

8. EXHIBIT E : USER DOCUMENTATION

Document PE/COM/DD/0012 (26 pages).

Document PE/ICM/DD/0076 (59 pages).

WIRELESS NETWORKS

GSM 900 / 1800 / 1900

S2000L

BASE TRANSCEIVER STATION PRODUCT OVERVIEW

© 1998 Northern Telecom

Printed in France

NORTHERN TELECOM CONFIDENTIAL: The information contained in this document is the property of Northern Telecom (Nortel). Except as specifically authorized in writing by Nortel, the holder of this document shall keep the information contained herein confidential and shall protect same in whole or in part from disclosure and dissemination to third parties and use same for evaluation, operation and maintenance purposes only.

The content of this document is provided for information purposes only and is subject to modification. It does not constitute any representation or warranty from Nortel as to the content or accuracy of the information contained herein, including but not limited to the suitability and performances of the product or its intended application.

NOTICE

This document presents the S2000L Base Station Transceiver (BTS) with options.

Available standard and optional hardware modules are described.

Available features are described, without full distinction between standard and optional functions.

For more detail on S2000L commercial packaging, please contact your correspondent in Nortel.

TABLE OF CONTENTS

Introduction	6
Nortel Base Station Portfolio.....	8
Highlights	9
Physical Characteristics	9
Features.....	9
Configuration and Packaging.....	10
General Description	11
Physical Arrangement.....	11
Dimensions	11
BTS Composition.....	11
Architecture.....	12
Capacity and Configuration	14
Capacity.....	14
Product Options	15
Internal Antenna	15
Battery and Interface Module.....	15
Connection to the Base Station Controller.....	16
Signaling Concentration.....	17
Drop and Insert	17
Radio Performance	17
Installation	19
Shipping and Installation.....	19
Site Requirements	19
Power Supply and Battery Backup	20
Primary Power Source	20
Battery Backup	20
Protection.....	20
Operation and Maintenance	21
Operation	21
Initialization	21
Configuration	21
Fault Monitoring/Recovery	21
Maintenance	22

APPENDIX

Environmental Performance	23
Abbreviations	24

FIGURES

Figure 1: S2000L BTS	6
Figure 2: S2000L BTS Architecture (O2 configuration).....	12
Figure 3: S2000L BTS Connections to the BSC	16

TABLES

Table 1: Base Unit Dimensions.....	11
Table 2: BTS Configurations.....	14
Table 3: Battery and Interface Module Dimensions	15
Table 4: S2000L PCM Requirements	17

Intentionally left blank

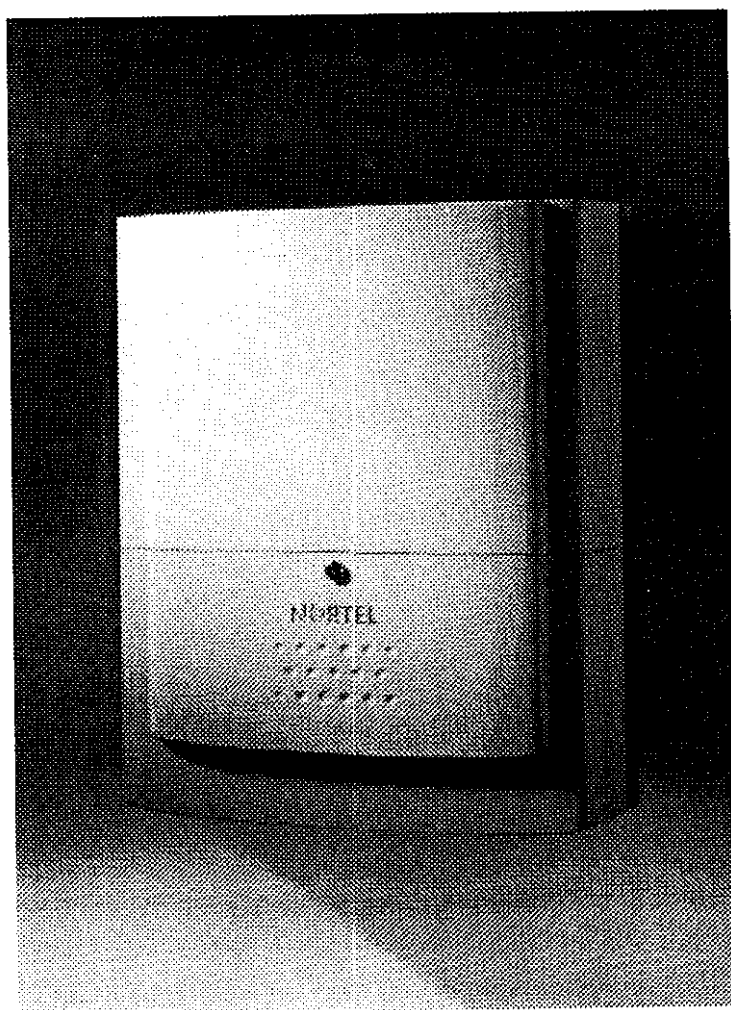


Figure 1: S2000L BTS

The S2000L micro BTS is Nortel's new high performance compact Base Transceiver Station. Part of Nortel's family of DRX based products, the S2000L is optimized specifically for microcellular underlay and capacity hot spot applications.

With the ability to handle more than 320 subscribers typically, the two transceiver S2000L can be swiftly deployed to relieve capacity requirements in urban areas where cells are engineered to be less than 300 meters in diameter. Site acquisition and installation time are reduced considerably as the compact packaging (including two integrated antennas) and extended operating temperature range (-40°C to +50°C) allow the S2000L to blend in and operate almost anywhere. From the elegant hallways of corporate offices to the busy street corners of major cities, the S2000L is the ideal BTS product to reduce an operator's initial investment and ongoing operational costs in areas requiring additional capacity in localized areas.

The S2000L is ideally optimized for the following applications:

- **microcell underlay**
- **in-building**
- **traffic hot spots and halls coverage**

and well suited for installations in:

- **shopping malls**
- **airports**
- **tunnels and busy intersections**

With the advanced technology contained within the DRX, S2000L BTS offers an optimized set of rich features to enhance the service quality and spectrum efficiency of the network:

- **optimized RF performance:** -104 dBm receive sensitivity and 3W output power (guaranteed 33 dBm)
- **capacity** with 3 times the supported subscriber capacity of a single transceiver BTS
- **voice quality enhancement** to reduce interference and improve quality of service at traditionally difficult coverage areas such as urban centers and cell edges

NORTEL BASE STATION PORTFOLIO

Nortel's DRX based family of BTS products possesses the flexibility of high performance and packaging necessary to provide the operator with an optimum network solution. Combined with Nortel's experience in spectrum management, handover management, and network engineering, the DRX based family of BTS products provides the operator with the key ingredients required to minimize both the initial and ongoing infrastructure investment and the on-going operational expenses.

The DRX based BTS products utilize a single module to provide the receiver, transmitter and frame processor. This single module, called the DRX, delivers superior performance through integration of advanced digital signal processing techniques.

The DRX based family of BTS products benefits from the experience gained through the manufacturing and delivery of over 50,000 TRX shipped (as of mid year 1997) to more than 20 countries throughout the world and addresses all possible coverage and capacity requirements ranging from rural-to-urban-to in-building coverage. This family includes:

- The **S8000** BTS is the highest performing high capacity BTS in the industry. Because of its modularity and expansion capability, the S8000 is the ideal product for all configurations ranging from S111 to S888. The indoor version is designed for protected sites while the outdoor version is a fully integrated BTS site with AC power supply and extended temperature range.
- The **S2000H** BTS is a fully featured BTS ideally suited for coverage of terrain such as highways and rural environments. Its small packaging simplifies the site acquisition process thereby improving the operator's time to market and reducing the number of sites required by up to 50% as compared to the industry standard.
- As mentioned above, the **S2000L** offers three times the capacity of a single transceiver micro BTS. Its small size allows for swift deployment as part of a microcellular underlay, providing a solution to traffic hot spots as well as in-building or campus coverage.

HIGHLIGHTS

The S2000L BTS is designed to meet the economical and environmental challenges inherent to indoor and outdoor installations with medium to low traffic requirements.

PHYSICAL CHARACTERISTICS

As such, its main physical characteristics, as listed below, are optimized to comply with these requirements:

- easy transportation and handling by a single person
- BTS fully pre-tested at factory for fast roll-out
- front access for ease of maintenance
- compact size, small foot print
- quiet operation (no fans, natural convection cooling)
- common package for both indoor and outdoor installations
- AC powering and battery backup
- extended environmental performance (-40°C to +50°C)
- optional lightning protection and battery module
- optional internal antennas

FEATURES

The S2000L BTS supports standard GSM features including:

- support of GSM 900, 1800 and 1900 frequency bands
- antenna diversity reception
- synthesized frequency hopping
- RF power control
- voice activity detection and discontinuous transmission (VAD/DTX)
- various ciphering algorithm options supported
- support of multiple GSM vocoders including full-rate, enhanced full-rate, half-rate
- support of drop and insert functionality and signaling concentration on the Abis interface in order to minimize the cost of communication between the BTSs and the Base Station Controller

The performance of the S2000L BTS is further enhanced by advanced microcell handover algorithms and network management facilities available on the Nortel BSC.

CONFIGURATION AND PACKAGING

Configuration and packaging are designed to enable:

- smooth and flexible capacity expansion beyond the basic O1 and O2 configurations
- packaging and modularity concept adapted to any environmental condition
- simple installation achievable within one hour with as little as one person, excluding site preparation.

GENERAL DESCRIPTION

PHYSICAL ARRANGEMENT

The S2000L BTS consists of a single enclosure which contains two physical modules:

- the Main Module
- the LPRF Module (Low Power Radio Frequency Module)

The S2000L BTS is supplied with standard mounting plates suitable for wall mounting. The front and back covers give the BTS an aesthetically pleasing appearance and they also function as sun shields. Optional internal antennas may be mounted inside.

The basic cabling includes the AC power cable, PCM cables and optional user alarm lines from ancillary equipment .

The S2000L BTS uses passive air convection cooling . This eliminates the need for mechanical cooling fans and their associated noise pollution .

DIMENSIONS

The dimensions of the S2000L BTS are:

Height	650 mm
Width	542 mm
Depth	197 mm
Weight	35 kg (*)
Weight (for installation)	heaviest module does not exceed 23 kg

(*) Weight for a basic O1 BTS including internal modules and front cover. Weight of options and mounting plate are extra and depend on the chosen configuration.

Table 1: Base Unit Dimensions

BTS COMPOSITION

The Main Module houses the Core Functions hardware:

- 1 or 2 DRXs
- the SBCF (Small Base Common Functions), which consists of the MCF (Main Common Functions) , the Network Interface and the User Interface
- the PSU (Power Supply Unit)

The LPRF Module houses the RF Drive hardware including:

- RF Power Amplifiers (PA)
- Low Noise Amplifiers (LNA)
- Duplexer coupling

For transmit coupling the S2000L BTS uses one duplexer per RF channel.

ARCHITECTURE

The DRX is the heart of the S2000L architecture containing the receive, transmit, and frame processing functionality. It interfaces with the RF drive of the LPRF Module and with the main common functions of the SBCF to deliver industry leading RF performance.

One of the key strengths of the S2000L BTS is product flexibility which is a direct result of the modular product architecture. A simplified block diagram representation of the S2000L architecture is shown in the following figure.

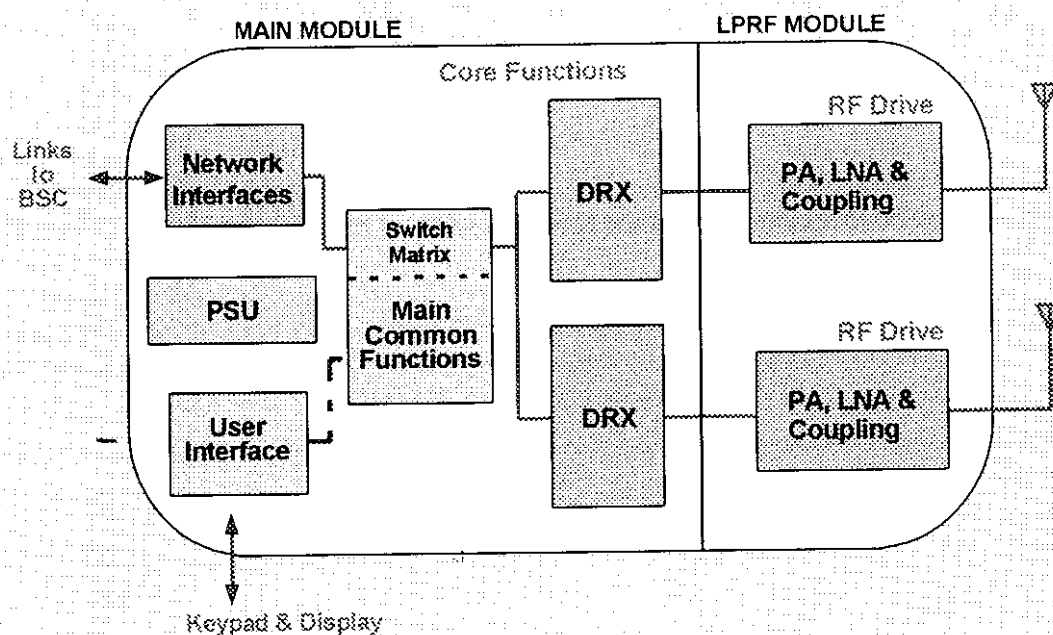


Figure 2: S2000L BTS Architecture (O2 configuration)

Each DRX includes the entire set of functions necessary to handle a full TDMA frame, including RF reception diversity and RF transmission.

The main functions supported by the DRX are:

- antenna diversity reception
- RF power control
- equalization
- RF modulation and demodulation
- synthesized frequency hopping
- ciphering

The MCF performs the site supervision and control functions. This includes the functions of:

- equipment initialization
- equipment supervision
- fault detection
- software downloading
- alarm monitoring and reporting
- User Interface control

The MCF integrates the Switch Matrix that provides the Drop and Insert functionality. This enhances the network connection flexibility to allow for chain or loop configurations.

Communication with the Mobile Network is accomplished through a Network Interface. This allows the BTS to communicate with the BSC using different transmission schemes such as E1/T1 PCM, HDSL, etc.

The User Interface provides the key man-machine interface functions through a simple keypad and alphanumeric display. This allows the user on site to select the following functions through an interactive menu:

- BTS initialization and software download
- fault diagnostics through built-in self test routines
- setting PCM and equipment parameters during installation

In addition to the Keypad/Display interface an external 10 Base T Ethernet interface is provided for the connection of an On-site Maintenance Terminal (TML). The TML is not required for installation and general maintenance of the S2000L. It is only used when detailed diagnostics are desired.

The RF signals to and from each DRX are connected to the RF Drive circuitry which consists of one RF chain for each carrier. The S2000L uses one duplexer per antenna eliminating losses in transmit combiners.

CAPACITY AND CONFIGURATION

CAPACITY

The BTS may be factory configured for omni applications (O1 or O2).

It may be supplied in the following basic configurations:

- equipped with one DRX for Omni-1 applications, using either one antenna (no diversity) or two antennas (reception diversity)
- equipped with two DRXs for Omni-2 applications, this configuration uses two antennas both of which are used to transmit and receive.

Either internal or external antennas may be used with the S2000L BTS.

Different cell configurations can readily be assembled from the basic BTS. Configurations beyond O2 are realized by connecting multiple BTSs through the PCM drop and insert facilities.

The table below gives the main cell site configurations.

Cell Capacity & Configuration	Reception Diversity	No. of BTS	No. of Antennas Per Cell
O1	yes	1	2
O2	yes	1	2
S22	yes	2	2
S222	yes	3	2

Table 2: BTS Configurations

Capacity extensions through the use of Extension Units are planned for future introduction. The extension units will allow capacity growth up to O4 in Omni configurations.

PRODUCT OPTIONS

INTERNAL ANTENNA

The internal antenna system in the S2000L is designed to provide optimum coverage in typical urban microcell environments.

The system consists of two antennas (typically 5 dBi gain antenna) arranged in an orthogonal cross-polarized arrangement. Each of the two polarizations are inclined at 45 degrees to vertical.

In the downlink direction each polarization is used for transmitting a single carrier. This takes advantage of "on air" combining and maximizes the transmit power by avoiding the normal 3 dB loss of a combiner.

In the uplink direction the orthogonal polarizations provide diversity reception. In a high multipath environment such as those found in urban indoor and outdoor microcells there is generally a high level of polarization conversion. As a result the internal antenna system using polarization diversity can provide good diversity performance.

Alternatively, the S2000L BTS can be connected to GSM900/1800/1900 external antennas typically available from antenna suppliers.

BATTERY AND INTERFACE MODULE

A Battery and Interface Module is available as an option to provide extended power backup capability beyond that provided by the internal batteries. This Battery and Interface Module provides a backup capacity of 2 hours.

The Battery and Interface Module is an external module which is usually mounted close to the S2000L BTS. Additional functionality provided by this module includes primary lightning protection and bare wire termination for the

- AC and PCM inputs.

The dimensions of the Battery and Interface Module are:

Height	408 mm
Width	317 mm
Depth	238 mm

Table 3: Battery and Interface Module Dimensions

Specific power backup requirements beyond that provided by the Battery and Interface Module may be accomplished through the use of customized battery solutions.

CONNECTION TO THE BASE STATION CONTROLLER

Transmission links between the BTS and the BSC are an important cost consideration in a cellular network comprising hundreds of cell sites. The S2000L BTS is designed to provide flexibility on the Abis transmission interface with the aim to reduce the operational cost for the mobile network operators.

The S2000L BTS is designed to support both T1 and E1 PCM links. Two PCM ports on the Base Unit allow various network configurations such as chain and loop BTS connections to be implemented.

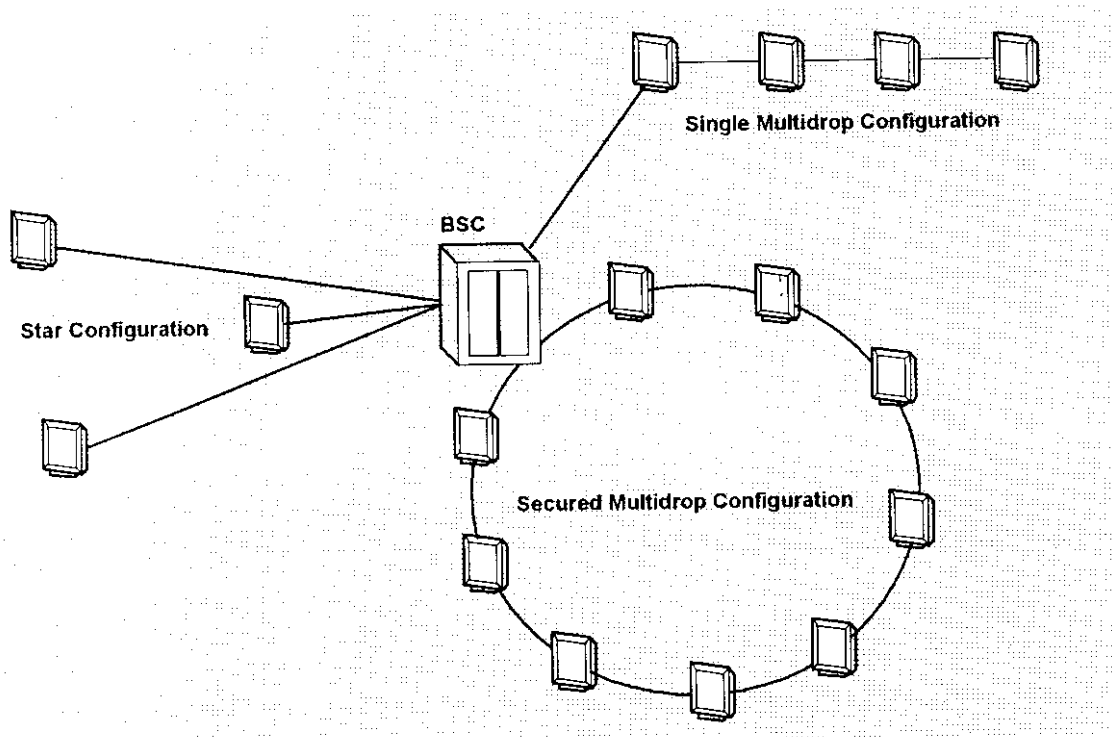


Figure 3: S2000L BTS connections to the BSC

An alternate transmission option planned for future introduction is the High-Bit-Rate Digital Subscriber Line (HDSL) transmission technology. This option allows the operator to take advantage of existing copper loop infrastructures instead of leasing E1/T1 PCM facilities. Depending on the application scenario and the availability of copper loops this can represent significant savings in the network operating cost.

Contact your Nortel representative for other transmission interface options.

SIGNALING CONCENTRATION

The number of PCM time slots required for transmission to the BSC is dependent on the transceiver capacity. The S2000L BTS employs signaling concentration for capacity beyond one transceiver thus allowing cost savings by reducing the number of required PCM time slots.

Configurations	Number of DRXs	Number of traffic TS	Number of signaling TS	Total number of TS
O1	1	2	1	3
O2	2	4	1	5

Table 4: S2000L PCM Requirements

DROP AND INSERT

The Drop and Insert capability is used to reduce the number of PCM links needed to connect the BTSs to their Base Station Controller (BSC). This can be implemented through Chain connection or Loop connection, depending on the level of PCM redundancy required, without any additional hardware. The loop configuration is particularly advantageous in that it provides PCM redundancy in the case of failure on one of the two PCM links.

RADIO PERFORMANCE

The transmit output power measured at the antenna connector is typically 3 watts (35 dBm $\pm$ 1 dB) per carrier.

Both static and dynamic power control are provided in accordance with GSM 05.05 recommendations.

The static power control range is 12 dB. The dynamic power control range is 30 dB.

The receive sensitivity measured at the cabinet antenna connectors is -104 dBm. This sensitivity is reduced from the -110 dBm sensitivity offered on the Nortel S2000H and S8000 BTSS. It is important to note that the S2000L receive sensitivity is intentionally reduced so as to ensure best performance in microcell environments where mobiles are operating in close proximity to the Base Station.

The effects of proximity mobile operation are twofold:

- High sensitivity is not required because of lower path loss.
- Blocking of radio channels by interfering mobiles is more severe when the mobiles are close to the Base Station.

The receive sensitivity of the S2000L BTS has been reduced to provide the optimum solution for microcell coverage.

Diversity reception is provided as a standard feature on the S2000L. This diversity feature is implemented based on a maximal ratio combining technique that gives up to 5 dB gain.

INSTALLATION

SHIPPING AND INSTALLATION

The S2000L BTS is designed to facilitate quick and easy installation. Installation can be achieved in one hour because the BTS is shipped pre-tested and ready for deployment.

The modular construction of the S2000L BTS minimizes the installation requirements by reducing the lifting weight to under 23 kg. As a result the S2000L BTS can be installed with as little as one person on prepared site.

In addition the simplified installation requirements of the S2000L BTS provide the operator with the ability to swiftly redeploy the BTSs when necessary due to changes in traffic patterns.

SITE REQUIREMENTS

The S2000L BTS is installed and maintained from the front:

- It may be deployed in both indoor and outdoor environments.
- It is suitable for mounting on walls, poles and antenna masts.
- All cabling connections are made through the bottom of the enclosure.

Thanks to mounting flexibility it has no requirements for floor space. This is particularly advantageous where cell sites are expensive or difficult to acquire. The result can be significant investment and operational cost savings to the network operator.

A self test facility in the S2000L BTS allows easy verification and validation of the installation process. The self test is activated through a simple built-in user interface. As a result the required skill level of the installation team is minimized.

POWER SUPPLY AND BATTERY BACKUP

PRIMARY POWER SOURCE

In the S2000L BTS the internal primary power supply allows the use of single phase AC sources of $120\text{ V} \pm 10\%$ /60 Hz or $230\text{ V} \pm 10\%$ /50 Hz. The nominal power consumption of the S2000L equipped with two transceivers is 220 Watts. At low temperatures (typically below 0°C) additional AC power is used for internal heating. The internal heater consumes up to 650 Watts at the low temperature limit of -40 °C.

BATTERY BACKUP

The S2000L BTS base unit contains up to 15 minutes internal battery backup.

Extended power backup capability is provided by the optional Battery and Interface Module. This module provides 2 hours of power backup capacity. Specific power backup requirements beyond that provided by the Battery and Interface Module may be accomplished through customized battery solutions.

PROTECTION

The S2000L BTS modules are housed in environmentally hardened enclosures. These enclosures protect the electronics components against water and dust ingress to a level of IP-55.

The S2000L can be equipped with various levels of protection against damage caused by electrical storms.

- The standard BTS is equipped with intrinsic protection circuits which protect the BTS interfaces against instances of low level electrical over-voltage and over-current.
- Optional lightning protectors are available to protect the antenna output ports against electrical damage. This is recommended for outdoor installations.
- The optional Battery and Interface Module offers lightning protection on the external AC, PCM and alarm interfaces.

Detailed environmental performances are summarized in Appendix 1.

OPERATION AND MAINTENANCE

OPERATION

The Base Station functions under the control of the Base Station Controller, through the Abis interface. These functions are initialization, configuration and fault monitoring /recovery .

INITIALIZATION

Base Station start-up may be triggered locally through the User Interface keypad or remotely by a re-initialization message from the OMC-R.

When used in combination with the remote software downloading capability, the latter feature provides a convenient means to perform software upgrade.

A software download may be initiated for reinitialization or software up-dating. All these operations can be handled remotely from the Operation and Maintenance Center.

CONFIGURATION

All parameters are programmed under the control of the Base Station Controller, namely: the Abis interface (traffic and signaling channels), the radio characteristics (frequency, power, BCCH filling, etc.), the TDMA frame and the PCM interfaces .

FAULT MONITORING/RECOVERY

The monitoring facilities include :

- internal fault monitoring and diagnostics
- reporting of all events to the OMC-R, for observation and corrective actions (in case of minor failure)
- six external physical alarms and two relay drivers .

MAINTENANCE

The S2000L adopts a simplified maintenance strategy which aims at reducing the operating cost of the BTS. BTS maintenance consists of periodic cleaning of the BTS exterior and occasional backup battery replacement. The S2000L BTS is designed as a Field Replaceable Unit. In the rare case of fault the entire S2000L is easily replaced and sent back for repair.

Access to the installed electronic equipment is from the front of the cabinet which facilitates maintenance.

Local tests and diagnostics are facilitated by the simple user interface consisting of LED indicators, keypad and an alphanumeric display.

- The LED indicators provide a direct and simple means of confirming proper BTS operation. Improper BTS functioning and faults are promptly shown on the LED indicators.
- Where a fault is indicated by the LED indicators, diagnostic tests may be initiated through the simple keypad and the results displayed on the alphanumeric display.
- If so desired a local maintenance terminal may be connected through the Ethernet interface for detailed diagnostics.

APPENDIX 1

ENVIRONMENTAL PERFORMANCE

OPERATING CONDITIONS

The S2000L is designed to operate under the conditions specified in ETSI ETS 300019-1-4 Class 4.1E for stationary use at non-weather protected locations. The operating temperature range is between -40 to +50 °C.

The S2000L is able to operate in the Relative Humidity range from 5% to 100% provided the Absolute Humidity limit of 30 g/m³ is observed.

The S2000L is designed to operate over the atmospheric pressure range from 70 to 106 kPa.

The S2000L can withstand NEBS Zone 4 earthquake conditions.

STORAGE CONDITIONS

The requirements specified in ETSI ETS 300019-1-1, Class 1.2 for storage in weather protected, non temperature-controlled locations should be observed when the S2000L is kept in storage.

TRANSPORTATION CONDITIONS

The S2000L should be transported in accordance with the requirements specified in ETSI ETS 300019-1-2, Class 2.2 for careful transportation.

DUST AND WATER INGRESS

The S2000L conforms with the IEC529 standard to a level of IP-55.

EMC/EMI

The S2000L complies with the applicable requirements specified in ETSI ETS 300 342-3 and FCC Part 15.

SAFETY

The S2000L BTS complies with the safety requirements specified in UL1950 (Underwriters Laboratories) and in IEC950/EN60950.

APPENDIX 2

ABBREVIATIONS

Abis	ETSI generic name for the BSC-BTS interface
AC	Alternative current
BSC	Base Station Controller
BSS	Base Station Subsystem A BSS is made up of BSCs, plus a number of BTSs, some transcoder units, and an OMC-R. A BSS is connected to an MSC, and therefore to the global network through the A interface.
BTS	Base Transceiver Station
dBm	Decibel milliwatt A logarithmic unit to express a power level, with reference to 1 mW.
DC	Direct Current
Diversity	The receiver includes both main and diversity channel down conversion and sampling in the same RX volume. Both channels are then processed by the Frame Processing Unit (FPU), using an equivalent Maximal Ratio Combining technique through a joint equalization of both receive signals.
Drop and insert	A technique allowing several components to be daisy chained on a common physical bus with each component, and ensuring data integrity and positioning.
DRX	Driver Receiver unit Signal processing unit for radio transmission and reception.
DTX	Discontinuous Transmission
Duplexer	A frequency band selective circulator. Used, as any multiplexer, to minimize the number of physical transmission lines. For radio, transmission lines are antenna systems.
E1	Standard European PCM (2.048 Mbit/s)
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ETSI	European Telecommunication Standard Institute
GSM	Global System for Mobile communication

GSM 900	Radio cellular network standard operating at 900 MHz.
GSM 1800	Radio cellular network standard adapted for the 1800 MHz frequency band.
GSM 1900	Radio cellular network standard adapted for the 1900 MHz frequency band.
Handover	Automatic call-transfer implemented between the radio channels of the same or different cells without interrupting transmission.
HDSL	High-bit-rate Digital subscriber Line
IEC	International Electrotechnical Committee
LNA	Low Noise Amplifier An RF amplifier used to enlarge very small useful signals received with minimum added noise.
LPRF	Low Power Radio Frequency module
MCF	Main Control Functions
MSC	Mobile Services Switching center
O1	Omni one transceiver cell configuration. In general an Ox designates stands an Omni cell configuration with x transceivers.
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
OMC	Operation and Maintenance Center for the radio sub-system
OMC-R	Operation and Maintenance Center - Radio
PA	Power Amplifier
PCM	Pulse Code Modulation By extension, name given to the E1 or T1 physical link.
PSU	Power Supply Unit
RF	Radio Frequency
RX	BTS receiver
S22	Bi-sectored site configuration with two transceivers in each cell. In general Sxyz designates a multi-sectored cell site configured with x, y and z transceivers in the respective sectors or cells.
SBCF	Small Base Common Function

	Generic name of the set of BTS equipment handling the common functionality of a radio site.
T1	Standard US PCM system (1.544 Mbit/s)
TDMA	Time Division Multiple Access Multiple access technique based on timeslot structure
TML	« Terminal de Maintenance Locale » On-site Maintenance Terminal
TRX	BTS Transmitter/Receiver
TX	BTS transmitter
UL	Underwriters Laboratories
VAD	Voice Activity Detection

NORTEL

NORTHERN TELECOM

Reference: **PE/ICM/DD/0076**

Version: **01.06/EN**

Status: **Approved**

Type: **PROC**

Product: **S2000H/L**

Cat.: **EXTERNAL**

Soc: **NMC**

Ext. ref.:

System release : **From V9**

Title: **S2000H/L BTS SITE SPECIFICATION**

Abstract / Comments:

On site validated: **No required.**

Approval restrictions (requiring additional on site validations): **Not required.**

distribution: Document available on WEB server and on files server (Refer to PE/ICM/APP/0040)

Key words:

This issue supersedes the previous edition which must be destroyed

Prepared by:

Date:

Approved by:

Date:

Authorized by:

Date:

AUTHOR:

L. ALBARET

12/03/98

TECHNICAL PRIME:

L. ALBARET

DOCUMENTALIST:

J.-M. LEBERRE

DOCUMENTATION PRIME:

X. PERULLI

DOCUMENT AMENDMENTS

Version	Date	Modifications	Author
01.01/ EN	30/04/97	Creation.	L. ALBARET
01.02/ EN	26/05/97	Modification for Gate1A.	L. ALBARET
01.03/EN	04/07/97	Modification after documentation review, refer to ICM/LA/97-196.	L. ALBARET
01.04/EN	18/08/97	Mounting support modification.	L. ALBARET
01.05/EN	08/12/97	Modification following VOs feedbacks.	L. ALBARET
01.06/EN	12/03/98	Modification after spreading.	L. ALBARET

S2000H/L BTS SITE SPECIFICATION

Reference: PE/ICM/DD/0076

Version: 01.06/EN

Date of issue: 12/03/98

CONTENTS

1. INTRODUCTION.....	7
1.1. OBJECT	7
1.2. SCOPE	7
2. RELATED DOCUMENTS.....	8
2.1. REFERENCE DOCUMENTS	8
2.2. APPLICABLE DOCUMENTS	8
3. ABBREVIATIONS AND TERMS	8
3.1. ABBREVIATIONS	8
3.2. TERMS	9
4. SAFETY	10
5. S2000H/L BTS MODULES INSTALLATION PRINCIPLE.....	10
6. EQUIPMENT PACKAGING.....	10
7. CABINET HANDLING.....	11
8. S2000H/L BTS CHARACTERISTICS	11
8.1. CABINET DIMENSIONS AND WEIGHT	11
8.1.1. MAIN CABINET	11
8.1.2. HPRF MODULE.....	12
8.1.3. BATTERY INTERFACE BOX.....	12
8.2. CABINET ACOUSTIC NOISE	12
8.3. TRANSPORTATION REQUIREMENTS	12
8.4. STORAGE REQUIREMENTS	12
8.5. OPERATING CONDITIONS	13
8.5.1. ENVIRONMENTAL CONDITIONS.....	13
8.5.2. POWER AND TEMPERATURE REQUIREMENTS.....	13
9. S2000H/L BTS SITE REQUIREMENTS	13
9.1. ACCESS CONDITIONS	13
9.2. SITE DIMENSIONING RULES	14
9.2.1. CABINET SECURING AND CONNECTION REQUIREMENTS.....	14
9.2.2. S2000H/L BTS CABINETS LAYOUT	15
9.3. SITE CHARACTERISTICS	19
10. SITE PREPARATIONS	19
10.1. SITE SAFETY FITTINGS.....	19

10.2. INSTALLING THE SYSTEM OF PULLEYS	20
10.3. INSTALLING THE MOUNTING PLATES	20
10.3.1. INDOOR SITE	20
10.3.2. OUTDOOR SITE.....	22
10.4. CUSTOMER INTERFACE SPECIFICATIONS.....	23
10.4.1. POWER SUPPLY	23
10.4.2. PCM TERMINAL	24
10.5. GROUND PLATE INSTALLATION	24
10.6. INSTALLING THE BATTERY INTERFACE BOX.....	25
10.7. SITE CABLES PROTECTION.....	25
10.8. INSTALLATION OF ANTENNAS, FEEDERS AND DC/DATA CABLES	25
10.9. WIRING	26
10.9.1. FEEDERS.....	26
10.9.2. POWER SUPPLY CABLE.....	27
10.9.3. GROUNDING CABLE.....	28
10.9.4. PCM AND EXTERNAL ALARM CABLE.....	29
⌘ END OF DOCUMENT ⌘.....	57

APPENDICES

Appendix 1 S2000H/L BTS installation view.....	31
Appendix 2 Battery interface box view	32
Appendix 3 Mounting plate	35
Appendix 4 Wall mounting.....	37
Appendix 5 Pole mounting	40
Appendix 6 Grounding	43
Appendix 7 Example of wall layout	45
Appendix 8 Tower layout.....	48
Appendix 9 Cabinet handling.....	50
Appendix 10 AC connector	52
Appendix 11 PCM and alarm connector pinouts	53
Appendix 12 S2000 Low Power.....	54
Appendix 13 S2000 High Power	55

FIGURES

Figure 1 - Cabinets clearance.....	14
Figure 2 - Base unit clearance (side view).....	15
Figure 3 - Base unit and battery interface box clearance (side view).....	16
Figure 4 - Base unit and HPRF clearance (side view).....	17
Figure 5 - Collocated site front view (1).....	18
Figure 6 - Collocated site front view (2).....	18
Figure 7 - Mounting plate directly secured on wall.....	21
Figure 8 - S2000H/L installation.....	31
Figure 9 - Battery interface box holes template.....	32
Figure 10 - Battery interface box parts.....	32
Figure 11 - Battery interface box securing.....	33
Figure 12 - S2000L with Battery interface box.....	34
Figure 13 - Standard mounting plate.....	35
Figure 14 - HP mounting plate.....	35
Figure 15 - HPRF mounting plate.....	36
Figure 16 - View of wall mounting.....	37
Figure 17 - Wall holes template for base unit mounting.....	37
Figure 18 - Wall holes template for HPRF mounting.....	38
Figure 19 - Concrete wall mounting.....	38
Figure 20 - Hollow wall mounting (1).....	38
Figure 21 - Hollow wall mounting (2).....	39
Figure 22 - Tilt adjustment.....	39
Figure 23 - Mounting plate securing.....	39
Figure 24 - View of pole mounting.....	40
Figure 25 - Mounting kit without tilt adjustment.....	40
Figure 26 - Mounting kit with tilt adjustment.....	41
Figure 27 - Pole mounting.....	41
Figure 28 - Tower mounting.....	42
Figure 29 - Base unit grounding.....	43
Figure 30 - Ground connection for all BTS except S2000L BTS Standard.....	43
Figure 31 - S2000L Standard ground connection.....	44
Figure 32 - HPRF grounding.....	44

Figure 33 - Ground connection on HPRF ground bar.....	44
Figure 34 - HPRF hoisting.....	50

1. INTRODUCTION

1.1. OBJECT

This document defines S2000H/L BTS site search and site preparation specifications.

1.2. SCOPE

This document applies to the deployment of S2000H/L BTS presenting the following characteristics:

- S2000H/L BTS GSM 900 MHz, GSM 1800 MHz, GSM 1900 MHz,

- S2000L BTS:

- . O1, O2.

- . 110 VAC or 220 VAC,

- . External antennas.

- S2000H BTS:

- . O1, O2 or 1S11

- . 220 VAC,

- . External antennas.

- E1 PCM 120 Ohms or T1 PCM 100 Ohms ,

- S2000H/L BTS installed on a wall or pole, tower.

2. RELATED DOCUMENTS

2.1. REFERENCE DOCUMENTS

These documents are not required on site.

[R1] S2000D Commercial Specification : PE/BTS/APR/0013

2.2. APPLICABLE DOCUMENTS

These documents are required on site.

[A1] Product safety for S2000H/L : PE/ICM/APP/0193

[A2] Technical specification of the S2000D MEU cable : PE/BTS/DD/1119

[A3] Technical specification of the S2000D daisy cable : PE/BTS/DD/1128

[A4] Technical specification of the S2000D 3/8 inch RF feeder assembly to be used in the GSM band : PE/BTS/DD/1129

[A5] Technical specification of the S2000D 1/2 inch RF feeder assembly to be used in the DCS band : DCS/BTS/DD/1129

3. ABBREVIATIONS AND TERMS

3.1. ABBREVIATIONS

BTS : Base Transceiver Station
DRX : Driver Receiver Frame Processor
HP : High Power
HPRF : High Power Radio Frequency
LNA : Low Noise Amplifier
LP : Low Power
LPRF : Low Power Radio Frequency
PA : Power Amplifier
PCM : Pulse Code Modulation
PSU : Power Supply Unit
SBCF : Small Base Commun Function
VGA : Variable Gain Amplifier

3.2. TERMS

S2000H/L BTS or Base unit	: BTS cabinet equipped with 1 or 2 DRX.
S2000L BTS Standard	: BTS cabinet for Low Power application composed of Main and LPRF modules and without ground bar.
S2000L BTS Protected	: BTS cabinet for Low Power application composed of Main and LPRF modules and with ground bar.
S2000H BTS	: BTS cabinet for High Power application composed of Main, RF Supply and remote HPRF modules.
Mounting support	: Frame used to secure the S2000 H/L BTS or HPRF module to a wall, pole or tower (via mounting plate).
Main module	: Unit which contains DRX, SBCF, backhaul and PSU.
LPRF module	: Unit for LP application which contains LNA, PA and duplexer modules.
RF Supply module	: Unit for HP application which contains VGA, and PSU modules.
HPRF module	: Remote unit for HP application which contains LNA, PA, duplexer and filter modules.
Battery interface box or AC/Telco box	: Additional for HP application, which ensure the connection between the BTS and site interface (supply, batteries, lightning protection for AC and Telco lines). The Battery interface box is delivered with cables for connection on the S2000H/L BTS.
Customer interfaces	: Power supply box, alarm and PCM distribution. This interface must be located on the site and close to the structure supporting the S2000H/L BTS.

4. SAFETY

Refer to [A1], Product safety for S2000H/L.

5. S2000H/L BTS MODULES INSTALLATION PRINCIPLE

The S2000H/L BTS modules are designed to be mounted on mounting plate (refer to **Appendix 1** and **Appendix 3**) used for direct securing to a flat wall.

For no flat wall, pole and tower a additional mounting support must be used (refer to **Appendix 4** and **Appendix 5** for examples.

In case of HP configuration 1 or 2 HPRF remote modules are installed.

Main cabinet and the first HPRF module are linked with DC/DATA composite cable.

The DC/Data composite cable (between S2000H BTS and HPRF module) must be ordered in length required for the site (maximum length 70 m or 2755,91 inches length).

The both HPRF modules are linked with daisy DC/Data cable.

Daisy HPRF cable (between HPRF modules) comes in 10 m or 2 m (393.7 or 78.7 inches) lengths.

RF feeder cables (between S2000H/L BTS and antennas, via HPRF modules for HP configuration) are customer responsibility.

In case of collocated site, the RF cables are delivered and come in 2 m (or 78.74 inches) length.

The cables (AC, DC, PCM and external alarms) between S2000H/L BTS and Battery interface box (or customer interface) come in 10 m (or 393.7 inches) length, pre-terminated with one connector (connected to base unit), the other end to be cut to length and terminated on terminal by installer.

6. EQUIPMENT PACKAGING

The S2000L BTS is delivered in six parts assembled on site (mounting plate, LP main module, LP RF module, cable cover, sunshield, battery backup).

The S2000H BTS is delivered in six parts assembled on site (mounting plate, HP main module, cable cover, sunshield, RF supply module, Battery interface box).

For HP configuration, the HPRF modules are delivered in four parts (mounting plate, HPRF module, cable cover, sunshield). One or two HPRF module(s) can be delivered according to the radio configuration.

7. CABINET HANDLING

One person is required for modules transportation, lifting and horizontal moving at human height, refer to **Appendix 9**.

But a second person is required for safety purposes and to help to handling in other case.

For height site installation, all the modules are lifted by using a system of pulleys secured on the wall or pole mount, refer to **Appendix 9** for example.

A lifting kit can be provided for cabinet hoisting and installation, refer to **Appendix 9**.

8. S2000H/L BTS CHARACTERISTICS

8.1. CABINET DIMENSIONS AND WEIGHT

8.1.1. MAIN CABINET

8.1.1.1. S2000L BTS STANDARD

The external dimensions of the S2000L BTS Standard (all assembled) are as follows:

Height	:	650 mm (25,6 in)
Width	:	542 mm (23,34 in)
Depth	:	197 mm (7,76 in)
Weight	:	< 42,5 Kg (92,6 lbs)

8.1.1.2. S2000L BTS PROTECTED

The external dimensions of the S2000L BTS Protected (all assembled) are as follows:

Height	:	740 mm (29,13 in)
Width	:	542 mm (23,34 in)
Depth	:	197 mm (7,76 in)
Weight	:	< 45 Kg (99,2 lbs)

8.1.1.3. S2000H BTS

The external dimensions of the S2000H BTS (all assembled) are as follows:

Height	:	740 mm (29,13 in)
Width	:	542 mm (23,34 in)
Depth	:	197 mm (7,76 in)
Weight	:	< 45 Kg (99,2 lbs)

8.1.2. HPRF MODULE

The external dimensions of the HPRF module (all assembled) are as follows:

Height	:	740 mm (29,13 in)
Width	:	273 mm (10,75 in)
Depth	:	330 mm (12,99 in)
Weight	:	< 27 Kg (59,52 lbs)

8.1.3. BATTERY INTERFACE BOX

The external dimensions of the cabinet are as follows:

Height	:	380 mm
Width	:	320 mm
Depth	:	190 mm
Weight	:	< 25 Kg

8.2. CABINET ACOUSTIC NOISE

No noise generating device.

Recommandation : ETS 300 019-1-4

8.3. TRANSPORTATION REQUIREMENTS

Temperature	:	$-40^{\circ}\text{C} \leq \text{TEMP} \leq 70^{\circ}\text{C}$
Relative humidity	:	100% max
Absolute humidity	:	30 g/m ³ max (1,084×10 ⁻⁰⁶ lb/in ³)
Recommandation	:	ETS 300 019-1-4

8.4. STORAGE REQUIREMENTS

Temperature	:	$-25^{\circ}\text{C} \leq \text{TEMP} \leq 55^{\circ}\text{C}$
Relative humidity	:	$10\% \leq \text{R.H} \leq 100\%$
Absolute humidity	:	0.5 g/m ³ ($\leq \text{A.H} \leq 29 \text{ g/m}^3$)
Air pressure	:	$70 \text{ kPa} \leq \text{A.P} \leq 106 \text{ kPa}$
Solar radiation	:	1120 Watt/m ²
Recommandation	:	ETS 300 019-1-1

8.5. OPERATING CONDITIONS

8.5.1. ENVIRONMENTAL CONDITIONS

The S2000H/L BTS is built to withstand severe environmental conditions, however it is advisable to locate equipment in sheltered areas where possible.

The S2000H/L BTS has been evaluated for protection against water jets projected against the enclosure from any direction. The product has been evaluated for water ingress protection, according to IP55. Refer to IEC529 (Degree of Protection Provided by enclosures) for limitations in outdoor installations.

The cabinets installed outside must be carefully positioned to limit the effects of strong winds and rain fall (work in bad weather). They must be placed parallel to the direction of dominant winds in that area (consult the local meteorological office).

8.5.2. POWER AND TEMPERATURE REQUIREMENTS

The product is approved for installation in an environment with expected temperature range of -40°C to 50°C.

	Max for LP	Max for HP
O1 without heater (VA)	150	400
O1 with heater	575	1125
O2 without heater (VA)	250	800
O2 with heaters (VA)	900	1450

9. S2000H/L BTS SITE REQUIREMENTS

The S2000H/L BTS can be installed on different types of site:

- indoor, outdoor;
- any case of pole, tower;
- any case of wall.

Their positioning must take in account some parameters as wind exposure, wind velocity, wind and ice loading, twist and sway.

9.1. ACCESS CONDITIONS

The access conditions must comply with cabinet dimensions and the available moving equipment and hoisting tools manipulation.

It must also be compliant to staff access for installation and maintenance.

9.2. SITE DIMENSIONING RULES

Installation and maintenance of the S2000H/L BTS requires front access only. All field replaceable modules and cabling can be accessed when the front cover is opened and the sunshield removed. That also allows module removal for extendability.

The following criterias have to be taken into account:

- cabinet and Battery interface box securing and connection requirements,
- cabinets layout (space, clearance, thermal restrictions),
- distance between main module and HPRF,
- distance between main module and Battery interface box,
- distance between HPRF modules,
- cover opening,
- limit access vandalism.

9.2.1. CABINET SECURING AND CONNECTION REQUIREMENTS

500 mm (19,67 in) of minimum clearance below and above each cabinet must be planned to enable the installer or the commissioner ease allowing the installation, maintenance and the removal of the lifting tool..

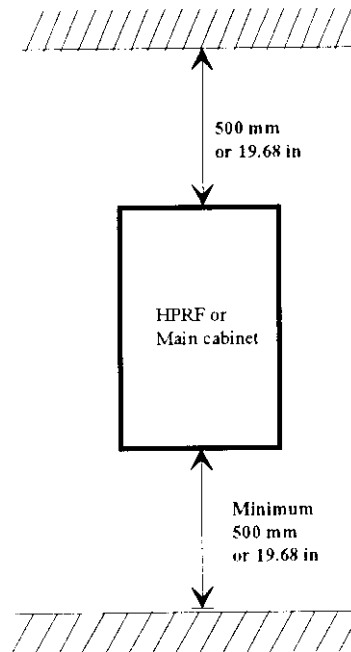


Figure 1 - Cabinets clearance

9.2.2. S2000H/L BTS CABINETS LAYOUT

The different cabinets layout are defined following site configuration (LP, HP, Battery interface box).

The cabinets layout defined depending on site dimensions.

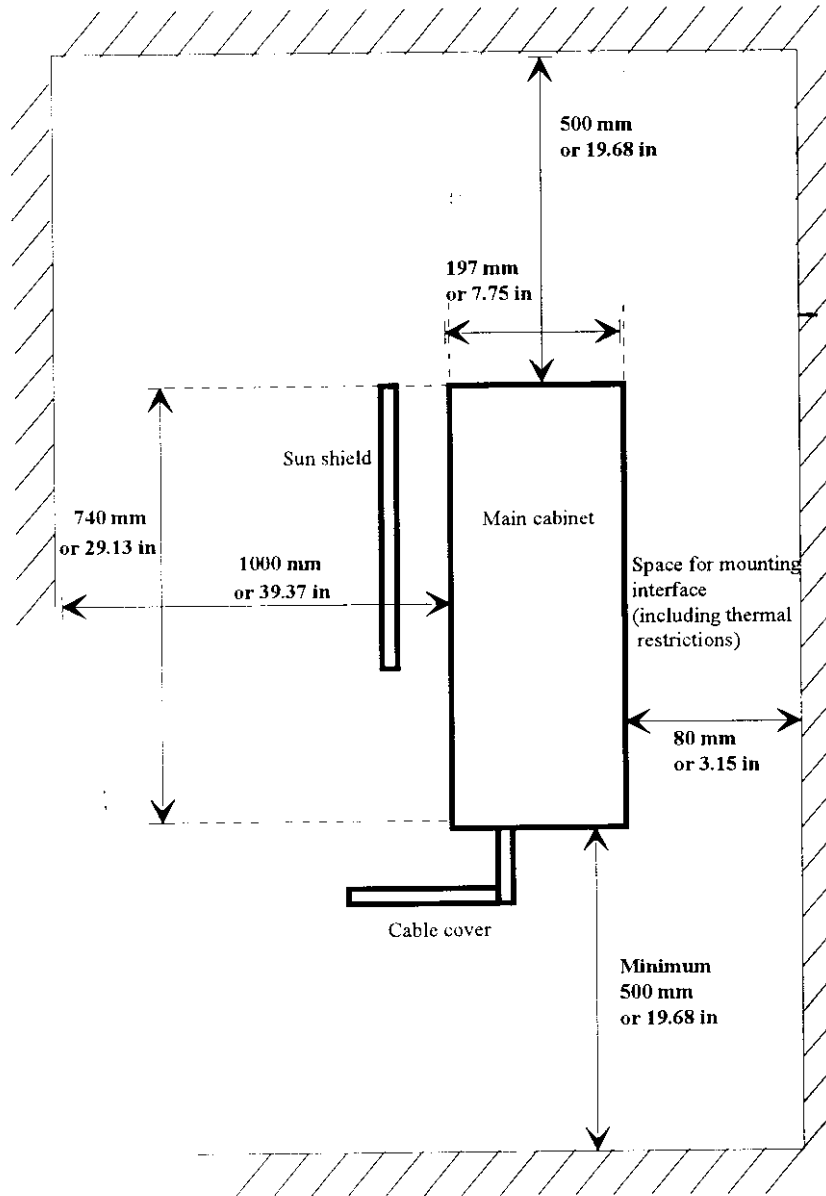


Figure 2 - Base unit clearance (side view)

9.2.2.1. S2000H/L BTS - BATTERY INTERFACE BOX

The minimum distance between the 2 modules is 1 m (39,37 in).

The maximum distance between the 2 modules is 9,2 m (362,2 in).

The 4 inches (100 mm) bending radius of the inter-cabinet data cables has to be respected.

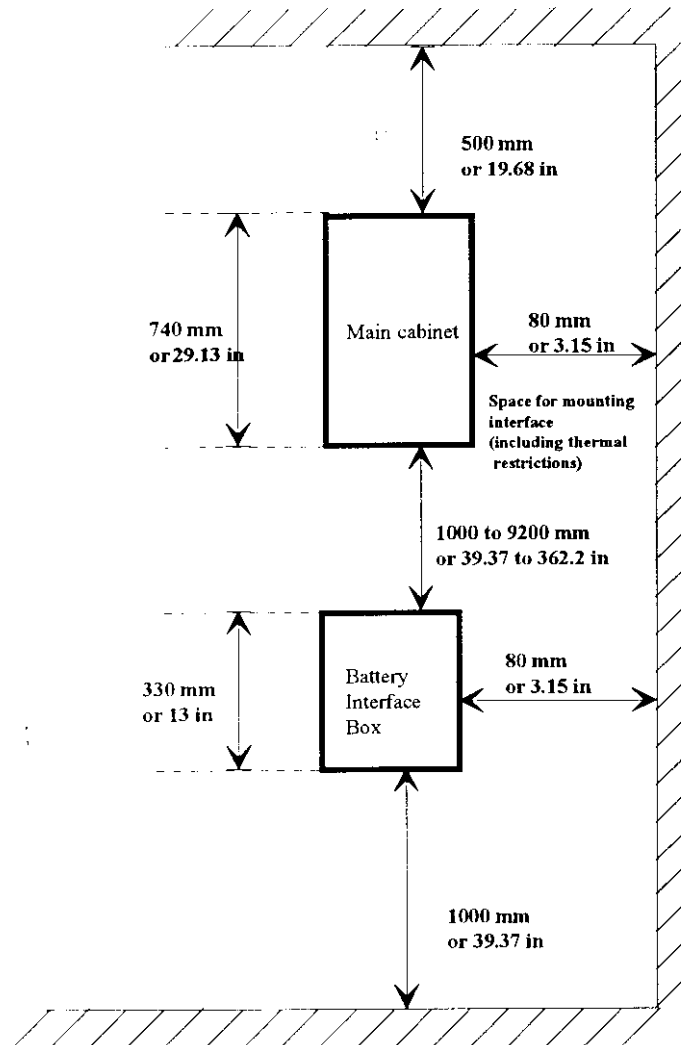


Figure 3 - Base unit and battery interface box clearance (side view)

9.2.2.2. HPRF - HPRF

The maximum inter-HPRF composite DC/DATA cable length is 10 m (393,7 in).

The 4 inches (100 mm) bending radius of the inter-cabinet data cables has to be respected.

9.2.2.3. HPRF - MAIN MODULE

The minimum distance between the modules is 1 m (39,37 in).

The maximum distance between the modules is 68 m (2677,2 in).

The maximum DC/Data cable length between the two modules is 70 m (2756 inches), but for cable connection and passageways facility the distance is limited to 68 m (2677,2 in).

The 4 inches (100 mm) bending radius of the inter-cabinet data cables has to be respected.

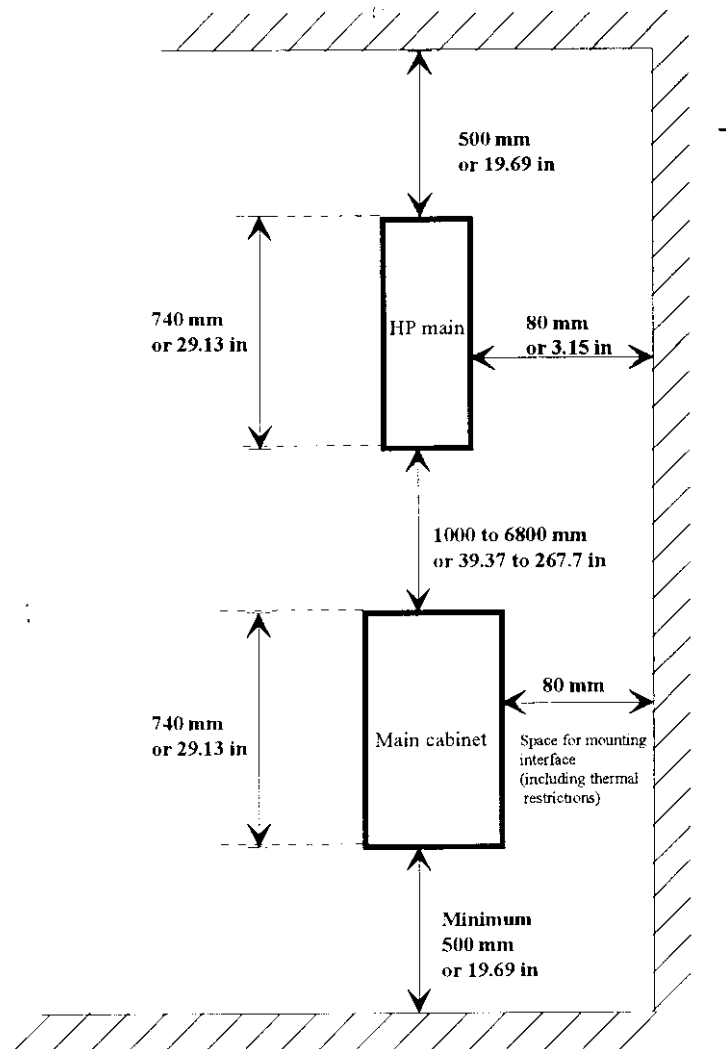


Figure 4 - Base unit and HPRF clearance (side view)

9.2.2.4. COLLOCATED SITE

The collocated cable kit are defined as following :

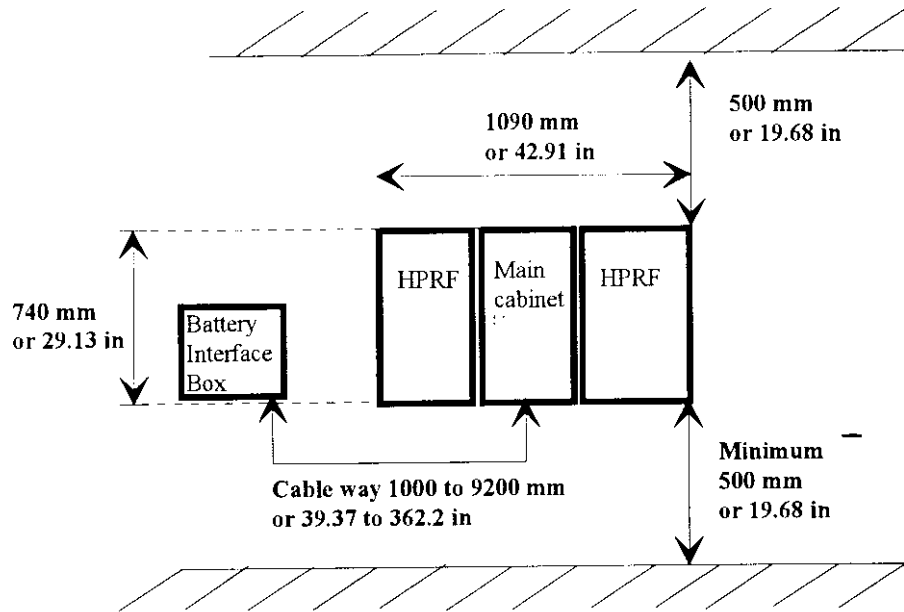


Figure 5 - Collocated site front view (1)

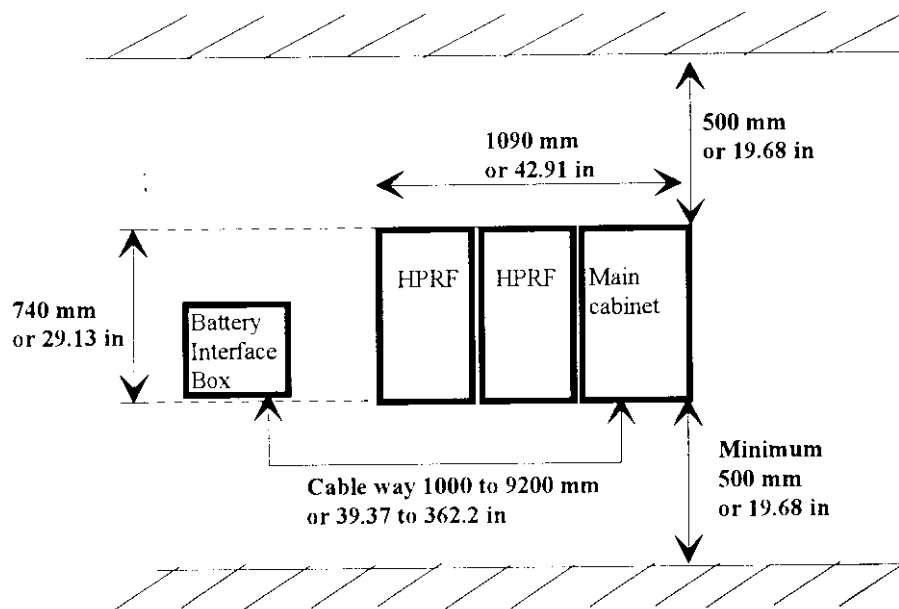


Figure 6 - Collocated site front view (2)

9.3. SITE CHARACTERISTICS

Any site must respect safety conditions.

The use of safety harness and a stable and safe area close to the cabinet is mandatory.

The supporting wall or pole must satisfy to the following characteristics:

- shearing >200 kg, (440,92 lbs)
- tearing >200 kg (440,92 lbs).

The wall must be flat and vertical for installation without mounting support.

For other site , a mounting support equipped with an adjustment tilt must be used.

10. SITE PREPARATIONS

The elevated position of the S2000H/L BTS (above 2 or 3m [78,74 or 118,11 in] from the ground level) involves safety requirements.

A careful selection and training of the staff must be planned.

To permit staff access to the S2000H/L BTS, some requirements are taken in account, as:

- lifting or climbing means,
- installation of a stable and safe area close to the cabinet,
- hoisting all the equipments required by the staff.

If the site is located in an easy accessible area, work area boundary lines and protection means to avoid equipment damage/robbery must be planned.

10.1. SITE SAFETY FITTINGS

In order to allow staff access to the cabinets, a suitable platform must be available close to the cabinets. This platform is a stable and safe area which must be easily erected.

It may be:

- a scaffolding,
- a safety platform supported and hoisted by a specific vehicle.
- all type of platform proposed by recommended professional suppliers.

The characteristics of such a platform must satisfy the minimum following requirements:

- ground surface of 2 m² (≈ 2 m x 1 m) or 3100 in² (78,74 in 39,37 in)
- height of the platform is at 1,2 m (47,24 in) below the bottom of the cabinet, to allow the access to the cables,
- the platform is placed in front of the cabinet at the closest distance from the wall mount.

10.2. INSTALLING THE SYSTEM OF PULLEYS

The installer will install the system of pulleys taking into account all the requirements for the site.

After securing the cabinets onto the wall or pole the system of pulleys must be removed easily.

Refer to **Appendix 9** for example

10.3. INSTALLING THE MOUNTING PLATES

10.3.1. INDOOR SITE

The mounting plates can be installed in indoor site directly on wall if the wall comply with following recommendations:

- Vertical flatness : 1 mm (0.039 in)
- Side-to-side flatness : 1 mm (0.039 in)
- Torsional flatness : 3 mm (0.118 in)
- Shearing : >200 kg, (440,92 lbs)
- Tearing : >200 kg (440,92 lbs).

The set of pegs and screws used to secure the mounting plate depend on the type of the supporting wall :

- Plaster wall : 50 mm (1.97 in) cast-iron pegs, M8,
- Hollow wall : 55 mm (2.16 in) metallic pegs, M8,
- Cement wall, concrete wall : 50 mm (1.97 in) hook-fitted PVC pegs, M8.

The mounting plate is secured to the wall using 3 fasteners, 1 in each top corner and 1 in the center at the bottom.

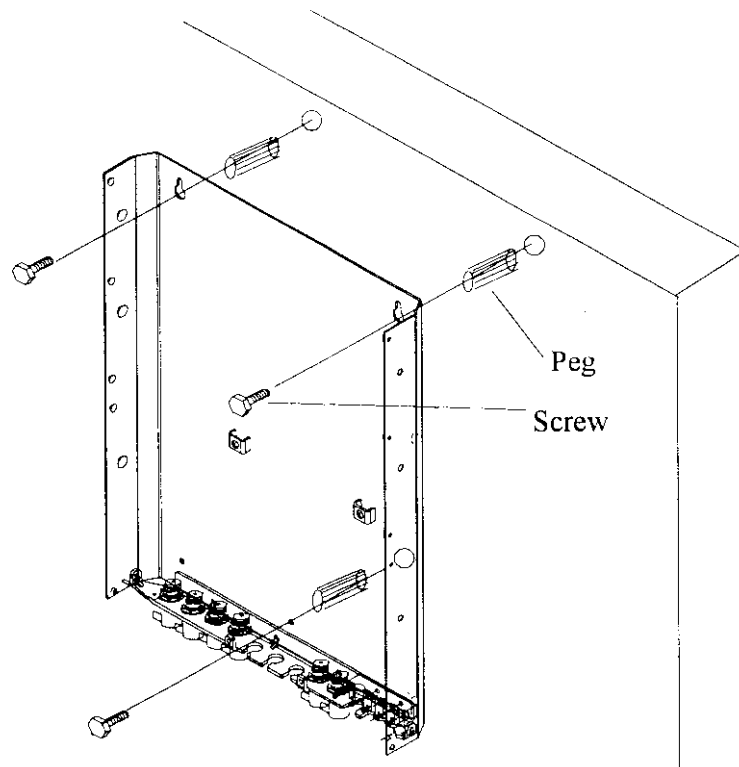


Figure 7 - Mounting plate directly secured on wall

To overcome a torsional out-of-specification situation, the mounting plate must be stood off the interfacing surface (by the use of washers/spacers) at a distance greater than the variation in flatness of the surface.

The mounting plate will be allowed to float free of the surface except for the small area of the 3 washers/spacers.

Refer to **Appendix 3** for the holes template.

The following table gives the size (diameter, depth) of the holes to be drilled for each wall type:

	Diameter (mm/in)	Depth (mm/in)
Plaster wall	15/0.59	60/2.36
Hollow wall	11/0.43	-
cement wall	10/0.39	60/2.36

10.3.2. OUTDOOR SITE

In outdoor site, the S2000H/L and HPRF modules are secured to the structure (wall or pole) with mounting support, refer to **Appendix 4** and **Appendix 5**.

The mounting support is delivered with its installation kit (screws, nuts washers...).

10.3.2.1. WALL MOUNTING

The supporting wall must satisfy the following characteristics:

- Shearing : >200 kg, (440,92 lbs)
- Tearing : >200 kg (440,92 lbs).

In case of hollow wall, the wall must be solidify with metallic or wood plate, refer to **Appendix 4**.

The mounting support is secured to the wall using 4 fasteners, refer to **Appendix 4** for holes template.

The mounting kit allows the air flow between the wall and the rear of the cabinet (80 mm or 3.14 inches space allowing air flow on sun drenched wall).

10.3.2.2. POLE OR TOWER MOUNTING

The pole mounting support is designed to be secured on tubular or square structure with a tilt which mustn't exceed 10°, refer to **Appendix 5**.

In other case, a mounting interface must be installed to compensate the tilt, refer to **Appendix 5**.

Outlined below are parameters that must be identified and specified :

- Service life
- Legs construction/component stress
- Tower loading
- Wind loading
- Ice loading
- Wind velocity
- Wind exposure
- Twist and sway
- Foundation

The tower or pole loading must take in account the modules weight, refer to the modules characteristics.

10.4. CUSTOMER INTERFACE SPECIFICATIONS

The Battery interface box interfaces:

- power supply,
- PCM lines,

with the BTS, refer to **Appendix 2**.

10.4.1. POWER SUPPLY

The customer has to provide a power supply with a protection against the transitory currents.

The required electrical power taking into account pike current, supplying the BTS as the following characteristics:

		Case of 220 VAC	Case of 110 VAC
Nominal AC current	LP	6 A	10 A
	HP	10 A	
Voltage		220 V (-10 %) to 240 V (+6 %)	110 V (-10 %) to 120 V (+6 %)

The S2000H BTS is powered by a single phase (220 VAC - 50 Hz for Europe) or 2 phases (110 VAC- 60 Hz for North American), 2 wires plus ground, commercial AC power source equipped with a Listed 10 A / 220-240 VAC for branch circuit protection.

The S2000L BTS is powered by a single phase (220 VAC - 50 Hz for Europe; 110 VAC- 60 Hz for North American), 2 wires plus ground, commercial AC power source equipped with a Listed 6 A / 220-240 VAC for European or a Listed 10 A / 115 VAC for American branch circuit protection.

A differential device is not mandatory at all for our cabinets. If the breaker has such a differential device, it has to be rated at 30 mA (min) delayed for LP and 100 mA (min) delayed for HP version.

Ensure that a readily accessible disconnect device is incorporated in the fixed wiring.

In case of no compliance, an appropriate disconnect device and an emergency stop switch should be provided as part of the building installation by the customer.

The disconnect device should be near the equipment, easily accessible by the service personnel, and marked as the disconnect device of the equipment.

Attachment-plug receptacles in the vicinity of the product should be of an grounding type and the grounding conductors should be connected to ground at the AC distribution box.

The S2000H/L BTS is not approved for use in a power distribution system having no direct connection to ground (an IT system). Refer to National Installation grounding requirements for details.

The lightning arresters are built in Battery interface box.

Each protective device in the power supply installation (circuit breaker, differential circuit breaker...) must be identified and its characteristics must be clearly indicated; a label on each device should indicate which equipment it protects.

For Europe: At the AC terminal, an man height accessible emergency stop switch for the power supply shall be installed.

If no AC Telco module is used, the site circuit breaker must be compliance with the BTS consumption.

If AC Telco module is being used (including a 16A breaker), site breaker must be superior to 16 A.

10.4.2. PCM TERMINAL

The S2000H/L BTS is not intended for connection directly to the telecommunications network.

For Europe: Approved protection must be provided as part of the installation by the operator in case of configuration without Battery interface box.

Do not install the PCM line during a lightning storm.

The S2000H/L BTS (main module) is equipped with 2 PCM interfaces (on SBCF).

Only Drop&Insert configurations (chain or loop) require the use of the second PCM interface.

The number of PCM terminals required is therefore determined by the network configuration (1 PCM terminal / PCM).

For the E1 or T1 line, PCM lines connected to the PCM terminal must be protected with a lightning arrester. For areas where thunderstorm days/year > 25 then the Battery interface box should be installed. Under 25, then install primary protection.

The S2000H/L BTS is compatible with the use of all PCM terminals, line-connected or microwave, offering minimum clock precision of 5×10^{-8} .

The installation conditions depend on the type of PCM terminal used.

10.5. GROUND PLATE INSTALLATION

The S2000H/L equipment (base unit, HPRF and battery interface box if required) are not approved for use in a power distribution system having no direct connection to ground. Refer to National Installation grounding requirements for details.

The ground plate is installed systematically and regroups all the S2000H/L site equipment ground circuits:

- Equipment protective ground circuits (Base unit, HPRF, Battery interface box),

- Feeder grounds.

The ground plate is installed close to the base unit.

The earth plate is **continuously** linked up to the ground sink. The maximum specified impedance measured from the ground plate is **less than 10 Ω** .

The ground plate sink and the power station sink are common or inter-connected.

10.6. INSTALLING THE BATTERY INTERFACE BOX

The Battery interface box can be installed on wall or pole with delivered mounting kit, next to the main module with a minimum distance of 1m and maximum of 9,2 m (362,2 in).

A ground link must be installed during site preparation to connect the mechanical frame of the battery interface box to the site ground.

For North America, protective conduits are installed along the entire cable route, from the S2000H/L site entrance up to the connection interface located on the underside of the module (via the Battery interface box if required). To reduce the length of conduits required, it is recommended that common passageways are used to convey the external cables onto the Battery interface box connection interface. The conduits allow to separate the mains AC cable from other cables. All the connection cables arrive below the Battery interface box and are left waiting in the protective cable conduit, with an extra 500 mm (11,81 in) length with respect to the Battery interface box connection interface.

10.7. SITE CABLES PROTECTION

All the external cables must be protected by cable trays or conduits which must be metallic, well grounded (and waterproof if outdoors). They must not have gaps or holes which allow lightning EMP ingress.

When the S2000H/L BTS is mounted on a wall, metallic cable trays may be used to route external cables via Battery interface box if required.

The cable trays must be dimensioned in order to handle the cables with respect to their bending radius.

They are positionned and secured onto the wall below the cabinets, at a distance from their bottom to allow easy wiring.

10.8. INSTALLATION OF ANTENNAS, FEEDERS AND DC/DATA CABLES

A S2000H/L BTS requires up to four antennas adapted to the frequency band.

The site engineering study determines the antenna locations.

The relative positioning of the antennas is determined in terms of the frequency band, so as to respect the decoupling and the decorrelating characteristics between antennas.

For S2000H configuration, composite DC/DATA cables must be installed between main and first HPRF module and between the both HPRF modules if required.

All the cables must meet the NORTEL cable specifications.

Each cables (feeders and DC/Data cables) must be routed to be directly connected to the corresponding modules, refer to **Appendix 12** and **Appendix 13**.

For collocated site, RF and DC/Data cables are delivered in 2 m length.

10.9. WIRING

Power feeders which meet National Installation requirements must be supplied by the customer, or the agent of the customer.

In rooftop applications, the ambient temperature may reach 70 °C.

The current and temperature rating of the feeder cables must comply to National requirements.

All external cables are supplied and installed by the party in charge of preparing the site.

Only copper conductors are used for field wiring.

10.9.1. FEEDERS

Protected feeders are used to establish the link between the S2000H/L BTS and the antennas (via HPRF module for HP configuration).

For correct operation of the BTS equipment, the VSWR must be < 1.5 at the feeder termination.

The diameter of the feeders to be used depends on the length of the link and type of configuration (LP, HP, GSM 900, 1800, 1900).

The feeders are left close to the wall or pole mount and ready to be connected. A straight male silver plated N type connector equips each feeder ends except for S2000L Standard (elbowed male silver plated N type connector).

The N type connector should be specified as IP67 and with no ferro magnetic materials.

10.9.2. POWER SUPPLY CABLE

10.9.2.1. SITE WITH BATTERY INTERFACE BOX

10.9.2.1.1. AC CABLE BETWEEN BTS AND BATTERY INTERFACE BOX

The AC cable between the S2000H/L BTS and the Battery interface box is systematically delivered in 10 m or 787,4 inches length, refer to **Appendix 10**.

10.9.2.1.2. AC CABLE BETWEEN BATTERY INTERFACE BOX AND CUSTOMER INTERFACE

For the connection between the customer's AC panel and the Battery interface box, a power supply cable must be installed during site preparation.

Type of cable:

Cable with three 1,5 mm² minimum wires; the green/yellow wire is used for grounding of the S2000H/L BTS.

US only: Cable with three 14 AWG wires; the green/yellow wire is used for grounding.

Conductor section	Distance Battery interface box - customer box
1.5 mm ²	length < 20 m
2.5 mm ²	20 m < length < 30 m

Color code	Phase	Neutral	Ground
European	Red, brown or black	Blue	Green/Yellow
N. America	Black, red or blue	White	Green/Yellow

Routes:

The cable runs between the customer's AC panel and the Battery interface box cables along cable trays or conduits and the rules for separating heavy and light currents are respected.

Connections:

Battery interface box: on terminal block

Power supply installation side: on circuit breaker.

10.9.2.2. SITE WITHOUT BATTERY INTERFACE BOX

The AC cable between the S2000H/L BTS and the customer's AC panel is systematically delivered in 10 m or 787,4 inches length, terminated at one end to be connected on the S2000H/L BTS.

Type of cable:

Cable with three 1,3 mm² wires; the green/yellow wire is used for grounding of the S2000H/L BTS.

US only: Cable with three 14 AWG wires; the green/yellow wire is used for grounding the S2000H/L BTS.

Routes:

The cable runs between the customer's AC panel and the S2000H/L BTS along cable trays or conduits and the rules for separating heavy and light currents are respected.

Connections:

BTS side: Refer to **Appendix 10** for connector.

Power supply installation side: on circuit breaker.

The AC cable from the S2000H/L must be connected to the AC supply equipped with AC protection and circuit breaker (refer to paragraph **10.4.1 Power supply**).

10.9.3. GROUNDING CABLE

A ground bar is installed on the mounting plate of the S2000H/L BTS (except S2000L Standard) and HPRF module, refer to **Appendix 6** and allows the S2000H/L BTS cabinet protective ground circuits.

For S2000L Standard and Battery interface box, the bonds are directly connected to the mounting frame (see **Appendix 6**).

A ground link must be installed during site preparation to connect the ground bar (or the frame) of each equipment to the ground earth plate.

Type of cable:

One conductor 16 mm² (6 AWG in N. America), insulated.

Routes:

Ground wires shall not be bent more than 90°, shall be run as straight as possible, shall not be run in steel conduit without bonding to the conduit at each end.

The rules for separating heavy and light currents are respected.

Connections:

- Equipment side: using two holes lugs (5/8" spacing).
- Ground plate side: using lugs

10.9.4. PCM AND EXTERNAL ALARM CABLE

10.9.4.1. SITE WITH BATTERY INTERFACE BOX

The PCM and alarms are combined into one cable between S2000H/L BTS and Battery interface box and comes from factory in 10 m (or 393.70 in) length with one end terminated.

For the connection between the customer interface and the Battery interface box, one PCM and one alarm cables must be installed during site preparation.

10.9.4.1.1. PCM CABLE

Type of cable : L904-4/2

4 twisted pair cable (2 PCM) shielded per pair.

Pair connector wire size range is 0.4 - 0.65 mm (22 - 26 AWG) with a maximum insulation of 1.57 mm (0.062 inches).

Routes:

The cables run between the customer interface and the bottom of the Battery interface box positioned on the wall mount as the other external cables along cable trays or conduits.

Connections:

Battery interface box : on terminal block,

10.9.4.1.2. ALARM CABLE

Type of cable:

6 shielded twisted pair cable.

Pair connector wire size range is 0.4 - 0.65 mm (22 - 26 AWG) with a maximum insulation of 1.57 mm (0.062 inches).

Routes:

The cables run between the customer interface and the bottom of the Battery interface box positioned on the wall mount as the other external cables along cable trays.

Connections:

Battery interface box : on terminal block.

10.9.4.2. SITE WITHOUT BATTERY INTERFACE BOX

The PCM and alarms are combined into one cable between S2000H/L BTS and Battery interface box (or customer interface) and comes from factory in 10 m (or 393.70 in) length with one end terminated.

Type of cable:

4 twisted pairs (2 PCM).

6 twisted pairs.

2 Relays.+

Routes:

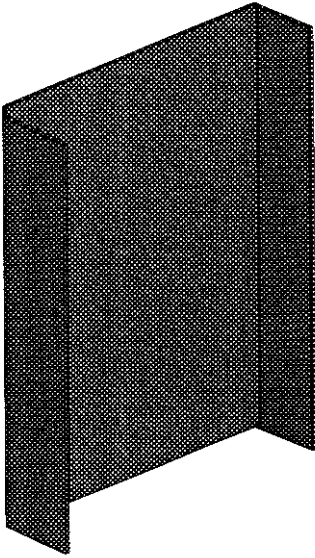
The cable runs between the PCM and alarms customer interfaces, as the other external cables, along cable trays or conduits.

Connections:

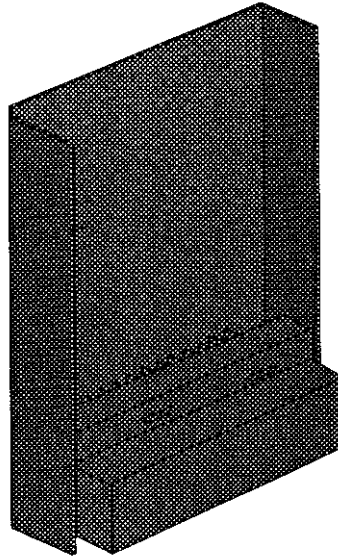
Customer interface: refer to **Appendix 11** for connector pinout.

Appendix 1 S2000H/L BTS installation view

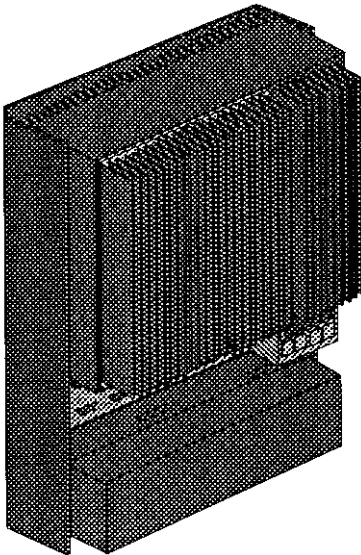
Step 1: mounting plate installation



Step 2 : LPRF or RF supply module installation



Step 3 : Main module installation



Step 4 : Cover and Sunshield installation

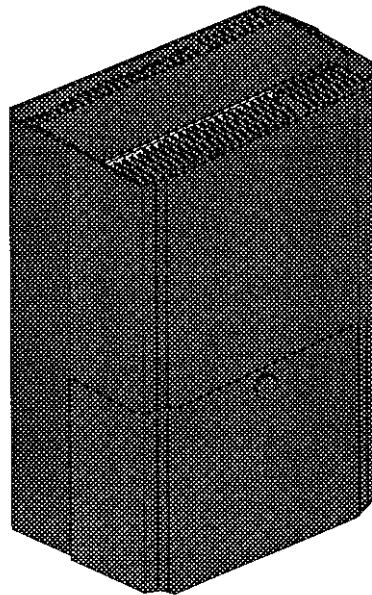


Figure 8 - S2000H/L installation

Appendix 2 Battery interface box view

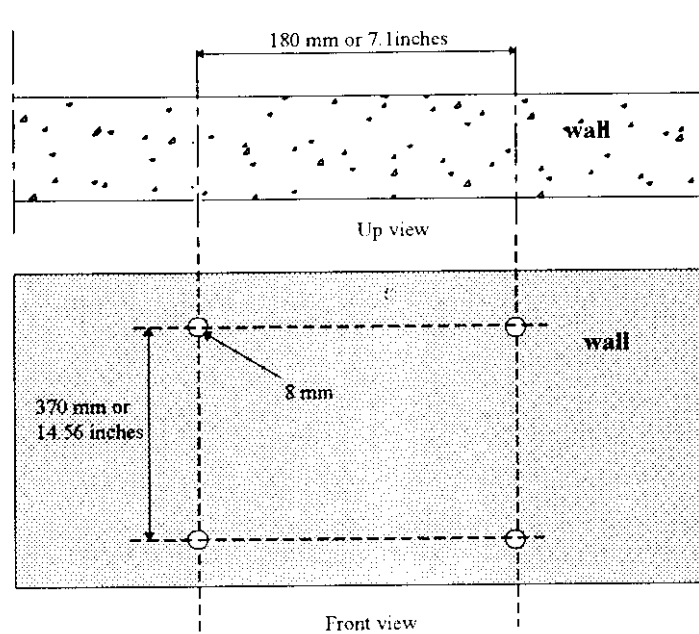


Figure 9 - Battery interface box holes template

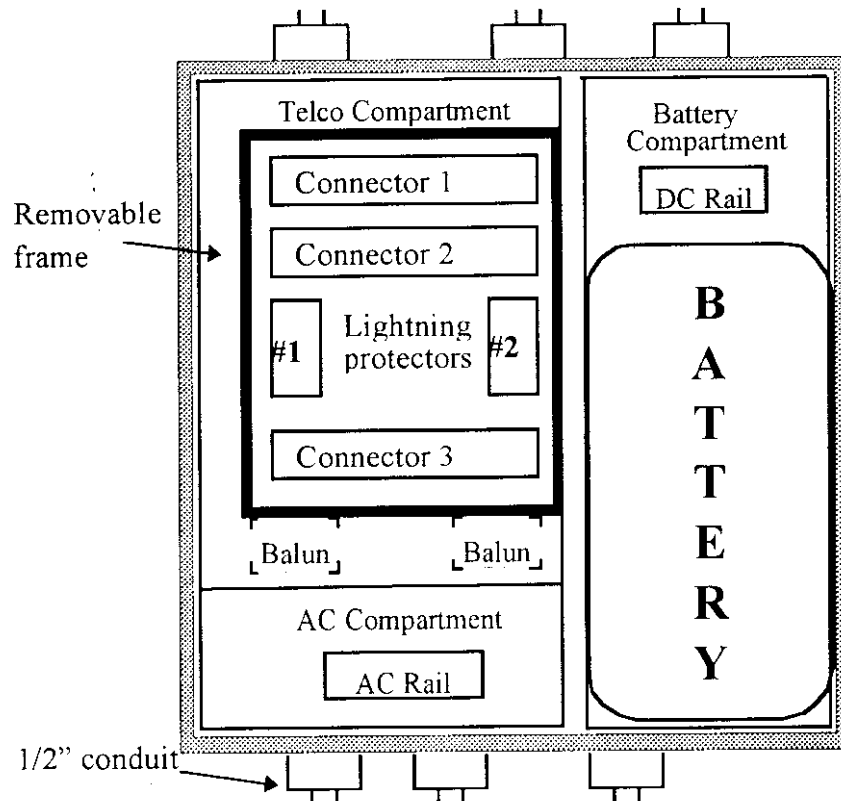


Figure 10 - Battery interface box parts

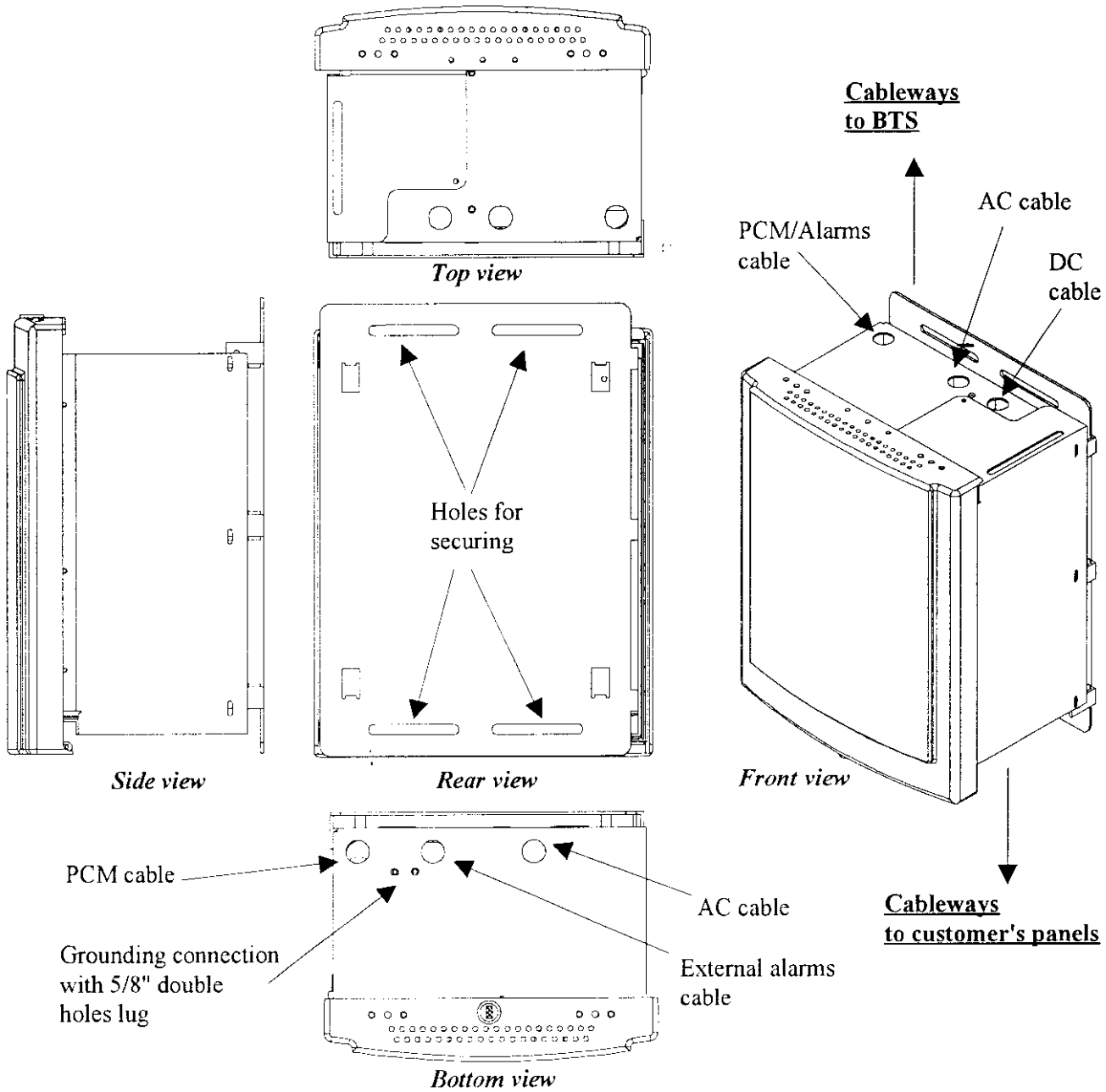


Figure 11 - Battery interface box securing

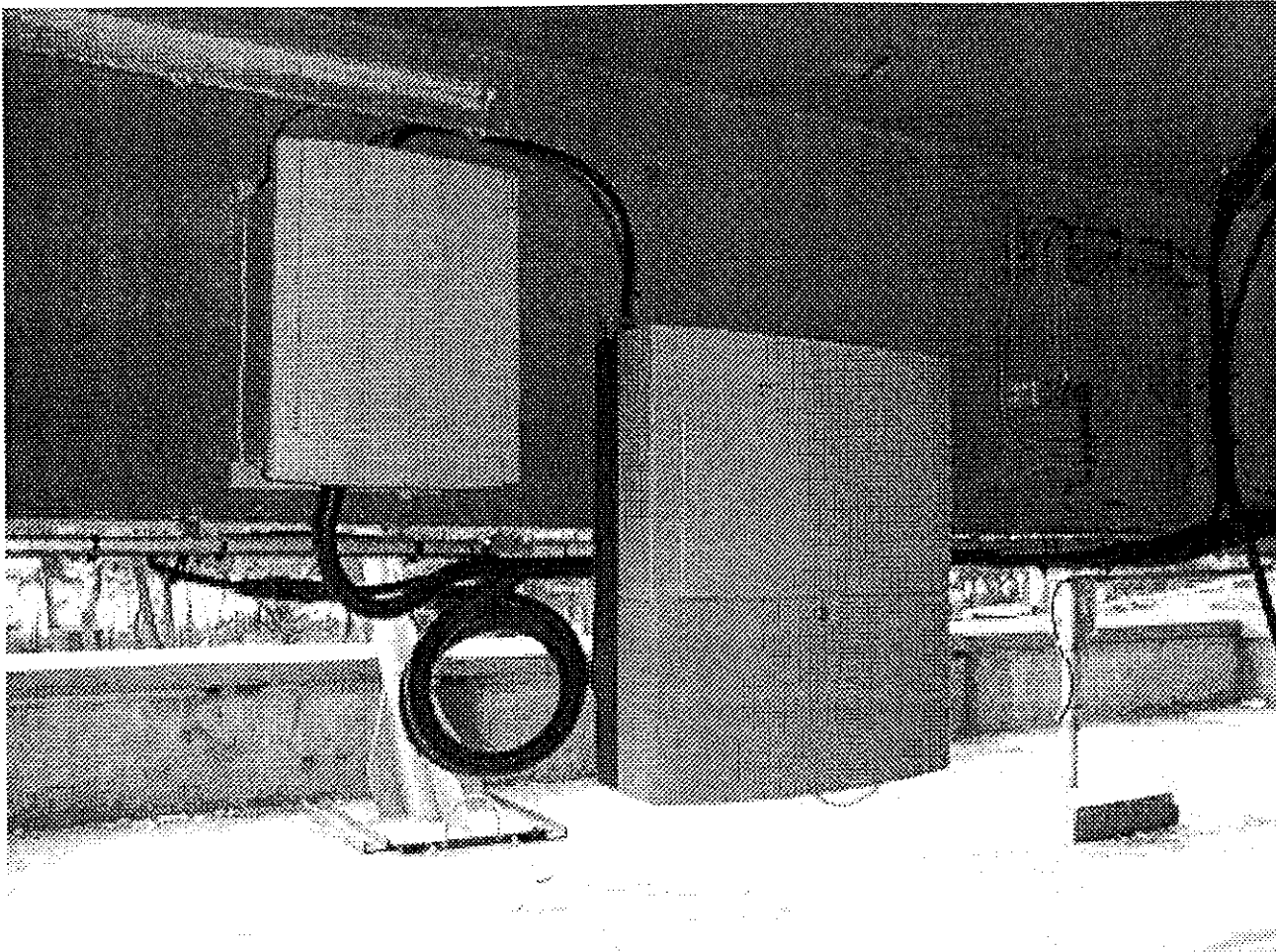


Figure 12 - S2000L with Battery interface box

Appendix 3 Mounting plate

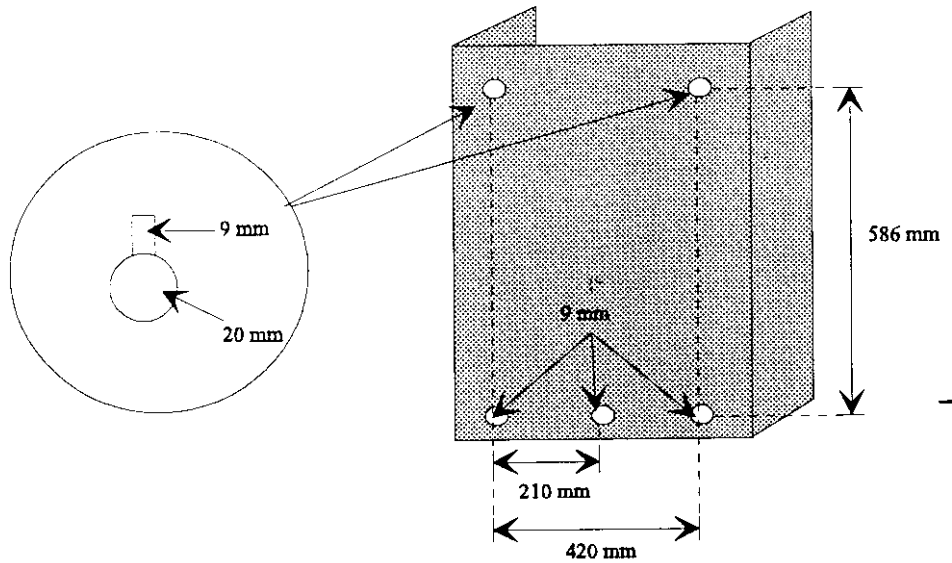


Figure 13 - Standard mounting plate

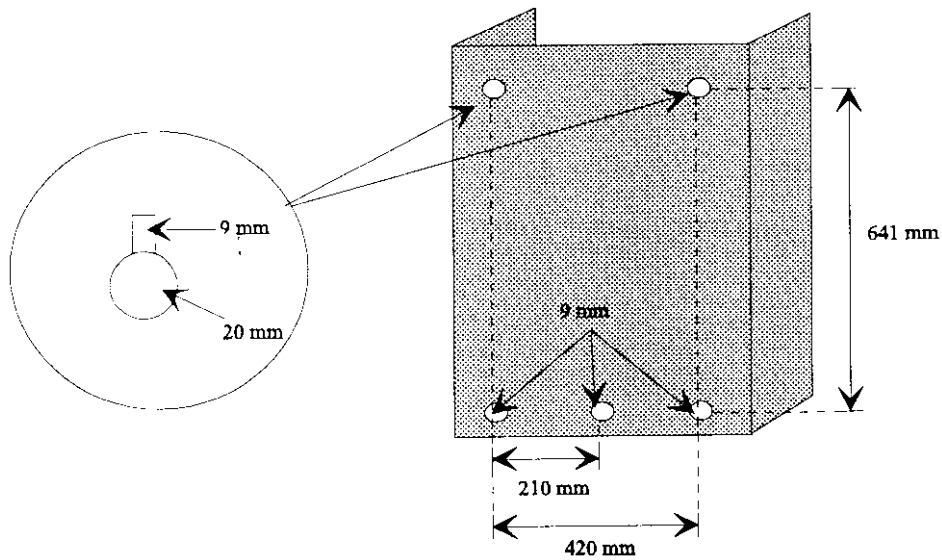


Figure 14 - HP mounting plate

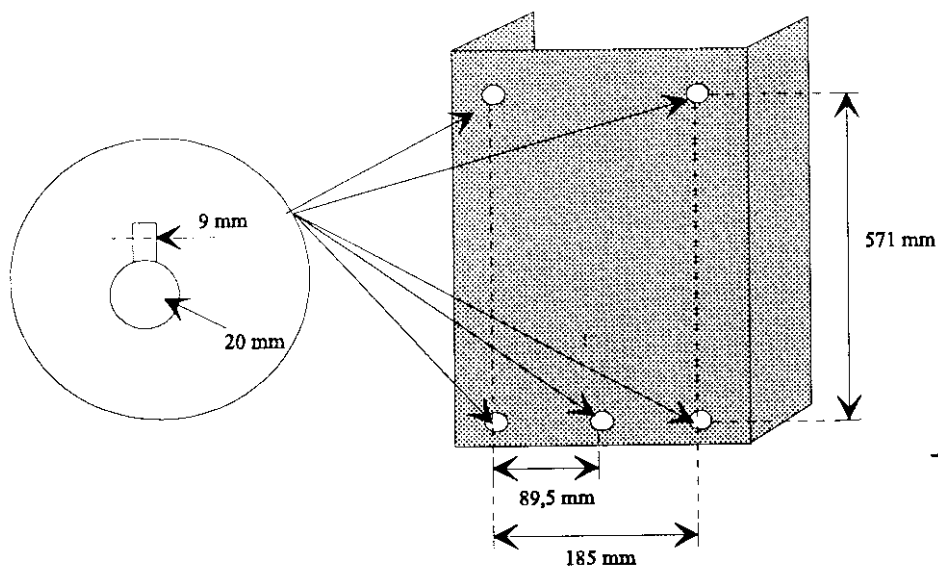


Figure 15 - HPRF mounting plate

Appendix 4 Wall mounting

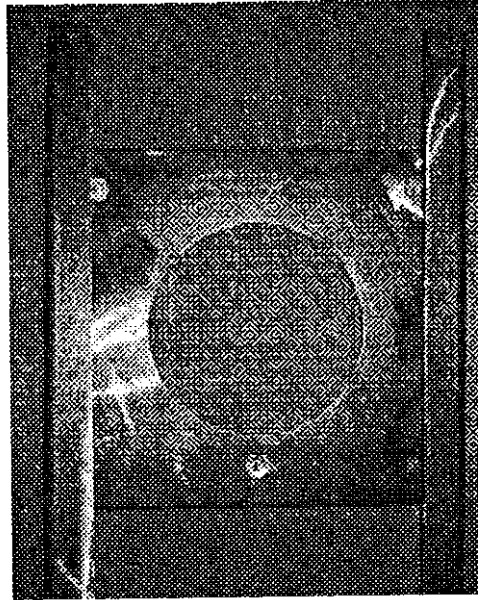


Figure 16 - View of wall mounting

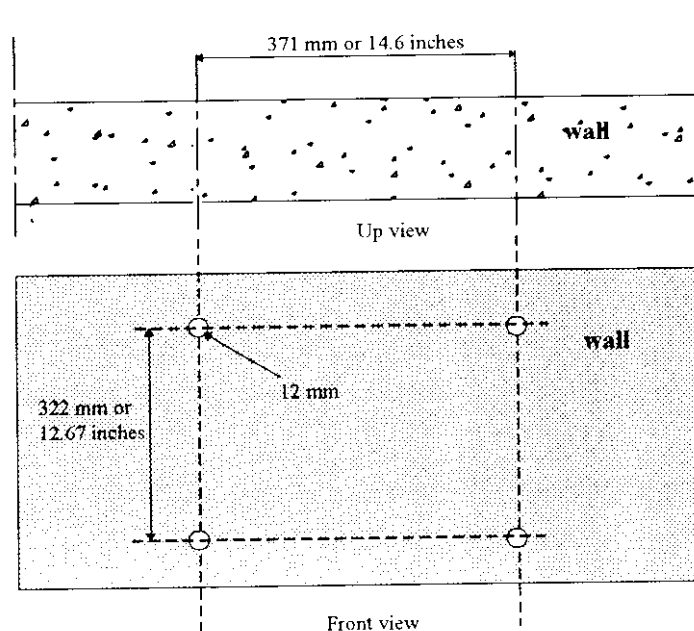


Figure 17 - Wall holes template for base unit mounting

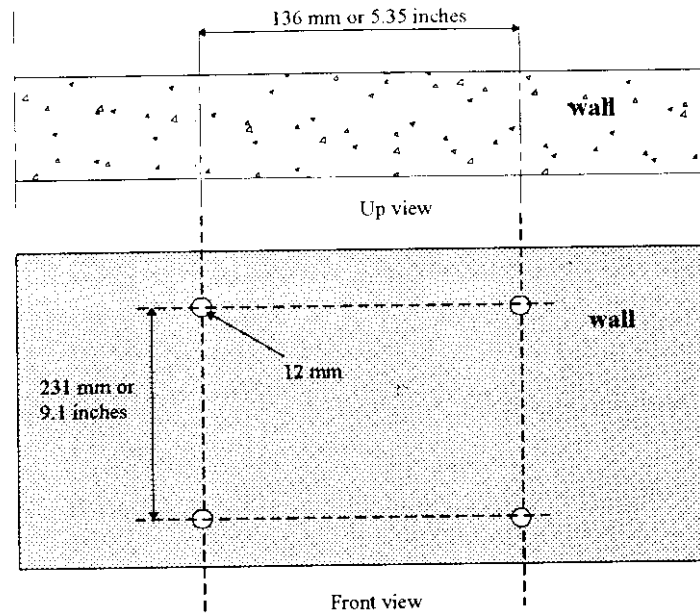


Figure 18 - Wall holes template for HPRF mounting

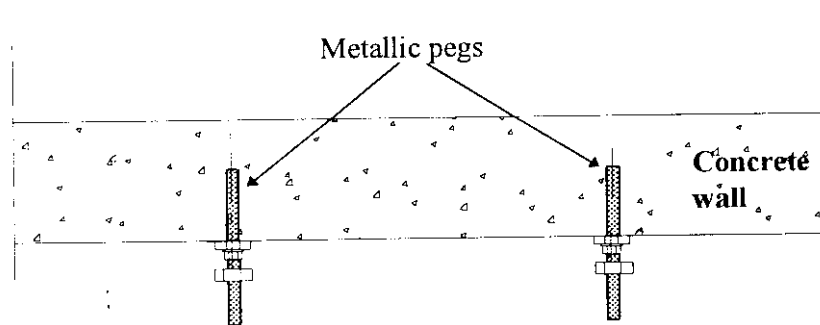


Figure 19 - Concrete wall mounting

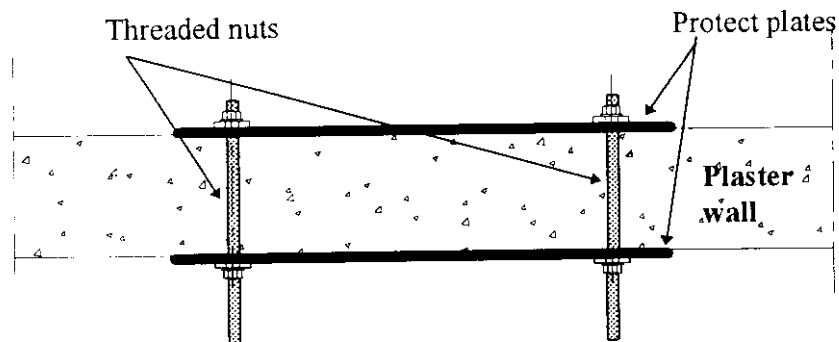


Figure 20 - Hollow wall mounting (1)

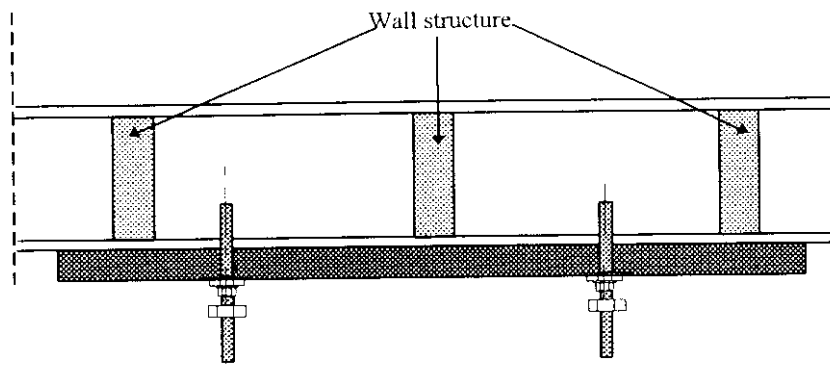


Figure 21 - Hollow wall mounting (2)

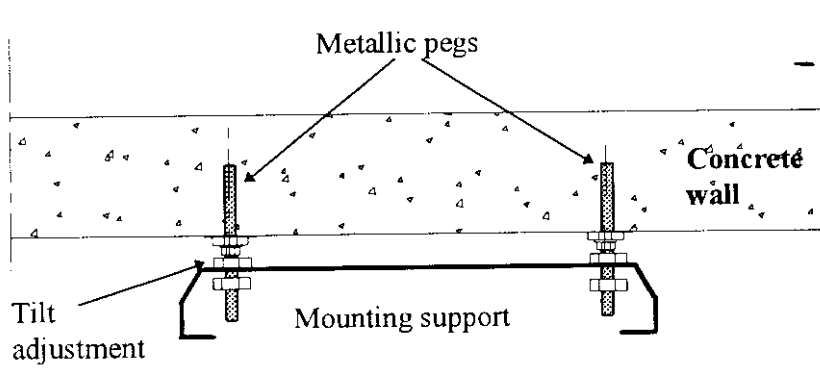


Figure 22 - Tilt adjustment

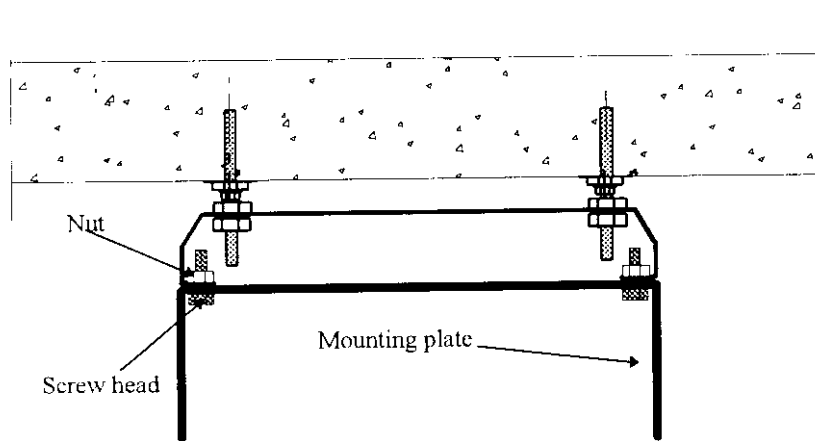


Figure 23 - Mounting plate securing

Appendix 5 Pole mounting

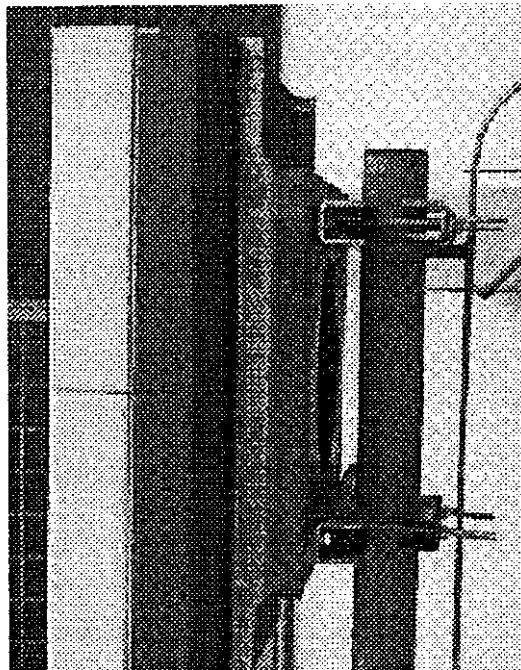


Figure 24 - View of pole mounting

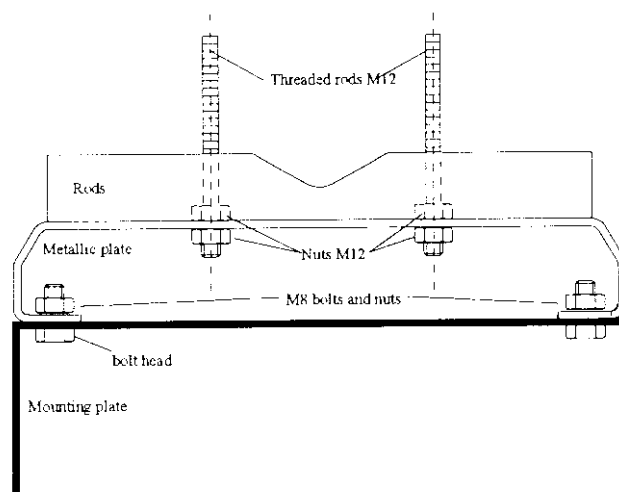


Figure 25 - Mounting kit without tilt adjustment

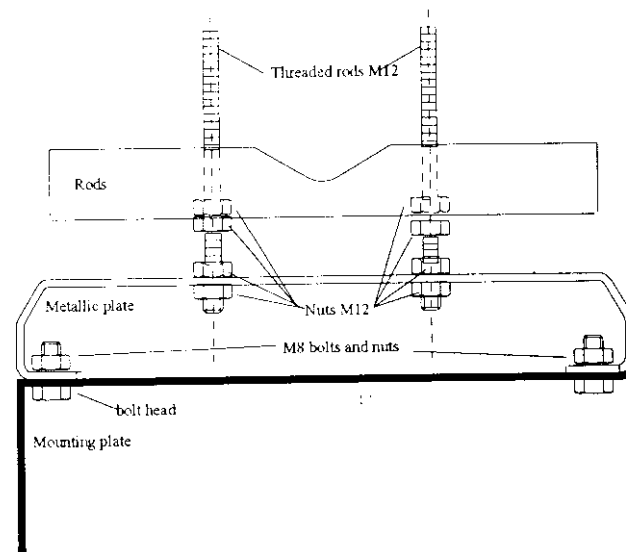


Figure 26 - Mounting kit with tilt adjustment

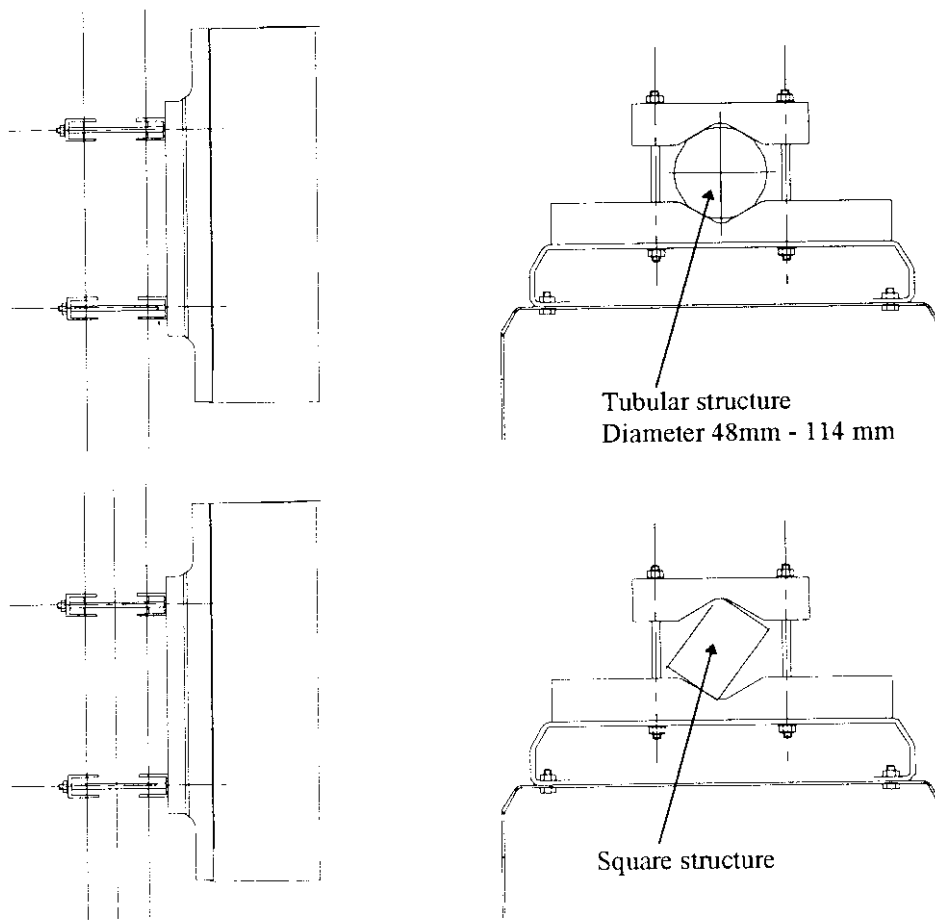


Figure 27 - Pole mounting

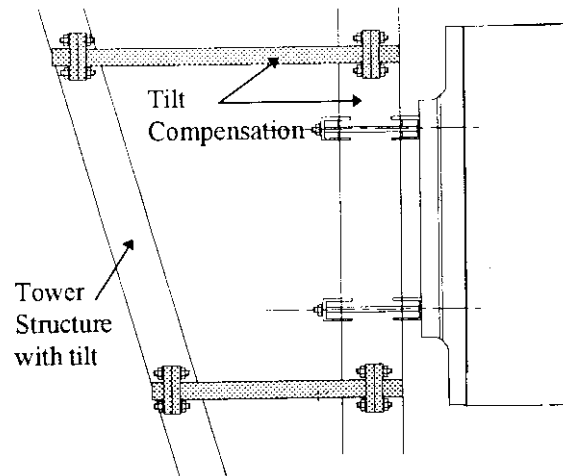


Figure 28 - Tower mounting

Appendix 6 Grounding

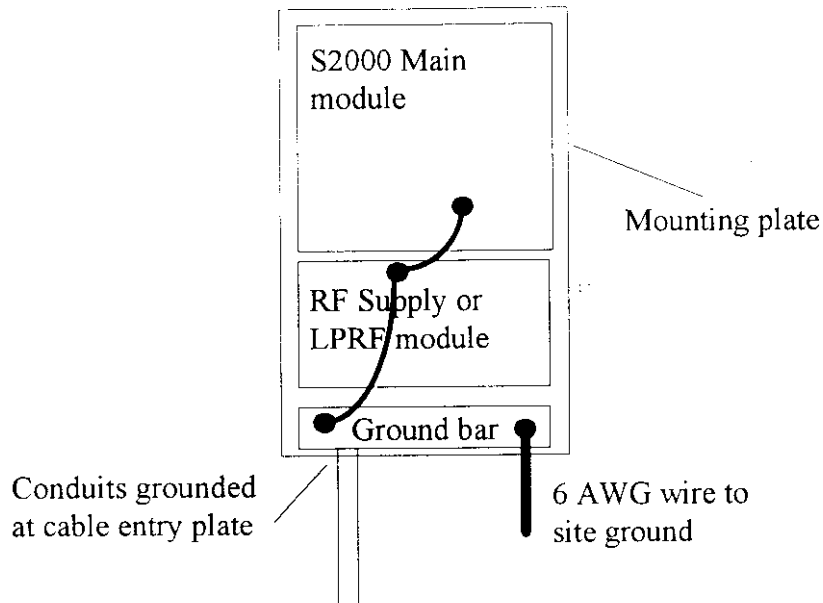


Figure 29 - Base unit grounding

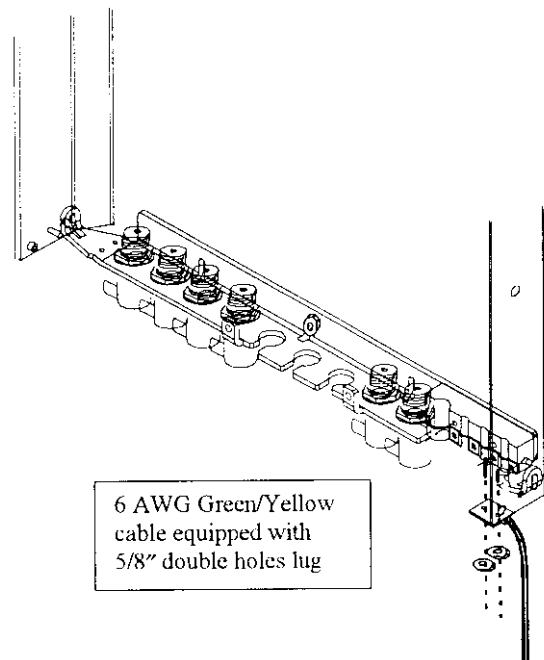


Figure 30 - Ground connection for all BTS except S2000L BTS Standard

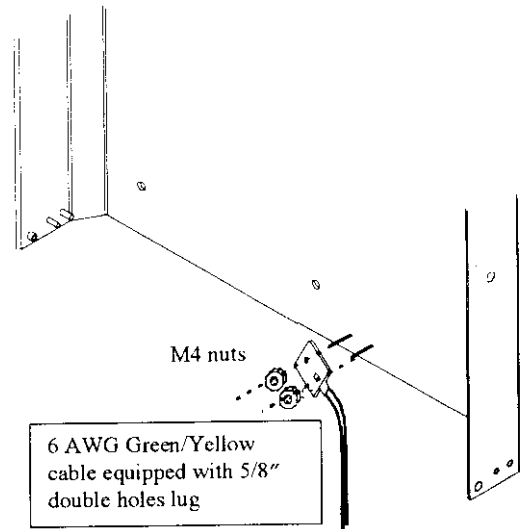


Figure 31 - S2000L Standard ground connection

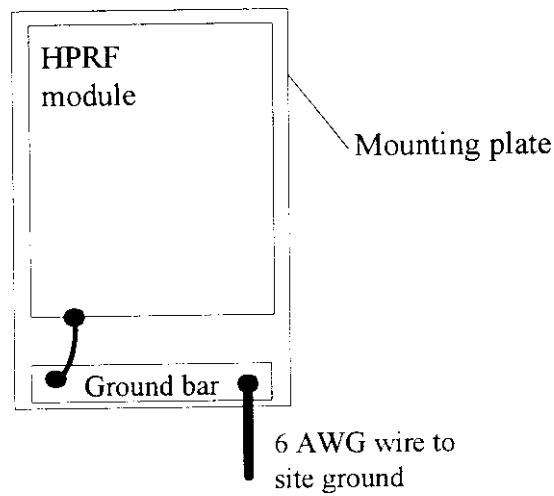


Figure 32 - HPRF grounding

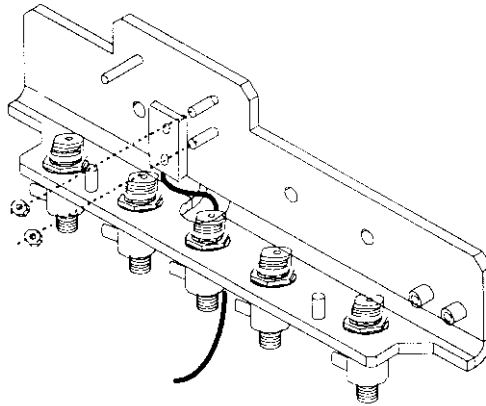
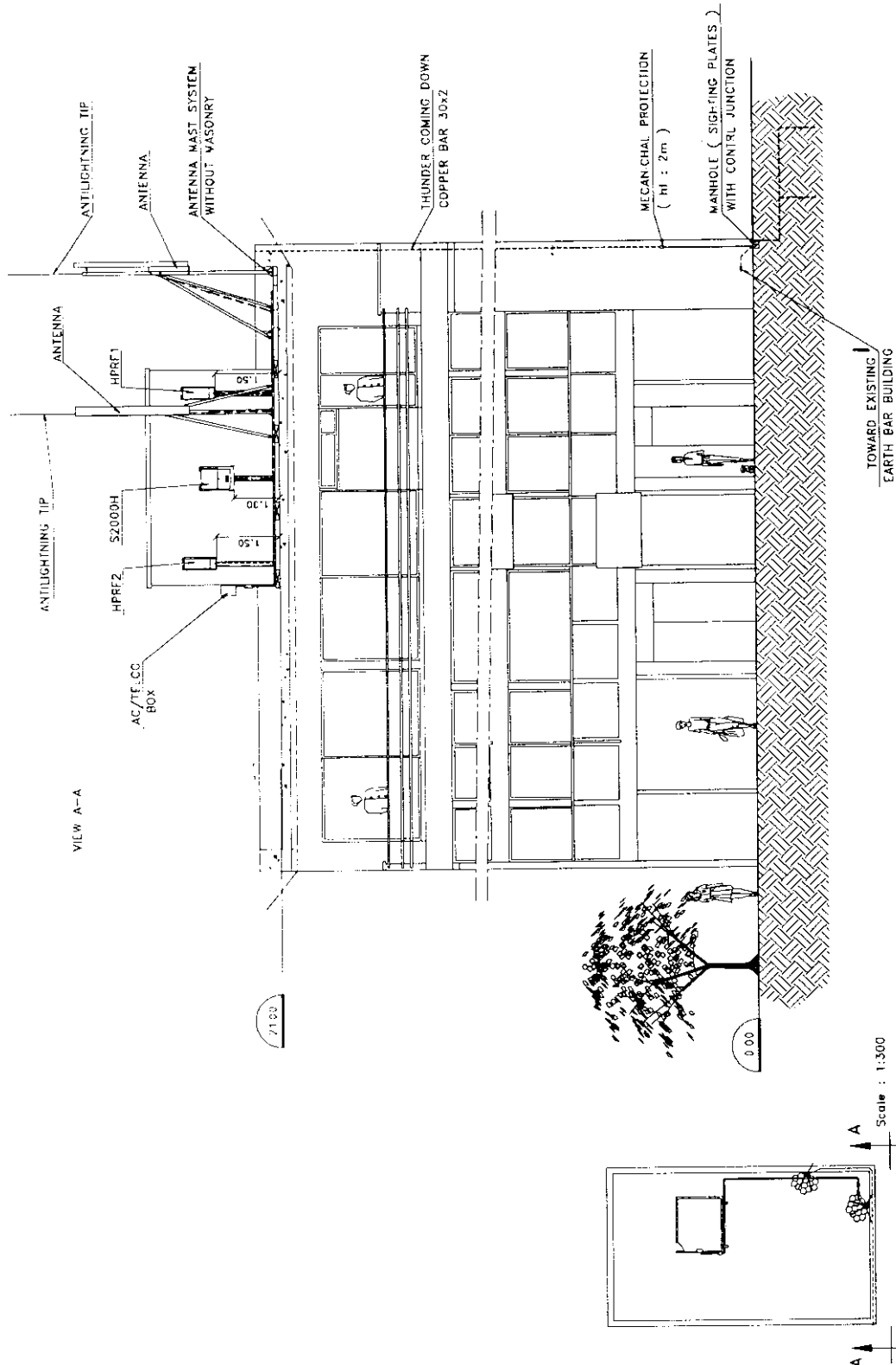
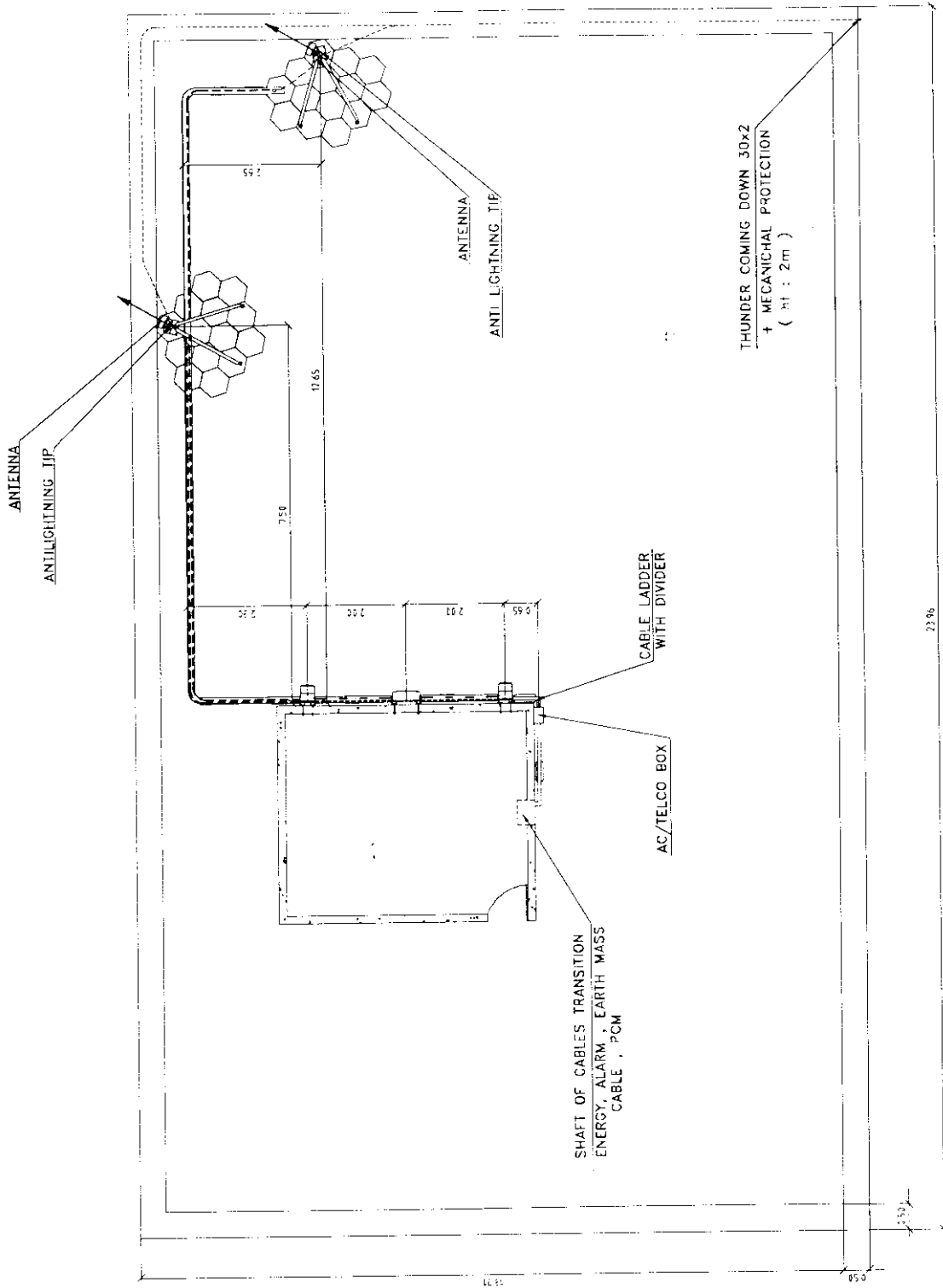


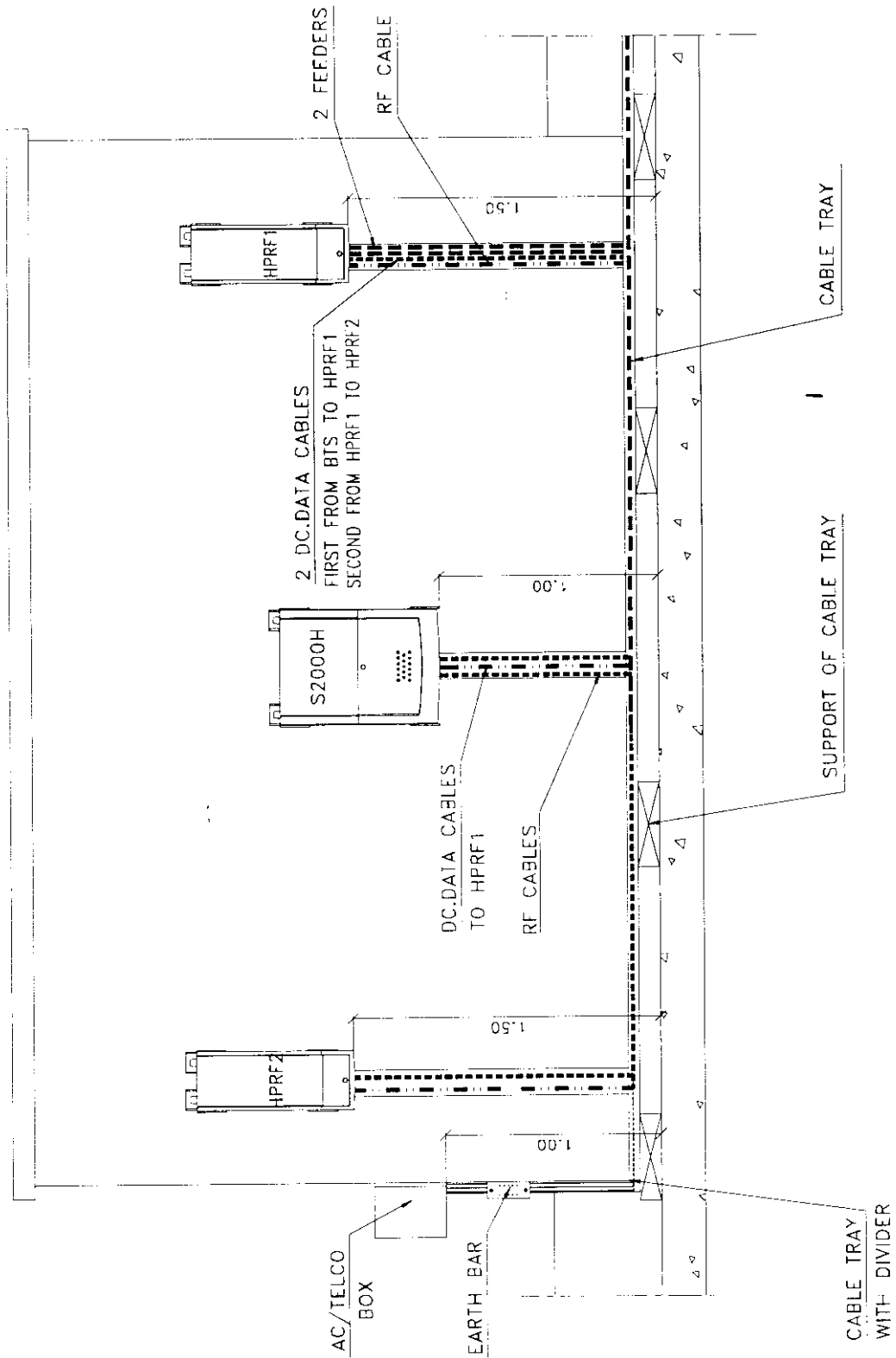
Figure 33 - Ground connection on HPRF ground bar

Appendix 7 Example of wall layout

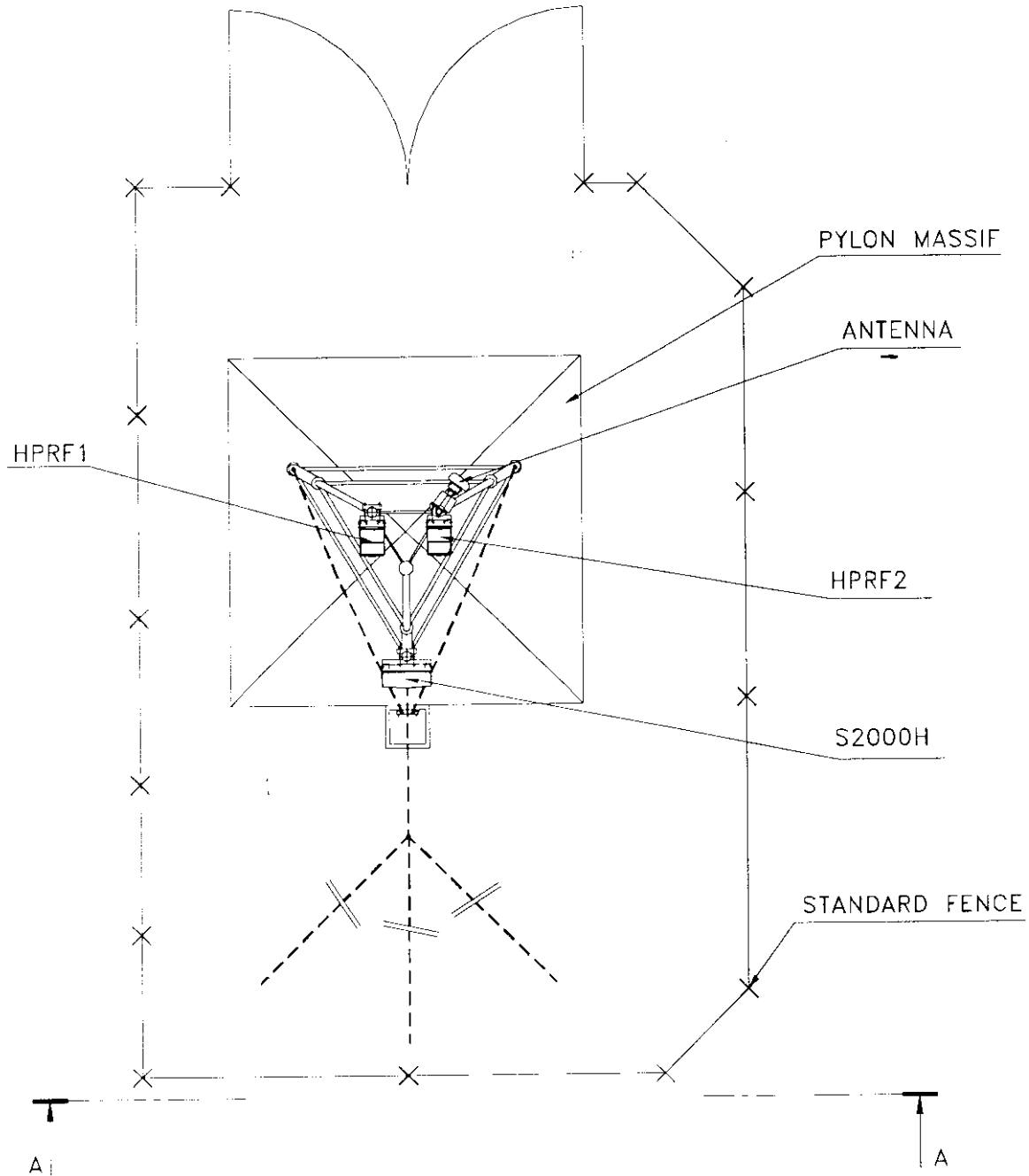


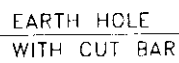


VIEW A-A



Appendix 8 Tower layout





Appendix 9 Cabinet handling

The lifting slings must have a length superior at 1,5 meters to avoid module M6 inserts pulling up.

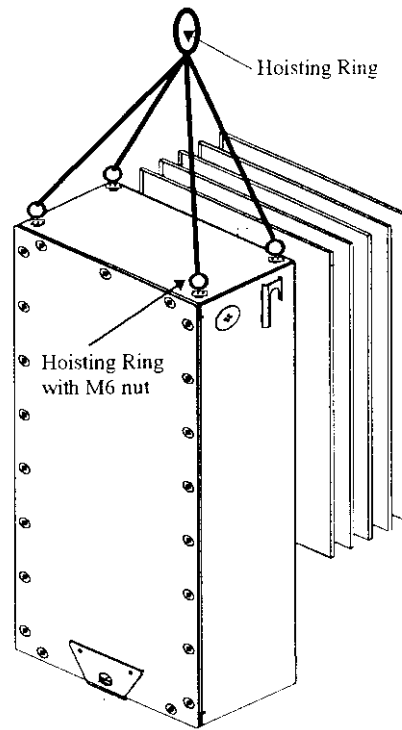
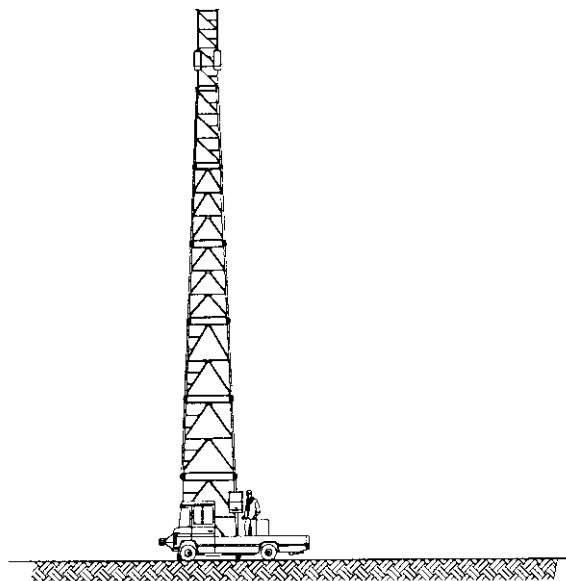
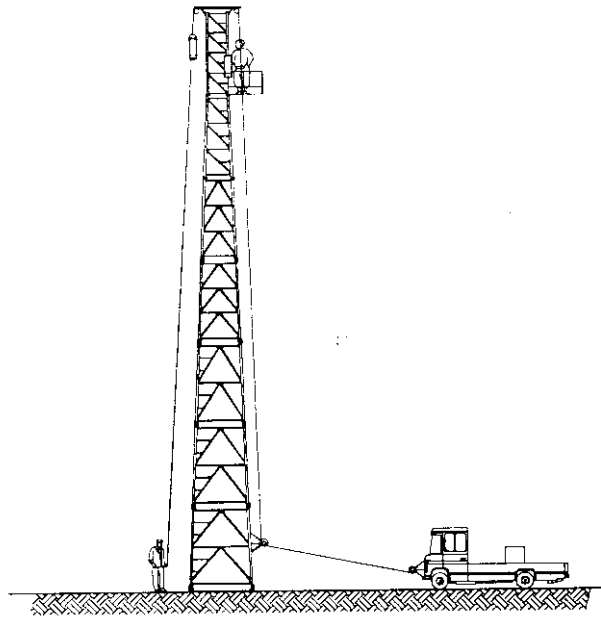


Figure 34 - HPRF hoisting

The same method is applied for the other modules.





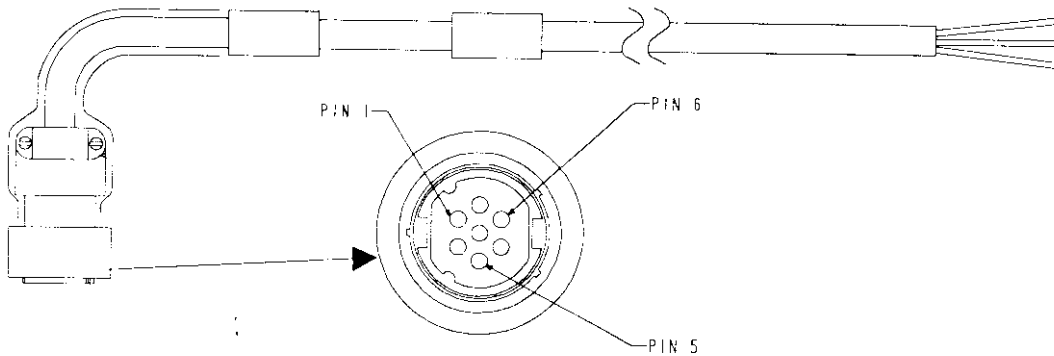
Appendix 10 AC connector

The AC cable between the S2000H/L BTS and the Battery interface box is systematically delivered in 10 m or 787,4 inches length. . For more longer use the Battery interface box or equivalent as interface box.

Connector type: AMP/CMP Female 7 pins

Pinouts:

Connectors pins	Signal	Wires
1	Line	Red
5	Neutral	Black
6	Earth	Green/Yellow



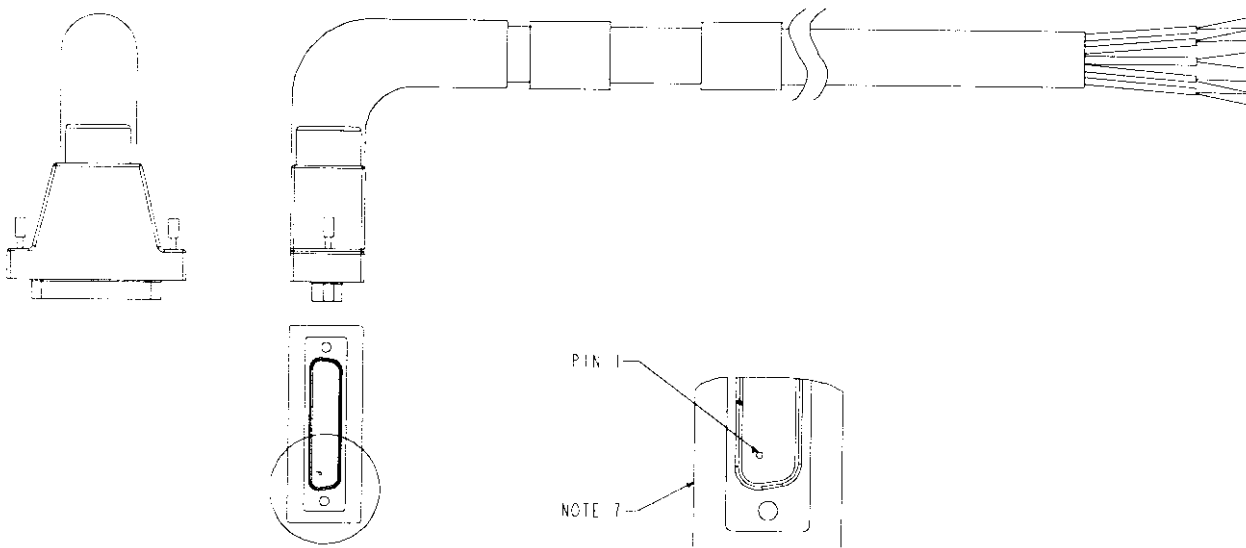
Appendix 11 PCM and alarm connector pinouts

The PCM/Alarms cable between the S2000H/L BTS and the Battery interface box is systematically delivered in 10 m or 787,4 inches length. For more longer use the Battery interface box or equivalent as interface box.

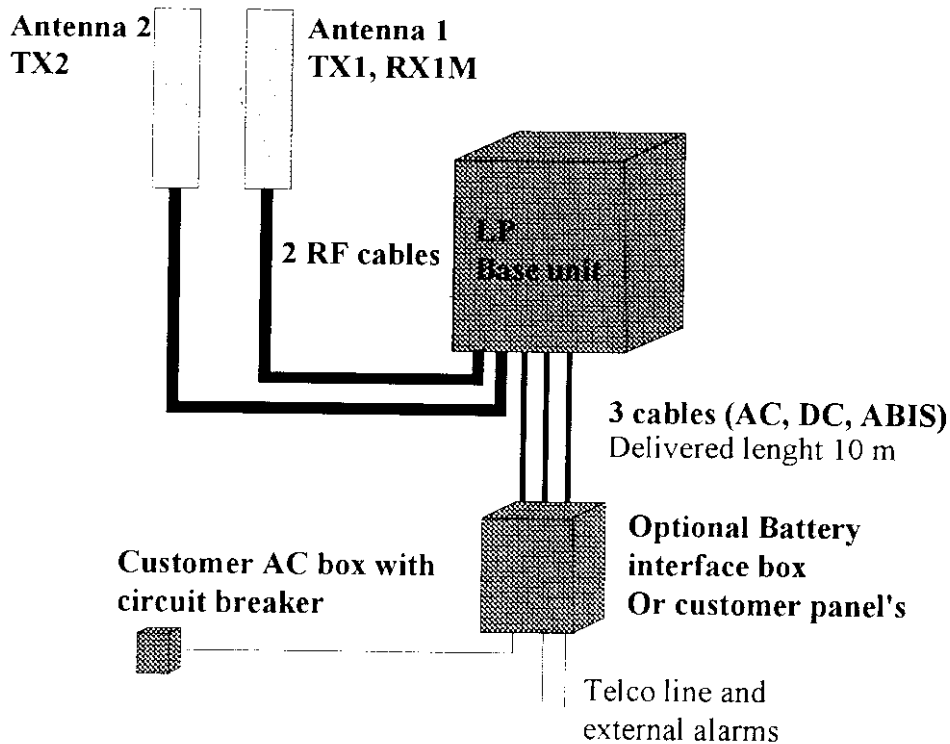
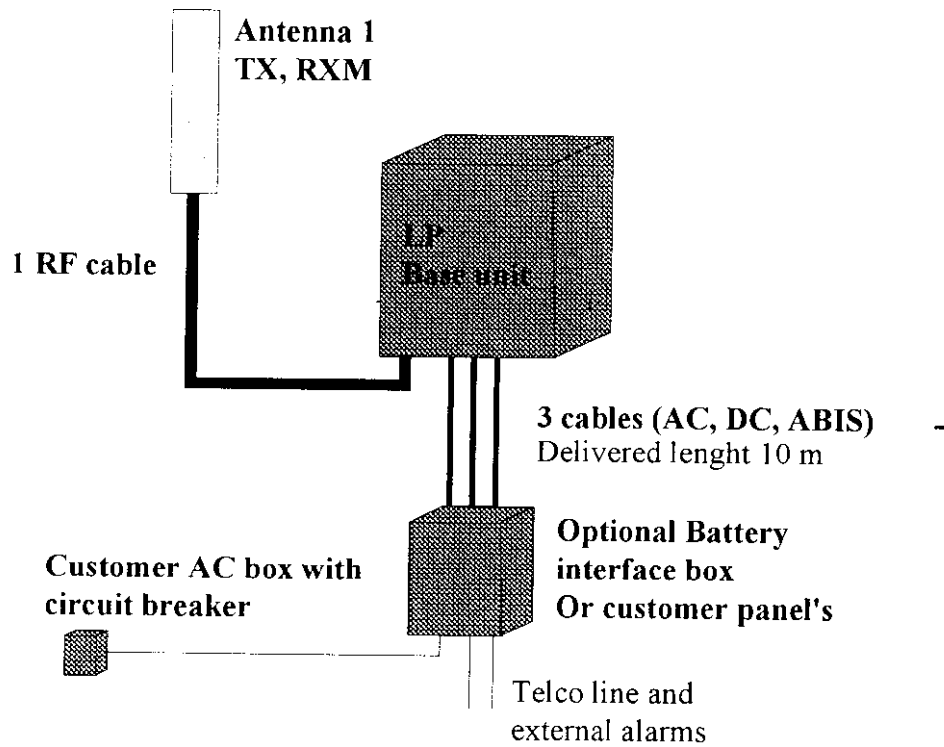
Connector type: Sub D 25 pins male

This connector must be delivered with waterproofing protection.

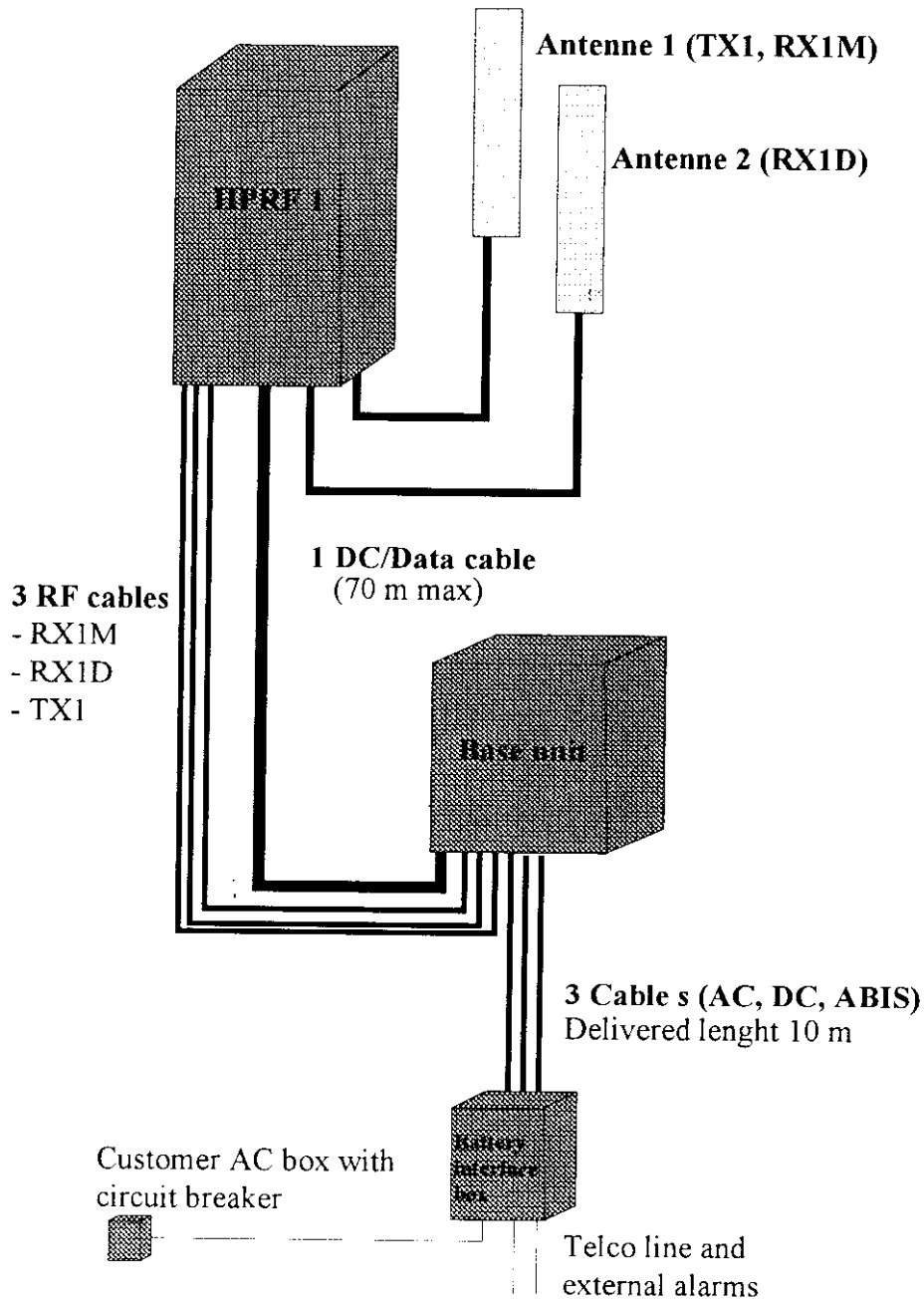
Pins	Signal	Pins	Signal
1	Ground	14	Alarm 3 (+)
2	PCM1 TX (+)	15	Alarm 3 (Gd)
3	PCM1 TX (-)	16	Alarm 4 (+)
4	PCM1 RX (+)	17	Alarm 4 (Gd)
5	PCM1 RX (-)	18	Alarm 5 (+)
6	PCM2 TX (+)	19	Alarm 5 (Gd)
7	PCM2 TX (-)	20	Alarm 6 (+)
8	PCM2 RX (+)	21	Alarm 6 (Gd)
9	PCM2 RX (-)	22	Relay 1 (+)
10	Alarm 1 (+)	23	Relay 1 (Gd)
11	Alarm 1 (Gd)	24	Relay 2 (+)
12	Alarm 2 (+)	25	Relay 2 (Gd)
13	Alarm 2 (Gd)		

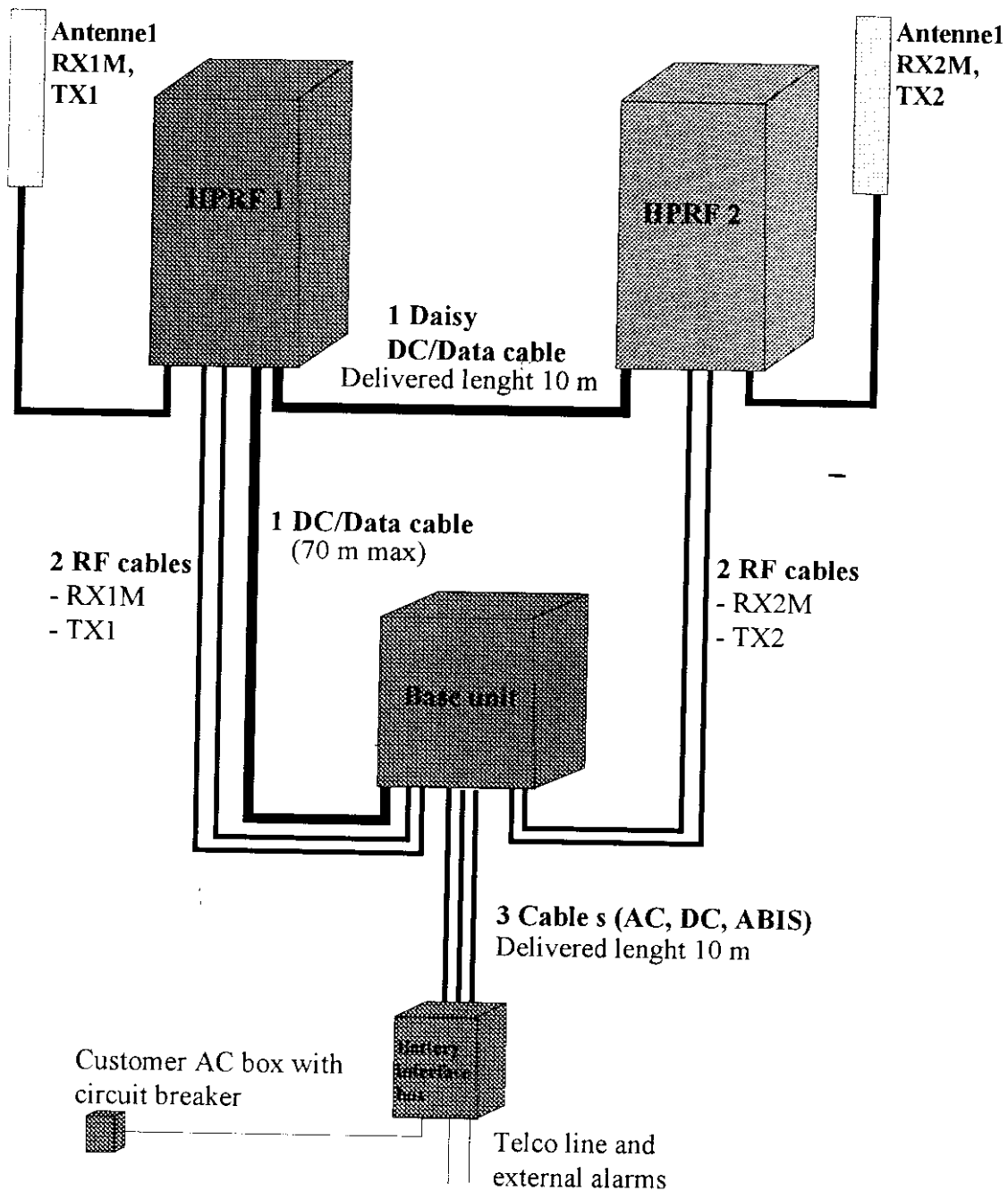


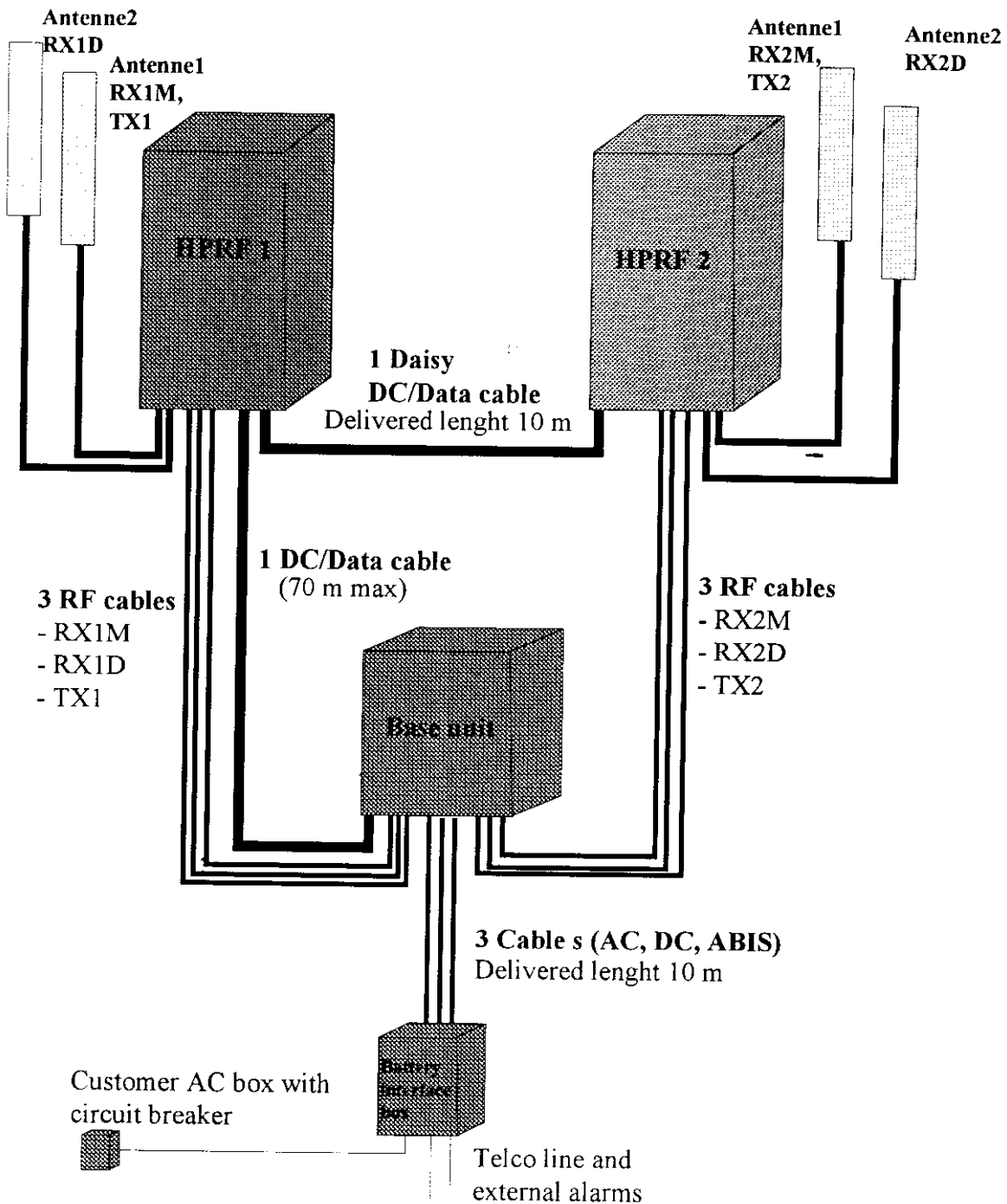
Appendix 12 S2000 Low Power



Appendix 13 S2000 High Power







⌘ **END OF DOCUMENT** ⌘