



TetraFlex® V7.5

US DRAFT version

Manual version 1.01
27.01.2012



The information contained in this document is the property of Damm Cellular Systems A/S. This document is subject to copyright and shall not be published or reproduced, in whole or in part, without the written permission of Damm Cellular Systems A/S.

© 2010 Damm Cellular Systems A/S. All rights reserved.

Møllegade 68, DK-6400 Sønderborg, Denmark

Phone: +45 74 42 35 00, Fax: +45 74 42 30 31,

E-Mail: dcs@damm.dk,

<http://www.damm.dk>

INTRODUCTION

This manual is intended for installation and maintenance of BS4xx TetraFlex® Base Station, including additional units, installation software, and how to configure the system for operational use.

Remark: TetraFlex® ver. 7.5 is not compatible with earlier versions! Please follow the update instructions or contact DAMM support if you have systems with older software versions.

Indoor Base station models

BS411



Max. 16 carriers



Max. 8 carriers

BS414



Max. 4 carriers

Outdoor station

BS421 + SB 421



Max. 4 carriers

It is recommended that engineers doing the installation and configuration of a BS4xx have practical experience in installation of radio and computer systems, and have made themselves familiar with the BS4xx equipment through appropriate DAMM training courses and study of the content of this manual.


This installation guide covers the installation of indoor as well as outdoor Base Stations as well as single units. Please skip the sections, which are not relevant for the actual case.

The manual is divided into more sections which may be printed separately. When doing so please print the Table of contents, introduction, update sheets and Index (all pages prior to page 1-1 and after page 4-x) and insert these in the printed section

IMPORTANT:

Updates / changes / important information related to the TetraFlex® system and software may be downloaded from the protected part of www.damm.dk

Please check this URL for updated information before attempting to install or correct errors

NOTE: Chapters marked with a  indicate areas where special care must be taken to avoid personal injury or damage to the equipment.



Before starting installation and configuration, please read the entire manual carefully.



NOTE: It is the responsibility of the system owner / operator to ensure that only authorized service persons has access to the keys / inside circuits of the SB412 / BS4xx.



NOTE: It is the responsibility of the system owner / operator to ensure that all local legislation, rules and regulations are complied with.



The SB412 / BS4xx are protected by internal fuses. Always replace with fuses of equivalent value and type.

General Warning

This manual contains important safety and operational information. Please read and follow the instructions in this manual. Failure to do so could be hazardous and result in damage to your device.

Changes and modifications to this device not expressly proved by DAMM could void the user's authorization to operate this device

FCC Regulations

The DAMM developed device mentioned in this User Manual fulfills the below statements according to FCC/IC warning statements:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

RF Exposure

The DAMM developed transmitting devices mentioned in this User Manual have the Nemko approval concerning “Maximum Permissible Exposure Calculations” which are the European limits for maximum permissible exposure defined in the document 1995/519/EC, Council Recommendation of 12. July 1999. The results are to be found in the Nemko Document 128948/5 in the appendix of this User Manual.

Antennas

The outside antenna connected to this device must be installed on an outdoor permanent structure with a separation of at least 20 feet from all persons during normal operation.

Notice

- ❖ Do not modify any part of this device for any reason
- ❖ Do not place any combustible material near the transceiver
- ❖ Do not spray any liquid over the device
- ❖ Ensure that the power and antenna connections are securely made, using cables recommended and with excess capacity for the power being utilized.

REFERENCE DOCUMENTS

For detailed information’s regarding the TetraFlex® release and features supported, please consult the documents listed below:

No.:	Document Title	Document Contents
1	TetraFlex v7.5 System description.pdf *	TetraFlex® system overview
2	TetraOM_7.5.pdf	TetraFlex® OM manual
3	TetraFlex_RN_7.52_2011-09-30_02.pdf *	TetraFlex® system release note
4	TetraFlex 7.4x to 7.5 update.pdf	Update guideline for ver.7.4x to 7.5
5	TetraFlex 7.5 BS41x redundant setup.pdf	Redundancy sw setup guideline for BS41x

*) These documents is a part of the TetraFlex® release and placed in the C:\tetra\Active\Doc directory

All documents can be found on www.damm.dk extranet.

TETRAFLEX® MANUAL BREAKDOWN

Section	Description	Level
Part 1	Physical hardware installation	Tech
Part 2	Software installation and configuration of software and system	Tech
Part 3	User manual intended for operators and non technical personnel	User
Part 4	Technical reference	Tech
Part 5	Hardware Units Ref.	Tech
Part 6	List of figures and Alphabetic index	All



Damm Cellular Systems A/S, Denmark

Doc. No.
DRAFT

Rev.
1.01

Date
2012-01-27

TetraFlex® 7.5 Manual - TetraFlex® Manual breakdown

TABLE OF CONTENTS

Introduction	2
Reference documents	5
TetraFlex® Manual breakdown	5
Revision	17
Abbreviations / Definitions	19

PART-1: HARDWARE INSTALLATION.....1-1

1.1 SB421	1-2
1.1.1 Environmental / climatic requirements	1-2
1.1.2 Placement.....	1-2
1.1.3 Grounding.....	1-2
1.1.4 SB421 basic elements.....	1-3
1.1.4.1 SB421 Variants	1-3
1.1.4.2 Mechanical Lock	1-3
1.1.4.3 Power supply / charger	1-3
1.1.4.4 BSC421 Base Station Controller	1-4
1.1.4.4.1 SB421 Processor board internal backup battery.....	1-4
1.1.4.4.2 Storage unit.....	1-4
1.1.4.4.3 BSC connections	1-5
1.1.4.4.4 BSC421 LED's and Fuses	1-5
1.1.4.5 Interconnection Board	1-6
1.1.4.5.1 Connections.....	1-6
1.1.4.5.2 Switches	1-6
1.1.4.5.3 LED's	1-7
1.1.4.5.4 TR1/TR2 connection module.....	1-7
1.1.4.5.5 PS Connection to TR1 and TR2	1-8
1.1.4.5.6 LAN Connection to TR1 and TR2	1-8
1.1.4.5.7 LAN/WAN/SEC/Alarm Connection module.....	1-8
1.1.4.5.8 Connections.....	1-8
1.1.4.5.9 Redundant SB421 operation	1-9
1.1.4.5.10 Temperature sensor (TS) Connection	1-9
1.1.4.5.11 Alarm Connection.....	1-9
1.1.4.6 Mains Connection block.....	1-9
1.1.4.7 Internal -48 battery assembly (option)	1-10
1.1.4.8 External -48 battery kit (option) connection block	1-10
1.1.5 HW change for redundant SB421 / 3 and 4 carrier operation	1-11
1.1.6 SB421 Internal Battery Assembly.....	1-13
1.1.6.1 Battery kit maintenance.....	1-13
1.1.6.1.1 Installing batteries.....	1-13
1.1.7 External -48 battery kit (option) connection block	1-15
1.2 BS421	1-17
1.2.1 Environmental / climatic requirements	1-17
1.2.2 Placement.....	1-17
1.2.3 Grounding.....	1-17
1.2.4 BS421 main components.....	1-18
1.2.5 Attaching RX/TX antennas.....	1-19

1.2.5.1	Single Carrier BS installation recommendation (1 x BS421)	1-19
1.2.5.2	Dual Carrier BS installation recommendation (2 x BS421)	1-19
1.2.6	Power connection to SB421	1-20
1.2.6.1	System Connector	1-21
1.2.6.1.1	Easy connection scheme	1-22
1.2.7	BS421 internal backup battery	1-22
1.3	BS41x	1-23
1.3.1	Environmental/climatic requirements	1-23
1.3.2	Placement	1-23
1.3.3	Grounding	1-24
1.3.4	Attaching antennas	1-25
1.3.5	Connection to Battery	1-25
1.3.6	Connection to AC Mains	1-27
1.3.7	Connection Box CB412	1-29
1.3.7.1	Ethernet connect	1-29
1.3.7.2	External alarm connections	1-30
1.3.8	Back-up battery for BS41x	1-30
1.3.8.1	Introduction	1-30
1.3.8.2	Selecting external batteries	1-30
1.3.8.3	External battery installation	1-31
1.3.8.4	Battery charging	1-32
1.3.8.5	Battery deep discharge protect	1-33

PART-2: SW INSTALLATION AND CONFIGURATION.....2-34

2.1	Basic system parameters	2-35
2.1.1	System capability	2-35
2.2	Virus protection	2-36
2.2.1	Introduction	2-36
2.2.2	Virus Threat	2-36
2.2.2.1	Standard PC	2-36
2.2.2.2	BSC	2-37
2.2.3	MS Security Essentials	2-37
2.3	Dongle Configuration	2-38
2.3.1	License Dongles	2-38
2.3.1.1	Site versus Node:	2-38
2.3.1.2	Dongle types	2-38
2.3.1.3	Dongle settings and combinations	2-40
2.3.1.4	Dongle Update	2-40
2.3.1.5	Spare part Dongle:	2-41
2.3.1.6	Dongle exchange and information of content	2-41
2.3.1.7	Explanation to the readout:	2-42
2.3.1.8	Partners access to Software Releases:	2-44
2.3.1.9	Programming of Dongle Application Date Limit:	2-45
2.3.1.10	Consequences for Partner and End-User:	2-45
2.4	Software installation	2-46
2.4.1	CF Storage media	2-46
2.4.2	Windows License	2-47
2.4.3	TetraFlex® Installation/Upgrade	2-47
2.4.3.1	Preconditions	2-47
2.4.3.2	Log Server running on Service Box with 2 Gbyte CF Card	2-48
2.4.3.3	Installing a new image on SB421 and BSC412	2-48

2.4.4	Installing individual parts of the TetraFlex packet.	2-49
2.4.4.1	BSC.....	2-49
2.4.4.2	Start Menu	2-50
2.4.4.3	OM.....	2-50
2.4.4.4	NM.....	2-51
2.4.4.5	Dispatcher	2-51
2.4.4.6	Log Server.....	2-52
2.4.4.7	Log Client.....	2-52
2.4.4.8	PS421.....	2-53
2.4.4.9	TR412.....	2-53
2.4.4.10	BS421.....	2-53
2.4.4.11	Installing TEA2 encryption.....	2-53
2.5	SB421 Configuration	2-54
2.5.1	Initial setup.....	2-54
2.5.1.1	Ethernet Connection	2-54
2.5.1.2	Turn on the SB421	2-54
2.5.1.3	System BIOS configuration.....	2-54
2.5.1.3.1	Hard disk disable	2-55
2.5.1.3.2	BIOS setup for the TetraFlex® V7.30 and newer (CF Boot).....	2-55
2.5.1.3.3	BIOS setup for new fast Compact Flash (CF) Cards.....	2-57
2.5.1.4	IP address set-up.....	2-58
2.5.1.4.1	Default network card IP address setup.....	2-59
2.5.1.5	MAC address Set-up.....	2-59
2.6	BS421 Configuration	2-60
2.6.1	Ethernet Connection	2-60
2.6.1.1	Set-up of IP address.....	2-60
2.6.1.1.1	DHCP (Typical TetraFlex® single node)	2-60
2.6.1.1.2	How does DHCP work with the SB421 (BSC)?	2-61
2.6.1.1.3	Changing the BS421 IP	2-61
2.6.1.1.4	Static IP.....	2-64
2.6.1.1.5	TR421 Update / Install.....	2-65
2.6.2	Installing Windows CE on BS421	2-66
2.6.2.1	Copy NK.bin (WinCE) to BS421.....	2-66
2.6.2.2	Configure admin user.....	2-68
2.6.2.3	Configure host name.....	2-69
2.6.2.4	Configure file-server user.....	2-69
2.6.3	Copy to and from Compact Flash Card (CF Card) on BS421.....	2-70
2.6.4	Add a transceiver	2-71
2.6.4.1	Diversity configuration.....	2-72
2.6.4.2	RX-B setting (Diversity) in TetraOM:	2-72
2.6.4.3	3 And 4 carrier operation	2-72
2.6.4.4	Synchronization.....	2-72
2.6.4.4.1	GPS setup commands.....	2-76
2.6.4.5	BS421 manual frequency adjustment procedure	2-76
2.7	BS41x Configuration.....	2-77
2.7.1	Turn on Base Station power.....	2-77
2.7.2	Special precautions	2-77
2.7.3	Set-up of IP address.....	2-77
2.7.4	Setting the main parameters	2-78
2.7.5	Add a Transceiver	2-80
2.7.6	TX Power	2-80
2.7.7	Diversity.....	2-82
2.7.8	TX alarm.....	2-83

2.7.9	Add a Power Supply	2-84
2.7.10	Combiner adjustment	2-84
2.7.11	Antenna measurement	2-84
2.7.12	Save BSC and TR configuration.....	2-85
2.7.13	TMA/TMD installation adjustment	2-85
2.7.13.1	Introduction	2-85
2.7.13.2	Tools and Equipment	2-85
2.7.13.3	Adjustment Procedure	2-86
2.7.13.4	BS41x manual frequency adjustment procedure.....	2-87
2.8	Network Management Installation	2-88
2.8.1	The DAMM Network management Application.....	2-88
2.8.2	NM Installation on an external PC	2-88
2.8.3	SNMP gateway	2-89
2.8.3.1	SNMP installation	2-90
2.8.3.2	SNMP Manually PC installation	2-90
2.8.3.3	SNMP MIB Tree	2-91
2.9	Dispatcher Installation	2-94
2.9.1	The DAMM Dispatcher Application.....	2-94
2.9.2	Dispatcher Installation:	2-94
2.9.3	Dispatcher Installation on a PC with Windows 7	2-95
2.9.4	Configurations to be done on the node	2-96
2.10	Log Server	2-97
2.10.1	General Description.....	2-97
2.10.2	LogServer License	2-97
2.10.3	Configuration.....	2-98
2.10.4	Installation.....	2-101
2.10.4.1	Internal Log Server:	2-101
2.10.4.2	External Log Workstation and Log Server	2-102
2.10.4.3	Log Client:.....	2-106
2.10.4.4	Log Client installation on a PC with Windows 7:.....	2-106
2.10.4.5	SQL Server	2-107
2.10.4.5.1	General Description	2-107
2.10.4.5.2	ODBC Access to SQL Server	2-107
2.10.4.6	Log server maintenance	2-107
2.11	Voice Gateway	2-108
2.11.1	Voice Gateway configuration	2-109
2.11.2	Innovaphone IP800 Configuration	2-111
2.11.2.1	Example of the IP800 objects.....	2-113
2.11.2.2	IP 800 Route table example	2-113
2.12	Packet Data Gateway	2-115
2.12.1	PD GW configuration.....	2-115
2.12.2	PC network configuration	2-119
2.12.2.1	Network configuration	2-119
2.12.2.2	MS configuration	2-120
2.12.3	Main router	2-120
2.13	Application Gateway	2-121
2.13.1	Application Programming Interface (API)	2-121
2.13.2	Support.....	2-122
2.13.3	Compatibility	2-122
2.13.4	Test applications	2-122
2.13.5	API Configuration	2-122
2.13.6	API Installation	2-122
2.13.6.1	To install the API client (dispatcher)	2-122

2.13.6.2	Bringing the API to work on your system:.....	2-123
2.13.6.2.1	In the subscriber register:	2-123
2.13.6.2.2	In the Application (Dispatcher) folder:.....	2-123
2.13.7	API Dongle settings	2-126
2.13.8	Configuration file.....	2-127
2.13.9	Test of API function	2-128
2.13.9.1	API test tool.....	2-128
2.13.9.1.1	Check API connection.....	2-129
2.13.9.1.2	Test via TetraOM.....	2-129
2.13.9.1.3	Useful commands.....	2-130
2.14	TetraOM.....	2-132
2.14.1	TetraOM	2-132
2.14.2	Power supply addressing outdoor (SB421)	2-133
2.14.3	TR421, Combiner, Power supply addressing indoor (BS4xx)	2-133
2.14.3.1.1	Functional Description	2-134
2.14.3.1.2	Commands	2-134
2.14.3.1.3	Running commands.....	2-134
2.14.3.1.4	Simultaneous commands.....	2-135
2.14.3.1.5	Local blocking mode.....	2-135
2.14.3.2	Parameters	2-135
2.14.3.3	Configuration.....	2-136
2.14.3.4	TetraOM set up	2-136
2.14.3.5	TetraOM Help.....	2-139
2.14.3.6	TetraOM Editor	2-141
2.14.3.7	TetraOM logging.....	2-142
2.14.3.7.1	Logging to File	2-142
2.14.3.8	Useful TetraOM Commands.....	2-144
2.15	TR Remote desktop communication (VNC).....	2-148
2.15.1	VNC setup.....	2-148
2.15.2	File transfer via to/from TR.....	2-149
2.15.3	Changing General setup and Sync.....	2-150
2.16	IP Backbone network layout and configuration	2-151
2.16.1	Multi node router considerations	2-151
2.16.2	Network layout principle.....	2-151
2.16.3	Backbone network physical connection.....	2-152
2.16.3.1	Outdoor/SB421	2-152
2.16.3.2	Indoor/BS41x.....	2-152
2.16.3.3	Redundant BSC – SB421 or BS41x.....	2-153
2.16.4	IP addressing schemes	2-153
2.16.5	Considerations about network bandwidth	2-156
2.16.5.1	Group call:	2-157
2.16.5.2	Full duplex:	2-157
2.16.5.3	Half duplex:	2-157
2.16.5.4	Replication:.....	2-157
2.16.5.5	Control packets:	2-157
2.16.5.6	Log server:.....	2-158
2.16.6	The IP interconnection scheme of TetraFlex® per site	2-158
2.16.7	Recommendation.....	2-160
2.16.8	Recommended router hardware	2-160
2.16.9	Recommended router firmware	2-160
2.16.10	Applicable router techniques.....	2-161
2.16.10.1	VPN.....	2-161
2.16.10.2	Multicast networking	2-161

2.16.10.2.1	Routing multicast:	2-161
2.16.10.2.2	Group management in multicast:	2-161
2.16.11	Applicable tools for router programming	2-162
2.16.11.1	Ultraedit:	2-162
2.16.11.2	WordPad:	2-162
2.16.11.3	HyperTerminal:.....	2-162
2.16.11.4	Putty:.....	2-162
2.16.11.5	3CDeamon:.....	2-163
2.16.11.6	Tftp32:.....	2-163
2.16.11.7	Example of router configuration	2-163

PART-3: TETRAFLEX® APPLICATIONS.....3-170

3.1	General system description	3-2
3.1.1	TetraFlex V7.5 General System description	3-2
3.1.2	Site versus Node:.....	3-2
3.1.3	Software packages:	3-2
3.1.3.1	Software packages execution or update:.....	3-2
3.2	Base Station Controller	3-4
3.2.1	BSC.exe description	3-4
3.2.2	BSC-GUI	3-4
3.3	Network Management	3-9
3.3.1	Network Management	3-9
3.3.2	Toolbar	3-9
3.3.3	NM menu.....	3-10
3.3.3.1	File	3-10
3.3.3.2	View.....	3-13
3.3.3.3	Tools	3-13
3.3.3.4	Help	3-13
3.3.4	Graphical tools for fast Access and information overview	3-14
3.3.4.1	Notification Icons	3-14
3.3.4.2	Selection Icons.....	3-15
3.3.4.3	Nodes	3-15
3.3.4.4	Status.....	3-17
3.3.4.5	Map	3-18
3.3.4.6	BSC list.....	3-19
3.3.4.6.1	Alarms	3-19
3.3.4.6.2	Status.....	3-19
3.3.4.6.3	Config	3-20
3.3.4.6.4	Subscriber.....	3-21
3.3.4.6.5	Sub. Chk.....	3-22
3.3.4.6.6	IP's	3-22
3.3.4.6.7	Radio Status.....	3-23
3.3.4.6.8	Radio Config	3-24
3.3.4.6.9	Carrier Numbers.....	3-26
3.3.4.6.10	Neighbor cells.....	3-27
3.3.4.6.11	Voice GW.....	3-27
3.3.4.6.12	SIP Setup.....	3-28
3.3.4.6.13	PD GW	3-30
3.3.4.6.14	App GW	3-30
3.3.5	Subscribers	3-32
3.3.5.1	Subscriber definition	3-32

3.3.5.2	Organization	3-33
3.3.5.3	Profile	3-35
3.3.5.4	Subscriber	3-44
3.3.5.4.1	Mobile subscriber	3-45
3.3.5.4.2	Group subscriber	3-46
3.3.5.4.3	Application subscriber	3-48
3.3.5.4.4	Dial-in subscriber	3-49
3.3.5.4.5	Emergency subscriber	3-50
3.3.5.5	Security Key	3-51
3.3.5.6	Log Servers	3-52
3.4	Authentication and Encryption	3-54
3.4.1	Description	3-54
3.4.2	Definitions	3-54
3.4.3	Description	3-54
3.4.4	Backup	3-55
3.4.5	Restore	3-55
3.5	Dispatcher	3-57
3.5.1	General Description	3-57
3.5.2	TetraFlex® Dispatcher Functionality	3-58
3.5.3	Views	3-59
3.5.3.1	Connection Configuration	3-59
3.5.3.2	Dispatcher Configuration	3-60
3.5.3.2.1	Audio	3-61
3.5.3.2.2	Language	3-62
3.5.3.2.3	Calls	3-62
3.5.3.2.4	Map View	3-64
3.5.3.2.5	Mobile Positions Storage	3-66
3.5.3.2.6	External Devices	3-67
3.5.3.2.7	Updates	3-67
3.5.3.3	Subscriber Register	3-68
3.5.4	Phonebook functionality	3-70
3.5.4.1	Mobile indicators in the phonebook	3-71
3.5.4.2	Phone book docking	3-71
3.5.4.3	Phone Book Search	3-71
3.5.4.4	Direct call	3-72
3.5.4.5	Call dialog	3-72
3.5.4.6	Show Associated Organizations	3-74
3.5.4.7	Show favorites	3-75
3.5.4.7.1	Show only registered subscribers	3-76
3.5.4.8	Voice Calls	3-77
3.5.4.9	Subscriber always displayed	3-77
3.5.4.10	Volume control	3-77
3.5.4.11	Master PTT button	3-78
3.5.4.12	USB foot switch	3-78
3.5.4.13	Standard PTT Button	3-78
3.5.4.13.1	Alternative audio devices	3-79
3.5.4.14	Audio device error	3-79
3.5.4.15	Standard voice call	3-79
3.5.5	Call Authorized by Dispatcher (CAD)	3-80
3.5.6	Call Merge (dispatching)	3-81
3.5.7	Receiving Emergency calls	3-82
3.5.8	Voice Call History	3-83
3.5.9	DGNA	3-84

3.5.9.1	Assigning subscribers to DGNA	3-84
3.5.9.2	De-assigning subscribers to DGNA	3-86
3.5.9.3	Showing DGNA history	3-86
3.5.10	SDS Functionality.....	3-87
3.5.10.1	SDS details	3-88
3.5.10.2	Receiving Emergency SDS	3-88
3.5.10.3	ADU200 emergency alarm box	3-89
3.5.11	Map	3-90
3.5.12	Detach Map	3-90
3.5.12.1	Positioning.....	3-90
3.5.12.2	Configuring positioning	3-91
3.5.12.3	Overlay file in ESRI map (.shp) format	3-91
3.5.12.4	Other map options	3-93
3.5.12.5	RSSI measurement plot.....	3-94
3.5.12.6	Send file.....	3-94
3.6	Log Server.....	3-96
3.6.1	Description	3-96
3.6.2	General Description.....	3-96
3.6.2.1	The TetraFlex® Network and the Log Server	3-96
3.6.3	Log Server Maintenance	3-97
3.6.3.1	Scheduled Maintenance.....	3-98
3.6.3.2	Maintenance Now	3-99
3.6.3.3	Maintenance History.....	3-100
3.6.3.4	Manual backup of the database.....	3-101
3.6.3.5	Restoring a database.....	3-101
3.7	TetraFlex® Log Client	3-103
3.7.1	Description	3-103
3.7.2	Functionality.....	3-104
3.7.3	Statistics View	3-104
3.7.3.1	Node	3-105
3.7.3.2	Radio.....	3-106
3.7.4	Radio Cell Alarm	3-106
3.7.4.1	Radio Cell Timeslot.....	3-106
3.7.4.2	Radio Cell Congestion.....	3-107
3.7.5	Voice GW.....	3-108
3.7.5.1	Voice GW Alarm	3-108
3.7.5.2	Voice GW Channels	3-108
3.7.5.3	Voice GW Congestion.....	3-108
3.7.6	Packet Data GW	3-109
3.7.7	Application GW	3-109
3.7.7.1	Application GW alarms.....	3-109
3.7.7.2	Application GW congestion.....	3-110
3.7.8	CDR View	3-111
3.7.9	MS Registration View	3-112
3.7.9.1	Latest MS Registrations.....	3-112
3.7.9.2	MS Registration History.....	3-113
3.7.9.3	MS RSSI History	3-113
3.7.10	Status View.....	3-114
3.7.10.1	Status.....	3-114
3.7.10.2	Common	3-114
3.7.10.3	Subscriber.....	3-115
3.7.10.4	Radio Status.....	3-115
3.7.10.5	Radio Config	3-115

3.7.10.6	Voice GW	3-116
3.7.10.7	PD-GW	3-116
3.7.10.8	App-GW	3-116
3.7.11	Settings View	3-117
3.7.11.1	Database	3-117
3.7.11.2	Nodes	3-118
3.7.11.3	Subscriber	3-119
3.7.11.4	Sound	3-120
3.7.11.5	LogServer Licens	3-122
3.7.11.6	LogServer Config	3-122

PART-4: TECHNICAL REFERENCES 4-1

4.1	Antenna System for BS41x	4-2
4.1.1	Introduction	4-2
4.1.2	Typical antenna configuration	4-3
4.1.2.1	TMA412/TMD412	4-3
4.1.2.2	RX antenna	4-4
4.1.2.3	TX antenna	4-5
4.1.3	GPS antenna	4-6
4.1.4	TX inter-modulation considerations	4-7
4.2	TX Combiner for BS41x	4-9
4.2.1	Introduction	4-9
4.2.2	Cavity combiner system	4-9
4.2.2.1	Circulator	4-10
4.2.2.2	Cavity Filter	4-11
4.2.2.3	Junction cables	4-12
4.2.2.4	Filter connection cable	4-12
4.2.2.5	TX output filter	4-12
4.2.2.6	Power measurement	4-13
4.2.2.7	TCC411 TX Combiner Controller	4-13
4.2.3	BS414 4-way Hybrid Combiner system	4-14
4.3	RX Multi coupler for BS41x	4-15
4.3.1	Introduction	4-15
4.3.2	RX signal path description	4-15
4.3.3	Supply and alarm circuits	4-16
4.3.4	RF Test Loop path description	4-16
4.4	TR412 Transceiver Description	4-18
4.4.1	Introduction	4-18
4.4.2	Receiver	4-18
4.4.3	Transmitter	4-19
4.4.4	Reference oscillators	4-20
4.4.5	DSP	4-20
4.4.6	Micro Controller	4-21
4.5	RX Diversity for BS41x	4-22
4.5.1	Diversity implementation	4-22
4.5.2	Diversity gain versus correlation factor	4-23
4.5.3	BER versus input signal TCH7.2	4-24
4.5.4	MER versus input signal SCH/F	4-24
4.6	Power Supply for BS41x	4-26
4.6.1	Introduction	4-26
4.6.2	Rectifier	4-26

4.6.3	+14V and +26V DC/DC converters	4-27
4.6.4	Micro-controller	4-27

PART-5: HARDWARE UNITS.....5-1

5.1	Hardware Unit References	5-2
5.2	Recommended hardware	5-3
5.2.1	Sealed Coaxial cable 880014	5-4
5.2.2	Ethernet cable 105091 / 105092.....	5-6
5.2.3	Power cable 105093 / 105094	5-10
5.2.4	SB421 internal battery 7980001	5-11
5.2.5	GPS antenna 8230001	5-13
5.2.6	MPE declaration	xiv

PART-6: LIST OF FIGURES & INDEX..... XV

6.1	List of Figures.....	xvi
6.2	Alphabetic Index.....	xx



Damm Cellular Systems A/S, Denmark

Doc. No.
DRAFT

Rev.
1.01

Date
2012-01-27

TetraFlex® 7.5 Manual - Revision

IMPORTANT:

DAMM will execute great effort to maintain and update this manual so it will always be up to date regarding information and readability.

To do this DAMM needs to get feedback from you.

So if you as reader find anything which could be done better, items which is not dealt with, sections which is difficult understandable etc. DAMM would appreciate your comments

Please mail support on support@damm.dk

or

Contact support on +45 73473520

Thank you for your input

ABBREVIATIONS / DEFINITIONS

Short	Explanation / Definition
AIR	Air interface encryption
API	Application Programming Interface
Application Date	Is checked against the Dongle Application Date Limit. Software package execution is only possible if Application Date is equal or less than the Dongle Application Date Limit. The Application Date is hard coded into the software package and will normally be the same date as the Release Date, but can be set to an earlier date.
Application Date Limit.	All software packages with an Application Date earlier than this Application Date Limit can be executed
Application PC	Any PC, with the exception of RF nodes, which are running DAMM application(s)
BS	Base Station, BS41x or a combination of SB421's and BS421's
BSC	Base Station Controller
BSC.exe	Base Station Controller Software
BSS	Base Station Switch
CAD	Call Authorized by Dispatcher
CDR	Call Data Records
Cell	(Radio) Cell – a radio node with one ore more transcievers
Cell ID	ID is broadcasted every 10 sec (configurable).
CF	Compact Flash memory card
DB	Data Base
DCK	Derived Cipher Key
DGNA	Dynamic Group Number Assignment
Dongle	A USB dongle, programmed by DAMM, to be inserted in the node and/or application PC. The dongle controls which functions and applications can be executed
Dongle Date Limit	When this date is exceeded the dongle will not allow execution of DAMM software packages
DSP	Digital Speech Processing
E2E	End to end encryption
ETSI	European Telecommunications Standard Institute
FACCH	Fast Associated Control Channel
FTP	File Transfer Protocol
GCK	Group Cipher Key
GIS	Geographical Information system
GPS	Global Positioning System
GSI	Group Subscriber Identity
GUI	Graphical User Interface
GW	Gate Way
IP	Internet Protocol
ITSI	Individual Tetra Subscriber Identity
L1 Warning	System function is not likely to be affected
L2 Alarm	System function is partly affected
L3 Blocked	Some components of the system is not active
LAN	Local Area Network (For TetraFlex® meaning connection BSC/TR and IP backbone)
MCC	Mobile Country Code
MCCH	Main Control Chanel
Missing	A node which has been visible is missing
NM	Network Management
MNC	Mobile Network Code
MS	Mobile Station (Terminal)
Node	Any unit, with exception of redundant BSC(s), running the DAMM bsc.exe application
OM	See TetraOM
OS	Operation System. Windows XP, Vista, 7, CE etc.
PABX	Private Automatic Branch Exchange
PC	Normally the BSC, but could also refer to a standard consumer PC
PD	Packet Data
PEI	Peripheral Equipment Interface

PSTN	Public Switched Telephone Network
PTT	Push To Talk
RAM	Random Access Memory
Release Date.	The date where DAMM releases the software. This date is hard coded into the software package
Release number	Hard coded into the software package and have 2 levels, separated with a dot (example: 7.40)
SACCH	Slow Associated Control Channel
SCCH	Secondary Control Channel
SCK	Static Cipher Key
SDS	Short Data Service
SELV	Safety Extra Low Voltage
Site	Geographical position of equipment or nodes
SLA	Service Level Agreement, earlier called "Service and Maintenance Agreement" (SMA).
SNMP	Simple Network Management Protocol
Software package	A package containing all functions and applications available on the release date.
SSI	Short Subscriber Identity
Subscriber register	Register where the variable data regarding subscribers and profiles are stored.
TBD	To Be Determined
TEA1...	Tetra Encryption Algorithm 1... 2.... 3... 4... etc.
TEI	Tetra Equipment Identification
TETRA	Terrestrial Trunked Radio
TetraOM	The DAMM Tetra Operations & Management command line application
ToIP	Tetra over IP
TSI	Tetra Subscriber Identity, consist of MCC:MNC:SSI
UDP	User Datagram Protocol
User number	Unique DAMM subscriber reference used as an example by the voice GW and to manage terminal exchange
UTP	Unshielded Twisted Pair
VoIP	Voice over IP
WAN	Wide Area Network (For TetraFlex® meaning connection to www, gateways etc.)



PART-1: Hardware Installation

1.1 SB421

1.1.1 Environmental / climatic requirements

The SB421 (Service Box) is designed for outdoor operation, in such a way that it can be placed in the antenna mast close to the Base station(s)

The Service Box is designed to be able to operate at severe environmental conditions.

The Service Box is guaranteed to operate from -20°C to $+55^{\circ}\text{C}$ with optional battery and -25°C to $+55^{\circ}\text{C}$ with CF card operation without battery. Maximum SB421 cabinet temperature is $+70^{\circ}\text{C}$. Storage temperature for the SB421 is from -40°C to $+85^{\circ}\text{C}$.

Note that the guaranteed MTBF data is valid only when operating within the specified temperature range

Screening of SB421 to specific customer defined operating temperature range (from -40°C to $+55^{\circ}\text{C}$ ambient air temperature) is optional upon request.

The Service Box encapsulation complies with IP65

1.1.2 Placement

The recommended placement of the Service Box is as close to the base station(s) as possible to reduce possibility of system failure due to LAN cable being interrupted.

The placement of the Service Box shall be such that it is securely fastened to a mast or building that is able to carry the weight of the SB421 and withstand the local environmental conditions. All cables etc. shall be properly fastened to the mast or building using appropriate fixtures as to avoid damage to the equipment and possible injury to persons.

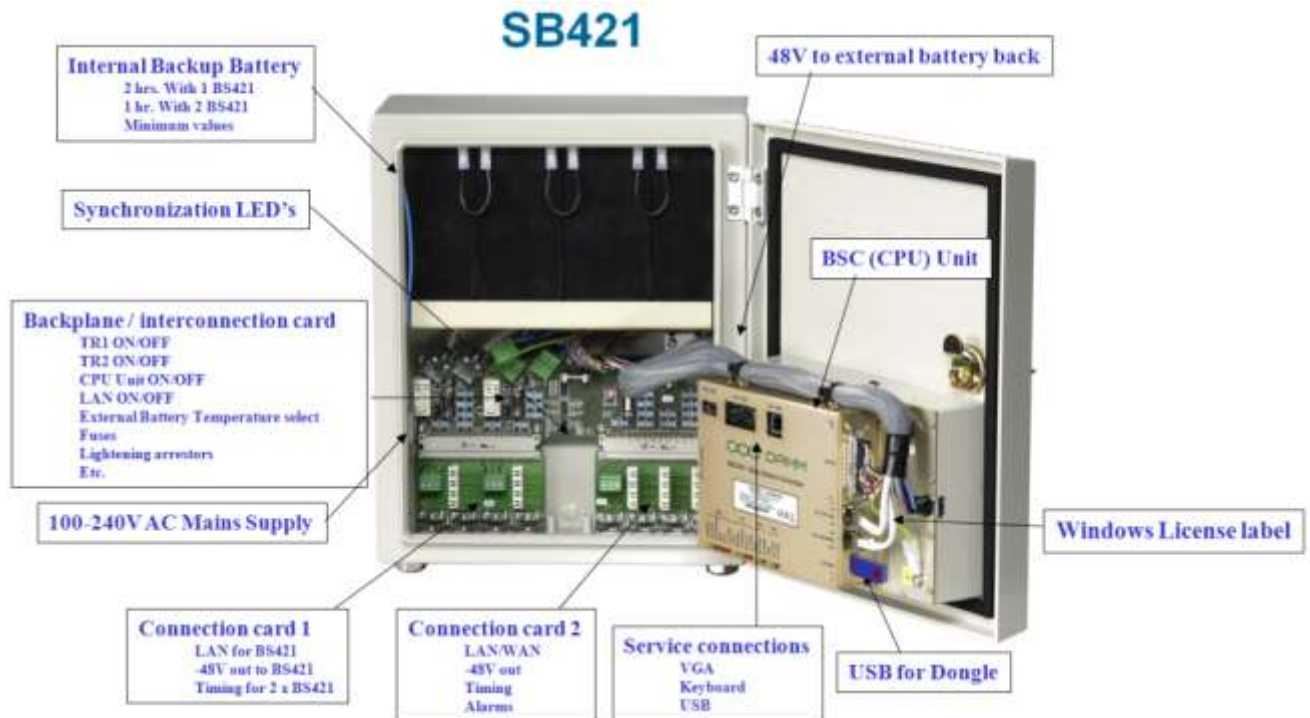
1.1.3 Grounding

The BS requires careful grounding.

Grounding is important to protect the equipment when inserting / removing cables and to protect the operator from faulty equipment.

An effective grounding is also important to protect the installation during thunderstorms (lightning).

1.1.4 SB421 basic elements



1.1.4.1 SB421 Variants

Item no.	SB421 Description	Processor	RAM	Storage
105102	General performance w/CF	Celeron M 1.0GHz	512Mb	2GB CF
105105	High performance with/CF	P4 Mobile 1.4GHz	1 GB	8GB CF (2+2+4)

Figure 1-1: SB421 Variants

The above specifications are a minimum and may be changed according to availability of processors and storage media. Any change in specification will be for a superior value. To update to 8GB CF and 1GB RAM, order an upgrade kit from DAMM

1.1.4.2 Mechanical Lock

Delivery option: System lock or standard lock, both options including 2 keys.

1.1.4.3 Power supply / charger

The power supply / Charger is capable of supplying -48V DC / 6,5A for the transceivers, BSC and for charging of the internal or external battery pack.

Connection to the BSC1 via TetraOM, it is possible to monitor the Power Supply

In OM enter AP <Enter> and the connection is established. Use <F1> for help menu and select PS421.

1.1.4.4 BSC421 Base Station Controller

Please refer to appropriate information in section 1.1.4.1 Regarding the type and specification of the CPU board (High performance or general performance dependent of the type of SB421)

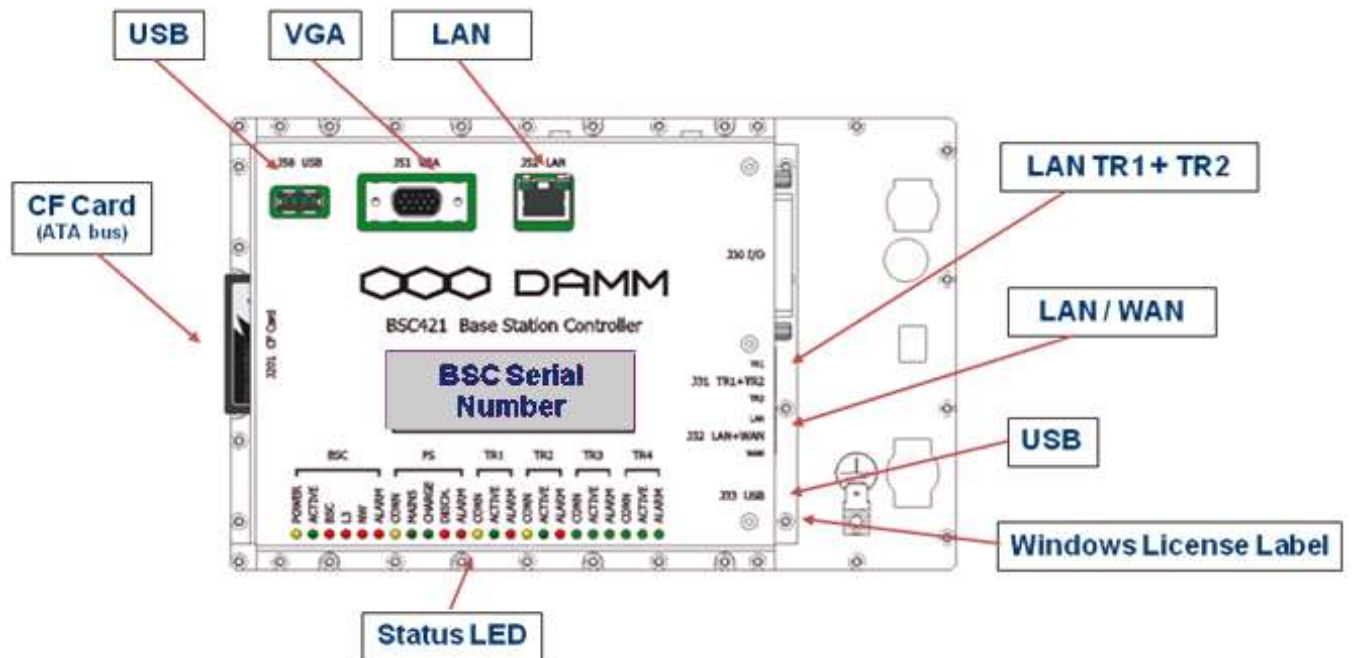


Figure 1-2: BSC421

1.1.4.4.1 SB421 Processor board internal backup battery



RISK OF EXPLOSION, IF BATTERY IS REPLACED BY AN INCORRECT TYPE
Dispose of used batteries according to local rules

1.1.4.4.2 Storage unit

Please refer to appropriate specifications in section 1.1.4.1 regarding the type and size of storage, 8GB Compact flash Card of SB421

1.1.4.4.3 BSC connections

Connections

- TR1 and TR2 LAN to Interconnection board (J31)
- LAN / Wan to Interconnection board (J32)
- I/O for PS etc. (J30)
- USB1 for Node Dongle (J33)
- USB2 for service and maintenance (J50)
- VGA for service and maintenance (J51)
- LAN for service and maintenance (J52)
- CF socket (J201)

1.1.4.4.4 BSC421 LED's and Fuses

BSC Status and warning LED's: All LED's ON, BSC software is not running

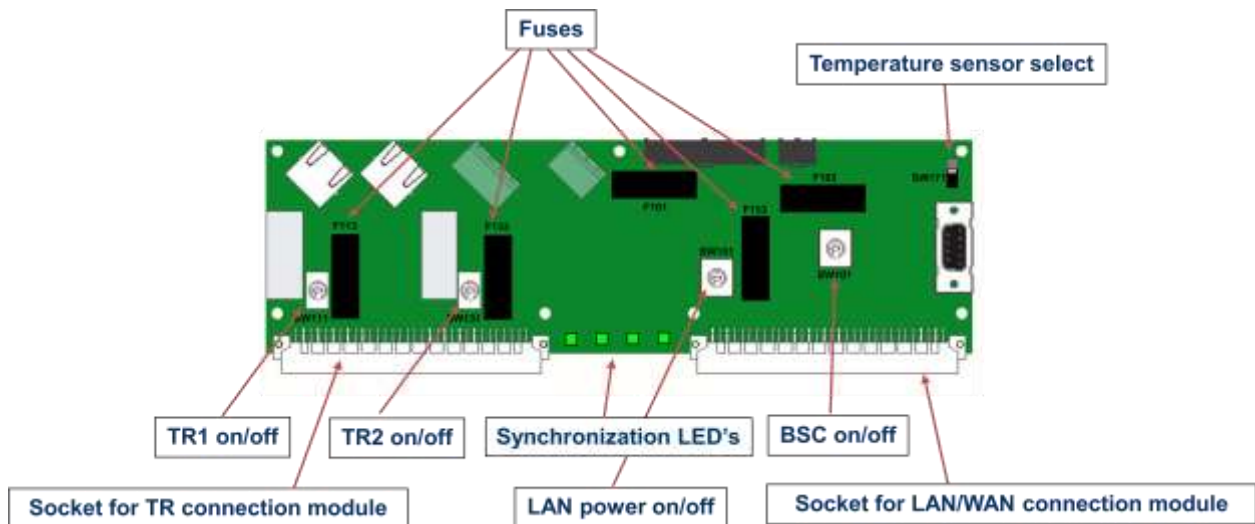
Group	Activity	LED	LED on Means
ALL			All LED's ON, BSC SW is not running
BSC	POWER	Yellow	Power On
	ACTIVE	Green	BSC Active
	NETWORK	Red	No Ethernet
	BSS	Red	No connection to BSS
	BSC	Red	No connection to redundant BSC
	ALARM	Red	Other BSC alarm present
PS	LINK	Yellow	Connected to PS
	MAINS	Green	Mains present
	CHARGE	Green	Battery is charging
	DISCH	Red	Battery is discharging
	ALARM	Red	PS alarm
TR1	LINK	Yellow	Connection to BS421_1
	ACTIVE	Green	BS421 active. (Tetra mode TX on)
	ALARM	Red Steady	Blocking alarm
Red Flash		Non-blocking alarm	
TR2	LINK	Yellow	Connection to BS421_2
	ACTIVE	Green	BS421 active. (Tetra mode TX on)
	ALARM	Red Steady	Blocking alarm
Red Flash		Non-blocking alarm	
TR3	LINK	Yellow	Connection to BS421_3
	ACTIVE	Green	BS421 active. (Tetra mode TX on)
	ALARM	Red Steady	Blocking alarm
Red Flash		Non-blocking alarm	
TR4	LINK	Yellow	Connection to BS421_4
	ACTIVE	Green	BS421 active. (Tetra mode TX on)
	ALARM	Red Steady	Blocking alarm
Red Flash		Non-blocking alarm	

Figure 1-3: BSC LED's

Unit	Placement	Fuse Rating	Fuse Size
Interconnection Board			
Battery	F101	10A Slow	5x20
BSC421	F102	1A Slow	5x20
TR1	F113	3.15A Slow	5x20
TR2	F133	3.15A Slow	5x20
LAN/WAN Power	F153	1A Slow	5x20
Power Supply			
PS421	F101	6.3A Slow	5x20

Figure 1-4: Fuse Listing

1.1.4.5 Interconnection Board



1.1.4.5.1 Connections

- LAN TR1 and TR2 (J31)
- LAN / WAN (J32)
- -48V PS (J22)
- -48V Internal / external battery dependent of plug used (J40)
- TR1 and TR2 connection module (J11)
- LAN / WAN / SEC / Alarm connection module (J12)

1.1.4.5.2 Switches

- TR1 On/Off (SW111)
- TR2 On/Off (SW133)
- LAN/WAN Power On/off (SW131)
- BSC421 On/Off (SW101)
- Temperature sensor internal / external (SW171)

1.1.4.5.3 LED's

- EXT SEC IN 2
- EXT SEC IN 1
- TR2 SEC IN
- TR1 SEC IN

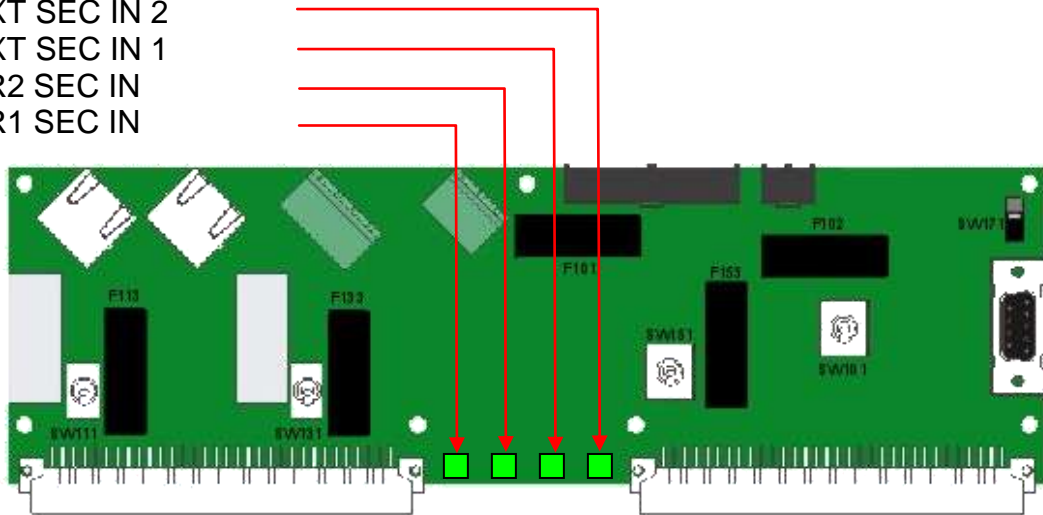


Figure 1-5: Interconnection Board

1.1.4.5.4 TR1/TR2 connection module

The TR1/TR2 connection module is located at the LEFT bottom side of the SB421 interconnection board

- -48V DC for TR1 (J1)
- LAN / 1 second synchronization pulse for TR1 (J2)
- -48V DC for TR2 (J3)
- LAN / 1 second synchronization pulse for TR2 (J4)

The TR1 / TR2 connection module is located at the left bottom side of the SB421 housing.

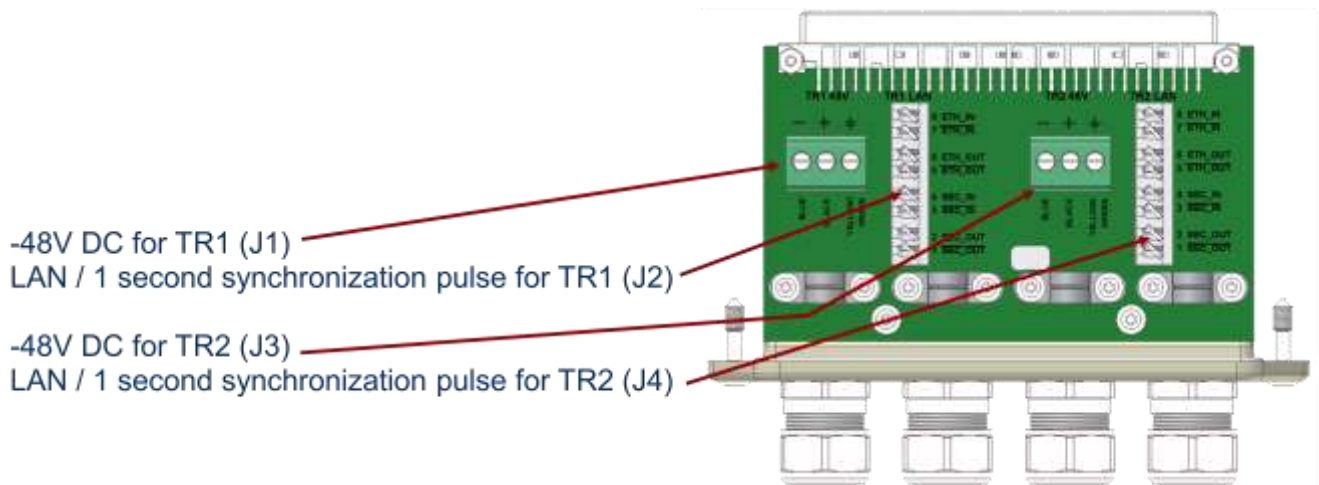


Figure 1-6: TR Connection Module

1.1.4.5.5 PS Connection to TR1 and TR2

- The blue wire of the BS shall be connected to the minus terminal
- The black wire of the BS cable shall be connected to plus terminal.
- The green / yellow wire of the SB421 cable shall be connected to the ground terminal.

1.1.4.5.6 LAN Connection to TR1 and TR2

Connect the following terminals:

NOTE: Cable used must be 24AWG solid core. See recommended hardware

Function	SB421	Function	BS421	Color
<u>ETH_IN</u>	8	<u>ETH_OUT</u>	1	White / Orange
<u>ETH_IN</u>	7	<u>ETH_OUT</u>	2	Orange
<u>ETH_OUT</u>	6	<u>ETH_IN</u>	3	White / Green
<u>ETH_OUT</u>	5	<u>ETH_IN</u>	4	Green
<u>SEC_IN</u>	4	<u>SEC_OUT</u>	5	Blue
<u>SEC_IN</u>	3	<u>SEC_OUT</u>	6	White / Blue
<u>SEC_OUT</u>	2	<u>SEC_IN</u>	7	White / Brown
<u>SEC_OUT</u>	1	<u>SEC_IN</u>	8	Brown

1.1.4.5.7 LAN/WAN/SEC/Alarm Connection module

The LAN/WAN/SEC/TS/Alarm connection module is located at the inside RIGHT side of the SB421 interconnection board

1.1.4.5.8 Connections

- -48V DC, 1A out for external units (router, switch etc.) (J5)
- LSA (8 pole) for LAN/WAN (J6)
- LSA (8 pole) for 1 SEC pulse / Temperature Sensor (J7)
- LSA (2x8 pole) for future alarm inputs (8 pairs) (J8A + J8B)

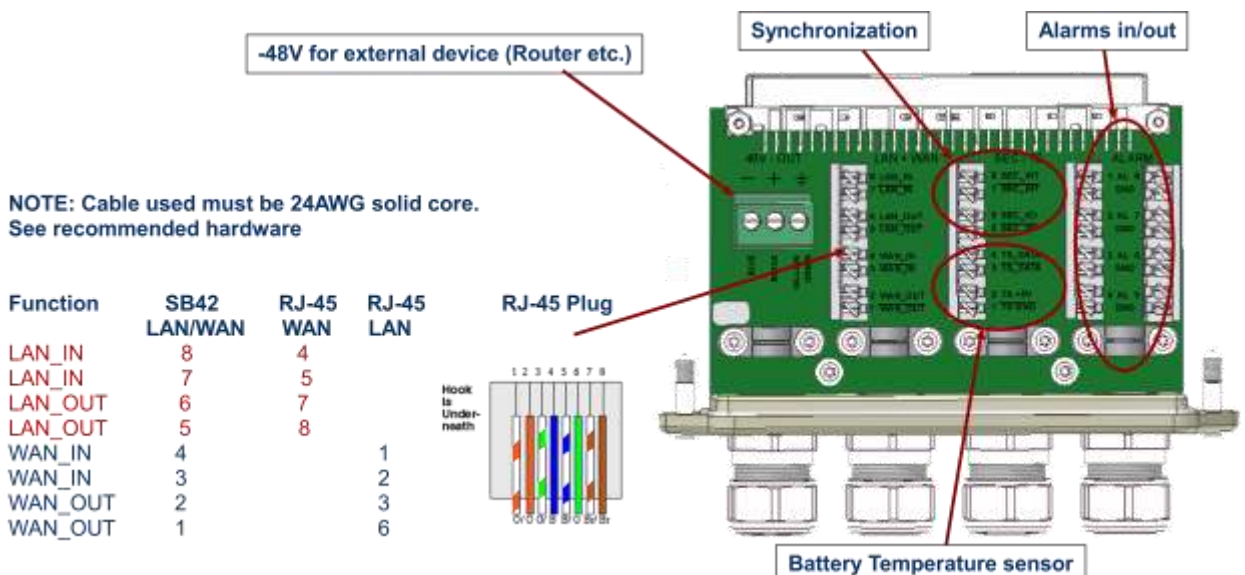


Figure 1-7: LAN/WAN and RJ-45 plug

1.1.4.5.9 Redundant SB421 operation

A second SB421 (BSC) may be configured for redundant operation both as 2 carriers and as 3 - 4 carriers.

Note: A HW modification is needed for redundant and/or 3-4 carrier operation. See section 1.1.5 for further information.

1.1.4.5.9.1 LAN Connection

Note: LAN in / out is used for redundant SB421. If redundant SB421 or multi node backbone is not used, connect cable to WAN part only. If environment permits, Y-splitter may be used to separate WAN and LAN, otherwise connect one or two Ethernet cables as desired.

For redundant SB421 (BSC) operation, connect the LAN from each SB421 together. Connection may be straight trough (auto sense) or crossed cable as preferred.

1.1.4.5.9.2 SEC Connection

In addition to the LAN connection, the SEC connection for synchronization must also be established.

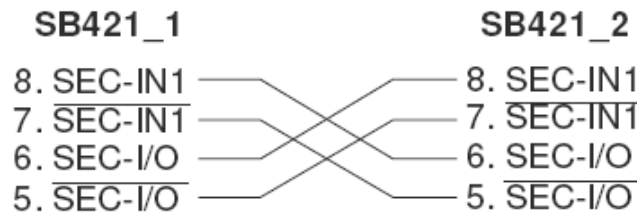


Figure 1-8: SEC Connections

1.1.4.5.10 Temperature sensor (TS) Connection

Terminals for External Battery Pack Temperature Sensor

For installation, refer to 1.1.4.8 or the instructions delivered with the external battery kit

When used, use SW171 on interconnection board to select internal / external battery temperature sensor

1.1.4.5.11 Alarm Connection

Future use, not yet defined

1.1.4.6 Mains Connection block

The 3 screw connection block for the 100-240V AC mains power Phase, Null and Ground is located on the inner left side of the SB421 housing.



The 100-240V AC mains power connection shall be provided with an appropriate fuse according to the selected mains supply voltage as to ensure a consumption of 4,5A (110V) / 2A (230V).

The cables used for the 100-240V AC and -48V DC to the base stations must be equal to or more than 3 x 1,5mm²

The type of mains cable and fastening of cables must at all times be in accordance with local rules and specifications.

1.1.4.7 Internal -48 battery assembly (option)

The SB421 is operated at -48V nominal DC (SELV) derived from the internal power supply. An internal or external battery pack may be connected for backup purposes.

If an internal battery assembly is installed, the battery serial connection wire located at the top front of the batteries is disconnected at delivery to avoid the battery from being drained. Please reconnect the wire before use.

Also make sure that the internal/external temperature sensor switch (SW 171 located at the top right hand corner of the interconnection board) is set to internal.

To ensure stable backup power, it is recommended to check/exchange the battery every 2 years.

1.1.4.8 External -48 battery kit (option) connection block

The 3 screw connection block for -48V DC, 0 and ground is located on the inner right side of the SB421 housing.

The SB421 is operated at -48V nominal DC (SELV) derived from the internal power supply. An internal or external battery pack may be connected for backup purposes.

When using an external battery pack, the plus pole of the battery pack shall be grounded with a 5mm² yellow/green wire.



Note: In case of using an external battery supply where the plus pole not is connected to ground then the connection shall include a disconnection device which disconnects both poles simultaneously, otherwise there shall be a disconnection device, inserted in the connection to the minus pole.

The external battery pack consists of a DIN-rail containing a 10A circuit breaker, a 3-pole terminal strip, a 4-pole modular coupler and the necessary cabling.

The DIN-rail must be mounted as close to the external battery as possible.

When delivered, the temperature sensor cable is terminated with a 4-pol modular connector. Please cut the connector and mount the wires in the LSA block of the LAN/WAN connection module according to this:

SB421 J8A Pin#	Temperature Sensor Cable Function	Color
1	Gnd.	Yellow
2	+5V	Brown
3	/Data	Red
4	Data	Blue

Figure 1-9: Temperature sensor connection

Note: If an internal battery kit is mounted, pull out the battery connector J40 for the internal battery and insert the free connector for the external battery into J40 instead. If no internal battery kit is present, the external battery plug is inserted from factory.



Note: Please observe polarity of the external battery leads. Serious damage to the SB421 **will** occur if not polarized correctly.

Also switch from internal temperature sensor to external temperature sensor using SW 171 on the interconnection board (top right hand corner)

1.1.5 HW change for redundant SB421 / 3 and 4 carrier operation

NOTE: Operation with 3 and/or 4 carriers and/or redundant BSC require a change to the HW of both SB421 as well as a HW change of carrier 2 and 4 if BS421 HW version is 1. If BS421 HW version is 2, these settings can be made via the TetraOM application. (Please see the SB421 installation section for further details)

This change is required to ensure correct BSC handover and synchronization of the carriers

A 3/4 carrier system and / or redundant SB421 is marked with a label close to the serial number label at the outside bottom of the SB421:

**REDUNDANT SB 421
3-4 CARRIER SYSTEM
(SYNCHRONIZATION OPTION 2)**

The interconnection board on the connector for the BS421 is marked with a label:

SYNCHRONIZATION OPTION 2

when delivered from factory.

If the hardware change is made in the field, i.e. outside DAMM facilities, it must be ensured that appropriate marking of the SB421 is performed.



NOTE: For change in the field, please order a change kit from DAMM. This kit includes a manual dealing with this issue, jumpers, screws, markings etc. This change operation includes soldering and unsoldering of SMD components and should only be done by skilled technicians familiar with SMD handling

The following hardware jumpers need to be changed for correct 3 and 4 carrier or redundant operation of the SB421:

Normally closed – change to open (marked with green):

- J211
- J241
- J252
- J255

Normally open – change to closed (marked with red):

- J212
- J242
- J251
- J254

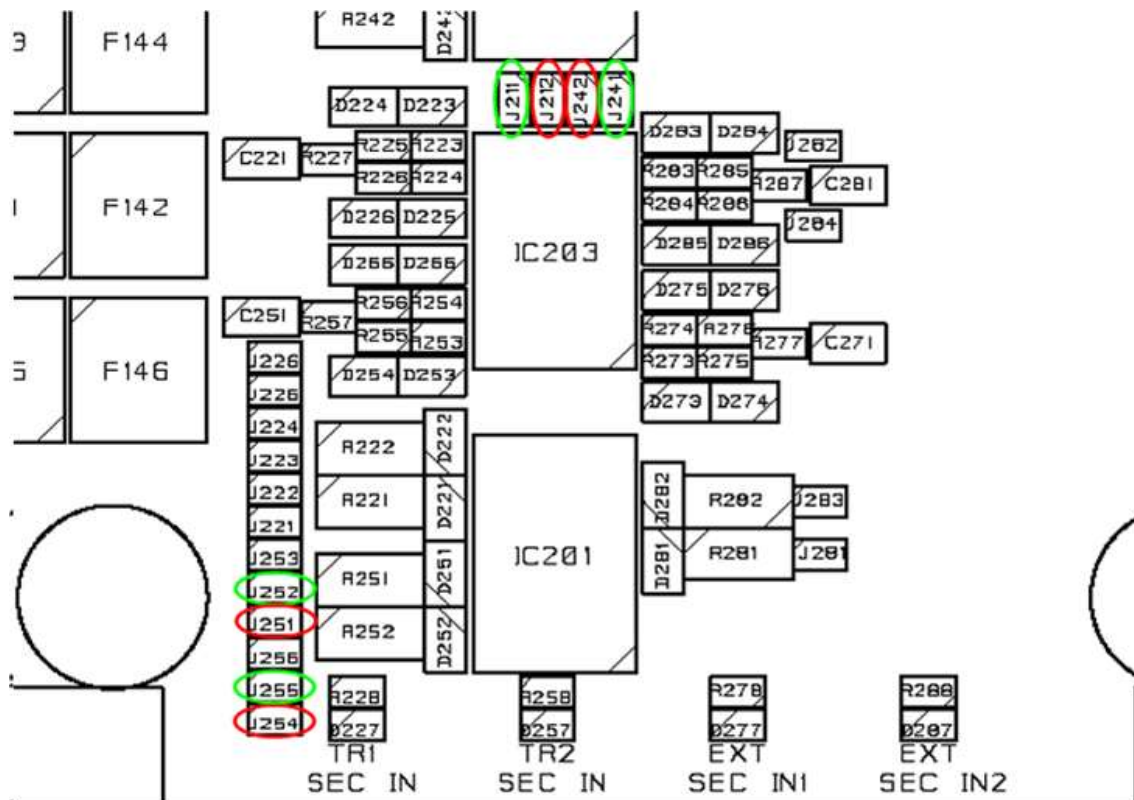


Figure 1-10: Interconnection board jumpers

1.1.6 SB421 Internal Battery Assembly

1.1.6.1 Battery kit maintenance

The battery is specified to a life time of 3-5 years depending on the use and environment. It is recommended that the battery is checked at least every second year and exchanged if necessary.

1.1.6.1.1 Installing batteries

1.1.6.1.1.1 Preparation



NOTE: To prevent electrical shock, it is highly recommended to ensure that the battery terminals are disconnected and properly isolated, either with dummy terminal shoes or by isolating with thick tape, crimp hose or similar while removing and/or installing the batteries.

- Place the SB421 on the backside with the door opening facing upward
- Carefully unscrew the two screws holding the door cable assembly

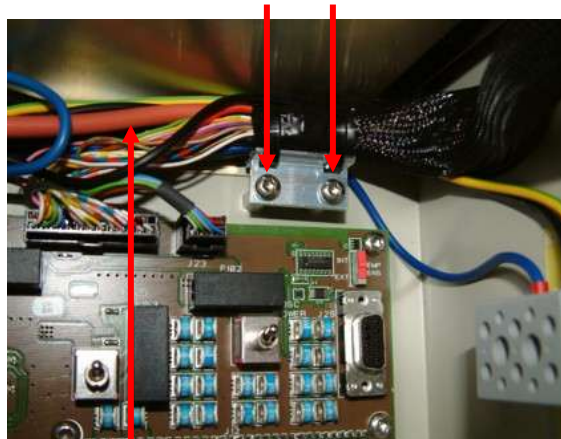


Figure 1-11: Cable assembly

- Move the cable assembly to give access to the 1 nuts holding the ground connection and the 4 threaded studs for battery base plate mounting
- Carefully remove the nut for grounding. Be careful not to damage the existing cabling

1.1.6.1.1.2 Installation

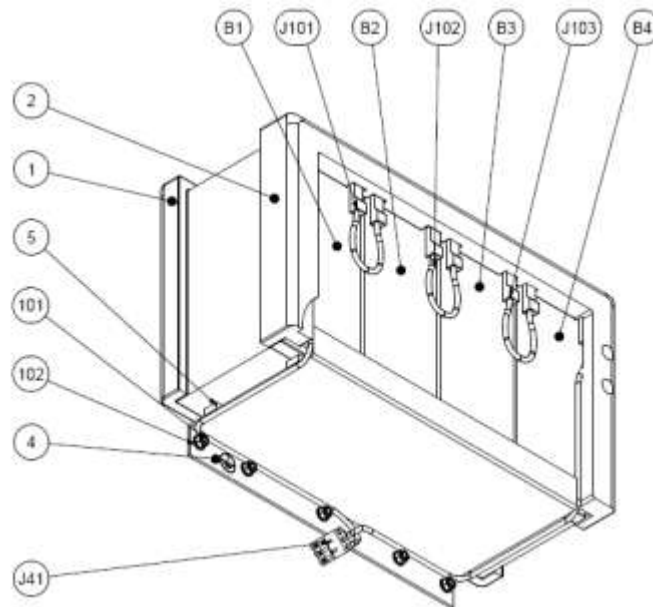


Figure 1-12: Internal battery assembly

- Install the “SB421 battery holder Lower” foam (pos.1) in the bottom of the SB421 casing.
- Install the “SB421 battery holder Upper” foam (pos.2) in the front of the SB421 casing.
- Attach the blue wire of the battery cable (pos.J41) to the left terminal of a battery (pos.B1)
- Insert the battery into the battery holder foam and push the battery to the utmost left position.
- Attach the black wire of the battery cable (pos.J41) to the right terminal of a battery (pos.B4)
- Insert the battery into the battery holder foam and push the battery to the utmost right position.
- Insert the two remaining batteries (pos. B2 and B3) into the battery holder foam between the two already inserted batteries.
- Place the battery holder (pos.4) on the bottom of the batteries in such way that the threaded studs are fitting the holes of the battery holder. NOTE: Be careful to ensure the battery cable in placed on the outside of the battery holder.
- Mount and tighten the 5 washers and nuts (pos.101 and 102) and ensure that the grounding wire is placed under one of the nuts.
- Replace the door cabling assembly using the two screws previously removed.

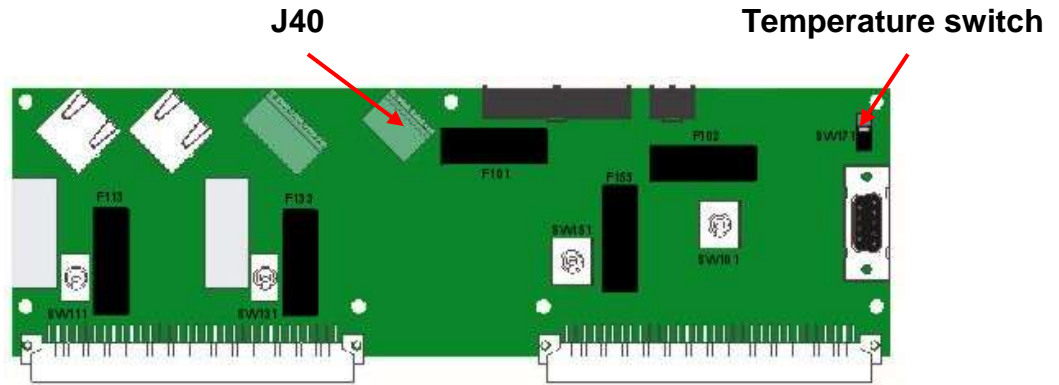


Figure 1-13: Interconnection Module

1.1.7 External -48V battery kit (option) connection block

The 3 screw connection block for -48V DC, 0 and ground is located on the inner right side of the SB421 housing.

The SB421 is operated at -48V nominal DC (SELV) derived from the internal power supply. An internal or external battery pack may be connected for backup purposes.

In case of using an external battery pack; the plus pole of the battery pack shall be grounded with a 5mm² yellow/green wire.



Note: In case of using an external battery supply where the plus pole not is connected to ground then the connection shall include a disconnection device which disconnects both poles simultaneously, otherwise there shall be a disconnection device, inserted in the connection to the minus pole.

The external battery pack consists of a DIN-rail containing a 10A circuit breaker, a 3-pol terminal strip, a 4-pol modular coupler and the necessary cabling. The DIN-rail must be mounted as close to the external battery as possible.

When delivered, the temperature sensor cable is terminated with a 4-pol modular connector. Please cut the connector and mount the wires in the LSA block of the LAN/WAN connection module according to this:

SB421 J8A Pin#	Temperature Sensor Cable Function	Color
1	Gnd.	Yellow
2	+5V	Brown
3	/Data	Red
4	Data	Blue

Figure 1-14: Temperature sensor

Note: If an internal battery kit is mounted, pull out the battery connector J40 for the internal battery and insert the free connector for the external battery into J40 instead. If no internal battery kit is present, the external battery plug is inserted from factory.



WARNING: Please observe polarity of the external battery leads. Serious damage to the SB421 **WILL** occur if not polarized correctly.

Also switch from internal temperature sensor to external temperature sensor using SW 171 on the interconnection board (top right hand corner)

- Unplug the external battery cable from J40
- Insert the internal battery cable plug into J40
- Place the battery temperature sensor switch in the upper position (internal battery)
- Connect the 3 jumper wires (pos.101-103) to the battery terminals.

The battery is now installed and ready for use.

1.2 BS421

1.2.1 Environmental / climatic requirements

The Base Station is designed for outdoor operation, such that it can be placed in the antenna mast close to the antennas.

The Base Station is designed to be able to operate at severe environmental conditions.

The Base station is guaranteed to operate under ambient air temperatures from -25°C to $+55^{\circ}\text{C}$ Celsius. Maximum BS421 cabinet temperature is $+85^{\circ}\text{C}$. Storage temperature for the BS421 is from -40°C to $+85^{\circ}\text{C}$.

Note that the guaranteed MTBF data is valid only within the standard specified temperature range

Screening of BS421 to specific customer defined temperature range (from -40°C to $+55^{\circ}\text{C}$ ambient air temperature) is optional upon request.

The Base Station encapsulation complies with IP65

1.2.2 Placement

The recommended placement of the Base Station is as close to the antennas as possible to reduce cable loss. The placement of the Base Station shall be such that it is securely fastened to a mast or building that is able to carry the weight of the BS421 and withstand the local environmental conditions. All cables, antennas etc. shall be properly fastened to the mast or building using appropriate fixtures as to avoid damage to the equipment and possible injury to persons.

1.2.3 Grounding

The BS requires careful grounding.

Grounding is important to protect the equipment when inserting/removing cables and to protect the operator from faulty equipment.

An effective grounding is also important to protect the installation during thunderstorm (lightning).

The grounding shall be as specified in paragraph 1.2.6 "Power connection to SB421"

1.2.4 BS421 main components

Filter cover and filters removed. BS viewed from the filter (back) side

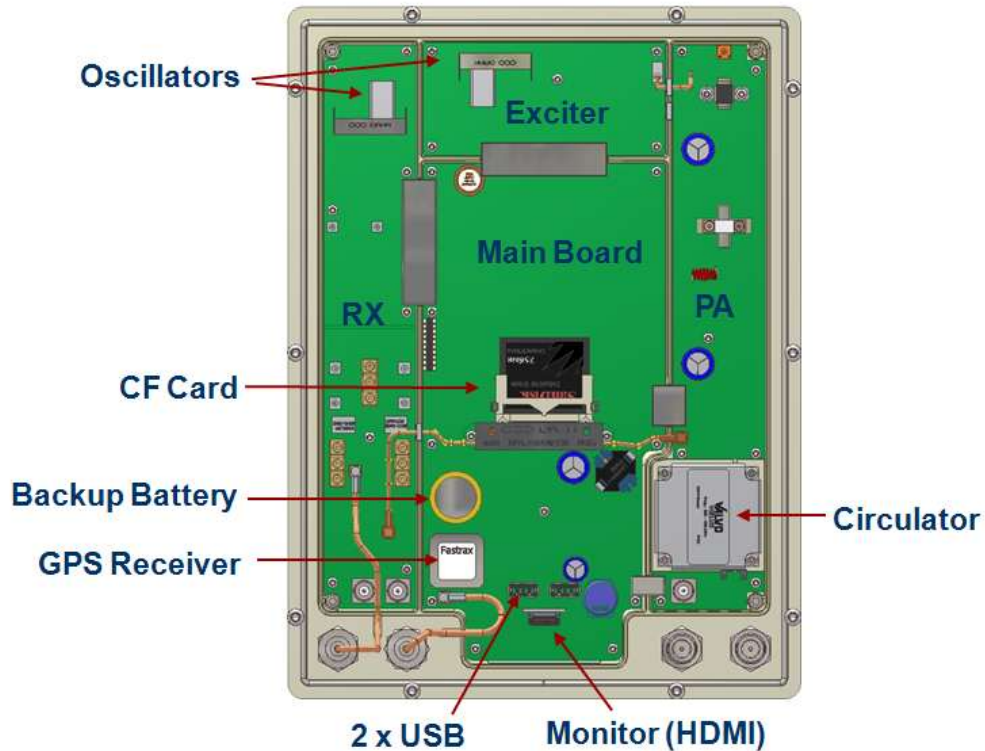


Figure 1-15: BS421 main components

The HDMI monitor connector together with the USB connector allows a connection of a standard monitor and mouse/keyboard connection

If monitor, keyboard and mouse are connected, the WindowsCE operation system in the BS421 can be accessed directly for configuration or fault finding purposes

To access the connectors, remove the filter cover

To access the CF card also remove the filter mounting plate

The connectors need not to be unscrewed, just carefully lift the filter base plate slightly and the CF card can be removed / inserted

1.2.5 Attaching RX/TX antennas

Before installing the Base Station please read the application note in this manual about the Antenna Systems.

The following antenna cables shall be attached:

1.2.5.1 Single Carrier BS installation recommendation (1 x BS421)

- 3 cables to the BS421 (one for RX, one for TX, and one for GPS)

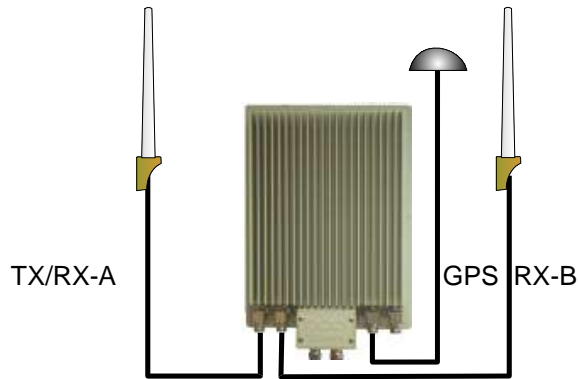


Figure 1-16: Single carrier

NOTE: THE BS421 WILL FUNCTION WITH ONE RX/TX AND WITHOUT GPS ANTENNA WITH THE FOLLOWING LIMITATIONS.
Timing via GPS will not be available (BS421 runs on internal oscillator. Not recommended)
Receiver diversity will not be available

1.2.5.2 Dual Carrier BS installation recommendation (2 x BS421)

- Cables to the 2 x BS421 (two for TX/RX, two for GPS and two for RX-B / A-OUT between the BS421's)

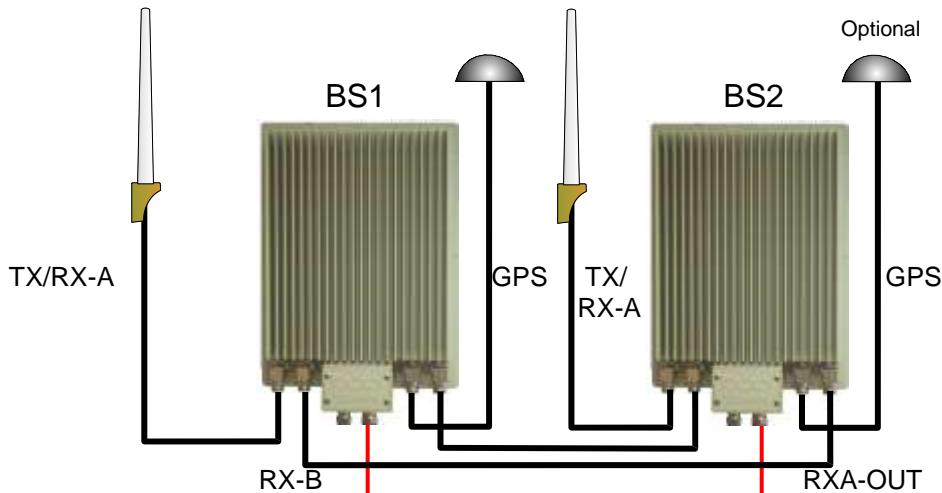


Figure 1-17: Dual carrier

NOTE: The shown cable (red) is part of the LAN cable and is connected through the SB421.
Cable is shown for system overview only.

NOTE: 2 x BS421 with 2 GPS antennas will provide full GPS redundancy
(Antenna and GPS receiver)

1.2.6 Power connection to SB421



Before starting on this task, please read the entire chapter carefully.

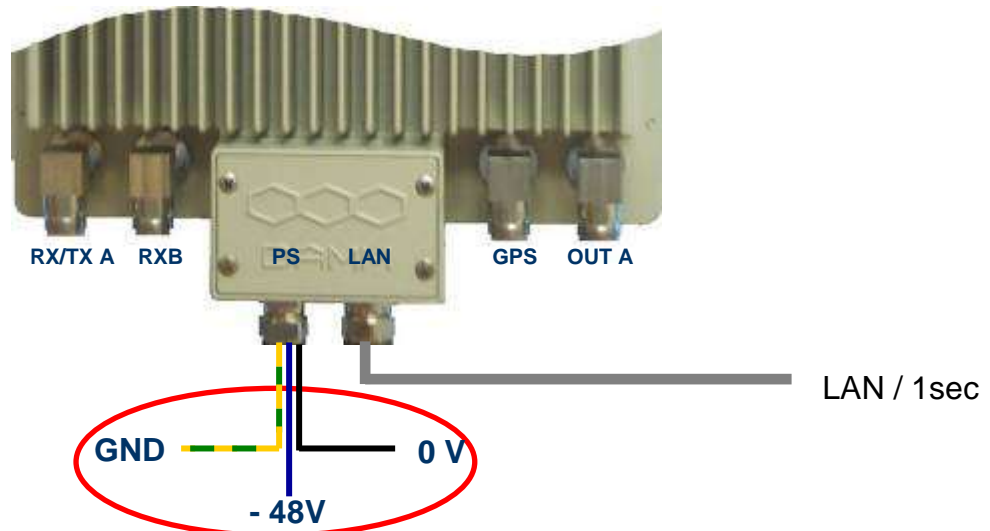


Figure 1-18: Power connection

The BS421 is operated at -48V nominal DC SELV (Safety Extra Low Voltage). The provision of power is done via the SB421 TR1/TR2 connection module. See the SB421 installation section for information on the connection pin out for SB421.



DO NOT UNDER ANY CIRCUMSTANCES USE A POWER SUPPLY THAT HAS THE MINUS CONNECTED TO POWER SUPPLY CHASSIS



The cables used for power supply must be equal to or more than 3 x 1,5mm²

Connect the three wires in the power connection cable according to the color markings inside the BS421 system connector.

1.2.6.1 System Connector

Use a LSA tool for the Ethernet connection

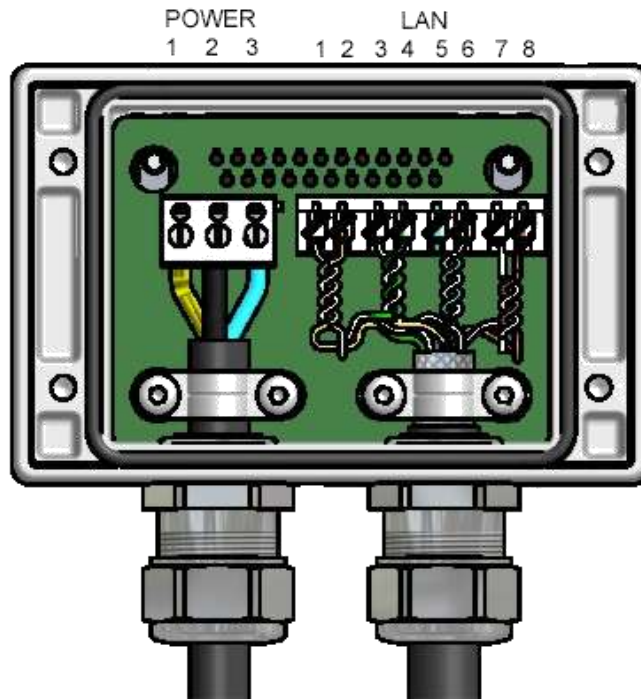


Figure 1-19: System Connector

Connect the following terminals:

NOTE: Cable used must be 0.4mm² to 0.6mm² (24AWG) solid cores

Function	SB421	Function	BS421	Color
<u>ETH_IN</u>	8	<u>ETH_OUT</u>	1	White / Orange
<u>ETH_IN</u>	7	<u>ETH_OUT</u>	2	Orange
<u>ETH_OUT</u>	6	<u>ETH_IN</u>	3	White / Green
<u>ETH_OUT</u>	5	<u>ETH_IN</u>	4	Green
<u>SEC_IN</u>	4	<u>SEC_OUT</u>	5	Blue
<u>SEC_IN</u>	3	<u>SEC_OUT</u>	6	White / Blue
<u>SEC_OUT</u>	2	<u>SEC_IN</u>	7	White / Brown
<u>SEC_OUT</u>	1	<u>SEC_IN</u>	8	Brown

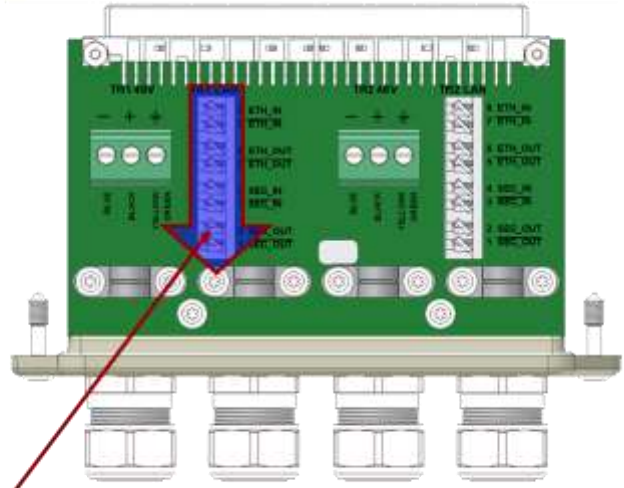
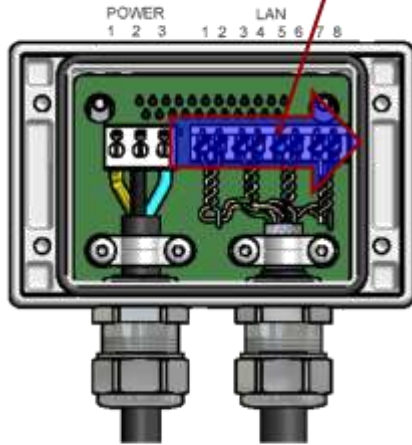
POWER:

NOTE: Cable used must be equal to or more than 3 x 1,5mm² (e.g. DAMM no. 883013)

Ground	GND	1	Yellow/Green
0	+	2	Black
-48Volt	-	3	Blue

1.2.6.1.1 Easy connection scheme

Connect from left to right starting with Orange, Orange/White and so on



Connect from top to bottom starting with Orange, Orange/White and so on

See the SB421 installation manual for further details,

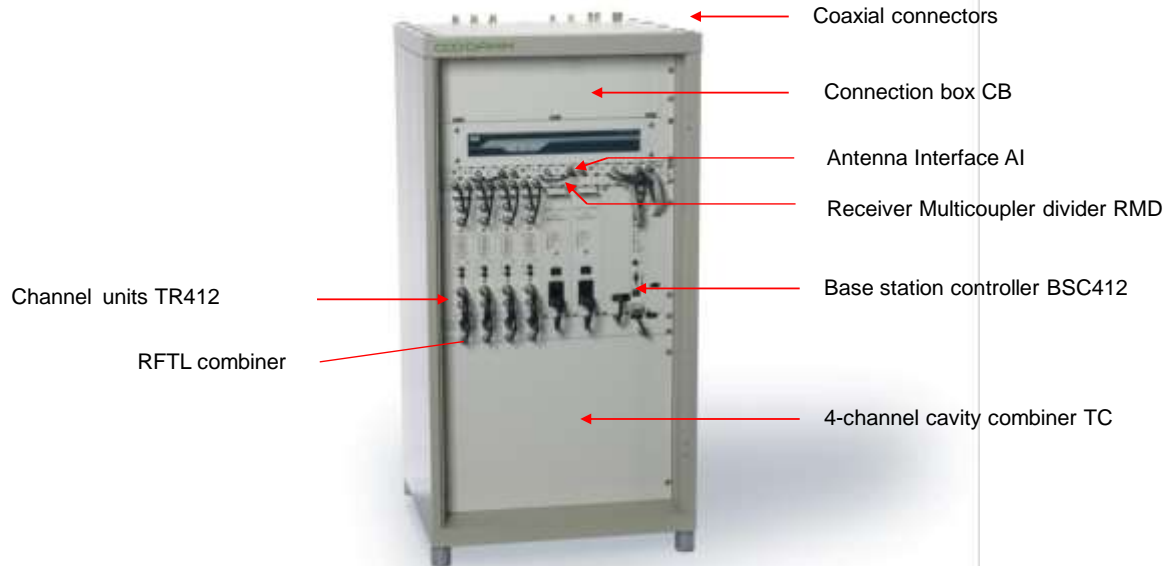
1.2.7 BS421 internal backup battery



RISK OF EXPLOSION, IF BATTERY IS REPLACED BY AN INCORRECT TYPE
Dispose of used batteries according to local rules

1.3 BS41x

BS 414



1.3.1 Environmental/climatic requirements

The Base Station is designed to be able to operate at severe environmental conditions. It is however recommended to install the BS in rooms with controlled environmental conditions in order to optimize its reliability and lifetime.

It is important, that the room is free of dust. Condensing humidity is not allowed.

The Base station is guaranteed to operate from -20°C to $+55^{\circ}\text{C}$.

Note that the guaranteed MTBF data is valid only within the standard specified temperature range

The BS41x encapsulation complies with IP20

1.3.2 Placement

The Base station shall be placed on a solid floor. It can be either free standing or standing with the rear against a wall. For normal service rear access to the BS is not needed.

After placement the four legs under the BS can be adjusted for accurate vertical position to compensate for an uneven floor.

In areas with the possibility of earthquakes, it is recommended that the BS be secured to the floor with bolts. Access to the base may require removal of the lowest TX combiner in the rack.



Figure 1-20: Level adjustment

1.3.3 Grounding

The BS requires careful grounding. For temporary operation, the mains earth connection can be used. For permanent installations an effective ground shall be established and connected to the grounding screw on the rear right top of the BS with a 15sq. mm yellow/green wire.

Grounding is important to protect the equipment when inserting/removing cables and to protect the operator from faulty equipment.

An effective grounding is also important to protect the installation during thunderstorm (lightning).



Figure 1-21: Grounding

1.3.4 Attaching antennas

Before installing the Base Station please read the application note in this manual about the Antenna Systems.

The following antenna cables shall be attached:

If the jumper between ANTA and RSOUT is NOT connected (Separate RXA, RXB and TX antennas)

- 3 cables to the TMD412 (two RXA and RXB and one for Test)
- 1 cable to the TX antenna
- 1 or 2 cables to the GPS antennas

When a jumper coaxial wire is connected between ANTA and RXOUT on the TMD.

- 3 cables to the TMD412 (one RXA/TX, one RXB and one for Test)
- 1 or 2 cables to the GPS antennas



Figure 1-22: Antenna connectors

1.3.5 Connection to Battery

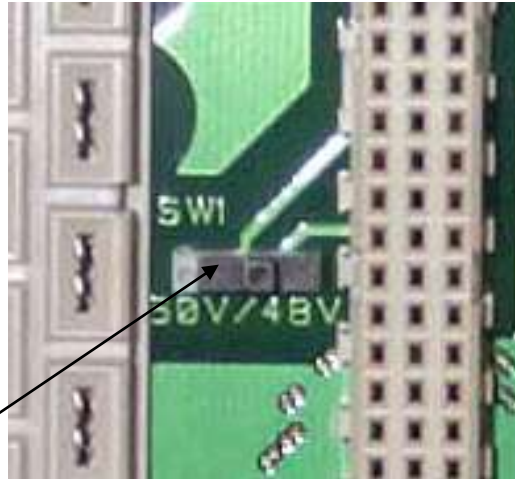
Before starting on this point please read the section 1.3.8.3 in this manual about Battery attachment.

The BS may be connected to a 48V battery, which the BS can charge.

The Base Station is prepared for –60V battery operation, wherefore a switch is placed on the back plane of the BS to indicate to the PS411's, whether a –48V or –60V battery is used.

Note that the present version of PS411 can only operate with –48V DC, wherefore this feature is not active, and the switch shall be placed in the –48V position.

The Switch is accessible by removing the PS411 Power Supplies.

**Figure 1-23: Power selection**

Left position = 60V, Right position = 48V

The external battery shall be connected in the connection box in top of the BS. Minimum recommended cables dimension is 10mm² with black for plus (ground) and blue for minus.

**Figure 1-24: Power terminals**

The battery connection shall be provided with a circuit breaker close to the battery to protect against over-current at short circuits in the connection cable or internal in the Base Station.

If the BS shall charge the battery, the TS411 Temperature Sensor shall be placed at the battery and connected to the BS in the connection box.

**Figure 1-25: Temperature sensor connection**

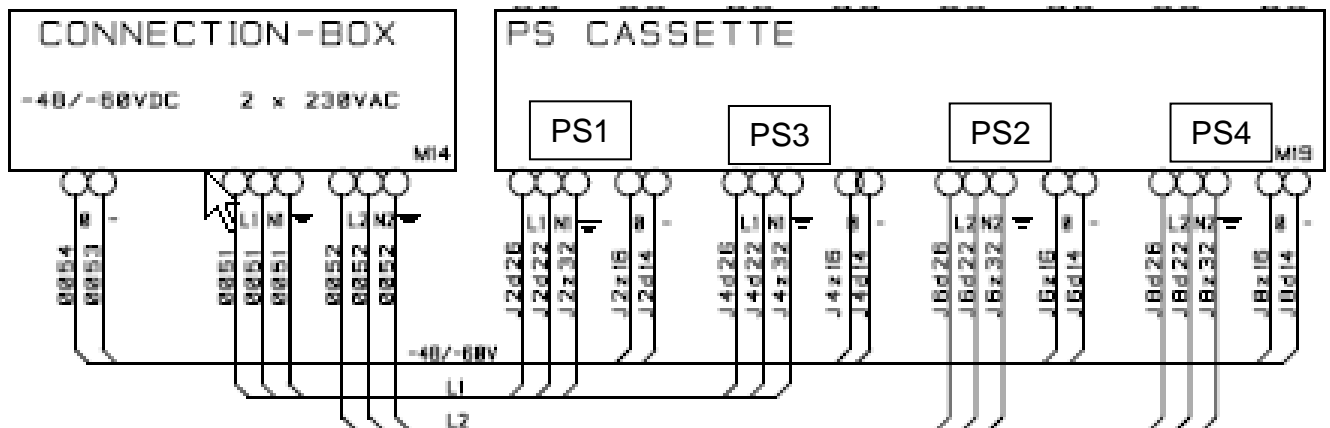
The plus pole of the Battery shall be grounded with a 15mm² yellow/green wire. A protective ground connection shall also be established from the Battery to the BS.

Note: In case of using a DC mains supply where the plus pole not is connected to ground then the connection to the DC mains supply shall include a disconnection device which disconnects both poles simultaneously, otherwise there shall be a disconnection device, in the connection to the minus pole.

1.3.6 Connection to AC Mains

The BS is provided with Power Supplies supporting direct connections to 100V-240V AC and 47-63 Hz, one phase. Mains connection shall not be established, when the BS is running on an external battery with separate charger.

Mains are connected in the connection box (See 1.3.7). Two separate connections are available and both shall be connected. The first (and third) PS411 is powered from the left connection and the second (and fourth) PS411 from the right connection. The split makes it possible to run the BS on two different mains phases to obtain redundancy in case of a phase dropout (fuse blown). The two connections can also be parallel connected in the BS.



The mains connection is provided with a protective earth connection. If a separate earth connection is provided on the BS, it is recommend to leave it open.

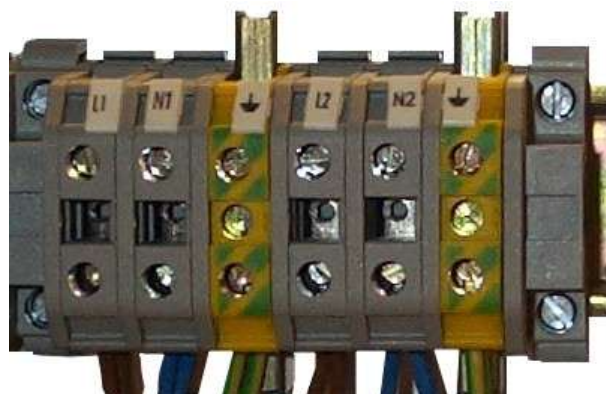



Figure 1-26: Mains connection block

 Damm Cellular Systems A/S, Denmark	Doc. No. DRAFT	Rev. 1.01	Date 2012-01-27
	TetraFlex® 7.5 Manual - BS41x		

Note: Each of the installed power supplies are individually connected to the AC mains therefore in order to disconnect the Base Station from AC mains, the AC switch of all installed power supplies shall be switched to off.

Note: It is recommended that the main power installation includes short circuit back protection which reacts in case of the current is exceeding 16A.

1.3.7 Connection Box CB412

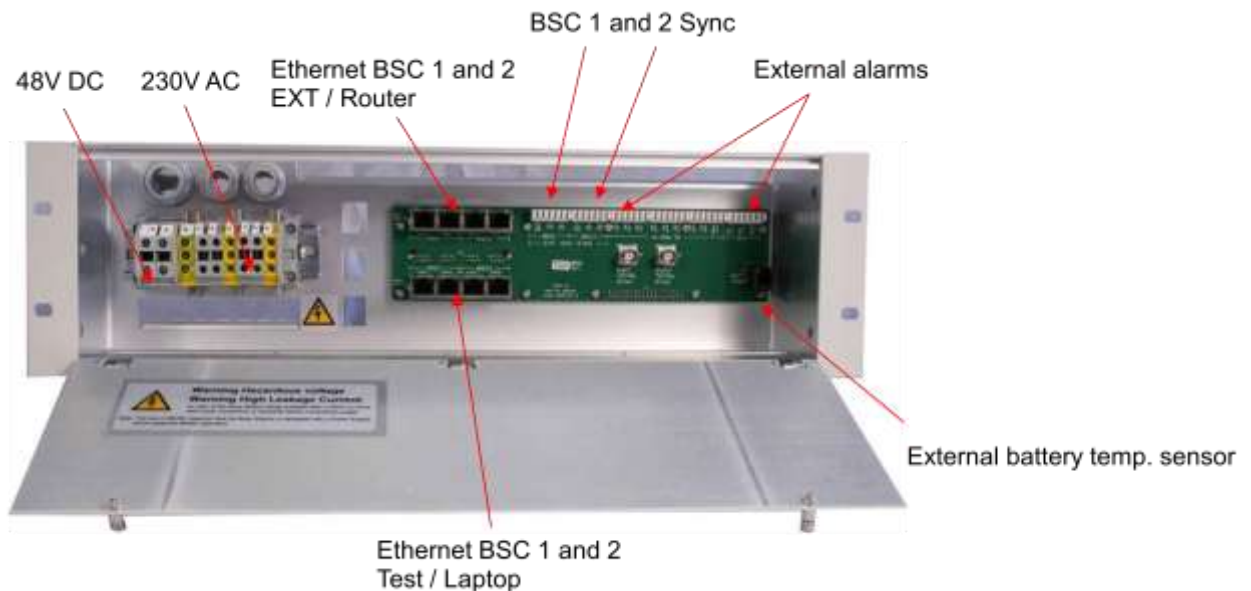


Figure 1-27: Connection box

1.3.7.1 Ethernet connect

8 Ethernet connections are present for BSC1 and BSC2:

BSC1 LAN1 and 2 and BSC 2 LAN1 and 2 for connection to other nodes, routers, log server, Network Management etc..

BSC1 WAN1 and 2 and BSC2 WAN1 and 2 for connection to corporate network, SIP units, Remote desktop, Switch board (PABX), API etc.

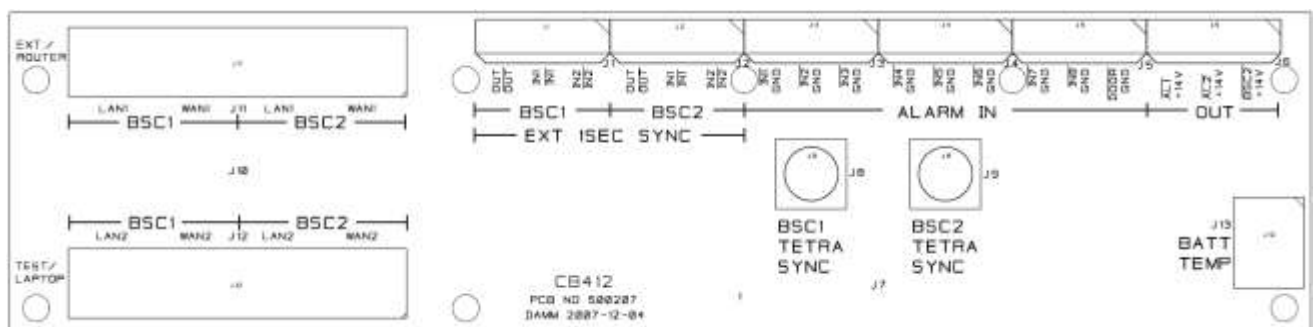


Figure 1-28: CB412 connection board

The connection from BSC1 and BSC2 is coming from the LAN and WAN connector on the front of the BSC412 front plate and connected on the backside of the connection box and spitted out to LAN1 / LAN2 and WAN1 / WAN2.

NB: When using 2 BSC412's there is a connection between the BSC1 and BSC2 LAN and WAN on the backplane connection, this will be switched off by an electronic switch device when there is a cable in both BSC1 LAN1 and BSC2 LAN1 and the same goes for the WAN connector. This is to avoid recirculation of the signals

See also section 2.7.3 for Ethernet software configurations description.

1.3.7.2 External alarm connections

The BS is provided with 8 external alarm inputs. One of these is reserved for the “Door Open” alarm (Not yet implemented) and the rest are currently not pre-defined for a specific function. All alarm inputs are provided with a 1Kohm resistor to +5V. To activate an alarm the input shall be grounded.

The BS is also provided with 3 alarm outputs currently not allocated any specific function. The outputs are open collector outputs capable of sinking 0.25A. The outputs are protected for inductive transients with 36V zener diodes.

The alarm connections are provided with LSA-type connections, accepting **solid** wires with the dimension 0.4mm² to 0.6 mm².

1.3.8 Back-up battery for BS41x

1.3.8.1 Introduction

This application note describes how to attach a backup battery to the BS41x Tetra Base Stations.

All the BS41x versions are powered with one or several PS411 Power Supplies.

The PS411 can be powered directly from an external DC source of –48V.

The PS411 can also be powered directly from AC mains of 100 to 240V, 47-63Hz without any battery backup. This mode is convenient at test of the Base Station.

The standard installations, however, is the combination of AC mains power feed with a –48V lead-acid backup battery connected. The PS411 has all the build-in features to have the battery connected and charge it. This allows uninterrupted service for a period depending on the size of the battery. For very service-critical systems this can be extended with a Diesel generator starting automatically after a certain period of battery operation.

All BS versions can be connected to an external –48V lead-acid battery. The external battery kit includes a circuit breaker to protect the battery and the TS411 temperature sensor to allow the PS411 to provide a temperature compensated charging voltage.

1.3.8.2 Selecting external batteries

Several issues should be taken into account, when selecting batteries. In general, only battery types intended for use as back-up battery in telecom systems should be used.

The battery lifetime is a critical parameter. High quality back-up batteries normally have a specified lifetime of 10-15 years at normal room temperature.

The batteries should also be of the gas-tight type when co-located with the BS to avoid corrosive gases, which may damage the electronics.

A battery capacity of 48V 50Ah would be a typical choice for a 4-carrier BS. The picture below shows an example of such a battery.



The following estimated back-up times is being achieved with a 50Ah battery (weight about 130kg):

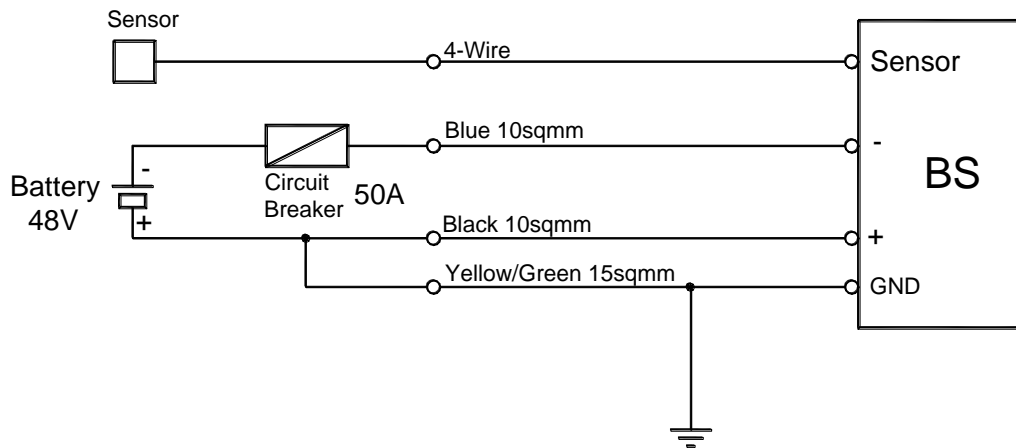
Base Station size	Current	Backup time
2-carrier	6A	8 hours
4-carrier	11A	4 hours
6-carrier	16A	2.5 hours
8-carrier	21A	1.8 hours

Note that for higher load current the efficiency of the battery drops considerably below the 100%.

For the 8-carrier Base Station a 100Ah battery could be considered (weight about 250kg).

1.3.8.3 External battery installation

The connections needed for the battery attachment is shown on the schematics below



The minus pole of the battery shall be provided with a circuit breaker as close to the battery as possible in order to protect for any excess current flow at a short circuit. The nominal current shall be higher than the peak charging/discharging current to avoid unintended disconnects.

The Base Station should be connected to the battery with 10 mm² blue and black wires. In addition, a 15mm² yellow/green wire shall connect protective ground on the rack to ground on the battery, which should be connected to the plus-pole of the battery. The Base Station itself (and optionally the battery) shall be provided with an effective grounding.

The TS411 temperature sensor shall be located at the battery and connected to the BS in the connection box with the delivered 10m of cable. The cable is a standard 4-wire telephone cable provided with two 4-pole RJ11 plugs (narrow types). The cable can be extended if needed.

1.3.8.4 Battery charging

The PS411 contains configuration settings to control the charging of a –48V battery. If charging is not selected the PS411 gives a fixed output voltage of –48V DC.

If charging is selected and the TS411 is properly attached, the PS411 changes to charging mode. The output voltage is then increased to the correct charging voltage selected with the configuration settings normally controlled from the BSC.

The output voltage is calculated from the nominal charging voltage at 25 Celsius, e.g. 2.25V DC per cell and the required temperature compensation, e.g. –72mV per Celsius. With these values the voltages would be:

Temperature	V-charge
-20 Celsius	57.2V
+25 Celsius	54.0V
+55 Celsius	51.8V

1.3.8.5 Battery deep discharge protect

The Base Station is provided with a feature to switch off the load, when the battery is close to being discharged in order to protect the battery.

The Base Station is prepared for –60V battery operation, wherefore a switch is placed on the back plane of the BS to indicate to the PS411's, whether a -48V or -60V battery is used.

Note that the present version of PS411 can only operate with -48V DC, wherefore this feature is not active, and the switch shall be placed in the –48V position.

Battery	48V
Turn-on voltage	45.0V
Turn-off voltage	40.0V



PART-2: SW Installation and Configuration

2.1 BASIC SYSTEM PARAMETERS

TetraFlex® 7.5 software is not compatible with earlier versions, and nodes with e.g. version 7.4 can not interact with nodes with version 7.5.

Please consult the document “Update guideline for ver.7.4 to 7.5” for upgrading to TetraFlex 7.5.

2.1.1 System capability

The System is preconfigured with the full TetraFlex® SW package, but some functions may be restricted by the dongle setting.

The following is the compiled default software parameters of the system, but they can be increased on request. Some of the functions are dongle related. Readout can be done with TetraOM command. The system can be ordered as “Standard” and “Optional Enhanced” system size.

Function	Standard	Optional Enh.	Dongle
Organizations	1.000	1.000	No
Profiles	2.000	10.000	No
Subscribers max.	20.000	150.000	No
Nodes max.	254	999	Yes
Voice GW connection max.	32	32	Yes
Application GW connections max.	20	20	Yes
Application GW Streams max.	100	100	Yes
Application GW Streams/Application max.	32	32	Yes
Numbers of Log servers max.	25	100	Yes

You can check these parameters with OM command: S00/C

2.2 VIRUS PROTECTION

2.2.1 Introduction

The DAMM system is designed with the LAN area as a completely closed IP area without any connection to the outside world.

That means, that BSC's, TR's etc. without a WAN connection cannot access the outside world and cannot be accessed from the outside world.

Only system components with a WAN connection have a risk to get infected, including Gateways, Log Servers, Terminal Servers etc., all entities, which if present need external access.

Any virus problem on systems have been closely watched for a period of time, but so far no infections have been observed.

Regarding system components WITHOUT a WAN connection, it is most safe to proceed without any virus protection as we do today. This is of cause under the presumptions that the operator has control with external media as USB sticks, CD etc. These media must be virus free before inserted or connected to the system. Installing a virus protection would create the need of opening up access to an update server, which would increase the risk that viruses could penetrate into the internal LAN area.

2.2.2 Virus Threat

The major threat for a system is that viruses will infect the system components with WAN access. These components will either be a Damm BSC running Windows or a PC with a full Windows installation. The major source of infection is normally via E-mails and via Home pages. It is therefore strongly recommended never to use any computer in a system for these tasks.

2.2.2.1 Standard PC

For standard PC's running Windows and used for tetra applications or running a BSC the firewall can be kept activated. It is just needed to include the programs in the exception list. Window XP SP3 and Windows 7 ask automatically, whether you want to do that. In addition, it is recommended to have an anti-virus program running on these computers. Internally at DAMM, AVG antivirus is used and can be recommended. This gives a reasonable protection, and no issues have been seen regarding conflicts between AVG and Tetra applications. The Log Server (TetraFlex® only) could have some performance degradation during scanning, whereas the BSC is running with higher priority and is not expected to be degraded. Scanning should be setup to run in the night when system activity is low. No experience has been gained with other anti-virus programs.

2.2.2.2 BSC

Regarding the DAMM BSC's running Windows Embedded the risk of infection is much lower as a lot of the services giving problems are not installed here, although the risk of infection still exists. Attempts have earlier been made to get AVG installed, but AVG does not accept the product code of Windows Embedded, and DAMM has not succeeded to get AVG to implement the needed changes.

2.2.3 MS Security Essentials

Microsoft has recently released their new Microsoft Security Essentials. At present this is not compatible with the BSC.

In case installation has been attempted, an error message

DATA ENCRYPTION detected an error in the protocol stream and has disconnected the client may appear when attempt is made to connect via the remote desktop

To correct this, refer to the following Microsoft KB article

<http://support.microsoft.com/kb/323497>

2.3 DONGLE CONFIGURATION

2.3.1 License Dongles

2.3.1.1 Site versus Node:

Until the DAMM TetraFlex® system software was introduced the word “Site” has been used to indicate number of Radio Sites in a system. There was coherency between number of “Sites” and number of “Radio sites”.

The DAMM TetraFlex® concept opens for “Sites” that is not a “Radio site” but a “Gateway site”, a “NM site” or a “Log Server site”, and that one physical “Site” can be both a “Radio site” but also a “Gateway site”.

Therefore “Node” is introduced.

A node is consequently:

Any PC running BSC.exe software, except for a redundant BSC

A site is consequently:

The geographical position of nodes or equipment

2.3.1.2 Dongle types

NOTE: TetraFlex® V7.20 and forward require a new type of dongle. If no encryption key is required in the dongle, it is possible to order a number of empty spare dongles and remotely upgrade these as needed. If encryption key is required and dongle is to be used at the node containing the master subscriber register, the dongle must be ordered from DAMM sales.

Currently there are 5 types of dongles:

- Node license dongle
 - Including possible settings for Node, API, Packet Data, Voice GW and Log Server
- API client dongle
- Dispatcher dongle
- Log Server/ log client dongle
- Spare dongle

All dongles are programmed with:

- Dongle hardware serial number.
- DAMM dongle serial number.

A Node dongle is programmed with:

- Application Date Limit.
- Dongle Date Limit. (This is intended for demo system and special projects only and will as default be set to infinity).
- Nodes Max (must be equal to or higher than the highest defined node number)
- Radio Cell TR's max

- Voice Gateway connections max
- Packet Data Gateway
- Application connections max
- Voice Streams max
- Air Interface Encryption
- Air Interface Encryption KSG

An API Client dongle is programmed with:

- Dongle Date Limit
- Dispatcher, Yes - No

A Log Server dongle is programmed with:

- Dongle Date Limit
- Application Date Limit
- Call Info Log
- SDS content Log
- Voice Log Max

By means of the dongle read out software or the TetraOM commands the End-User can read:

- Dongle hardware serial number
- DAMM dongle serial number
- System and Node license's settings.

2.3.1.3 Dongle settings and combinations

A detail for each application has been defined in the system planner. Be aware that the selections here may result in additional dongle hardware to be invoiced.

		APPLICATIONS							
		BSC		Application Conn	Log Server	Log Client	API	DAMM Dispatcher	Network Management
		Voice GW	Packet data GW						
DONGLE	BSC node (BSC 4xx)	1st BSC							
	Redundant BSC node (BSC 4xx)	2nd BSC							
	BSC node dongle (PC)								
	API Client Dongle								
	Log Server dongle								
	Log client dongle								
	Network management dongle								

Network Management may be invoked from any PC with a valid DAMM dongle. Select only if separate NM dongle is desired

OBS: Max. 1 selection per column except for BSC. Max 4 applications per dongle. (BSC = 1 application)

Log server *statistics only* functionality is available if Log Server is installed and a DAMM dongle is present. Needs no dongle reference to server or client

Dispatcher only refers to DAMM dispatcher, not customer programmed

Figure 2-1: Dongle Combinations

2.3.1.4 Dongle Update

The dongle can be reprogrammed by means of an update file. The file can be sent by e-mail from DAMM to the Partner, and downloaded locally to the system by means of the Remote Desktop icon in the node and thereafter executed. The update file is linked to the Dongle hardware serial number and can only be executed on the node where the specific dongle serial number is installed. The update file (.exe file) can be placed on any driver on the target e.g. C:\ or the desktop and executed from there.

The special encryption key cannot be updated. The dongle must be returned to DAMM for change/update of encryption key, but other parameters may be upgraded remotely.

2.3.1.5 Spare part Dongle:

- A Spare Part Dongle will be offered at a nominal price. If used in the node containing the master subscriber register, the dongle can only be used as spare dongle if the original dongle has no encryption key programmed. In case that encryption key is present, the replacement dongle must be ordered from DAMM sales.
- An order for Spare Part Dongles shall follow the Administrative procedure for ordering.
- A Spare Part Dongle is programmed with all settings at “zero”.
- When needed, the Partner must inform DAMM about the serial number of the faulty / missing dongle and DAMM will send a mail with a file containing the System and Node license’s settings from the original dongle.
- An invoice will be issued with the value of the System and Node licenses in the dongle, which will be credited when the original dongle is received by DAMM

2.3.1.6 Dongle exchange and information of content

At startup the BSC.exe is checking if a dongle is present, and if missing, the BSC will not start.

To view the preprogrammed BSC settings in the dongle, the following TetraOM commands may be used:

S04 Shows the license settings of the dongle for the BSC:

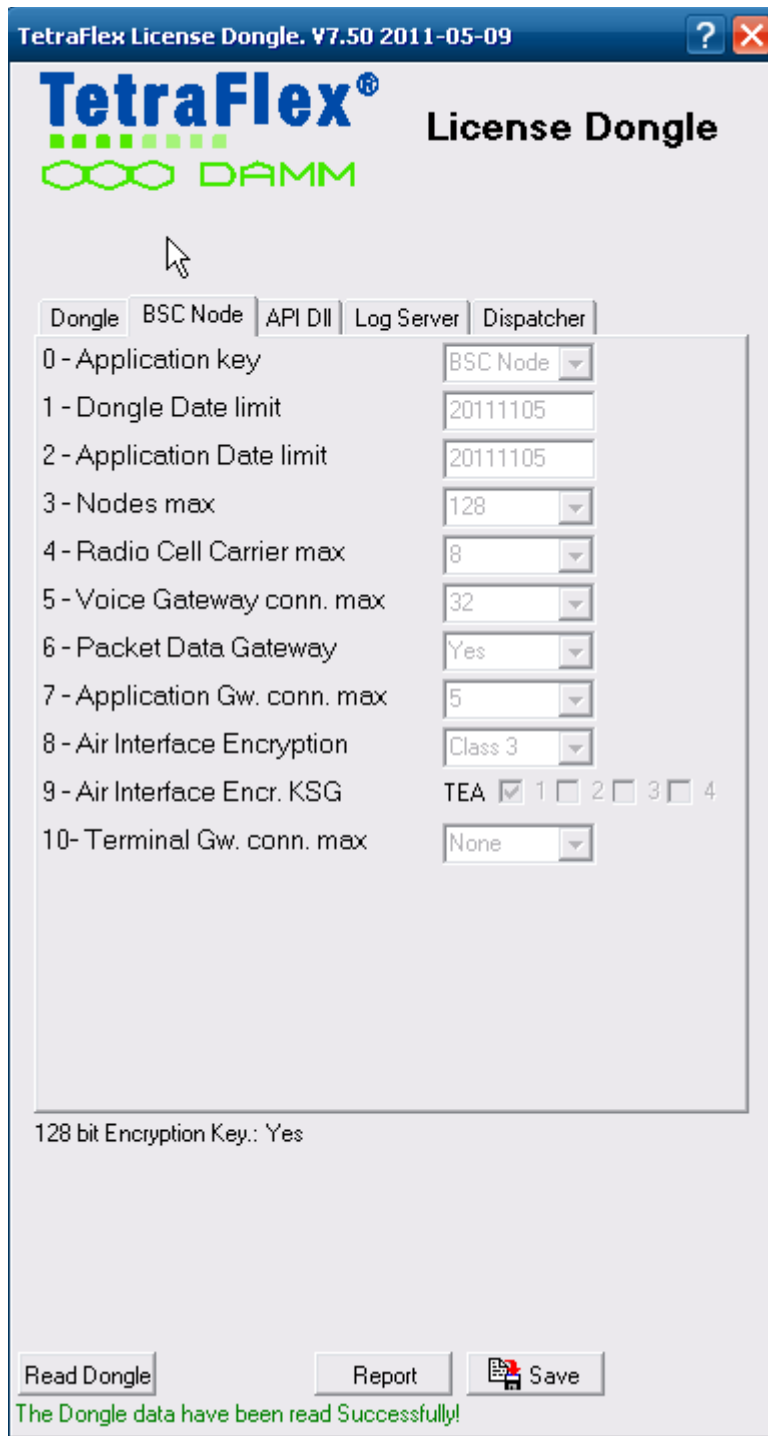
```

S04
***** TetraFlex License Dongle *****
03: Damm Serial Number.....: 10001923
05: Brand.....: DAMM TetraFlex
06: Language.....: 0: English only
07: Language 2.....: 0: None
15: Key Ref. Serial Number..: 10001923
    Security Key Register...: Yes

***** BSC Node Dongle entry *****
01: Dongle Date Limit.....: 2011-11-05
02: Application Date Limit..: 2011-11-05
03: Nodes max.....: 128
04: Radio Cell TR's max....: 8
05: Voice Gateway conn. max.: 32
06: Packet Data Gateway....: Yes
07: Application Gateway max.: 5
08: Air Interface Encryption: Yes
09: Air Interface Encr. KSG.: TEA1
10: Terminal Gateway max....: 0
    
```

Figure 2-2: Dongle Readout

The total numbers of dongle settings can only be shown with the license dongle reader program that can be found on the “Startmenu” – “Tetraflex” – “Dongle” – “License dongle”:



2.3.1.7 Explanation to the readout:

- DAMM dongle serial number (HW serial number can be red by S04/I)
- Brand, in this case DAMM TetraFlex® (OEM version are available)
- Language
- Key Register: If YES the dongle is programmed with a security key for Authentication / Encryption

BSC Node:

- Dongle Date Limit:
If set, the dongle ceases operation when the specified date is reached
- Application Date Limit:
The Application Date in the SW package is compared to this date for SW update allowance
- Nodes Max:
The maximum node number which can be defined in the system
- Radio Cell TR's max:
Maximum allowed transceivers per radio cell
- Voice Gateway Conn. max:
Maximum telephone connections per node
- Packet Data Gateway:
Packet data allowed or not
- Application Conn. max:
Maximum application connections (API interfaces)
- Air Interface Encryption:
Encryption allowed or not
- Air Interface Encr. KSG:
The TEA active in the BS (TEA1, TEA2, and TEA3)
- Terminal Gateway max:
(not include in this version)

The next dongle settings are not shown with the S04 command only in the Dongle reader program:

Log Server:

- Dongle Date Limit:
If set, the dongle ceases operation when the specified date is reached
- Application Date Limit:
The Application Date in the SW package is compared to this date for SW update allowance
- Call Info Log:
Call information logging set Yes or No
- SDS content Log:
SDS contents logged Yes or No
- Voice Log Max:
Maximum of voice streams that can be logged simultaneously

API DLL:

- Dongle Date Limit:
If set, the dongle ceases operation when the specified date is reached
- Voice Streams max:
Number of simultaneous voice streams in the application
- Flags:
Discreet listening – if flag is set discreet listening into ongoing calls is possible on the API (e.g. when using the dispatcher)
Ambience listening- if flag is set ambient listening is possible on the API (e.g. In the dispatcher)
- Application Server:
(not included in this version)

Dispatcher:

- Dongle Date Limit:
If set, the dongle ceases operation when the specified date is reached
- Application Date Limit:
The Application Date of the SW package is compared to this date for SW update allowance
- Flags:
When flag is set ESRI (.shp), GeoTIFF(.tif) and ECW (.ecw) maps can be used in the dispatcher.

The dongle is programmed at the factory by use of a master dongle. A specific dongle can however be updated with a specific update exe file created by use of the master dongle and executed on the computer with the dongle installed. This allows the update file to be sent by e-mail and updated locally, or it could be installed and executed from DAMM's hotline access. NOTE: This does not apply if the dongle is programmed with a security key. If this key needs to be updated, the dongle must be returned to DAMM for upgrade/change

2.3.1.8 Partners access to Software Releases:

- Any Partner with access to the restricted area on <http://www.damm.dk> can download all software packages available, and save them locally in his administrative system, for later use. If a Partner needs a software package not saved locally and not available on <http://www.damm.dk>, he can require this package by means of a mail to support@damm.dk
- An End-User can only execute software packages on a BSC4XX or PC, when the dongle is inserted and the software Application Date is earlier than the Application Date Limit programmed into the dongle.
- In case a Partner has a SLA, and wishes to have the Application Date Limit extended, he can place an order for extension of the SLA. He will then receive a dongle update for the total population of dongles. This update can be implemented when convenient or together with a new software releases, at an appropriate time.
- In case a Partner does not have a SLA, and wishes to have the Application Date Limit extended for one or more dongles, he can order a SLA. He will then receive a

dongle updates for the total population of dongles. This update can be implemented if convenient together with the new Software Releases, at an appropriate time.

- In case a Partner does not have a SLA and does not intend to order one, but wishes to execute a new Software Release on one or more systems, he can order the new Software Release and he will receive dongle updates with new Application Date Limit for the concerned dongles, which can be implemented together with the new Software Releases, at an appropriate time.

2.3.1.9 Programming of Dongle Application Date Limit:

This setting is subject to change without notice

- The Application Date Limit for execution of software packages is set to:
 - Partners without SLA: - the delivery date plus warranty period.
 - This can be set individually.
 - Partners with SLA: - 24 months and can be extended with periods of 24 months

2.3.1.10 Consequences for Partner and End-User:

- The Partner can at any time execute all software packages with an Application Date that is earlier than the Application Date Limit programmed in his dongle.
- This ensures that a Partner has support in the warranty period alternatively the SLA period and can run the latest software available just before the warranty period alternatively the SLA period expires.
- The End-User can decide to continue running a software package after the Application Date Limit is passed
- The End-User can also decide via an agreement with Partner to obtain new released and to have the Application Date Limit changed in order to run new releases

2.4 SOFTWARE INSTALLATION

All software is preinstalled from factory on the CF Storage media in the SB421 or BSC412. This includes also the BS421, TR412, Power supply- and combiner software.

The next chapter is covering the re-installing or updating of software on these units. Also installation of relevant software on external PC is covered.

Please also read the relevant release notes and upgrade guides.

2.4.1 CF Storage media

The TetraFlex® system uses an 8GB Compact Flash (CF) Card as storage media
The CF card is divided in to 3 partitions

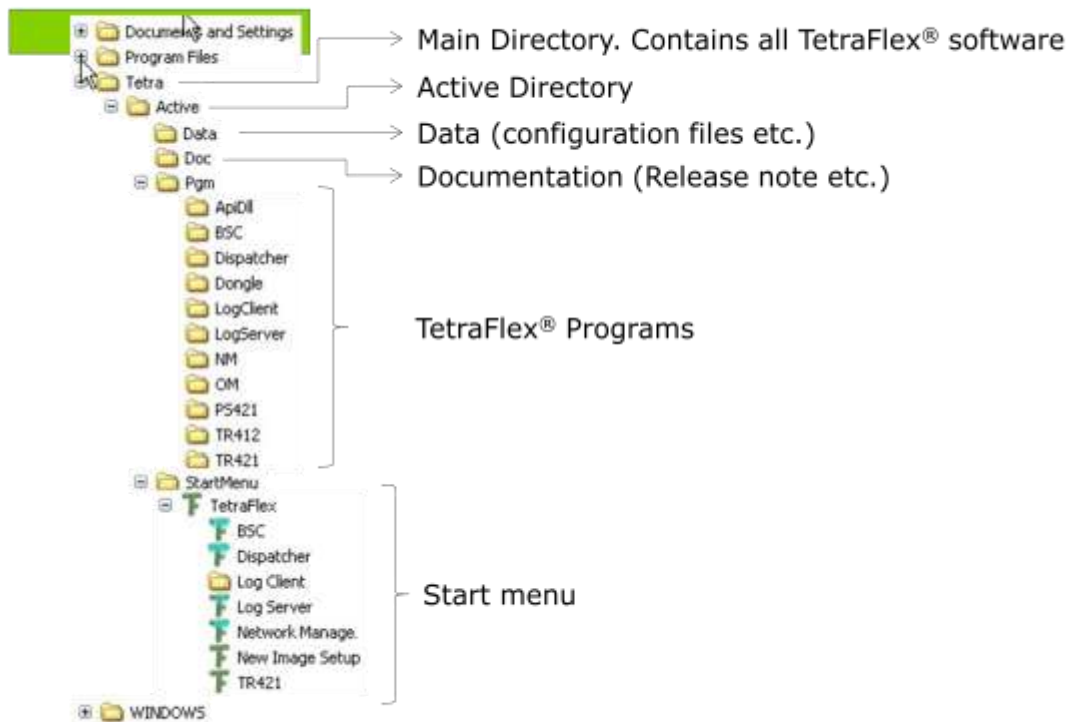
8GB CF Card – Order no. 105126* (V7.30 and forth)		
Partition No.	Name	Usage
1 (2 Gbyte)	CF-P1 (C:drive)	Primary partition (system) -TetraFlex® and operation system
2 (2 Gbyte)	CF-P2 (D:drive)	Secondary partition for Upgrade TetraFlex® and operation system
3 (4 Gbyte)	CF-P3 (E:drive)	Log Server database files

*Please inform about sw version when ordering a new flash card.

On previous versions (Pre Ver.7.x) a build in hard disk was installed having the drive letter F:

Apart from the standard Windows Operation System (OS) directories, the CF card contains the directory “c:\Tetra” where the primary Tetra functionality is stored

BSC CF File organization



2.4.2 Windows License

The TetraFlex® has previously been delivered with the Windows XP embedded OS. Due to the obsolescence of XP from Microsoft, future systems will be delivered with Windows Embedded Standard 2009 (WES2009).

The license label on the BSC will state which version is initially delivered.

Be aware that it is a violation of license to upgrade an XP embedded OS with WES2009 unless a new license is purchased from sales.

A WES2009 can legally be downgraded to XP embedded should this be decided.

2.4.3 TetraFlex® Installation/Upgrade

2.4.3.1 Preconditions

The software package can be installed on either the SB421, BSC412 or on an external PC.

The Dispatcher and ApiDll applications are compatible with the following operating systems:

- XP
- Windows 7

The BSC, Log Client, Log Server, NM and OM are compatible with the following operating system:

- XP embedded

- Windows Embedded Standard 2009 (WES2009)
- XP
- Windows 7
- Windows Server 2008 R2

Installing the new Release can be done in different ways:

- Installing whole image including XP - relevant when upgrading SB421 and BSC412 from releases older than 7.30 e.g. 7.21 or new installation
- Installing whole image including WES 2009 (if the SB421 or BSC412 has a license for WES2009) - relevant when upgrading SB421 and BSC412 from releases older than 7.30 e.g. 7.21 or new installation
- Installing the TetraFlex packet or individual parts of the packet

2.4.3.2 Log Server running on Service Box with 2 Gbyte CF Card

If the Service Box has to run the Log Server program, the CF card has to be exchanged to the new 8GByte CF card with the full TetraFlex packet including a preinstalled Log Server. The actual TetraFlex configuration should be copied from the old to the new CF card (the configuration is stored in C:\Tetra\Active\data\.

The Service box with the Log Server needs also to have 1GB RAM to function properly.

2.4.3.3 Installing a new image on SB421 and BSC412



If this procedure is not followed, and the upgrade is done remotely, the remote connection to the system might be lost and it is necessary to go on site for configuration.

NOTE: Always use CF-card delivered from DAMM that are prepared to be bootable from either BSC 412 or SB421. Having any configuration files on the cf-card they should be backed up, otherwise they are lost. If you want to be able to use the old sw version again Copy drive C: (CF-P1) to drive D: (CF-P2).

The new image can be downloaded from DAMM's web site (see chapter "Partners access to Software Releases").

Before using the image – please unzip. Use a PC and place the unzipped files in a directory e.g. \Image.

Always check the Application Date Limit on the Dongle before installing new software. If the the Application Date Limit is older than the date of the software version you are installing, it will not work.

- Move the flash disk to an external card reader and check if it is formatted (C: NTFS format, label CF-P1) and copy the new image to the partition CF-P1)
- Place the CF Card in the BSC412 or SB421 and reboot. After a while the "FBReseale" dialog appears, please be patient it takes a while.

- Go to ...\\Tetra\\Active\\Pgm\\BSC directory and open the file ImageSetup.bat file for editing
- Edit the file (delete REM notes) for the configuration needed (recommendation is all except headlines)
- Insert the correct IP and data (PC Name) in the top “set” lines (do not edit the bottom “set” lines)
- Save the file
- DO NOT RUN. The bat file will be executed and then deleted the first time the BSC.exe is started
- To make the BSC service and application start, make a copy of bsc.exe to bsc_.exe

The system configuration is stored in the the files CnfgBsc.txt, CnfgBss.txt, CnfgMain.txt, CnfgFact.txt and CnfgBs.txt in the \\Tetra\\Active\\Data folder. When these files are missing they are auto-generated when the BSC application is started (with default values).

These files can also be generated with the following OM commands:

```
F70/SAVE → CnfgBsc.txt
S70/SAVE -> CnfgBss.txt
M70/SAVE ->CnfgMain.txt
M90/FACTORYUNLOCK
M90/SAVE -> CnfgFact.txt
M90-
H71/SAVE-> CnfgBs.txt (used by BSC412 only)
```

After the files have been generated they must be edited with the correct IP address and other parameters. Please see the chapter “*SB421 configuration*” and “*BS41x Configuration*” for more details.

If you want to use DHCP server (recommend for SB421) this must be started manually. Go to \\Program files\\DHCPserver and start the program DHCPsrv.exe. Install as service.

- **NOTE** This does NOT include the configuration of the LAN and WAN network card settings in Windows. This must be done manually.

2.4.4 Installing individual parts of the TetraFlex packet.

All applications are preinstalled from factory on the SB421 and the BSC412, but can be re-installed or installed on different external PC's. Be aware of having the appropriate dongles when running the applications on various machines. Also check the Application Date Limit before installing new releases.

Note: See also relevant upgrade guidelines and release notes when installing new software.

2.4.4.1 BSC

1. If the system is already installed with TetraFlex® release 7.5 you only have to install the new BSC software:

- Copy “...\Pgm\BSC\BSC.exe” into the active folder in the BSC “C:\Tetra\Active\”.
 - Restart the BSC.
 - Repeat the above two points for all BSC’s in the system.
2. If the system is installed with older TetraFlex releases please follow the Update guideline for ver.7.4 to 7.5
3. If the installation is done on a new XP/ Windows installation, the following files should be executed (If not already there the files could temporary be placed in the following path “C:\Tetra\Active\pgm\BSC”):
- XpQosSetup.reg
 - WinPcap_4_0_1.exe
 - Restart the BSC via start menu “BSC Restart” or execute BSC.vbs and select RESTART
4. If the installation is done on a PC with Windows 7, the following files should be executed (If not already there the files could temporary be placed in the following path “C:\Tetra\Active\pgm\BSC”):
- vbs-runas.reg (to allow BSC and BSC-GUI to run as administrator)
 - XpQosSetup.reg
 - WinPcap_4_0_1.exe
 - Restart the BSC via start menu “BSC Restart” or excecute BSC.vbs and select RESTART

In the “C:\Tetra\Active\” you will find a number of directories beside the pgm directory - mentioned above-, these directories contain: system configuration files, the subscriber database, and sound files to be used as part of the Tetra core features.

If a specific audio file doesn’t exist it is copied to the disk, when the service starts. User generated sound files (in the C:\Tetra\Active\Audio folder) with different names as the standards are kept.

Authentication keys need to be re-imported from the security key file from where they originally were imported (and a renew of all keys must be performed).

2.4.4.2 Start Menu

The various TetraFlex parts can be started from the Windows start menu if the C:\Tetra\Active\StartMenu\TetraFlex folder with all its content is copied to C:\Documents and Settings\All Users\Start Menu.

2.4.4.3 OM

Stop the OM program - when running - before proceeding.

1. If the system is installed with TetraFlex release 7.5:
 - Copy all files from “...\Pgm\OM” into the active folder: “C:\Tetra\Active\PGM\OM”.
 - Repeat this for all nodes in the system.

2. If the system is installed with older TetraFlex releases please follow the Update guideline for ver.7.4x to 7.5

Having an OM shortcut on the desktop, change it to point at “C:\Tetra\Active\pgm\OM\OM.vbs”.

2.4.4.4 NM

Stop the NM program - when running.

1. If the system is installed with TetraFlex release 7.5:
 - Copy all files from “...\Pgm\NM” into the active folder: “C:\Tetra\Active\PGM\NM”.
 - Repeat this for all nodes in the system.
2. If the system is installed with older TetraFlex releases please follow the Update guideline for ver.7.4x to 7.5

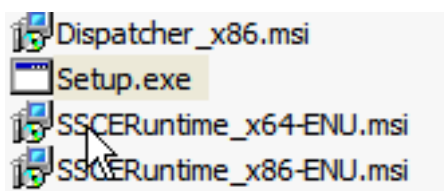
If there is a NM shortcut on the desktop, change it to point at “C:\Tetra\Active\pgm\NM\NM.vbs”.

2.4.4.5 Dispatcher

The dispatcher application can only run on an external PC (not SB421 or BSC412) and the PC must be provided with the appropriate dongle for starting the dispatcher.

The installation programs for the Dispatcher are default placed at the SB421 and BSC412 and can be installed on a external PC(s) from there.

Dispatcher installation programs:



When (re)starting the BSC, a Dispatcher distribution point is created via the TetraFlex share under the folder structure: C:\Tetra\Share\Dispatcher\. Install the dispatcher on an external PC by executing the **Setup.exe** file from this folder (to find the share use the File Explorer on the PC where you want to install the Dispatcher).

For updating the dispatcher installation program on the the SB421 or BSC412, place the dispatcher files in c:\tetra\share\dispatcher and c:\tetra\active\pgm\dispatcher.

Having any unwanted files in any of the above mentioned folders (e.g. from older installations) please delete them before copying the new Dispatcher installation files.

If you are allowed to restart the BSC you may place the Dispatcher files in c:\tetra\update\pgm\dispatcher\ They will then be copied to the right directory when activating "BSC BackupUpdateRestart"

Having any unwanted files in any of the above mentioned folders (e.g. from older installations) please delete them before copying the new Dispatcher installation files.

2.4.4.6 Log Server

The Log Server is available either as an external Log Server or installed on the 8GByte Compact Flash card. The Log Server requires at least 1GB RAM to operate properly. The log server is as default stopped and need to be restarted when needed.

To upgrade an existing Log Server to release 7.5 the Log Server must be stopped, all files and folders from C: \Tetra\Active\Pgm\LogServer\ and C: \Tetra\Active\Pgm\LogClient\ must be copied to the unit where the Log Server is installed. The Log Server can then be restarted using the start menu TetraFlex → LogServer Restart. The Log Server is now running and the Log Client installation files are ready for distribution via the "TetraFlex" share C:\Tetra\Share\LogClient\

Note: The database for ver. 7.5 is not compatible with earlier versions. When restarting - the new log server is making a copy of the old database - and it is starting with a new empty database. The old database is stored in a folder with ver. no and date like: \TetraFlexLogDB_4_0_20110912_103145

If you want to use the subscriber information in the Logserver from you ver. 7.4 database it can be copied from the ver. 7.4 to ver 7.5 database following this procedure:

- a. Stop the Log Server and MySql server service
- b. Copy the following files from the old database to the new:
 - i. MsLogConfig.myd
 - ii. MsLogConfig.myi
 - iii. MsLogConfig.frm
- c. Start the MySql server service and the Log Server again.

If using a database older than ver. 7.4 you have to contact DAMM for converting the subscriber data.

2.4.4.7 Log Client

The Log Client applications may be installed on an external PC work station with the appropriate dongle.

Install the Log Client by connecting to the Log Server (on SB421, BSC412 or external logserver) with the file explorer. Find the folder Log Client using the TetraFlex share (C:\Tetra\share\LogClient) and execute the LogClientInstall.vbs. When the Log Client shortcut is executed, the new and the old LogClient.exe are compared. If they differ a backup of the old Log Client files will be made and all the Log Client files are copied from the Log Server to the local machine, except for the LogClient.ini file. If they are equal the local Log Client files will be executed without copying.

2.4.4.8 PS421

The power supply software (PS421.hex) is placed in c:\tetra\active\pgm\PS421 directory. The PS421 can be upgraded by using the OM command

M68/PS421/+

2.4.4.9 TR412

When unpacking the software package the TR412.bin file will be placed in \Tetra\Active\Pgm\TR412.

Download this file to all TR412 by using the TetraOM command:

H68/TR412/A

2.4.4.10 BS421

Overwrite the existing TR421.dll file at C:\Tetra\Active\Pgm\TR421 with the new TR421.dll. On the local BSC execute the BS421Download.bat file (Path: C:\Tetra\Active\Pgm\TR421). Restart all the TR's by help of TetraOM commands:

99/RESTART

2.4.4.11 Installing TEA2 encryption

Files for TEA2 encryption are not part of the software package, but have to be ordered separately. The TEA2 version of TR421.dll and TR412.bin are installed in the same way as described above for BS421 and TR412.

2.5 SB421 CONFIGURATION

The SB421 enables you to connect a VGA monitor and a USB keyboard directly to the SB421 without having an external PC.

In case no graphics is shown, press <Ctrl> + <Alt> + <F1> to reset the connection.

2.5.1 Initial setup

2.5.1.1 Ethernet Connection

The SB421 supports the following Ethernet connections, all auto negotiating

- 2 x 10/100 Mb/s Ethernet LAN connection for the Base Stations
- 1 x 10/100 Mb/s Ethernet WAN/LAN connection for remote operation and multi-node backbone connection
- 2 x Ethernet type DC 1 second pulse connection for BS421 timing.

The Ethernet connections are LSA-type connections accepting only **solid wires** with the dimension 0.4mm² to 0.6mm².

The Ethernet connections are protected by arresting devices.

The Ethernet connections are limited to SELV

The Ethernet WAN connection is connected to an Ethernet switch or directly to the PC / Network by means of a straight or crossed Ethernet cable.

The Ethernet LAN connection shall solely be connected to the BS421(s) and optionally to a redundant SB421 and/or IP backbone for multimode operation.

For redundant BSC operation, please see the chapter describing setup and requirements.

2.5.1.2 Turn on the SB421

Turn on the power to the BSC using SW101 on the Interconnection Board

Turn on the power to the BS421(s) using SW111 (TR1) and SW133 (TR2)

If changes in the BIOS are required, press F2 key shortly after applying power (while screen is still blank)

Power up will take 2-3 minutes, mainly dependent on the startup time of operating system on the SB421.

After successful power up, check the BSC LED's for proper function as described in section 1.1.4.4.4

2.5.1.3 System BIOS configuration

To enter the BIOS setup application, press F2 during initial boot of the SB421



WARNING: Be careful not to disable the USB ports in the BIOS. When USB ports are disabled, the dongle cannot be read and there is no way of getting direct access to the SB421 PC by means of a monitor and keyboard / mouse.

2.5.1.3.1 Hard disk disable

NOTE: In case of an internal hard disk is present, disable this totally before booting from the CF card. After initial boot the HD may be enabled again and should appear as D:\ drive with a 2GB CF card installed and F:\ with an 8GB CF card installed.

DO NOT try to reconfigure drive letters with the build-in drive manager in the OS

2.5.1.3.2 BIOS setup for the TetraFlex® V7.30 and newer (CF Boot)

Please configure the BIOS according to the following screenshots



Figure 2-3: Miscellaneous

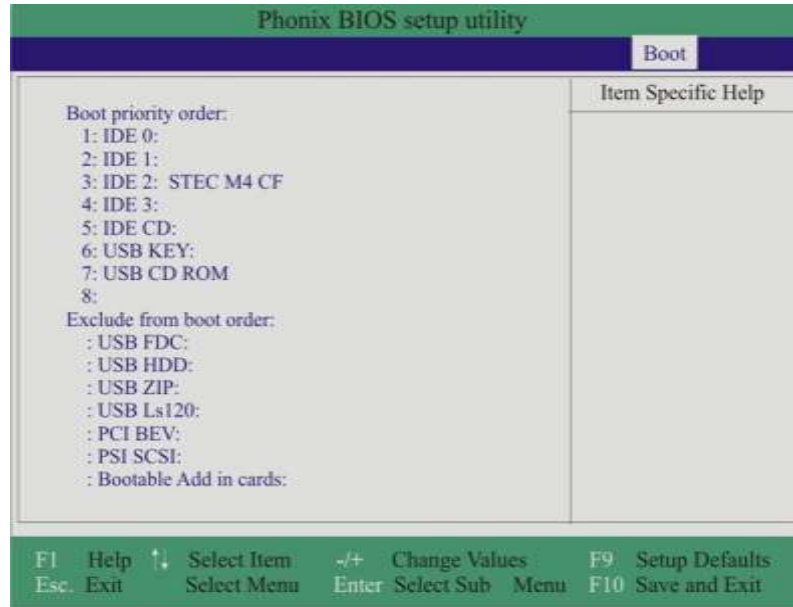


Figure 2-4: Boot configuration

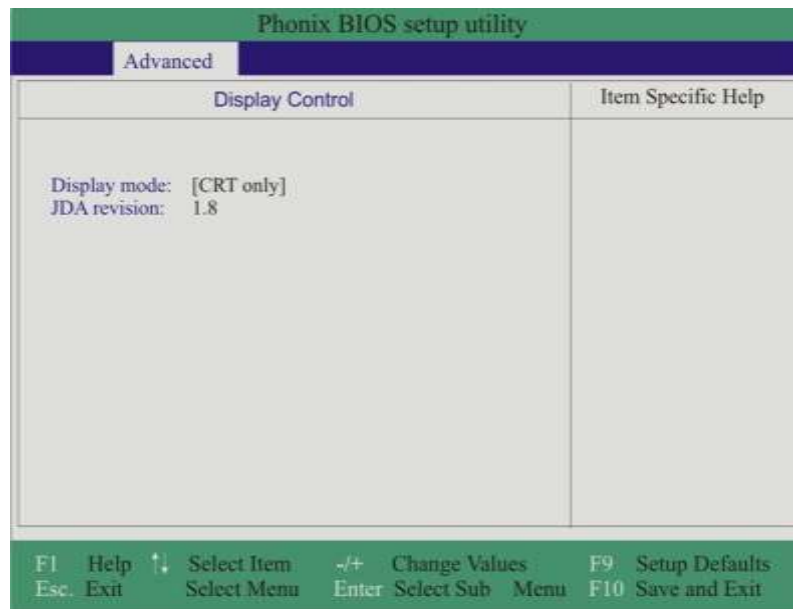


Figure 2-5: Display configuration

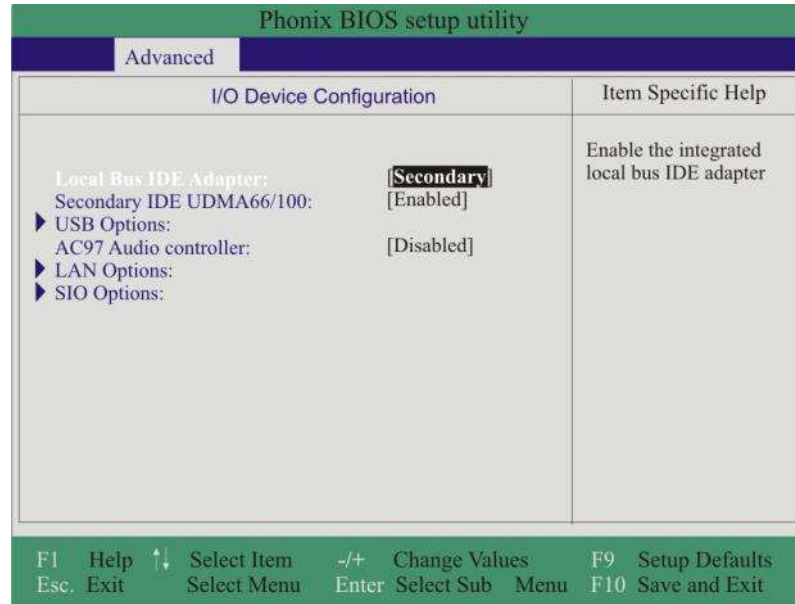


Figure 2-6: I/O selection



Figure 2-7: Port configuration

2.5.1.3.3 BIOS setup for new fast Compact Flash (CF) Cards

Due to a BIOS incompatibility, the use of new CF cards requires a change in the BIOS set up:

- Enter the BIOS setup by pressing F2 key under boot
- Select the MAIN area



Figure 2-8: BIOS main selection

- Select Secondary Master



Figure 2-9: USER type change

- Select “TYPE” and change type to “Auto” by tapping the <Space> key
- Press <F10> to save the setting and exit the BIOS setup

2.5.1.4 IP address set-up

For the TetraFlex® system all IP addresses except for multi node networking is preset upon delivery. The only setup necessary is the IP addresses for the WAN used for application GW, network management, remote desktop connection, log server client, and dispatcher client. These IP addresses are entirely user dependent and they are setup using the WAN Ethernet board configuration in Windows operation system.

2.5.1.4.1 Default network card IP address setup

As default the IP addresses are defined as

- LAN Network Card: 172.16.1.10

This IP address must be equal to the IP address defined for the BSC
If these IP's addresses are miss-configured, in addition to a non working system,
also a PS alarm may show on the BSC LED's

- WAN Network Card: DHCP

2.5.1.5 MAC address Set-up

On delivery from DAMM, the MAC is set to the correct value

BSC's delivered from 01.01.2008 has the MAC address stored in a flash device. No action needed.

BSC's delivered before 01.01.2008 (MAC address label may be present on the BSC unit) may have the MAC redefined.

The MAC is stored on the storage device (HD or CF). This means that if the system is cloned from another SB421 or reinstalled with the image file available at the <http://www.damm.dk>, the MAC address MUST be changed from the MAC specified in the source file to the actual value valid for the specific SB421 serial number.

If MAC cannot be determined, contact support@damm.dk with the serial number in question

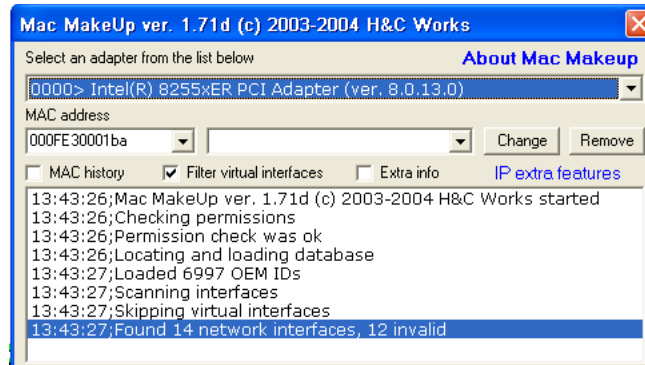
To enter / change the MAC, follow the procedure as stated.

- Look up and write down the MAC address noted on the label placed in the upper right corner of the CPU (BSC) unit in the SB421. See
- Figure 1-2: BSC421
- Use the file explorer and go to C:\Programs\MacMakeUp\MacMakeup.exe



Figure 2-10: Start MacMakeUp Application

- In the MacMakeUp application select the 825xER PCI Adapter
- Enter the MAC address (Enter value like 000FE3000431)
- Press "Change"
- Close the application
- Re-open MacMakeUp and check that the MAC is actually changed / saved
- Disable and then enable the WAN net card to make MAC change valid.

**Figure 2-11: Change MAC**

2.6 BS421 CONFIGURATION

2.6.1 Ethernet Connection

The BS421 supports 1 x 10/100 Mb/s. Ethernet connection and 1 x Ethernet type DC connection for timing.

The purpose of the connections is

- To establish SB421 connection for control of the base station
- To establish connection to another BS421 for timing and synchronization. (1 sec Pulse).

The Ethernet connections are limited to SELV (Safety Extra Low Voltage) connections.

The Ethernet connection shall be connected directly to the SB421 TR connection board.

The DC timing connection is connected through the SB421 LAN cable. Arresting units are an integrated part of the SB421.

2.6.1.1 Set-up of IP address

2.6.1.1.1 DHCP (Typical TetraFlex® single node)

The IP address and the net mask is setup by means of DHCP.

When the system is delivered from DAMM, the BSC and the BS421 are paired and should start-up without any need of configuration change.

However, if the BS421 is connected to another BSC, the IP address configuration must be reset.

2.6.1.1.2 How does DHCP work with the SB421 (BSC)?

The IP address may be assigned by means of DHCP.

This means that the SB421 must first be started. When the SB421 is started here after the BS421/1 must be started and then in a dual carrier system the BS421/2.

The BS421 gets an IP address from the PC's DHCP server. This IP address is tied to the BS421 MAC address.

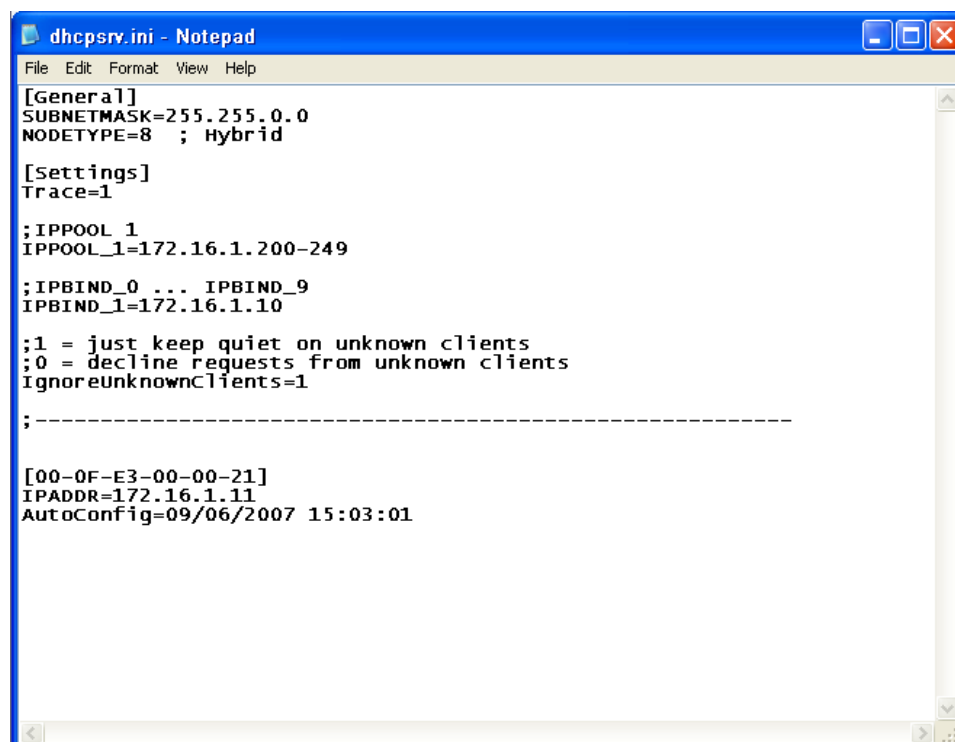
If the MAC address is unknown to the PC, the BS421 will be assigned an IP in the range 172.16.1.200 - 249.

In this case the BS421 IP address must be changed.

2.6.1.1.3 Changing the BS421 IP

- Open C:\Program Files\DHCPserver\dhcprsv.ini with notepad or another text editor.
- (Hint: save a backup of the original file before editing)

NOTE: All entries above the dotted line are factory presets and must only be changed for redundant SB421 (change IP Bind to 172.16.1.19) or when IP address segments must be changed.



```

dhcprsv.ini - Notepad
File Edit Format View Help
[General]
SUBNETMASK=255.255.0.0
NODETYPE=8 ; Hybrid

[Settings]
Trace=1

;IPPOOL 1
IPPOOL_1=172.16.1.200-249

;IPBIND_0 ... IPBIND_9
IPBIND_1=172.16.1.10

;1 = just keep quiet on unknown clients
;0 = decline requests from unknown clients
IgnoreUnknownClients=1

;-----

[00-0F-E3-00-00-21]
IPADDR=172.16.1.11
AutoConfig=09/06/2007 15:03:01
    
```

Figure 2-12: DHCP Setup

- Below the dotted line one or more MAC [In Brackets] / IP addresses are shown.
- If only one MAC / IP is shown, change the IP address to 172.16.1.11
- If more IP's are shown and only one BS421 is connected, determine which IP address is valid by use of a ping command to the IP's. Delete the wrong IP / MAC entries and change the remaining IP to 172.16.1.11
- If more IP's are shown and two BS421 is connected, determine which IP's are valid by use of a ping command to the IP's. Delete the wrong IP/MAC entries and change the remaining IP's to 172.16.1.11 for the first BS421 and 172.16.1.12 for the second BS421 and so on. Observe the correct MAC / IP combination.
- NOTE: It is highly recommended to assign IP's to one BS at a time by shutting of the power to the other.
- Save the dhcprsv.ini file
- Restart BS421 by means of the appropriate switch (SW111 and SW133) inside the SB421 or use TetraOM PS command 11- / 11+ and 12- /12+
- Ping the 172.16.1.11(TR1) and 12 (TR2) to check if the addresses are correct

2.6.1.1.3.1 DHCP with redundant SB421

With redundant SB421 the procedure for DHCP also applies, but the redundant SB421 communication with the BS421(s) is (are) initially off line (DHCP server stopped).

To stop the DHCP server, log in to C:\ProgramFiles\DHCPserver and double click on the dhcprsv.exe file



Figure 2-13: DHCP Redundant Setup

Then select “STOP” to temporarily stop the DHCP server.

When the IP setup of the main SB421 is finished,

- The dhcpserver.ini file must be copied to the C:\ProgramFiles\DHCPserver of the redundant SB421
- The IPBIND setting must be changed from IPBIND_1=172.16.1.10 to IPBIND_1=172.16.1.19
- The DHCP server must be started up again

2.6.1.1.4 Static IP

Setting the TR with Static IP address (Default is dynamic):

- Open the VNC for the selected BS421
- Select START -> Settings -> Network and dial up connections
- Open the AU1MAC1
- Select Specify an IP address and enter the relevant data into the fields
- Select OK and exit the program

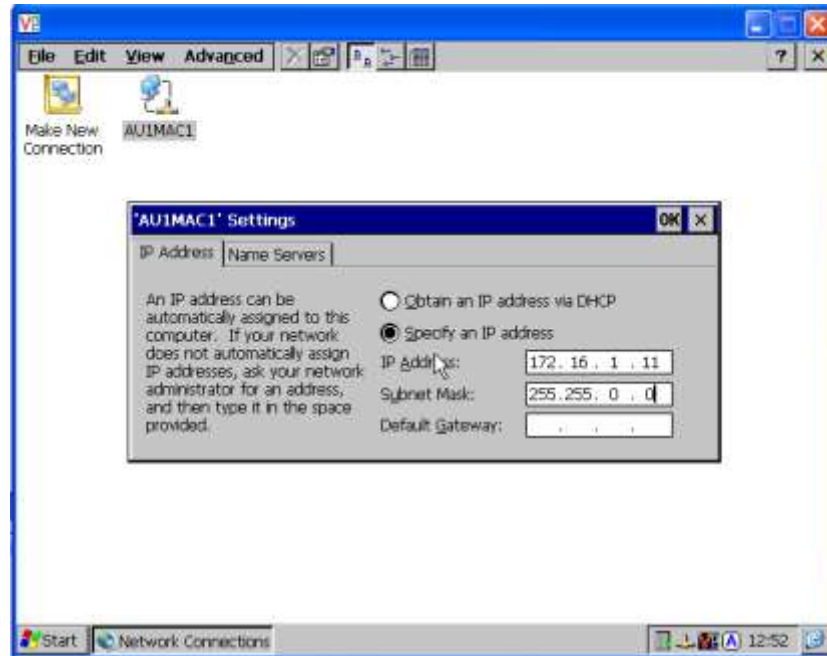


Figure 2-14: Static IP setup

- Using TetraOM command F71/..., check or change the IP for BS1 (TR remote)

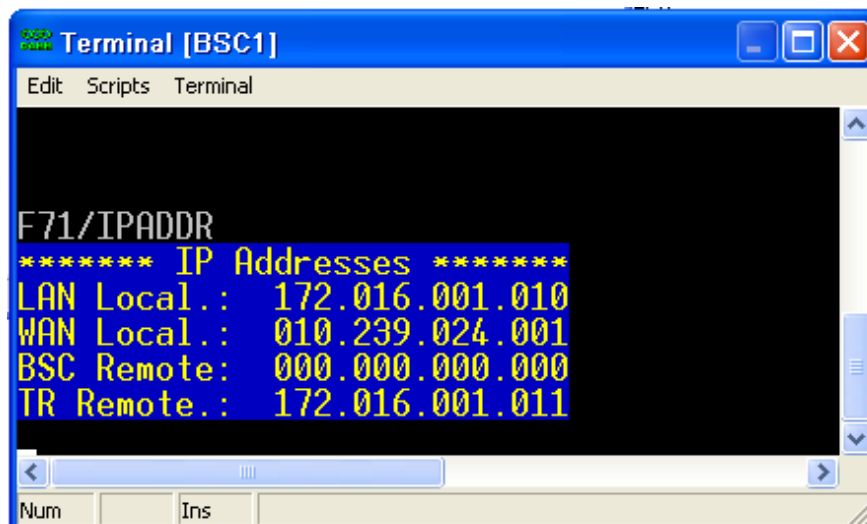


Figure 2-15: TetraOM IP definition

2.6.1.1.5 TR421 Update / Install

For updating the transceiver program; TR421.dll on the BS421, use this procedure:

- Change the IP addresses used in “TR421Download.bat” file (path c:\tetra\active\pgm\TR421\) with the actual IP addresses to match the TR421's.
- The address of the first TR is default 172.16.x.11 where x is the node number (IP must be written in the bat-files without the leading zeros).
- “Rem” out all unused TR421's

Default TR421Download.bat:

```
@echo *****
@echo *****      TR421 file download      *****
@echo *****
@echo Copyright 1985-2009
@echo Damm Cellular Systems A/S, Denmark
@echo Ver. 7.40 2009-09-17

@echo Change all the IP Addresses below to match the BS421's
@echo rem out all unused BS421's

@echo ***** Copy files to TR421-1 *****
net use Z: \\172.16.1.11\CF-Card tetra /USER:tetra /PERSISTENT:NO
copy TR421.dll Z:\Tetra\Pgm\Tr\*. * /Y
copy TR421.bat Z:\Tetra\Pgm\Tr\*. * /Y
net use Z: /DELETE

rem @echo ***** Copy files to TR421-2 *****
rem net use Z: \\172.16.1.12\CF-Card tetra /USER:tetra /PERSISTENT:NO
rem copy TR421.dll Z:\Tetra\Pgm\Tr\*. * /Y
rem copy TR421.bat Z:\Tetra\Pgm\Tr\*. * /Y
rem net use Z: /DELETE

rem @echo ***** Copy files to TR421-3 *****
rem net use Z: \\172.16.1.13\CF-Card tetra /USER:tetra /PERSISTENT:NO
rem copy TR421.dll Z:\Tetra\Pgm\Tr\*. * /Y
rem copy TR421.bat Z:\Tetra\Pgm\Tr\*. * /Y
rem net use Z: /DELETE

rem @echo ***** Copy files to TR421-4 *****
rem net use Z: \\172.16.1.14\CF-Card tetra /USER:tetra /PERSISTENT:NO
rem copy TR421.dll Z:\Tetra\Pgm\Tr\*. * /Y
rem copy TR421.bat Z:\Tetra\Pgm\Tr\*. * /Y
rem net use Z: /DELETE

@echo Please restart all TR421 services afterwards
@echo by executing B/99/RESTART from BSC
pause
```

On the local BSC execute “BS421Download.bat” file (Path “C:\Tetra\Active\Pgm\TR421”):

Restart all TR's by using the TetraOM commands:

99/RESTART

NB: Update only NK.BIN and Boot.ini if you are advised to do so (in case they are damaged or need to be updated).

Installation of NK.bin file (Windows CE): Refer to section 2.6.2.1

Installation of the Boot.bin file:

- Copy the Boot.bin file to the root of the TR421 CF-Card.
- Restart the TR421 with the command

99/RESTART

- Reboot the TR421 with command to the PS421, commands

AP (Address the Power supply)
11- (power off for TR1 and TR3)
11+ (power on for TR1 and TR3)
12- (power off for TR2 and TR4)
12+ (power on for TR2 and TR4)

2.6.2 Installing Windows CE on BS421

The operating system on BS421 is Windows CE that is contained in one file - NK.bin this chapter describes how to install it.

IMPORTANT:

Do not copy NK.bin (WinCE) to the BS421 unless instructed to do so, or forced to do so due to breakdown.

2.6.2.1 Copy NK.bin (WinCE) to BS421

If the BS421 is connected with VNC, the BS application (TR421) MUST be stopped before copying files. Enter 99/STOP <Enter> in the OM Command Interpreter and the application stops and shows the normal WinCE desktop

WARNING: If the BS application is not stopped before copying, the connection to the BS421 may be lost. In this case proceed as follows:

- Disassemble the BS421
- Take out the CF-Card
- Put the CF-card into an compatible card reader
- Manually copy the NK.bin file to the CF card
- Put the CF-card back in the BS421
- Reassemble the BS421 and proceed as described in section 2.6.2.2

If communication with BS421 is present, proceed as follows

- Search for BS421 using Start -> Search -> Files or Folders -> Computer
- Enter the IP address of the BS421 e.g. 172.16.1.11 or 172.16.1.12
- Select Search
- Select the search result
- Select CF-Card
- Create a new directory called CF-Card\TMP on the BS421
- Copy the file NK.bin from SB421 C:\tetra\PGM\TR to the CF-Card\TMP on BS421
- Open VNC for TR1 or TR2 from the desktop
- Open My Device
- Copy NK.bin from CF-Card\TEM to CF-Card
- Accept overwrite of old NK.bin file

The copy function takes app. 15 min.

Note: If for some reason the connection to the system is broken, the copying of the file will continue locally. Just wait until the copying has finished (minimum 15-20 minutes) before restart.

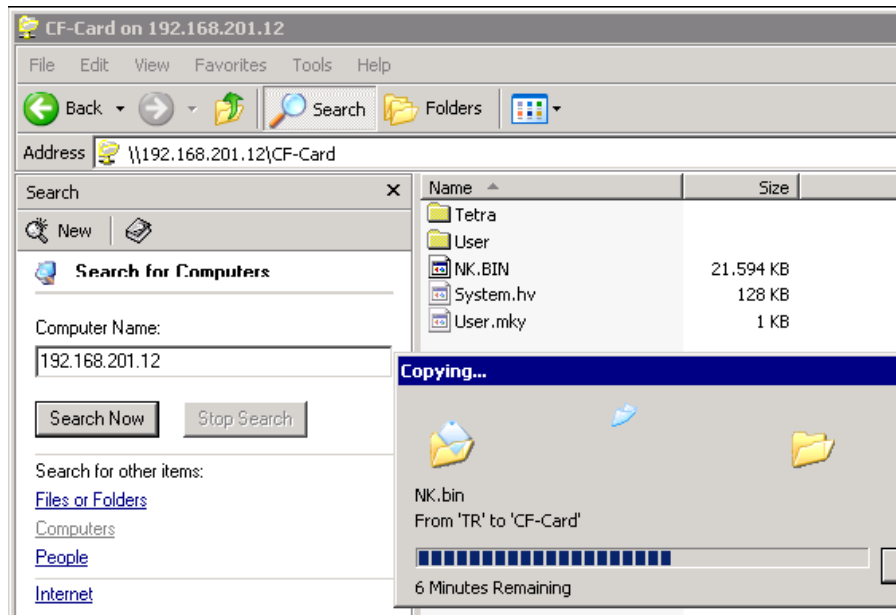


Figure 2-16: NK.BIN copy

- After successful copy, delete the CF-Card\TMP directory
- Restart BS421 using switch in SB421

2.6.2.2 Configure admin user

When a new NK.bin file has been copied to the BS421, the BS421 Admin and User settings are lost. To reestablish, follow the procedure:

- Start the Internet Explorer from SB421 Start -> Programs -> Internet Explorer
- Connect to the file-server web client on BS421 using:

http://”TRx IP address”/remoteadmin
 (“TRx IP address” = 172.16.1.11 for TR1 or 172.16.1.12 for TR2)

- Password = tetra
- Verification = tetra
- Select Apply

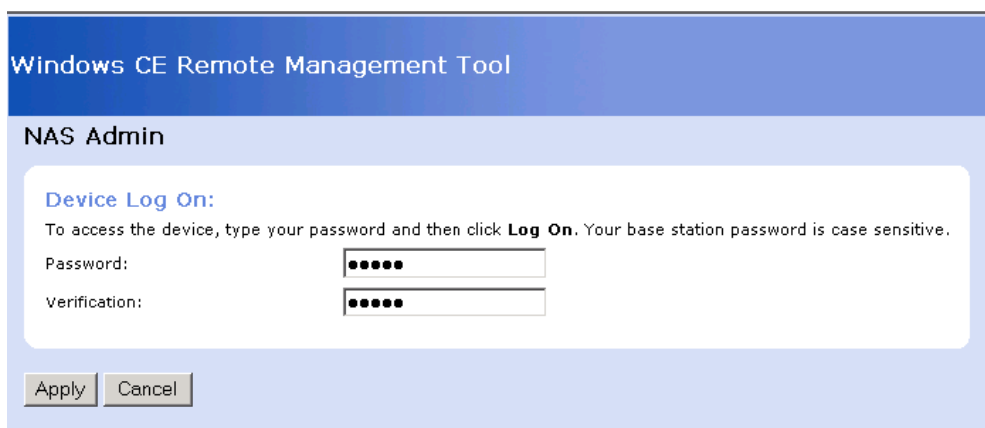


Figure 2-17: Configure Admin and User

The gateway will restart and prompt for username and password

- Enter username = admin
- Enter password = tetra

2.6.2.3 Configure host name

- Insert BS421-“BS421 serial number”
- Press Apply. **To move on, it might be necessary to temporarily make a change to the Device Name and press <Apply>. Immediately change it back to the original name and press <Apply>, then move to on to the next point**

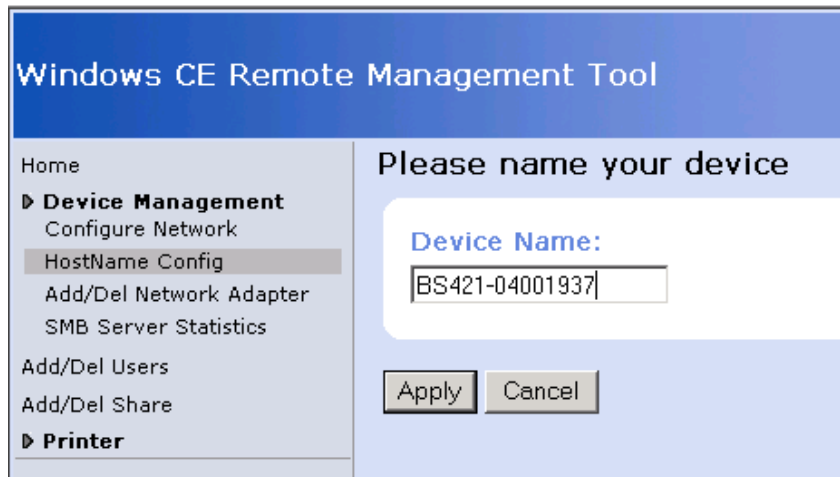


Figure 2-18: Configure Host Name

2.6.2.4 Configure file-server user

- Select add/del User
- Enter username = tetra
- Enter password = tetra
- Enter confirm = tetra
- Press Add New or <Enter>
- Check user tetra has been added and exit the browser

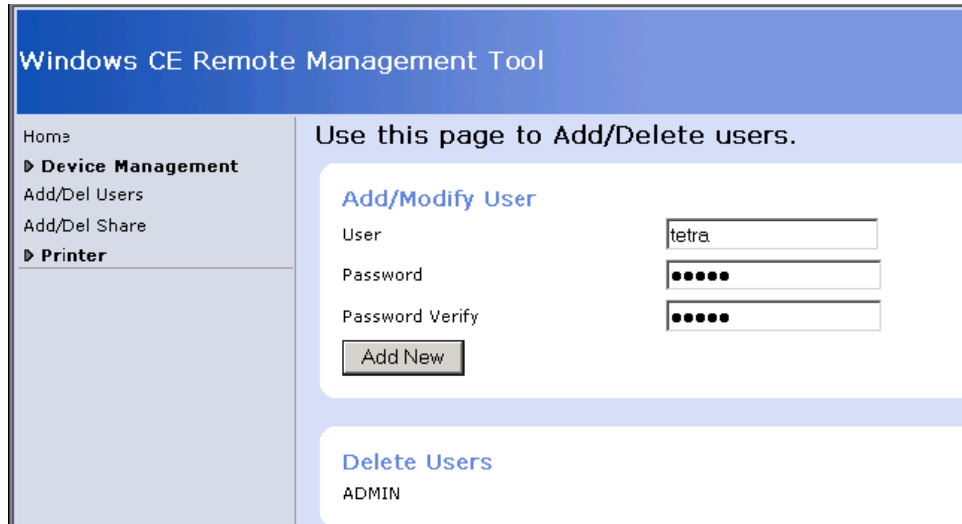


Figure 2-19: Configure user and password

2.6.3 Copy to and from Compact Flash Card (CF Card) on BS421

- Use Explorer to connect to BS421
- Start -> Search -> For files or folders -> Computers
- Enter TRx IP address 172.16. 1.11 for TR1, 172.16.1.12 for TR2 and so on
- Check that the S/N is correct
- When connected, update the CF card as required