RadioFrame Networks

S-Series OmniCell@Home Picocell GSM Implementation Guide

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Revision History

Date	Rev	Notes
May 24, 2008	x	Preliminary
June 25, 2008	x1	Remove commissioning artifact
July 2, 2008	x2	Correct compliance statement

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Service Information

Operation is subject to the two following conditions: This device may not cause harmful interference, and this device must accept any interference received, including interference that may cause undesired operation. <<<TO BE CONFIRMED BEFORE PUBLICATION This equipment has been tested and found to comply with the limits pursuant to Parts 22 and 24 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.>>>

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S-Series OmniCell@Home Picocell GSM Implementation Guide

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1 Introduction

1.1 System Definition

The RadioFrame® Networks OmniCell@Home™ picocell is a modular radio solution that provides flexible and efficient software-driven base stations for Mobile Network Operators (MNO) that need to deploy cost-effective radio access in small, inexpensive increments.

Unlike traditional approaches from vendors offering proprietary, single-technology equipment, RadioFrame Networks offers an agile, multiple-technology, future-proof solution that integrates into the existing Radio Access Network (RAN) reducing capital expenditure.

The OmniCell@Home picocell base-transceiver station (PicoBTS), shown in Figure 1, reduces operating costs associated with expensive, dedicated E1/T1 leased lines by making use of DSL and cable broadband packet-switched networks for backhaul between the customer premises and the mobile operator network.

Figure 1 OmniCell@Home Picocell Base-Transceiver Station (PicoBTS)

1.2 Document Scope

This document covers installation and configuration of the OmniCell@Home base-transceiver station, often referred to as Customer-Premise Equipment (CPE). The Network Elements (NEs) are addressed in other documents in the OmniCell@Home S-Series System Document Set as follows:

- <<To Be Supplied>>

1.3 General Safety Information

Read all the notices in this section prior to installing or using the S-Series system or any of its components.

1.3.1 Confirmation of Conformance to National Regulation

The S-Series equipment complies with the provisions of the European R&TTE Directive (99/05/EC). Declaration of conformity may be obtained from RadioFrame; Compliance Engineering Department; 9461 Willows Road NE, Suite 100; Redmond, WA 98052, USA.

1.3.2 Static Sensitive Precautions

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures.

- Prior to handling, shipping, and servicing equipment, always put on a conductive wrist strap connected to a grounding device to discharge any accumulated static charges. All RFN FRUs ship with a disposable anti-static wrist strap.


Warning!

Use extreme caution when wearing a conductive wrist strap near sources of high voltage. The low impedance provided by the wrist strap also increases the danger of lethal shock should accidental contact with high voltage sources occur.

- Place FRUs only on an anti-static mat when removed from the system. The conductive surface must be connected to ground through 100 kΩ.
- Do not use non-conductive material for packaging FRUs for shipment or storage. Wrap all FRUs with anti-static (conductive) material.
- If possible, retain all original packing material for future use.

1.3.3 Safety Warnings


Warning!

Ultimate disposal of this product should be handled according to all national laws and regulations.


Warning!

The user is cautioned that changes or modifications made to the equipment that are not expressly approved by the party responsible for compliance, could void the user's authority to operate the equipment.


Warning!

To ensure FCC compliance of this equipment, it is the user's responsibility to obtain and use only shielded and grounded interface cables.


Warning!

Customer-premise equipment (CPE) emits RF. Protection stipulations were required as a condition of qualification for the CE mark. It is the responsibility of the supplier to the end user to provide information necessary for installation and operation of CPE in accordance with the European R&TTE Directive (99/05/EC) with regard to safety. The following statement (or expression to its effect) must accompany CPE delivered to the end user:
This equipment emits radio-frequency (RF) energy. For compliance with European directives regarding RF exposure, the manufacturer has determined that to prevent sustained RF exposure, the equipment must be installed such that persons maintain at least twenty (20) cm clearance.

1.3.4 Recommendations

- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.
- Look carefully for possible hazards in the work area, such as moist floors, ungrounded extension cables, frayed power cords and missing safety grounds.

1.4 Repair and Technical Support

RadioFrame Networks provides technical support services to the **supplier** of the S-Series system and its components, which is Nokia Siemens Networks (NSN).

The NSN Helpdesk service, sometimes referred to as End-to-End Customer Care (ECC), is operational Monday-Friday, 0900 to 1700 hrs GMT.

The service is for reporting of faults that are of a non-urgent nature, i.e., non-service-affecting, limited impact, etc.

Faults can be logged via telephone, e-mail and Nokia Online Services (NOLS).

1.4.1 Technical Support

The following methods can be used to submit a request into the NOLS support pipeline:

- Internet www.online.nsn.com
- Telephone 0800 421321, option 1
- E-mail NET.contactcentre.EUR1@nokia.com

Please have the following information available when submitting a case into the support pipe:

- Company
- Affected Network Element
- Request Type (SW/HW etc.)
- SW Release/CD Level
- Severity
- Detailed Description
- Contact Person/details
- Customer reference ID

1.4.2 Field Replaceable Unit (FRU) Policy

The S-Series system has been designed so that Field Repairable Units (FRUs) can be replaced to restore normal system operation as quickly as possible. RadioFrame Networks components are individually tested prior to shipment.

If RadioFrame Networks equipment should require service or repair, note the requested information from Section 1.4.1, and then contact the NSN ECC.

Note: Do not attempt to repair RadioFrame Networks equipment and components in the field.

Note: Always use a static grounding wrist strap before handling any chassis.

- Include the serial numbers of the affected equipment.
- Give a clear return address, including:
  - Name
  - Address, including building or Suite #
  - Postal code
  - Contact phone number
  - Alternate Contact phone number
- Securely package the FRU in its original shipping carton, if available. Otherwise, package in a static protection bag in a well-padded carton.

Table 1 lists current FRU equipment for the S-Series system. Refer to the table for replacing any of the following equipment. For equipment not supplied by RadioFrame, follow standard policies and procedures for FRU replacement of that equipment.

Table 1 FRU Table

Nokia PN	RadioFrame PN	Nokia Name	Description
471444A.101	176-0110-Rxx	SBTA Nokia Pico GSM/EDGE BTS ANSI Band	PicoBTS, North American, Lead Free
471644A.101	176-0125-Rxx	SBTE Nokia Pico GSM/EDGE BTS ETSI Band	PicoBTS, European, Lead Free
083950A.101	176-0208-Rxx	SPSM Nokia Pico GSM/EDGE PSM	FRU, Power Supply, PicoBTS

2 System Description

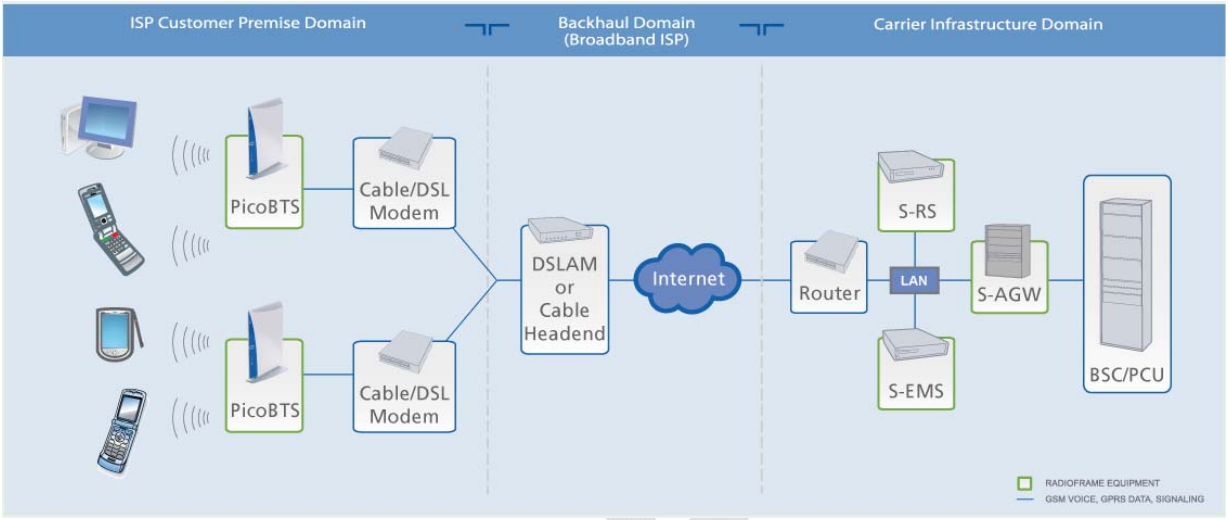
The S-Series system is a picocell base-transceiver station (BTS) solution that provides radio coverage in small footprint increments with low additional cost.

2.1 Three-Domain Architecture

The OmniCell@Home picocell interoperates with aggregating nodes in the BSS to optimize BSC resource utilization. The S-Series components, shown in Figure 2, include the OmniCell@Home Base Transceiver Station (PicoBTS), which provides coverage in the customer premises, the S-Series Registration Server (S-RS), which provides a mechanism for authenticating each PicoBTS, the Element Management System (S-EMS), which manages operation of the network elements, and the Aggregation Gateway (S-

AGW), which presents the Abis interface to the Base Station Controller (BSC) and Packet Control Unit (PCU) in the Base Station System (BSS).

Figure 2 S-Series Architecture



2.1.1 Internet Service Provider (ISP) Customer-Premise Domain

The Customer-Premise Domain consists of small form factor PicoBTSs with DSL and/or cable modem/router connections to the Backhaul Domain. Each PicoBTS is connected to the DSL/cable modem/router via an RJ-45 CAT5 Ethernet cable.

- Connection to the Backhaul Domain may alternatively be provided through a customer-premise LAN
- PicoBTSs are distributed in the customer premises to optimize coverage
- Each PicoBTS acts as a single picocell

2.1.2 Backhaul Domain

The Backhaul Domain provides secure transport between the PicoBTSs and the S-AGW in the Infrastructure Domain. The Backhaul IP Domain must also include a local DHCP server or access to a DNS server.

The backhaul domain link must meet minimum performance requirements.

2.1.3 Carrier Infrastructure Domain

The Infrastructure Domain consists of a mobility network and optionally a separate data network that provides access to the Internet. Common to both networks is a firewall (optional).

The S-AGW manages system resources and multiplexes/de-multiplexes user traffic to multiple RadioFrame customer-premise PicoBTSs. Each PicoBTS is configured to be a logical 1-TRX Metro-Site BTS from the BSC's point of view.

Note: The Transcoder Rate Adaptation Unit (TRAU) function is required, as it is for an existing GSM BTS.

The S-RS provides a mechanism for authenticating each S1 BTS as it joins the service-provider (SP) network (during system start-up) and initial key exchange for protection of subsequent signalling communications between the PicoBTS and the S-AGW. In essence, the S-RS serves as a “gatekeeper” – ensuring that only authenticated PicoBTS equipment may reach the S-AGW via its backhaul IP address.

The S-EMS is used to manage the operation of the S-Series AGW and PicoBTS network elements. The S-EMS performs typical Element Manager Layer (EML) services as defined by the Telecommunications Management Network (TMN) model. The S-EMS provides management functions in addition to the GSM management provided by the MNO’s existing OMC across the Abis interface.

2.2 PicoBTS Functional Block Diagram

Figure 3 shows the functional subsystems of the PicoBTS. These are described in the following paragraphs.

RF Monitor

The RF monitor functional block is a GSM receiver capable of receiving in the 900/1800 and 850/1900 bands. The purpose of this block is to monitor the radio environment and look for carriers from the macro network as well as carriers from other nearby PicoBTS units. Signal information from these sources is passed to the Host CPU block where it is used for frequency planning and other system-management functions.

EDGE/GPRS/GSM

This block is the PicoBTS quad-band transceiver. It performs the radio functions required in a base station as well as baseband processing of transmitted and received signals. Though not strictly part of the transceiver, the SIM-card reader is included in this block as it interfaces directly to the FPGA.

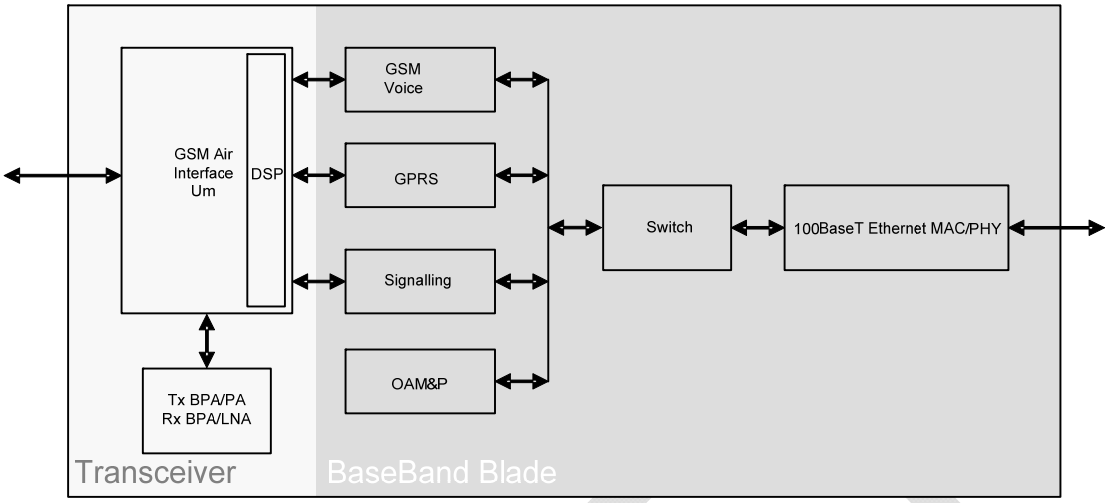
Host CPU

This block performs a variety of control and processing functions necessary for operation of the HRBS. The WLAN transceiver, router, GSM transceiver and RF monitoring sections interface to the host CPU.

Router and Ethernet PHY

In addition to providing LAN capability, the router section allows additional Ethernet connections to the ISP network.

Figure 3 PicoBTS Functional Block Diagram



2.3 System Manager Software

Management is primarily intended to be performed using existing Operation Support System (OSS) resources within the MNO infrastructure. However, there are also local and remote management capabilities provided by the System Manager software package. System Manager is a web-based graphical management system, which is accessible via an IP-based connection.

System Manager provides Operations personnel with remote access and control, including configuration, alarm monitoring, triage/troubleshooting and system statistical reporting. All S-Series systems include System Manager as standard equipment. Core System Manager functions include:

- Software Download (both locally and remotely)
- X.733 Alarming
- Configuration Management
- Diagnostics and Troubleshooting
- Call Statistics and Uptime
- RF Performance Metrics (e.g., Uplink SQE, Noise Floor, etc.)
- Test and Maintenance (e.g., automated BER testing)

2.4 Network Integration

To support needed personalization and location features, the S-Series communicates with one or more of the databases (such as Personalization and Location DBs) which may or may not already exist in the Mobile Network Operator (MNO) BSS and CN.

Each PicoBTS is equipped with a SIM card that stores necessary information for S-Series provisioning and authentication. SIM-based authentication methodology, similar to GSM authentication but with no core-network involvement, is used during the PicoBTS registration with the S-RS to ensure that stolen PicoBTSs are barred from operating. The PicoBTS authentication does not involve the HLR or any other core-network (CN) element.

The existing BSC and BTS MIBs can be managed by the existing BSS OMC, and the additional PicoBTS MIBs can be managed by the new S-EMS (a separate NE) or these MIBs can be integrated into the OMC. One common scenario is to initially deploy a single S-EMS and then remove it once the integration of the S-Series with standard MNO element and network management resources is completed.

3 Specifications

3.1 Dimensions

Table 2 Dimensions

	Metric (w x h x d cm)	Imperial (w x h x d in.)
PicoBTS Volume (approximate form factor)	26.7 x 18.9 x 4.4	10.6 x 7.5 x 1.8

3.2 Weight

Table 3 Weight

Unit	Estimated Weight
PicoBTS	Inclusive of power supply: 1 kg

3.3 Power Supply

The PicoBTS operates on a single nominal 12 VDC, 1.25 A supply. The electrical characteristics of the power supply and the input power requirements of the PicoBTS are listed in Table 4.

Table 4 Power Supply Electrical Requirements

Spec	Value
Input Voltage	90-264 VAC
Input Current	< 0.6 A RMS Max
Input Frequency	47 - 63 Hz
Output Voltage / Current	12 VDC @1.25 A
Output Current	No Load to Full Load, No Minimum Load Required
Output Power (Rated)	18 Watts Max
Output Ripple (Peak to Peak)	<150 mV
Output Regulation (Line/Load)	+ 5% for Main Output, Measured at O/P Connector
Line Regulation	+ 1% Max at Full Load

Spec	Value
Hold-up Time	>10 ms Min at Nominal Input and Full Load
Inrush Current	Inrush Limiting
Over-Current / Short Circuit	Auto Recovery
Dielectric Withstand Voltage	3000 VAC Primary-Secondary
Leakage Current	< 1 mA
Line Surge	EN 61000-4-5 Level 4

Table 5 Power Supply Mechanical Requirements

Spec	Value
Housing	High Impact Plastic, 94V0 Polycarbonate, Non-vented, Color Black
Size, Max., Any Dim.	100 mm
Cooling	Convection
Weight	<350 g
Output Connector	Center Positive, 2.5 mm Barrel
Input Connector	Shaver C8; or Molded AC Cable Included, Country Specific

Table 6 Power Supply Safety Requirements

Spec	Value
Other Protection	Input Fusing
Safety Approvals	UL60950, CUL TO 22.2# 950, SEMKO TO EN60950, CCC TO GB4943-2001, GB9254-1998, GB17625.1-2003, CE CLASS II, AS/NZ 60950, PSE TO J60950, CB REPORT

Table 7 Power Supply Environmental Requirements

Spec	Value
ROHS	Compliant
WEEE	Compliant
MTBF	50,000 hours
Operating Temperature	0°C to 40° C
Storage Temperature	–40°C TO 80° C
Humidity	0% TO 90% Relative Humidity
EMI	EN550022 Class B, EN61000-3-2, EN61000-3-3
Immunity	EN55024:1998

Table 8 Power Requirements

	Min	Nom	Max	Units	Comments
Operational	11.4	12	12.6	VDC	Required range for normal operation of the PicoBTS
Operational	1.43	1.25	1.58	A	
Operational	8.3	–	13.2	VDC	PicoBTS will power up, but may not function properly
Operational	1.36	–	2.17	A	
Absolute Max	–	–	15	VDC	Exceeding may cause permanent damage
Absolute Max	–	–	2.2	A	
Absolute Min	7.9	–	–	VDC	Below this voltage the PicoBTS will not power up
Absolute Min	1.2	–	–	A	

3.4 Output Power

The PicoBTS is configured for an output power of:

- GMSK **+23 dBm max**
- 8-PSK **+15 dBm max**

3.5 Power Control

Transmit power control is statically provisioned in 2 dB ± 1 dB steps according to GSM 05.05, sub clause 4.1.2.

3.6 Typical Coverage Area

The typical coverage radius measures approximately 50 m. Nominal coverage per PicoBTS is 6,360 sq m (70,000 sq ft).

3.7 Heat Load

Table 5 identifies the heat load for a functional PicoBTS.

Table 9 Heat Load

Component	Heat Load	
	(W)	(BTU per Hour)
PicoBTS	18	61.45

3.8 RF Performance

The PicoBTS employs dual-band transceivers, which for the European market includes GSM900 (GSM) and GSM1800 (PCS) and for the North American market includes GSM850 and GSM1900.

3.8.1 Spurious RF Emissions

The S-Series system meets the emissions mask requirements per ETSI EN 301 502 V8.1.2 (2001-07).

3.8.2 Operating Frequency Bands

Table 6 provides a breakdown of the frequency ranges covered; Table 6 provides the channel and duplex spacing for Absolute Radio Frequency Channel Number (ARFCN) pairings.

Table 10 Transmit and Receive Frequency Ranges

Band	Receive Frequency (MHz)	Transmit Frequency (MHz)
900	890 to 915 880 to 915 (E-GSM) 876 to 915 (R-GSM)	935 to 960, 925 to 960 (E-GSM) 921 to 960 (R-GSM)
1800	1710 to 1785	1805 to 1880
850	824 to 849	869 to 894
1900	1850 to 1910	1930 to 1990

Table 11 Spacing for ARFCN Pairing

Band	Channel Spacing (kHz)	No. of channels	Duplex Spacing (MHz)
900	200	124 174 (E-GSM) 194 (R-GSM)	45
1800	200	374	95
850	200	124	45
1900	200	299	80

3.8.3 Transmitter Performance Summary

Table 12 Transmitter Performance Summary

Parameter		Condition		Value			Unit
				Min	Typ	Max	
Tx Output Power Level	**GMSK**	GSM850, GSM900 Power Step 0		16	18	20	dBm
		GSM1800, GSM1900, Power Step 0		19	21	23	dBm
	8PSK	GSM850, GSM900 Power Step 0		10	12	14	dBm
		GSM1800, GSM1900, Power Step 0		13	15	17	dBm
Tx Output Power Range		Static + Dynamic		21	24	27	dB
Tx Output Power Control Step Size		Minimum step size		1	2	3	dB
Adjacent Channel Power (these break points are perceived to be most difficult to achieve and are listed for convenience)		200 kHz offset				–30	dBc
		400 kHz offset	GMSK			–60	dBc
			8PSK			–56	dBc
		1800 kHz offset				–70	dBc
RMS phase error		GMSK				5	deg
Peak phase error		GMSK				± 20	deg
EVM Average%		8PSK				7	%
Origin Offset		8PSK		35			dB

3.8.4 Receiver Performance Summary

Table 13 Receiver Performance Summary

Parameter	Condition			Value			Unit
				Min	Typ	Max	
Max Rx Input Level	No damage occurs					+10	dBm
Rx Input Level Static Channel (Note 1)	SM850, GSM900, BER < $1e^{-3}$		GMSK	–88		–16	dBm
			8PSK	–85		–16	
	GSM1800, GSM1900, BER < $1e^{-3}$		GMSK	–95		–17	dBm
			8PSK	–92		–17	
Rx Input Reference Sensitivity Fading Channel (Note 2)	SM850, GSM900, BER < $1e^{-3}$		GMSK	–85		–16	dBm
			8PSK	–77.5		–16	
	GSM1800, GSM1900, BER < $1e^{-3}$		GMSK	–92		–17	dBm
			8PSK	–84.5		–17	
Intermodulation Rejection	Interferers 800 kHz, 1600 kHz offset, Desired 3dB above sensitivity	GSM850, GSM900		–43			dBm
		GSM1800, GSM1900		–49			

Parameter	Condition		Value			Unit
			Min	Typ	Max	
Out-of-band blocking	600 kHz offset	GSM850, GSM900	–34			dBm
		GSM1800, GSM1900	–41			
	1.6 MHz offset	GSM850, GSM900	–26			
		GSM1800, GSM1900	–31			
	> 3 MHz offset	GSM850, GSM900	–18			
		GSM1800, GSM1900	–23			
In-Band Interferer	0 kHz offset				13	dBc
	200 kHz offset				–5	
	400 kHz offset				–37	

Note1: Static reference sensitivity is measured with TCH/FS and PDTCH/CS-1 for GMSK and MCS-5 for 8PSK

Note 2: Page 64 of TS 101 087 V8.5.0 lists the fading channel requirements the PicoBTS must support

3.9 Environmental Specifications

Table 9 represents the environmental specifications for the S-Series system components.

Table 14 Environmental Specifications

Parameter	Condition	Value			Unit
		Min	Typ	Max	
Ambient Temperature	Normal operation	0	27	40	°C
	Storage	–40		70	°C
Humidity	Normal operation relative, non-condensing	0		90	%
	Storage, non-condensing	0		90	%
Altitude	Relative to mean sea level	–60		1800	m
Shock		40			G
Seismic	Level 4 earthquake; meets or exceeds GR-63-CORE Earthquake Environment NEBS requirements	99.9			% pass
Storage	ETSI ETS 300 019-1-1				Class 1.3E
Transport	ETSI ETS 300 019-1-2				Class 2.3
Operation	ETSI ETS 300 019-1-2				Class 3.1
UL Pollution	Degree 3	99.9			% pass
Transport Vibration	NSTA, ISTA compliant	99.9			% pass
RoHS Directive	The PicoBTS will be compliant with the RoHS Directive				

3.10 Safety and Compliance Specifications

The S-Series system will meet the following safety and compliance specifications.

Table 15 Safety and Compliance Specifications <<<PENDING>>>

Parameter	Applicable Standard
CE / R&TTE	TS 101 087 V8.5.0 ETSI EN 301 502 V8.1.2 (2001-07) (Requested parts only) – Radio ETSI EN 301 489-1 V1.5.1 (2004-11) – EMC ETSI EN 301 489-8 V1.2.1 (2002-08) – EMC for GSM 900/1800 and 850.1900 Pico Class BTS ETS 300 019 – Parts met by test or design (TBD) EN 60950 and IEC 60950
FCC	Parts 22 & 24
UL	UL60950
IP Rating	IP 10 (Intended for indoor use)
RoHS	The PicoBTS is designed to meet the RoHS directive
WEEE	The PicoBTS is designed to meet the WEEE directive

3.11 Antennas

Table 16 Antennas

	Connector	Interface
Antenna	SMA-type	Um

Note: With the housing in place, the antennas are not visible.

3.12 Logical Channels

Each PicoBTS supports up to 7 traffic channels (1 GSM/GPRS TRX).

Logical channel configurations:

- BCCH (FCCH + SCH + BCCH + PCH + AGCH)
- Extended BCCH
- Combined BCCH and SDCCH
- SDCCH (SDCCH4 and SDCCH8 configurations)
- TCH (TCH + FACCH + SACCH)
- PDCH
- RACH

3.13 Services

Voice	GSM FR and EFR AMR TCH_AFS and TCH_AHS
Data	GPRS CS 1-2 E-GPRS MCS1-9 E-GPRS Incremental Redundancy BS20 at up to 9.6 kbps
Encryption	A5/1
System Interfaces:	Nokia Abis Interface
Network Interfaces:	Onboard router that supports One wide area network port (RJ-45) for connection to broadband IP backhaul network Four local area network switch ports (RJ-45) to provide connectivity for other devices such as WLAN router, PCs, etc.

4 Installation

4.1 Dimensioning Considerations

Dimensioning of infrastructure domain equipment (S-AGW, S-RS, and S-EMS) is covered in <<<Doc Set To Be Supplied>>>.

4.1.1 CPE Scaling

For the purpose of planning PicoBTS (CPE) deployment, the following assumptions are valid:

- Each PicoBTS is configured as a BCCH TRX
- Each PicoBTS supports up to 7 FR voice calls (depending on how many slots are used for GPRS)
- Each S-AGW has the capability of supporting 40 TRXs

4.1.2 Link Dimensioning

Data traffic on links is implementation dependent, but for the purpose of dimensioning links, the following information is provided.

- Suggested DSL or cable modem bandwidth available at the PicoBTS is 256 kbps for both uplink and downlink (calculated minimum under “typical” conditions is 182 kbps)
- A complete and successful registration procedure typically results in traffic load (from PicoBTS to S-RS) of 14 IP/TCP/SSL packets, for a total of about 1733 bytes and (from S-RS to PicoBTS) of 12 IP/TCP/SSL packets, for a total of about 2226 bytes. Therefore, the total for both directions is 26 packets, or approximately 4000 bytes.

  Note: *The S-RS employs a throttling mechanism such that a limited number of registration requests may be handled concurrently. Each request spawns a temporary thread in the S-RS process,*

- The bandwidth required for a fully loaded S-AGW at the S-AGW – IP backhaul interface is about 200 kbps (per TRX) * 40 = 8 Mbps

4.2 Preparation for Installation

In Section 4.3 you will connect the cabling and bring up the PicoBTS CPE. Installation requires no training or prior expertise on the product. The software architecture of the S-Series allows for a “plug-and-play” behaviour. No intervention is required if the preparation described in this section has been accomplished.

Before the PicoBTS CPE is able to register, it must be provisioned with the FQDN (or IP address) of the S-RS in order to initiate the process. (For security, the S-RS does not advertise or poll.) Normally this provisioning is pre-loaded in the CPE.

Refer to Appendix B, Default Configuration of the OmniCell@Home Picocell as Shipped, for the Factory settings for the PicoBTS.

4.3 Installing CPE Equipment

Note: Infrastructure equipment must be operational before CPE can be installed. The PicoBTS hardware is installed at customer premise locations, most likely at different times and by different personnel.

The following items come with the PicoBTS:

- Power supply transformer assembly with country-specific adapters
- Ethernet cable: CAT5e, 7 ft (2.13 m)

The customer needs to supply additional Ethernet cables if additional equipment will be connected to the PicoBTS router on the LAN side. Auto MDX/MDIX is supported.

The PicoBTS should be placed on a table top in the vertical position as shown in Figure 1.

Plan to route the necessary cabling to the location of the PicoBTS, including power, WAN cable, and any LAN cables.

4.3.1 Mechanical Installation Time

Mechanical installation time for the PicoBTS is designed to be minimal, and should be less than 10 minutes.

Connect the PicoBTS WAN port to the broadband IP backhaul network (xDSL or cable modem).

Connect the LAN ports to the local area network as necessary.

4.3.2 Bringing up the PicoBTS

Connect the provided AC power cable to the PicoBTS, and, using the correct adapter for the country's power receptacles, plug the cable into the wall receptacle. Within three minutes, the PicoBTS registers and is ready for use.

CPE IP Address

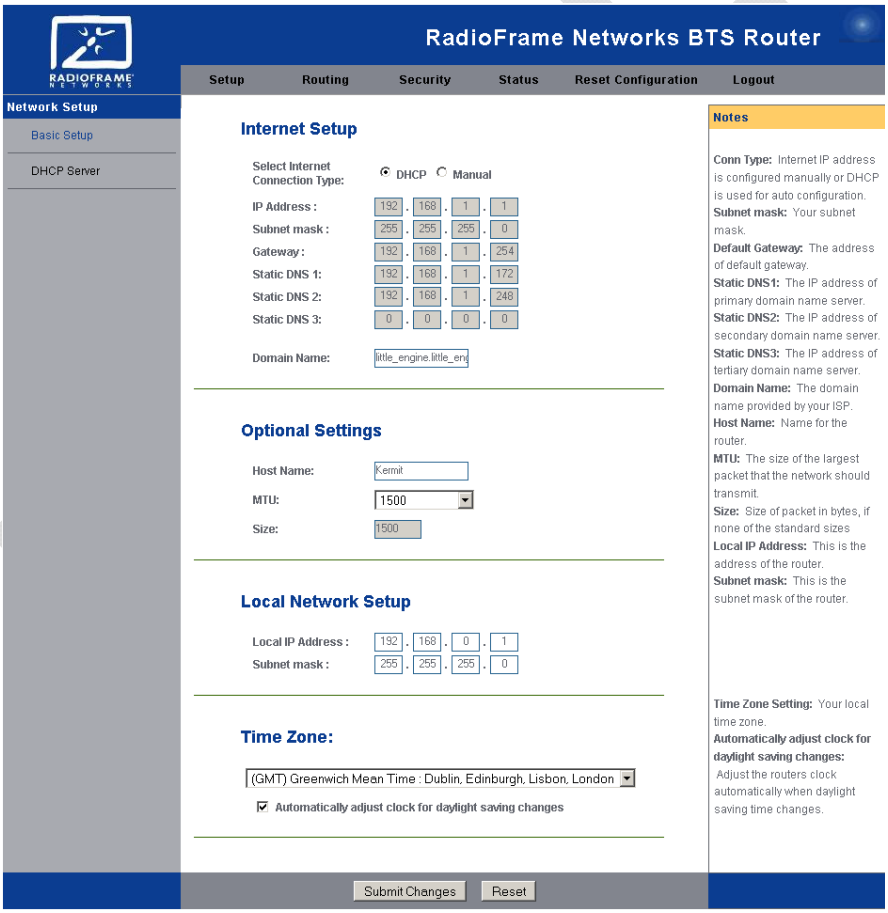
PicoBTSs can be configured with a static IP address, or addresses can be assigned by DHCP. To change settings on a PicoBTS, you can connect a PC to one of the LAN ports on the PicoBTS and browse to 192.168.0.1.

The default username is admin, with password admin123

Refer to Figure 4. On the general setup page you can select either DHCP or static IP address.

It is not critical what IP addresses the PicoBTSs receive as long as they do not clash with anything else on the same network.

Figure 4 PicoBTS Router Configuration Page



5 Scheduled and Unscheduled Maintenance

5.1 Maintenance

5.1.1 Customer Domain Component (PicoBTS)

There are no maintenance procedures required for the PicoBTS.

5.2 Troubleshooting Guidelines

Technicians should conduct the following troubleshooting steps in order:

1. Visually inspect for fault indication (LEDs).
2. Inspect the Alarm Manager, and follow alarm resolution procedures.
3. Refer to section1.4, “Repair and Technical Support” on page 8.
4. Complete and save the serial log upload of **<<<TBS>>>**.
5. Refer to sections **<<<power down procedure TBS>>>** and **<<<FRU procedures: TBS>>>**.

5.2.1 Fault Indications

<<<TO BE SUPPLIED>>>

5.2.2 System Manager Alarms

<<<TO BE SUPPLIED>>>

5.2.3 Serial Log Upload Procedure

<<<TO BE SUPPLIED>>>

5.2.4 Power Down Procedure

<<<TO BE SUPPLIED>>>

5.2.5 Field Replaceable Unit (FRU) Procedures

<<<TO BE SUPPLIED>>>

6 System Configuration Changes

The S-Series system is shipped with the latest software installed. With each new software release, RadioFrame Networks provides its customers with the new software and accompanying information in the RadioFrame Networks Customer Release Notes. Software Download to the PicoBTSs is accomplished remotely from the Software Download Server.

System Manager contains two separate partitions in which to install software: active and inactive. This provides the means to revert back to a previous version of system software if required.

6.1 Adding S-Series Components

<<<PROCEDURE TO BE SUPPLIED>>>

6.2 Spares, Parts and Suppliers

<<<TO BE SUPPLIED>>>

Appendix A. Definitions and Abbreviations

Term	Definition
A-bis	Interface between BTS and BSC
A/D	Analog to Digital
AGW	Aggregating Gateway (proposed function of IP BSC)
AP	Access Point
ARFCN	Absolute Radio Frequency Channel Number
ARP	Address Resolution Protocol
BGP	Border Gateway Protocol
BSS	Base Station System
BTS	Base Transceiver Station
CLI	Command Line Interface
CN	Core Network
DAC	Digital-to-Analog Converter
DES	Digital Encryption Standard
DHCP	Dynamic Host Control Protocol
DSP	Digital Signal Processing
EML	Element Management Layer
EMS	Element Management System
FCAPS	Fault, Configuration, Accounting, Performance and Security
FIT	Failure in Time
FPGA	Field Programmable Gate Array
FQDN	Fully Qualified Domain Name
FRU	Field Replaceable Unit
GPRS	General Packet Radio Service
HDLC	High-Level Data Link Control
HLR	Home Location Register
HO	Handover
HRBS	Home Radio Base Station
HSDPA	High-Speed Downlink Packet Access
HSS	Home Subscriber Server
IGRP	Interior Gateway Routing Protocol
LA	Location Area
LME	Local Management Entity
LMT	Local Maintenance Terminal
LSA	Localized Service Area
LSAID	Localized Service Area Identity
MAC	Media Access Control
MCC	Mobile Country Code

Term	Definition
MIB	Management Information Base
MNC	Mobile Network Code
MO	Managed Object
MS	Mobile Station
NB	neighbor cell (list)
NE	Network Element
NEL	Network Element Layer
O&M	Operations and Maintenance
OAM	Operations, Administration, Maintenance
OMC	Operations and Maintenance Center
OSPF	Open Shortest Path First
OTAP	Over the Air Programming
PCU	Packet Control Unit
PHY	Physical Layer
PLL	Phase Lock Loop
PLMN	Public Land Mobile Network
RBS	Radio Base Station
RFN	RadioFrame Networks
RIP	Routing Information Protocol
RS	Registration Server (proposed function of IP BSC)
RSSI	Received Signal Strength Indication
RSZI	Regional Subscription Zone Identity
RTP	Real-time Transport Protocol
SGSN	Serving GPRS Support Node
SIM	Subscriber Identity Module
SME	Small to Medium Enterprise
SMI	Structure of Management Information
SMLC	Serving Mobile Location Center
SNMP	Simple Network Management Protocol
SRTP	Secure Real-time Transport Protocol
STK	SIM Card Toolkit
TMN	Telecommunications Management Network
TMSI	Temporary Mobile Subscriber Identity
TRAU	Transcoder Rate Adaptation Unit
TRX	Transmit/Receive Pair
UART	Universal Asynchronous Receiver/Transmitter
VLR	Visitor Location Register
ZC	Zone Code

Appendix B. Default Configuration of the OmniCell@Home Picocell as Shipped

Setting	Default
Router Information	
Current Time	—
Mac Address	—
Domain Name	—
Host Name	—
Internet Information	
Connection Type (WAN Port)	DHCP
IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.254
DNS1, -2, -3	—
MTU	—
Local Network Information	
Local IP	192.168.0.1
Subnet Mask	255.255.255.0
Dynamic Routing	Disabled
DHCP Details	
DHCP Server	Enabled
Security Information	
HTTPS	Disabled

Appendix C. RF Emissions Precautions

C.1 Exposure vs. Frequency

Overall exposure may be affected by radio frequency generating facilities that exist at the time the equipment is being installed or even by equipment installed later. Therefore, the effects of any such facilities must be considered in site selection and in determining whether a particular installation meets the requirements of safe operation. Determining the compliance of transmitter sites of various complexities may be accomplished by means of computational methods. For more complex sites, direct measurement of power density may be more expedient. Persons responsible for installation of this equipment are urged to consult the listed reference material to assist in determining whether a given installation complies with the applicable limits. In general the following guidelines should be observed when working in or around radio transmitter sites:


Warning!

All personnel should have electromagnetic energy awareness training.


Warning!

Obey all posted signs.


Warning!

Assume all antennas are active.


Warning!

Never operate transmitters without shields during normal operation.


Warning!

Do not operate base station antennas in equipment rooms.

Appendix D. Communication Interconnects

<<<TO BE SUPPLIED>>>