



EXHIBIT 7

USER'S MANUAL

TRANSMITTER BOOSTER UNIT TBU

FOR GSM 900/1800/1900

TBU Unit Description

DRAFT

NOKIA

The information in this document is subject to change without notice and describes only the product and its version defined in the introduction of this document. This document is intended for the use of Nokia Telecommunications' customers only for the purposes of the agreement under which the document is submitted, and no part of it may be reproduced or transmitted in any form or means without the prior written permission of Nokia Telecommunications. The document has been prepared to be used by professional and properly trained personnel, and the customer assumes full responsibility when using it. Nokia Telecommunications welcomes customer comments as part of the process of continuous development and improvement of the documentation.

The information or statements given in this document concerning the suitability, capacity, or performance of the mentioned hardware or software products cannot be considered binding but shall be defined in the agreement made between Nokia Telecommunications and the customer. However, Nokia Telecommunications has made all reasonable efforts to ensure that the instructions contained in the document are adequate and free of material errors and omissions. Nokia Telecommunications will, if necessary, explain issues which may not be covered by the document.

Nokia Telecommunications' liability for any errors in the document is limited to the documentary correction of errors. Nokia Telecommunications WILL NOT BE RESPONSIBLE IN ANY EVENT FOR ERRORS IN THIS DOCUMENT OR FOR ANY DAMAGES, INCIDENTAL OR CONSEQUENTIAL (INCLUDING MONETARY LOSSES), that might arise from the use of this document or the information in it.

This document and the product it describes are considered protected by copyright according to the applicable laws.

NOKIA logo is a registered trademark of Nokia Corporation.

Other product names mentioned in this document may be trademarks of their respective companies, and they are mentioned for identification purposes only.

Copyright © Nokia Telecommunications Inc 1997. All rights reserved.

INTERNAL HISTORY PAGE

Archive

Location: J:\User_Man\Hardware\3rd_Gen\Booster
Filename: 043591AE.doc

History

Date	Version	Author	Change Note No./Notes
5 Aug. 97	0.0.1	K Saukko (KSa)	1st Draft
29 Aug 97	0.0.2	C.A. Parchen	2nd Draft
29 Sept 97	0.0.3	C.A. Parchen	Update
24 Oct 97	0.0.4	C.A. Parchen	Update
10 Nov 97	0.1.0	C.A. Parchen	Update
21 Nov 97	0.2.0	C.A. Parchen	Update
1 Dec 97	0.3.0	C.A. Parchen	Update per 11/21 meeting includes changes in Intro: "form-fit replacement to a TRX" and "enabling the same geographic coverage with fewer base stations"
17 Dec 97	0.4.0	C.A. Parchen	V-M edits BeO and -12

APPROVAL PAGE

Edited/Translated by: C.A. Parchen Date: _____

Checked by: Veli-Matti Sarkka Date: _____

Approved by: Olli-Pekka Raikaa Date: _____

AUDIENCE IS:

NOKIA CUSTOMERS

NOKIA MARKETING

NOKIA PRODUCT SUPPORT

CONTENTS

1. INTRODUCTION	3
2. GENERAL DESCRIPTION	4
2.1. Features.....	4
2.2. Operation	4
2.3. Main Blocks.....	5
2.3.1. Power Amplifier.....	5
2.3.2. Interface Board.....	6
2.3.3. Front Panel Alarm Connector	6
3. INTERFACE DESCRIPTION.....	7
3.1. Front Panel LEDs	7
3.2. X1 and X3 Connectors	8
4. TECHNICAL DATA.....	11
4.1. Electrical Data	12
4.2. Dimensions and Weight	12
4.3. RF Performance Values.....	13
4.4. Handling and Storage Requirements	13

1. INTRODUCTION

The Nokia Transmitter Booster Unit (TBU) is the core of the Nokia Booster configuration. The Booster configuration fits seamlessly into Nokia's 3rd Generation base stations, enabling the same geographic coverage with fewer base stations. The main units comprising the Booster configuration are:

Transmitter Booster Unit (TBU)
Antenna Filter High-power Unit (AFH)
Masthead Amplifier (MHA)

The TBU provides amplification for downlink (transmitted RF). It is a form-fit replacement for one of the TRXs in the base station cabinet and uses the same DC power source and cooling as a TRX.

This document describes the main functions, functional blocks, and external interfaces of the TBU. There are three versions of the TBU:

GSM900:	TBUA
GSM1800:	TBUB
GSM1900:	TBUL

Figure 1 shows the mechanics outline of the TBU for GSM 900, 1800 and 1900.

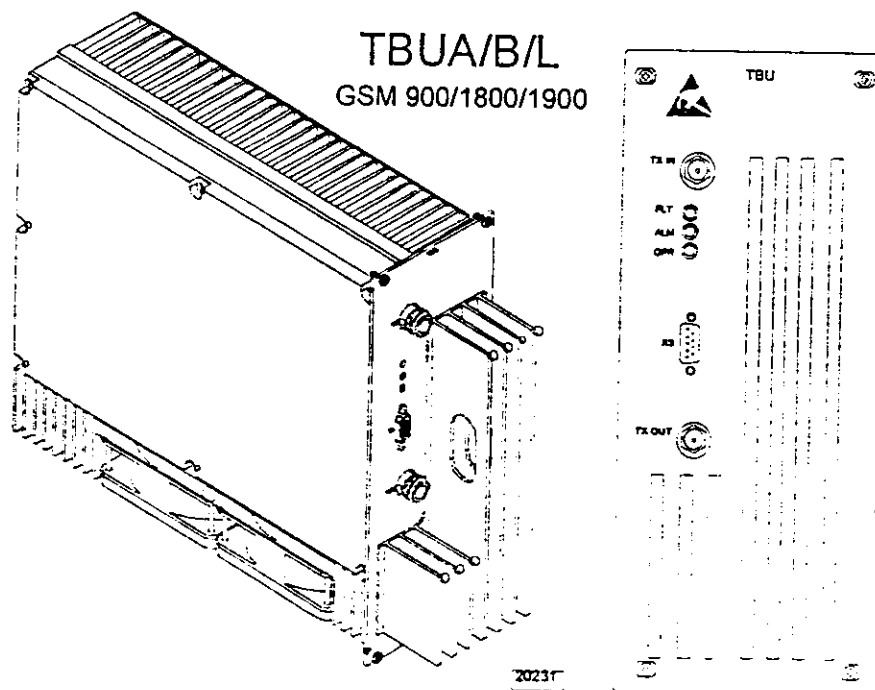


Figure 1. TBU Mechanics Outline

2. GENERAL DESCRIPTION

2.1. Features

Following are the main features of the TBU:

- 7 dB amplification for 65 W output power for downlink (transmitted RF)
- Continuous self-testing for gain, temperature and output VSWR
- Internally controlled cooling fans
- Input overload protection.

2.2. Operation

The TBU amplifies the input signal from the TRX and outputs the amplified signal to the AFH unit.

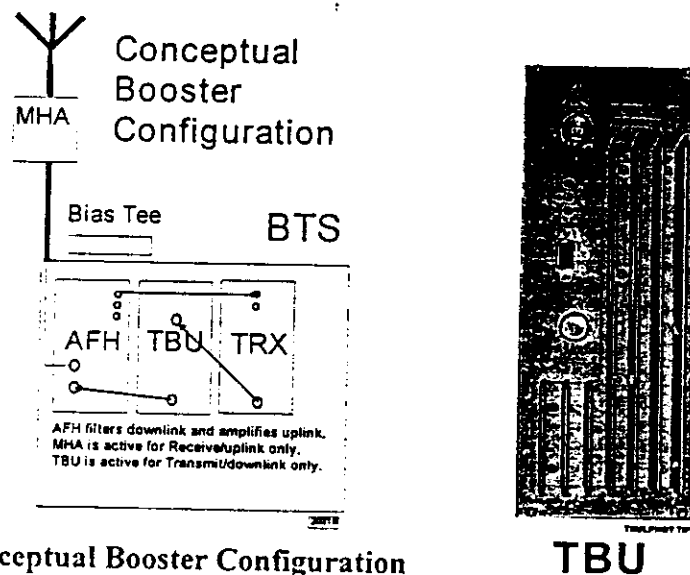
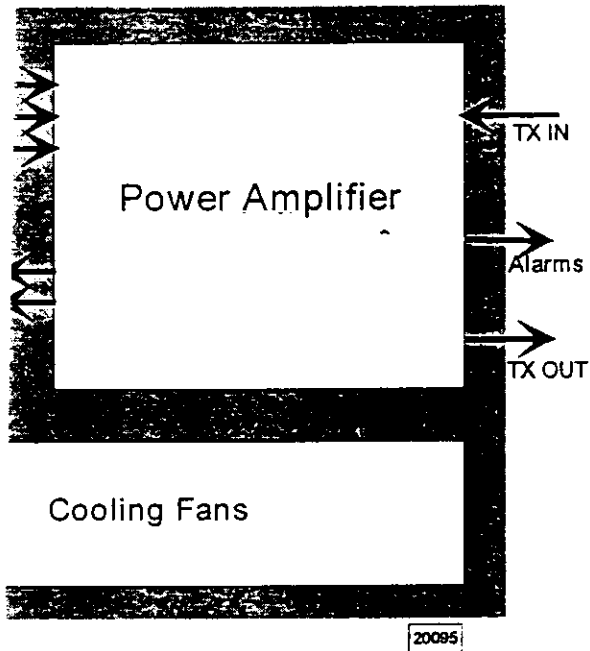


Figure 2. Conceptual Booster Configuration and the TBU

The TBU provides the monitoring function for its own operation. During operation, the following are monitored continuously: gain, temperature, input power and output VSWR. If one of these is not functioning properly, an alarm signal is given to the base station controller BCF. The TBU's front panel LEDs display operating status.

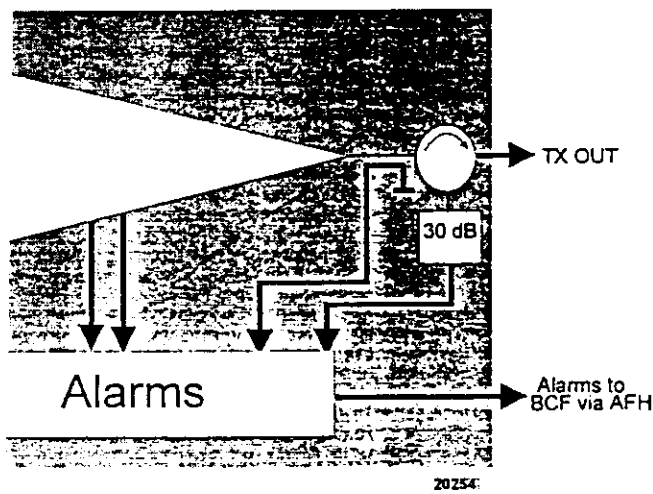
The TBU replaces one TRX and occupies the TRX's slot.

functional blocks: power amplifier, interface



Main Functional Blocks of the TBU

contains a power amplifier and alarm circuits.



Functional Blocks of the Power Amplifier

ator blocks interference from the
d to sample reflected power. If the
he set limit, the VSWR alarm is given.

nd input power, and generate an alarm
hesh power levels of the TRX are not
ocked by the base station software
ware data base. If the hardware database
levels are available when too much
ates gain and temperature alarms which

r exceeds normal conditions, alarm
mechanics. If the temperature exceeds
s generated and the base station

ect TBU power lines to the base station
which protect the base station from

ted through the front panel connector
nes to the BCFA unit.

3. INTERFACE DESCRIPTION

There are four interface connectors in the TBU, as shown in Table 1.

Table 1. TBU Interface Connectors

Connector Name	Type	Purpose
TX IN	N	Transmitter input
TX OUT	N	Transmitter output
X3	D-9	Alarm signals to AFH unit
X1	EURO connector	Back panel connections for power supply

3.1. Front Panel LEDs

The colors and explanations of the front panel LEDs are given in Table 2.

Table 2. TBU Front Panel LEDs

Colour	Code	Explanation
Red	FLT	Failure (Gain alarm is on)
Yellow	ALM	Alarm (Temperature or VSWR alarm is ON)
Green	OPR	Normal operation

The pin configuration for the X1 connector on the TBU back panel is detailed in Table 3.

Table 3. X1 Connector (Back Panel) Pin Configuration

Pin	Signal	Description
a1	NOT USED	NOT USED (Digital ground)
a2	AGND	Analogue ground
a3	AGND	Analogue ground
a4	+26V	Power supply +26V (+24V in TBUB unit)
a5	+26V	Power supply +26V (+24V in TBUB unit)
a6	+26V	Power supply +26V (+24V in TBUB unit)
a7	+26V	Power supply +26V (+24V in TBUB unit)
a8	AGND	Analogue ground
a9-a25	NOT USED	NOT USED
a26	+5V	Power supply +5V
a27	-12V	Power supply -12V
a28	+12V	Power supply +12V
a29	+12V	Power supply +12V
a30	AGND	Analogue ground
a31	AGND	Digital ground
a32	NOT USED	NOT USED (Digital ground)

Pin	Signal	Description
b1	AGND	Analogue ground
b2	AGND	Analogue ground
b3	AGND	Analogue ground
b4	+26V	Power supply +26V (+24V in TBUB unit)
b5	+26V	Power supply +26V (+24V in TBUB unit)
b6	+26V	Power supply +26V (+24V in TBUB unit)
b7	+26V	Power supply +26V (+24V in TBUB unit)
b8	AGND	Analogue ground
b9-b25	NOT USED	NOT USED
b26	+5V	Power supply +5V
b27	-12V	Power supply -12V

Pin	Signal	Description
b28	+12V	Power supply +12V
b29	+12V	Power supply +12V
b30	AGND	Analogue ground
b31	AGND	Analogue ground
b32	AGND	Analogue ground

Pin	Signal	Description
c1	AGND	Analogue ground
c2	AGND	Analogue ground
c3	AGND	Analogue ground
c4	+26V	Power supply +26V (+24V in TBUB unit)
c5	+26V	Power supply +26V (+24V in TBUB unit)
c6	+26V	Power supply +26V (+24V in TBUB unit)
c7	+26V	Power supply +26V (+24V in TBUB unit)
c8	AGND	Analogue ground
c9-c25	NOT USED	NOT USED
c26	+5V	Power supply +5V
c27	-12V	Power supply -12V
c28	+12V	Power supply +12V
c29	+12V	Power supply +12V
c30	AGND	Analogue ground
c31	AGND	Analogue ground
c32	AGND	Analogue ground

The pin configuration for the X3 connector on the TBU front panel is detailed in Table 4.

Table 4. X3 Connector(Front Panel) Pin Configuration

Pin	Signal	Description
1	NOT USED	NOT USED
2	Temp Alarm	Temperature alarm to AFH
3	AGND	Analogue ground
4	NOT USED	NOT USED
5	GAIN Alarm	GAIN Alarm to AFH
6	AGND	Analogue ground
7	NOT USED	NOT USED
8	VSWR Alarm	VSWR Alarm line to AFH
9	AGND	Analogue ground

4. TECHNICAL DATA

4.1. Electrical Data

Table 5. Supply Voltages and Current Consumption, TBUA/B/L

TBUA

Supply Voltages	Typical Current Consumption
+26 V	7.0 A @ Pout +48 dBm
+12 V	1.0 A
-12 V	0.2 A

TBUB

Supply Voltages	Typical Current Consumption
+24 V	8.0 A @ Pout +48 dBm
+12 V	1.0 A
-12 V	0.2 A

TBUL

Supply Voltages	Typical Current Consumption
+26 V	8.0 A @ Pout +48 dBm
+12 V	1.0 A
-12 V	0.2 A

Table 6. Nominal Power Consumption

With fans ON	200 W @ Pout +48 dBm
With fans OFF	195 W @ Pout +48 dBm

4.2. Dimensions and Weight

Table 7. Dimensions and Weight

Parameter	
Height	262 mm (10.3 in)
Width	95 mm (3.7 in)
Depth	287.5 mm (11.5 in) +47.5mm (1.9 in) heat sink
Weight	maximum 6 kg (13.2 LB)

4.3. RF Performance Values

Table 8. Typical RF Performance Values

Version	TX Frequency Range	Gain	Output Power
TBUA	925 ... 960 MHz	7.0 dB	65 W
TBUB	1805 ... 1880 MHz	6.6 dB	65 W
TBUL	1930 ... 1990 MHz	6.6 dB	65 W

4.4. Handling and Storage Requirements

Some components inside of the TBU unit contain beryllium oxide (BeO). This must be considered when handling the TBU unit.



EXHIBIT 8

BLOCK DIAGRAM

EQUIPMENT DESCRIPTION



This Section has been removed and placed in the Confidential
Section accompanying this report.



EXHIBIT 9

APPENDIX



This Section has been removed and placed in the Confidential
Section accompanying this report.