THALES
NAVIGATION

Scorpio 6000 RK

Relay Station

USER'S MANUAL

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IMPORTANT NOTICE

Each country maintains its own rules and regulations with respect to the operation of radio equipment. It is the user's responsibility to assure that proper licensing procedures are followed in accordance with the laws of each country. THALES NAVIGATION may provide licensing assistance for operation of the UHF transmitter.

Operating an unlicensed radio transmitter is a violation of the law. You may be subject to fines or other penalties if you operate a radio transmitter without proper licensing.

FCC statement (USA):

The United States Federal Communications Commission (in 47 CFR 15.105) has specified that the following notice be brought to the attention of users of this product:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interferences by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet, prepared by the Federal Communications Commission, helpful: How to identify and Resolve Radio/TV Interference Problems. This booklet is available from the U.S. Government Printing Office, Washington, DC. 20402 , Stock No. 004-000-00345-4. Use of a shielded cable is required to comply within Class B limits of Part 15 of FCC Rules. Pursuant to Part 15.21 of the FCC Rules, any changes or modifications to this equipment not expressly approved by THALES Navigation may cause harmful interference and void the FCC authorization to operate this equipment.

Conventions used in this manual:

The ends of sections are denoted by the ♣ symbol.

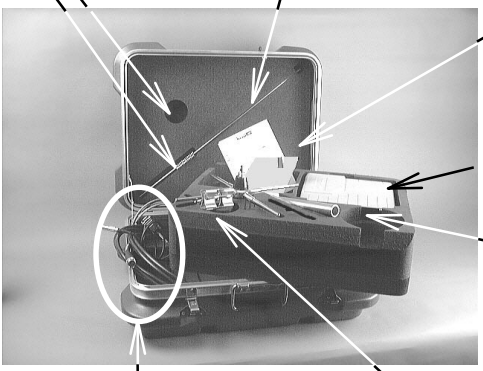
Table of contents

1. Unpacking & Description

1

Unpacking

The 6000 RK relay station is shipped in a rigid container (Part No. 790076906). The following parts are provided:



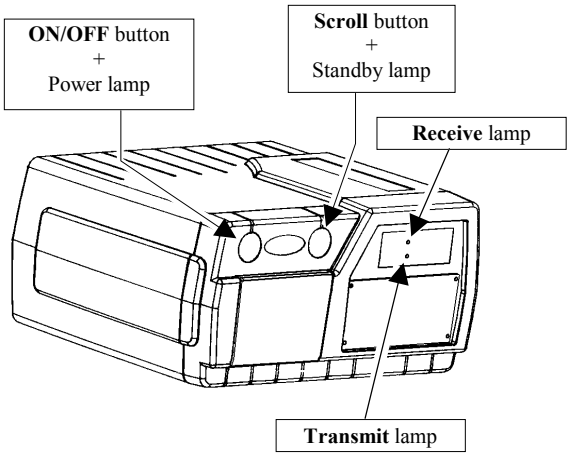
NOTE: THALES Navigation reserves the right to make changes to the standard supply described above without prior notice.

Description

❑ Front Panel

The relay station is fitted with the following parts on its front and rear panels.

- **Front panel controls**



⏻ **ON/OFF** pushbutton : used to turn on the relay station. Pressed simultaneously with the **Scroll** pushbutton, it will shutdown the relay station

The indicator light nested in this button starts blinking when you press the button (if the station is connected to a DC power source of suitable voltage). After successful completion of the self-tests, the light is permanently ON.

Scroll pushbutton : Pressed simultaneously with the **ON/OFF** pushbutton, it will shutdown the relay station. The indicator light nested in this button informs the user of the following:

Flashing : Standby mode. A session is programmed to be run at a later time.

Permanently lit : Operating session in progress

Receive lamp : Lit while the relay station receives data from the expected station

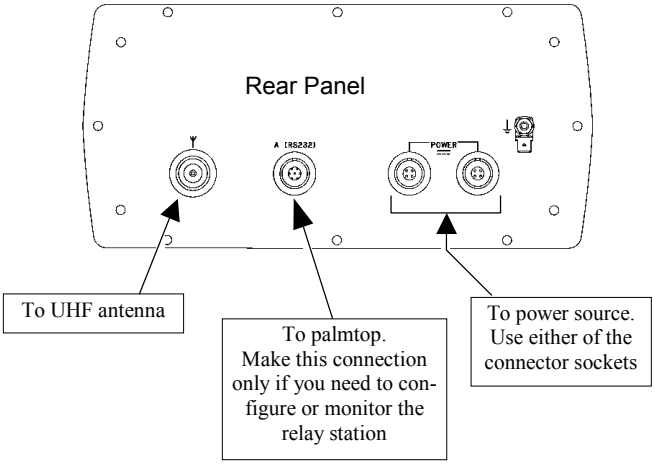
Transmit lamp : Lit while the relay station transmits (relays) a valid set of data

• Rear Panel

The rear panel is fitted with the following connectors:

- A UHF coaxial connector socket, N-female type
- One RS232C connector (A)
- Two power connectors in parallel

❑ Connections



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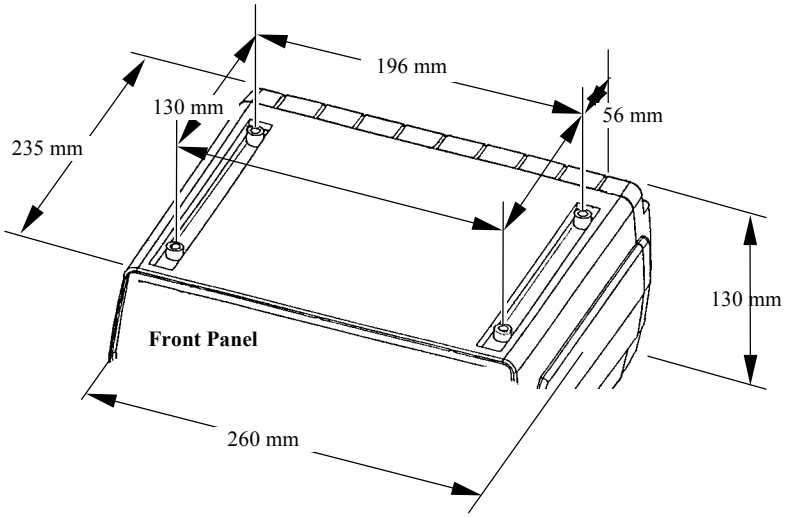
2. Operating instructions

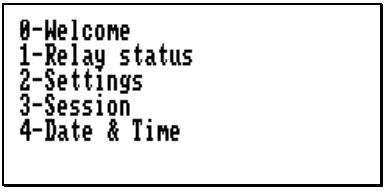
Field Installation

The relay station may be secured from below the case using the four tapped holes (see dimensions below, case shown upside down). Use M4 screws and choose a length for these screws compatible with the 6-mm max. insertion length allowed in these holes.



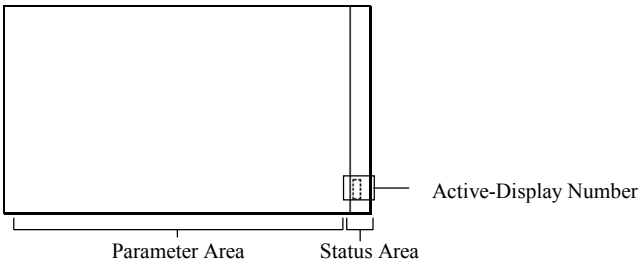
Introduction to the Relay Station Control Software

- The Relay Station Control Software (r.exe) provides access to different displays giving you full control of the relay station.
- It can be run at any time with the relay station in operation. If the station is off, starting this program, from the palmtop, will cause the station to be started as well.
- For most of the displays, two viewing modes exist as explained below.
    - The *Read mode*, which is the default mode when accessing the display, just lets you read, not change, the data on the screen
    - The *Edit mode*, which you validate and leave by pressing ↵ (the ENTER or YES key), lets you change the modifiable data on the screen
- A few keys have to be known for best use of the program:
    - Pressing the ∗ key will display the program menu listing all the accessible functions.



- From this list, and generally from any display in *Read mode* or from the program menu only (default mode), the keys 0 to 4 allow you to access the corresponding functions. For example, pressing "2" will cause display #2 to appear on the screen.
- After selecting the desired display, pressing the ↵ (or Yes) key allows you to enter the *Edit mode* for that display. You cannot select another display until you quit the *Edit mode* by pressing ↵ again.
- In *Edit mode*, after modifying parameters on the screen, pressing ↵ will cause the program to validate the new values assigned to these parameters.
- In *Edit mode* only, the "dot" key (.) is used in those fields where only preset values can be entered. In this case, pressing this key repeatedly will let you view all the possible values in the field. There is an exception however on the welcome screen where the ↑ and ↓ keys should be used for this purpose.
- In *Edit mode* only, the keys ← ↑ → and ↓ allow you to move the cursor within a field and from a field to an adjacent one.
- In *Edit mode* only, the Del/No key allows you to quit this mode without validating the changes you made on that screen.
- The Esc key allows you to quit the program.

- All displays are divided into two distinct areas as shown below. The status area is permanently shown whatever the display chosen.



- Alarm report:
  - Framed messages will appear on the screen together with a specific sound in case of battery alarm.
- The buzzer will sound in the following cases:
  - Battery alarm (brief 3-tone "up" sound every 6 seconds approx.)
  - Invalid display request (brief 2-tone sound)
  - Invalid data entry (brief 2-tone sound)
  - Other errors (brief 2-tone sound)

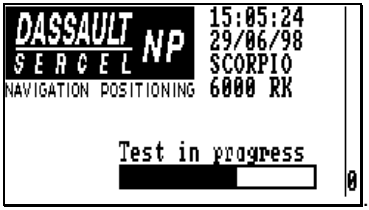
Configuring a relay station

Assuming the relay station is in operation and the palmtop is attached to the station through the RS232 serial line:

- Switch on the palmtop by depressing the red key (upper right).

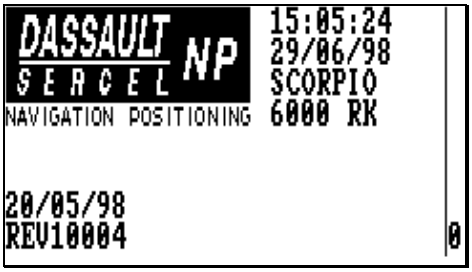
  Note that starting the Relay Station Control software will automatically switch the station on if it is currently in standby mode. However in this case, the self-tests on the palmtop will be longer.

- From the DOS prompt, type "r" (not case-sensitive) and press the "Yes" key (↵).The following is then displayed:



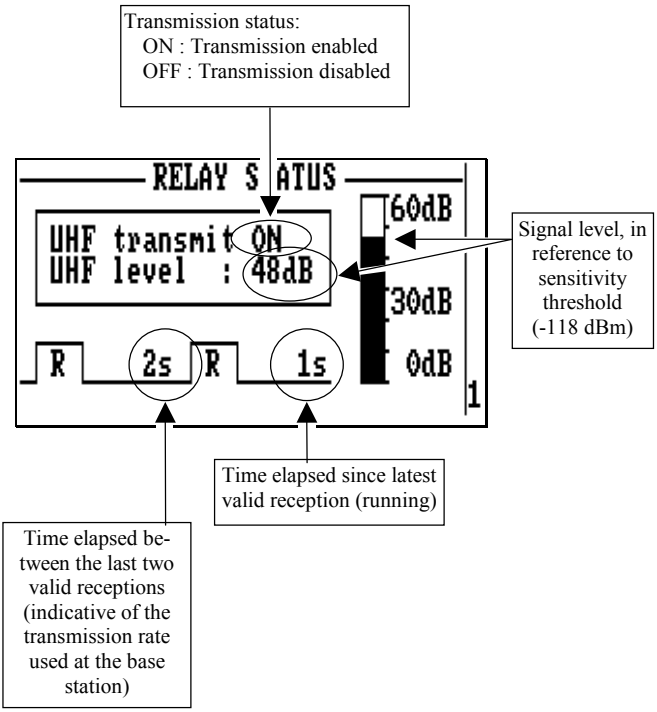
...

Let the palmtop complete its self-tests, the end of which is denoted by the test bar-graph disappearing from the palmtop screen and the version number appearing on the left:



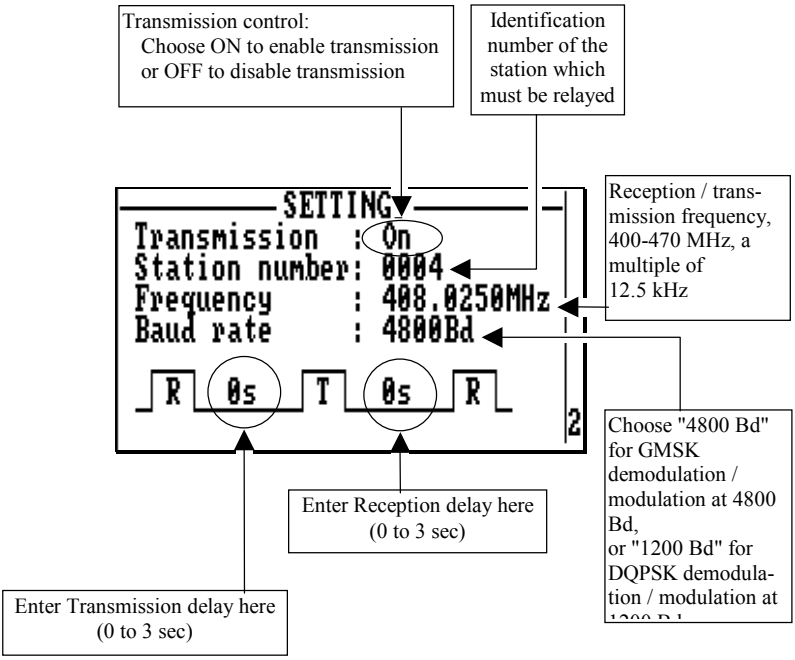
❑ Relay Status

From any display in *Read mode*, or from the menu, press the "1" key. The screen which then appears, a "read-only" screen, informs you of the operating parameters currently used by the relay station:



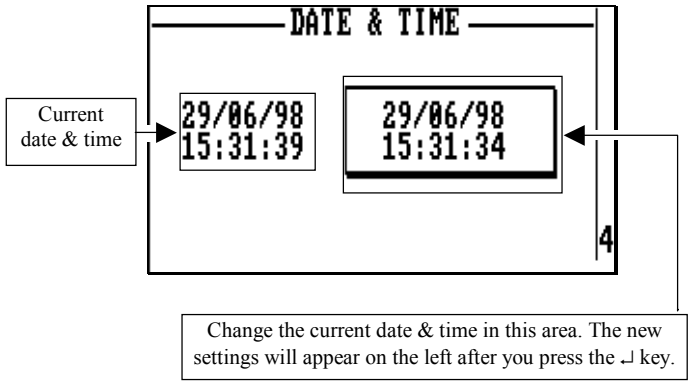
Settings

From any display in *Read mode*, or from the menu, press the "2" key. The screen which then appears, allows you to read/change the settings of the relay station (follow the instructions given below).



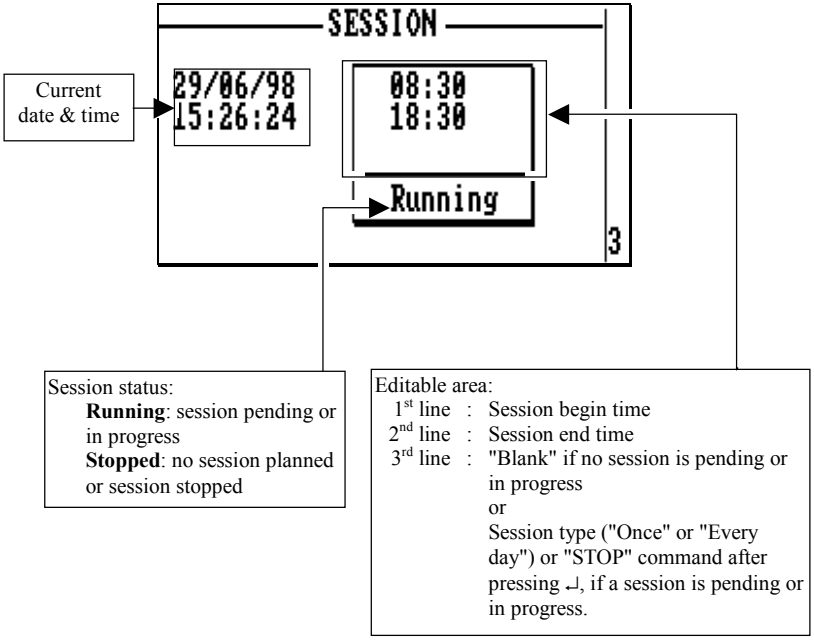
❑ Date & Time

From any display in *Read mode*, or from the menu, press the "4" key. The screen which then appears, allows you to read/change the date & time of the relay station (see instructions below).



❑ Operating session

From any display in *Read mode*, or from the menu, press the "3" key. The screen which then appears, allows you to read the session status or change the programming of the session (see instructions below).



Important: You can change the type as well as the begin and end times of a session when it is in progress.

- **Examples of session screens in different contexts**

1. Pressing ↵ while an Everyday session is in progress will cause the cursor to appear in the "begin time" field:

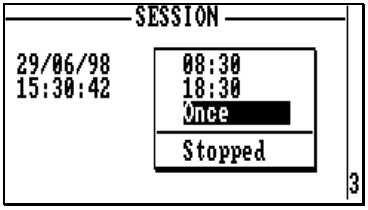
To abort the session in progress, move the cursor to "Every day", press the "dot" key until "Stop" appears and then press ↵ again.

2. Planning an Everyday session from 8:30 am to 6:30 pm:

The session will start immediately after pressing ↵ as the start time precedes the current time.

This session will be repeated every day as long as the station is left operating and no changes are made concerning the session

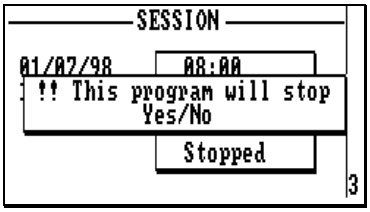
3. Planning a session from 8:30 am to 6:30 pm:



The session will start immediately after pressing ↵ for the same reason as above. The session will be run once.

4. Time when validating a planned session is outside this session . Example:

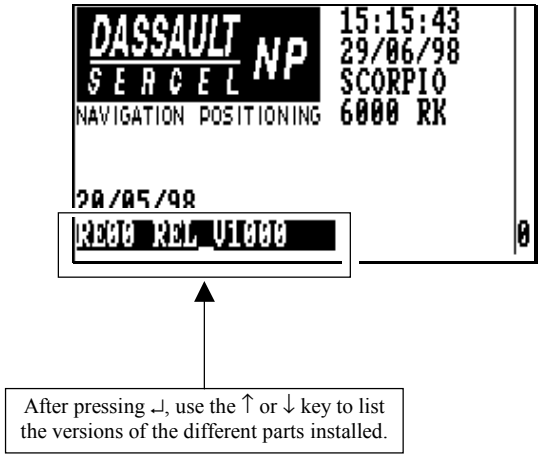
…then the following message will appear:



If you select "Yes", the relay station will immediately be switched to the standby mode and this program will stop.

❑ Versions

From any display in *Read mode*, or from the menu, press the "0" key. The read-only screen which then appears (the "welcome" screen) allows you to list the versions of the different parts in the relay station.



❑ How to quit the relay station control program

From any screen in *Read mode*, simply press the ESC key. After you confirm this choice, the DOS prompt will appear on the palmtop screen.

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3. Appendices

Introduction to the UHF Relay Station

❑ Purpose

The UHF relay station is used to enhance (or extend) the working area of a THALES surveying system.

The UHF relay station makes this enhancement or extension possible by relaying the data received from a base station, or from another relay station, toward users.

The data received by the relay station is transmitted unchanged according to a user-set timing.

Only the data received from the expected base station is relayed.

❑ Operating environment

Before it is left operating at its installation location, a relay station must be configured from a control computer (palmtop) via an RS232 serial line. After configuring the relay, the operator can disconnect the control computer and let the relay station operate on its own.

A relay station does not need the continual presence of an operator. To make it even more "invisible" for the user, it can be configured to be active only during a preset operating session, which can possibly be repeated everyday at the same time.

❑ Theory of operation

Signals received by the relay station are demodulated according to the selected baud rate (which should be the same as the one used by the relayed station):

- 1200 Bd → DQPSK
- 4800 Bd → GMSK

The relay station tests the station number contained in the demodulated data, which should be that of the base station it is assumed to relay (this number is part of the settings made on the relay station).

If the test is negative, then the demodulated data is simply discarded (no further processing for this data).

If the test is positive, then the inverse operation is performed: the demodulated data is re-modulated on the same carrier frequency, according to the same modulation type and baud rate used earlier for demodulation.

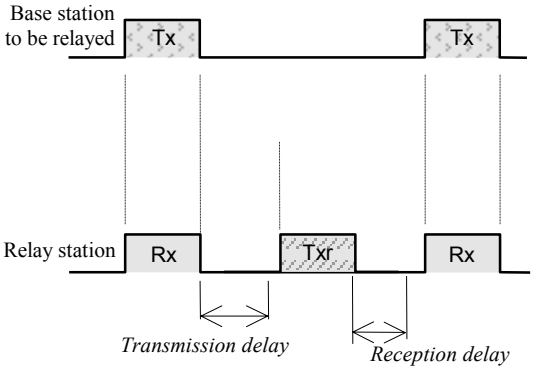
❑ Timing considerations

The relay transmission then takes place after a user-set delay called *transmission delay*. Reception in the relay station is invalidated until this transmission takes place.

After the relay station has relayed the data, a user-set delay, called *reception delay*, is activated continuing to invalidate reception until this delay has elapsed.

The need for the two delays introduced above is explained in the following time charts.

- **1 relay for a base station**



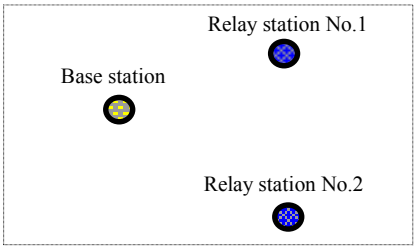
Tx : transmit time (in base stations)
Rx : receive time (in relay station)
Txr : transmit time (in relay station), data relayed to users (rover units)

In this example, the *transmission* and *reception delays* are adjusted so that the global transmission scheme matches the transmit rate of the base station.

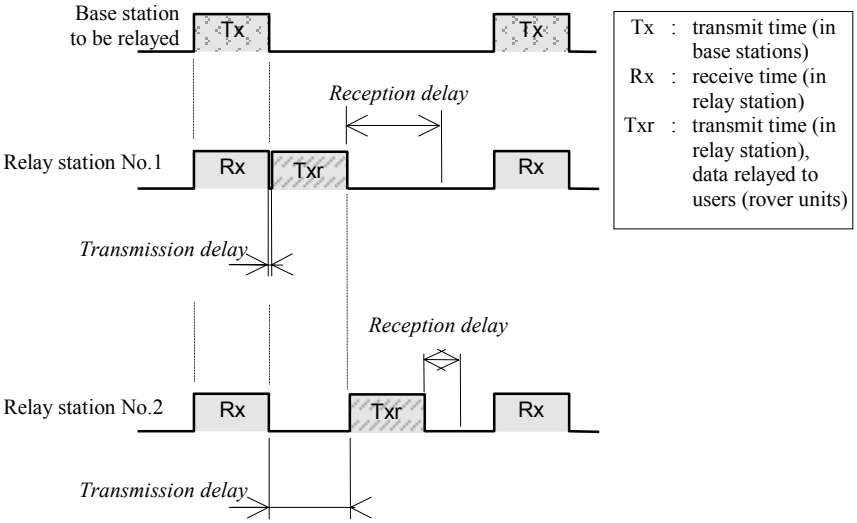
In the typical example where the transmission rate used at the base station is 2 seconds, use the following as transmission and reception delays in the relay station:

transmission delay = reception delay = 0 second

- **2 relays for a base station ("Circular" geometry)**



The two relay stations are within range of the base station.



Reception delays are adjusted so as to avoid data links between relays if they are mutually within range.

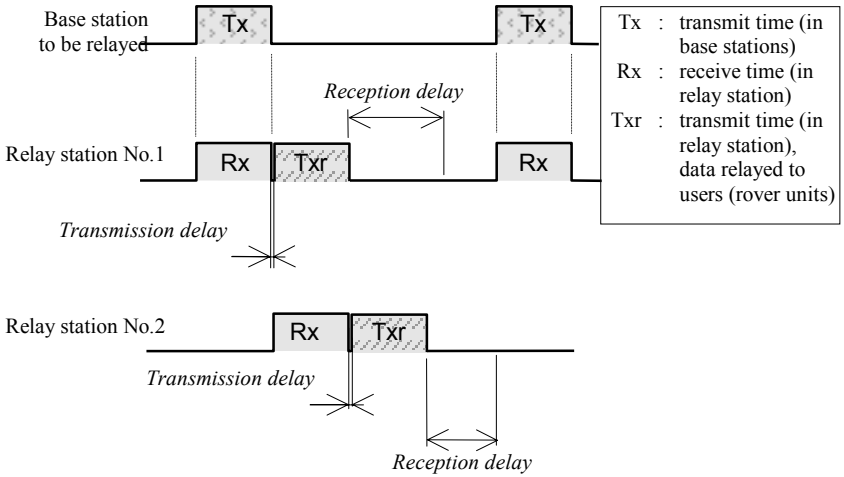
Transmission delays are adjusted so that the global transmission scheme matches the transmit rate of the base station.

In the typical example where the transmission rate used at the base station is 4 seconds, use the following in the relay stations:

	Transmission delay	Reception delay
Relay Station No. 1	0 s	2 s
Relay Station No. 2	1 s	1 s

- **2 relays for a base station ("In line" geometry)**

Relay station No.1 is within range of the base station whereas relay station No.2 is not.



The *reception delay* in relay No. 1 prevents a "loop" between the two relays. This is done by disabling reception in relay No. 1 while relay No.2 transmits the data it received from this relay.

The *reception delay* in relay No. 2 is not so critical since this relay can only receive data from a single source (which is relay No. 1).

Transmission delays are adjusted so that the global transmission scheme matches the transmit rate of the base station.

In the typical example where the transmission rate used at the base station is 4 seconds, use the following in the relay stations:

	Transmission delay	Reception delay
Relay Station No. 1	0 s	2 s
Relay Station No. 2	1 s	1 s

Specifications

❑ Operational

Two operating modes	:	Standby/Active operation controlled by means of a programmed session or Manual operation, controlled by the front panel pushbuttons
Transmission type	:	Simplex operation
Relaying capability	:	A single base station relayed by a relay station. Conversely, a base station can be relayed by two different relay stations

❑ Settings

- Number of the station which must be relayed
- Reception/Transmission frequency
- Baud rate (1200 or 4800 Bd) (modulation type deduced from this choice)
- Transmission control
- Transmission delay (0 to 3 sec)
- Reception delay (0 to 3 sec)

- Date & time

- Session start time (hh:mm)
- Session end time (hh:mm)
- Session type ("once" or "every day")
- Session control

❑ Electrical

Power voltage range	:	10 to 15 V DC, non-floating
Power input protection	:	from polarity reversal, over-voltage, ESD
Radiated power	:	4 W
Frequency band	:	400-470 MHz
Channel bandwidth	:	12.5 kHz
Demodulation/modulation type	:	DQPSK or GMSK, deduced from the selected baud rate

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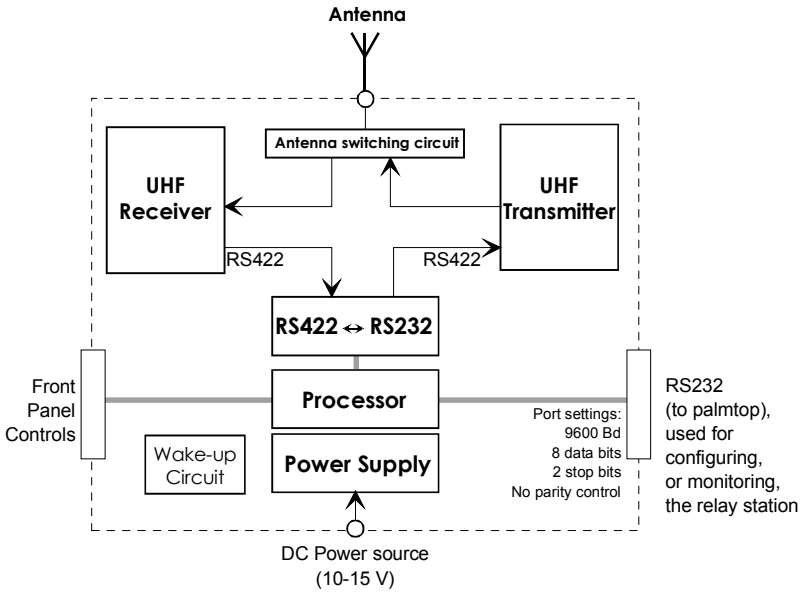
❑ Physical

Dimensions	:	260×235×130 mm (W×D×H)
Operating temperature range	:	-20 to +55°C
Storage temperature range	:	-40 to +70°C
Case	:	fully sealed, complying with IP66

❑ Block Diagram



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