

# Installation & Configuration Horizon*macro* indoor

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Installation & Configuration: Horizon*macro* indoor

31st Oct 01

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**CONTROLLED INTRODUCTION**

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## Issue status of this manual

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### Introduction

The following shows the issue status of this manual since it was first released.

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### Version information

The following lists the versions of this manual in order of manual issue:

Manual issue	Date of issue	Remarks
O	3rd Jun 99	Original issue.
A	15th Oct 99	Updated to include details for EGSM900.
B	31st Oct 01	Updated to include details for GSM850 and PCS1900.

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### Resolution of Service Requests

The following Service Requests are now resolved in this manual:

Service Request	GMR Number	Remarks
N/A	N/A	

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## General information

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### Important notice

If this manual was obtained when attending a Motorola training course, it will not be updated or amended by Motorola. It is intended for TRAINING PURPOSES ONLY. If it was supplied under normal operational circumstances, to support a major software release, then corrections will be supplied automatically by Motorola in the form of General Manual Revisions (GMRs).

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### Purpose

Motorola cellular communications manuals are intended to instruct and assist personnel in the operation, installation and maintenance of the Motorola cellular infrastructure equipment and ancillary devices. It is recommended that all personnel engaged in such activities be properly trained by Motorola.

<b>WARNING</b> Failure to comply with Motorola's operation, installation and maintenance instructions may, in exceptional circumstances, lead to serious injury or death.
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These manuals are not intended to replace the system and equipment training offered by Motorola, although they can be used to supplement and enhance the knowledge gained through such training.

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### About this manual

The manual contains: technical description of the hardware elements, installation and configuration information, repair procedures and parts lists for the Horizon*macro* indoor equipment in Motorola GSM850, GSM/EGSM900, DCS1800 and PCS1900 systems.

The objectives are to help the reader:

- Gain an overview of the equipment and interconnection of components.
- Understand the function and operation of all components.
- Recognize configurations, and equivalent module functions to M-Cell6 (an interchangeable previous cabinet).
- Be aware of the **warnings** (potential for harm to people) and **cautions** (potential for harm to equipment) to be observed when working on the equipment.
- Understand how to install and commission the equipment.
- Understand how to inspect, maintain, and repair the equipment.
- Have a clear ready reference for all dedicated information in one manual.

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## Cross references

Throughout this manual, cross references are made to the chapter numbers and section names. The section name cross references are printed bold in text.

This manual is divided into uniquely identified and numbered chapters that, in turn, are divided into sections. Sections are not numbered, but are individually named at the top of each page, and are listed in the table of contents.

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## Text conventions

The following conventions are used in the Motorola cellular infrastructure manuals to represent keyboard input text, screen output text and special key sequences.

### Input

**Characters typed in at the keyboard are shown like this.**

### Output

Messages, prompts, file listings, directories, utilities, and environmental variables that appear on the screen are shown like this.

### Special key sequences

Special key sequences are represented as follows:

<b>CTRL-c</b>	Press the Control and c keys at the same time.
<b>ALT-f</b>	Press the Alt and f keys at the same time.
<b> </b>	Press the pipe symbol key.
<b>CR or RETURN</b>	Press the Return (Enter) key. The Return key is identified with the ↵ symbol on both the PC and the Sun keyboards. The keyboard Return key may also be identified with the word Return.

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## First aid in case of electric shock

### Warning

<b>WARNING</b> Do not touch the victim with your bare hands until the electric circuit is broken. <b>Switch off.</b> If this is not possible, <b>protect yourself</b> with dry insulating material and pull or push the victim clear of the conductor.
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### Artificial respiration

In the event of an electric shock it may be necessary to carry out artificial respiration. Send for medical assistance immediately.

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### Burns treatment

If the patient is also suffering from burns, then, without hindrance to artificial respiration, carry out the following:

1. **Do not attempt to remove clothing adhering to the burn.**
2. If help is available, or as soon as artificial respiration is no longer required, cover the wound with a **dry** dressing.
3. Do **not** apply oil or grease in any form.

## Reporting safety issues

### Introduction

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Whenever a safety issue arises, carry out the following procedure in all instances. Ensure that all site personnel are familiar with this procedure.

### Procedure

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Whenever a safety issue arises:

1. Make the equipment concerned safe, for example, by removing power.
2. Make no further attempt to tamper with the equipment.
3. Report the problem directly to the Customer Network Resolution Centre, Swindon +44 (0)1793 565444 or China +86 10 68437733 (telephone) and follow up with a written report by fax, Swindon +44 (0)1793 430987 or China +86 10 68423633 (fax).
4. Collect evidence from the equipment under the guidance of the Customer Network Resolution Centre.

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## Warnings and cautions

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### Introduction

The following describes how warnings and cautions are used in this manual and in all manuals of this Motorola manual set.

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### Warnings

#### Definition of Warning

A warning is used to alert the reader to possible hazards that could cause loss of life, physical injury, or ill health. This includes hazards introduced during maintenance, for example, the use of adhesives and solvents, as well as those inherent in the equipment.

#### Example and format

<b>WARNING</b> Do not look directly into fibre optic cables or data in/out connectors. Laser radiation can come from either the data in/out connectors or unterminated fibre optic cables connected to data in/out connectors.
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### Cautions

#### Definition of Warning

A caution means that there is a possibility of damage to systems, software or individual items of equipment within a system. However, this presents no danger to personnel.

#### Example and format

<b>CAUTION</b> Do not use test equipment that is beyond its calibration due date when testing Motorola base stations.
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## General warnings

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### Introduction

Observe the following warnings during all phases of operation, installation and maintenance of the equipment described in the Motorola manuals. Failure to comply with these warnings, or with specific warnings elsewhere in the Motorola manuals, violates safety standards of design, manufacture and intended use of the equipment. Motorola assumes no liability for the customer's failure to comply with these requirements.

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### Warning labels

Personnel working with or operating Motorola equipment must comply with any warning labels fitted to the equipment. Warning labels must not be removed, painted over or obscured in any way.

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### Specific warnings

Warnings particularly applicable to the equipment are positioned on the equipment and within the text of this manual. These must be observed by all personnel at all times when working with the equipment, as must any other warnings given in text, on the illustrations and on the equipment.

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### High voltage

Certain Motorola equipment operates from a dangerous high voltage of 230 V ac single phase or 415 V ac three phase supply which is potentially lethal. Therefore, the areas where the ac supply power is present must not be approached until the warnings and cautions in the text and on the equipment have been complied with.

To achieve isolation of the equipment from the ac supply, the ac input isolator must be set to off and locked.

Within the United Kingdom (UK) regard must be paid to the requirements of the Electricity at Work Regulations 1989. There may also be specific country legislation which need to be complied with, depending on where the equipment is used.

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### RF radiation

High RF potentials and electromagnetic fields are present in the base station equipment when in operation. Ensure that all transmitters are switched off when any antenna connections have to be changed. Do not key transmitters connected to unterminated cavities or feeders.

Refer to the following standards:

- ANSI IEEE C95.1-1991, *IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.*
- CENELEC 95 ENV 50166-2, *Human Exposure to Electromagnetic Fields High Frequency (10 kHz to 300 GHz).*

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## Laser radiation

Do not look directly into fibre optic cables or optical data in/out connectors. Laser radiation can come from either the data in/out connectors or unterminated fibre optic cables connected to data in/out connectors.

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## Lifting equipment

When dismantling heavy assemblies, or removing or replacing equipment, the competent responsible person must ensure that adequate lifting facilities are available. Where provided, lifting frames must be used for these operations. When equipments have to be manhandled, reference must be made to the Manual Handling of Loads Regulations 1992 (UK) or to the relevant manual handling of loads legislation for the country in which the equipment is used.

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## Do not ...

... substitute parts or modify equipment.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of equipment. Contact Motorola if in doubt to ensure that safety features are maintained.

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## Battery supplies

Do not wear earth straps when working with standby battery supplies.

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## Toxic material

Certain equipment may incorporate components containing the highly toxic material Beryllium or its oxide Beryllia or both. These materials are especially hazardous if:

- Beryllium materials are absorbed into the body tissues through the skin, mouth, or a wound.
- The dust created by breakage of Beryllia is inhaled.
- Toxic fumes are inhaled from Beryllium or Beryllia involved in a fire.

Beryllium warning labels are fitted to equipment incorporating Beryllium or Beryllium Oxide. Observe all safety instructions given on warning labels.

Beryllium Oxide is used within some components as an electrical insulator. Captive within the component it presents no health risk whatsoever. However, if the component should be broken open or burnt, the Beryllium Oxide, in the form of dust or fumes, could be released, with the potential for harm.

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## Lithium batteries

Lithium batteries, if subjected to mistreatment, may burst and ignite. Defective lithium batteries must not be removed or replaced. Any boards containing defective lithium batteries must be returned to Motorola for repair.

## General cautions

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### Introduction

Observe the following cautions during operation, installation and maintenance of the equipment described in the Motorola manuals. Failure to comply with these cautions or with specific cautions elsewhere in the Motorola manuals may result in damage to the equipment. Motorola assumes no liability for the customer's failure to comply with these requirements.

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### Caution labels

Personnel working with or operating Motorola equipment must comply with any caution labels fitted to the equipment. Caution labels must not be removed, painted over or obscured in any way.

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### Specific cautions

Cautions particularly applicable to the equipment are positioned within the text of this manual. These must be observed by all personnel at all times when working with the equipment, as must any other cautions given in text, on the illustrations and on the equipment.

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### Fibre optics

The bending radius of all fibre optic cables must not be less than 30 mm.

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### Static discharge

Motorola equipment contains CMOS devices that are vulnerable to static discharge. Although the damage caused by static discharge may not be immediately apparent, CMOS devices may be damaged in the long term due to static discharge caused by mishandling. Wear an approved earth strap when adjusting or handling digital boards.

See **Devices sensitive to static** for further information.

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## Devices sensitive to static

### Introduction

Certain metal oxide semiconductor (MOS) devices embody in their design a thin layer of insulation that is susceptible to damage from electrostatic charge. Such a charge applied to the leads of the device could cause irreparable damage.

These charges can be built up on nylon overalls, by friction, by pushing the hands into high insulation packing material or by use of unearthed soldering irons.

MOS devices are normally despatched from the manufacturers with the leads shorted together, for example, by metal foil eyelets, wire strapping, or by inserting the leads into conductive plastic foam. Provided the leads are shorted it is safe to handle the device.

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### Special handling techniques

In the event of one of these devices having to be replaced, observe the following precautions when handling the replacement:

- Always wear an earth strap which must be connected to the electrostatic point (ESP) on the equipment.
- Leave the short circuit on the leads until the last moment. It may be necessary to replace the conductive foam by a piece of wire to enable the device to be fitted.
- Do not wear outer clothing made of nylon or similar man made material. A cotton overall is preferable.
- If possible work on an earthed metal surface. Wipe insulated plastic work surfaces with an anti-static cloth before starting the operation.
- All metal tools should be used and when not in use they should be placed on an earthed surface.
- Take care when removing components connected to electrostatic sensitive devices. These components may be providing protection to the device.

When mounted onto printed circuit boards (PCBs), MOS devices are normally less susceptible to electrostatic damage. However PCBs should be handled with care, preferably by their edges and not by their tracks and pins, they should be transferred directly from their packing to the equipment (or the other way around) and never left exposed on the workbench.

# Motorola GSM manual set

## Introduction

The following manuals provide the information needed to operate, install and maintain the Motorola equipment.

## Generic GSM manuals

The following are the generic manuals in the GSM manual set, these manuals are release dependent:

Classification number	Name	Order number
GSM-100-101	System Information: General .....	68P02901W01
GSM-100-201	Operating Information: GSM System Operation ...	68P02901W14
GSM-100-202	Operating Information: OMC-R System Administration .....	68P02901W19
GSM-100-313	Technical Description: OMC-R Database Schema .	68P02901W34
GSM-100-320	Technical Description: BSS Implementation .....	68P02901W36
GSM-100-321	Technical Description: BSS Command Reference .	68P02901W23
GSM-100-403	Installation & Configuration: GSM System Configuration .....	68P02901W17
GSM-100-423	Installation & Configuration: BSS Optimization ....	68P02901W43
GSM-100-413	Installation & Configuration: OMC-R Clean Install ..	68P02901W47
GSM-100-501	Maintenance Information: Alarm Handling at the OMC-R .....	68P02901W26
GSM-100-520	Maintenance Information: BSS Timers .....	68P02901W58
GSM-100-521	Maintenance Information: Device State Transitions	68P02901W57
GSM-100-523	Maintenance Information: BSS Field Troubleshooting .....	68P02901W51
GSM-100-503	Maintenance Information: GSM Statistics Application .....	68P02901W56
GSM-100-721	Software Release Notes: BSS/RXCDR .....	68P02901W72
GSM-100-712	Software Release Notes: OMC-R System .....	68P02901W74

## Related GSM manuals

The following are related Motorola GSM manuals:

Classification number	Name	Order number
GSM-001-103	System Information: BSS Equipment Planning . . . .	68P02900W21
GSM-002-103	System Information: DataGen . . . . .	68P02900W22
GSM-002-703	Software Release Notes: DataGen . . . . .	68P02900W76
GSM-005-103	System Information: GSM Advance Operational Impact . . . . .	68P02900W25
GSM-008-103	System Information: Network Health Analyst . . . . .	68P02900W36
GSM-008-703	Software Release Notes: Network Health Analyst . . . . .	68P02900W77
GSM-TOOLS-001	System Information: Cell Optimization (COP) . . . . .	68P02900W90
GSM-TOOLS-002	System Information: Motorola Analysis and Reporting System (MARS) . . . . .	68P02900W94
GSM-TOOLS-701	Software Release Notes: Cell Optimization (COP) . . . . .	68P02900W69
GSM-TOOLS-702	Software Release Notes: Motorola Analysis and Reporting System (MARS) . . . . .	68P02900W68
GSM-006-202	Operating Information: OMC-R System Administration (OSI) . . . . .	68P02901W10
GSM-006-413	Installation & Configuration: OSI Clean Install . . . . .	68P02901W39
GSM-006-712	Software Release Notes: OMC-R OSI System . . . . .	68P02901W70

## Generic GPRS manuals

The following are the generic manuals in the GPRS manual set, these manuals are release dependent:

Classification number	Name	Order number
GPRS-300-101	System Information: GPRS Overview . . . . .	68P02903W01
GPRS-300-202	Operating Information: OMC-G System Administration . . . . .	68P02903W03
GPRS-300-222	Operating Information: GSN System Administration . . . . .	68P02903W37
GPRS-300-313	Technical Description: OMC-G Database Schema . . . . .	68P02903W46
GPRS-300-321	Technical Description: GSN Command Reference . . . . .	68P02903W18
GPRS-300-423	Installation & Configuration: GSN Clean Install . . . . .	68P02903W47
GPRS-300-413	Installation & Configuration: OMC-G Clean Install . . . . .	68P02903W04
GPRS-300-501	Maintenance Information: Alarm Handling at the OMC-G . . . . .	68P02903W19
GPRS-300-503	Maintenance Information: GSN Statistics Application . . . . .	68P02903W20
GPRS-300-722	Software Release Notes: GSN System . . . . .	68P02903W76
GPRS-300-712	Software Release Notes: OMC-G System . . . . .	68P02903W70

## Related GPRS manuals

The following are related Motorola GPRS manuals:

Classification number	Name	Order number
GPRS-001-103	System Information: GPRS Equipment Planning . . . . .	68P02903W02
GPRS-005-103	System Information: GSN Advance Operational Impact . . . . .	68P02903W38

## BSS service manuals

The following are the Motorola Base Station service manuals, these manuals are not release dependent. The internal organization and makeup of service manual sets may vary, they may consist of from one to four separate manuals, but they can all be ordered using the overall catalogue number shown below:

Classification number	Name	Order number
GSM-100-020	Service Manual: BTS .....	68P02901W37
GSM-100-030	Service Manual: BSC/RXCDR .....	68P02901W38
GSM-105-020	Service Manual: M-Cell2 .....	68P02901W75
GSM-106-020	Service Manual: M-Cell6 .....	68P02901W85
GSM-201-020	Service Manual: M-Cellcity and M-Cellcity+ .....	68P02901W95
GSM-202-020	Service Manual: M-Cellaccess .....	68P02901W65
GSM-203-020	Service Manual: Horizonmicro .....	68P02902W36
GSM-206-020	Service Manual: Horizoncompact .....	68P02902W15
GSM-205-020	Service Manual: Horizonmacro Indoor .....	68P02902W06
GSM-204-020	Service Manual: Horizonmacro Outdoor .....	68P02902W12
GSM-207-020	Service Manual: Horizonoffice .....	68P02902W46
GSM-209-020	Service Manual: Horizonmicro2 Horizoncompact2 ..	68P02902W61
GSM-208-020	Service Manual: Horizonmacro 12 Carrier Outdoor	68P02902W66

## GPRS service manuals

The following are the Motorola GPRS service manuals, these manuals include the Packet Control Unit (PCU) service manual which becomes part of the BSS for GPRS:

GPRS-301-020	Service Manual:GPRS Support Nodes (GSN) .....	68P02903W05
GPRS-302-020	Service Manual: Packet Control Unit (PCU) .....	68P02903W10

## Classification number

The classification number is used to identify the type and level of a manual. For example, manuals with the classification number GSM-100-2xx contain operating information.

## Order number

The Motorola 68P order (catalogue) number is used to order manuals.

## Ordering manuals

All orders for Motorola manuals must be placed with your Motorola Local Office or Representative. Manuals are ordered using the order (catalogue) number. Motorola manual sets may also be ordered on CD-ROM.

## GMR amendment

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### Introduction to GMRs

Changes to a manual that occur after the printing date are incorporated into the manual using General Manual Revisions (GMRs). GMRs are issued to correct Motorola manuals as and when required. A GMR has the same identity as the target manual. Each GMR is identified by a number in a sequence that starts at 01 for each manual at each issue. GMRs are issued in the form of loose leaf pages, with a pink instruction sheet on the front.

### GMR procedure

When a GMR is received, remove and replace pages in this manual, as detailed on the GMR pink instruction sheet.



## GMR amendment record

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### GMR instructions

When a GMR is inserted in this manual, the amendment record below is completed to record the GMR. Retain the pink instruction sheet that accompanies each GMR and insert it in a suitable place in this manual for future reference.

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### Amendment record

Record the insertion of GMRs in this manual in the following table:

GMR number	Incorporated by (signature)	Date
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		
11		
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*Chapter 1*

# Introduction and site preparation



**Chapter 1**

<b>Introduction and site preparation .....</b>	<b>i</b>
Introduction to installation .....	Inst. 1-1
Manual scope .....	Inst. 1-1
Software requirements .....	Inst. 1-1
Safety instructions .....	Inst. 1-2
Horizonmacro indoor tool list .....	Inst. 1-3
Overview of tool list .....	Inst. 1-3
Tool list .....	Inst. 1-3
Preparation overview .....	Inst. 1-6
Overview of site preparation .....	Inst. 1-6
Pre-installation procedures .....	Inst. 1-6
Site requirements and considerations .....	Inst. 1-7
Overview of requirements .....	Inst. 1-7
Indoor cabinet dimensions .....	Inst. 1-7
Cabinet weights .....	Inst. 1-8
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RF output power .....	Inst. 1-10
Environmental requirements .....	Inst. 1-10
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On site safety .....	Inst. 1-13
Preparing the site .....	Inst. 1-14
Introduction to site preparation .....	Inst. 1-14
Base site structure .....	Inst. 1-14
Site requirements .....	Inst. 1-14
Site access .....	Inst. 1-14
Cabinet installation layout .....	Inst. 1-14



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# Introduction to installation

## Manual scope

This category (GSM-205-423) covers installation and commissioning for the cabinet, arranged in the following chapters:

### Chapter 1 Introduction and site preparation

General information, **safety instructions** and information about tools needed to install the equipment.

Describes the procedures to be followed for initially preparing the site and installing the necessary ducting and plinths.

### Chapter 2 Installation of indoor cabinet

All the procedures necessary to install the cabinet ready for operation and an overview about the different configurations available.

### Chapter 3 Interoperability

Describes interoperability between the Horizon*macro* indoor BTS and earlier Motorola BTS products.

### Chapter 4 Commissioning of indoor cabinet

All procedures necessary to enable the cabinet to be fully operational.

### Chapter 5 Decommissioning of indoor cabinet

All procedures necessary to decommission the cabinet.

<b>NOTE</b>	For hardware optimization and base site integration, refer to <i>Installation and Configuration: BSS Optimization: (GSM-100-423)</i> .
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## Software requirements

The GSM/EGSM900 and DCS1800 BTSs require software release GSR4 (or later) in the network.

The GSM850 and PCS1900 BTSs require software release GSR5.1 (or later) in the network.

## Safety instructions

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**WARNING** This equipment must only be installed by trained personnel.

The following safety instructions must be observed when installing the equipment described in this manual:

- The installation and configuration procedures described in this manual must only be carried out by suitably trained personnel.
- Installation and commissioning must comply with all relevant national and regional regulations.
- The equipment must only be installed in a location to which unauthorized access can be prevented.
- Cabinets must be bolted to the plinth base which must be bolted to the floor.



## Horizonmacro indoor tool list

### Overview of tool list

This section lists the recommended tools required for installing, commissioning and maintaining the Horizonmacro indoor cabinet.

### Tool list

Table 1-1 lists the recommended tools for the Horizonmacro indoor.

<b>Table 1-1</b> Horizonmacro indoor tool list	
<b>Quantity</b>	<b>Description</b>
1 pair	Safety goggles
1	Hard hat
1	Dust mask
1 pair	Ear defenders
1	Antistatic wrist strap with coiled lead
1	Antistatic mat
1	Marker pen
1	Torch
1	Socket set (A/F/Metric 13 mm or 1/2 sq drive)
1	280 mm insulated adjustable spanner
1 each	Combination spanners A/F: 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 7/8, 3/4, 1.
1 each	Combination spanners metric: 8 mm to 25 mm
1	Ratchet ring spanner (15 mm x 13 mm)
1	Torque spanner (12 mm)
1	Torque wrench (1–25 Nm)
1	Torxdriver set (T10 to T30) and Security Torxdriver set (T10 to T30)
1	6 mm torque spanner (for SMA Tx block connectors)
1	Security Allen key set
1	Claw hammer
1	Pipe cutter
1	Junior hacksaw
1	300 mm hacksaw
1 pair	150 mm side cutters
1 pair	150 mm heavy-duty side cutters

Quantity	Description
1 pair	Flush cut wire cutters
1 pair	Light duty cable cutters
1 pair	Cable shears
1	Knife with retractable blade
1 pair	General purpose pliers
1 pair	Snipe nose pliers
1 pair	Industrial scissors
1 pair	GP serrated jaw pliers
1	Set of jeweller's screwdrivers
1	Screwdriver set (including flat and cross-head blades)
1	Isolating transformer (suitable for site use)
1	Piston drill (suitable for drilling concrete and capable of accepting an M20 drill bit)
1	M20 drill bit
1	Drill bit set
1	6 m 240 V extension cable (twin outlet)
1	Soldering iron (dual temperature) with holder
1	Coax cable stripper for 2002 (75 ohm coaxial cable)
1	Hand crimp tool
1	Crimp tool for type 43 connectors
1	BNC crimp tool with inserts
1	Telephone plug crimp tool
1	50 mm crimp tool
1	Cable tie gun
1	1.5 m wooden step ladder
1	Table vice
1	250 mm vice grips
1	7.5 m tape measure
1	300 mm steel rule
1	Spirit level (1 m)
1	Centre punch
1	Pocket scriber
1	250 mm half round file
1 pair	Straight point tweezers
1	Null modem

Quantity	Description
1	RS232 mini tester
1	M to M gender changer

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Installation & Configuration: Horizon*macro* indoor

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Inst. 1–5

**CONTROLLED INTRODUCTION**



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## Preparation overview

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### Overview of site preparation

This section contains:

- Information that should be read for initial planning.
- Information that should be read for safe completion of procedures.
- Pre-installation procedures to be followed to prepare the site before beginning the installation.

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### Pre-installation procedures

Pre-installation for the cabinet comprises the sections listed in Table 1-2.

<b>Section</b>	<b>Description</b>
<b>Site requirements and considerations</b>	Details mechanical, electrical and structural parameters to be taken into account when selecting a site.
<b>Visiting the site</b>	Defines the site operating procedures.
<b>Preparing the site</b>	Details general site construction parameters.

## Site requirements and considerations

---

### Overview of requirements

The base site area, where the equipment is to be installed, must meet :

- Structural requirements including:
    - Space for all conditions, including maintenance, expansion and associated cables.
    - Allowance for cabinet height. including allowance for second cabinet placed on top with stacking bracket.
    - Allowance for weight, including that for potential additions on expansion.
    - Additional space to allow door to be opened beyond 90 degrees.
  - Environmental and power requirements, as defined in manual specifications.
- 

### Indoor cabinet dimensions

The dimensions of cabinets are listed in Table 1-3.

Cabinet type	Height	Width	Depth
Cabinet (without hood)	750 mm	700 mm	430 mm
Cabinet with optional hood	870 mm	700 mm	430 mm
Cabinet with stacking bracket (to hold CCB)	1025 mm	700 mm	430 mm
Two cabinets, with stacking bracket between, and optional hood on top	1900 mm	700 mm	430 mm
Two cabinets, with stacking bracket between, and stacking bracket on top.	2050 mm	700 mm	430 mm

The optional hood allows cables to enter the cabinet from the back and above.

The stacking bracket allows a second cabinet to be stacked on top of the first cabinet. The stacking bracket can also contain a metal basket, in which CCBs are fitted (the only Tx unit that cannot fit in the cabinet itself).

## Cabinet weights

The weights of the fully populated cabinets are listed in Table 1-4.

**CAUTION** Consider future expansion. Another cabinet may be added by stacking on top of the existing cabinet. This, if used with stacking units on both, each with CCBs, and associated cables, could result in a total weight of 280 kg. Ensure floor is capable of supporting this weight.

<b>Table 1-4</b> Main indoor cabinet weights (with six transceivers)	
<b>Cabinet with plinth and hood</b>	<b>Cabinet with plinth, stacking bracket and CCB</b>
115 kg	130 kg

## Torque values

Use the torque values listed in Table 1-5 during installation (see **NOTE** for M12).

<b>Table 1-5</b> Torque values for all cabinet screws/bolts and RF connectors							
<b>Size of screw/bolt</b>	<b>M4</b>	<b>M6</b>	<b>M8</b>	<b>M10</b>	<b>SMA</b>	<b>N-type</b>	<b>7/16</b>
Torque value	2.2 Nm	3.4 Nm	5 Nm	10 Nm	1 Nm	3.4 Nm	25 Nm

**NOTE** Torque values used with M12 anchor bolts will depend on the anchor bolt manufacturer. Check manufacturers data for correct values.

## Power requirements

The power requirements of cabinets depends on the configuration. Indoor cabinets require either ac or a positive or negative earth dc supply.

### Power consumption (dc and ac)

Table 1-6 lists typical and maximum power consumption values

<b>Table 1-6</b> Power consumption of full cabinet, including digital redundancy	
<b>Typical measured consumption</b>	<b>Maximum power consumption</b>
1400 watts	1700 watts

**NOTE** Maximum power consumption figures are theoretical values derived under extreme conditions and are affected by variables such as temperature, component tolerances, transmission power and supply voltage. although these figures must be considered when planning site power requirements, typical measured consumption values will be lower.

### Cabinet power supply requirements

**WARNING** All cabinets and supply cables must be protected by a fuse or circuit breaker selected in accordance with national and regional wiring regulations.

Table 1-7 lists the power supply requirements for the different power supply options.

<b>Table 1-7</b> Main indoor cabinet power supply requirements		
<b>Nominal voltage</b>	<b>Voltage supply range</b>	<b>Current supply maximum</b>
+27 V dc (negative earth)	+20 to +30 V dc	64 A (at nominal voltage)
-48 V dc (positive earth)	-39 to -72 V dc	36 A (at nominal voltage)
120/240 V ac (50 – 60 Hz)	88 to 264	7.5 A (at nominal voltage)

**NOTE** Voltage transients must be less than 35 V peak amplitude (never below 0 V). Ripple and noise must be less than 200 mV p-p (30 mV rms) over 10 Hz to 14 MHz. Voltage application stabilization must be within the specified range in less than 1 second.

**RF output power**

Table 1-8 lists the RF power output of the CTU types.

<b>Table 1-8</b> CTU RF power output at Tx connector	
<b>GSM850 and EGSM900</b>	<b>DCS1800 and PCS1900</b>
60 W (47.8 dBm) +/- 1.0 dB	50 W (47.0 dBm) +/-1.0 dB

Table 1-9 lists the expected power output from the various Tx blocks for both types of CTU.

<b>Table 1-9</b> RF power output at cabinet after Tx blocks				
<b>Tx block</b>	<b>GSM850</b>	<b>EGSM900</b>	<b>DCS1800</b>	<b>PCS1900</b>
TDF	40 W (46.0 dBm)		32 W (45.1 dBm)	
DCF	20 W (43.0 dBm)		16 W (42.1 dBm)	
DDF	8.5 W (39.3 dBm)		7 W (38.5 dBm)	
CCB*	n/a	20 W (43.0 dBm)	16 W (42.1 dBm)	n/a

\* For a six-channel configuration with minimum cavity separation of 800 kHz.

<b>NOTE</b>	CCBs are not currently available for use with the GSM850 or PCS1900 variants.
-------------	---

**Environmental requirements**

Table 1-10 lists the operating environmental limits.

<b>Table 1-10</b> Environmental limits		
<b>Environment</b>	<b>Temperature</b>	<b>Relative Humidity</b>
Operating	-5 °C to + 45 °C.	5% to 100% relative humidity, not to exceed 0.029 g water / m <sup>3</sup> dry air.
Storage	-45 °C to +70 °C.	8% to 100% relative humidity, not to exceed 0.029 g water / m <sup>3</sup> dry air.

<b>NOTE</b>	This specification is valid up to 3 km altitude, corresponding to an atmospheric pressure range of 648 to 1048 millibars.
-------------	---



## Structural considerations

Adequate clearance must be provided at the front of the equipment for operation and maintenance purposes. There must be adequate side clearance (50 mm) to enable the door to open beyond 90° (see Figure 1-1). The door can also stop at 95° and 130°, but this is only to protect the door, or give optional additional operator space.

The cabinet ventilation entry can be solely from the bottom front of the cabinet. This allows a cabinet to be placed against a wall. However, if the unit is placed 50 mm from back or side obstructions, such as wall or other cabinets, the ventilation will be improved, and fan noise reduced.

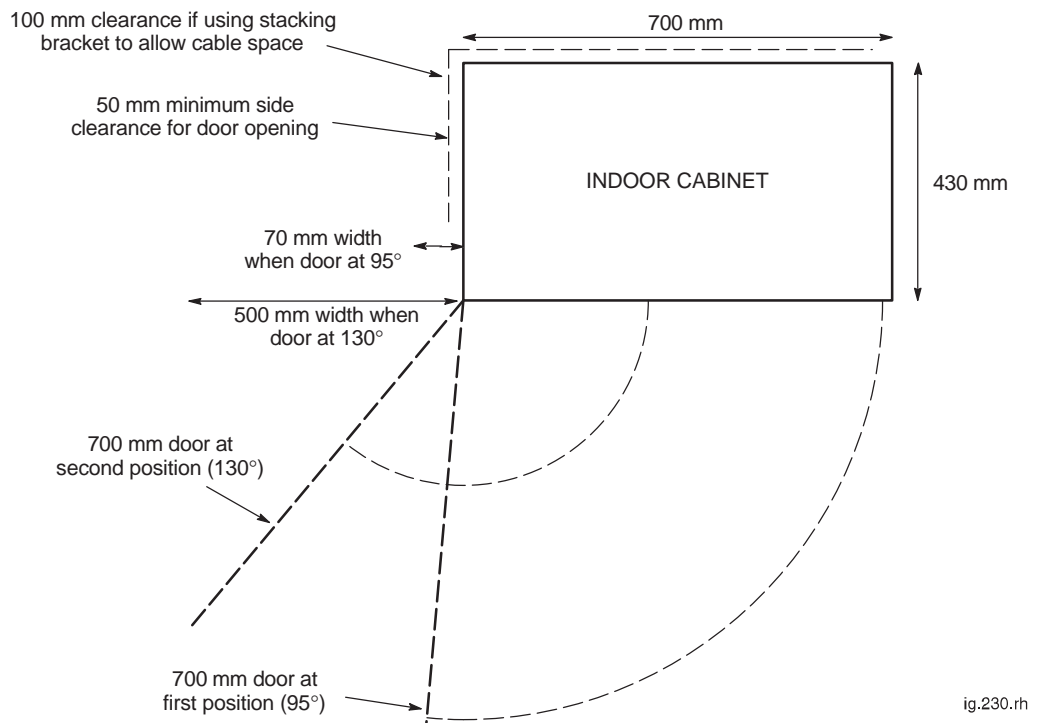
Up to 100 mm rear space may be required for cables if using stacking bracket.

The foundation or structure on which the BTS cabinet is mounted must be of sufficient strength to support a maximum gross weight of 130 kg for a single cabinet or 280 kg for two stacked cabinets.

<b>NOTE</b>	In seismically active areas, Motorola suggest using a qualified structural engineer to assess frame mounting requirements, such as floor construction, mounting anchors, cell site construction and to provide a suitable design for top frame support if a stacked configuration is required.
-------------	--

## Layout plan

Figure 1-1 shows the cabinet installation layout plan.



**Figure 1-1** Indoor cabinet installation layout plan view

---

## Visiting the site

---

### Site visit instructions

When preparing to do work at a site and upon arrival, follow the instructions provided in this section.

---

### Before leaving for the site

Before leaving for the site:

1. Check that team members have adequate test equipment, tools, and hardware to complete the tasks. Check for any special requirements.
2. Contact the person in charge of the building to advise of the team's estimated time of arrival and the expected duration of their stay on the site. Usually the logistics will have already been arranged, but it is good practice to check that the information was received.
3. Ensure that the team read the site access details on each visit to a site as local regulations may change.

---

### Arrival at site

When entering any site:

1. Do not enter the site before contacting the communications site manager. Obtain the following information from the building contact:
  - Local regulations.
  - Parking instructions.
  - Waste material removal instructions.
  - Directions to canteen facilities (if available).
2. Enter the site.
3. Check for building alarms, for example, intruder alarms, that may have been activated by entry. If fitted, disable the CO2 gas systems, and any other alarms activated by entry.
4. Read any local instructions provided.

---

### Leaving the site

When leaving a site:

1. Enable the CO2 gas system, if fitted, and any alarms that were disabled.
2. Contact the local site manager to announce the team's departure.
3. Sign out of the building as necessary

---

## Waste material on site

Clear waste material from the site on completion of the job, unless otherwise indicated by the customer.

<b>WARNING</b> Do not burn waste material, as packaging might give off toxic gasses.
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## Rural sites

It is the responsibility of the senior member of the team to ensure that all personnel on site are aware of all applicable national and regional environmental regulations or codes of practice and, especially with respect to water authority sites, any relevant health regulations.

Adhere to these points:

- Guard against all risk of fire.
- Fasten all gates (remember site visits could be traced back if a complaint is made).
- Leave no litter.
- Drive carefully on country roads and observe speed restrictions at all times.
- Keep to the paths/tracks across farm land.

---

## On site safety

All personnel must:

- Ensure that under no circumstances should anyone move cabinets without assistance. Cabinets must be safely positioned at all times.
- Wear supplied safety helmets when antenna or overhead work is in progress, and when local regulations require them.
- Wear supplied safety goggles and dust masks when drilling. This is particularly important when drilling overhead ironwork.
- Wear supplied ear protectors while drilling is in progress.
- Wear approved safety footwear when moving heavy equipment.

Stop any work that you are supervising should any person in your team not be properly protected, or be unaware of safety requirements.

When installing cable ties, even temporarily, cut the excess or tail properly. This is to prevent sharp edges inflicting injury when not cut flush with the locking edge.

# Preparing the site

## Introduction to site preparation

This section provides a general overview on the preparation of a site, and site requirements. For specific sites, refer to the site-specific documentation.

## Base site structure

The base site structure should be designed to meet accepted cellular system specifications. Additionally, the site must meet the environmental and electrical operating criteria.

## Site requirements

The customer should provide secure access free from unauthorized personnel, ample protection from fire, and adequate lighting and clearance at the front and rear of the equipment for operation and maintenance. Additionally, four cable ducts with sufficient space for communications cables, mains cables, earth cables, and antenna RF cables should be provided.

## Site access

The site access road and equipment receiving area must be constructed of asphalt, concrete, or other suitable load bearing aggregate capable of supporting the transportation vehicle and the cabinet.

**NOTE** Ensure the unloading area is clear of standing water, fallen leaves, mud, and building debris.

## Cabinet installation layout

The cabinet installation layout plans are provided in the **Site requirements and considerations** section. Figure 1-1 shows the cabinet installation layout plan with dimensions.

## *Chapter 2*

# **Installation of indoor cabinet**



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# Installation overview

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## Introduction to installation

This chapter provides the information required to install cabinets and their internal and external interfaces.

<b>CAUTION</b>	Ensure that all site associated equipment is completely installed before commissioning the cabinet for operation.
----------------	---

<b>NOTE</b>	Some site equipment may not be produced by Motorola, including battery chargers, power supplies, and antennas. Refer to site-specific documentation and non-Motorola vendor instructions.
-------------	---

Before starting an installation, ensure the site has been prepared according to the description summarized in **Preparation overview** in the Site preparation chapter, and the site-specific documentation.

<b>WARNING</b>	Do <b>NOT</b> stack more than two <i>Horizonmacro</i> indoor cabinets. The floor mounted cabinet <b>must</b> be securely bolted to the floor before a second cabinet is stacked on top.
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In multiple cabinet sites, up to two *Horizonmacro* indoor cabinets may be stacked with another two stacked *Horizonmacro* indoor cabinets installed adjacent, to provide the maximum 24 carrier BTS site.

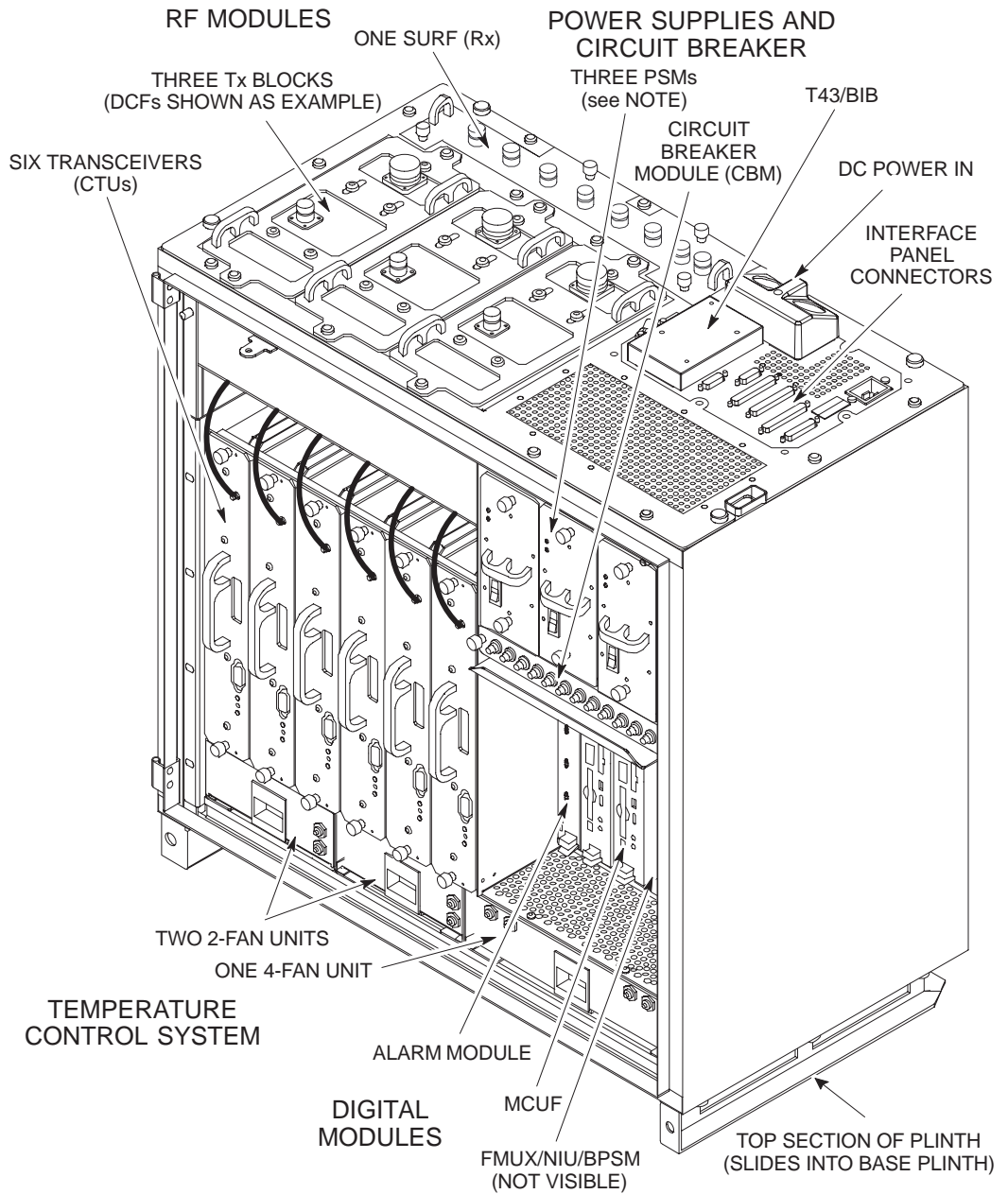
## Installation sections

Installing cabinets comprises the sections shown in Table 2-1.

<b>Section</b>	<b>Description</b>
<b>Equipment delivery and unpacking</b>	Information on delivery packaging, and how to unpack the equipment.
<b>Installing cabinet plinth</b>	Details the procedure for fitting the cabinet plinth base.
<b>Fitting cabinet to plinth</b>	Provides procedure for attaching cabinet to prepared plinth.
<b>Hood or stacking bracket fit</b>	Provides procedure for attaching stacking bracket on top of any cabinet.
<b>Fitting cabinet onto stacking bracket</b>	Provides procedure for attaching second cabinet to stacking bracket of first cabinet.
<b>Installing CCBs into stacking bracket</b>	Provides procedure for installing CCBs into stacking bracket of any cabinet.
<b>Earthing and transient protection</b>	Details site earthing procedures and cabinet internal earths.
<b>Connecting antennas and cabinet configurations</b>	Details setting up antenna connections, with additional configuration information to illustrate potential equipment connections.
<b>Interface cabling</b>	Details cabling to the interface panel.
<b>Installing power and earth cabling</b>	Details of power supply earthing requirements.
<b>Connecting input power</b>	Details the correct sequence for power connection.

**Cabinet view**

Figure 2-1 shows the main components of a fully equipped cabinet.



**NOTE** Three PSMs = 2 + 1 redundant (if required). An optional hold-up battery module may be installed instead of a redundant PSM.

**Figure 2-1** Cabinet with components identified (door and hood removed)

**E1/T1 line testing**

If an E1/T1 line has been provided, contact the local MSC and, at the earliest opportunity, arrange to test the line back to the MSC.

# Equipment delivery and unpacking

## Delivery and packaging overview

Before the cabinet equipment arrives, installation personnel should designate an area at the site where the equipment can be unloaded. This area should also be suitable for unpacking the equipment. Consult with the heavy freight or moving company and the owners of the building (if applicable) to select this area.

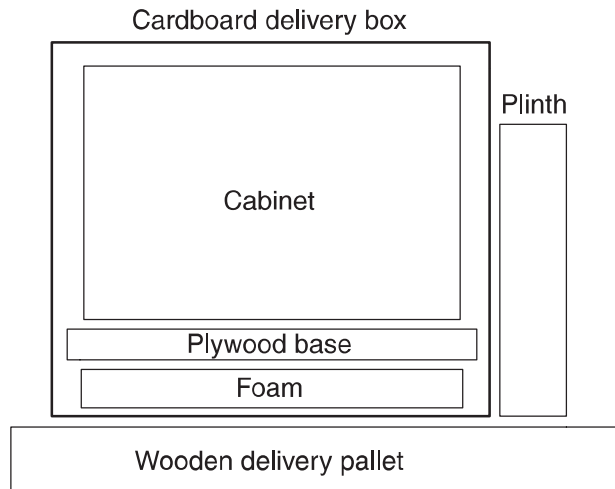
**CAUTION** The cabinet equipment should be delivered to the site while still contained in its packaging. This is to protect the cabinet in transit and from moisture.

The equipment should be carefully delivered to the site by the freight company, along with the necessary moving dollies and padding. Use the dollies and padding to move the equipment from the unloading area to the installation point.

**NOTE** Keep all paperwork attached to packaging, or found inside cabinet.

## Packaging crate

The cabinet equipment is shipped in a crate of a similar construction to that shown in Figure 2-2.



ig.331.rh

**Figure 2-2** Typical shipping crate detail

## Equipment module packaging

The equipment modules are supplied already fitted into the cabinet. The only exception to this is the plinth, supplied in a separate package. The plinth is attached to the side of the main package to enable preparation work to proceed, using the plinth, without opening the main cabinet package. This keeps the cabinet protected during initial preparation.

The optional hood is supplied in a separate package.

---

## Unpacking the crate, plinth and cabinet

The following describes the procedure for unpacking the equipment.

<b>NOTE</b>	It is recommended that the installer read through the following procedure before starting to unpack and install the equipment.
-------------	--

### Tools

Use the following tools to dismantle the crate and unpack the cabinet.

- Claw hammer (or similar levering device).
- Knife.

### Obtaining plinth base

To obtain the plinth:

1. Cut the plastic banding that secures the crate.
2. Remove separate plinth package, and deliver to site for site preparation if required separately.

### Delivery and dismantling of shipping crate

To deliver and dismantle the shipping crate:

1. Deliver remaining cabinet equipment to site in its original packaging.

<b>NOTE</b>	The packing material used by Motorola is non-returnable and should be disposed of safely.
-------------	---

2. Lift the lid free of the crate.
  3. Lift out cardboard protective pieces.
  4. Lift the box over the cabinet.
-

### Removing the cabinet from the crate base

**WARNING** The cabinet can weigh up to 130 kg if fully equipped. Handle each cabinet with extreme caution, and in accordance with local health and safety regulations.

To remove the cabinet from the crate base pallet:

**CAUTION** Care must be taken to avoid damaging the cabinet in any way, especially by scratching the outer surfaces.

1. Carefully cut open the sealed barrier bag containing the cabinet.
2. Use straps attached to the plywood base holding the cabinet, to lift cabinet over the delivery pallet and foam packing pieces.
3. Remove the desiccant bag from the cabinet.
4. Inspect the equipment immediately for damage. Report the extent of any damage to the transport company.

The cabinet is now unpacked.

---

### Safe disposal of packing material

The packing material used by Motorola is non-returnable and should be disposed of safely.

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### CTU allotted slot retention

CTUs are supplied already fitted in the cabinet, with Tx cable correctly attached by Motorola. CTUs must remain in the allotted slots for Motorola calibrations to be valid.



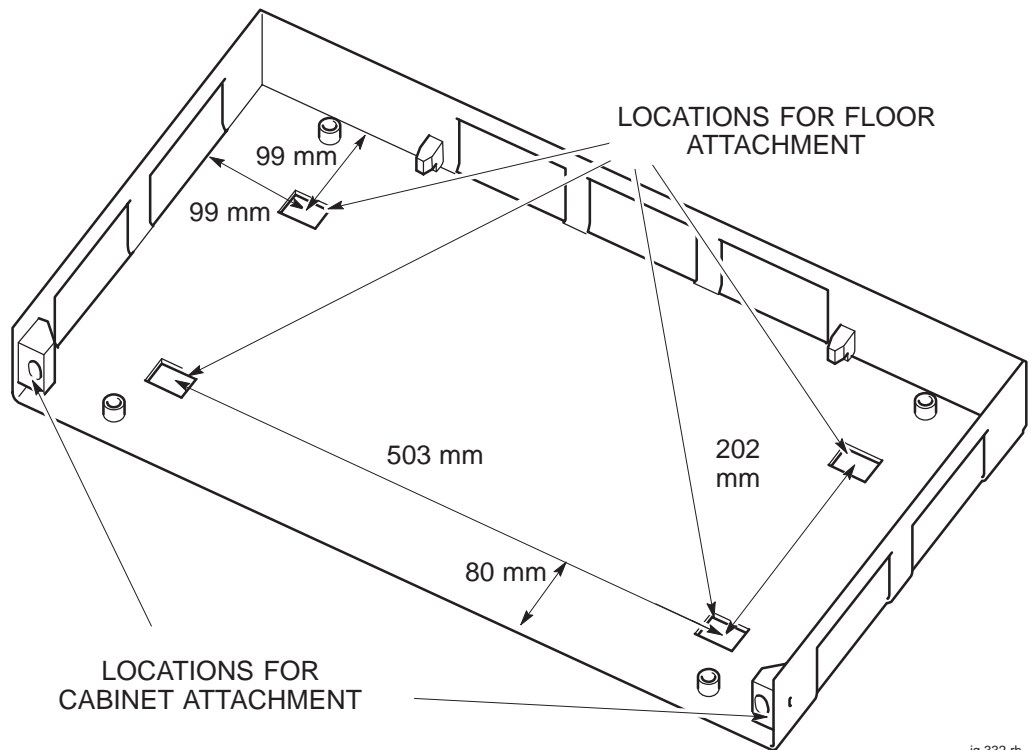
## Installing cabinet plinth

### Overview of foundation and plinth with diagram

An indoor cabinet is supplied with a plinth, into which the cabinet structure is located. This plinth can be used on a smooth, level concrete floor, or other strong supportive construction. In addition the plinth is used in conjunction with the stacking bracket in stacked cabinet configurations. The plinth ensures correct weight distribution, and requires four M12 mounting or anchor bolts to hold it firmly in position.

**WARNING** The cabinet must be bolted to the floor using the supplied plinth. This prevents danger from toppling, if a stacking bracket is ever added together with a second cabinet on top. The plinth also reduces fire hazards. **NEVER** install the cabinet without the plinth, and **ALWAYS** bolt the plinth to the floor. Ensure the selected bolts are suitable.

The plinth is first fitted to the floor, then the cabinet is slid into the plinth and bolted to the plinth. Figure 2-3 shows the plinth with locations for both floor attachment and cabinet attachment.



**Figure 2-3** Plinth for cabinet installation

---

## Recommended bolt length for concrete floor

The recommended length of the M12 steel anchor bolts is 105 mm minimum. This is to ensure adequate strength if stacked cabinets are installed.

---

## Installing the plinth

If the cabinet is a direct replacement for existing Motorola M-Cell6, BTS4 or BTS6 units, the cabinet can be mounted in place using the existing fixing holes. Only use existing holes if sufficient space exists for the new configuration (see **Site requirements and considerations**).

If the installation is new, the concrete floor must be drilled to accept M12 anchor bolts. Washers and bushes are supplied, but the M12 steel bolts are supplied by the customer.

1. Move the cabinet plinth to the selected mounting position. Consider future as well as present space requirements (see **Site requirements and considerations**).
2. Mark the positions of the four mounting holes in the base of the plinth. These are in the form of four square holes in the middle of the plinth.
3. Move the plinth well away from the mounting position.

**WARNING** Wear safety glasses and a dust mask when drilling holes.

**CAUTION** Drilling concrete flooring produces cement dust, which is harmful to equipment and wiring. Protect the cabinets and any nearby equipment from dust. Use a tarpaulin, cloth, or plastic sheeting to cover exposed equipment. Clean up any accumulated debris from the anchor installation carefully before exposing the equipment. Use drilling equipment suitable for cutting steel reinforced concrete.

4. Drill out the four holes to a depth and clearance for an M12 anchor bolt, using the plinth as a template.
5. Fit the M12 mounting anchors to the holes in the floor.
6. Position the plinth over the mounting anchor holes.
7. Fit the anchor bolts with the supplied bushes and washers, through the plinth floor, to each anchor.
8. Tension up the anchor bolts and then check for alignment and level using a spirit level.
9. When satisfied that the plinth is correctly aligned, torque the bolts to the correct value for M12 bolts (see **Site requirements and considerations** in this chapter).

## Fitting cabinet to plinth

### Methods of plinth use

There are two methods of using the plinth:

- For floor mounting, with the plinth previously secured firmly to the floor.
- For mounting cabinet on a stacking bracket attached to the top of another cabinet. In this case the plinth is fitted to upper cabinet prior to lifting.

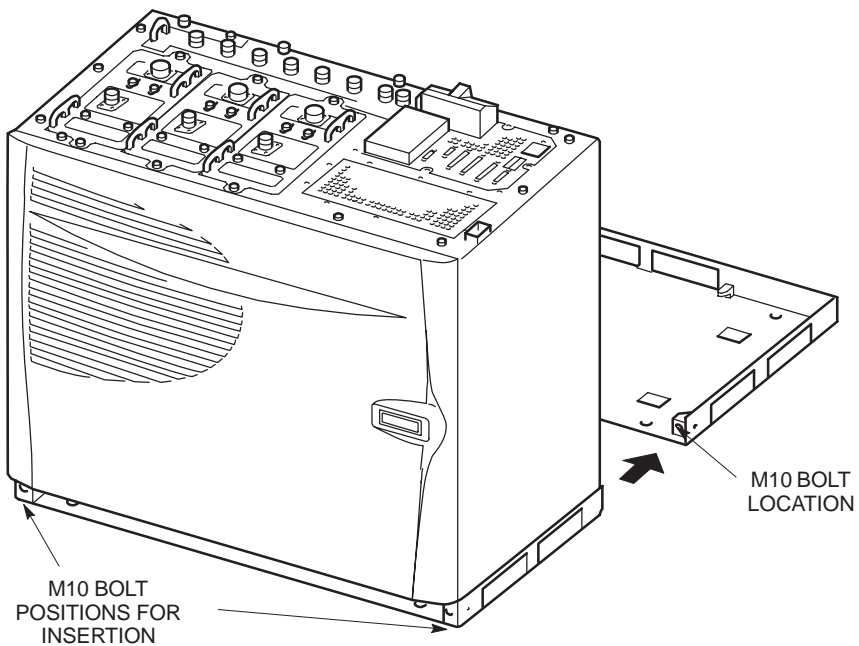
### Fitting cabinet to plinth

To fit the cabinet onto the plinth:

1. Remove the two M10 bolts attached to the front of the plinth.

**WARNING** Before lifting, ensure that the straps are either side of each cabinet corner.

2. Tilt and slide the cabinet off the plywood base and move to the plinth, using the straps provided.
3. Slide cabinet into the plinth grooves, as shown in Figure 2-4.
4. Fit the two M10 bolts and tighten to correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).



**Figure 2-4** Cabinet sliding onto plinth

## Hood or stacking bracket fit

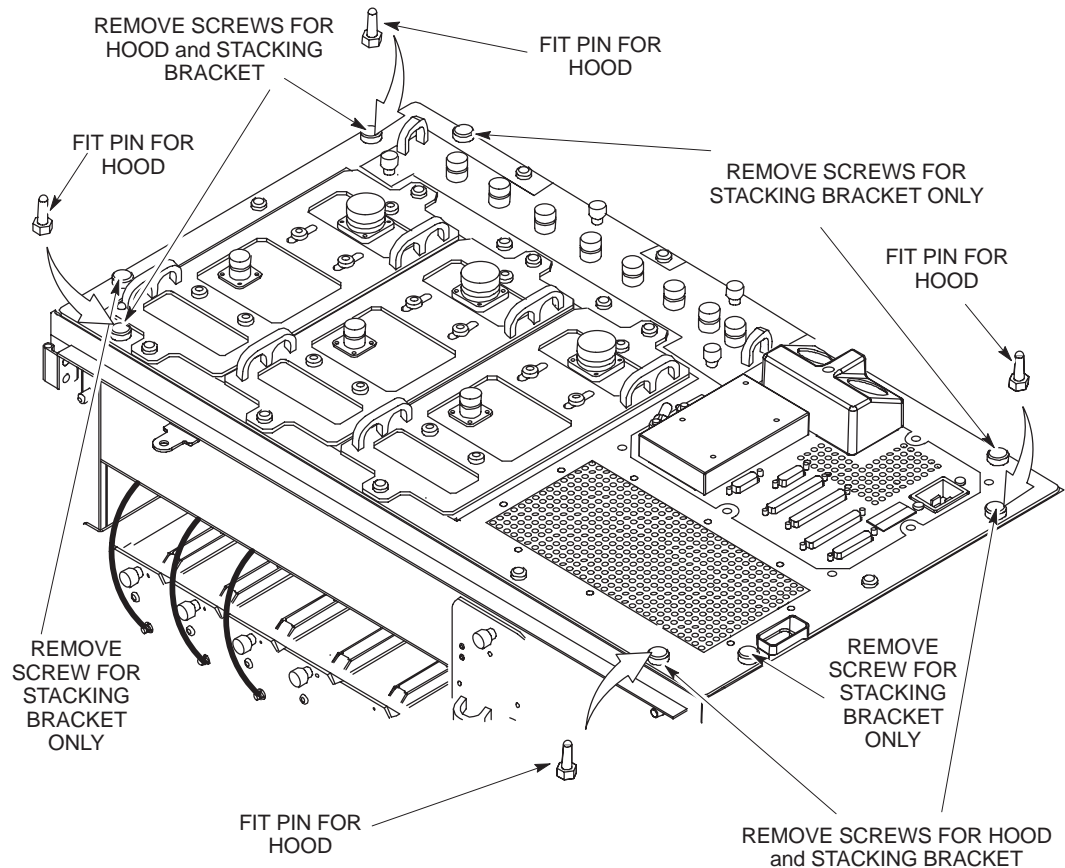
### Introduction to hood and bracket fit

If required, the optional hood or stacking bracket are fitted at this stage.

To change from an existing hood to a stacking bracket, the pin locations for the hood are used by removing the pins before fitting the stacking bracket screws. Similarly, if replacing a stacking bracket with the optional hood, the appropriate stacking bracket securing screws are replaced with the hood pins (see Figure 2-5).

### Diagram of pin location points on cabinet top

Figure 2-5 shows the eight screw positions used by the stacking bracket, including the four positions also used for hood pins.



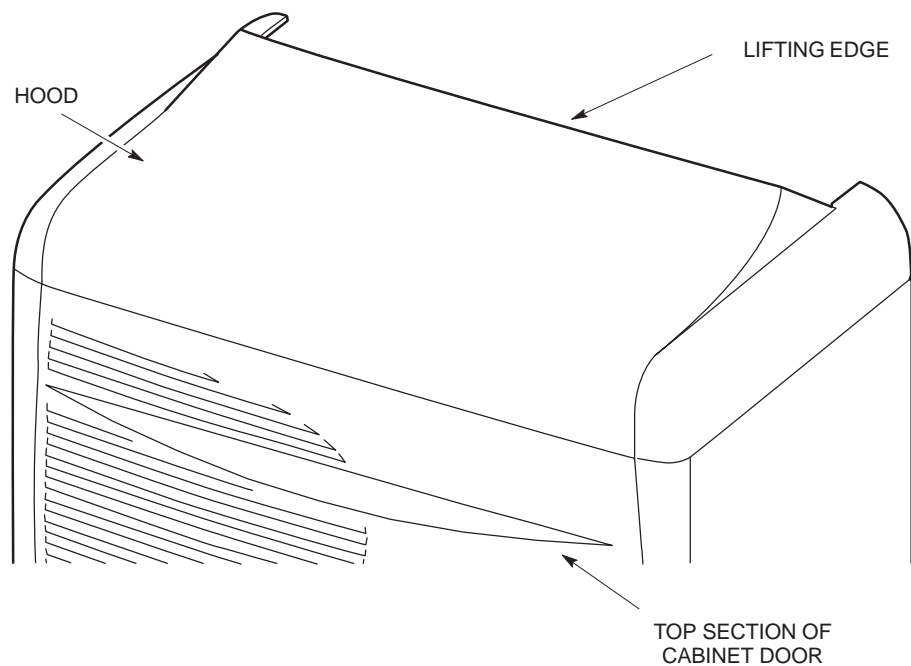
**Figure 2-5** Hood pin and stacking bracket screw positions

## Fitting the optional hood

The hood is held in place by four pins. To fit the hood:

1. Locate the four top panel M8 screws to be replaced by hood pins, as shown in Figure 2-7, and remove.
2. Screw the four pins into the cabinet top panel. Tighten to correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).
3. Align the hood with the back pins, then lower the hood onto the pins, and press firmly into place.

Figure 2-6 shows a top view of the hood as seen when on the cabinet:



**Figure 2-6** Hood view when placed on top of cabinet

## Fitting a stacking bracket

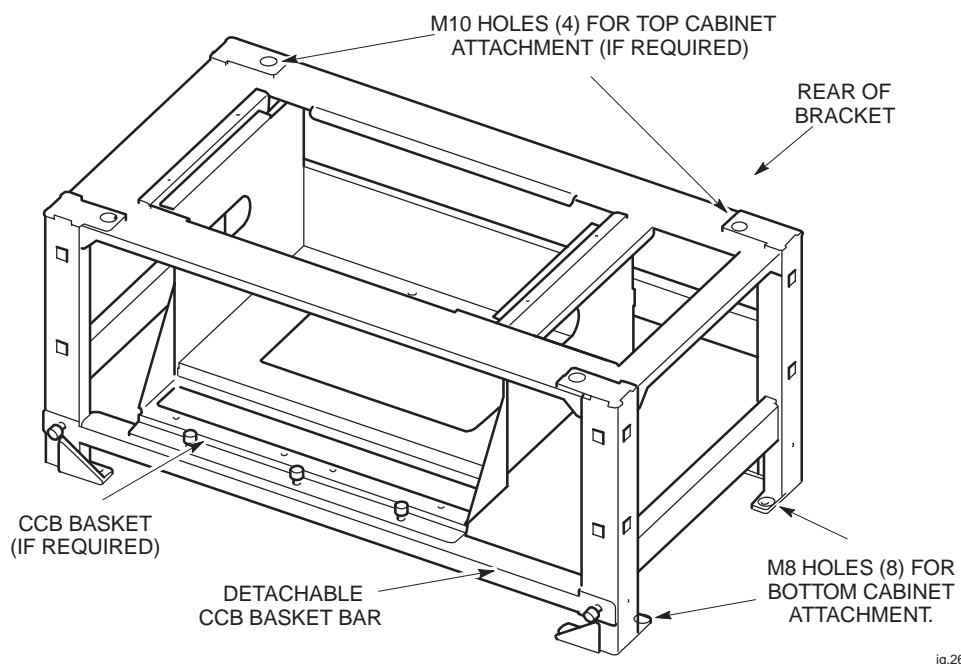
To fit a stacking bracket:

1. If an optional hood is fitted:
  - a. Lift hood by rear lifting edge, until free of the pins.
  - b. Unscrew and remove the four pins from the cabinet. Store the pins with the hood.
2. Remove the eight (or four remaining) M8 screws from the cabinet top panel as shown in Figure 2-7 and retain.

**WARNING** The stacking bracket can weigh as much as 15 kg (more if CCBs are contained in the CCB basket). Observe correct lifting precautions when handling the stacking bracket.

3. Align the stacking bracket onto the cabinet, and fit the eight M8 screws. Tighten to correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).
4. Fit the front cover following the procedure detailed in **Fitting the stacking bracket front cover**.

Figure 2-7 shows a stacking bracket fitted with optional CCB basket.



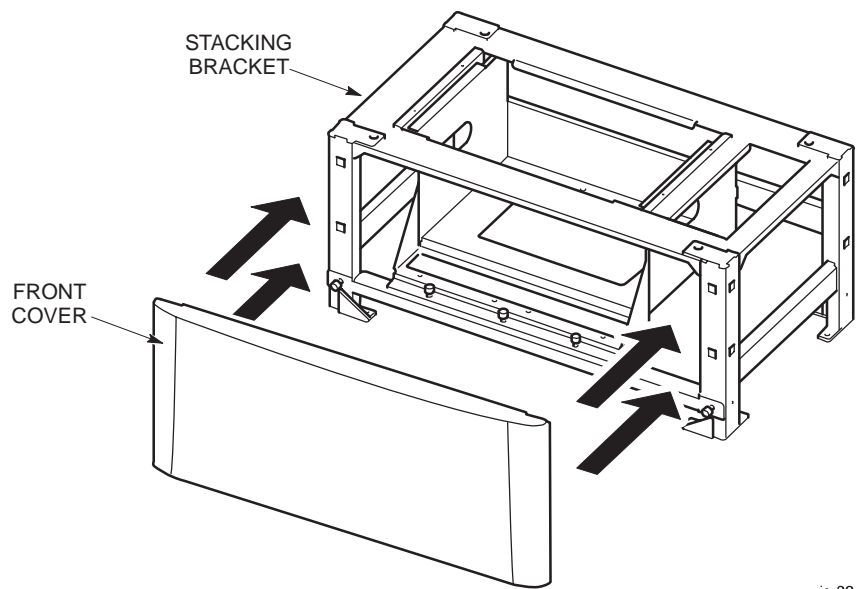
**Figure 2-7** View of stacking bracket with optional CCB basket installed

## Fitting the stacking bracket front cover

The stacking bracket front cover is attached to the stacking bracket by four locating clips. The procedure to fit the front cover is as follows:

1. Align the four locating clips on the front cover with the four square holes in the front of the stacking bracket. Ensure that the cut out slot on each clip is facing downward.
2. Press the cover against the stacking bracket, so that the cut out slot on each locating clip engages with the bottom edge of each square hole. It may be necessary to gently push in and down to ensure the cut out slots are fully engaged and the cover securely in place.

Figure 2-8 shows the locating points for the stacking bracket front cover.



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**Figure 2-8** Fitting the stacking bracket front cover

## Fitting upper cabinet onto stacking bracket

### Overview of stacked cabinet fit

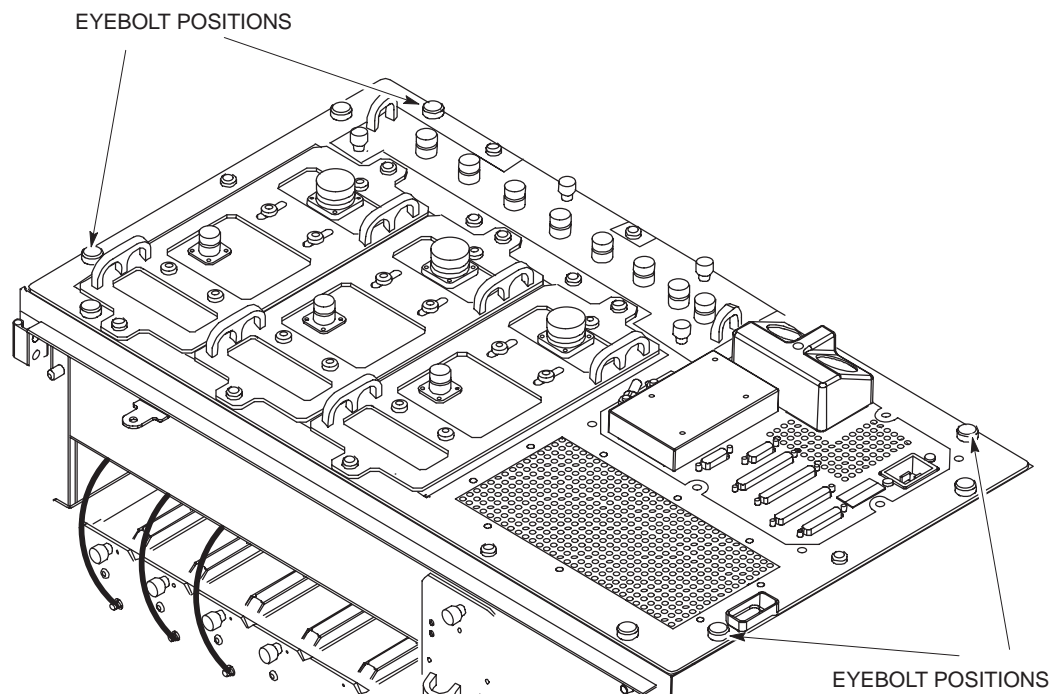
**WARNING** Do **NOT** stack more than two *Horizonmacro* indoor cabinets.  
The floor mounted cabinet **must** be securely bolted to the floor before a second cabinet is stacked on top.

In multiple cabinet sites, up to two *Horizonmacro* indoor cabinets may be stacked with another two stacked *Horizonmacro* indoor cabinets installed adjacent, to provide the maximum 24 carrier BTS site.

When a second cabinet is stacked above a floor mounted cabinet, the plinth is used to secure the cabinet to the stacking bracket mounted on the lower cabinet top panel. The plinth is connected to the cabinet prior to lifting onto the stacking bracket.

### View of eyebolt positions

Figure 2-9 shows the positions to which eyebolts can be fitted.



**Figure 2-9** Eyebolt positions



## Eyebolt positions and safety

There are four eyebolt positions to enable lifting of a second cabinet on top of the first cabinet stacking bracket. Eyebolts are available from Motorola for this purpose (part number 0386436N01 – eyebolt, M8).

<p><b>WARNING</b> The cabinet can weigh as much as 130 kg with stacking bracket and CCB. Handle cabinets with extreme caution, and in accordance with any national or regional health and safety regulations.</p> <p>Horizon<i>macro</i> cabinets are heavy and should not be installed without the use of lifting equipment unless sufficient personnel are available to ensure that Health and Safety regulations are not breached.</p> <p>Eyebolts used to lift the cabinet must be of the collared type, manufactured to CE conformity, and must have sufficient safe working load to lift the cabinet, in accordance with national or regional health and safety regulations.</p> <p>Eyebolts, must be visually checked for damage before use. If any damage is apparent, <b>DO NOT USE</b>. The eyebolts must not be overtightened; hand tight is sufficient.</p> <p>Motorola recommends the use of slings in conjunction with hydraulic lifting apparatus for moving and positioning Horizon<i>macro</i> cabinets.</p> <p>The four screw locations used for hood pins must <b>NOT</b> be used for eyebolts.</p> <p>In addition to these points, refer to and comply with any local regulations that govern the use of lifting equipment.</p>
---

For the subsequent use of eyebolts, there may be local regulations that govern the use of lifting equipment and stipulate a test and/or examination regime. If the eyebolts are to be used, ensure that all such regulations are met.

Eyebolts can be fitted into the four designated cabinet top panel locations, shown in Figure 2-9, after removal of the screws. These locations are identified with an eyebolt symbol and the word **LIFT**. The eyebolt locations are also used for stacking bracket attachment.

## Fitting upper cabinet to stacking bracket

This procedure assumes the upper cabinet has been unpacked (see **Equipment delivery and unpacking**).

To install the upper Horizon*macro* indoor cabinet in a stacked configuration:

**WARNING** Do **NOT** stack more than two indoor cabinets. The bottom cabinet must be bolted to the floor using the supplied plinth. This prevents danger from toppling in stacked configurations.

1. Ensure the stacking bracket is fitted to the lower cabinet. If not, refer to **Fitting a stacking bracket**.
2. Place the plinth in a convenient position, near to unpacked upper cabinet.
3. Fit the cabinet to unsecured plinth as described in **Fitting cabinet to plinth**.

**WARNING** Each cabinet can weigh up to 130 kg if fully equipped. Handle the cabinets with extreme caution, and in accordance with local health and safety regulations. Eyebolts are to be used with lifting equipment. These must be located in the correct position as shown in Figure 2-9. The four screw locations used for hood pins must **NOT** be used for eyebolts. Visually check each eyebolt before inserting. If any damage is apparent, **DO NOT USE**. The eyebolts must not be over tightened; hand tight is sufficient. **Do not tighten eyebolts with a t-bar or spanner**. Screw the eyebolt fully into the lifting point so that no thread is left exposed.

4. Fit the eyebolts to the locations identified with an eyebolt symbol and the word **LIFT**. hand tighten the eyebolts and, using suitable lifting equipment, lift the cabinet onto the stacking bracket and slide to position.
5. Attach four M10 bolts to the cabinet plinth from underneath the top of the stacking bracket. Tighten to the correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).
6. Install the top stacking bracket to hold the CCBs (see **Fitting a stacking bracket**) or optional hood (see **fitting the optional hood**), if required.

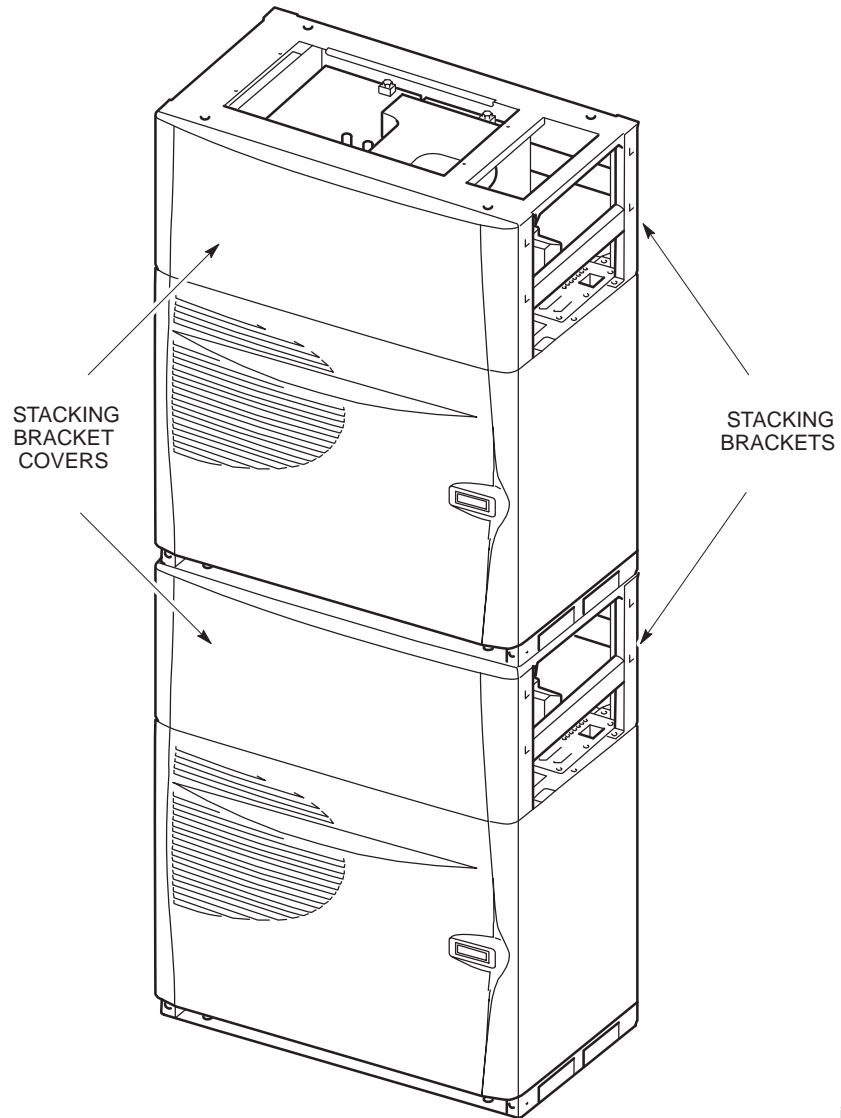
**CAUTION** Incorrect airflow may cause internal cabinet temperatures to rise above operational limits. Do not obstruct the honeycomb ventilation panels on the top of the cabinets. Ensure the stacking brackets are clear of obstruction, particularly on the right side.

7. Fit a stacking bracket front cover onto each stacking bracket, using the procedure described in **Fitting the stacking bracket front cover**.

The finished assembly is shown in Figure 2-10.

## Completed stacked cabinet assembly

Figure 2-10 shows the maximum stacked assembly, (two cabinets), with stacking brackets, covers and CCBs installed.



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**Figure 2-10** View of two cabinets stacked with stacking brackets, covers and CCBs installed

## Installing CCBs into stacking bracket

### Overview of installing CCBs

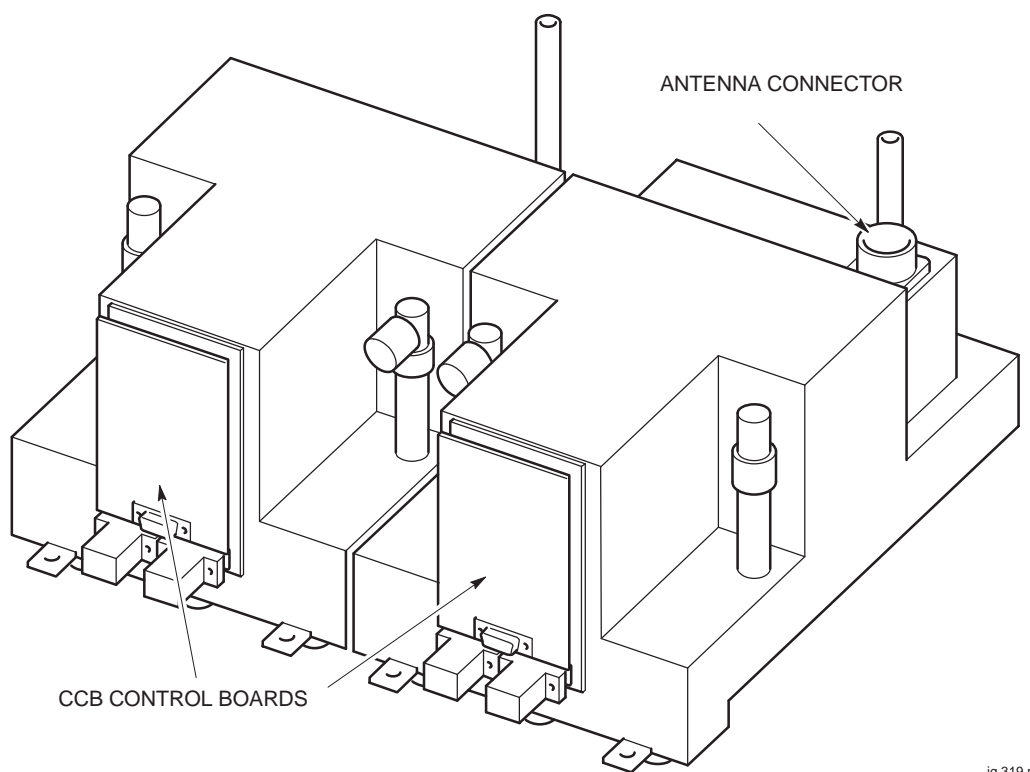
A maximum of two CCBs can be fitted into a CCB basket. The CCB basket fits inside a stacking bracket.

**NOTE** CCBs are not currently available for use with the GSM850 and PCS1900 BTS variants.

### View of DCS1800 CCBs

Figure 2-11 shows two DCS1800 CCBs, with CCB control boards fitted.

**NOTE** CCB appearances may vary slightly, depending on type and manufacturer.



**Figure 2-11** Two DCS1800 CCBs with control boards fitted

## Installing CCBs

Follow these procedures to install CCBs.

### Cabinet preparation

1. Ensure the SMA to N-type feedthrough plates are fitted inside the Tx block basket, with SMA cables installed from CTUs underneath. Ensure the N-type cables are connected to the feedthrough plates and draped over the front of the cabinet.
2. Ensure the stacking bracket is fitted to lower cabinet. If not, refer to **Fitting a stacking bracket**.

### Fitting CCBs into basket

1. Place the CCB basket onto a flat surface.
2. Place the CCBs into the basket and secure with four M6 screws on the front and two M8 screws at the back. Tighten to the correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).
3. Insert each CCB control board, then secure the control board cover with four M4 screws. Tighten to the correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).
4. Connect the phasing lead between the CCB control boards.

### Fitting basket to stacking bracket

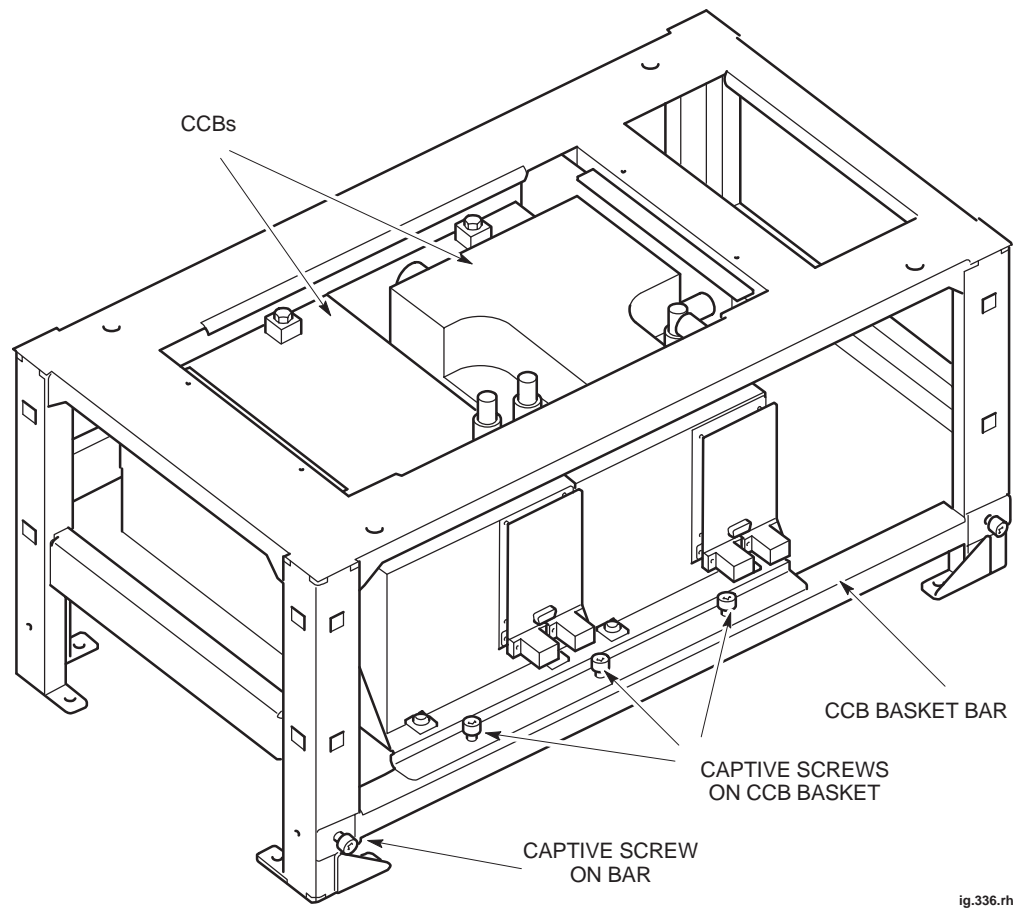
<b>NOTE</b>	Due to space limitations and the need for flexibility, Motorola recommends the use of Superflex jumper cables for antenna connections to the CCBs.
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1. Slide the basket part way into the stacking bracket, and connect antennas to the CCBs.
2. Slide the CCB basket fully home.
3. Connect the six N-type to N-type RF cables from the feedthrough plates to the CCB inputs.
4. Attach the CCB basket bar to the sides of the stacking bracket with the two captive screws. The bar is then directly underneath the basket captive screws.
5. Attach the CCB basket bar to the basket with the three captive screws on the basket.
6. Connect the power cable to each CCB from the single connector (marked CCB) on the interface panel, shown in Figure 2-36.
7. Fit the front cover onto the stacking bracket, pushing it in so that it drops into position on the side lugs, as described in **Fitting the stacking bracket front cover**.

The fully installed CCBs are illustrated in Figure 2-10 and Figure 2-12.

## CCBs installed without front cover

Figure 2-12 shows two EGSM900 CCBs located in stacking bracket (cabinet not shown).



**Figure 2-12** CCBs in installed position with CCB basket bar attached

## Earthing and transient protection

### Site earthing

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This manual describes only general procedures for earthing the site. Refer to the *Grounding guidelines for cellular radio installations 68P81150E62*, for detailed earthing information.

**WARNING** Each cabinet must be earthed separately and **not** daisy chained together.

- The cell site equipment must be earthed (in the same common earth point as its power source).
- Provision should be made for routing earthing lines into the site and to the cabinet before beginning the installation of the system cabinets.
- There is an earthing terminal (stud) located on the interconnect panel on top of each cabinet.
- Refer to the site-specific documentation for detailed site earthing information.

### Transient and lightning protection

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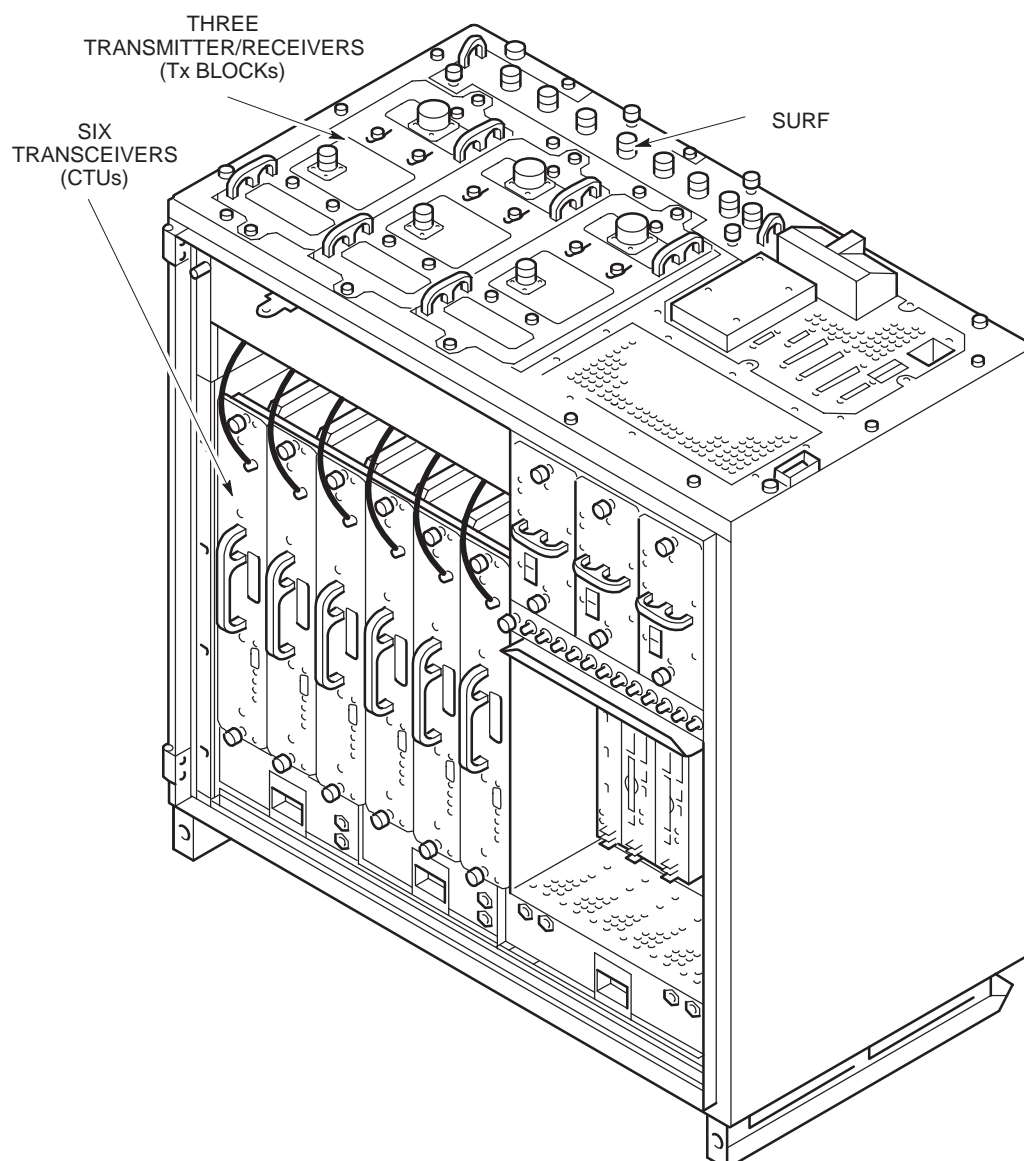
All E1/T1 lines connected to Motorola equipment have secondary transient protection as part of the BIB or T43 board. Ensure the receive and transmit antenna connections to the building are fed through coaxial electromagnetic protection (EMP) devices.

**CAUTION** The end user is responsible for transient protection of the E1/T1 lines connected to Motorola equipment.

## Connections to RF modules

### Overview of RF connections

The components shown in Figure 2-13 provide all the RF connections to the cabinet, and internally within the cabinet. Up to four cabinets can be interconnected to form a single BTS site.



**Figure 2-13** Location of RF components



## Types of RF connector

Table 2-2 lists the RF module connectors with their destinations.

RF module	Type of connector	Destination
CTU transceiver	SMA	Tx Block (underneath)
Tx Block	SMA	CTU transceiver
	N-type	SURF
	7/16	antenna
SURF	N-type	Rx N-type of Tx Block

## SURF/Tx block interconnecting cables

Table 2-3 lists cable types used for SURF/Tx block interconnections.

Part number	Description	Use
3086225N01	34.5 cm coaxial cable terminated at either end with straight N-type plugs.	Tx block to SURF
3086225N02	28 cm coaxial cable terminated at one end with a straight N-type plug, and at the other end with a right-angle N-type plug.	Tx block to Tx block
3086225N03	2.25 m coaxial cable terminated at either end with straight N-type plugs.	SURF to SURF
3086225N04	2.25 m coaxial cable terminated at one end with a straight N-type plug, and at the other end with a right-angle N-type plug.	Tx block to Tx block

## Unused SMA connections

Ensure that any unused SMA inputs to DCF, DDF or HCU modules are fitted with 50 ohm termination loads.

## Torque of RF connectors

<b>CAUTION</b>	Care should be taken when tightening SMA connectors to avoid damage by excess force.
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For correct torque of connectors, see *Installation & Configuration: GSM-205-423 Site requirements and considerations*.

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## Tx connection to CCB via feedthrough plates

If CCBs are used instead of Tx blocks, the Tx cables are connected through an N-type to SMA feedthrough plate. This plate converts the normal Tx block SMA connector underneath to an N-type connector above.

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## RF connection principles

The primary receive path is connected to the A branch of the SURF module, either directly or from the Rx connector on the Tx block in non-diversity configurations. The diversity receive path is connected to the B path on the SURF. This is normally duplexed with the transmit signal on a single antenna, and fed to the SURF from the Rx connector on the Tx block. Within any single cabinet the lowest numbered sector is normally connected to amplifier 0 connections, and higher numbered sectors to amplifiers 1 and 2 as appropriate. For example, sector one is connected to SURF connectors 0A and 0B, sector two to 1A and 1B, and sector three to 2A and 2B. However, if a sector is split between two cabinets, the split sector antennas must be connected to amplifier 0, (this is the only path with connection to the extension ports). Extension ports must be connected to the correct branch at the destination cabinet.

The transmit path feeds from the CTUs to the Tx block or feedthrough plate immediately above. Two signals are combined in most Tx blocks. A third signal can be combined using a feedthrough plate and the third input of a DDF. The Tx blocks then duplex the Tx signal with the diversity Rx signal, before feeding to the antenna.

---

## Rx/Tx single antenna duplexing

Duplexers allow a single antenna to be used for both transmit and receive operations. Duplexers exist within several of the transmit blocks. Normally duplexed RF signals are used through one antenna, with a second receive antenna to provide diversity.

<b>CAUTION</b>	If a single antenna (non-diversity) is required, the duplex antenna RF receive cable from the transmit block must be connected to the RxA path at the SURF. Simply switching off diversity at the OMC-R without the correct SURF configuration will cause a loss of reception.
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## Suggested RF configurations

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### Overview of configuration diagrams

The following series of RF configuration diagrams show suggested ways of connecting together Horizon*macro* SURF and Tx blocks to meet different operational requirements. The series of diagrams is by no means exhaustive, and numerous alternative configurations may be adopted to achieve the same aim.

Each Horizon*macro* cabinet is represented by a SURF module and three Tx blocks. Interconnecting cables are identified by a label; N01, 2, 3 or 4. Further details of each cable type are shown in Table 2-3. Antenna connecting cables, not supplied as part of the Horizon*macro* equipment, are shown as dotted lines.

With the exception of Figure 2-33 and Figure 2-34, the diagrams are applicable to GSM850, EGSM900, DCS1800 or PCS1900 single band operation, although only the 1800 SURF module is illustrated.

<b>NOTE</b>	Dual band 900 and 1800 SURFs are available, but 850 and 1900 SURFs are only available as single band.
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Figure 2-33 shows one way of achieving dual band operation using two Horizon*macro* cabinets. A single band 1800 SURF is installed in one cabinet and a dual band 900 SURF in the other. Figure 2-34 shows another, using one of each type of dual band SURF.

Diversity is assumed in the majority of RF configuration diagrams shown here, Figure 2-15 being the exception. Other non diversity configurations can be derived from this figure by ensuring that the single receive path is always connected to branch A at the SURF module.

### Digital connections

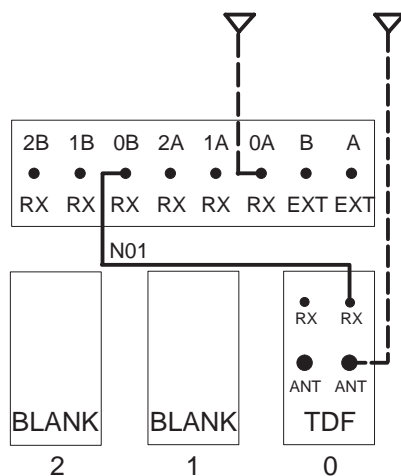
Digital connections between cabinets are not shown in the following diagrams. Fibre optic cables used to provide digital connections between cabinets are described in **Connecting fibre optic cables**.

### Depopulated site configurations

The purpose of a depopulated site configuration is to allow customers to provide a future expansion capability, at the time of installation. The diagram showing the final target configuration is to be used to connect Tx blocks, SURF and antennas. Depopulated site configurations are supplied with fully equipped RF section to achieve the target configuration, with CTUs only fitted to alternate slots. CTUs are fitted in slots 0, 2 and 4. Unused Tx block SMA connectors must be fitted with 50 ohm terminating loads.

## Configuration for omni 1

Figure 2-14 shows a suggested configuration, using one Horizon*macro* cabinet, for omni 1 with twin duplexed filter.

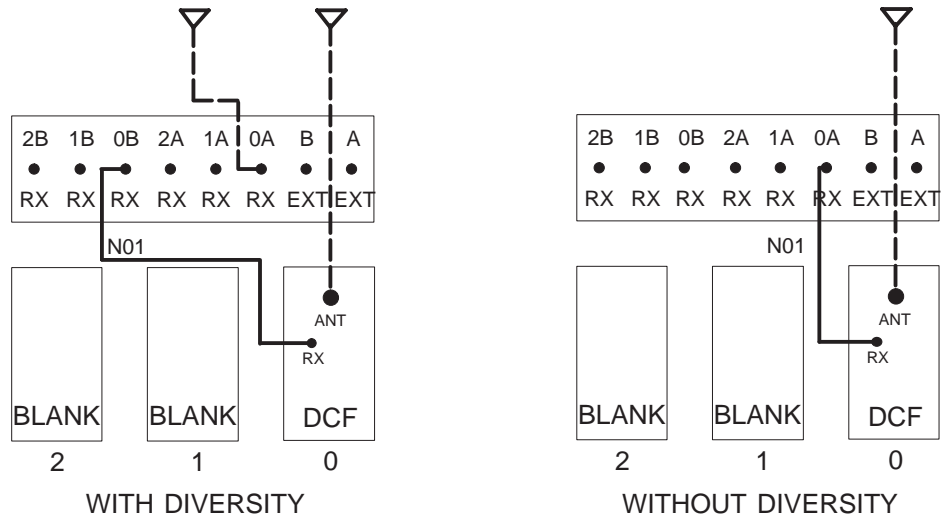


**Figure 2-14** Single cabinet omni 1 with TDF

**Configuration for omni 1 or 2 (with and without diversity)**

Figure 2-15 shows suggested single Horizon*macro* cabinet configurations, with and without diversity, for omni 1 or omni 2 with duplexed combining bandpass filter.

**NOTE** If a single antenna (non-diversity) is required, the duplex antenna RF receive cable from the transmit block must be connected to the RxA path at the SURF. Simply switching off diversity at the OMC-R without the correct SURF configuration will cause a loss of reception.



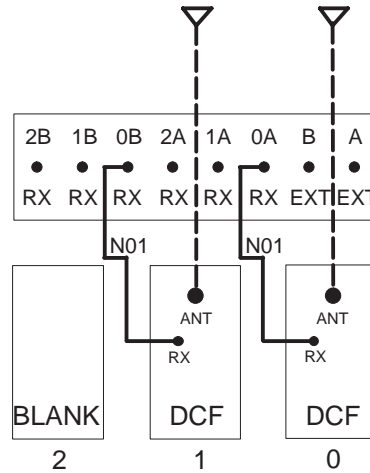
**Figure 2-15** Single cabinet omni 1 or 2 with DCF

Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
omni 1	DCF 0

**Configuration for omni 3 or 4**

Figure 2-16 shows a suggested configuration, using a single Horizon*macro* cabinet, for omni 3 or omni 4 with duplexed combining bandpass filter.



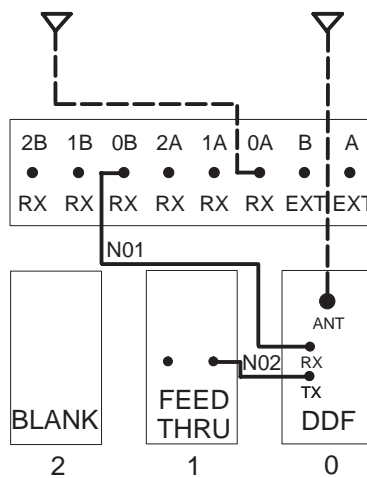
**Figure 2-16** Single cabinet omni 3 or 4 with DCF

Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
omni 3	DCF 1

**Configuration for omni 3**

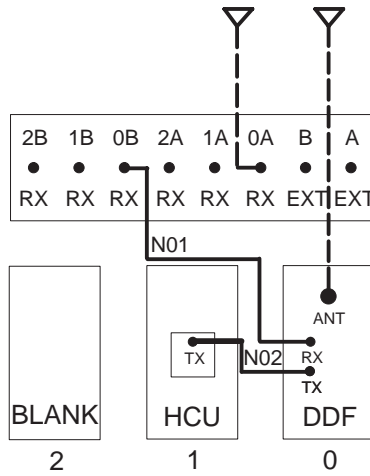
Figure 2-17 shows a suggested configuration, using one Horizon*macro* cabinet, for omni 3 with dual stage duplexed combining filter.



**Figure 2-17** Single cabinet omni 3 with DDF

**Configuration for omni 4**

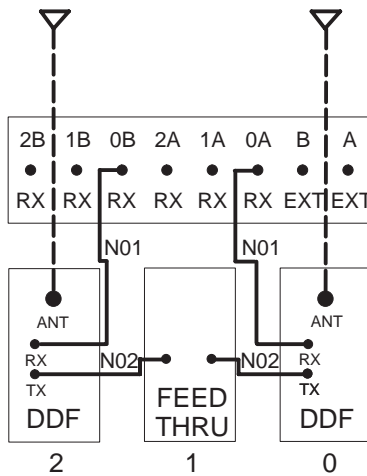
Figure 2-18 shows a suggested configuration, using a single Horizon*macro* cabinet, for omni 4 with dual stage duplexed combining filter and hybrid combining unit.



**Figure 2-18** Single cabinet omni 4 with DDF and HCU

**Configuration for omni 5 or 6**

Figure 2-19 shows a suggested configuration, using one Horizon*macro* cabinet, for omni 5 or 6 with dual stage duplexed combining filter and air combining.



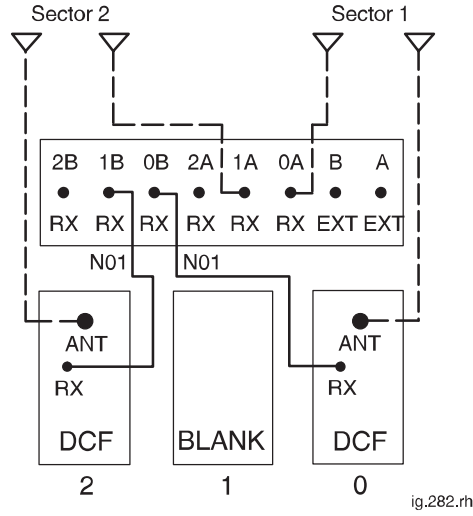
**Figure 2-19** Single cabinet omni 5 or 6 with DDF and air combining

Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
omni 5	DDF 2

**Configuration for sector 1/1 or 2/2**

Figure 2-20 shows a suggested configuration, using a single Horizon*macro* cabinet, for sector 1/1 or 2/2 with duplexed combining bandpass filter.



**Figure 2-20** Single cabinet sector 1/1 or 2/2 with DCF

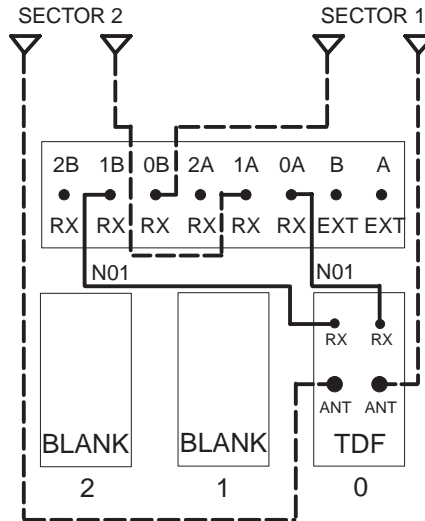
Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
sector 1/1	DCF 0 and DCF 2



**Configuration for sector 1/1**

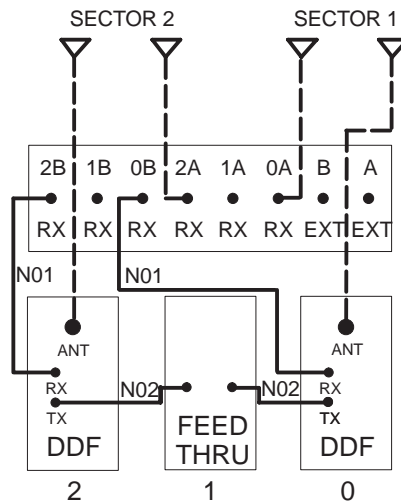
Figure 2-21 shows a suggested configuration, using one Horizon*macro* cabinet, for sector 1/1 with twin duplexed filter.



**Figure 2-21** Single cabinet sector 1/1 with TDF

**Configuration for single cabinet sector 3/3**

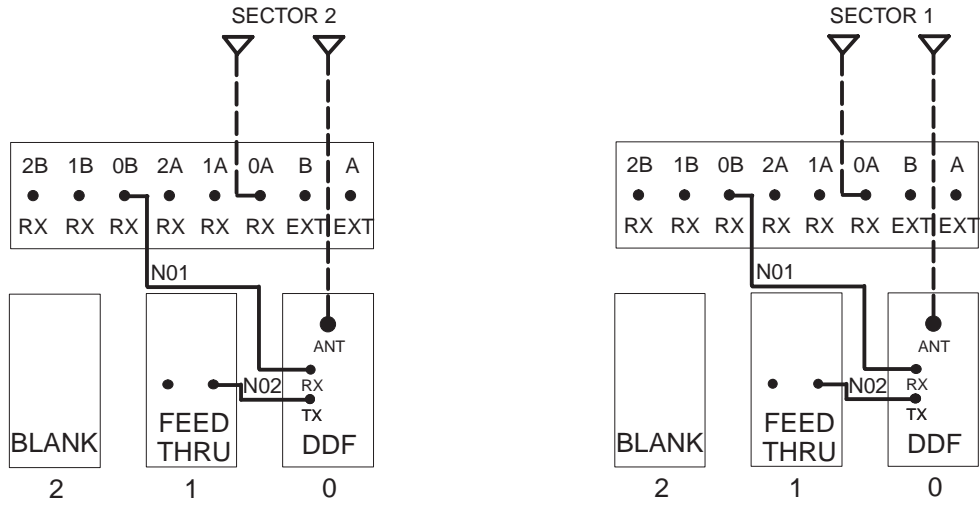
Figure 2-22 shows a suggested configuration, using one Horizon*macro* cabinet, for sector 3/3 with dual stage duplexed combining filter.



**Figure 2-22** Single cabinet sector 3/3 with DDF

**Configuration for 2 cabinet sector 3/3**

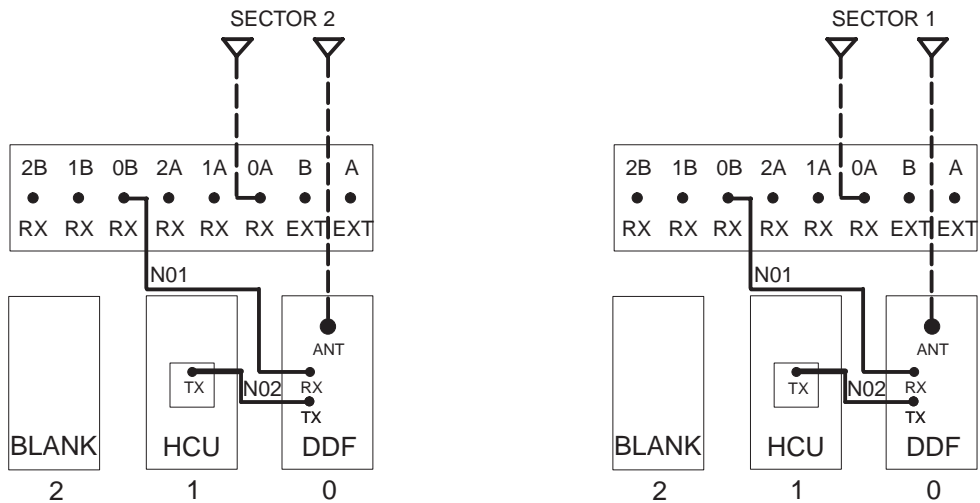
Figure 2-23 shows a suggested configuration, using two Horizon*macro* cabinets, for sector 3/3 with dual stage duplexed combining filter.



**Figure 2-23** Two cabinet sector 3/3 with DDF

**Configuration for 2 cabinet sector 4/4**

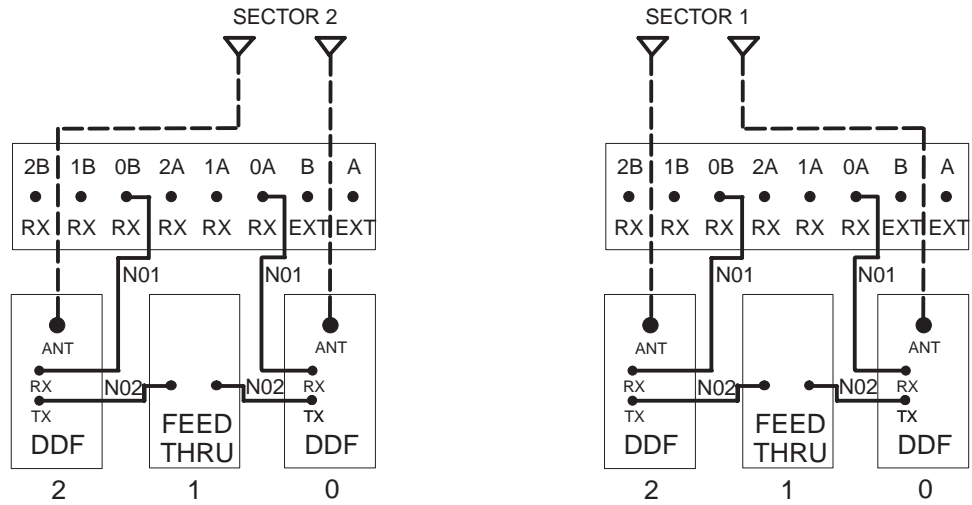
Figure 2-24 shows a suggested configuration, using two Horizon*macro* cabinets, for sector 4/4 with dual stage duplexed combining filter and hybrid combining unit.



**Figure 2-24** Two cabinet sector 4/4 with DDF and HCU

**Configuration for 2 cabinet sector 5/5 or 6/6**

Figure 2-25 shows a suggested configuration, using two Horizon*macro* cabinets, for sector 5/5 or 6/6 with dual stage duplexed combining filter and air combining.



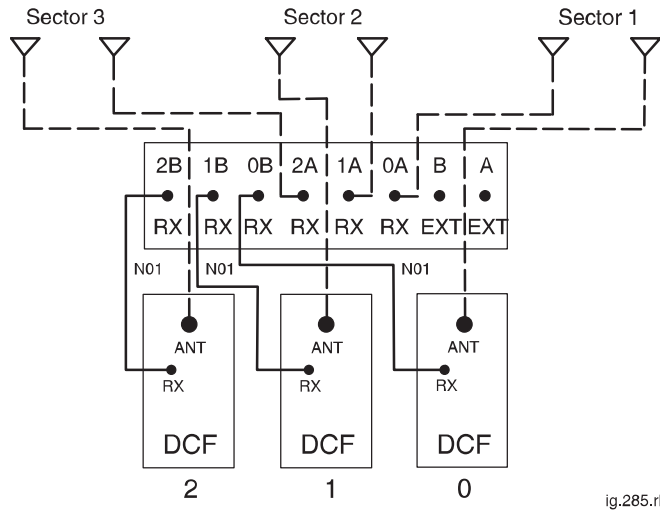
**Figure 2-25** Two cabinet sector 5/5 or 6/6 with DDF and air combining

Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
sector 5/5	both DDF 2 modules

**Configuration for single cabinet sector 1/1/1, 1/1/2, 1/2/2 or 2/2/2**

Figure 2-26 shows a suggested configuration, using a single Horizon*macro* cabinet, for sector 1/1/1, 1/1/2, 1/2/2 or 2/2/2 with duplexed combining bandpass filter.



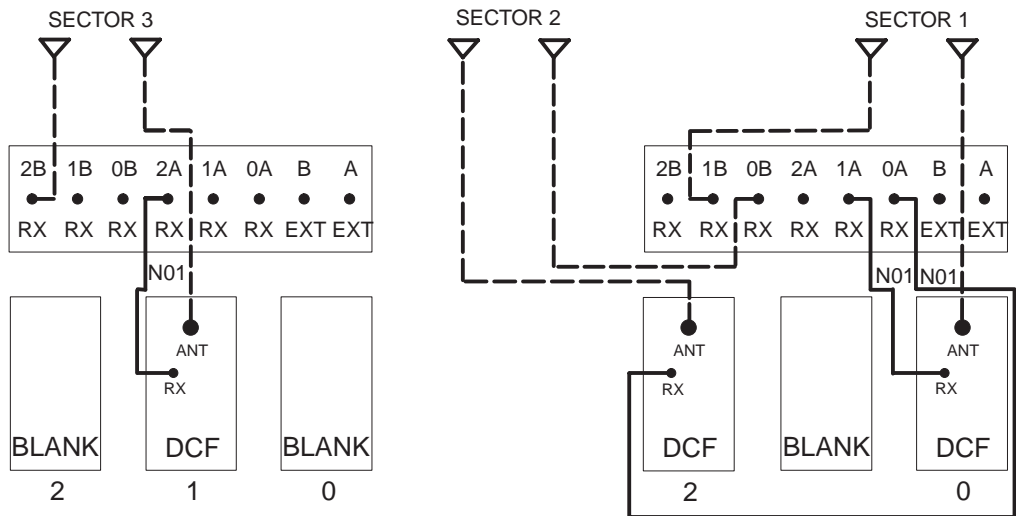
**Figure 2-26** Single cabinet sector 1/1/1, 1/1/2, 1/2/2 or 2/2/2 with DCF

Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
Sector 1/1/1	DCF 0, 1 and 2
Sector 1/1/2	DCF 1 and 2
Sector 1/2/2	DCF 2

**Configuration  
for 2 cabinet  
sector 2/2/2**

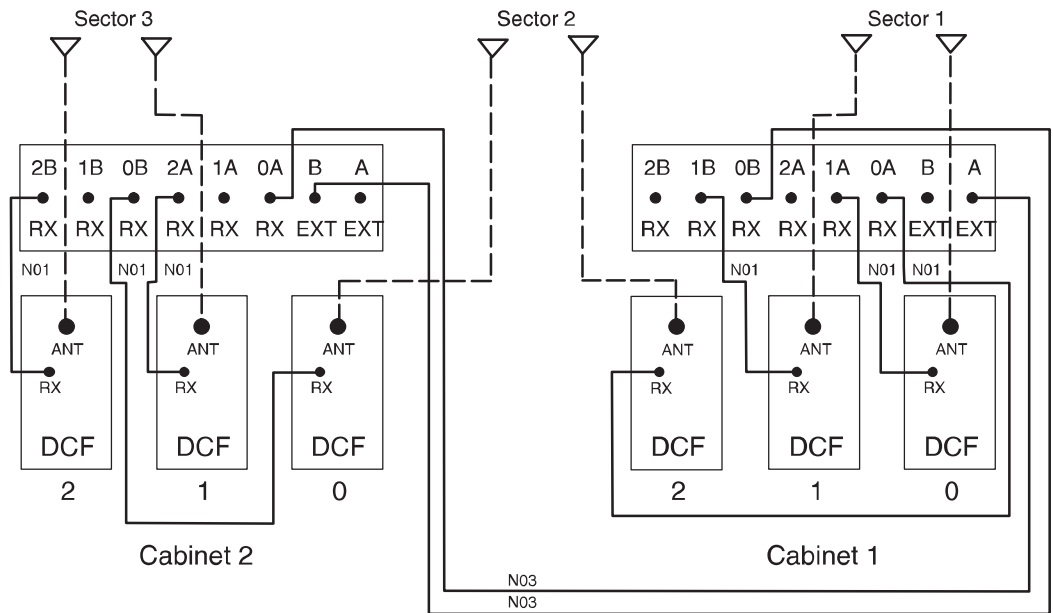
Figure 2-27 shows a suggested configuration, using two Horizon*macro* cabinets, for sector 2/2/2 with duplexed combining bandpass filter.



**Figure 2-27** Two cabinet sector 2/2/2 with DCF

**Configuration for 2 cabinet sector 3/3/3 or 4/4/4**

Figure 2-28 shows a suggested configuration, using two Horizon *macro* cabinets, for sector 3/3/3 or sector 4/4/4 with duplexed combining bandpass filter and air combining.



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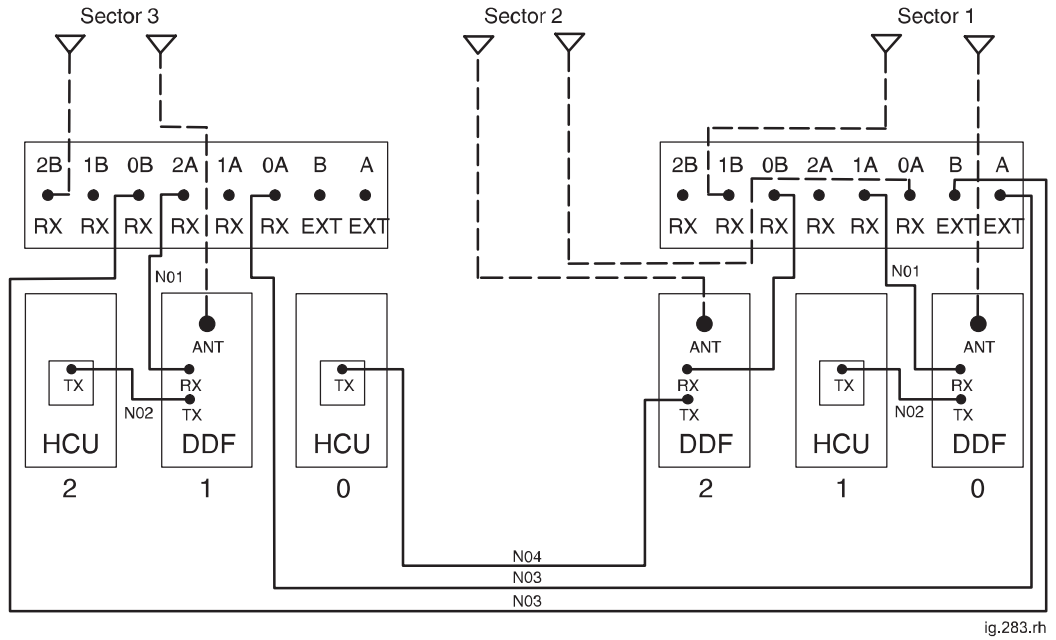
**Figure 2-28** Two cabinet sector 3/3/3 or sector 4/4/4 with DCF and air combining

Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
sector 3/3/3	cabinet 1, DCF 1 cabinet 2, DCF 0 and DCF 2

**Configuration  
for 2 cabinet  
sector 4/4/4**

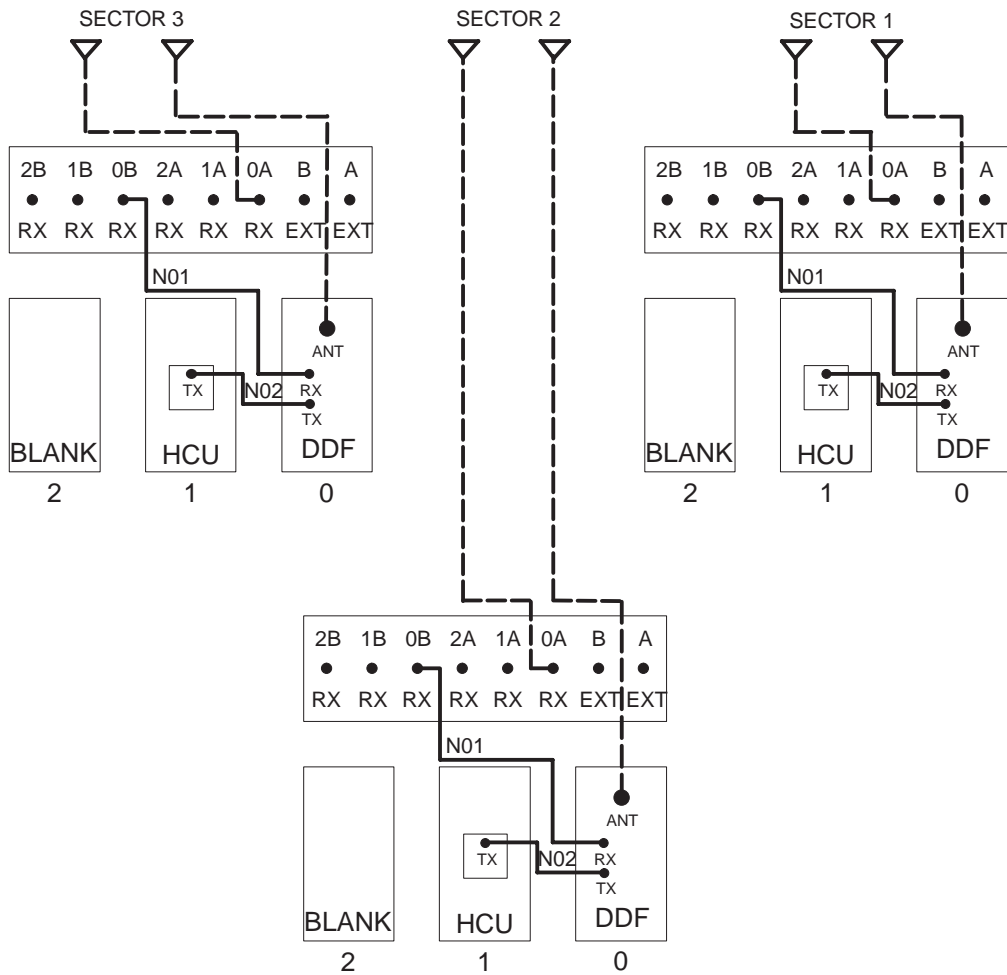
Figure 2-29 shows a suggested configuration, using two Horizon*macro* cabinets, for sector 4/4/4 with dual stage duplexed combining filter and hybrid combining unit.



**Figure 2-29** Two cabinet sector 4/4/4 with DDF and HCU

**Configuration for 3 cabinet sector 4/4/4**

Figure 2-30 shows a suggested configuration, using three Horizon *macro* cabinets, for sector 4/4/4 with dual stage duplexed combining filter and hybrid combining unit.

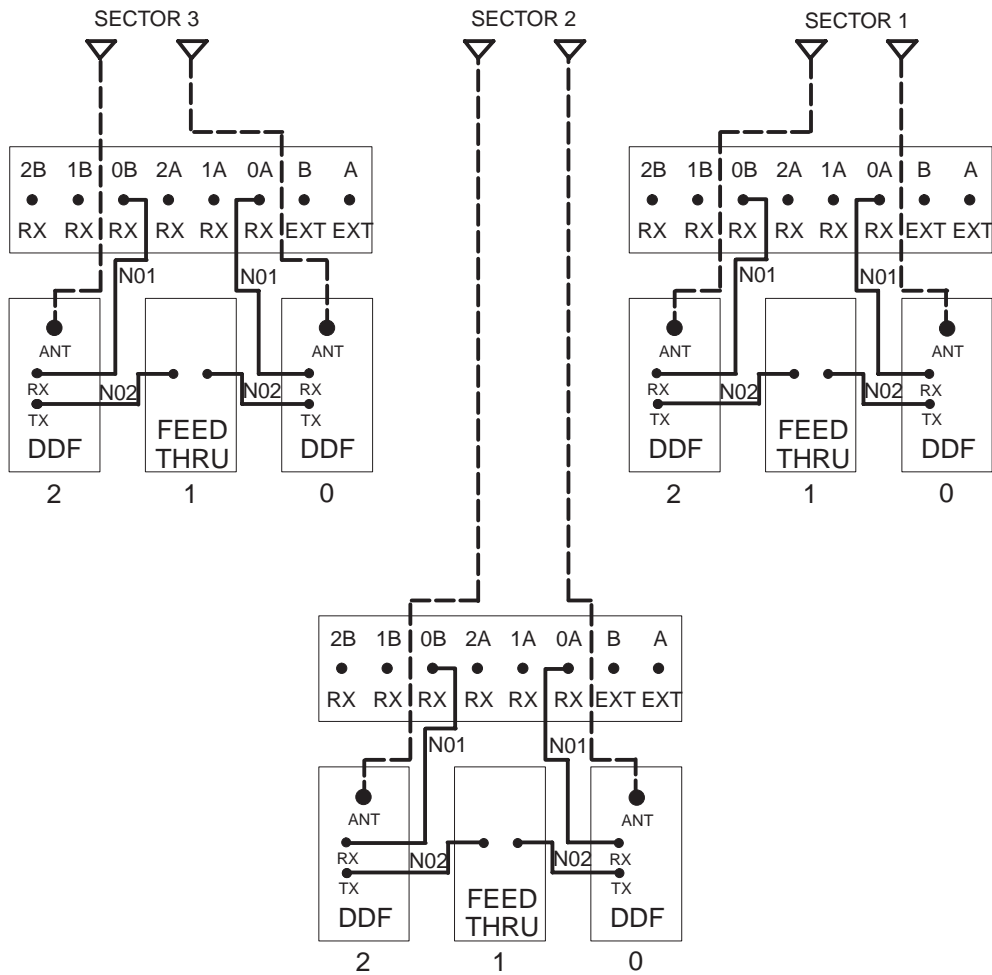


**Figure 2-30** Three cabinet sector 4/4/4 with DDF and HCU



**Configuration for sector 5/5/5 or 6/6/6**

Figure 2-31 shows a suggested configuration, using three Horizon*macro* cabinets, for sector 5/5/5 or sector 6/6/6 with dual stage duplexed combining filter and air combining.



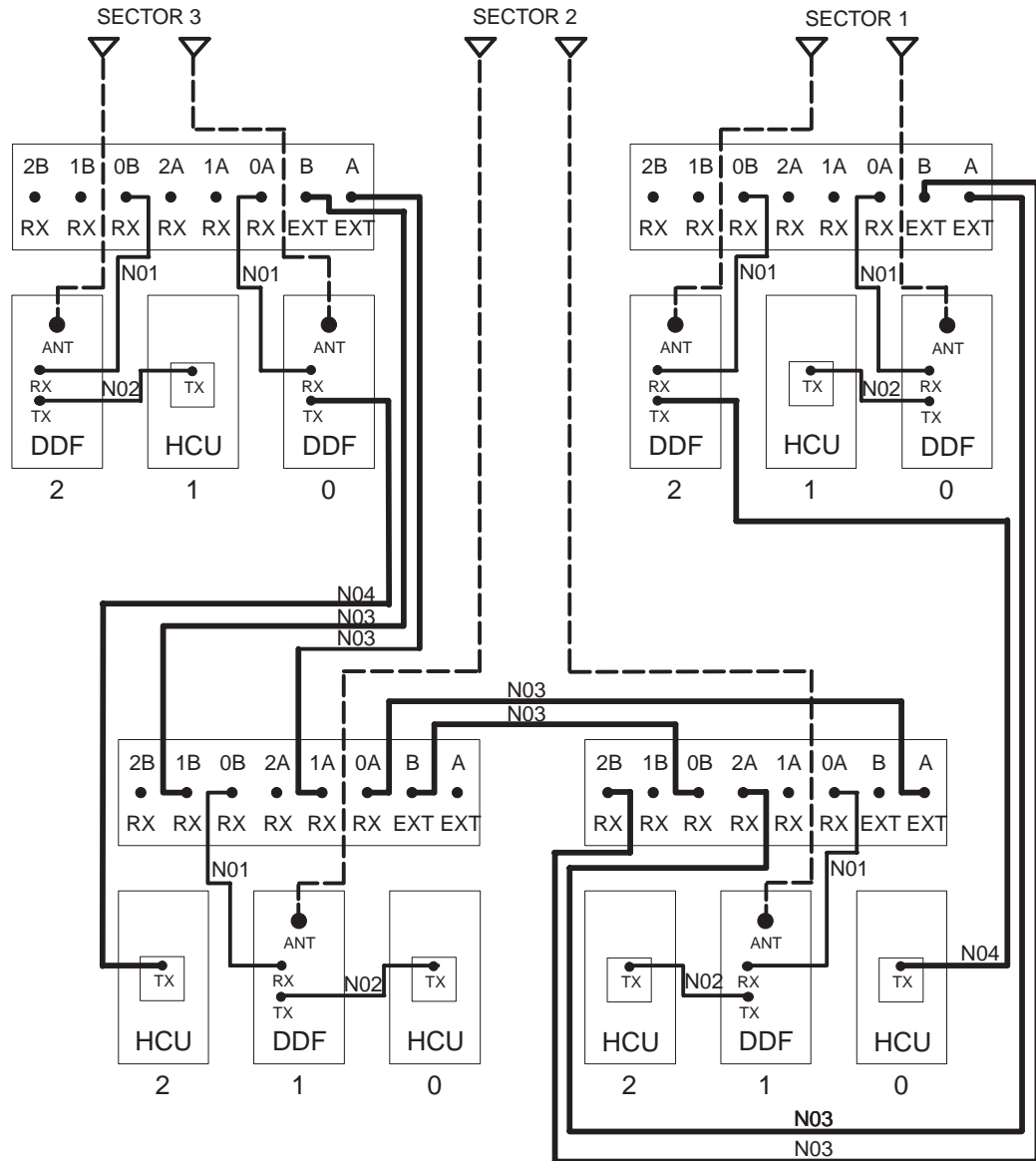
**Figure 2-31** Sector 5/5/5 or sector 6/6/6 with DDF and air combining

Unused SMA connectors must be fitted with 50 ohm terminating loads as shown below.

If configured for...	Then 50 ohm load required on unused SMA input to...
sector 5/5/5	all DDF 2 modules

**Configuration for sector 8/8/8**

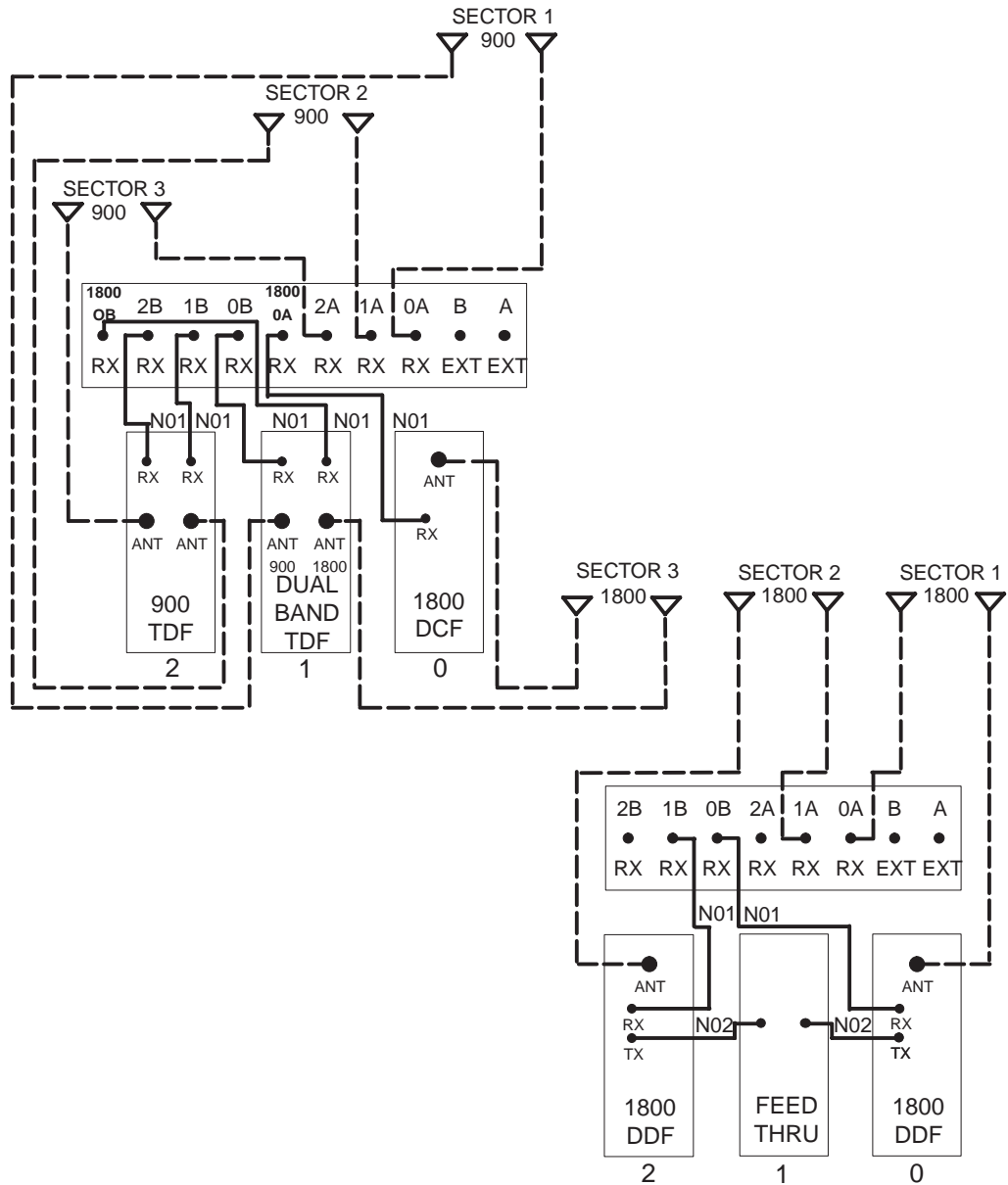
Figure 2-32 shows a suggested configuration, using four Horizon*macro* cabinets, for sector 8/8/8 with dual stage duplexed combining filter, hybrid combining unit and air combining.



**Figure 2-32** Sector 8/8/8 with DDF, HCU and air combining

**Configuration for dual band 1/1/1-3/3/3**

Figure 2-33 shows a suggested configuration, using two Horizon*macro* cabinets, for dual band sector 1/1/1–3/3/3 operation, where sector 1/1/1 is EGSM900 and sector 3/3/3 is DCS1800. This dual band configuration requires one single band 1800 SURF and one dual band 900 SURF.

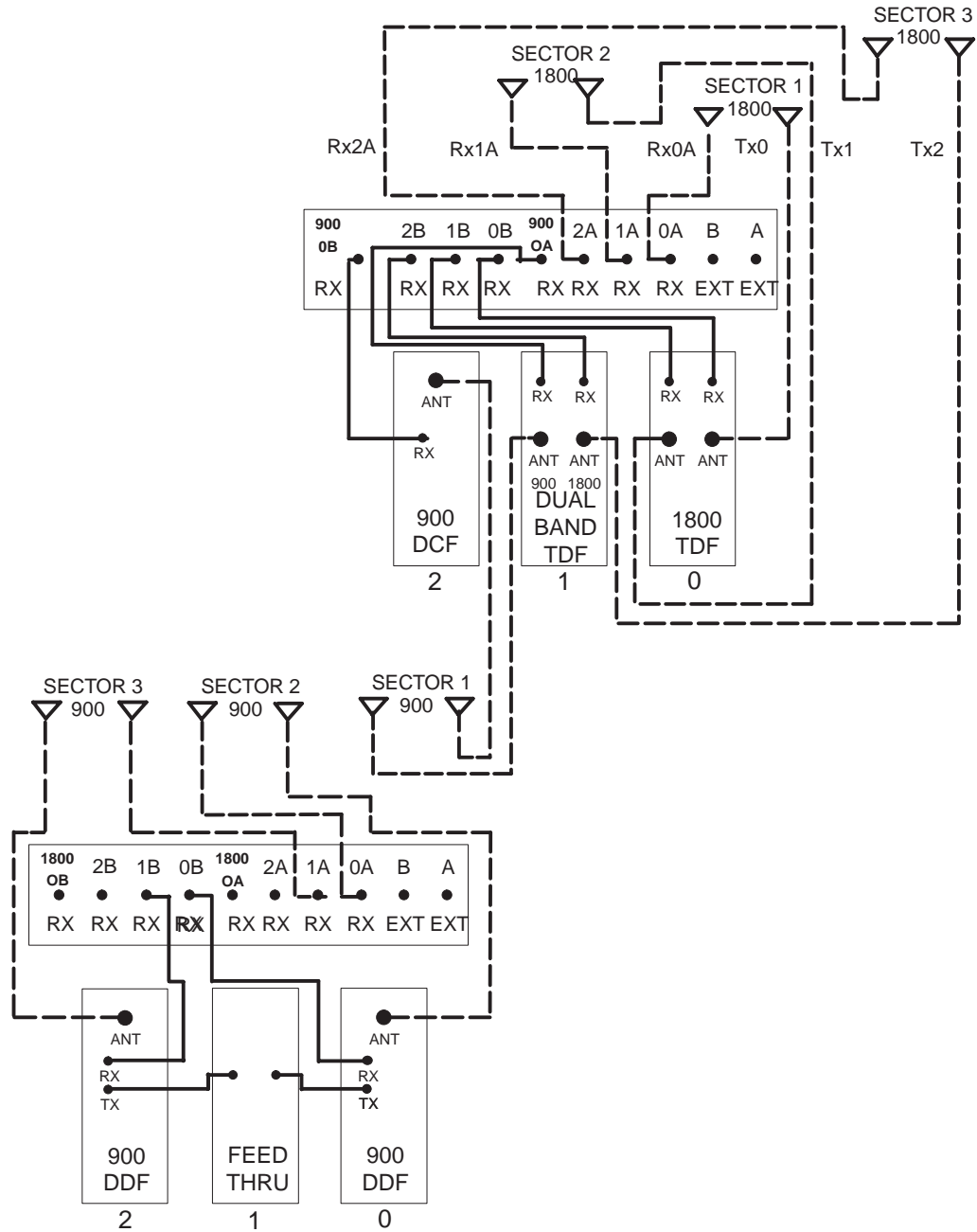


**Figure 2-33** Two cabinet dual band sector 1/1/1-3/3/3

Unused SMA connectors must be fitted with 50 ohm terminating loads.

**Configuration for dual band 3/3/3-1/1/1**

Figure 2-34 shows a suggested configuration, using two Horizon*macro* cabinets, for dual band sector 3/3/3-1/1/1 operation, where sector 3/3/3 is EGSM900 and sector 1/1/1 is DCS1800. This dual band SURF configuration requires one dual band 1800 SURF and one dual band 900 SURF.



**Figure 2-34** Two cabinet dual band sector 3/3/3-1/1/1

Unused SMA connectors must be fitted with 50 ohm terminating loads.

## Connecting fibre optic cables

### Location of fibre optic connections

**WARNING** Do not look directly into a fibre optic cable or the data in/out connectors of the FMUX or MCUF, with or without the use of optical aids. Laser radiation can come from either the data in/out connectors or unterminated fibre optic cables connected to data in/out connectors.

In an installation configuration with more than one Horizon*macro* indoor cabinet, fibre optic connections are used to link the MCUF in the master cabinet to the extension cabinets. A maximum of three extension cabinets can be added to the master cabinet.

Connections from the master cabinet are provided by three fibre optic multiplexers (FMUXs). Two are located integral to the MCUF, and the third is a separate module located in the slot next to the master MCUF. Additional redundant modules may be installed for both MCUF and FMUX modules.

Extension cabinets have only a single FMUX, with optional redundancy, for fibre optic connectivity to the master cabinet.

Tx and Rx data connections to the MCUF and FMUXs are located on the front panel of each module.

Three different types of fibre optic cable, coloured orange and terminated with ST fibre connectors, are available for use. These are described in Table 2-4.

Order number	Length	Description
SVKN1244	5.6 m long	connects master cabinet to first extension
SVKN1245	7.6 m long	connects master cabinet to second extension
SVKN1246	7.6 m long	connects master cabinet to third extension

### Care of fibres

Optical fibre cables contain an inner core, which is a strand of glass coated by a cladding (sometimes in two layers), and an outer protective sheath which provides mechanical protection.

The fibre acts as a light waveguide. In order for the link to work correctly light must be propagated with minimal losses from end-to-end of the fibre. A number of problems can prevent this from happening, resulting in a potentially faulty link. Care must be taken to ensure that the conditions that follow are met.

### Minimum bend radius

All optical fibres have a minimum bend radius. This represents the smallest circle that is allowed to be formed from a loop of fibre, that is how tight it can be coiled, looped or bent.

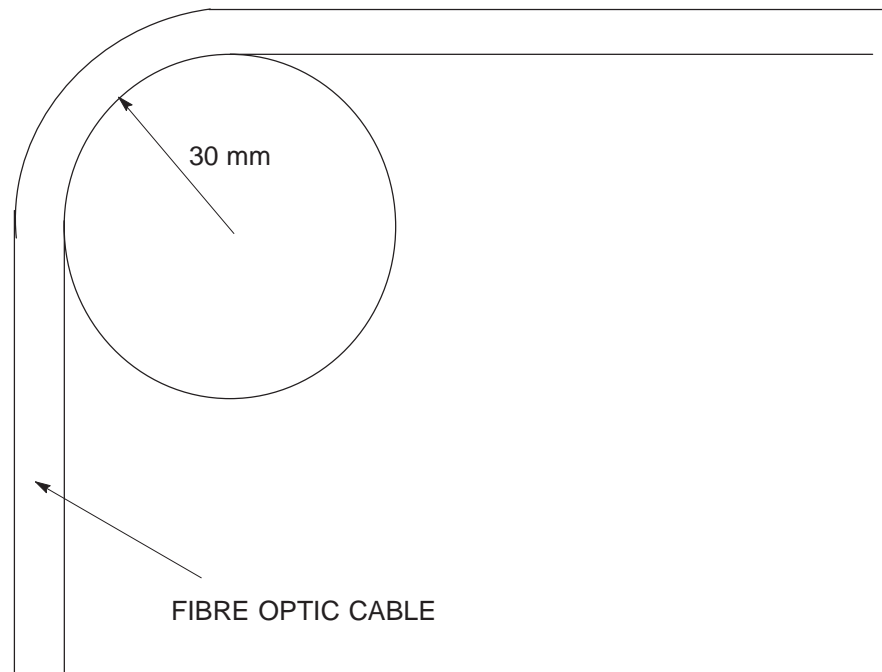
**CAUTION** Under no circumstances should fibres be bent tighter than the minimum bend radius.

If fibres are bent tighter than the minimum bend radius then two possible effects can happen:

- Excessive light loss can occur from the outside of the bend, resulting in a loss of performance.
- The fibre can fracture due to microscopic imperfections in the surface. This type of break is invisible externally. If such a break occurs, excessive light loss would be permanent and light would be scattered and reflected from the break in the fibre. Returning the fibre to straight will not help and the whole assembly will require replacement.

For glass fibres (orange or green outer sheath) the long term minimum bend radius is approximately 30 mm.

Figure 2-35 illustrates the minimum bend radius for fibre optic cables.



**Figure 2-35** Minimum bend radius of 30 mm

If the fibre is under tension (being stretched), the bend radius should be much larger, at least doubled. This is because the tension in the fibre can increase the possibilities of damage.

If in doubt about the radius, the fibre should be allowed to form its natural bend radius by allowing it to bend under gravity only. This natural bend radius is normally greater than 30 mm.

### Protecting fibres and connectors

To maintain good light transmission through the fibre optic link it is essential to maintain cleanliness of the connector end surfaces and/or bare fibre ends.

At all times when fibres are not connected into the system, the connector protective caps (normally red) should be fitted and kept in place. This is especially important when routing fibres during installation.

### Cleaning fibres and connectors

Cleanliness of fibre terminations and connectors is essential. If cleaning of contaminated optical components is required, then all areas should be wiped gently with a lint free cloth soaked in a suitable cleaning solution. Care should be taken to ensure the ends of the fibres are not scratched in any way, and are completely dry before reconnection.

### Connecting glass fibre cables

Fibre-ST connectors are used to terminate the fibre optic cables. These are push fit and should not be tightened when connecting. Table 2-5 shows the fibre optic interconnections between master and extension cabinets in multiple cabinet sites.

<b>Master cabinet connection</b>	<b>Extension cabinet</b>	<b>FMUX connection</b>
<b>MCUF</b> TCU0 FMUX0 IN	2nd cabinet	DATA OUT
<b>MCUF</b> TCU0 FMUX0 OUT	2nd cabinet	DATA IN
<b>MCUF</b> TCU1 FMUX1 IN	3rd cabinet	DATA OUT
<b>MCUF</b> TCU1 FMUX1 OUT	3rd cabinet	DATA IN
<b>FMUX</b> module DATA IN	4th cabinet	DATA OUT
<b>FMUX</b> module DATA OUT	4th cabinet	DATA IN

## Connecting fibre optic cables between cabinets

**WARNING** Do not look directly into a fibre optic cable or the data in/out connectors of the FMUX or MCUF, with or without the use of optical aids. Laser radiation can come from either the data in/out connectors or unterminated fibre optic cables connected to data in/out connectors.

To connect fibre optic cables between master and extension cabinets in multiple cabinet sites.

1. Open master and extension cabinet doors and remove hoods, (if fitted).

**CAUTION** Under no circumstances should fibres be bent tighter than the minimum bend radius.

2. Route the appropriate length extension cabinet fibre optic cable from the digital module compartment of the master cabinet, through the aperture in the right side of the CBIA cage, to the top section of the cabinet.

**CAUTION** Under no circumstances should any tools, such as pliers, be used to connect ST fibre connectors.

3. Connect the push fit ST connector of the fibre optic cables to the appropriate ports on the master MCUF, or master FMUX module, front panel (see Table 2-5).
4. Route the fibre optic cable to the extension cabinet, following existing cable layout as far as possible.
5. Pass the fibre optic cable through the fibre optic cable hole in the cabinet top section to the extension cabinet FMUX.
6. Connect the push fit ST connector of the fibre optic cables to the data ports on the extension cabinet master FMUX front panel.
7. Repeat steps 2 to 6 for digital redundancy MCUF and FMUX, if fitted.
8. Repeat steps 2 to 7 for additional extension cabinets.



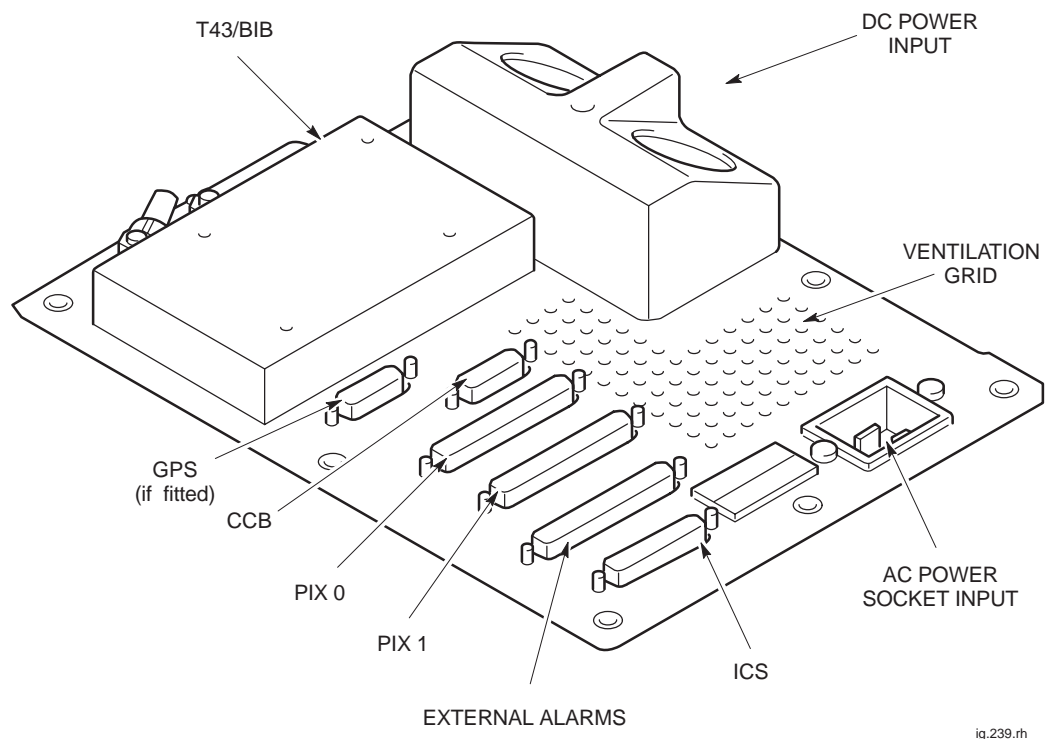
## Interface panel cabling

### Interface panel diagram and pinout overview

All cabinet connectors are located on the interface panel. Each connector is marked with the appropriate label. Power connectors are also located on the interface panel.

An extension cabinet fibre optic cable is not connected to the interface panel, but directly connected to the FMUX digital module in the CBIA cage. The fibre optic cable enters the cabinet through a hole on the top panel in front of the interface panel.

Figure 2-36 shows the locations of all the interface panel connectors.



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**Figure 2-36** Interface panel connector locations

**Connector pinout tables**

**CAUTION** Keep the plastic connector covers, supplied by Motorola, on unused connectors to protect from damage by static or foreign matter.

The following tables list the connector pinouts:

- External alarms see Table 2-6 and accompanying information.
- GPS see Table 2-7.
- CCB see Table 2-8.
- BIB see Table 2-9.
- T43 see Table 2-10.
- PIX0 see Table 2-11.
- PIX1 see Table 2-12.
- ICS see Table 2-13.

**NOTE** Some pin connections only refer to indoor or outdoor cabinets.

**External alarm connector**

The external alarms connector is used by the battery backup system (BBS). When this connector is not in use, a shorting plug, Motorola part number 2886169N01, is inserted. This plug must be removed to allow connection of the alarm cable from the BSS and should be retained for refit during decommissioning of BBS. The external alarm connector carries different alarms in the *Horizonmacro* outdoor.

The shorting plug joins pairs of pins as shown in Table 2-6.

<b>Table 2-6</b> External alarms indoor pin shorts (37-way D-type)			
<b>Pin Nos</b>	<b>Pin Nos</b>	<b>Pin Nos</b>	<b>Pin Nos</b>
1 + 2	11	21+22	32
3 +4	12	23+24	33
5+6	13+14	25+26	34
7+8	15+16	27+28	35
9	17+18	29+30	36+37
10	19 +20	31	

## GPS connector

Table 2-7 lists the GPS connector pinouts.

**NOTE** The GPS connector is optional on later BTS cabinets.

Pin No	Signal/Description	Pin No	Signal/Description
1	GPS power 1	9	GPS power 2
2	Not connected	10	Not connected
3	chassis earth	11	PPS positive
4	Tx negative	12	PPS negative
5	Tx positive	13	Rx positive
6	Rx negative	14	VPP
7	Earth	15	GPS return 2
8	GPS return 1		

## CCB connector

Table 2-8 lists the CCB connector pinouts. This provides a single connector, to provide power for up to two CCBs.

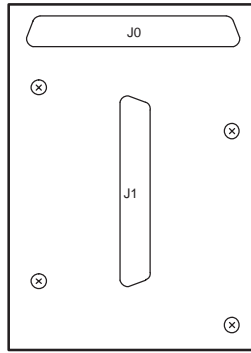
**NOTE** The CCB connector is not currently used on GSM850 or PCS1900 BTS variants.

Pin No	Signal/Description	Pin No	Signal/Description
1	Not connected	9	Not connected
2	Not connected	10	Not connected
3	CCB0 27 V	11	Earth
4	CCB0 27 V	12	Earth
5	Not connected	13	Not connected
6	CCB1 27 V	14	Earth
7	CCB1 27 V	15	Earth
8	Not connected		

**BIB (BIM)  
interconnection**

The Balanced-line Interconnect Board (BIB), also known as BIM, provides the line isolation between the E1/T1 circuit lines and the CBIA backplane. The board provides an interface for up to six input and six output balanced 120 ohm lines. 12 transformers are used to provide line isolation while maintaining impedance matching between the E1/T1 circuit lines and the NIU module. Each transformer has a 1:1 turns ratio to match the external and backplane 120 ohm connections.

Connection is made using a 37-pin D-type connector to both the BIB and the external PCM twisted pair circuit lines. Figure 2-37 shows a typical BIB and Table 2-9 lists BIB interconnections:



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**Figure 2-37** Balanced-line interconnect board (BIB)

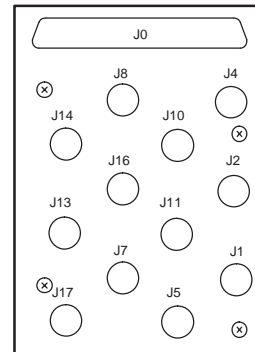
Table 2-9 BIB interconnections						
NIU/ port	Pin no	Equipment/Ext	Pin no	Pin no	Equipment/Ext	Pin no
A0/0	J0-1	Tx1+	J1-1	J0-20	Tx1-	J1-20
	J0-2	Rx1+	J1-2	J0-21	Rx1-	J1-21
B0/0	J0-4	Tx4+	J1-4	J0-23	Tx4-	J1-23
	j0-5	Rx4+	J1-5	J0-24	Rx4-	J1-24
A0/1	J0-7	Tx2+	J1-7	J0-26	Tx2-	J1-26
	J0-8	Rx2+	J1-8	J0-27	Rx2-	J1-27
B0/1	j0-10	Tx5+	J1-10	J0-29	Tx5-	J1-29
	j0-11	Rx5+	J1-11	J0-30	Rx5-	J1-30
A1/0	J0-13	Tx3+	J1-13	J0-32	Tx3-	J1-32
	J0-14	Rx3+	J1-14	J0-33	Rx3-	J1-33
B1/0	J0-16	Tx6+	J1-16	J0-35	Tx6-	J1-35
	J0-17	Rx6+	J1-17	J0-36	Rx6-	J1-36
Connector J0 and J1 pins 3,6,9,12,15,18,19, 22, 25, 28, 31, 34 and 37 are <b>connected to earth</b>						

## T43 (CIM) interconnection

The Type 43 Interconnect Board (T43), also known as CIM, provides the impedance matching and line isolation between the E1/T1 circuit lines and the CBIA backplane. The board provides an interface for up to six input and six output unbalanced coaxial 75 ohm lines. 12 transformers are used to provide impedance matching and line isolation between the E1/T1 circuit lines and the NIU module. Each transformer has a 1:1.25 turns ratio to match the external 75 ohm and backplane 120 ohm connections.

Connection is made using a 37-pin D-type connector to the interconnect board and twelve type 43 coaxial connectors to the external E1/T1 circuit lines.

Figure 2-38 shows a typical T43, and Table 2-10 lists the T43 interconnections.



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**Figure 2-38** Type 43 interconnect board (T43)

Table 2-10 T43 interconnections						
NIU/ port	Pin no	Equipment / Ext	Pin no	Pin no	Equipment / Ext	Pin no
A0/0	J0-1	Tx1+	J1 centre	J0-20	Tx1–	J1 shield
	J0-2	Rx1+	J2 centre	J0-21	Rx1–	J2 shield
B0/0	J0-4	Tx4+	J4 centre	J0-23	Tx4–	J4 shield
	j0-5	Rx4+	J5 centre	J0-24	Rx4–	J5 shield
A0/1	J0-7	Tx2+	J7 centre	J0-26	Tx2–	J7 shield
	J0-8	Rx2+	J8 centre	J0-27	Rx2–	J8 shield
B0/1	j0-10	Tx5+	J10 centre	J0-29	Tx5–	J10 shield
	j0-11	Rx5+	J11 centre	J0-30	Rx5–	J11 shield
A1/0	J0-13	Tx3+	J13 centre	J0-32	Tx3–	J13 shield
	J0-14	Rx3+	J14 centre	J0-33	Rx3–	J14 shield
B1/0	J0-16	Tx6+	J16 centre	J0-35	Tx6–	J16 shield
	J0-17	Rx6+	J17 centre	J0-36	Rx6–	J17 shield
Connector J0 pins 3,6,9,12,15,18,19, 22, 25, 28, 31, 34 and 37 are <b>not used</b>						

## PIX conditions input/output

### PIX outputs

PIX outputs comprise 4 relay contacts controlled by the alarm board and MCUF. The relays have multiple contacts, some normally open and some normally closed. The contacts are rated for 1A at 30 V. The contacts may be used for control of external equipment such as fans or audible alarms.

### PIX inputs

PIX inputs comprise 16 connections to external sensors. These inputs report alarms to the BSC, via the alarm board and MCUF, which forwards the alarms to the OMC-R. The end-user supplies the external sensors. Each sensor connects across an opto-coupled pair of PIX inputs (eight per PIX connector).

All sensors **must** be dry-contact type with the following specification:

- 5 kohms or greater across sense inputs for logic 1 (PIX opto-coupler **off**).
- 500 ohms or less across sense inputs for logic 0 (PIX opto-coupler **on**).

Table 2-11 shows PIX0 connections and Table 2-12 shows PIX1 connections.

Pin No	Signal/Description	Pin No	Signal/Description
1	Site input Ext 1–1	19	Not connected
2	Site input Ext 2–1	20	Site input Ext 1–2
3	Site input Ext 3–1	21	Site input Ext 2–2
4	Site input Ext 4–1	22	Site input Ext 3–2
5	Site input Ext 5–1	23	Site input Ext 4–2
6	Site input Ext 6–1	24	Site input Ext 5–2
7	Site input Ext 7–1	25	Site input Ext 6–2
8	Site input Ext 8–1	26	Site input Ext 7–2
9	Not connected	27	Site input Ext 8–2
10	Not connected	28	spare
11	Site output relay 1 – NO	29	Site output relay 1 – NC
12	Site output relay 2 – NO	30	Site output relay 1 – COM
13	Site output relay 2 – NC	31	Site output relay 2 – COM
14	Site output relay 3 – NO	32	Site output relay 3 – NC
15	Site output relay 4 – NO	33	Site output relay 3 – COM
16	Site output relay 4 – NC	34	Site output relay 4 – COM
17	Not connected	35	Not connected
18	Not connected	36/37	Not connected

<b>Table 2-12</b> PIX1 pin connections (37-way D-type)			
<b>Pin No</b>	<b>Signal/Description</b>	<b>Pin No</b>	<b>Signal/Description</b>
1	Site input Ext 9–1	19	Not connected
2	Site input Ext 10–1	20	Site input Ext 9–2
3	Site input Ext 11–1	21	Site input Ext 10–2
4	Site input Ext 12–1	22	Site input Ext 11–2
5	Site input Ext 13–1	23	Site input Ext 12–2
6	Site input Ext 14–1	24	Site input Ext 13–2
7	Site input Ext 15–1	25	Site input Ext 14–2
8	Site input Ext 16–1	26	Site input Ext 15–2
9	Not connected	27	Site input Ext 16–2
Pins 10 to 18 not connected		Pins 28 to 37 not connected	

## ICS connector

Table 2-13 lists the Integrated Cell Site (ICS) connector pinouts. This is a future feature.

<b>Table 2-13</b> ICS pin connections (25-way D-type)			
<b>Pin No</b>	<b>Signal/Description</b>	<b>Pin No</b>	<b>Signal/Description</b>
1	ICS0 TTY earth	10	ICS3 TTY earth
2	ICS0 TTY Rx	11	ICS3 TTY Rx
3	ICS0 TTY Tx	12	ICS3 TTY Tx
4	ICS1 TTY earth	13	ICS4 TTY earth
5	ICS1 TTY Rx	14	ICS4 TTY Rx
6	ICS1 TTY Tx	15	ICS4 TTY Tx
7	ICS2 TTY earth	16	ICS5 TTY earth
8	ICS2 TTY Rx	17	ICS5 TTY Rx
9	ICS2 TTY Tx	18	ICS5 TTY Tx
Pins 19 to 25 not connected			

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## Installing and connecting power and earth cabling

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### Overview of power and earth cabling

This section describes the procedure for connecting power and earth cabling to the cabinet.

<b>WARNING</b>	Use the earth stud, located on the interface panel on the top of the cabinet, to earth the cabinet. Do not daisy chain cabinet earths together. Cabinets must be earthed with a conductor capable of carrying the full fault current of the overcurrent protection device. Do not make input power connections at the main power source at this time. <b>Connecting input power</b> is the final installation procedure in this chapter.
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Power specifications can be found in Chapter 2 **Site requirements and considerations**.

---

### Cable routeing

<b>CAUTION</b>	Ensure that covers are fitted to any unused connectors on the cabinet interconnect panel; the covers protect the connectors from damage by static electricity or foreign matter. Do not make dc input power connections at the main dc power source at this time. The external converter supplying power to the cabinet must have double or reinforced insulation between its primary and secondary circuits. The external converter that supplies power to the cabinet must meet safety standard EN 60950.
----------------	--

An adequate means should be provided for routeing cables from the main power source to the equipment, such as a cable trough or conduit.

<b>NOTE</b>	The current-carrying capacity of a cable for continuous service is affected by all of the following factors (reference IEC 364): <ul style="list-style-type: none"><li>– Ambient temperature.</li><li>– Grouping.</li><li>– Partial or total enclosure in thermal insulating material.</li><li>– Frequency (ac only).</li></ul>
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## Cabinet and ESP earthing points

The main earth connection point is on the top interface panel, with a 10 mm M6 threaded stud, adjacent to the dc input. This connection is for protective earthing and functional earthing of the cabinet.

Additional internal earths are:

- Door to cabinet frame.
- Main cage to interface panel above PSM.
- Tx block top panel to interface panel, near dc input.
- AC input connector to interface panel at rear of panel.
- Enclosure to interface panel, at rear near dc input.

An earthing wrist strap must be worn when handling electronic modules, including the MCUF, FMUX, NIU, alarm module, CTU, and SURF. An ESP earthing connection point is provided above the leftmost PSM.

---

## Power supply cable colour coding

<b>CAUTION</b> Ensure correct PSMs are fitted to match the supply source voltage.
---

### +27 V dc cabinets

To connect a +27 V dc (negative earth) cabinet to the main dc power source. Observe the following rules:

- The **27 volt** (+ve) power cable is **red**.
- The **0 volt** (-ve) cable is **black**.

### -48/60 V dc cabinets

To connect a -48/60 V dc (positive earth) cabinet to the main dc power source, Motorola recommends using a 35 sq. mm dc input power cable with a maximum length of 24 m. Observe the following rules:

- The **-48/60 volt** (-ve) power cable is **blue**.
- The **0 volt** (+ve) cable is **black**.

---

## + 27 V dc connection procedure

To connect dc power cables to a + 27 V dc cabinet:

**WARNING** Each cabinet must be earthed separately and **not** daisy chained together.

1. Route the earth wire from the building master earth and connect to the earth stud on top of the cabinet. Tighten to correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).

**WARNING** Do not make input power connections at the main power source at this time. **Connecting input power** is the final installation procedure in this chapter.

2. Thread the cone-shaped plastic covers onto the cables before connection.
3. Connect the black 0 volt (–ve) dc power cable to the cabinet dc power connector assembly **0 V** terminal, and route to the main dc power source.
4. Connect the red 27 volt (+ ve) dc power cable to the cabinet dc power connector assembly **V IN** terminal, and route to the main dc power source.
5. Tighten the dc power connections (nuts on studs with star washers) to correct torque as in step 1.

The + 27 volt dc power cable connection procedure is now complete.

---

## – 48/60 V dc connection procedure

To connect dc power cables to a –48/60 V dc cabinet:

**WARNING** Each cabinet must be earthed separately and **not** daisy chained together.

1. Route the earth wire from the building master earth and connect to the earth stud on top of the cabinet. Tighten to the correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).

**WARNING** Do not make input power connections at the main power source at this time. **Connecting input power** is the final installation procedure in this chapter.

2. Thread the cone-shaped plastic covers onto the cables before connection.
3. Connect the black 0 volt (+ve) dc power cable to the cabinet dc power connector assembly **0 V** terminal, and route to the main dc power source
4. Connect the blue –48/60 volt (–ve) dc power cable to the cabinet dc power connector assembly **V IN** terminal, and route to the main dc power source.
5. Tighten the dc power terminal connections (nuts on studs with star washers) to correct torque as in step 1.

The –48/60 volt dc power cable connection procedure is now complete.

## Cabinet ac install

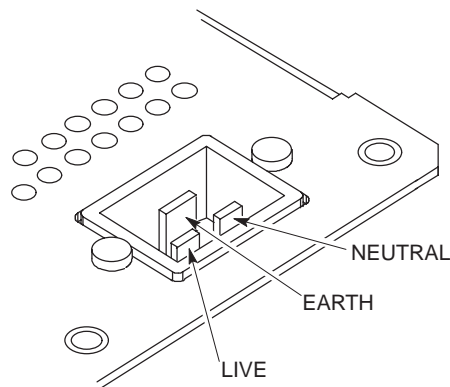
**WARNING** For connection to ac supply, use correct socket type, protective device and appropriately rated cable, selected in accordance with National and regional wiring regulations.

The 230 volt ac input is via a recessed plug connector, rated at 20 amps, into which an ac supply cable terminated with a standard type IEC320 socket may be connected.

## AC input connection

Figure 2-39 shows the ac input connection located on the interface panel. The live, neutral and earth connections are clearly marked.

**WARNING** If assembling a cable and socket for connection to this ac input, ensure live, neutral and earth connections within the socket match equivalent plug connections. That is, live connects to live, neutral to neutral and earth to earth.



**Figure 2-39** View of ac input recessed plug connector

**WARNING** Do not make ac input power connections at the main power source at this time. **Connecting input power** is the final installation procedure in this chapter.

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## Connecting input power

### Pre-connection checks

At this point in the installation, ensure that:

- The cabinet is not already connected to the main ac or dc power source.
- The cabinet is connected to the ac or dc power cabling.

---

### Connecting dc power

To connect dc power to a cabinet:

<b>WARNING</b>	Do not wear an anti static wrist strap while servicing the power supplies or power distribution cabling, as serious personal injury can result. The external converter supplying the cabinet must have double or reinforced insulation between its primary and secondary circuits, and must conform to Safety Standard EN 60950.
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<b>CAUTION</b>	Perform any adjustments recommended by the manufacturer on the main power supply equipment before connecting dc power cables to the main dc power source. Input to the base station must remain between 20 V and 30 V under all load conditions for normal +27 V dc operation. Input to the base station must remain between –40 V and –60 V dc for –48 V dc operation.
----------------	---

1. Turn off the main dc power supply.
2. Use a digital voltmeter to ensure that power is not present.
3. Route and secure the dc power and earth cables to the building ac power supply from the cabinet.
4. Connect the earth wire to the building master earth.
5. Connect the 0 volt lead of the input dc power cable to the 0 volt terminal of the main dc power supply. See **Installing and connecting power and earth cabling**.
6. Connect the V IN lead of the input dc power cable to the V IN (+ 27 or –48/60 volt, as appropriate for cabinet PSM type) terminal of the main dc power supply. See **Installing and connecting power and earth cabling**.
7. Tighten connections to correct torque (see **Site specific or electricity supply company documentation**).

---

## Connecting ac power

**WARNING** Ensure the ac power supply input has been safely isolated, so that there is no risk of power being applied to the cable during this procedure. The source should be isolated and locked, and warning label attached.

To connect ac power to a cabinet:

1. Isolate the ac power source and lock the isolator switch.

**WARNING** Do not make input power connections at the main power source at this time. Connecting to ac power source is the final step in this procedure.

2. Route and secure the power cable from the building ac power supply to the cabinet, near the interface panel.
3. Insert the ac power connector into the ac power socket on the cabinet.
4. Connect the ac power cable to the building power supply socket.

Ensure that all correct **Request for connection** and **Completion and inspection form** certificates have been sent to the local electricity supply board.

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## Installing a hold-up battery module

### Introduction to hold-up module installation

The hold-up battery module is an optional item fitted in the PSM shelf within the CBIA main cage, in any empty slot or in place of the redundant PSM. It may be installed at the same time as the Horizon*macro* BTS or retrospectively. There is no requirement to take the BTS out of service to retrofit the hold-up battery module.

---

### Installing a hold-up battery module

**WARNING** The batteries are capable of supplying high short circuit currents and as such present a high energy hazard.

To install a hold-up battery module:

1. Check that the hold-up battery module enable switch is set to **O** (off).
2. Cut the cable tie that secures the jumper lead to the isolation connection access hatch. Open the access hatch by turning the fastener a quarter turn anticlockwise and lifting.
3. Fit the jumper lead between the battery spade terminals as shown in Figure 2-40. Close the access hatch and turn the fastener a quarter turn clockwise to secure.
4. Set switch of the redundant PSM, (if fitted) to **OUTPUT DISABLE**. The **ACTIVE** LED (green) will extinguish. The **ALARM** LED (red) will light, or if already lit due to alarm state, will stay on.
5. Remove redundant PSM or blanking assembly from the spare slot, by unscrewing attachment screws with a torxdriver.

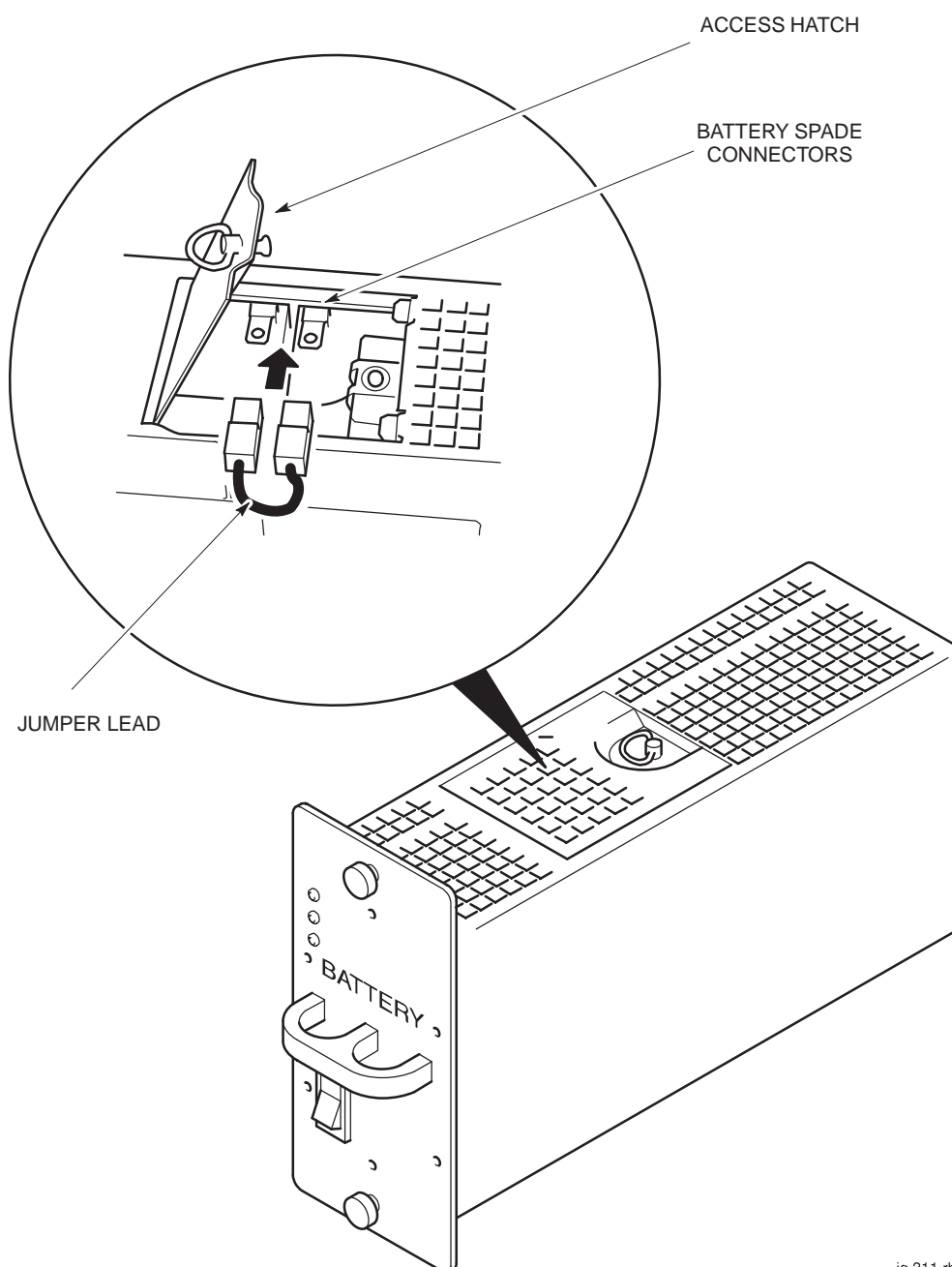
**WARNING** The hold-up battery module weighs 5.9 kg. Handle with care.

6. Insert hold-up battery module in spare slot.
7. Ensure hold-up battery module is firmly in position and tighten both module attachment screws using a torxdriver. Tighten to a torque of 2.2 Nm.
8. Set the hold-up battery module enable switch to **I** (on). Check that the **CHARGE** LED (green) is lit.

**NOTE** The **ACTIVE** LED (green) will not light until 1.5 to 2 hours after installation. The **ALARM** LED (red) may also be lit if the initial battery voltage is below 19 V dc (+/-0.25 V).

### Hold-up battery module view

Figure 2-40 shows the hold-up battery module with the battery isolation jumper connection shown in detail.



ig.311.rh

**Figure 2-40** Connecting battery isolation jumper lead



*Chapter 3*

**Interoperability between different  
Motorola BTSs**



**Chapter 3**

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## Introduction to interoperability

### Mixed product sites

This chapter describes how the *Horizonmacro* indoor can be used in conjunction with other Motorola BTS products.

Different Motorola product types can be collocated at the same physical site without restriction, provided they are configured as logically separate installations, and in accordance with the normal product engineering rules.

When mixed product types are installed at the same logical site, a number of technical issues arise that restrict the hardware that can be configured, and the way it is interfaced. This chapter explains which product types can be mixed in this way, and how they are interfaced.

<b>NOTE</b>	This chapter only applies to the <i>Horizonmacro</i> GSM/EGSM900 and DCS1800 BTS variants. GSM850 and PCS1900 <i>Horizonmacro</i> BTS variants cannot be mixed with other Motorola BTS types.
-------------	---

### Architectural constraints

To enable different product types to be used at the same logical site, one product type is chosen as master, which is connected to the extender equipment so that the two product types can function as a single, logical BTS. This approach is viable when the product types to be interfaced have similar architectures.

Motorola BTS product types that can be interfaced for collocation at a single logical site are therefore restricted to those shown in Table 3-1 below.

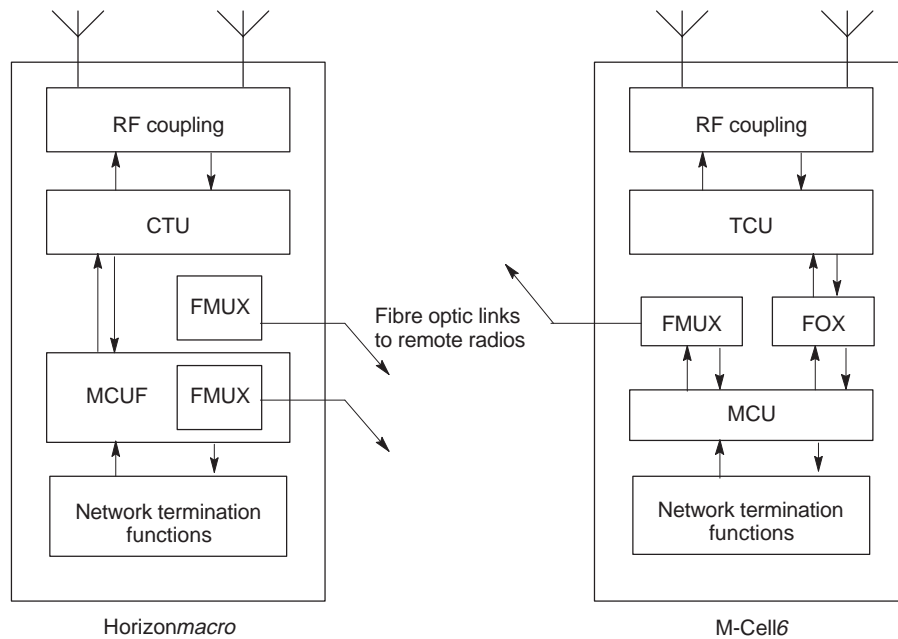
Master	Extender			
	InCell	M-Cell2	M-Cell6	<i>Horizonmacro</i>
InCell	Discontinued	No	No	No
M-Cell2	No	Yes*	Yes*	No
M-Cell6	No	No	Yes*	Yes
<i>Horizonmacro</i>	No	No	Yes*	Yes
* Check for availability before ordering				

Indoor and outdoor cabinets can be mixed, but different mechanical arrangements may be required for routeing the inter-cabinet cabling.

# BTS architectures and interoperability

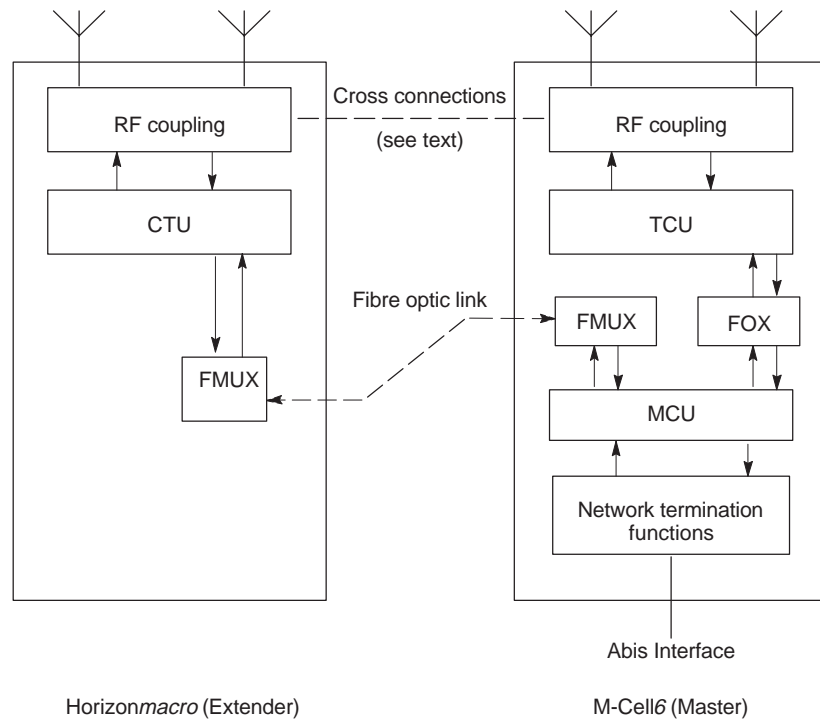
## M-Cell6 and Horizonmacro architectures

Figure 3-1 represents the high level architecture of the M-Cell6 and Horizonmacro BTSs. Both systems provide an optical interface for connection to remote transceivers, which in a normal installation would be used to connect to transceivers of the same product type.



**Figure 3-1** High level architecture of M-Cell6 and Horizonmacro BTSs

However, since the optical interface is identical for both products, it can be used to link an M-Cell6 to Horizonmacro transceivers, or a Horizonmacro to M-Cell6 transceivers. The principle is shown in Figure 3-2.

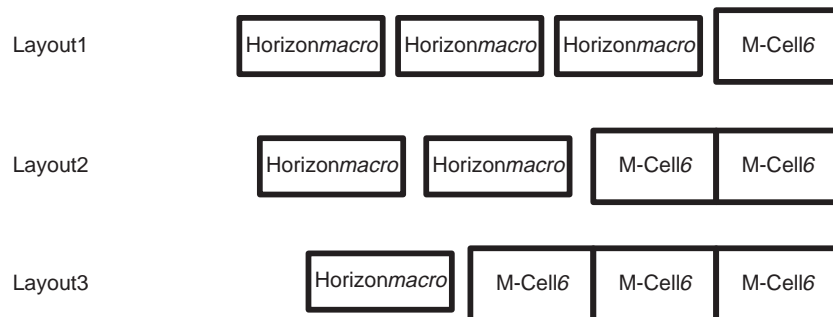


**Figure 3-2** Example of interfacing different products at a single logical site

When two product types are interfaced in this way, the control function for the entire BTS is implemented by the master product. In Figure 3-2, this is the M-Cell6. In practice, either BTS can be configured as master according to the needs of the network concerned.

**Example mixed site**

A multi-cabinet mixed site can typically be achieved in several ways. Figure 3-3 shows the alternative layouts for a four cabinet mixed BTS site



**Figure 3-3** Example of alternative layouts for a 4-cabinet mixed BTS site

## Technical issues

When mixing different BTS types, the interface may be required to resolve some or all of the following issues, depending on the site configuration:

- The interface must deliver both Rx and Rx<sub>div</sub> (receive diversity) signals to each transceiver.
- The interface must not change the uplink (receive) signal level delivered to any transceiver.
- The interface must ensure that in the mixed BTS configuration, RF combiners remain correctly loaded.

---

## Receive path

When a cell is wholly configured within one cabinet, there is no requirement to connect the uplink or downlink RF signals between the master and extender cabinets. The only interface between the cabinets in this type of mixed BTS configuration is therefore at digital level, between FMUXs via the fibre optic link.

When a cell is split between two cabinets, the uplink signals must be connected between the cabinets since both Rx and Rx<sub>div</sub> signals are required at each transceiver. In this situation the downlink signal may or may not require connection between cabinets, depending on the site configuration. The uplink connectivity requirements are shown in Figure 3-4 (DCS1800) and Figure 3-5 (GSM900).

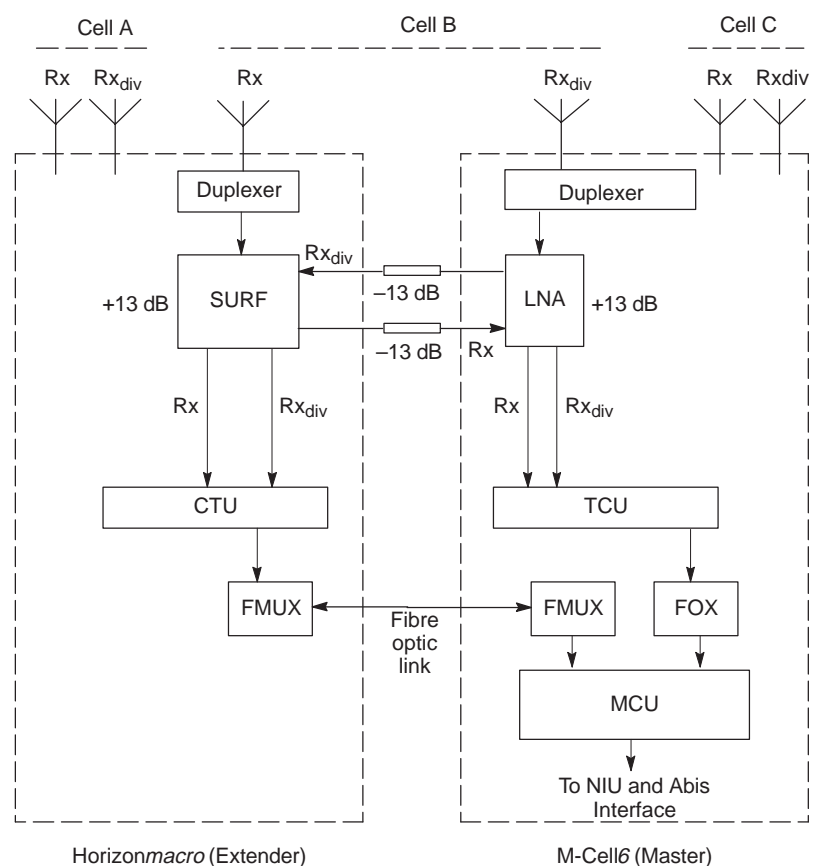


## DCS1800

Refer to Figure 3-4. In the *Horizonmacro* cabinet, low noise amplification in the SURF module first boosts the Rx signal by +13 dB. Separate Rx outputs from the SURF are then discretely routed to relevant transceivers in the master cabinet, and to the LNA in the extender cabinet. Since the LNA boosts the Rx signal by a further +13 dB, a 13 dB attenuator is placed in the signal path to offset this additional signal gain, which would otherwise result in signal levels outside the permitted range for the transceivers.

The  $Rx_{div}$  signal is similarly given a +13 dB boost by the LNA in the extender cabinet. Separate  $Rx_{div}$  outputs from the LNA are then discretely routed to relevant receivers in the extender cabinet, and to the SURF module in the master cabinet. Since the SURF provides a further +13 dB boost, a 13 dB attenuator is again placed in the signal path to offset this additional gain.

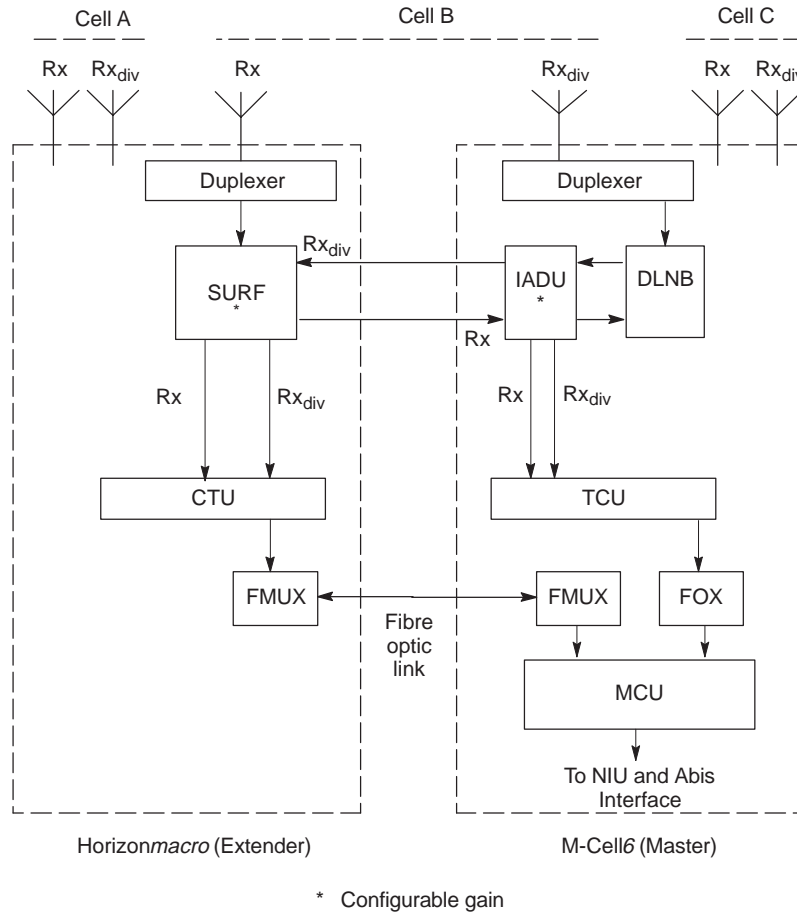
In this way, the arrangement shown in Figure 3-4 delivers Rx and  $Rx_{div}$  signals to the uplink path in both cabinets, at the required signal level.



**Figure 3-4** Functional overview of the receive path for a DCS1800 split cell configuration

**GSM900**

Refer to Figure 3-5. In GSM900 products, RF gain for the IADU and SURF is configurable. A split cell configuration is therefore dealt with in the same way as that described for DCS1800, except that the 13 dB attenuators are not required. Instead, the required signal level is maintained by using appropriate gain settings for the IADU and SURF.

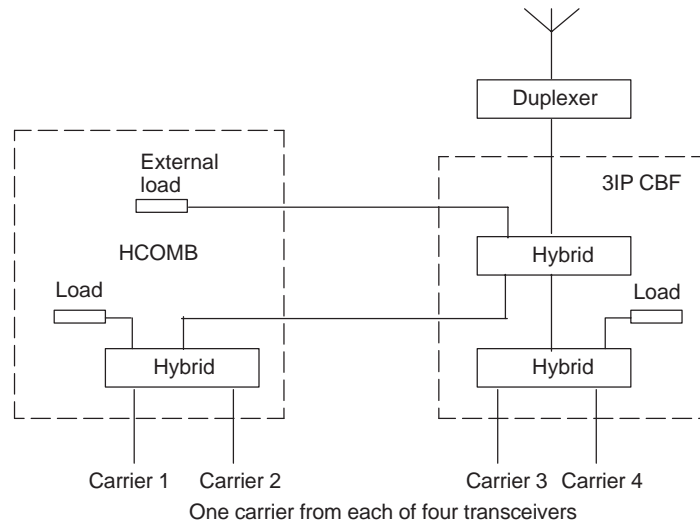


**Figure 3-5** Functional overview of the receive path for a GSM900 split cell configuration

## Transmit path

### M-Cell6 combining

When configuring the downlink paths for a cell using three carriers or more, it may be necessary to provide additional external RF load(s) for the combiners. This is illustrated by Figure 3-6, which shows a typical M-Cell6 combining arrangement for a 4-carrier cell.

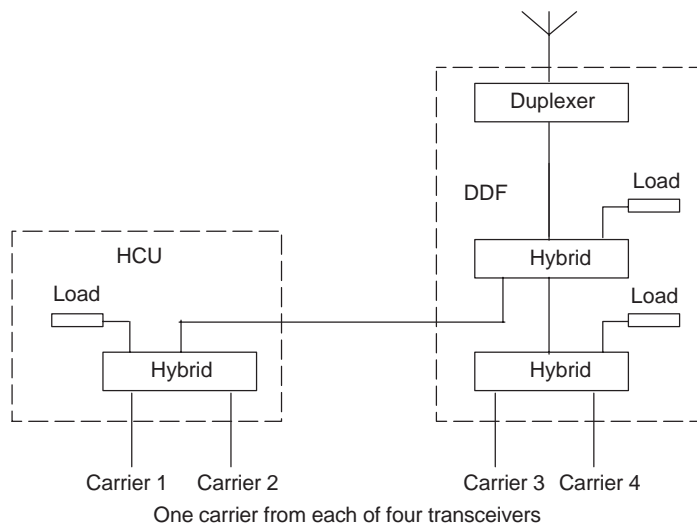


**Figure 3-6** Typical M-Cell6 arrangement for combining four carriers

Carriers 1 and 2 are combined in a hybrid combiner (HCOMB) module. The output from this module provides one of the three inputs to the 3IP CBF. The HCOMB is equipped with an internal RF load, and is therefore self-contained. The 3IP CBF requires one RF load for each of the two hybrids it contains, but is equipped with only a single internal RF load. An additional load is therefore provided for this purpose on the HCOMB casing.

**Horizon*macro* combining**

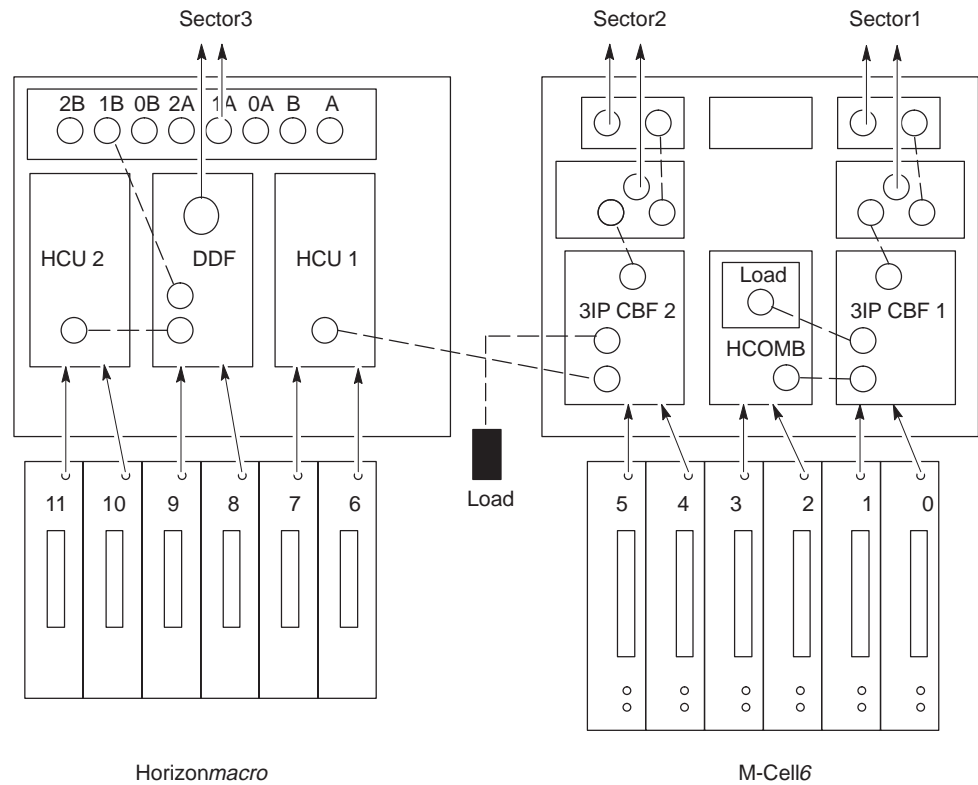
A similar arrangement is used in the Horizon*macro*, which uses a Hybrid Combiner Unit (HCU) and Dual stage Duplexed combining Filter (DDF), as shown in Figure 3-7. The DDF has three input ports together with two internal RF loads, and therefore does not require the addition of any external load.



**Figure 3-7** Typical Horizon*macro* arrangement for combining four carriers

### Mixed equipment combining

When the two different product types are interfaced, a situation can arise where a 3IP CBF is connected to an HCU, as shown in Figure 3-8. In this configuration it is therefore necessary to provide an additional external RF load for this 3IP CBF. The example in Figure 3-8 shows downlink connections for a 4/4/4 configuration using mixed BTS types.



**Figure 3-8** Downlink configuration for a 4/4/4 mixed cabinet installation

Inputs for the DDF are carriers 8 and 9, together with the output of HCU2. The DDF contains two RF loads and is therefore self-contained. Inputs to 3IP CBF1 are carriers 0 and 1, together with the combined output of HCOMB. 3IP CBF1 contains a single load and is therefore connected to the external load mounted on HCOMB. Inputs for 3IP CBF2 are carriers 4 and 5, together with the output of HCU1, from the master cabinet. 3IP CBF2 contains a single load and therefore requires the addition of an external 50 ohm load, as shown.

## M-Cell6 and Horizonmacro hardware equivalents

Table 3-2 shows the RF hardware equivalents for the Horizonmacro and M-Cell6 BTSs.

Horizonmacro 900/1800	M-Cell 900	M-Cell 1800
DCF	CBF + duplexer	Hybrid + duplexer
DDF	3- input CBF* + duplexer	2 x hybrid + dup/BPF
HCU	Hybrid	Hybrid
Feedthrough plate	Non-hybrid	(no equivalent)
TDF	TBF + duplexer	2 x dup/BPF
CCB master	CCB master	CCB master
CCB extender	CCB extender	CCB extender
SURF	3 x DLNB + IADU	3 x LNA
Split Sector Cable	Rx Extender	(no equivalent)

\* 3-input CBF contains only one internal 50 ohm load.

## Further configuration information

Provided the functional guidelines described in this chapter are followed, the steps involved in upgrading an existing site with mixed equipment are essentially the same as with a conventional upgrade:

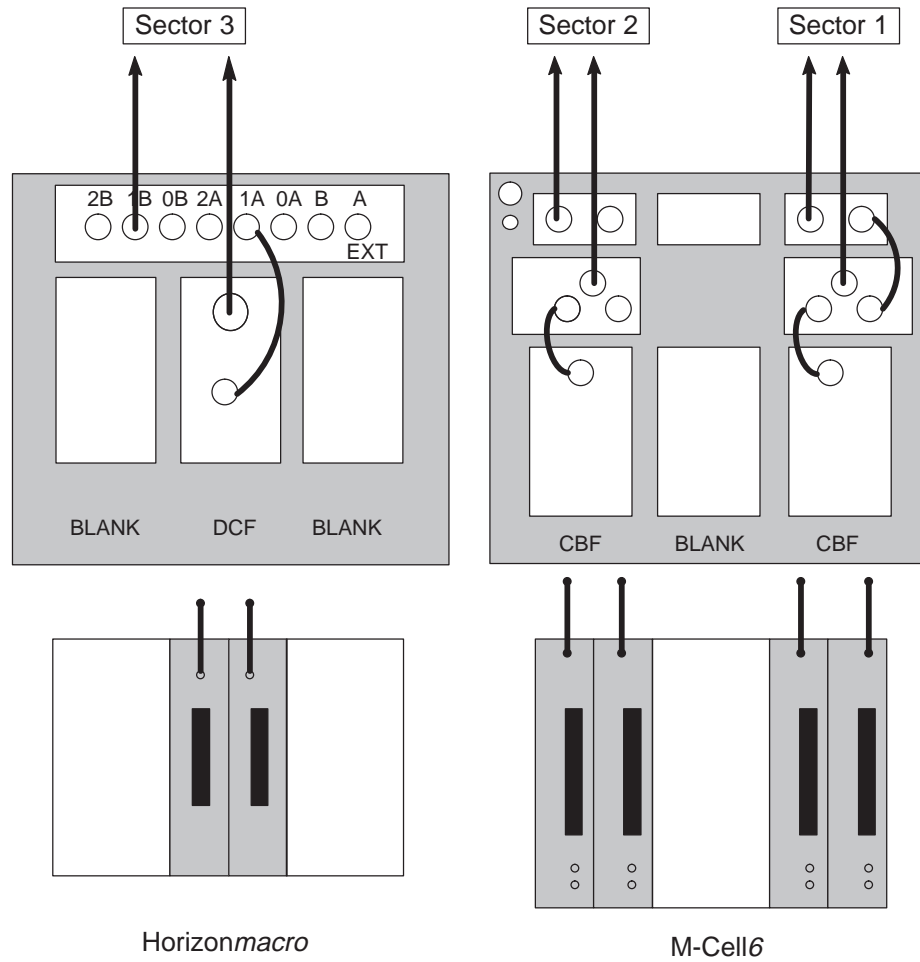
- Determine the number of additional carriers required in the upgraded site.
- Based on the required site configuration (for example, 4/4/4), use the functional guidelines provided in this chapter to decide the most effective hardware configuration for the additional cabinet(s).
- Special upgrade kits are available for specified configurations.
- Configuration diagrams and product ordering help are available from the Motorola local office.

**Example configurations**

Configuration diagrams provided by the Motorola local office show top of rack cable and antenna connections for mixed product configurations, together with details of external RF loads required. Figure 3-9, Figure 3-10 and Figure 3-11 are examples of the type of diagram that can be provided.

**GSM900 2/2/2 configuration using two cabinets**

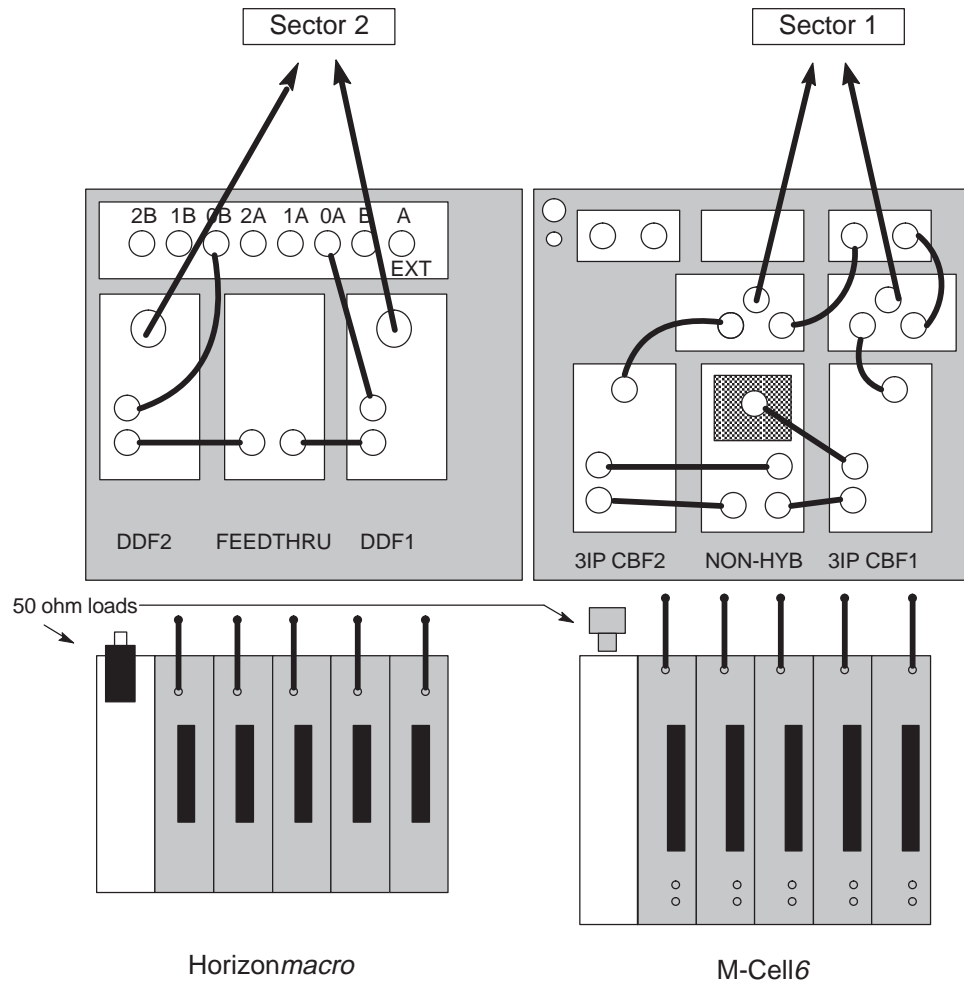
In this configuration, there are no split cells, and therefore no uplink/downlink connections between the cabinets. The CBFs are 2-input devices, consequently no external RF loads are required.



**Figure 3-9** GSM900 mixed *Horizonmacro* / M-Cell6 2/2/2 configuration using two cabinets

**GSM900 5/5 configuration using two cabinets**

In this configuration, there are no split cells, and therefore no uplink or downlink connections between the cabinets. In the M-Cell6 cabinet, both 3IP CBFs are configured with external loads provided by the NON HYB. In the *Horizonmacro*, one DDF has two direct RF inputs, plus a third input via the FEEDTHRU. The second DDF has two RF inputs, one direct and one via the FEEDTHRU. This arrangement facilitates using the transceivers in sequence. The two 50 ohm loads are required to terminate the unused DDF/3IP CBF input ports.

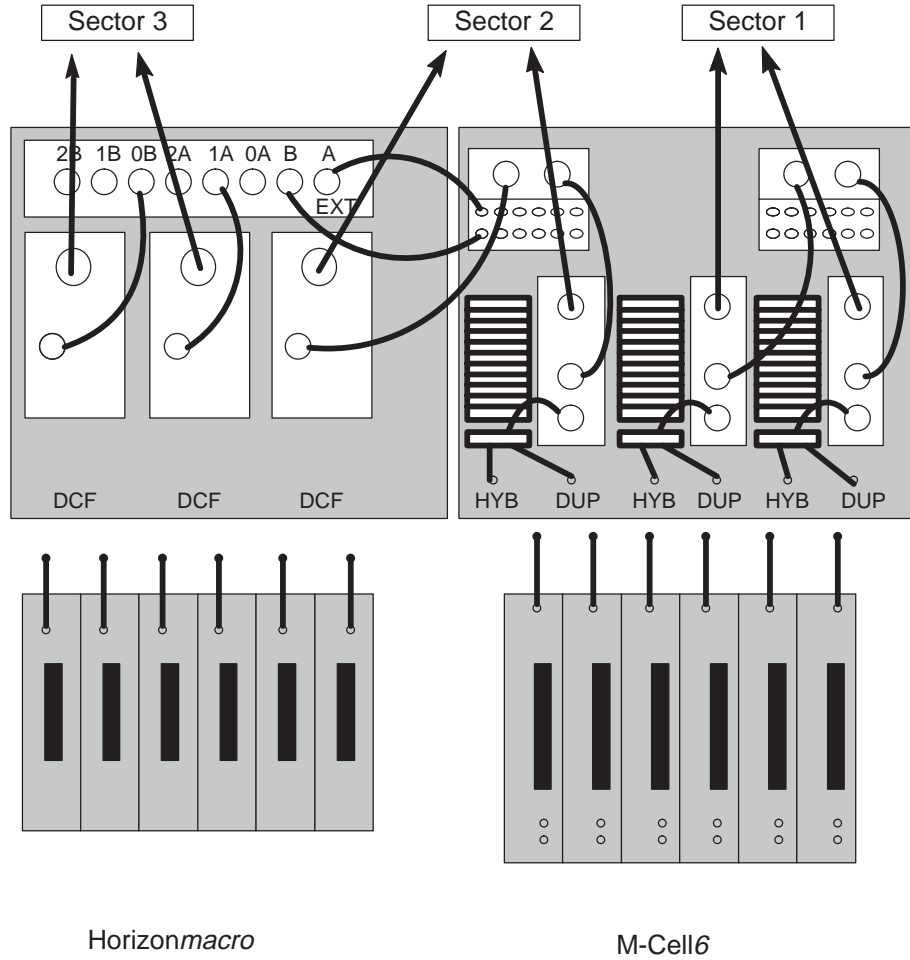


**Figure 3-10** GSM900 mixed *Horizonmacro* / M-Cell6 5/5 configuration using two cabinets



**DCS1800 4/4/4 configuration using two cabinets**

In this configuration, sector 2 is split between the cabinets. The uplink Rx and Rx<sub>div</sub> signals for sector 2 are therefore connected between the BTS types to ensure the availability of both signals in both cabinets. In the M-Cell6 cabinet, 2-input hybrids are used for combining, each configured with a discrete external load.

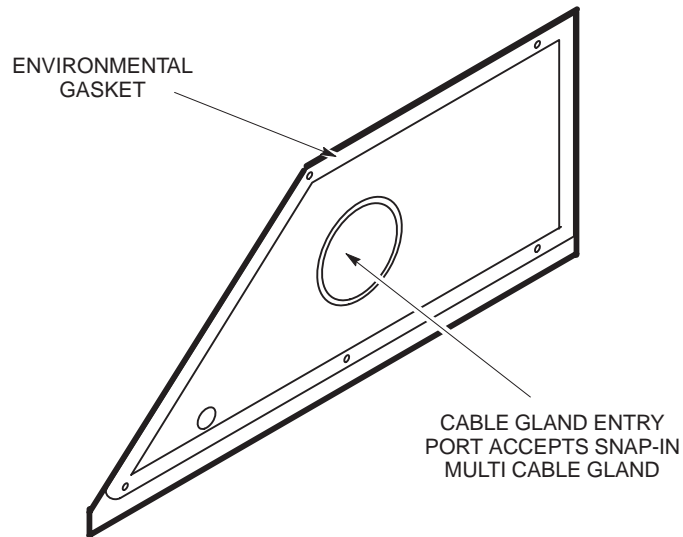


**Figure 3-11** DCS1800 Mixed *Horizonmacro* / *M-Cell6* 4/4/4 configuration using two cabinets

### Special hardware

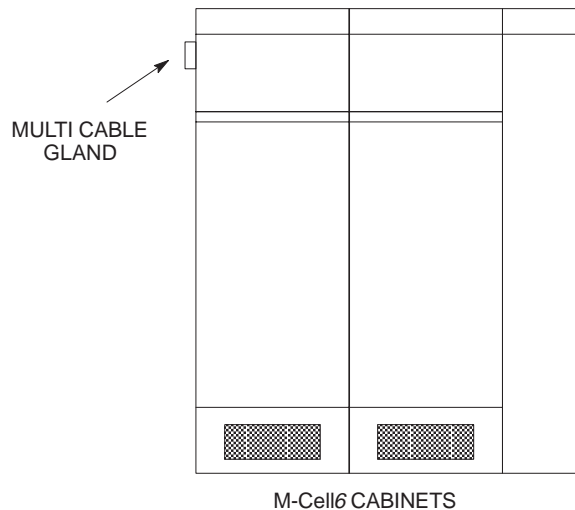
A range of cables is available for uplink, downlink and fibre optic connections, together with the uplink attenuators described earlier. Contact the Motorola local office for further details.

In addition, the mounting plate and snap-in multi cable gland shown in Figure 3-12 are required when expanding M-Cell6 outdoor sites with Horizonmacro cabinets. In this type of configuration, the Horizonmacro equipment is located to the left of the M-Cell6 cabinets.



**Figure 3-12** Special cable gland plate required for mixed M-Cell6 and Horizonmacro installations

The mounting plate is located as shown in Figure 3-13 in place of the original blanking plate fitted to the M-Cell6.



**Figure 3-13** Location of the snap-in multi cable gland and mounting plate in the M-Cell6

## *Chapter 4*

# **Commissioning of indoor cabinet**



<b>Chapter 4</b>	
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Test equipment .....	Inst. 4-2
Pre-power up checks .....	Inst. 4-3
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Request for power supply connection .....	Inst. 4-4
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## Commissioning overview and test equipment

### Overview of commissioning

This chapter provides information required for the commissioning of cabinets and their internal and external interfaces.

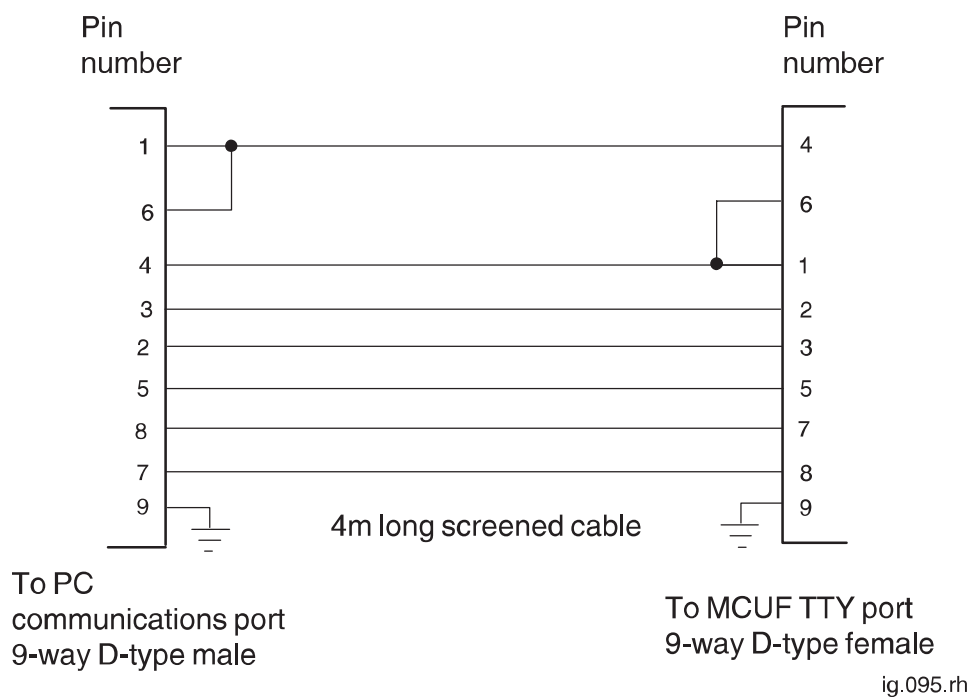
<b>NOTE</b>	Some equipment at the site may not be produced by Motorola, including battery chargers, power supplies, and antennas. Refer to site-specific documentation and the non-Motorola vendor instructions.
-------------	--

All site preparation and equipment installation in the previous chapters must be completed before commissioning. Commissioning consists of the following:

- Pre-power up checks.
- Powering up the cabinet.
- Optimization procedures as detailed in *Installation and Configuration: BSS Optimization (GSM-100-423)*.

### PC to MCUF cable pin connections

Figure 4-1 shows the pin connections for the PC to MCUF test cable. These are standard null modem pin connections. There is also a TTY adapter, to attach to the cable, for CTU use, Motorola part number 58C86540N01.



**Figure 4-1** 9-way to 9-way PC to MCUF cable pin connections

## Test equipment

Table 4-1 provides details of the test equipment required to perform the commissioning procedures in this chapter.

<b>Table 4-1</b> Test equipment required for commissioning		
<b>Quantity</b>	<b>Description</b>	<b>Comments</b>
1	IBM compatible portable Personal Computer (PC) (486 DX2 or DX4 minimum)	The minimum requirements are: TFT colour screen. 170 Mbyte hard drive (minimum). Minimum 4 Mbyte RAM or recommended 8 Mbyte. 3.5 inch floppy drive. Serial port. CD-ROM drive (recommended) PCMCIA (Type 2) compatible slot. Windows (3.1 running in 386 enhanced mode minimum) loaded and running. Battery power.
1	Commercial terminal emulator software	PC PLUS or similar software (suitable for PC being used)
1	Digital multimeter (must be sensitive enough to measure 0.05 ohms)	Hewlett Packard E2378A or equivalent
1	ESD protection kit	
1	9-way male D-type to 9-way female D-type adaptor	For PC to MCUF Pin connections shown in Figure 4-1.
1	PAT tester	Insulation and earth tester



## Pre-power up checks

---

### Overview of pre-power up checks

**WARNING** Before powering up the equipment, the power system checks provided in this section must be performed.

This section contains procedures for testing the power system prior to applying power to the cabinet.

**WARNING** 230 V is present within the cabinet, when the cabinet is directly connected to an ac supply. Earth straps are not to be worn during the commissioning of the ac and dc power system, and watches and other jewellery should be removed. Only insulated tools should be used.

**CAUTION** This equipment contains CMOS devices and is vulnerable to static discharge. Although the damage may not be immediately apparent, CMOS devices may be damaged in the long term due to mishandling causing barrier breakdown. The approved earth strap (high impedance) must be worn at all times when adjusting or handling the processor cards (but see WARNING above, regarding use of earth straps). If the cabinet door is kept open for long periods of time during commissioning, an alternative method of cooling must be provided to avoid damage to the equipment through overheating.

---

## Visual inspection

Inspect the installation for damage in accordance with BS 7671 (16th Edition <Section 712>) or the IEC 364 equivalent.

<b>WARNING</b>	If damage is discovered during the visual inspection, the commissioning must not proceed further until the damage has been inspected and rectified by the manufacturers or their representatives.
----------------	---

### Cabinet exterior

Examine the exterior of the cabinets for structural, paint or mechanical damage and report any damage to Motorola.

### Cabinet interior

Examine the interior of the cabinet for structural, paint or mechanical damage and report any damage to Motorola.

### Power equipment

Examine the power equipment for mechanical damage and report any damage to Motorola.

---

## Request for power supply connection

Ensure that all correct **Request for connection** and **Completion and inspection form** certificates have been sent to the local electricity supplier.

<b>NOTE</b>	Samples of a typical <b>Request for connection</b> and a <b>Completion and inspection form</b> are shown in <b>Sample form 1</b> and <b>Sample form 2</b> at the end of this chapter.
-------------	---

## Earth continuity check

Ensure an earth continuity check has been performed on appropriate equipment if required. Use the digital multimeter to check that the resistance of the test equipment leads is less than 0.05 ohms.

### Main equipment earths

Connect the PAT tester to the earth terminal and to the following earth points:

- Antenna feeders.
- AC supply input earth.
  - The local electricity board termination point.
  - AC distribution board.
  - AC supply isolator.

**NOTE** The switched isolator will not be connected to earth if it is a double insulated device and will therefore not require testing.

- Battery box chassis.
- Cabinet chassis (all cabinets).
- +27 V power supply unit chassis.
- Rack members.

Check that the measured resistance is less than 0.1 ohms with the tester connected to a conductive surface (bare metal) at extreme ends of the earth cables.

On completion of each earth check apply conductive non-oxidizing grease to the earth connections on the earth busbar.

## AC power system insulation check

Ensure an insulation check has been performed on all ac power cables which supply the site up to the ac input to the Cabinet. Testing must be carried out in accordance with the BS 7671 (16th Edition <section 713-04-01 to 713-04-06>) or IEC 364 equivalent, at the voltage levels shown in Table 4-2, using an approved insulation tester. Check that the resistance at each point is as shown in Table 4-2.

Table 4-2 BS7671 (16th edition) Table 71A (part of)		
Parameter	AC test voltage (volts)	Minimum insulation (megohms)
Up to and including 500 V	500	0.5

When the test has been completed, sign the completion and inspection certificate, a sample of which may be found in **Sample form 2**.

---

## Powering up the cabinet

### Power up overview

This procedure assumes all previous procedures have been completed.

<b>CAUTION</b>	Ensure correct PSMs are fitted to match the supply source voltage. Ensure that there is no blockage to ventilation at the base of the cabinet.
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### Power up procedure without code load

The following procedure should be carried out to power up the cabinet, with no code load. This proves the cabinet hardware is capable of operation. The procedure for cabinet code load is described in the next section.

Relevant components are shown in Figure 4-2.

<b>WARNING</b>	Earth straps are not to be worn during the commissioning of the power system, and watches and other jewellery should be removed. Only insulated tools should be used. The power source must be supplied to the cabinet via a suitable over-current protective device and be isolated from the BTS cabinet.
----------------	--

#### Procedure to prepare cabinet for power up without code load

To prepare the cabinet prior to power up:

1. Ensure the power source isolator is switched off.
2. Disconnect all E1/T1 lines from the BTS.
3. If fitted, remove the optional PCMCIA card from the MCUF slot.
4. Set the switch of each PSM to the OUTPUT DISABLE position.
5. Press and release all push on/push off circuit breaker buttons to the **out** (off) position.

### Power up of cabinet without code load

To power up the cabinet:

1. Switch on the external power supply to the cabinet.
2. Turn each PSM switch to the OUTPUT ENABLE position; check that each PSM has the active (green) LED on and the alarm (red) LED off.
3. Press the CBM circuit breaker button marked **FANS**. Check that each fan module is operating correctly. Activate any fan not started by the restart button (marked either **FRONT** or **REAR**) on the fan module.
4. Press the CBM circuit breaker button marked **SURF**, and if CCBs are fitted, press the circuit breaker buttons marked **CCB0** and **CCB1**.
5. Press the CBM circuit breaker button marked **BPSM A** and (if redundant BPSM fitted) **BPSM B**. Check all associated digital module LEDs operate correctly; green LEDs lit on BPSM, NIU and MCUF, and red LEDs off on NIU and MCUF.

**NOTE**

Both red and green LEDs are initially lit on the NIU while the unit conducts a self test. After approximately 20 seconds, the red LED will extinguish, indicating normal condition.

6. Press the appropriate CBM circuit breaker buttons for the CTUs fitted, and check that the RADIO STATUS LED for each CTU flashes green.
7. Close the door to ensure correct ventilation.

This completes the power up of the cabinet.

### Power down of cabinet

If the cabinet is not required to remain powered up, power down the cabinet as follows:

1. Press all circuit breaker buttons to the **out** (off) position.
2. Switch each PSM to the OUTPUT DISABLE position.
3. Switch off the external power supply to the cabinet.

This completes the power down of the cabinet.

### Power up procedure with code load

The following procedure should be carried out to power up the cabinet, with code load. The code will be provided either direct from the BSC from E1 line or from a PCMCIA card installed in the PCMCIA socket of the master MCUF.

Relevant components are shown in Figure 4-2.

**CAUTION**

This procedure should be carried out only by experienced field engineers.

### Procedure to prepare cabinet for power up with code load

To prepare the cabinet prior to power up, proceed as follows:

1. Ensure E1 connection to BSC is made.
2. Insert (optional) PCMCIA card in MCUF PCMCIA socket.
3. Connect the 9 to 9-way cable from the PC serial A port to MCUF TTY port.
4. At the PC start the terminal emulator program.
5. Change to Level 3 and at the MMI-RAM> prompt type:  
**CTRL N**
6. Set the switch of each PSM to the OUTPUT DISABLE position.
7. Press and release all push on/push off circuit breaker buttons to the **out** (off) position.

### Power up of cabinet with code load

To power up the cabinet, proceed as follows:

<b>CAUTION</b>	When the two LEDs of the CTU or the MCUF are flashing, the boot code is downloading into non-volatile memory for software upgrade. Power should not be removed, nor the cabinet reset, until downloading has been completed, as this will corrupt the non-volatile memory. If boot code is corrupted, contact the Motorola Customer Network Resolution Centre and request the boot code restoration procedure and the appropriate boot code file.
----------------	---

1. Switch on the external power supply to the cabinet.
2. Turn each PSM switch to the OUTPUT ENABLE position; check that each PSM has the active (green) LED on and the alarm (red) LED off.
3. Press the CBM circuit breaker button marked **FANS**. Check that each fan module is operating correctly. Activate any fan not started by the restart button (marked either **FRONT** or **REAR**) on the fan module.
4. Press the CBM circuit breaker button marked **SURF**, and if CCBs are fitted, press the circuit breaker buttons marked **CCB0** and **CCB1**.

5. Press the CBM circuit breaker button marked **BPSM A** and (if redundant BPSM fitted) **BPSM B**. Check all associated digital module LEDs operate correctly; green LEDs lit on BPSM, NIU and MCUF, and red LEDs off on NIU and MCUF.

MCUF initialization will commence at power up. A connection to the BSC will be established and code download will take place. After download the site will be initialized.

<b>NOTE</b>	The NIU module will initially show both red and green LEDs lit while the unit conducts a self test. When rebooting due to a code download, the red LED extinguishes after approximately 50 seconds.
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<b>CAUTION</b>	If the code is a different version, the non-volatile memory will be upgraded at this point. Both LEDs will be flashing, and a warning message will appear on the PC terminal. Do not power down or reset the cabinet as this will corrupt the non-volatile memory. If this happens, contact Motorola Customer Network Resolution Centre and request the boot code restoration procedure and the appropriate boot code file.
----------------	---

6. Press the CBM circuit breaker buttons for the appropriate CTUs fitted, and check that the RADIO STATUS LED for each CTU flashes green.

At this point, after the MCUF has initialized, the CTUs will download code from the MCUF.

<b>CAUTION</b>	If the code is a different version, the non-volatile memory will be upgraded at this point. Both LEDs will be flashing. Do not power down or reset the cabinet as this will corrupt the non-volatile memory. If this happens, contact Motorola Customer Network Resolution Centre and request the boot code restoration procedure and the appropriate boot code file.
----------------	---

7. Once fully initialized, all CTUs should have RADIO STATUS LED solid green, and TRANSMIT STATUS LED either off or solid yellow.
8. Disconnect the 9 to 9-way cable from the MCUF TTY port.
9. Close the door to ensure correct ventilation.

This completes the power up of the cabinet.

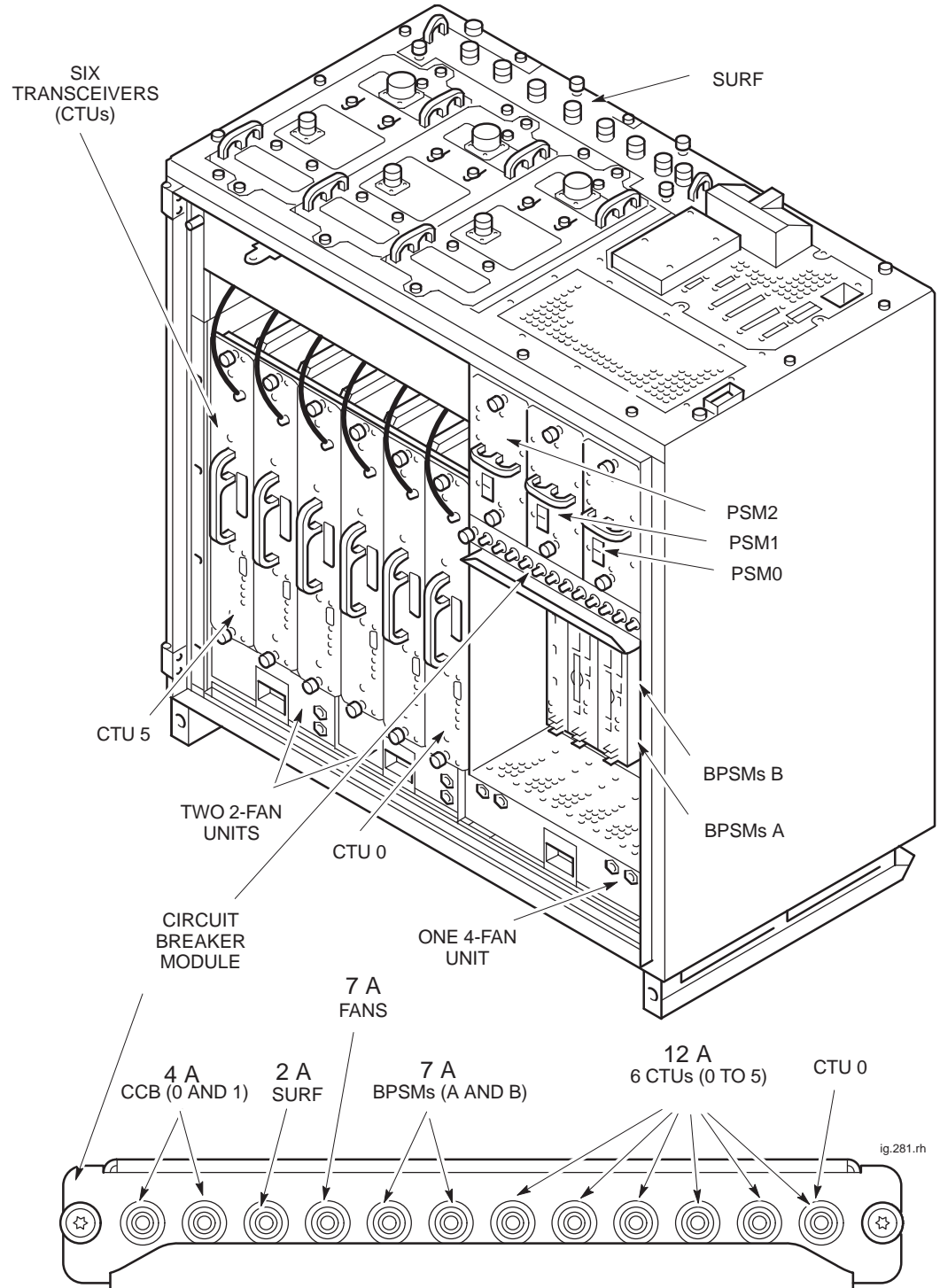
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## Installation and configuration

Consult *Installation and Configuration: BSS Optimization (GSM-100-423 68P02901W43)* for further procedures associated with ensuring a new site is fully operational and optimized.

### Cabinet and CBM views

Figure 4-2 shows the cabinet components and enlarged view of CBM showing circuit breaker buttons.



**Figure 4-2** Diagram of cabinet with expanded view of CBM



# Sample form 1: Request for connection

## XXXXXXXXXX ELECTRIC REQUEST FOR A CONNECTION OF A CUSTOMER'S INSTALLATION

The electrical installation at the following address will be ready for connection  
on (date) .....

**NOTE :** At least 4 full working days' notice is required.

Address .....

..... Telephone No. ....

### DETAILS OF INSTALLATION

The installation to be connected is :  
*tick as appropriate*

A completely new installation                       An alteration                       A rewire

#### TYPE OF EQUIPMENT

- Cooker
- Water heater
- Storage radiators
- Other *list below*

#### CONNECTED LOAD (kW)

#### METHOD OF EARTHING *tick as appropriate*

- PME
- Cable Sheath
- RCD
- Other  Give Details

#### NO OF PHASES

- 1
- 3
- Other  Give Details

### DECLARATION

The electrical installation, summarised above, complies with the current edition of the Regulations for Electrical Installations published by the Institution of Electrical Engineers and is now ready for connection to xxxxxxxx Electric's supply network.

It is understood that xxxxxxxx Electric will carry out tests, required by law, prior to connection, but these tests will NOT confirm that the installation complies with the IEE Wiring Regulations, NOR will its connection imply that it is approved by xxxxxxxx Electric in any way.

Electrical Installer's Name .....

Address .....

..... Telephone No. ....

Signed ..... Date .....

**PARTICULARS OF THE INSTALLATION**

(Delete or complete items as appropriate)

Type of Installation New/alteration/addition/to existing installation

Type of earthing (312-03): TN-C   TN-S   TN-C-S   TT   IT  
 (Indicate in the box)            

Earth Electrode Resistance ..... ohms  
Method of Measurement .....  
Type (542-02-01) and Location .....

Characteristics of the supply at the origin of the installation ( 313-01):

Nominal voltage ..... volts  
 Frequency ..... Hz ..... Number of phases .....

	ascertained by enquiry	determined by calculation	measured
Prospective short-circuit current ..... kA			
Earth fault loop impedance (Z <sub>e</sub> ) ..... ohms			
Maximum demand ..... A per phase			

Overcurrent protective device – Type BS ..... Rating ..... A  
 Main switch or circuit-breaker (460-01-02): Type BS ..... Rating ..... A No of poles .....  
 (if an r.c.d., rated residual operating current I ..... mA.)

Method of protection against indirect contact:

1. Earthed equipotential bonding and automatic disconnection of supply
- or
2. Other  (Describe) .....

Main equipotential bonding conductors (413-02-01/02, 547-02-01): Size ..... mm<sup>2</sup>

schedule of Test Results: Continuation ..... pages

Details of departures (if any) from the Wiring Regulations (120-04, 120-05) .....

Comments on existing installation, where applicable (743-01-01): .....

# Sample form 2: Completion and inspection form

<b>FORMS OF COMPLETION AND INSPECTION CERTIFICATE</b> (as prescribed in the IEE Regulations for Electrical Installations)	
<b>DETAILS OF THE INSTALLATION</b>	
Client:	
Address: <span style="float: right;">(1.) (see Notes overleaf)</span>	
<b>DESIGN</b>	
I/We being the person(s) responsible (as indicated by my/our signatures below) for the Design of the electrical installation, particulars of which are described on Page 3 of this form CERTIFY that the said work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with the Regulations for Electrical Installations published by the Institution of Electrical Engineers, 16th Edition, amended to (3.) (date . . . . .) except for the departures, if any, stated in this Certificate.	
The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.	
For the DESIGN of the installation:	
Name (In block Letters):	Position:
for and on behalf of:	
Address:	
(2.) Signature:	(3.) Date
<b>CONSTRUCTION</b>	
I / We being the person(s) responsible ( as indicated by my/our signatures below ) for the Construction of the electrical installation, particulars of which are described on Page 3 of this form CERTIFY that the said work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with the Regulations for Electrical Installations published by the Institution of Electrical Engineers, 16th Edition, amended to (3.) (date . . . . .) except for the departures, if any, stated in this Certificate.	
The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.	
For the CONSTRUCTION of the installation:	
Name (In block Letters):	Position:
for and on behalf of:	
Address:	
(2.) Signature:	(3.) Date
<b>INSPECTION AND TEST</b>	
I / We being the person(s) responsible ( as indicated by my / our signatures below ) for the Inspection and Test of the electrical installation, particulars of which are described on Page 3 of this form CERTIFY that the said work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with the Regulations for Electrical Installations published by the Institution of Electrical Engineers, 16th Edition, amended to (3.) (date . . . . .) except for the departures, if any, stated in this Certificate.	
The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.	
For the INSPECTION AND TEST of the installation:	
Name (In block Letters):	Position:
for and on behalf of:	
Address:	
I RECOMMEND that this installation be further inspected and tested after an interval of not more than . . . . years (5.)	
(2.) Signature:	(3.) Date
(6) page 1 of . . . . pages	

1. This document is intended for the initial certification of a new installation or of an alteration or addition to an existing installation and of an inspection.
2. The signatures appended are those of the persons authorised by the companies executing the work of design, construction and inspection and testing respectively. A signatory authorised to certify more than one category of work shall sign in each of the appropriate places.
3. Dates to be inserted.
4. Where particulars of the installation recorded herein constitute a sufficient schedule for the purpose of Regulation 514-09-01 further drawings / schedules need not be provided. For other installations the additional drawings/schedules listed below apply.
5. Insert here the time interval recommended between periodic inspections. Regard should be paid to relevant National or Local legislation and reference should be made to chapter 13.
6. The page numbers of each sheet should be indicated together with the total number of sheets involved.

**(4) Schedule of additional records.**

(6) page 2 of . . . . pages

*Chapter 5*

# Decommissioning of cabinet



**Chapter 5**  
**Decommissioning of cabinet** ..... **i**

Decommissioning Horizonmacro indoor ..... Inst. 5-1

- Introduction to decommission procedures ..... Inst. 5-1
- Before cabinet decommission ..... Inst. 5-1
- To decommission using checklist ..... Inst. 5-1
- Initial decommission checks ..... Inst. 5-1
- Powering down the cabinet ..... Inst. 5-2
- Disconnection of cabinet cables ..... Inst. 5-2
- Eyebolt positions and safety ..... Inst. 5-3
- Removing upper cabinet in stacked configuration ..... Inst. 5-4
- View of eyebolt positions ..... Inst. 5-5
- Removing CCBs ..... Inst. 5-6
- Removing a stacking bracket ..... Inst. 5-7
- Removing floor mounted cabinet ..... Inst. 5-8
- Returning equipment to Motorola ..... Inst. 5-8
- Horizonmacro indoor decommission checklist ..... Inst. 5-9





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## Decommissioning Horizon*macro* indoor

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### Introduction to decommission procedures

This chapter describes how to decommission a Horizon*macro* indoor cabinet. To decommission equipment not supplied by Motorola, for example E1/T1 links, power supplies and antennas, refer to the vendor instructions.

<b>WARNING</b>	Hazardous voltages in excess of 240 V ac may exist inside a Horizon <i>macro</i> indoor cabinet. Use extreme caution when working on a Horizon <i>macro</i> Indoor cabinet with power applied. Remove all rings, watches and other jewellery. In a stacked cabinet configuration, check that the bottom cabinet is bolted to the floor using the supplied plinth. IF NOT, this presents a danger of toppling that the decommissioning personnel must take into account.
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### Before cabinet decommission

Read all the earlier chapters of this installation section, before attempting to decommission a Horizon*macro* indoor cabinet.

---

### To decommission using checklist

The following procedure should be recorded by use of the checklist, to check that each action has been completed. Photocopy the checklist as often as required; do not write on the original manual copy.

---

### Initial decommission checks

When starting to decommission a Horizon*macro* indoor cabinet:

- Contact the OMC-R and ensure the cabinet is taken out of service.
- Open the cabinet door and power down the cabinet, as described in **Powering down the cabinet** in this section.
- Ensure that NO power is connected to the enclosure.
- Ensure that sufficient packing cartons are available to pack the decommissioned equipment.
- Ensure any unused items, such as hood pins, have been retrieved from storage elsewhere.

---

## Powering down the cabinet

To power down the cabinet:

1. Press and release all circuit breaker buttons to the **out** (off) position.
2. Switch each PSM to the OUTPUT DISABLE position.
3. Switch off the external power supply to the cabinet.

---

## Disconnection of cabinet cables

Follow this procedure to disconnect a Horizon*macro* indoor cabinet cables for decommissioning:

<b>WARNING</b> Untidy disconnected cables can create a trip hazard to personnel using the site.
---

### Checking and disconnecting from power source

To disconnect power supply cables:

1. Check the cabinet for signs of damage.
2. Ensure that power is NOT present at the cabinet.
3. Disconnect the ac or dc input power cables, from the power source.
4. Disconnect the ac or dc input power cables, from the cabinet.
5. Stow disconnected cables safely.
6. If the power cable is not to be used again for other equipment, dispose of safely.

### Disconnecting all remaining external cables

To disconnect remaining cables:

1. Disconnect all cabling from interface panel.
2. Disconnect all RF cables to antennas or other cabinets.
3. Disconnect fibre optic cables between main cabinet and any extension cabinets.
4. Disconnect the earth cable.
5. Stow disconnected cables safely.
6. If the cables are not to be used again for other equipment, dispose of safely.

## Eyebolt positions and safety

There are four eyebolt positions to enable lifting of a second cabinet from the top of the first cabinet stacking bracket. Eyebolts are available from Motorola for this purpose (part number 0386436N01 – Eyebolt, M8).

<p><b>WARNING</b> The cabinet can weigh as much as 130 kg with stacking bracket and CCB. Handle cabinets with extreme caution, and in accordance with any national or regional health and safety regulations.</p> <p>Horizon<i>macro</i> cabinets are heavy and should not be installed without the use of lifting equipment unless sufficient personnel are available to ensure that Health and Safety regulations are not breached.</p> <p>Eyebolts used to lift the cabinet must be of the collared type, manufactured to CE conformity, and must have sufficient safe working load to lift the cabinet, in accordance with national or regional health and safety regulations.</p> <p>Motorola recommends the use of slings in conjunction with hydraulic lifting apparatus for moving and positioning Horizon<i>macro</i> cabinets.</p> <p>The four screw locations used for hood pins must <b>NOT</b> be used for eyebolts.</p> <p>In addition to these points, refer to and comply with any local regulations that govern the use of lifting equipment.</p>
--

For the subsequent use of eyebolts, there may be local regulations that govern the use of lifting equipment and stipulate a test and/or examination regime. If the eyebolts are to be used, ensure that all such regulations are met.

Eyebolts can be fitted into the four designated cabinet top panel locations, shown in Figure 5-1, after removal of the screws. These locations are identified with an eyebolt symbol and the word **LIFT**. The eyebolt locations are also used for stacking bracket attachment.

## Removing upper cabinet in stacked configuration

**WARNING** Check that the bottom cabinet is bolted to the floor using the supplied plinth. IF NOT, this presents a danger of toppling that the decommissioning personnel must take into account.

To remove the upper cabinet in a stacked configuration:

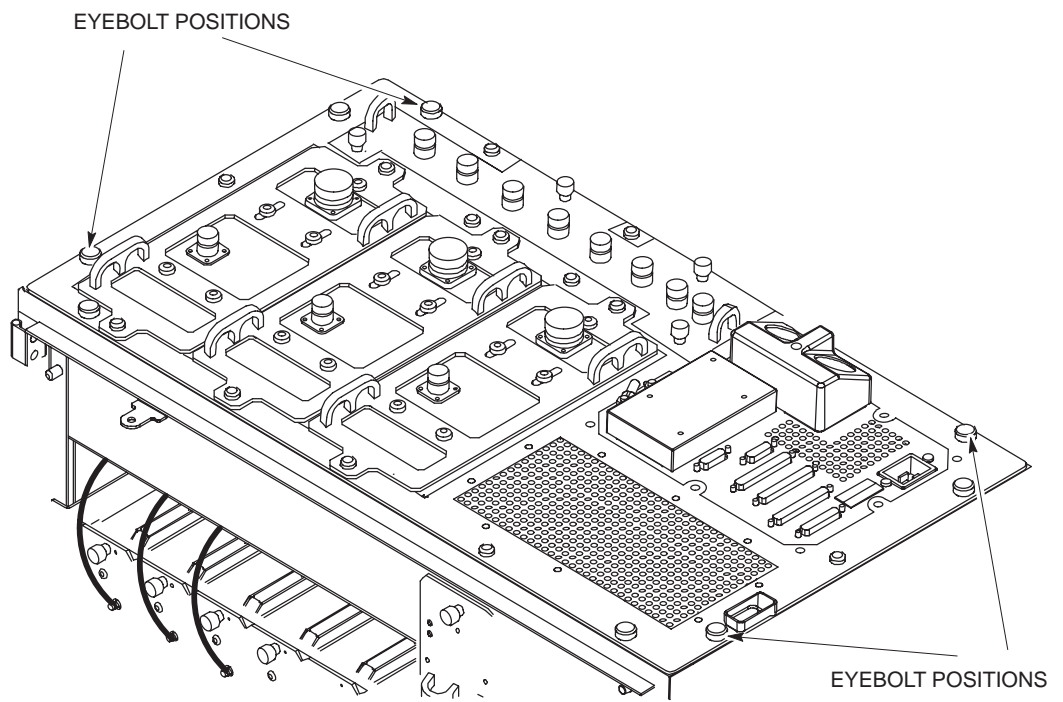
1. If CCBs are fitted to upper cabinet, remove as described in **Removing CCBs** in this section.
2. If stacking bracket is fitted to upper cabinet, remove as described in **Removing a stacking bracket** in this section.

**WARNING** The cabinet can weigh up to 130 kg if fully equipped. Handle each cabinet with extreme caution and in accordance with local health and safety regulations. Eyebolts are to be used with lifting equipment, and these must be located in the correct position as shown in Figure 5-1. The four screw locations used for hood pins must **NOT** be used for eyebolts. Before attempting to insert the eyebolts, visually check each one for damage. If any damage is apparent, **DO NOT USE**. The eyebolts must not be over tightened; hand tight is sufficient. **Do not tighten eyebolts with a t-bar or spanner.** Screw the eyebolt fully into the lifting point so that no thread is left exposed.

3. Fit eyebolts to the locations, identified with an eyebolt symbol and the word **LIFT**. Attach eyebolts to suitable lifting equipment.
4. Remove the four bolts holding upper cabinet plinth to stacking bracket.
5. Lift upper cabinet, complete with plinth, off stacking bracket, and lower to floor.
6. Remove the two M10 bolts securing plinth to cabinet, and slide apart.
7. Pack upper cabinet and plinth in separate containers, for storage, transport or safe disposal.

### View of eyebolt positions

Figure 5-1 shows the positions to which eyebolts can be fitted.



**Figure 5-1** Eye bolt positions

---

## Removing CCBs

The removal of CCBs is accomplished in two stages:

- Removing the CCB basket from the stacking bracket.
- Separating CCBs from CCB basket.

### Removing CCB basket from stacking bracket

To remove the CCB basket:

1. Remove the stacking bracket front cover by applying gentle pressure to the outer edges, while easing the cover up and pulling it away from the bracket.

Figure 5-2 in **Removing a stacking bracket** shows how to remove the stacking bracket front cover.

2. Disconnect the power cable to each CCB from the single connector (marked CCB) on the interface panel.
3. Loosen the three captive screws attaching CCB basket bar to basket and the two captive screws securing CCB basket bar to the sides of the stacking bracket. Remove the bar.
4. Disconnect the six N-type to N-type RF cables from the CCB inputs and the feedthrough plates.
5. Slide basket part way out of the stacking bracket, and disconnect antennas to CCBs.
6. Remove the CCB basket, complete with CCBs, from the stacking bracket.

### Separating CCBs from CCB basket

To separate the CCBs from the CCB basket:

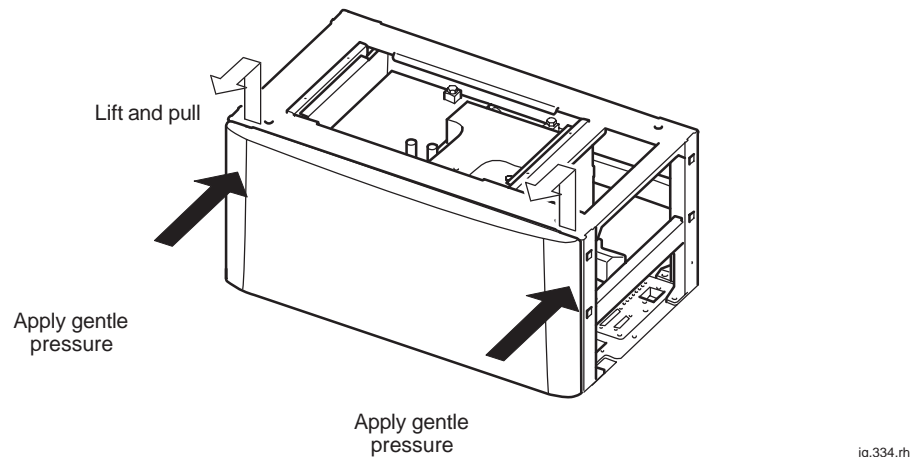
1. Place the CCB basket, complete with CCBs, onto a flat surface.
2. Disconnect and remove the phasing lead between CCB control boards.
3. Remove the four M4 screws securing each control board cover, and remove the CCB control boards.
4. Remove the six screws securing each CCB to the basket, (four M6 screws on the front and two M8 screws at the back).
5. Remove the CCBs from the basket.
6. Place the CCBs, control boards and associated cables in box for storage, transport or safe disposal and retain the CCB basket to be packaged with stacking bracket.

## Removing a stacking bracket

To remove a stacking bracket:

1. Remove the stacking bracket front cover by applying gentle pressure to the outer edges, while easing the cover up and pulling it away from the bracket.

Figure 5-2 shows how to remove the stacking bracket front cover.



**Figure 5-2** Removing the stacking bracket front cover

2. Loosen and remove the eight M8 screws holding the stacking bracket to the cabinet top, and retain.

**WARNING** The stacking bracket can weigh as much as 15 kg (more if CCB is contained in CCB basket). Observe the correct lifting precautions when handling the stacking bracket.

3. Lift the stacking bracket off the cabinet.
4. Fit eight previously removed M8 screws to correct cabinet screw points (see Figure 2-5). Tighten to correct torque (see *Installation & Configuration: GSM-205-423 Site requirements and considerations*).
5. Place the stacking bracket, with CCB basket (if previously removed), in a box for storage, transport or safe disposal.

If the upper cabinet only is being decommissioned and an optional hood is required after stacking bracket removal refer to *Installation & Configuration: GSM-205-423 Fitting the optional hood*.

## Removing floor mounted cabinet

<p><b>WARNING</b> The cabinet can weigh up to 130 kg if fully equipped. Handle each cabinet with extreme caution, and in accordance with local health and safety regulations. Horizon<i>macro</i> cabinets are heavy and should not be installed without the use of lifting equipment unless sufficient personnel are available to ensure that Health and Safety regulations are not breached.</p>
--

To remove a floor mounted cabinet for decommissioning:

1. Unscrew the two front bolts holding the cabinet to the plinth.
2. Slide the cabinet out of the plinth.
3. Unscrew the plinth anchor bolts and lift the plinth from the floor.
4. Carefully pack all bolts, washers and other removed items.
5. Pack the cabinet and plinth in separate containers, for storage, transport or safe disposal.

---

## Returning equipment to Motorola

If sending equipment back to Motorola, seal the shipping containers and return, as advised, by the Motorola in-country project manager.



**Horizonmacro  
indoor  
decommission  
checklist**

Copy this sheet and fill in the checklist in Table 5-1.

NAME \_\_\_\_\_ DATE \_\_\_\_\_  
 SIGNATURE \_\_\_\_\_  
 SITE NAME \_\_\_\_\_  
 EQUIPMENT TYPE \_\_\_\_\_  
 NATIONAL ID \_\_\_\_\_

<b>Table 5-1</b> Checklist of completed decommissioning steps			
<b>ACTION</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
Horizonmacro Indoor cabinet taken out of service by the OMC-R			
Packing material (including polythene bag) on site			
Is cabinet damaged? If yes, detail in comments box			
Hood (if fitted) removed and packed			
Power cable disconnected			
Interface panel cables disconnected			
RF cables disconnected			
Extension cabinet fibre optic cables disconnected			
Earth cable disconnected			
CCBs (if fitted) removed and packed			
Stacking bracket (if fitted) removed and packed			
Cabinet removed from plinth and packed			
Plinth removed from floor and packed			
All loose cables stowed and secured			

<b>COMMENTS</b>

