater than 0. This could discharge your battery and/or prevent proper operation.*

PARAMETERS A verbosity level (0...255).

REMARKS **SET** only.

RETURNS Error code.

REMOTE No.

EXAMPLE
```
VERB 1 # tx: 'AT'
rx: 'OK'
tx: 'ATE0Q0V1&K3&C1&D2'
rx: 'OK'
tx: 'AT+CMEE=1'
rx: 'OK'
tx: 'AT+CRC=1'
```

XDATA

DESCRIPTION This command requests data for a list of logical channels for given timestamps.

PARAMETERS XDATA requires a lot of parameters for specifying what to retrieve. Please consult the *A740 User Manual* for detailed explanation of this command. The output of the command is not intended to be human readable.

REMARKS **GET** only. (This is a data retrieval command, local as well as remote.)

RETURNS A data block.

REMOTE Yes, for a **GET**, but only one frame at a time.

EXAMPLE
```
# 42914 XDATA 0 8 0 255 1 0
42914 XDATA 0 199 0x18 0x4A4211BC 1 0 0xF6 :8F0384645739
0
#
```

XIMME

DESCRIPTION Samples all inputs and immediately returns the sampled data.

PARAMETERS First parameter specifies the sample mode, which has to be 2 for raw data. The second parameter sets the maximum packet size. If you specify the third parameter, you can select a specific input connector.

REMARKS **GET** only. The command needs a specific delay to execute (for example, for the standard SST setting this delay amounts to two seconds). The delay is necessary to allow for the sensors to settle after applying power to them.

RETURNS A data block of io-port, raw adc and counter values.

REMOTE Yes.

EXAMPLE
```
# ximme 2
42914 ximme
0 0 89 61 0 0
1 15 1024 69 69 153
2 15 67 65 69 0
3 15 68 67 67 0
4 15 67 66 67 0
0
#
```

The first column is the channel number. Channel 0 uses the internal sensors such as temperature and battery voltage. Channels 1- 4 are the connectors IO-A through IO-D. Column 6 of channels 1 - 4 are the counter values. The analog inputs are mapped to columns 3, 4, and 5.

Column 2 of channel 1 or 2 displays the status of the four digital inputs DIG0 through DIG3. In the above example, the first analog input of IO-A (AN0) is 1024 and the IO-A counter (RAIN0) has a value of 153.

ANLGTHRESHOLD

DESCRIPTION The RTU does not store data for analog channels when the voltage is less than the given cut-off threshold for that channel, and thus save radio/GSM traffic).

PARAMETERS A threshold, specified as ADC value (0..65535 for 0..2.5V) and a ANLG channel. The channel is the ANLG channel (0..11) or omitted (to set the threshold for all analog inputs)

REMARKS **GET/SET**.

RETURNS The current settings.

REMOTE Yes.

EXAMPLE
```
# anlgthreshold 80 2
5 anlgthreshold 0
#
# anlgthreshold
5 anlgthreshold 0 0 80 0 0 0 0 0 0 0 0 0 0
#
```

CNTRTHRESHOLD

DESCRIPTION The RTU does not store data for counter channels when the number of pulses is less than the given cut-off threshold, and thus save radio/ GSM traffic).

PARAMETERS A threshold, specified as number of pulses on the CNTR input pin (0..65535) and a CNTR channel. The CNTR channel (0 = IOA, 1 = IOB, 2 = IOC, 3 = IOD) or omitted (to set the threshold for all counter inputs)

REMARKS **GET/SET**.

RETURNS The current settings

REMOTE Yes.

EXAMPLE
```
# cntrthreshold
5 cntrthreshold 0 1 0 0 0
#
# cntrthreshold 80 1
5 cntrthreshold 0
#
```

DYNSLOT

DESCRIPTION The dynamic slot switching function checks whether the measurement value of the given sensor matches the given condition, then switches between two operating modes:

- normal mode (when the condition is false and the lock timer is zero)
- exception mode (when the condition is true and the lock timer is nonzero)

The rules for the mode switching are:

- when the condition becomes true the first time, exception mode is entered and the lock timer is set
- while the condition is true, the lock timer is set at every sample, thus does not reach zero
- while the condition is false, the lock timer is decremented if not already zero
- when the lock timer reaches zero, normal mode is entered
- the SLOT settings are only changed when the mode changes

Thus, the RTU enters exception mode whenever a sample value matches the condition, and stays there until the sample value does notmatch the condition for at least the given locktime (this prevents excessive wear of the EEPROM due to jitter in the measurement value).

PARAMETERS

REMARKS **GET/SET**.

RETURNS

REMOTE Yes.

EXAMPLE
```
we set up theDYNSLOT feature to measure IOA and IOB every
minute when the sensor value on cabling 1 is more than 1.25
Volts (ADC value 32768):
```

Returned Errors List

Following are error messages you might get.

Command Line Interpreter

- 1 — nonexistent command
- 2 — command line buffer overflow (input line too long)
- 3 — internal error
- 4 — reserved
- 5 — missing or false parameters in command
- 6 — operation not implemented
- 7 — remote operation not allowed
- 8 — invalid IMEI Number
- 9 — command not supported in this configuration

Device Descriptor and Storage Handler

- 10 — device not found (attempt to perform a command on a nonexistent device)
- 11 — device already exists
- 12 — reserved
- 13 — no more space for descriptors (too many devices)

- 14 — no more records for the specified device
- 15 — temporary communication break, no more data (the last request was not successful)
- 16 — time-out (the handler blocked or is busy)
- 17 — internal error
- 18 — attempt to insert a reserved device ID number (0 or 65535)

Real-time Clock

- 20 — incorrect time supplied (no conversion to time_t was possible)

Notifications

- 40 — request to read a notification when no notification is pending

Appendix. Specifications

Table 4 shows the main operational parameters of the A753.

Table 4. Operational parameters

Parameter	Min	Typical	Max	Unit
Common				
Supply Voltage (internal battery)	+5.6	+6.2	+10	V
Operation Temperature	-30		+70	°C
Relative Humidity			99	% rH
Class Protection		IP65		
Data Rate	1000	1500	2000	
Operating Current (including onboard microcontroller)			35	mA
Frequency Stability (-20 tp +50°C)			+/- 1.5	kHz
Frequency Stability (-30 to +60°C)			+/- 2.5	kHz
Receive Mode				
Sensitivity (12 dB S/S+N)		-118		dBm
Image Frequency Attenuation (1st IF=45MHz)	-70			dBm
Local Oscillator Leakage			2	nW
Transmit Mode (50 Ohm resistive load)				
Output Power	24		27	dBm
Spurious Radiation			200	nW
Adjacent Channel Power			-44	dBm

Table 4. Operational parameters (Continued)

Parameter	Min	Typical	Max	Unit
Peak Current (at TX burst, including microcontroller)			700	mA

A

B

C

D

E

F

I

L

U

V

X