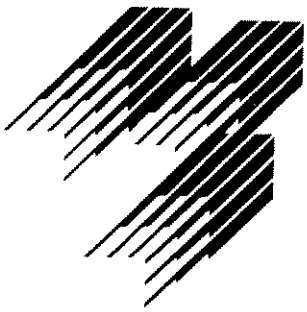


NOKIA NAS

DMR 7000 Training
Product Description

NOKIA
TELECOMMUNICATIONS

NTC RDV 18/7/96
TitlePgs.DOC

Chapter 1
General

1.1 Basic Properties

The Radio Relay Equipment DMR 7000 is a member of the Nokia Telecommunications' Digital Radio Relay Equipment family. It operates in the 7.1...7.7 GHz frequency band. The DMR 7000 can transmit two, four, eight or sixteen 2 Mbit/s signals or one 34 Mbit/s signal (G.703). An 8 Mbit/s interface can be implemented by using an external multiplexer (Second-order Multiplex Equipment DM 8 = one E2-size plug-in unit).

The frequency allocation meets the recommendations by ITU-R (formerly CCIR). The use of the radio frequency spectrum has been optimized at all transmission capacities.

The good system value of Radio Relay Equipment DMR 7000 and the O-QPSK (Offset Quadrature Phase Shift Keying) modulation method employed enable the implementation of long radio hops and produce good interference immunity.

The main channel capacity variants are:

- 2 x 2 Mbit/s
- 4 x 2 Mbit/s
- 8 x 2 Mbit/s
- 16 x 2 Mbit/s
- 1 x 34 Mbit/s

The transmitter output power is +26 dBm. This corresponds to 400 mW.

In addition, the output power may be adjusted either manually or automatically by means of the ALCQ feature (Adaptive Level Control with Quality Measure) within a wide range (15 dB) to optimize the route and minimize interference.

The Digital Radio Relay Equipment family is fully compatible with the Nokia Telecommunications' Transmission Management System TMS, and it also complies with the Telecommunication Management Network (TMN) architecture standardized by ITU-T (formerly CCITT).

All commissioning and transmission management functions of the DMR 7000 (software settings, controls, measurements, fault location) can be performed locally by using a handheld Service Terminal or remotely with the TMS.

Almost all of these functions can also be carried out with the DMR Manager program running on a PC under Microsoft Windows.

The DMR Manager program is in English and it is only compatible with the English version of the radio relay equipment's program.

1.2 Frequency Allocation

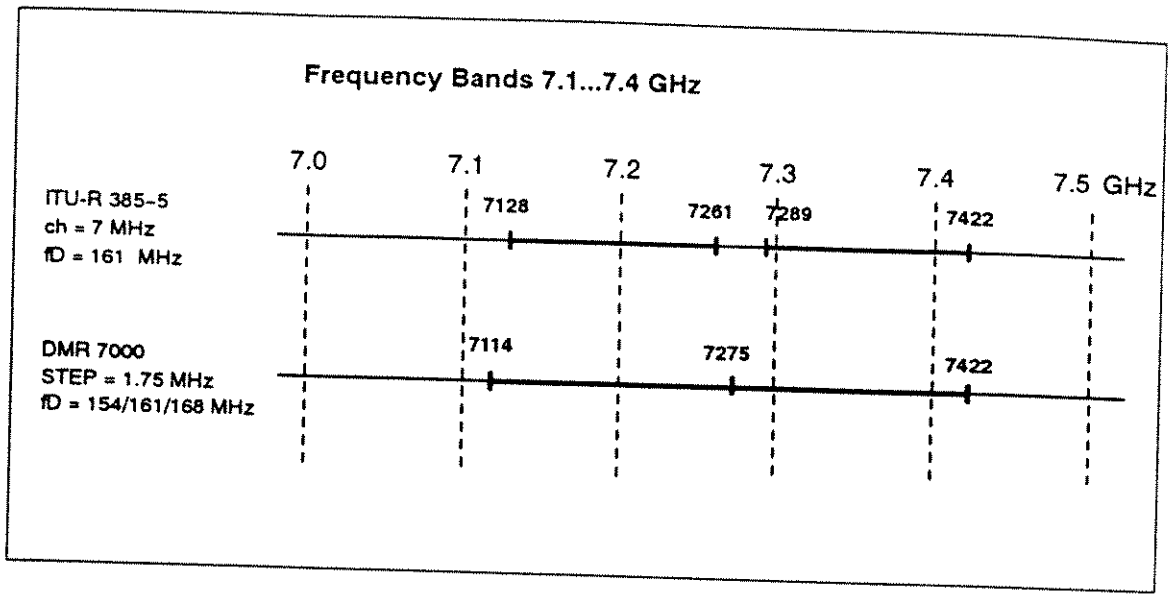


Figure 1 DMR 7000 frequency bands 7.1...7.4 GHz

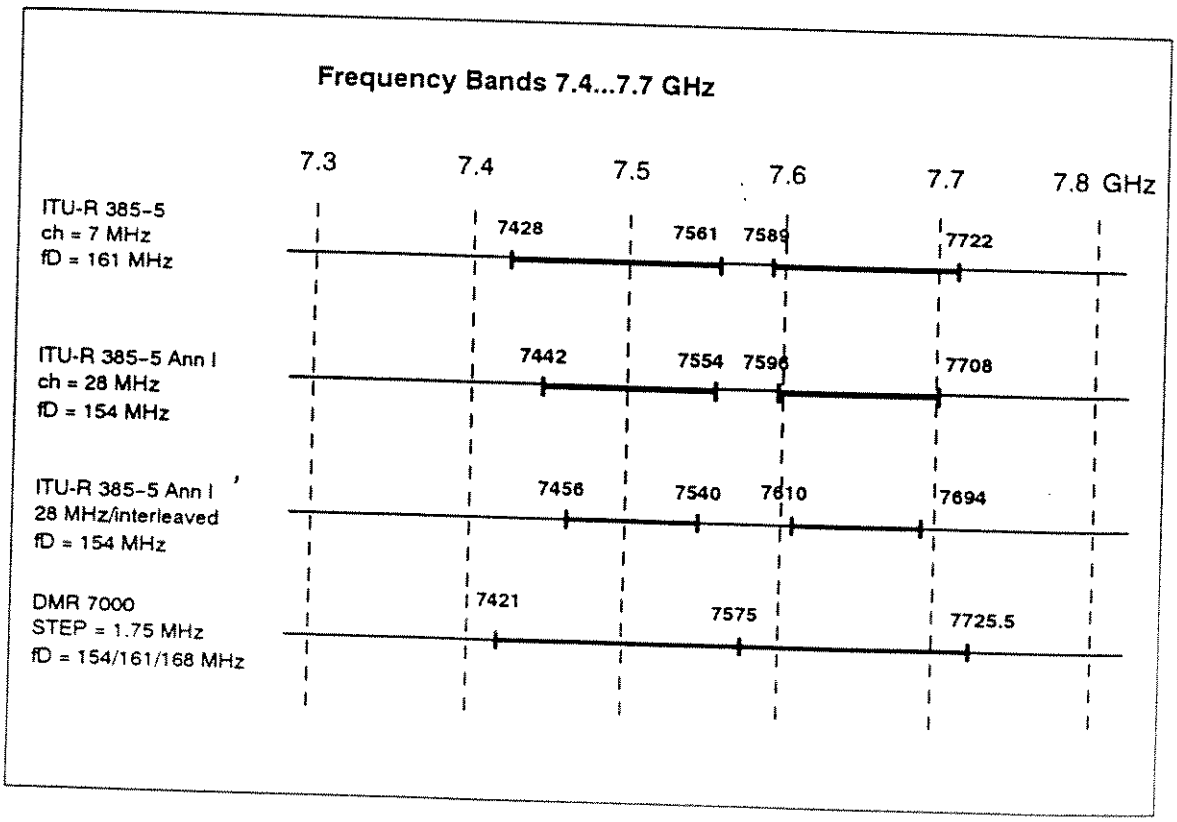


Figure 2 DMR 7000 frequency bands 7.4...7.7 GHz

The DMR 7000 Radio Relay Equipment covers the frequency ranges 7.1...7.4 GHz and 7.4...7.7 GHz. This enables the realization of the channel allocation according to ITU-R Recommendation 385-5. The channel frequencies can be freely selected in 1.75 MHz steps within each frequency band. Duplex spacings 154 MHz, 161 MHz and 168 MHz can be used.

The channel frequencies are entered using the handheld Service Terminal. The antenna filter, however, has to be used on the particular channel for which it has been tuned.

The minimum spacing between two adjacent channels depends on the capacity used. The offset-QPSK modulation method and narrow filtering enable efficient use of the spectrum:

Capacity	Minimum channel spacing, df_{min}
2 x 2 Mbit/s	3.5 MHz
4 x 2 Mbit/s	7.0 MHz
8 x 2 Mbit/s	14.0 MHz
16 x 2 Mbit/s	28.0 MHz
1 x 34 Mbit/s	28.0 MHz

Table 1 The minimum spacing between two adjacent channels depends on the capacity

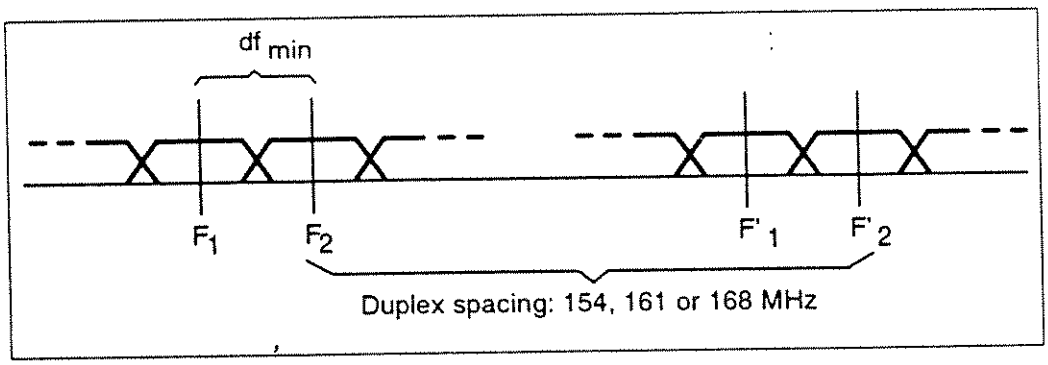


Figure 3 Channel spacing and duplex spacing

1.3 Mechanical Construction

The RF boards of the transmitter and receiver and the modem board of the radio relay equipment are mounted in an aluminum chassis. The motherboard is mounted to the cover on the modem side.

The power supply unit which generates and regulates the operating voltages required has been mounted to the motherboard. The motherboard is connected to the Baseband Unit (BBU) and in the 16 x 2 Mbit/s variant also to the Expansion Unit (EXU). This entity has been installed in a cartridge made of steel sheet metal. The front connectors have been covered with a front case to provide interference shielding. The main components of the DMR 7000 are illustrated in Figure 4.

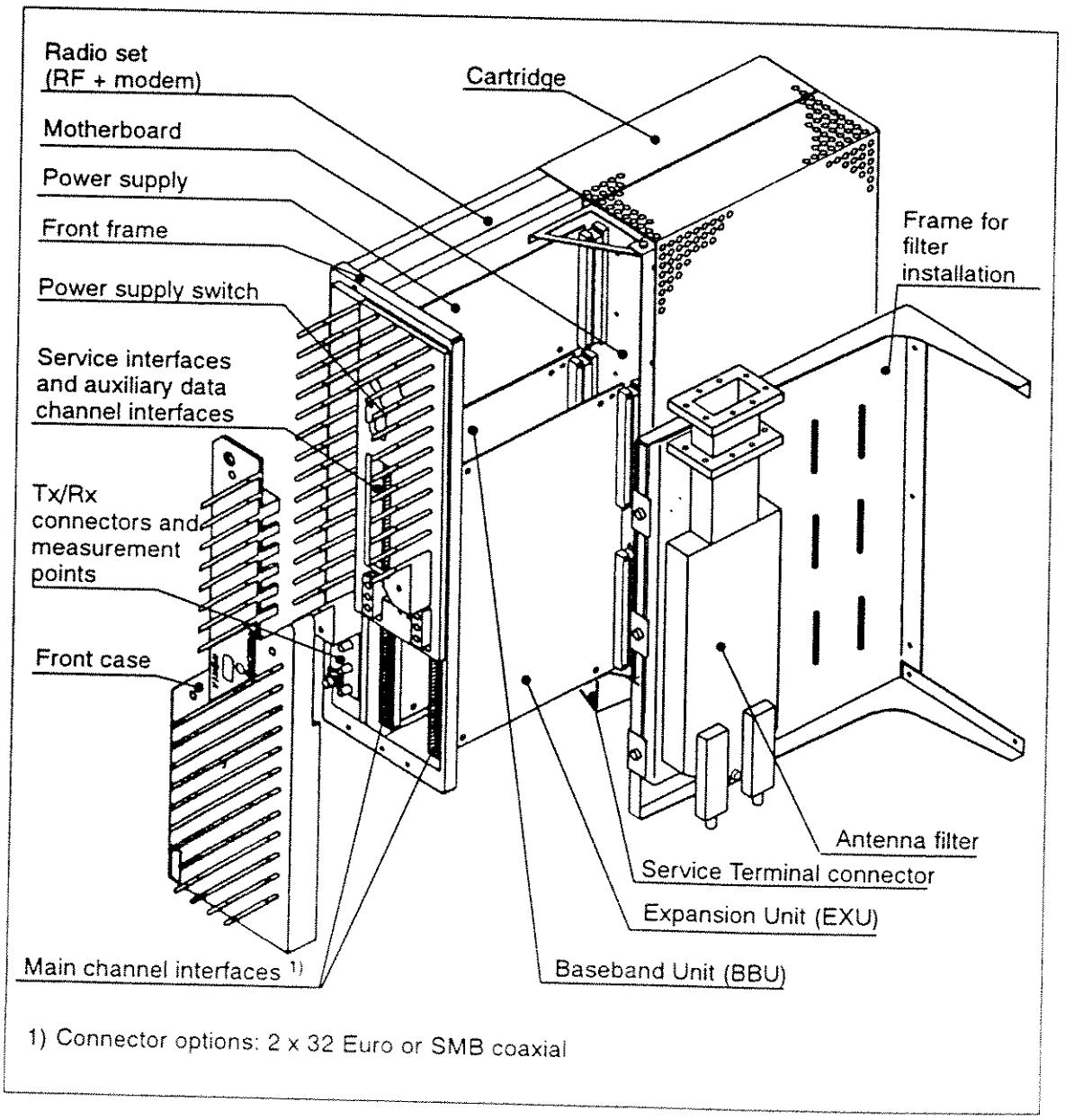


Figure 4 Main components of Radio Relay Equipment DMR 7000

Normally the antenna filter is mounted separately beside the radio unit, on an adjacent rack. In single use it can be installed on top of the radio in a slim rack. A Euroconnector for the Service Terminal is located in front of the radio. This connector may also be used to recharge the Service Terminal batteries. The HSB-switch and baseband branching needed in redundant operation are fastened outside the cartridge.

The dimensions of the cartridge are (excluding filter) 445 mm (height), 120 mm (width) and 305 mm (depth from front edge of cooling extrusion to rear edge of rack).

At the equipment station, the cartridge is suspended by the brackets at its rear wall to the rack. It may be installed in a Nokia TM4 rack (CEPT-A slim rack). In redundant set-ups, the two sets of equipment are installed vertically; the lower B equipment upside down. The radio relay equipment may also be installed in a 19" rack, or it may be mounted on the wall using the installation accessories. In redundant set-ups, the two sets of equipment are then installed side by side. The various installation options are described in more detail in the *Installation* part of this Operating Manual.

The main channel interfaces (2 Mbit/s) may be either balanced using Euroconnectors or unbalanced using coaxial connectors (SMB). At the 34 Mbit/s capacity, the main channel interface is always implemented by means of coaxial connectors.

The front connectors and the power switch of the radio equipment are located behind the front case. The measurement point connector MP is accessible without having to open the front case which provides protection against interference.

Only the cables for the repeater bus and protection bus, if any, are connected to the rear of the cartridge.

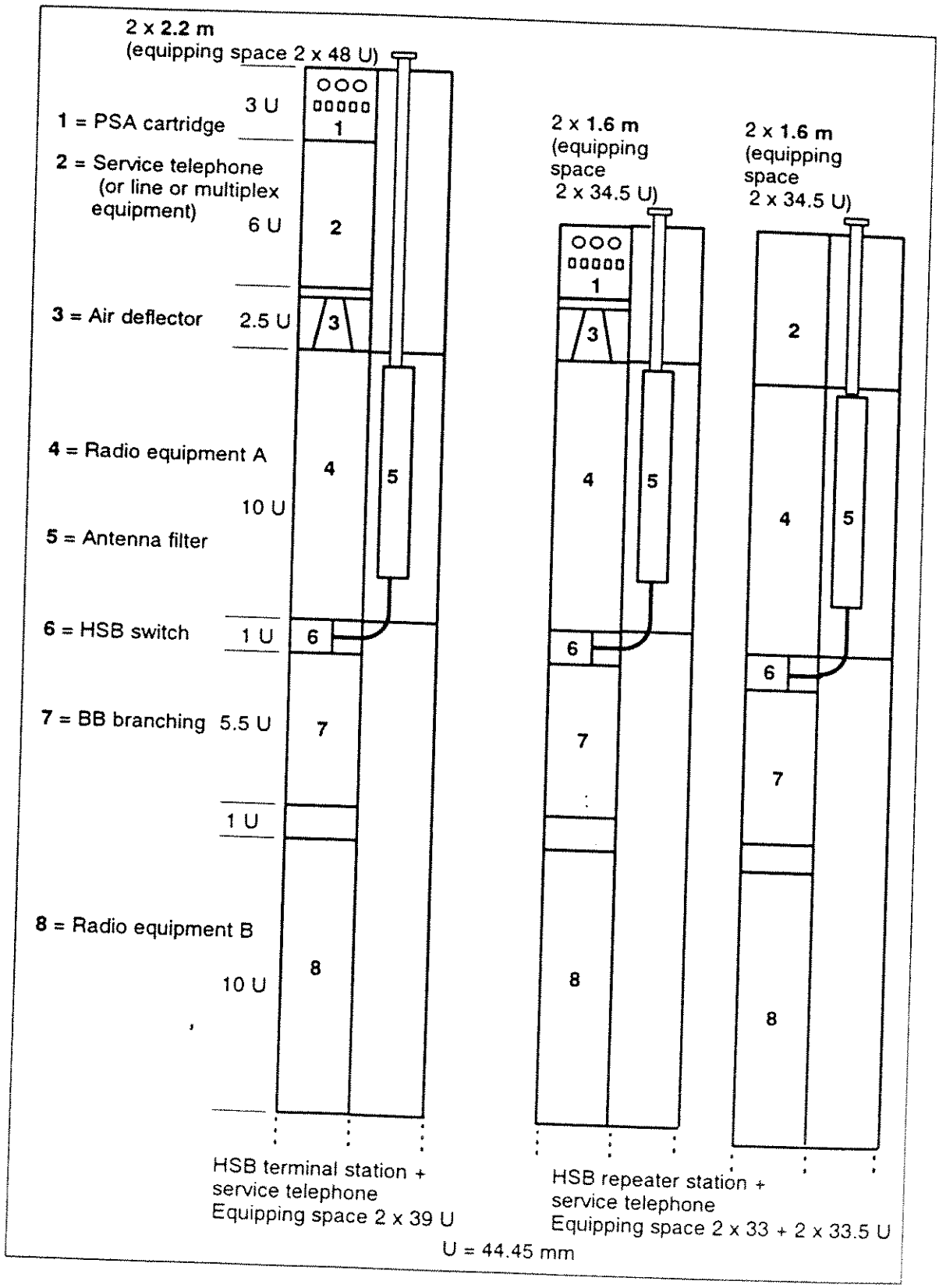


Figure 5 Installation of HSB terminal and repeater station into Nokia TM4 racks (slim rack), example

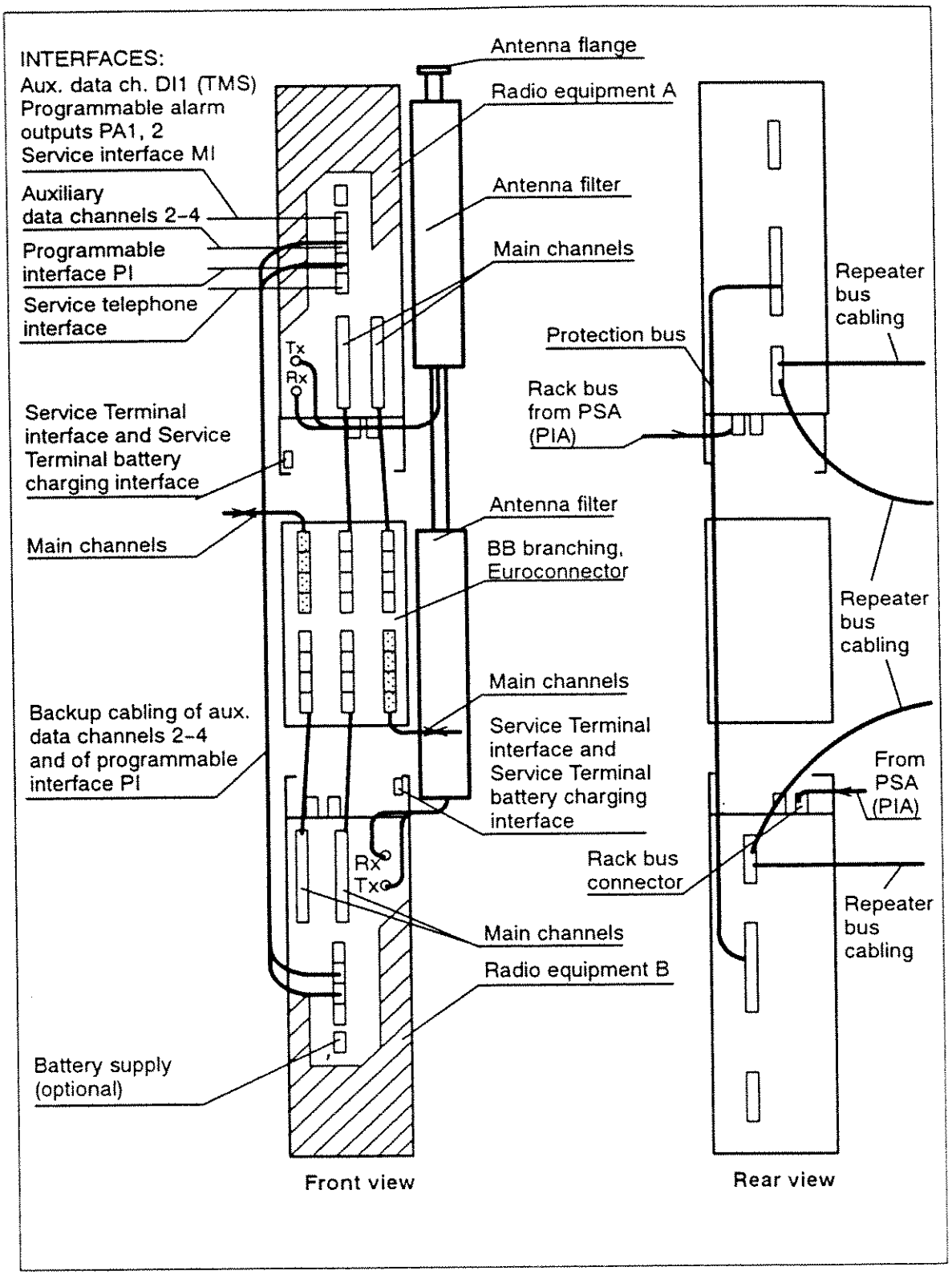


Figure 6 Cabling principle for the DMR 7000. Typical slim rack installation for redundant operation (space diversity 2 Tx).

1.4 Block Diagram and Interfaces

Figure 7 shows the general block diagram of Radio Relay Equipment DMR 7000. A more detailed block diagram is enclosed to this section. The equipment may be divided on block level into the baseband and radio sections, the motherboard, power supply and antenna branching.

The baseband section includes the baseband unit (BBU with 2 x 2 Mbit/s, 4 x 2 Mbit/s, 8 x 2 Mbit/s or 1 x 34 Mbit/s interfaces) and the expansion unit (EXU with 8 x 2 Mbit/s interface in the 16 x 2 Mbit/s variant). The signals between the BBU, the EXU and the radio section pass via the motherboard.

The radio section consists of the modem and the RF part which is further divided into transmitter, receiver and loop mixer.

The power supply is connected to the motherboard which distributes the operating voltages to the other parts of the equipment.

The antenna branching comprises the antenna filter, HSB-switch and possibly application-specific accessories.

Main Channels

The N x 2 Mbit/s and 1 x 34 Mbit/s main channel interfaces of the DMR 7000 meet the ITU-T Recommendation G.703.

Auxiliary Channels

In addition to the main channel interfaces, the radio relay equipment provides auxiliary channel interfaces and external inputs and outputs.

- One service telephone channel with two parallel interfaces TI1 and TI2; the channel and the interfaces are connected with analog branching
- TMS interface DI1, specifically wired for transmission management communications. It can also be used as auxiliary data channel if TMS is not used.
- Three asynchronous auxiliary data channels DI2...DI4 operating at 1200...4800 bit/s depending on the total capacity of the system
- Service interface MI, (V.11)

Externál Inputs and Outputs

- Five digital (PI1I, PI2I, PI3I, PI4I, PI5I) and one analog input (PI6I) for controlling external alarms
- Three digital control outputs (PI3O, PI4O, PI5O)
- Two programmable alarm outputs (PA1 and PA2)

The interfaces and their use are described in more detail in the *Technical Specifications* and *Application Planning* parts of this Operating Manual.

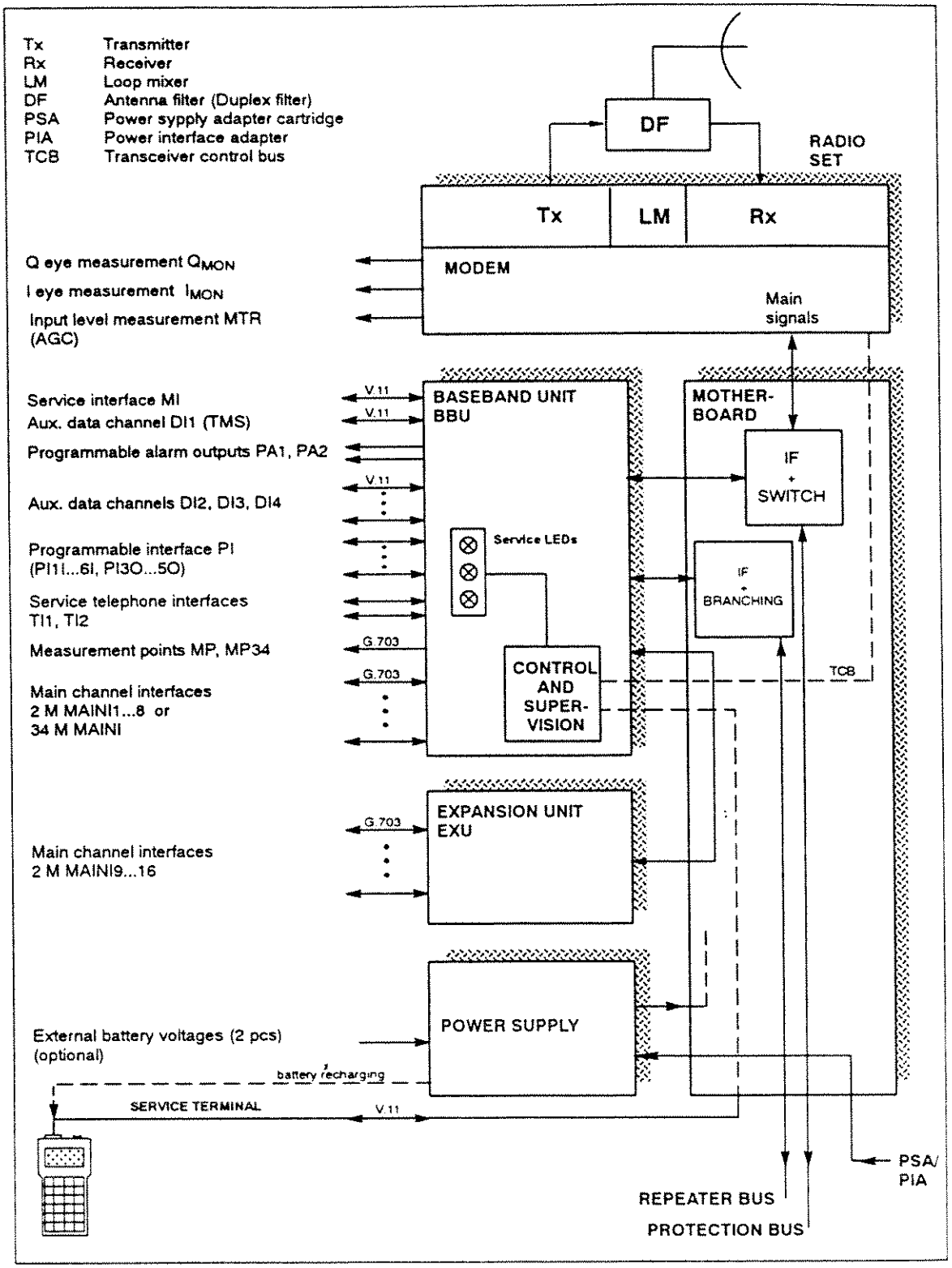


Figure 7 DMR 7000, general block diagram

1.5 Transmission Management

The operation of the radio relay equipment is locally controlled with the Service Terminal via the Service Terminal interface located at the front of the equipment. (See the Operating Handbook of the Service Terminal.) Via this interface, the state and alarm information of the equipment is read, controls and settings are issued, loops are connected etc. The communication over the service interface is serial.

The radio relay equipment may also be controlled remotely with a Transmission Management Computer (TMC; see the Operating Handbook of the Transmission Management System TMS).

The transmission management is described in more detail in the *Application Planning* and *DMR 7000, Service Menu Reference* parts of this Operating Manual.

It is possible to use a DMR Manager program running on a PC under Microsoft Windows to carry out all the same transmission management functions that are made using the Service Terminal (except the Local alarm cancel and Reset local cancel functions).

The descriptions of these functions in this document are thus applicable to DMR Manager use even if not stated expressly.

The transmission management functions carried out with the DMR Manager are described in the following documents:

- *DMR Manager, PC Program for Managing DMR Equipments:*
  - *Product Overview C33309.21*
  - *User's Manual C33309.20*

Note The DMR Manager program is in English and it is compatible only with the English version of the radio relay equipment's program.

1.6 Automatic Power Control (ALCQ)

The Adaptive Level Control with Quality Measure (ALCQ) feature enables the transmitter section of the radio relay equipment to increase or decrease the RF power automatically according to the response received from the receiver at the other end of the hop which indicates the quality of the input signal. This arrangement has at least two significant advantages:

- The design of the entire radio network is made easier: Since the transmission power will be at an optimum value under all conditions, the interference between adjacent hops is minimized. Several radio hops may thus originate at the same point without danger of mutual interference.
- Automatic compensation for any changes occurring on the radio path (especially fading) is accomplished, enabling the transmission quality to be kept within acceptable limits.

In practice, the ALCQ feature is implemented by the program in the processor of the control and measurement section of the baseband unit, by a variable amplifier in the transmitter and by transferring information on the received signal quality required for the power control from the receiving end to the transmitting end in the radio frame structure.

This feature is described in more detail under 8.1 *Adaptive Level Control with Quality Measure (ALCQ)* in the *Application Planning* part of this Operating Manual.

1.7 Multiplexing and Cross-connection

The BBU multiplexes the 2 Mbit/s main channels so that each channel may be placed into any time slot of the radio frame (by means of the Service Terminal settings).

At the repeater station, the Service Terminal may also be used to specify without restrictions which channels shall be directed to the interfaces at the station for branching and which channels will continue on the repeater bus to the next radio hop (see Chapter 1.8).

In addition to the 2 Mbit/s main channels, the following information is multiplexed into the frame structure:

- The frame alignment signal
- The justification bits
- The auxiliary data channels DI1...DI4
- Service telephone channel (TI1, TI2)
- The internal control channel of the equipment for the transfer of the information required by the adaptive power control and to monitor the state at the far end
- The parity bit.

Figure 9 illustrates the main features of the frame structure and indicates the number of bits reserved for various purposes.

1.8 Dynamic Branching and Repeater Bus

DMR 7000 includes built-in facilities for branching one or more of the 2 Mbit/s channels by means of the software (locally with Service Terminal or remotely with TMS, see Figure 8). This branching is possible in single and redundant uses.

The dynamic branching is described in more detail in the *Application Planning* and *Operation* parts of this Operating Manual.

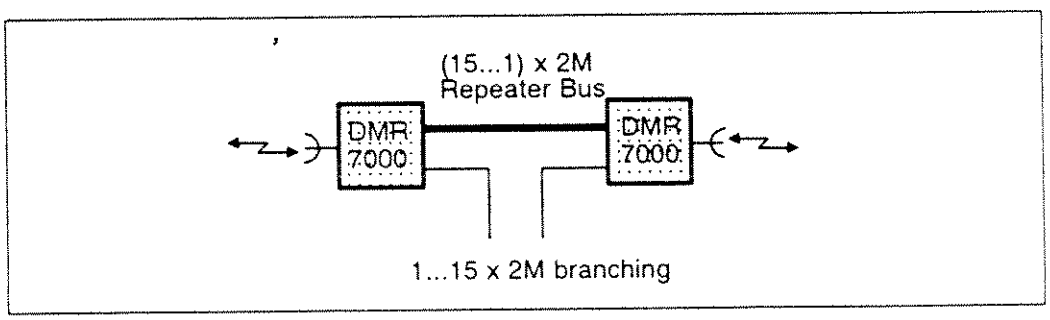


Figure 8 Branching at a repeater station. Any 2 Mbit/s channel in the repeater bus may be branched or connected through.

The repeater bus considerably reduces the 2 Mbit/s main channel cabling at a repeater station. The repeater bus carries from one hop to another those channels that are not branched at the repeater station.

	Capacity, Mbit/s				
	2 x 2	4 x 2	8 x 2	16 x 2	1 x 34
Multiframe frequency, Hz	4002.89	4002.89	8011.58	16046.39	17050.75
Frame frequency, Hz	8005.79	8005.79	16023.16	32092.78	34101.50
Data	1022	2044	2040	2032	2015
Justification	2	4	8	16	1
Justification indication	10	20	40	80	5
Frame alignment signal + multiframe bit	20	20	20	20	20
Internal control channel	2	2	2	2	2
Parity 1	2	2	2	2	2
Auxiliary data channel DI3	2	2	2	2	2
Auxiliary data channel DI1	16	16	8	4	4
Auxiliary data channel DI2	2	2	2	2	2
Auxiliary data channel DI4	2	2	2	2	2
Service telephone data	16	16	8	4	4
Service telephone octet	-	-	-	1	1
Frame bits	72	82	86	142	45
Bit rate on radio path, bit/s	4387170.77	8526162.17	17096712.84	35141592.45	35141592.45

MULTIFRAME

Figure 9 Main features of frame structure and allocation of time slots between the various needs

1.9 Scrambling

A certain polynomial may be added to the data going to the radio path. This procedure is called scrambling. In the DMR 7000, the operator may select the polynomial from seven available options separately for each hop. Both ends of the hop must have the same polynomial.

If the scrambling is disabled and AIS or other regular data is connected to the main channels, the receiver will not be locked.

The scrambling is described in more detail in the *Application Planning* and *DMR 7000, Service Menu Reference* parts of this Operating Manual.

1.10 Signal Delay Compensation

In two DMR 7000 radio relay equipments protecting each other, a delay difference is caused by the different lengths of signal transmission paths and it must be compensated for. This takes place in a programmable delay circuit where the delay can be compensated for in increments of one bit. The compensation range is -3...+4 bits which corresponds to approx. 60 m of waveguide line at the 34 Mbit/s capacity.

1.11 Effect of Variation on Structure

In the DMR 7000 there are several optional features, some of which affect the structure of the equipment. The radio frequencies and duplex spacing do not affect the structure of the baseband sections but they affect the radio set (its RF board) and the antenna branching.

The capacity of the equipment affects the line interface hybrids (type and number) of the baseband units (BBU), the crystal frequencies of the BBU and expansion unit (EXU), and the modem board of the radio set. If more interfaces are needed, an EXU can always be added (eight 2 Mbit/s interfaces).

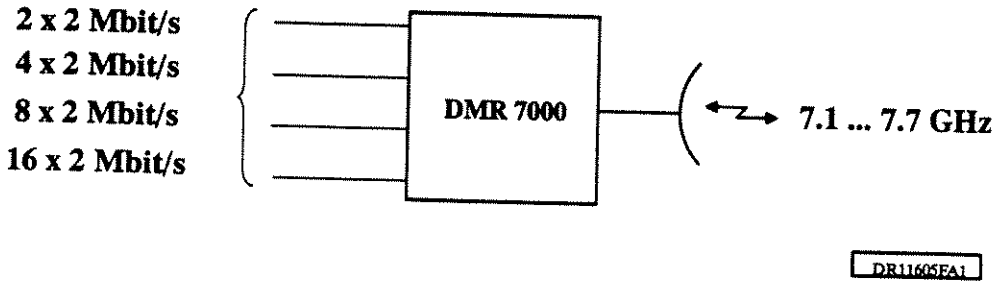
The redundancy and operating modes of the radio relay equipment do not affect the structure of the baseband section, only the possible need for branchings. Antenna branching is, however, affected.

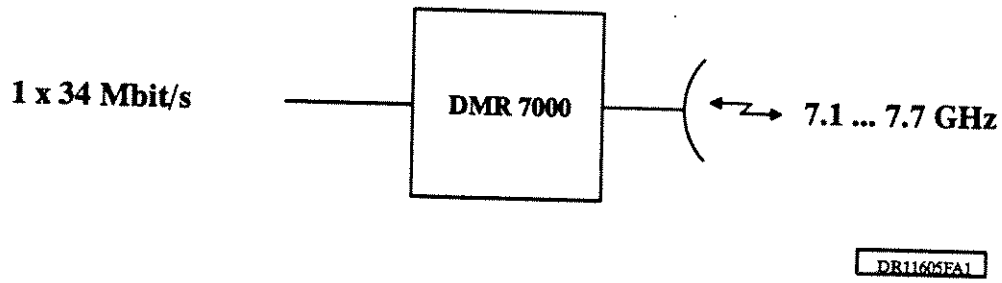
TRAINING MANUAL

DMR 7000 DIGITAL RADIO RELAY EQUIPMENT

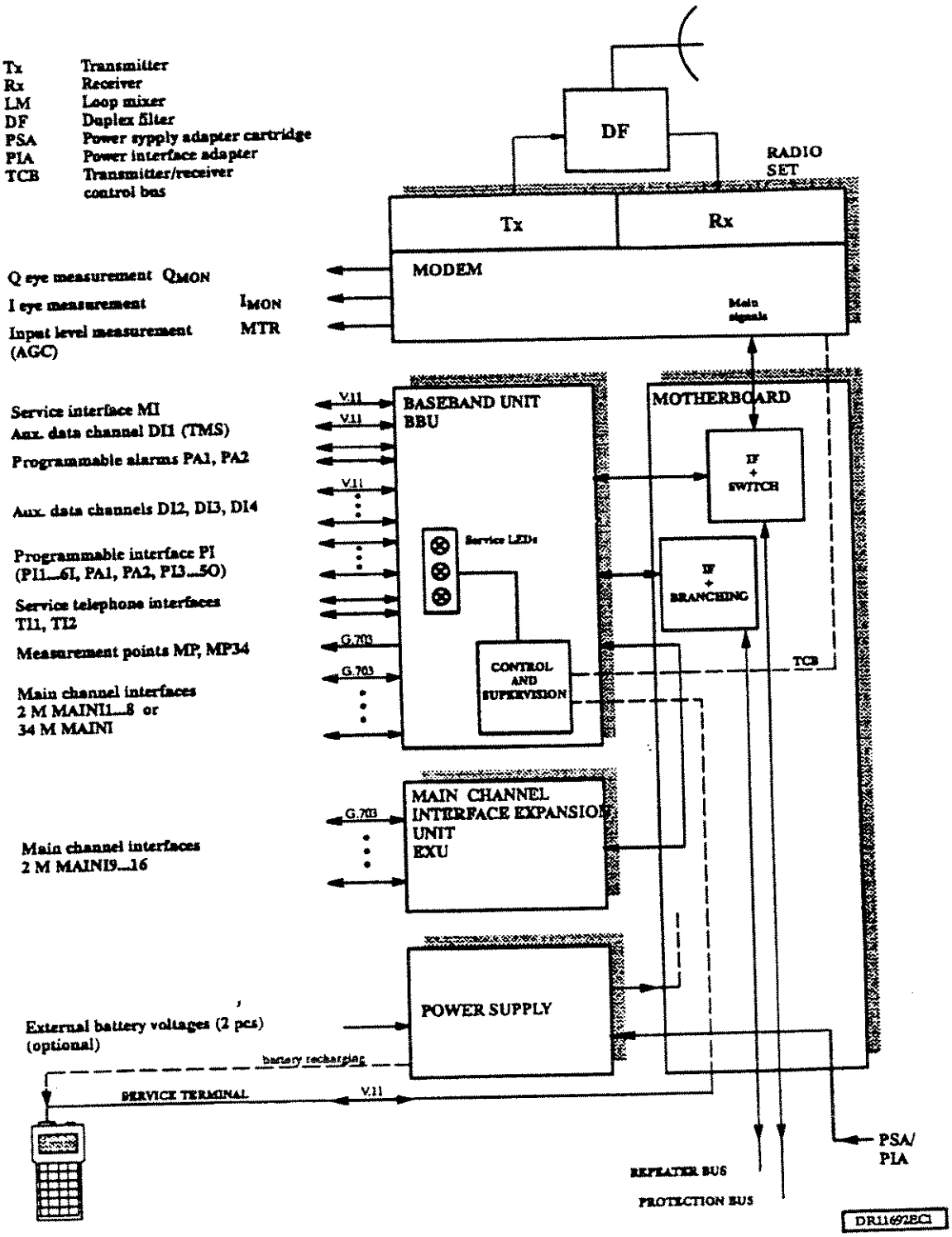
CONTENTS

Telecommunications network applications typically use G.703 compatible 2 Mbit/s channels. When using the DMR 7000 Radio Relay Equipment, no external multiplexers are needed in addition to the radio. The DMR 7000 offers the interfaces for N x 2 Mbit/s channels.





Tx Transmitter
Rx Receiver
LM Loop mixer
DF Duplex filter
PSA Power supply adapter cartridge
PIA Power interface adapter
TCB Transmitter/receiver control bus



INTERFACES:

BASEBAND UNIT

–MAINI1....8 or MAINI:

*** 8 x 2 Mbits/s or 34 Mbits/s main channel interfaces**

–MP, or MP34

*** Measurement point**

–P1:

*** MI service interface**
*** TI1, TI2 service telephone channels**
*** DI1, TMS interface (Speed 9600 bits/s)**
*** PI1I...PI5I five digital and PI6I one analog input**
*** DI2...DI4 three asynchronous auxiliary data channels operating at 1200...4800 bit/s depending on the total capacity of the system.**

EXPANSION UNIT

–MAINI9...16

*** 8 x 2 Mbit/s main channel interfaces**

RADIO AND THE MODEM SECTION

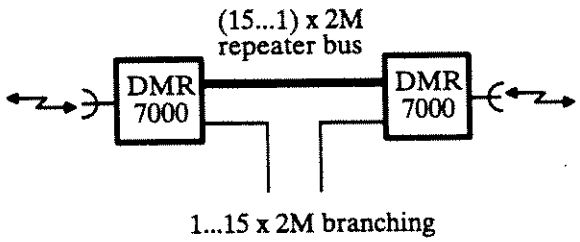
–Q	**Q eye measurement**
–I	**I eye measurement**
–MTR	**input level measurement (AGC)**
–Tx	**Transmitter output power**
–Rx	**Receiver input**
–LM	**Loop mixer**
–DF	**Duplex filter**
–TCB	**Transmitter/receiver control bus**

THE ADAPTIVE LEVEL CONTROL (ALCQ)

The Adaptive Level Control with Quality Measure (ALCQ) feature enables the transmitter section of the radio relay equipment to increase or decrease the RF power automatically according to the response received from the receiver at the other end of the hop which indicates the quality of the input signal.

BRANCHING, CROSS–CONNECTION AND REPEATER BUS

The DMR 7000 includes built–in facilities for branching one or more of the 2 Mbit/s channels by means of the software. This branching is possible in both single and redundant use. The optional repeater bus considerably reduces repeater station cabling.



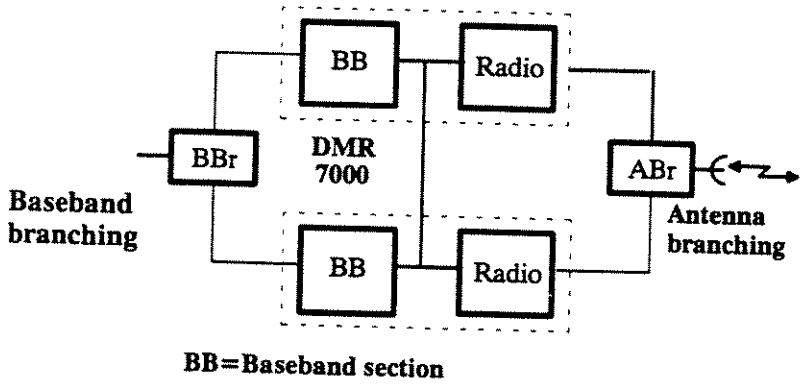
SCRAMBLING

A certain polynomial may be added to the data going to the radio path. This procedure is called scrambling. In the DMR 7000, the operator may select the polynomial from seven available options separately for each hop.

Scrambling prevents locking in incorrect frame alignment; the equipment in the both ends of the hop recognizes the polynomial selected for the hop.

Redundancy

In a redundant pair the complicated section have been duplicated.The common parts of the two radios (the branchings) are very simple and reliable.



There are two different types of redundancy:

Equipment redundancy

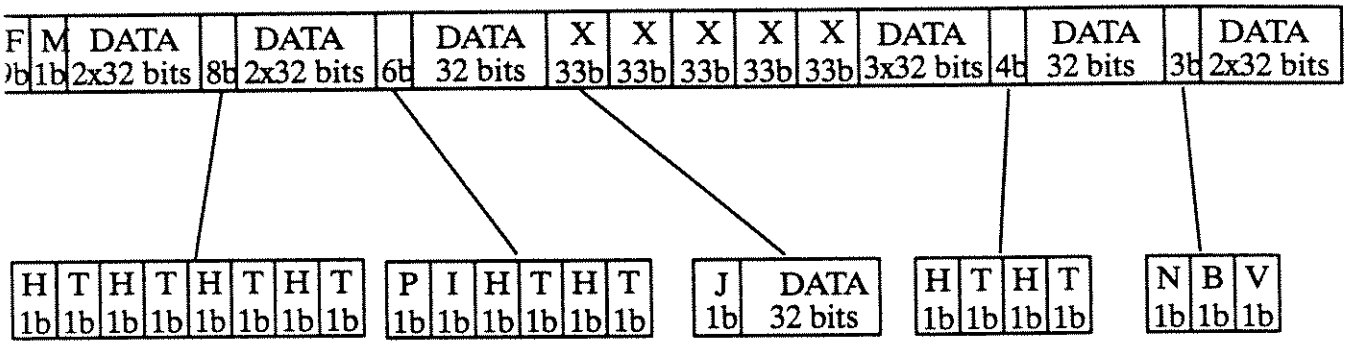
- **HSB (hot standby)**
- **WSB (warm standby)**
- **HSB + space diversity**
- **Frequency diversity**
- **Space diversity 2 Tx.**

Propagation redundancy

- **HSB + space divercity**
- **Frequency diversity**
- **Space divercity 2 Tx**

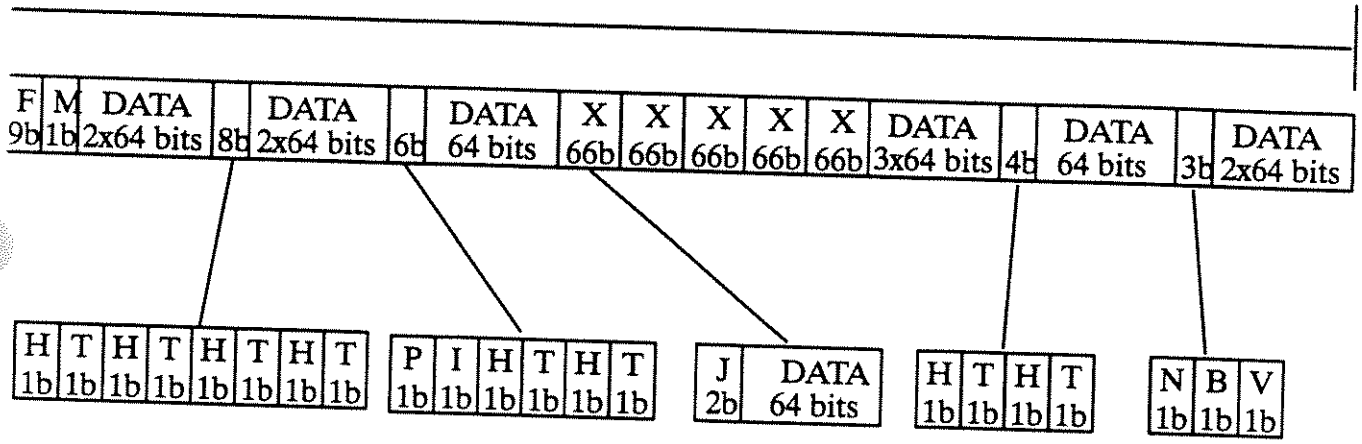
FARME STRUCTURE OF DMR 7000

CAPACITY 2 x 2 Mbits/s



F = **Frame alignment word (101110000)**
M = **Multiframe**
H = **Service telephone ch.**
T = **TMS channel**
P = **Parity**
I = **uP−link**
J = **Justification pointer**
N = **DI2**
B = **DI3**
V = **DI4**

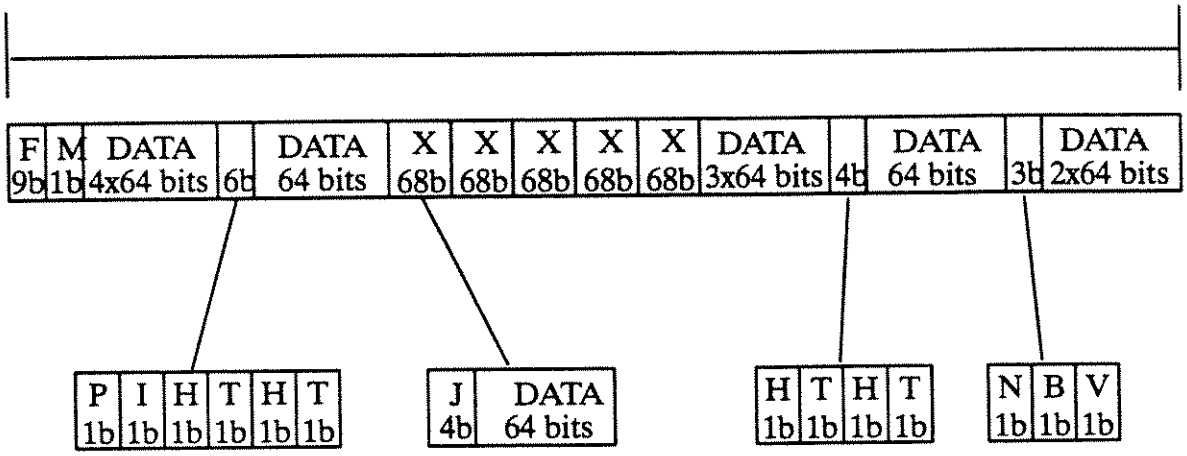
FARME STRUCTURE OF DMR 7000
CAPACITY 4 x 2 Mbits/s



F = **Frame alignment word (101110000)**
M = **Multiframe**
H = **Service telephone ch.**
T = **TMS channel**
P = **Parity**
I = **uP–link**
J = **Justification pointer**
N = **DI2**
B = **DI3**
V = **DI4**

FARME STRUCTURE OF DMR 7000

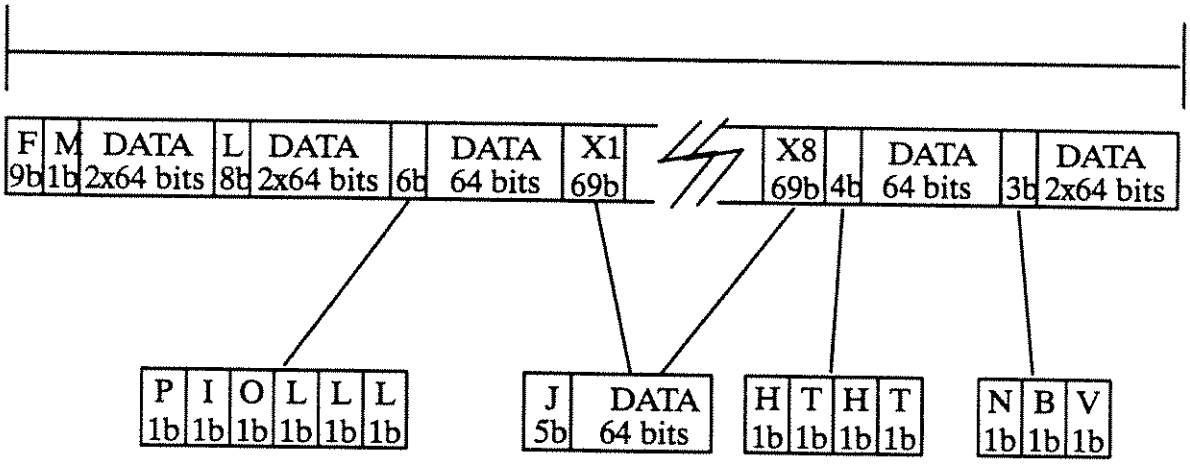
CAPACITY 8 x 2 Mbits/s



F = Frame alignment word (101110000)
M = Multiframe
H = Service telephone ch.
T = TMS channel
P = Parity
I = uP−link
J = Justification pointer
N = DI2
B = DI3
V = DI4

FARME STRUCTURE OF DMR 7000

CAPACITY 16 x 2 Mbits/s



F = **Frame alignment word (101110000)**

M = **Multiframe**

L = **DI5**

P = **Parity**

I = **uP−link**

O = **not used**

J = **Justification pointer**

T = **TMS channel**

H = **Service telephone ch.**

N = **DI2**

B = **DI3**

V = **DI4**

Power adjustment	**0...−15 dB manual/automatic**
Insertion loss of antenna branching	**< 3.0 dB single/Tx** **< 3.0 dB single/Rx** **< 5.0 dB HSB or WSB/Tx** **< 7.0 dB HSB or WSB/Rx** **< 5.0 dB HSB + SpDiv/Tx** **< 5.0 dB HSB + SpDiv/Rx** **< 3.3 dB/3.5 dB FeqDiv/Tx1/Tx2** **< 3.5 dB/3.3 dB FeqDiv/Rx1/Rx2**
RF loop	**75 ... 86 dB mixing attenuation**

Power supply

DC supply	**20...72 V, floating**
Power consumption	**approx. 36 ... 39 W (single use)** **approx. 47 W (+30 dBm Tx)**

Environmental conditions

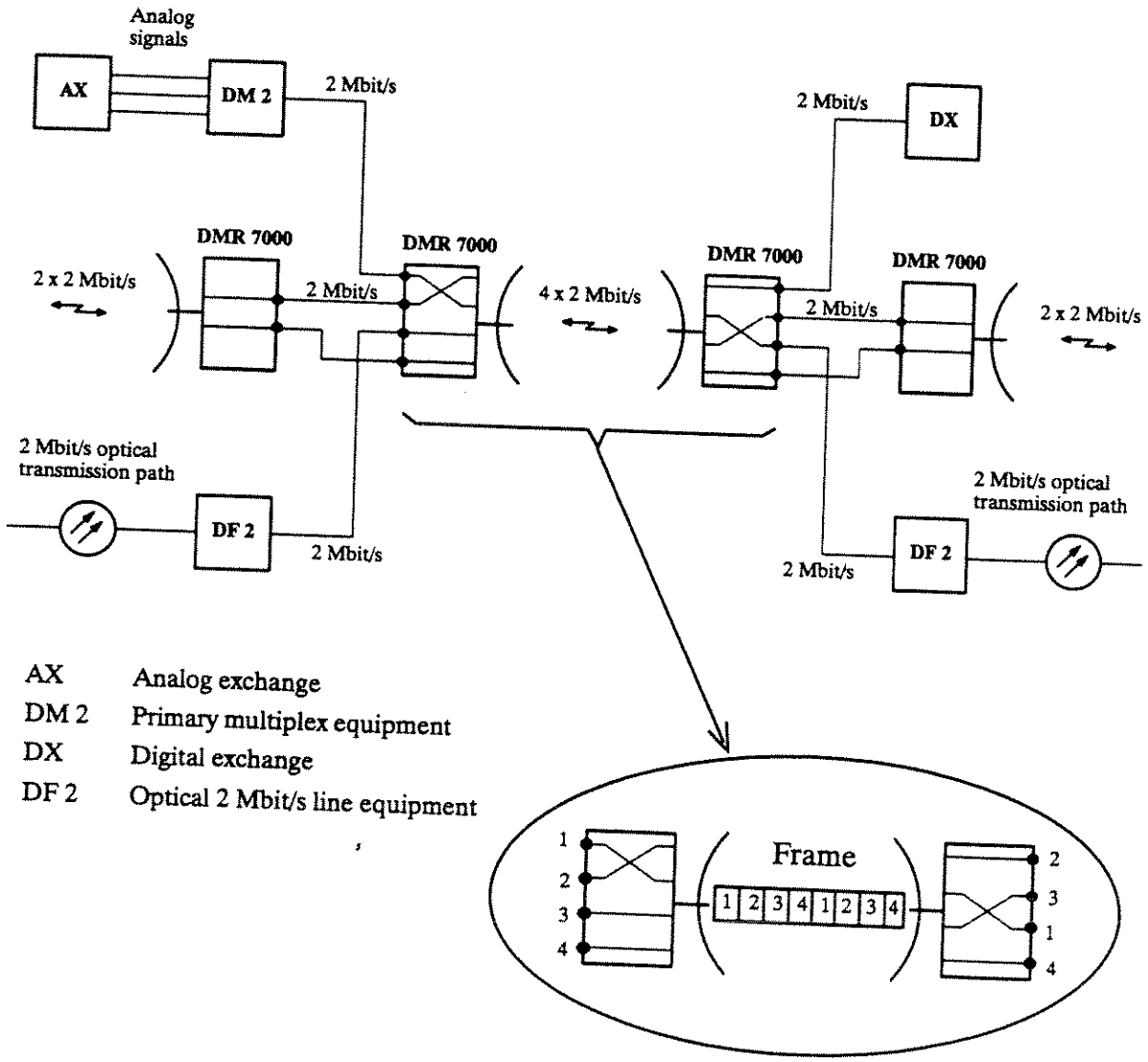
EMC/radiation	**C.I.S.P.R. 22 class B (single)**
EMC/radiation	**C.I.S.P.R. 22 class A (protected)**
Installation options	**slim rack (TM4)** **19" rack** **wall mounting** **(outdoor cabinet)**
Temperature range	**0 °C...+45 °C specifications met** **−10 °C...+55 °C allowed for single use terminal and protected terminal in slim rack.** **Note: For other installation options, see the Operating Handbook.**

Dimensions

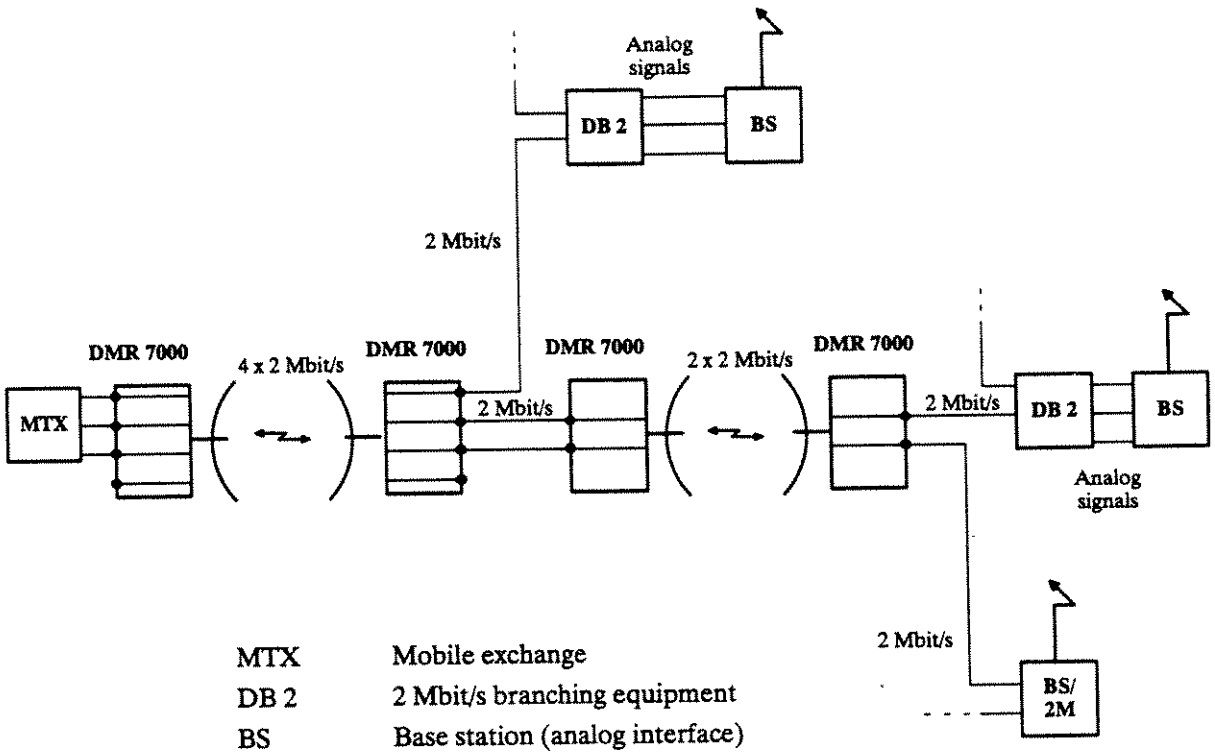
Depth	**305 mm (One DMR Terminal)**
Width	**120 mm**
Height	**445 mm**
Weight	**approx. 10 kg**
Depth	**200 mm (Antenna Branching)**
Width	**120 mm**
Height	**450 mm**
Weight	**approx. 3 kg**

APPLICATION EXAMPLES

PUBLIC NETWORKS

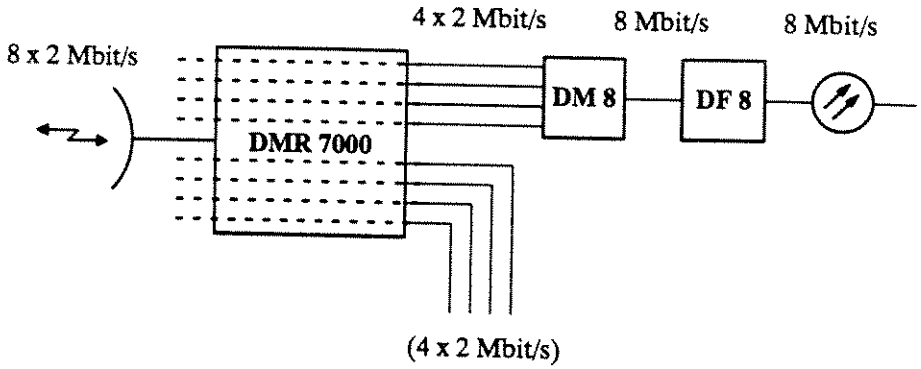


CELLULAR NETWORKS

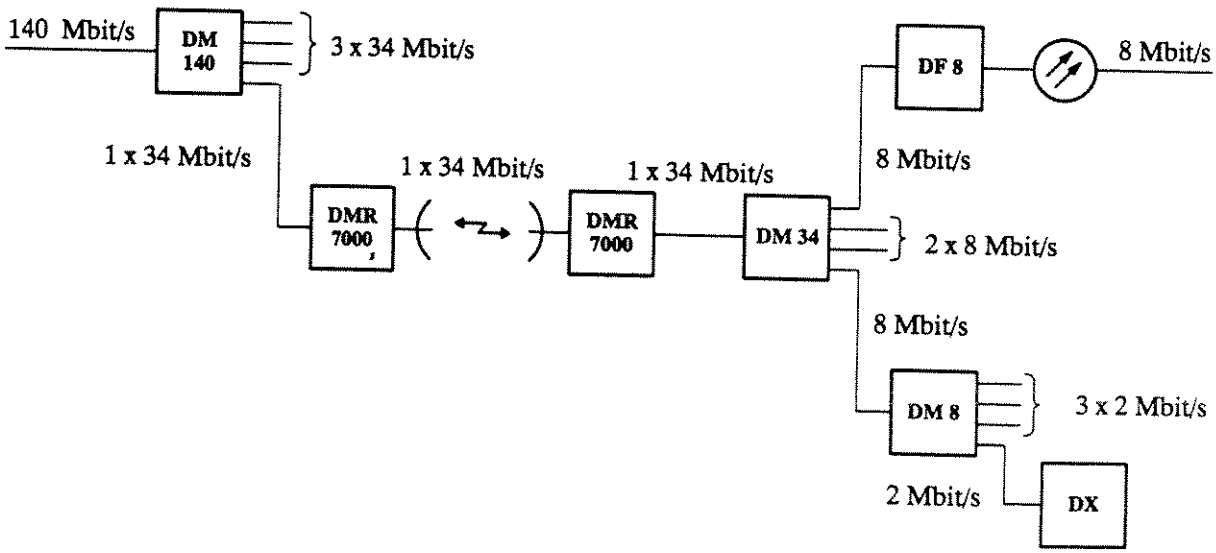


MTX	Mobile exchange
DB 2	2 Mbit/s branching equipment
BS	Base station (analog interface)
BS/2M	Base station (2 Mbit/s digital interface)

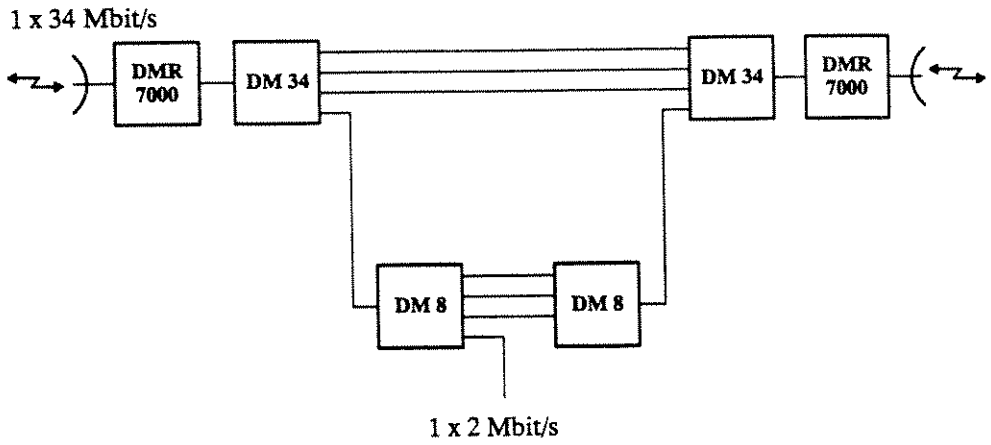
CONNECTION TO AN OPTICAL FIBER



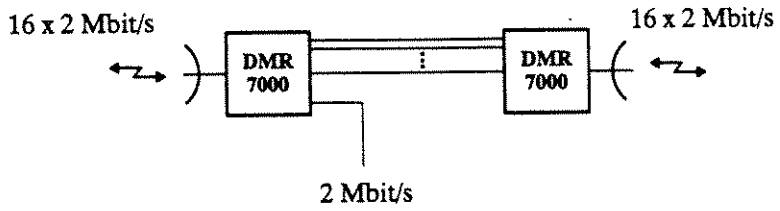
APPLICATION AT THE 1 X 34 MBIT/S CAPACITY



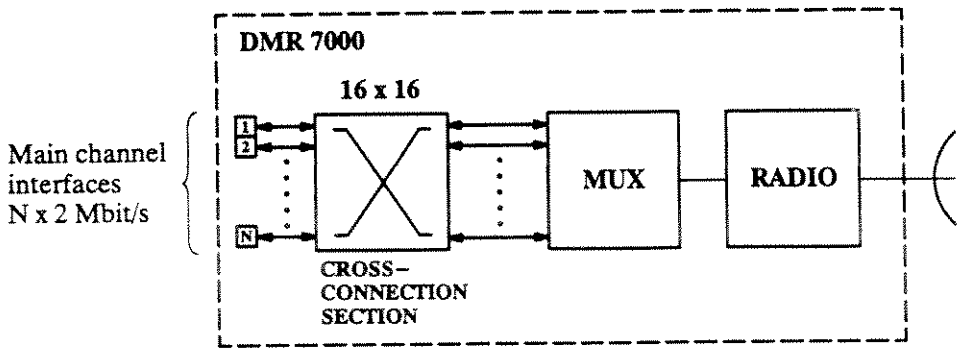
BRANCHING FROM A HIGH–CAPACITY TRANSMISSION PATH



BRANCHING WITHOUT ANY EXTERNAL EQUIPMENT



DYNAMIC BRANCHING

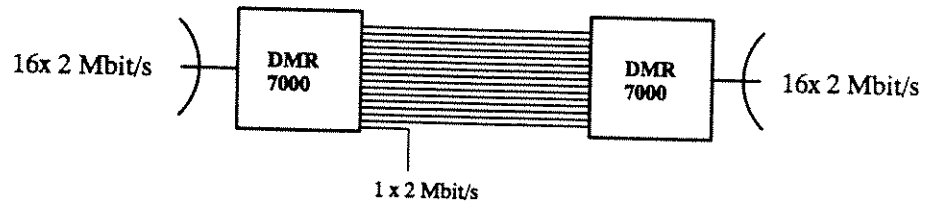


DR11614EA1

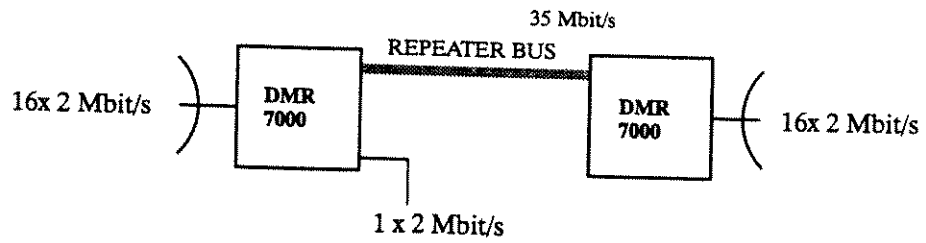
Repeater bus in telecommunications network

To minimize the number of wires for connecting 2 M main channel signals through the repeater station and to decrease the amount of work, a so-called repeater bus is used . It is a bus consisting of four symmetrical line pairs to which the selected 2 Mbit/s channels can be directed. The repeater bus can transmit data at the rate of 35 Mbit/s, i.e. it is possible to through-connect all the channels of the 16x 2 Mbit/s capacity along the repeater bus.

a) No repeater bus (example of 16x2M)



b) Implemented with repeater bus

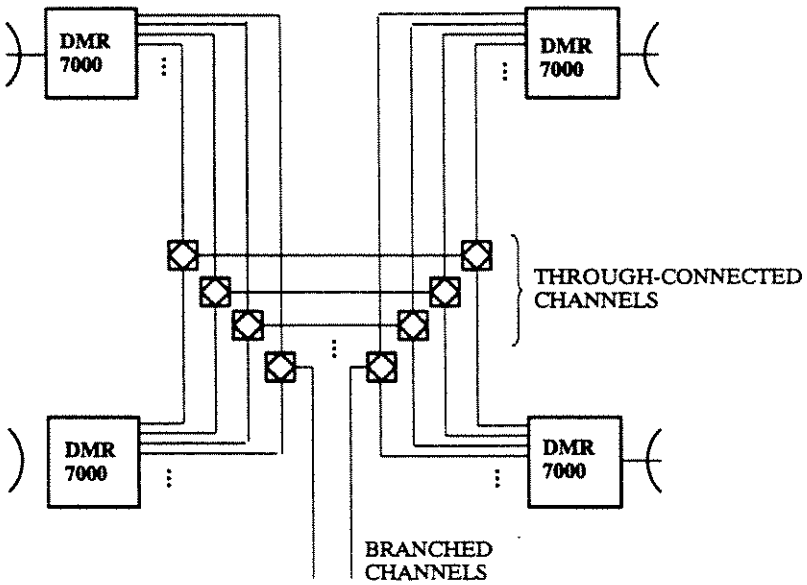


DR32032EA1

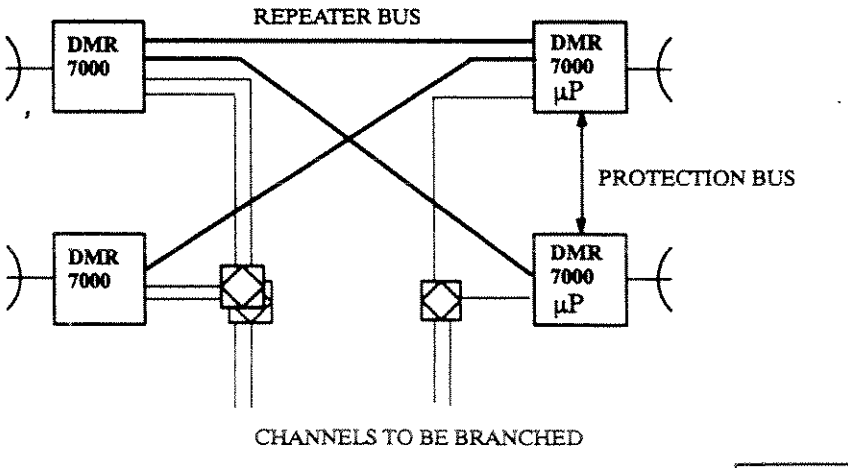
The repeater bus requires that the capacity of both radio hops must be the same. At the moment the repeater bus is implemented with 8 x 2M and 16 x 2M capacities.

The use of a repeater bus at a redundant repeater station. In redundant operation the repeater buses are connected together without extra equipment. The processors of the equipments choose which one of the redundant equipments will use the repeater bus. For the channels to be branched, baseband branchings are used.

a) No repeater bus

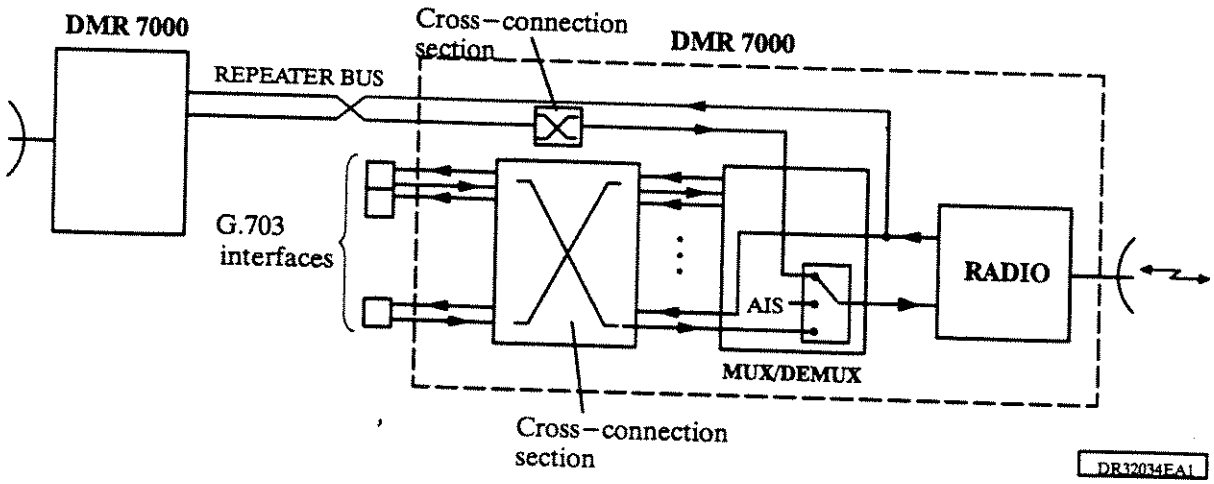


b) Implemented with repeater bus

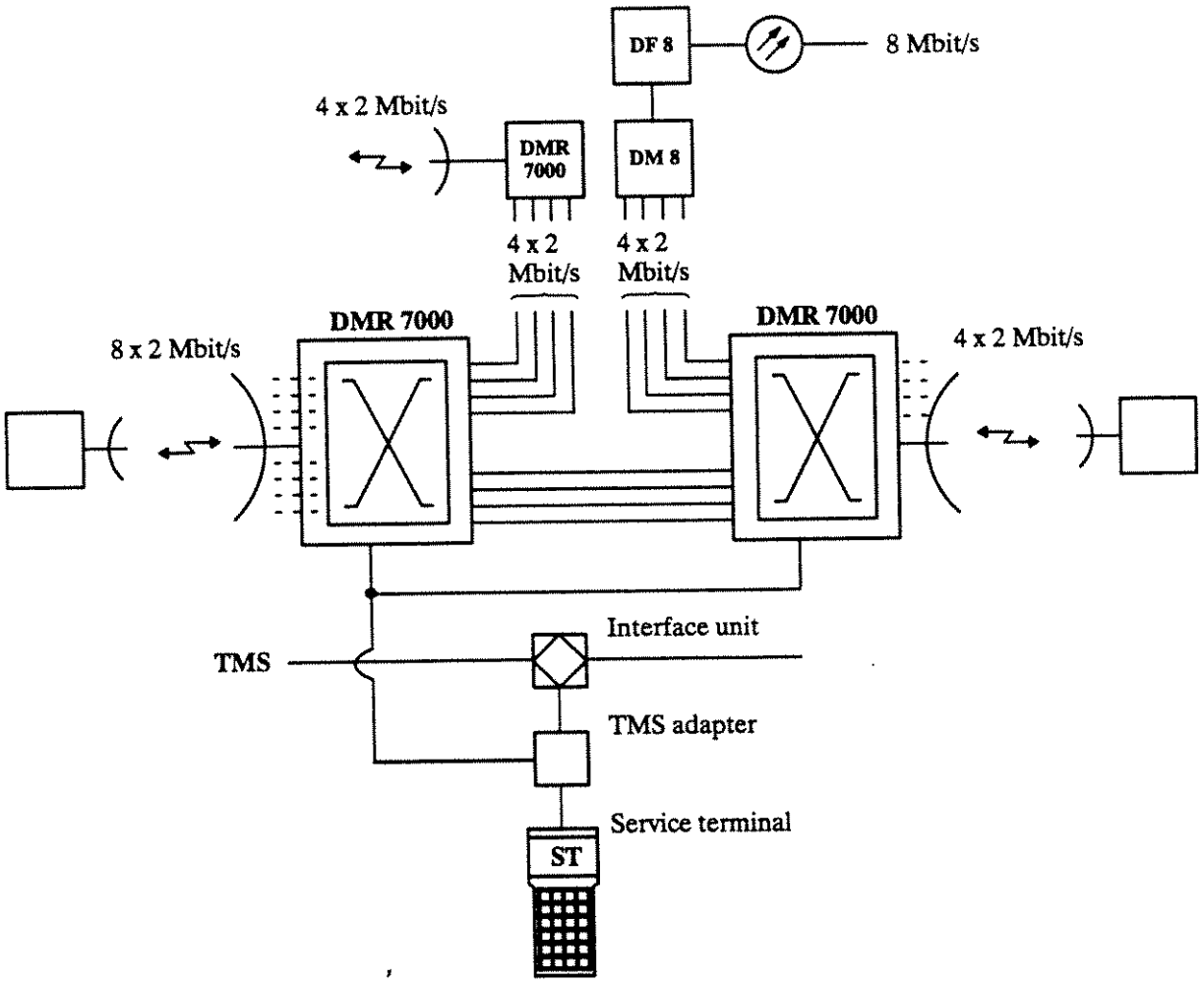


A repeater bus can also be called a bypass bus of a repeater station: the bus bypasses the cross-connection section of the main channels and the interfaces, i.e. it passes from one radio to another through a multiplexer. Thus the channels to be through-connected need not be demultiplexed to 2 Mbit/s. The 2 Mbit/s timeslots are selected from the line interfaces or repeater bus in the Tx direction. The selecting switch belongs to the multiplexer and it is controlled with the service terminal.

The repeater bus contains its own processor-controlled cross-connection section for which the order of the 2M channels can be changed in the Tx direction if desired.



DYNAMIC BRANCHING



METHODS OF REDUNDANCY

The methods of redundancy of the radio relay equipment may be divided into two groups:

— **Propagation redundancy** to protect the operation from interference on the transmission path: The better–quality signal is selected automatically from the two received radio signals.

— **Equipment redundancy**: When one piece of equipment becomes faulty, the intact protective equipment is selected. The faulty equipment is taken out of use.

The changeover caused by propagation interference is error–free (hitless). It is error–free in that the phase of the transferred data is retained and pulses are not added to or omitted from the clock signal of the data. Any errors which (a moment earlier) caused the changeover will pass through. The change in the AGC voltage will, however, indicate the need for changeover and therefore the aim is to perform the changeover before any errors occur.

The changeover caused by the equipment redundancy to the intact equipment is not synchronized and therefore not error–free.

Abbreviations in Figures

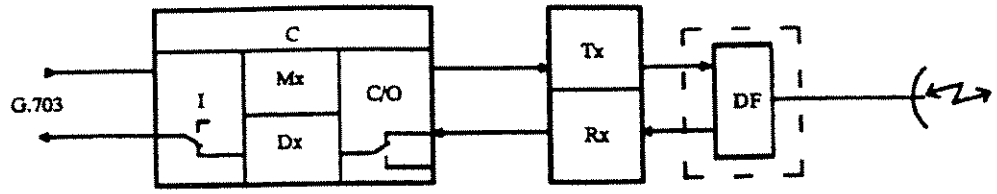
Baseband section

I	line interface
C	control block
Dx	demultiplexer
Mx	multiplexer
C/O	changeover device
BBr	baseband branching

Radio

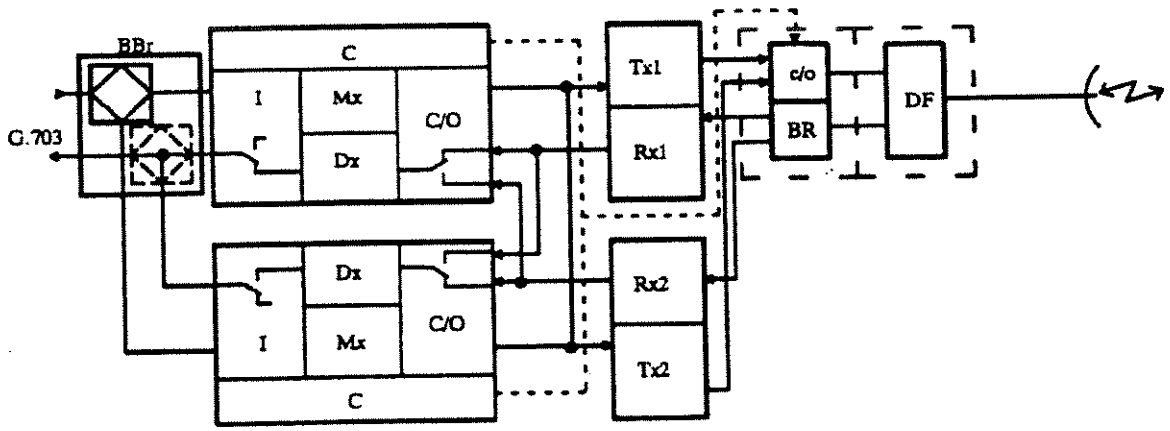
Tx	transmitter
Rx	receiver
c/o	Tx switch
BR	Rx hybrid
LM	loop mixer
LS	loop switch
DF	duplex filter

SINGLE USE



The signal is not backed up against propagation and equipment faults. In single use, the line interface switch (I in the figure) and changeover device switch (C/O in the figure) are forced into the position indicated in Figure.

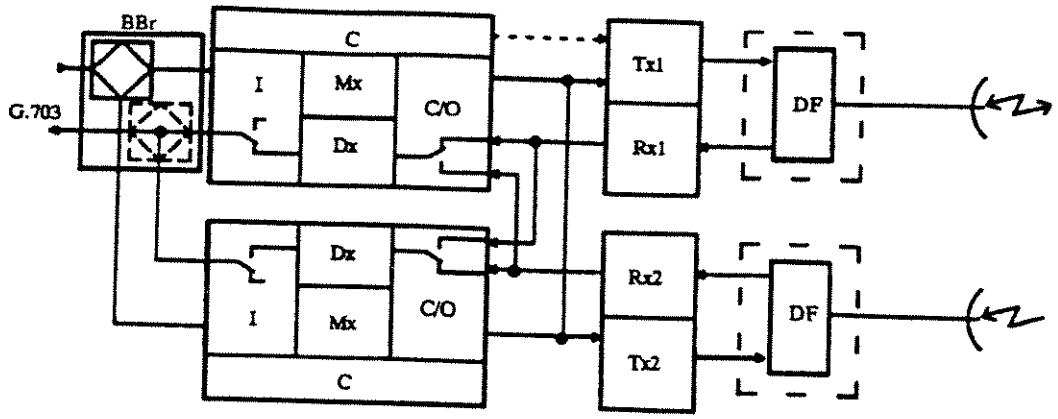
HOT STANDBY



HSB is a method of equipment redundancy. Both transmitters (Tx1 and Tx2 in the figure) are continuously on with the output power of one transmitter going to the antenna.

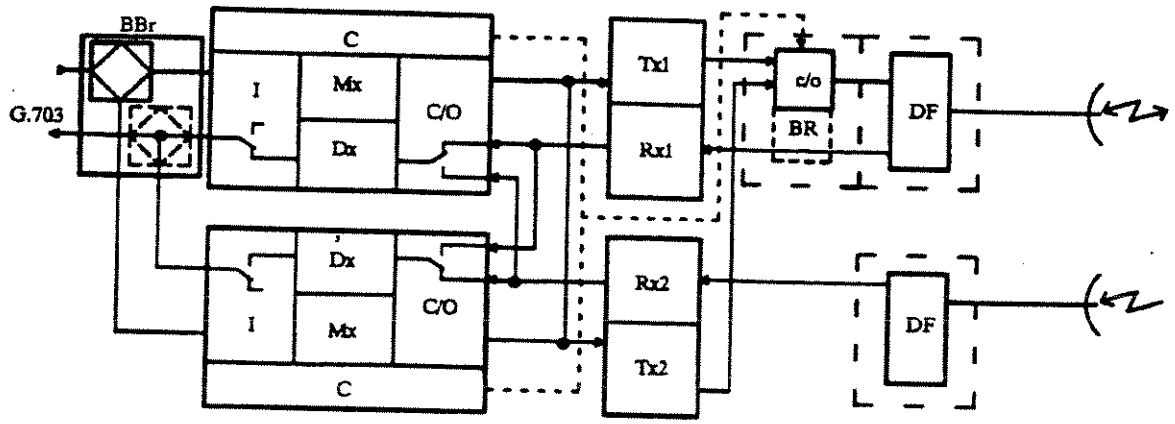
WSB (Warm standby operation) is similar to HSB, except that power is off from the amplifier chain in the protective transmitter.

SPACE DIVERSITY



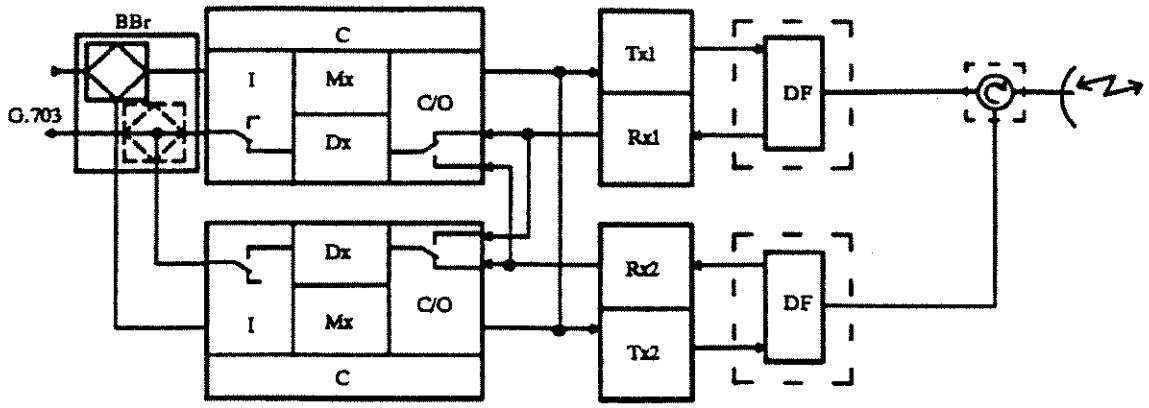
In space diversity 2 Tx operation, two antennas are used which are placed far enough apart that it is unlikely for the same propagation problem to occur simultaneously at both antennas. The transmitters are controlled in such a way that one transmitter is on and the other one off.

HOT STANDBY + SPACE DIVERSITY



The HSB + space diversity operation is a combination of HSB and space diversity 2 Tx, resulting in both propagation redundancy and equipment redundancy.

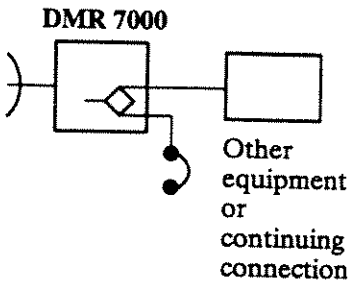
FREQUENCY DIVERSITY



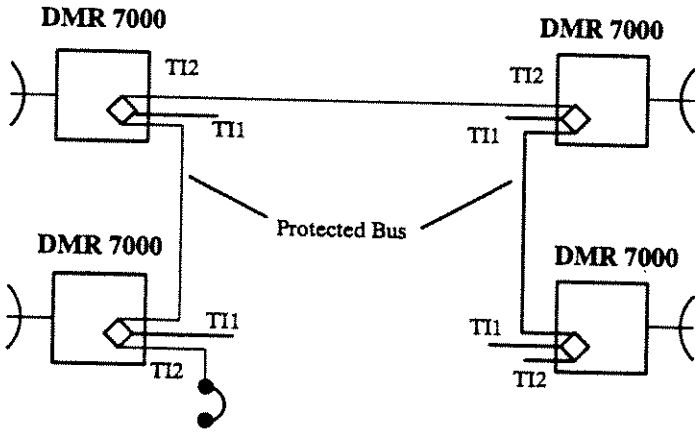
The transmitter/receiver pairs operate at different radio frequencies. This operating mode also provides equipment redundancy.

THE SERVICE TELEPHONE BRANCHING

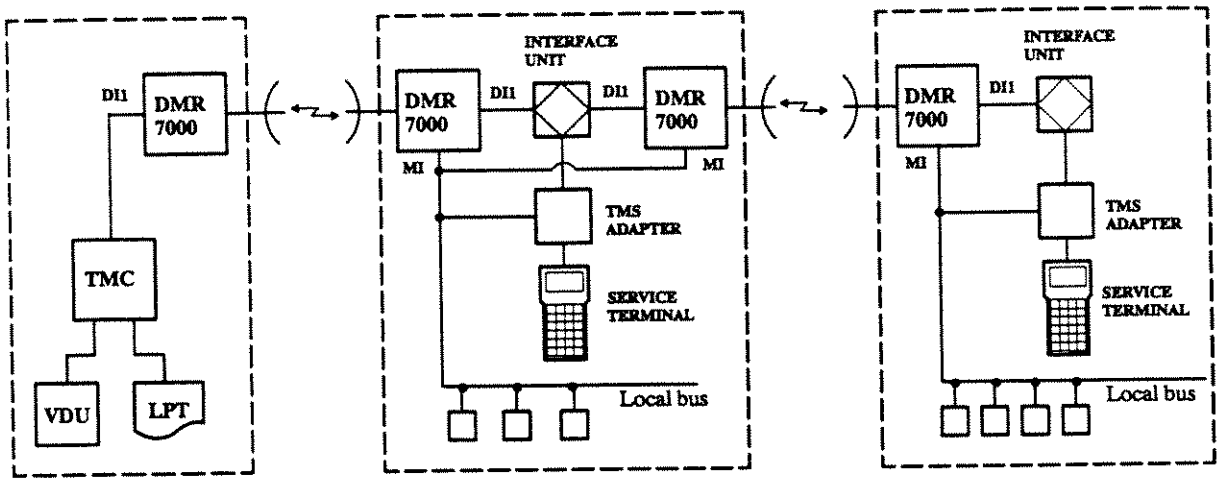
SINGLE USE



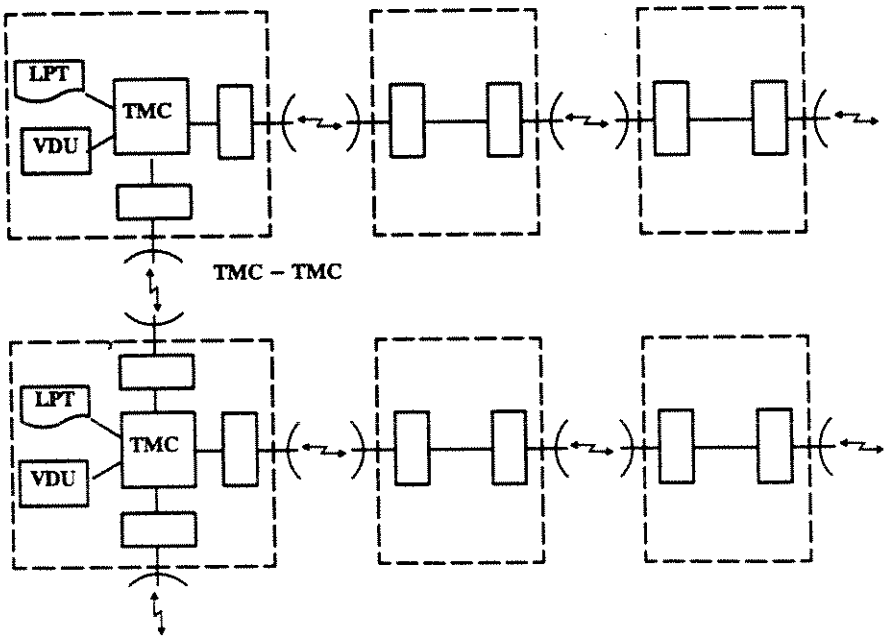
REDUNDANCY



PRINCIPLE OF TMS NETWORK



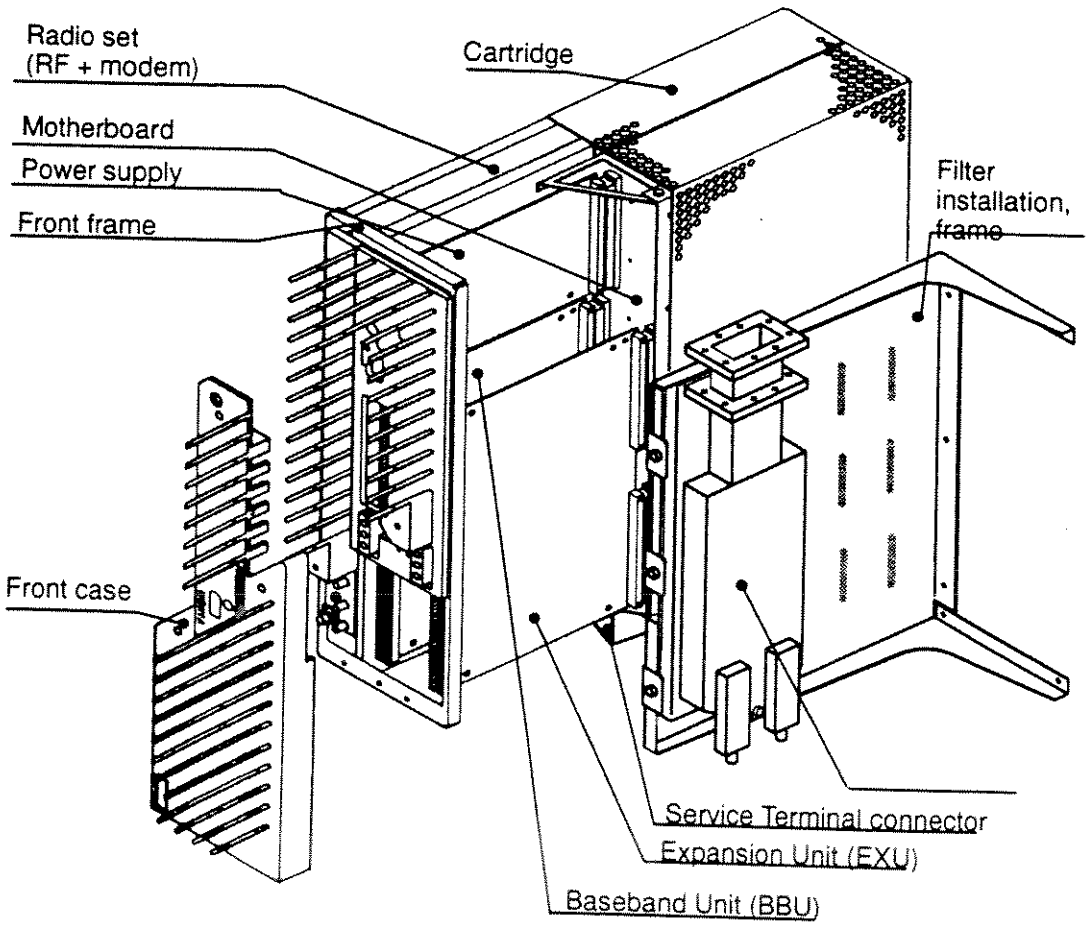
STATION 1 STATIONS 2, 3 STATION 4



INSTALLATION

The main parts of the DMR 7000 are shown in figure below. The Radio Set contains the RF sections and the Modem plus the Motherboard. The Power Supply and the Baseband Units have been mounted on the motherboard. The latter units include at least a primary Baseband Unit BBU and in the 16 x 2 Mbit/s variation also a baseband Expansion Unit EXU.

The DMR 7000 cartridge is a metal case which is suspended in the equipment rack by its brackets and locked in place by screws. A separate Service Terminal connector is fastened to the cartridge. An antenna filter is mounted in an adjacent rack. The purpose of the Front Frame is to support the equipment by the cartridge. The front connectors of the operating equipment (with the exception of the Service Terminal connector) are covered by the Front Case.



INSTALLATION

1 = PSA cartridge

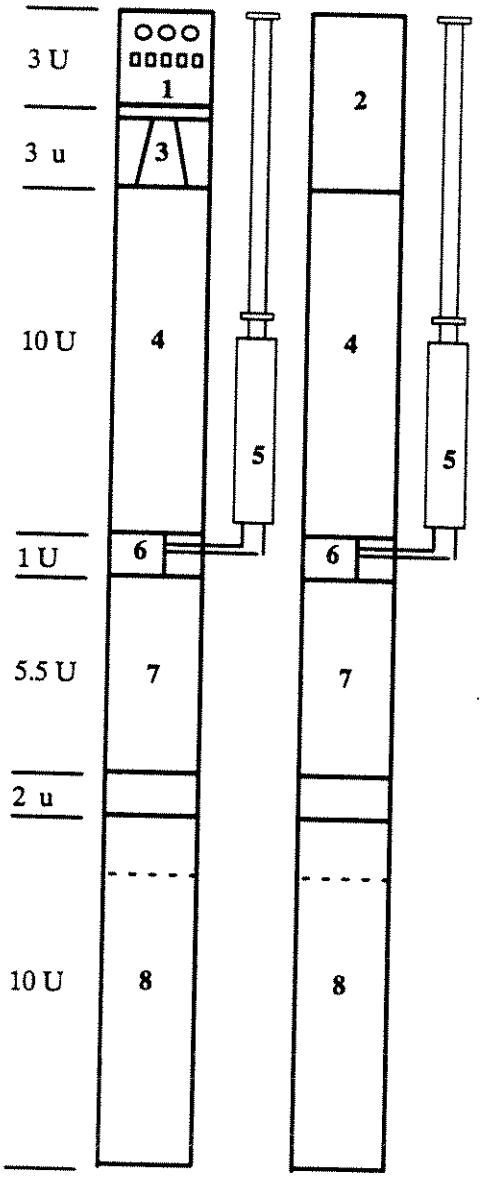
3 = Air deflector

4 = Radio equipment A

6 = RF branching

7 = BB branching

8 = Radio equipment B

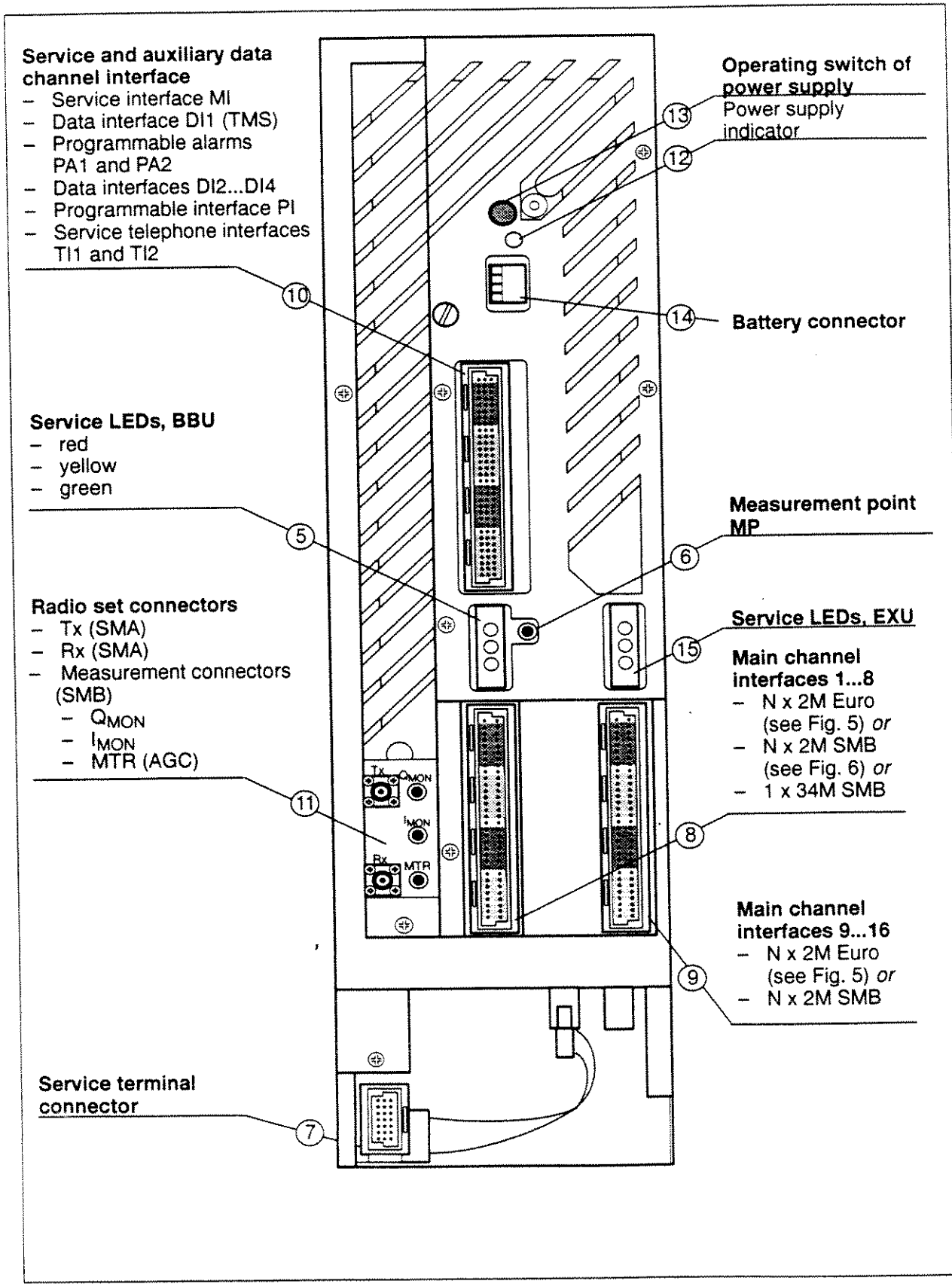


2 = Service telephone

5 = Antenna filter + loop mixer

HSB repeater station +
service telephone
Equipping space 33 + 33.5 U

U = 44,45 mm


Service and auxiliary data channel interface
– Service interface MI
– Data interface DI1 (TMS)
– Programmable alarms PA1 and PA2
– Data interfaces DI2...DI4
– Programmable interface PI
– Service telephone interfaces TI1 and TI2
10
Service LEDs, BBU
– red
– yellow
– green
5
Radio set connectors
– Tx (SMA)
– Rx (SMA)
– Measurement connectors (SMB)
– Q_{MON}
– I_{MON}
– MTR (AGC)
11
Service terminal connector
7
Operating switch of power supply
13
Power supply indicator
12
14
Battery connector
Measurement point MP
6
Service LEDs, EXU
15
Main channel interfaces 1...8
– N x 2M Euro (see Fig. 5) or
– N x 2M SMB (see Fig. 6) or
– 1 x 34M SMB
8
Main channel interfaces 9...16
– N x 2M Euro (see Fig. 5) or
– N x 2M SMB
9
Tx
Rx
MTR

INTERFACES

The locations of the front connectors of the DMR 7000 are indicated in Figure NO TAG. The placement of the 3 x 7 Euroconnectors on the 2 or 3 x 32 Euroconnectors is also shown. The figure also provides the numbers of the figures where the interfaces are shown in more detail.

The service and auxiliary data channel interfaces (10) are connected to connector P1 on the baseband unit. P1 is a 3 x 32 Euroconnector. **The Service Terminal connector** (7) used to operate the equipment and to charge the service terminal batteries is located at the bottom of the cartridge, on the left side.

The main channel interfaces (8, 9) are located on the BBU and the main channel interface expansion unit EXU. The EXU is used only in the 16 x 2 Mbit/s variant. In the N x 2 Mbit/s variant, the connectors are either 2 x 32 Euroconnectors or SMB coaxial connectors (see Figure NO TAG). In the 1 x 34 Mbit/s variant, the connectors are always SMB coaxial connectors .

The Tx and Rx connectors of the radio set are of SMA type. Next to these connectors, there are three SMB connectors dedicated to measurement purposes. The signals appearing at the connectors are marked in the picture.

The power supply is equipped with a **battery connector** via which the equipment may be powered instead of using the rack bus connector. It is a screw connector whose pin arrangement is illustrated in Figure.

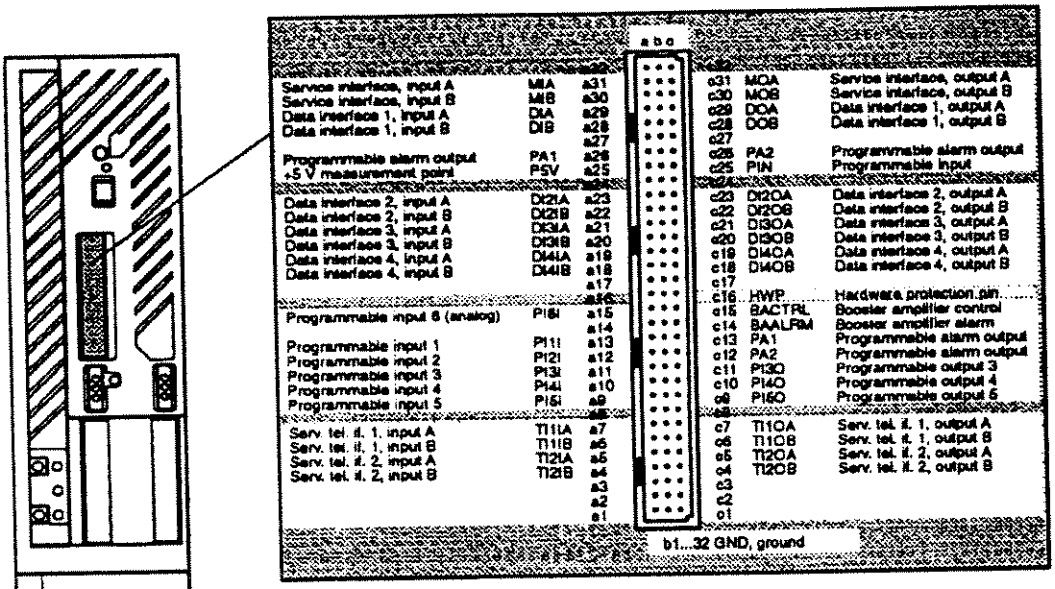
The measurement points MP and MP34 (see Figure 7) are used only temporarily for the duration of service and test measures to be taken.

The Tx and Rx connectors of **the antenna filter** are SMA connectors. The waveguide flange of the filter is 154 IEC-UER 70.

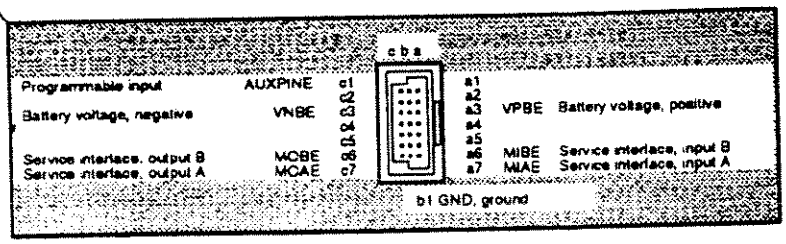
The protection bus and repeater bus are connected to the rear of the radio equipment cartridge with connectorized bus cables . These cables are normally supplied by Nokia Telecommunications.

The power supply and rack alarm interface is connected by a flat cable to the cartridge bus connector of the radio equipment when using a Power Supply Adapter Cartridge (PSA) or Power Interface Adapter (PIA).

CONNECTORS IN DMR 7000



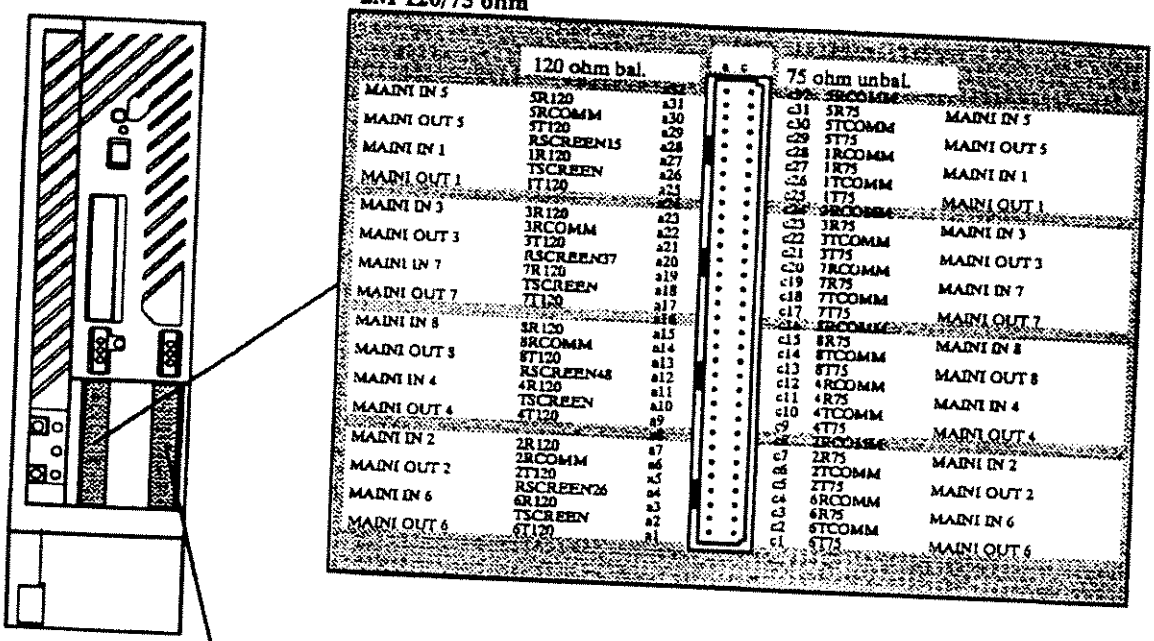
SEPARATE SERVICE TERMINAL CONNECTOR



MAIN INTERFACES WITH EUROCONNECTOR

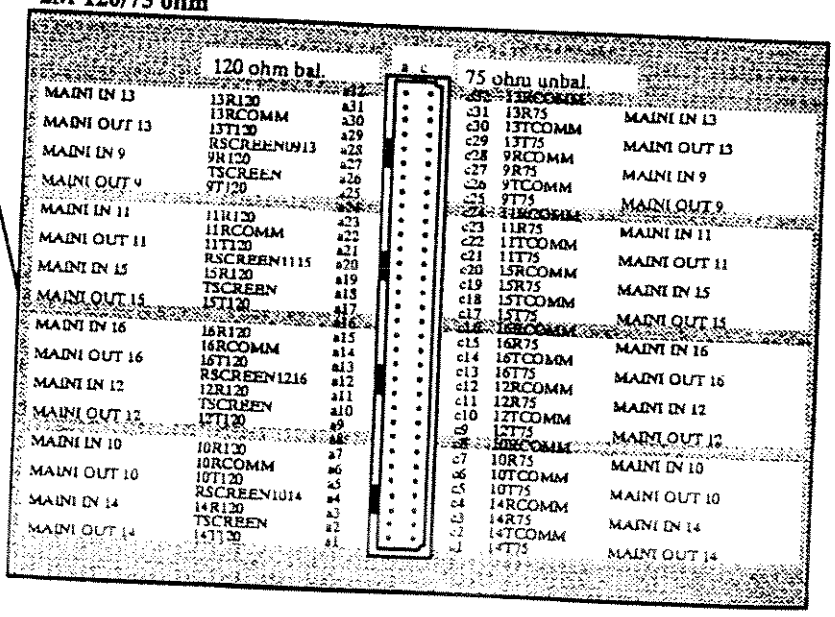
PRIMARY BASEBAND UNIT (BBU), Euroconnector P3

Main channel interfaces (MAINI) 1...8
2M 120/75 ohm



BASEBAND EXPANSION UNIT (EXU), Euroconnector P1

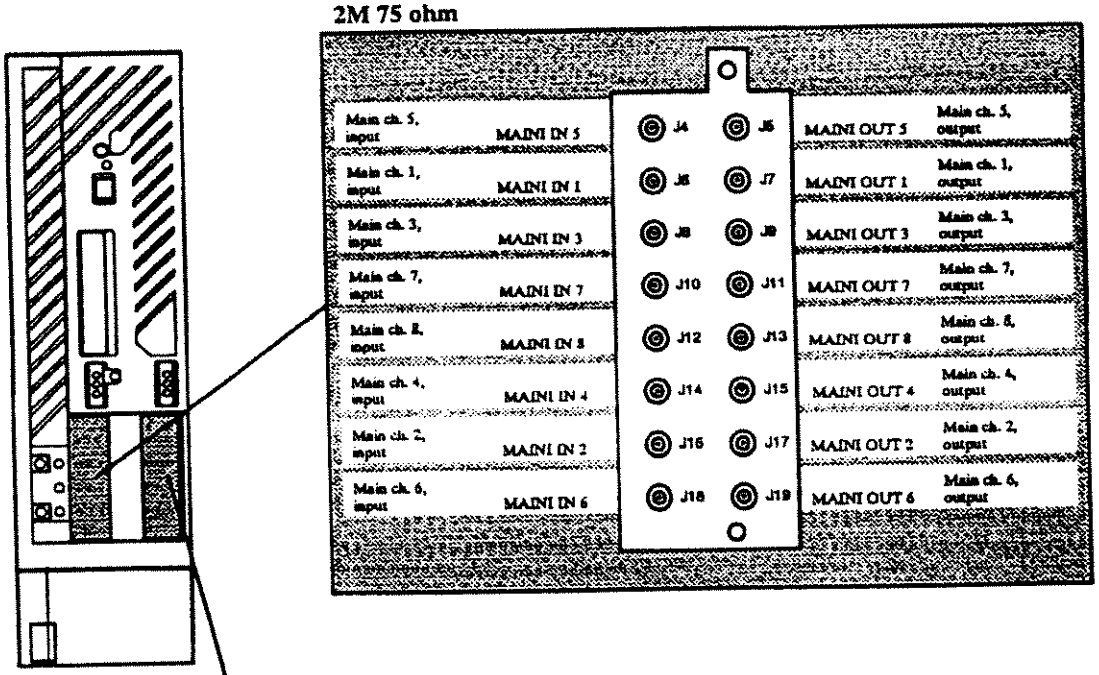
Main channel interfaces (MAINI) 9...16
2M 120/75 ohm



MAIN INTERFACES WITH SMB CONNECTORS

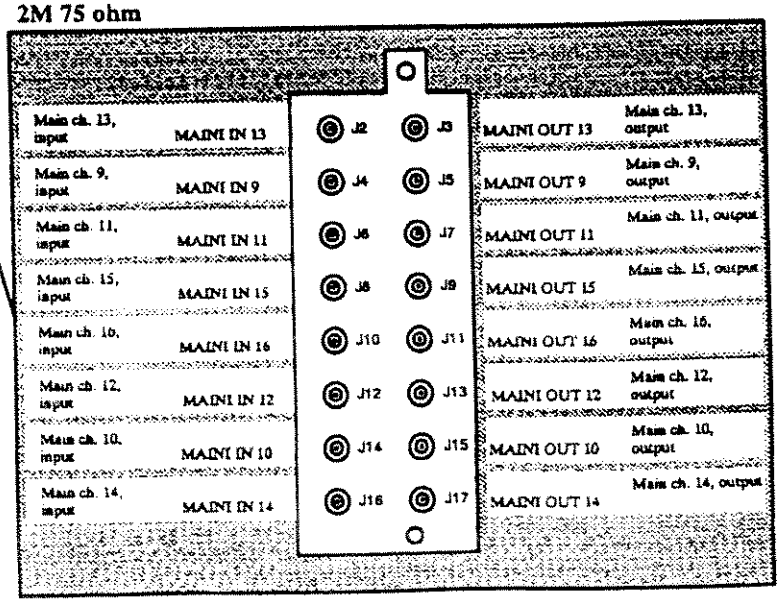
PRIMARY BASEBAND UNIT (BBU),
SMB connectors J4...J19

Main channel interfaces (MAINI) 1...8
2M 75 ohm



BASEBAND EXPANSION UNIT (EXU),
SMB connectors J2...J17

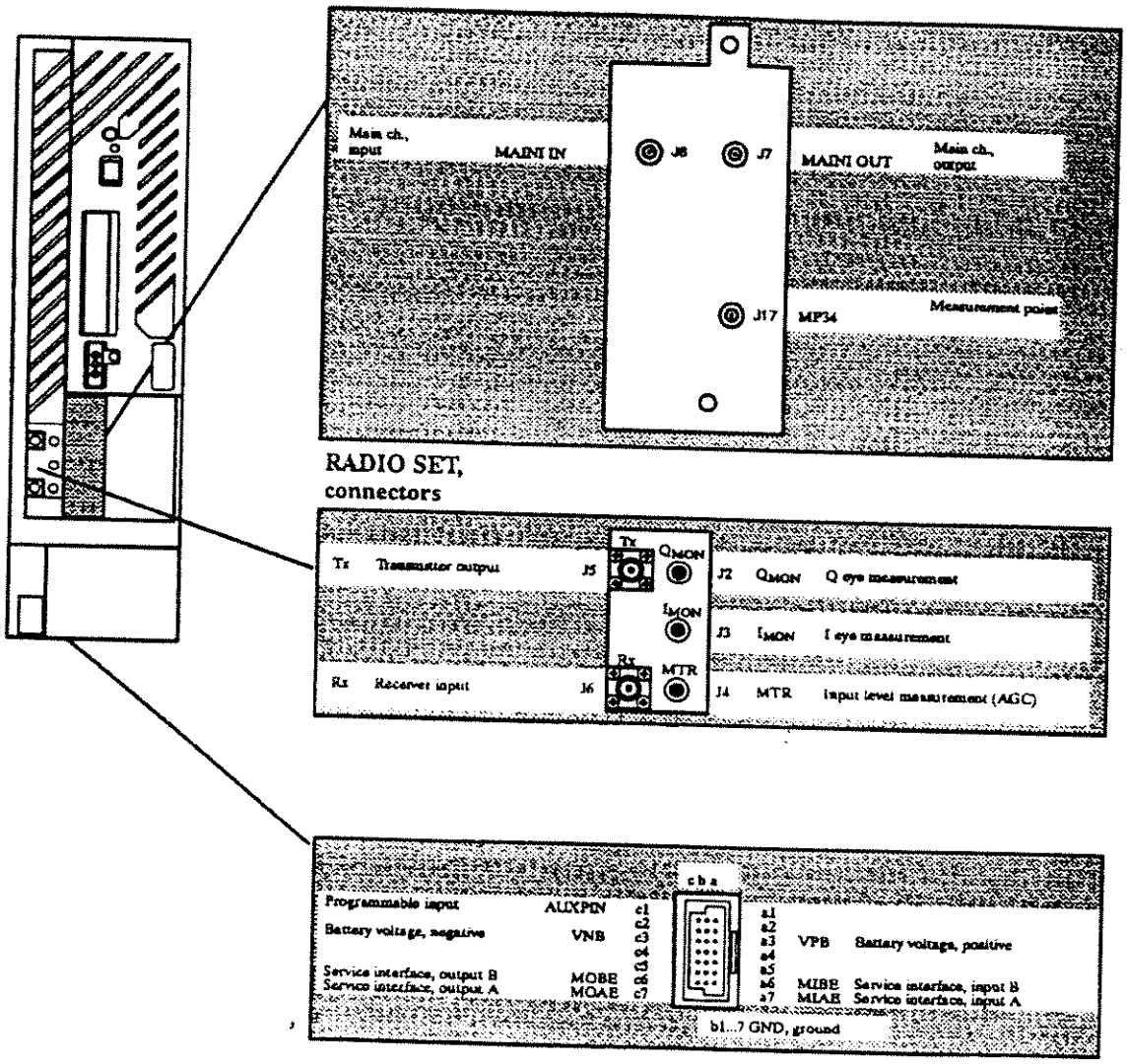
Main channel interfaces (MAINI) 9...16
2M 75 ohm



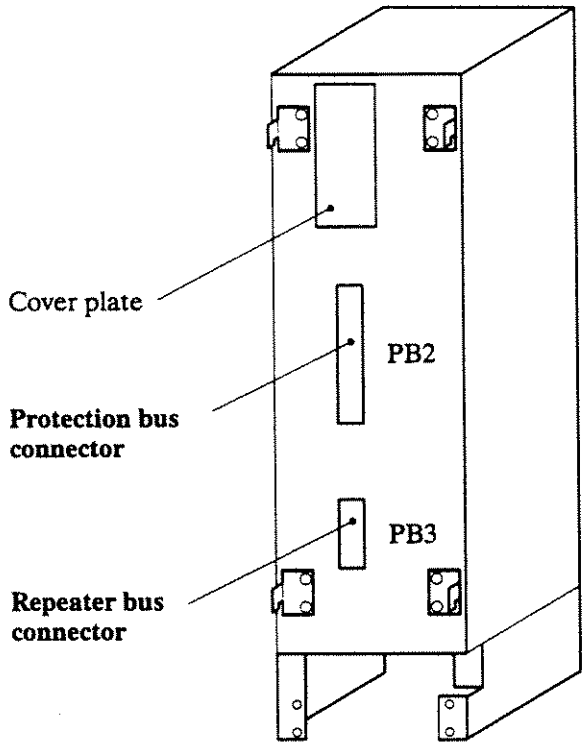
Note:
Only the number of connectors required by the capacity is supplied.

PRIMARY BASEBAND UNIT (BBU),
SMB connectors J6, J7, J17

Main channel interface (MAIN)
34M 75 ohm
Measurement point MP34

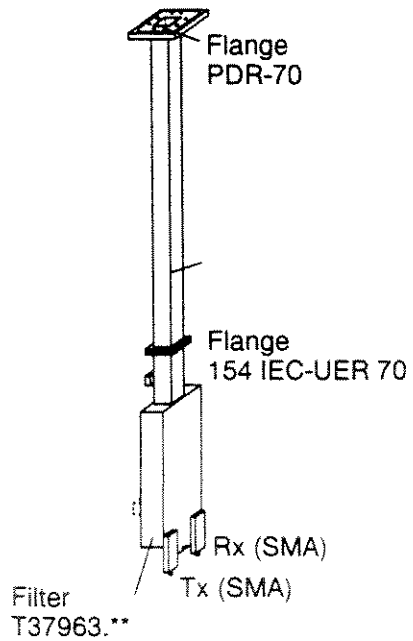


PROTECTION BUS AND REPEATER BUS CONNECTORS

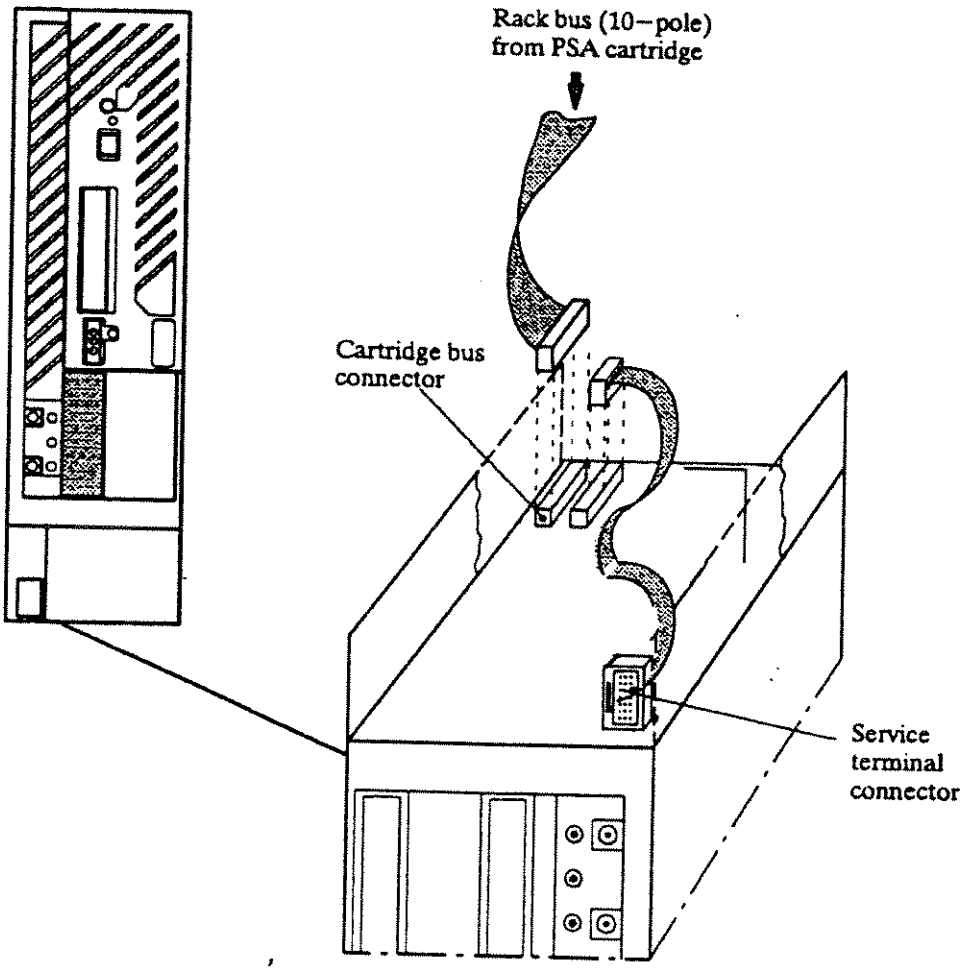


ANTENNA FILTER AND LOOP MIXER

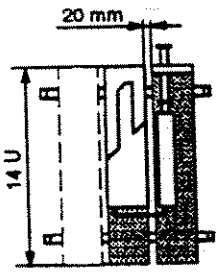
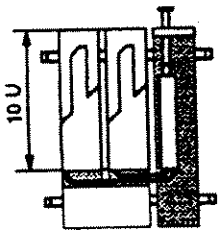
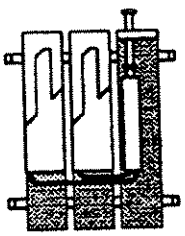
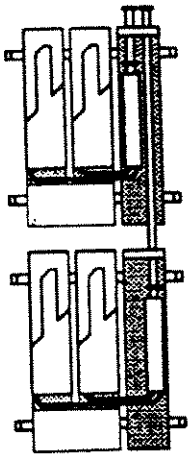
DR11658EA1

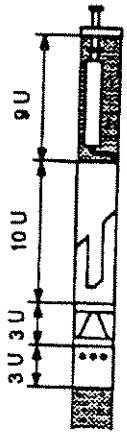
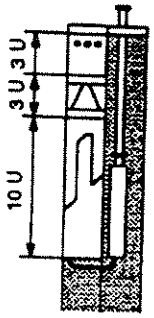
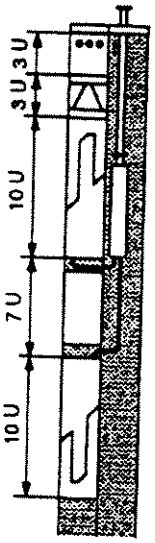
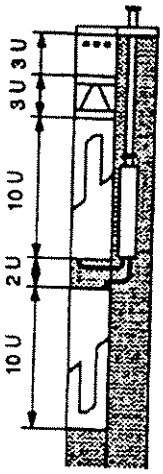
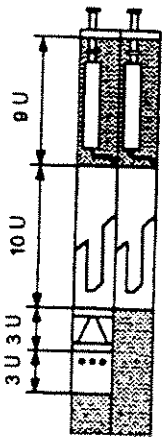
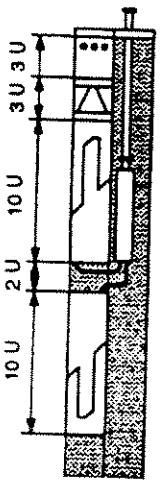
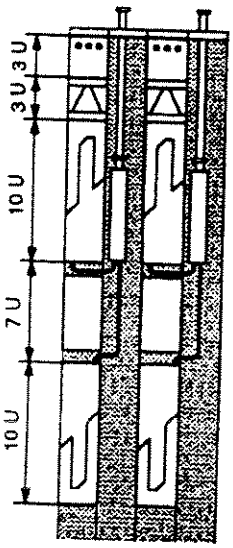
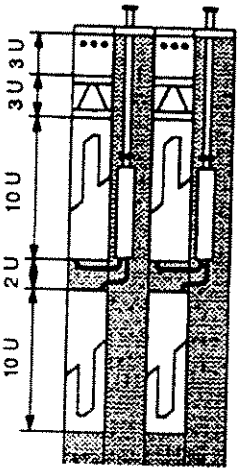


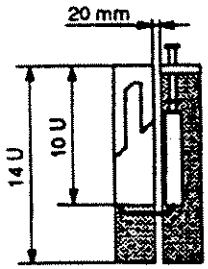
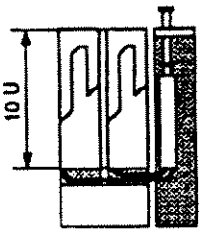
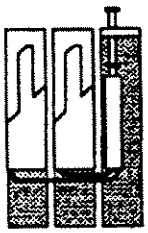
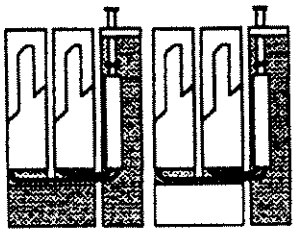
FLAT CABLE INTERFACES



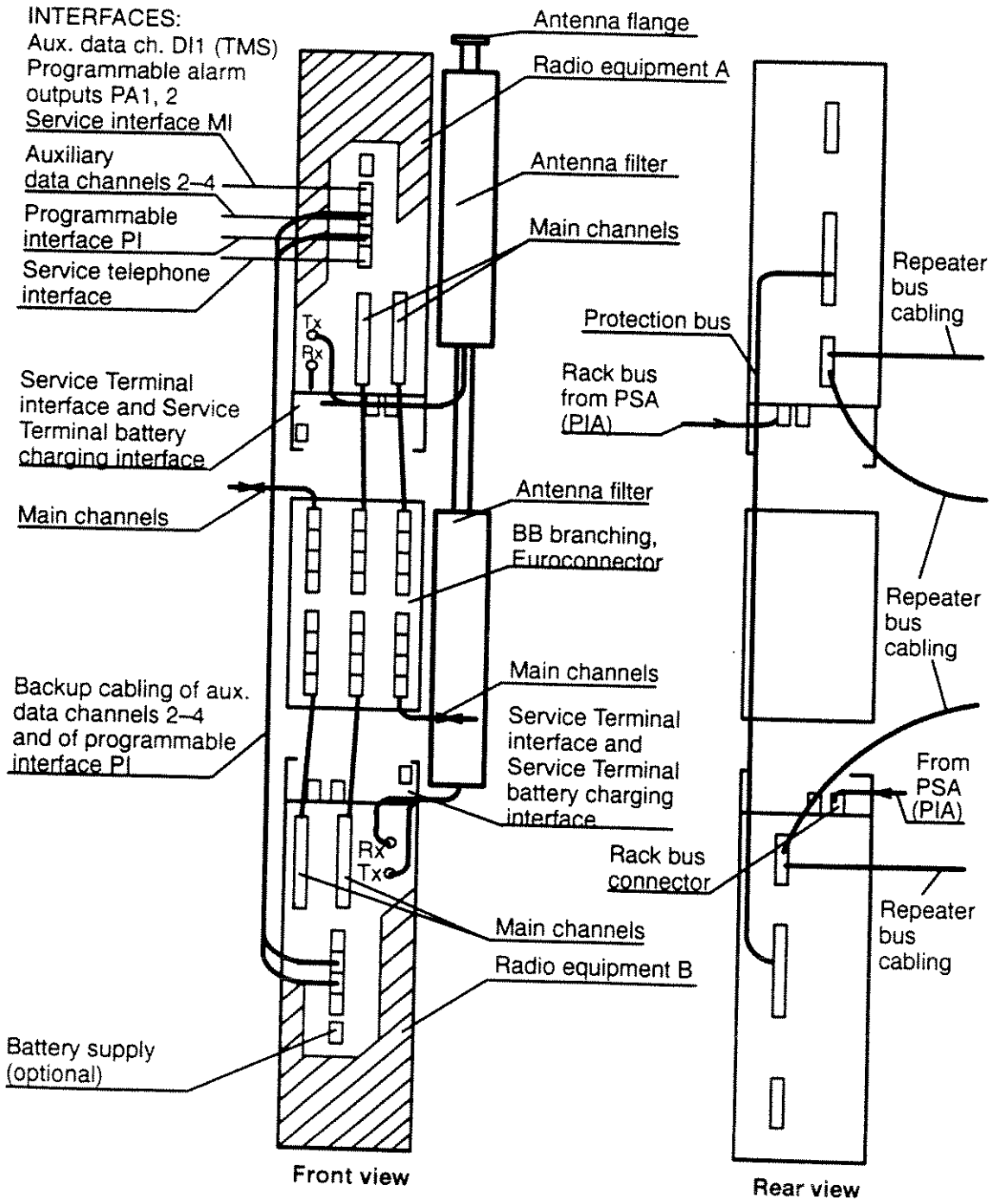
INSTALLATION DIMENSIONS

19" rack	SINGLE USE	REDUNDANCY
Terminal station		
Repeater station		

TM4 rack	SINGLE USE		REDUNDANCY	
	SLIM 1	SLIM 2	N x 2 Mbit/s	1 x 34 Mbit/s
Terminal station				
Repeater station				

Wall mounting	SINGLE USE	REDUNDANCY
Terminal station		
Repeater station		

CABLING PRINCIPLE FOR REDUNTANT OPERATION

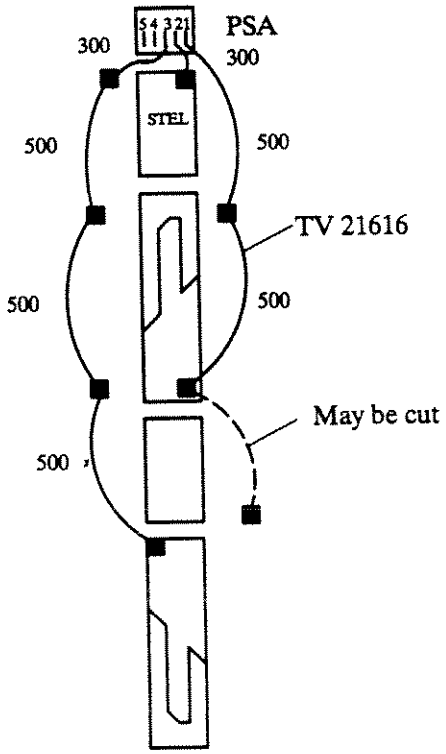


CABLING OF RACK BUS

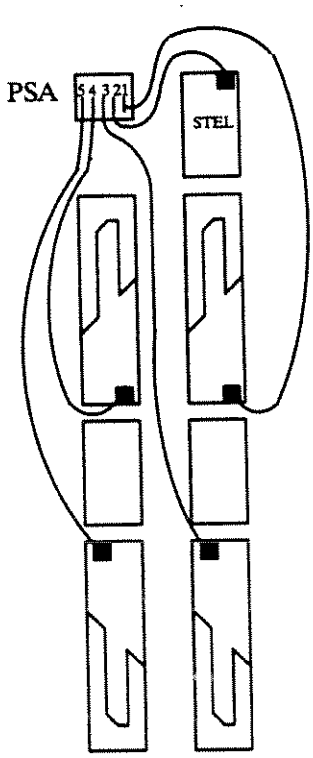
Before installing the radio relay equipment, one rack bus cable is taken for each radio from the PSA cartridge to the equipment. Only one radio relay equipment can be connected to one cable, because the maximum current allowed to pass through the cable is 2 A.

The antenna cable can not be accommodated in the cabling space of the TM4 rack. It should be brought as close to the radio as possible, e.g. on the side of the rack. The end of the antenna cable should be fastened to the rack or wall.

If the interconnection cable to the antenna line is to be routed in the cabling space of the rack, it shall be placed inside the rack body at this stage with the cable end positioned a little bit below the intended position of cartridge A (upper one). The interconnection cable is not yet connected.



HSB terminal station + service telephone (STEL)



HSB repeater station + service telephone (STEL)

DR11663EA1

ASSEMBLY

Assembly and disassembly can be performed with the cartridge either installed in the rack or separate. The equipment is assembled as shown in next page :

1) Place the entity containing the RF parts and the modem on the table with the guide pins for the BBU and the power supply facing up and the cooling plate (front part of radio) towards yourself.

2) Place the motherboard in its guides as indicated in the figure with the male connectors of the board and the flat cable towards the rear section of the radio.

3) Connect the flat cable connector of the motherboard to the rear section of the radio. The radio set is now complete.

4) Push the BBU in place with the service LEDs facing the front of the radio and the guide rails down so that they slide onto the guide pins of the radio set. The connectors to be connected to the motherboard shall be carefully pressed all the way down.

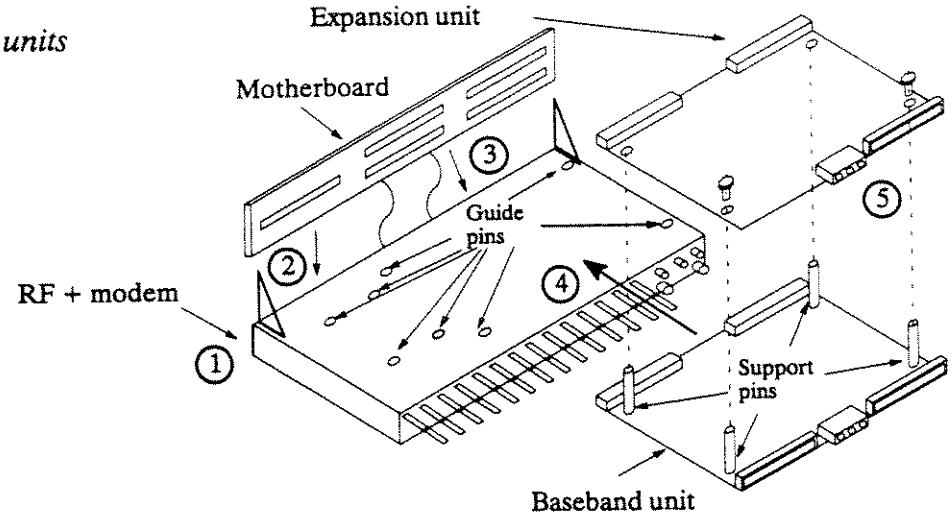
5) If the expansion unit EXU is to be installed, the screws (M3x6) must be removed from the front two support pins on the BBU. The EXU is then mounted to the motherboard connectors and fastened with the same screws to the front support pins. **Note! Screws are not fastened to the rear support pins.**

6) Push the assembled entity into the cartridge with the radio set on the side of the cartridge without holes. Press the equipment as far into the cartridge as it will go, and fasten it to the cartridge by alternately turning the two screws at the upper and lower edge of the cartridge.

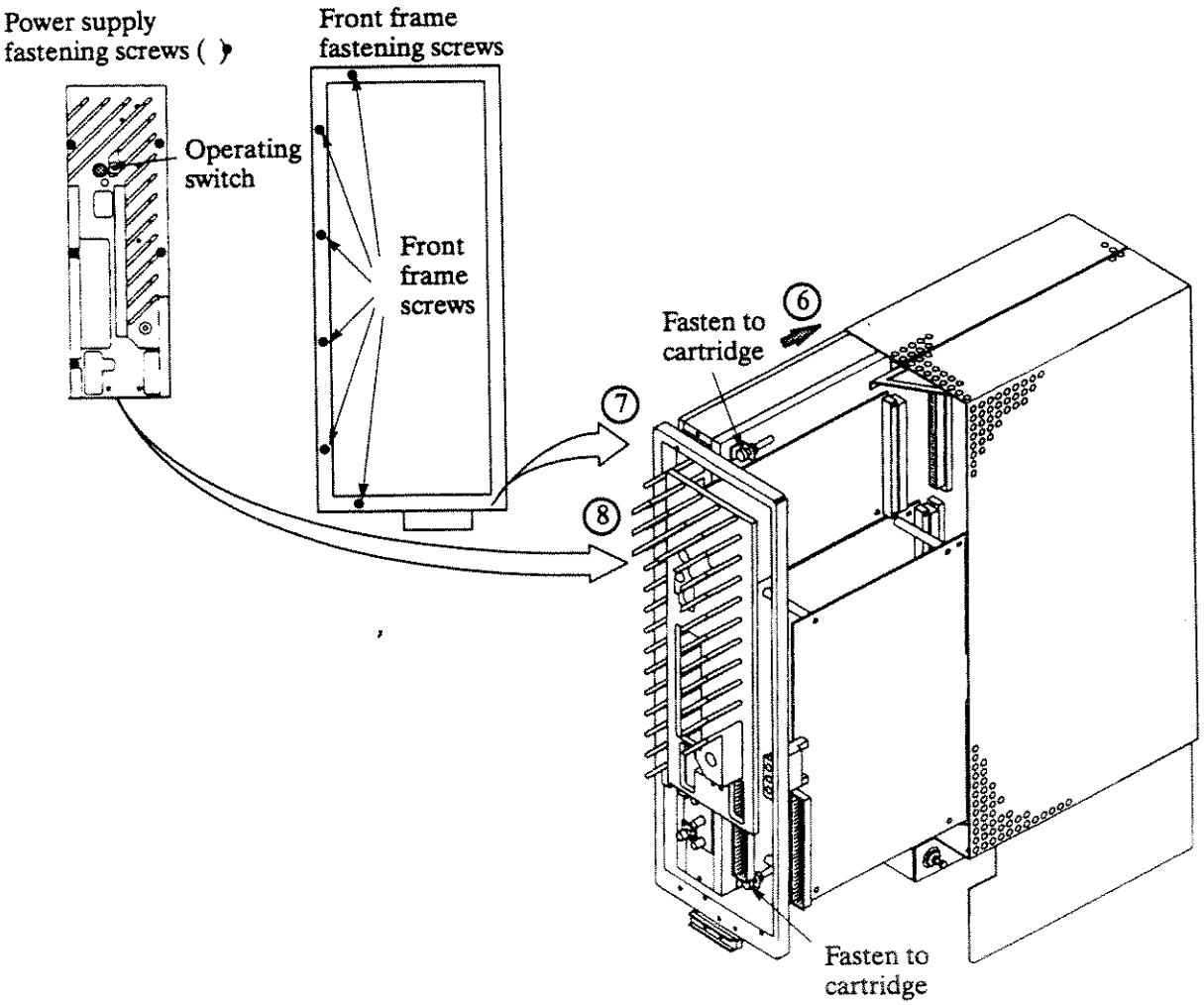
7) Press the front frame in place and fasten it to the radio set with six screws (M3x6).

8) **Make sure that the operating switch of the power supply (push button) is in the up position.** Push the power supply into its guide pins and fasten it with five screws (M3x12).

Radio set, BB units



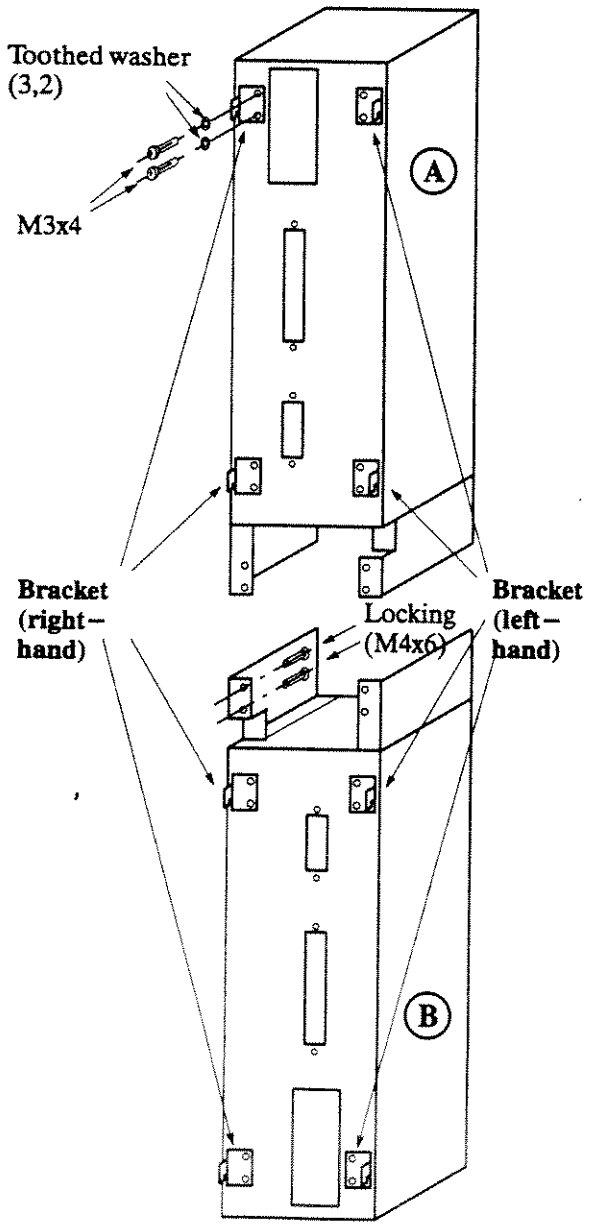
Assembly into cartridge



SUSPENDING THE CARTRIDGE IN THE RACK

BRACKETS

Mounting brackets are fastened to the rear of the radio equipment cartridges to suspend the cartridges in the rack. A single use cartridge is suspended as cartridge A. Note that there are two kinds of brackets. They are mounted with the notches down by using M3x4 screws with toothed washers underneath.



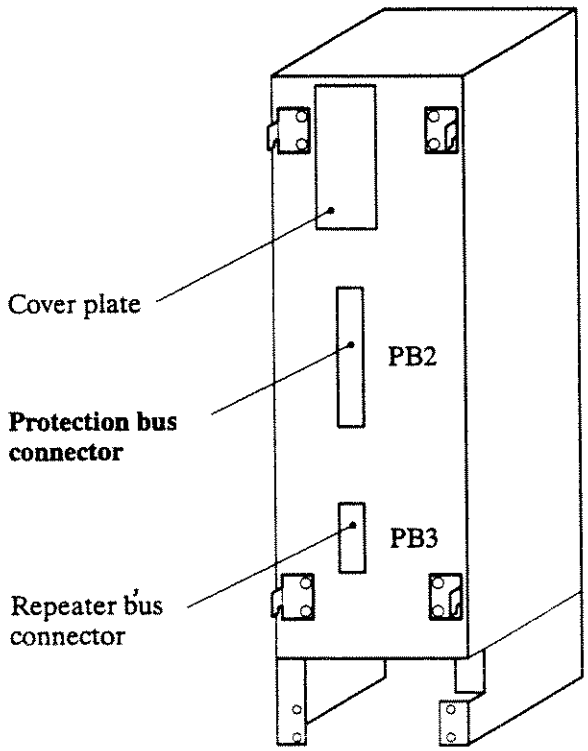
PROTECTION BUS

In redundant operation, the protection bus cable is connected to equipment A before suspending the equipment in the rack. The ends of the cable have been marked for equipment A and B.

The connector of the protection bus cable is connected to the cartridge as follows:

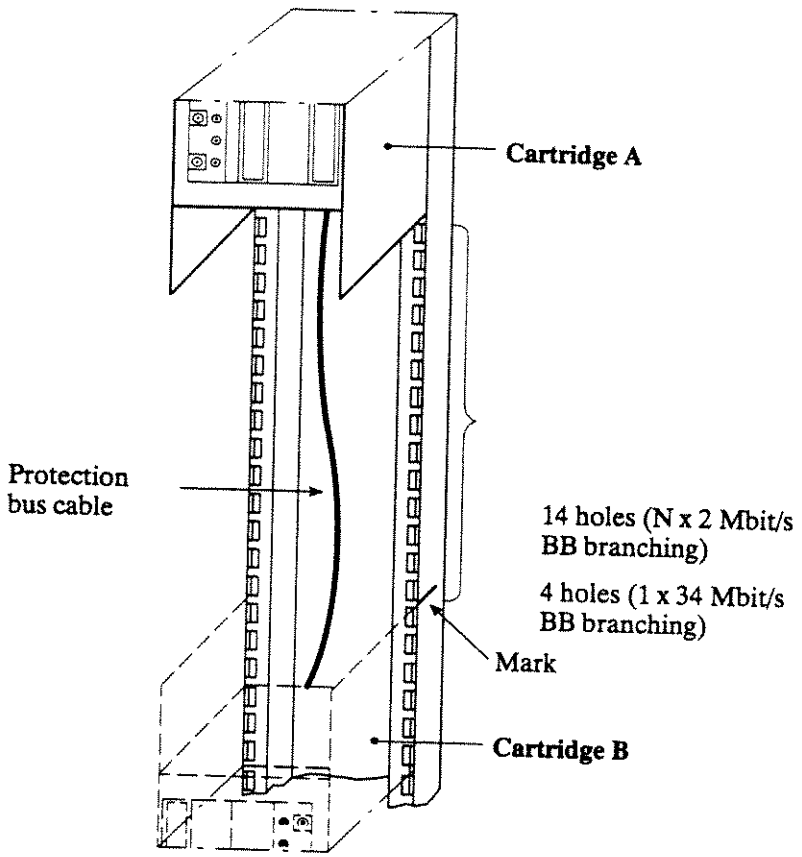
1) Remove the screws of the shield over the center connector opening at the rear of the cartridge and take off the shield.

2) Push the connector into the revealed motherboard connector and fasten it with the same screws.



DR11658EA1

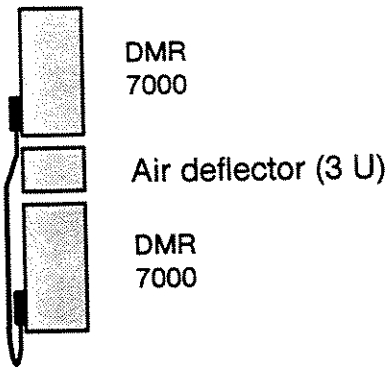
SPACING OF CARTRIDGES



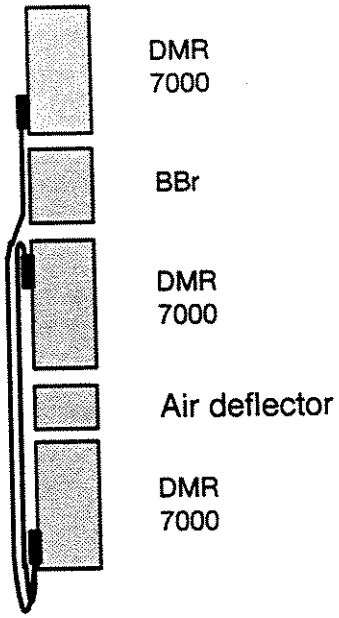
Before cartridge B is installed, a mark is made for the alignment of the upper edge of the cartridge at the location indicated in Figure. The mark is made below the 14th free hole as counted from the lower edge of cartridge A when using N x 2 Mbit/s BB branching and below the 4th hole when using 1 x 34 Mbit/s BB branching.

Remove the shield over the connector opening for the protection bus cable in cartridge B and hold up the cartridge in such a way that the protection bus cable can be connected. Suspend the cartridge upside down from its brackets with the upper edge aligned with the mark. Lock the cartridge in place in the same way as cartridge A.

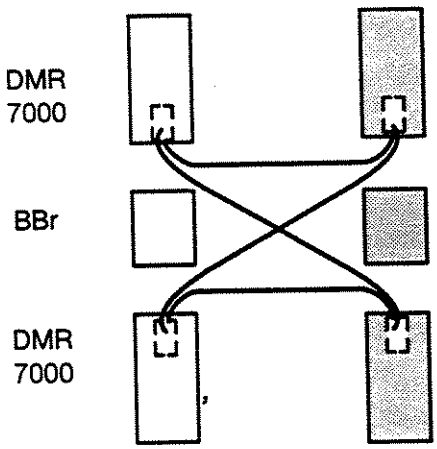
a) Single use



b) Single-Redundant use

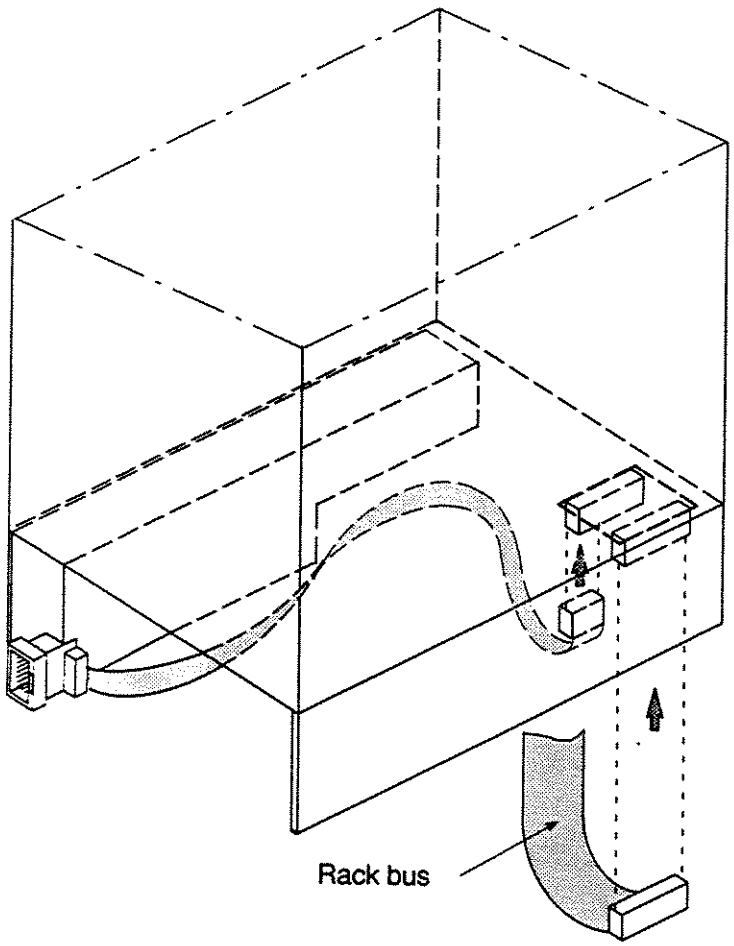


c) Redundant-Redundant use viewed from the front



Redundant DMR 7000 pair is placed in adjacent racks

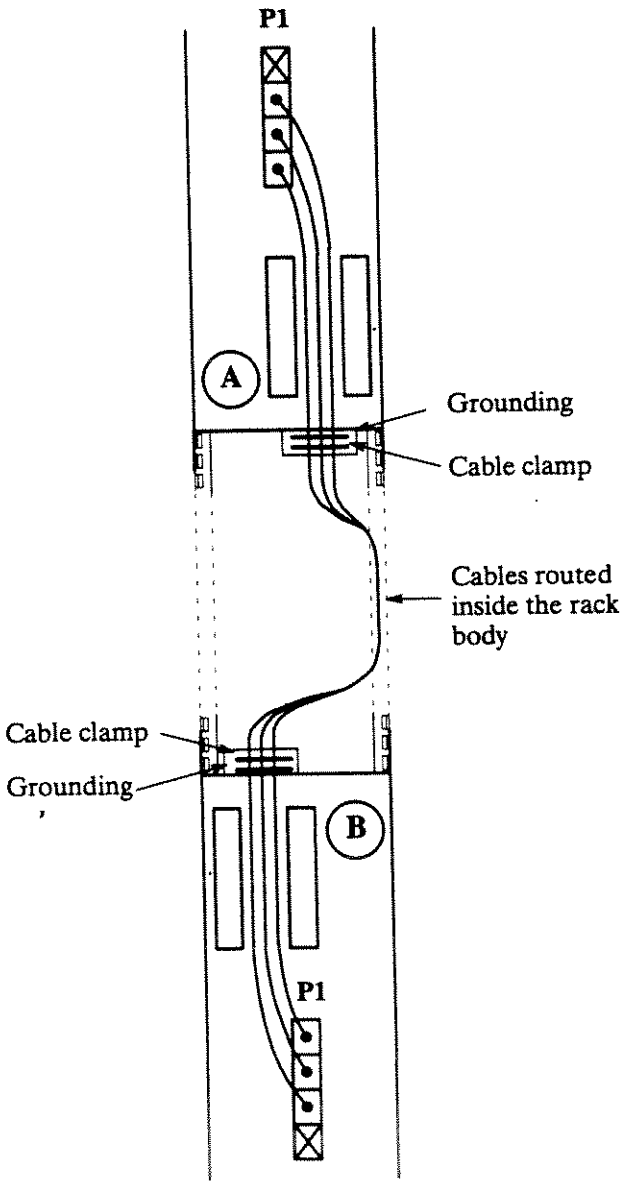
INSTALLING THE SERVICE TERMINAL CONNECTOR



When the cartridge has been locked to the rack, the rack bus is connected to the cartridge.

AUXILIARY DATA CHANNEL INTERFACES AND BACKUP CABLING

In redundant operation the auxiliary data channel interface cables are connected as shown in Figure from the three connector locations of the primary baseband unit connector P1 to the corresponding connector in the backup equipment. The connector location of the service interfaces is not connected to a backup cable because it is backed up via the protection bus.



INSTALLING THE RF BRANCHING

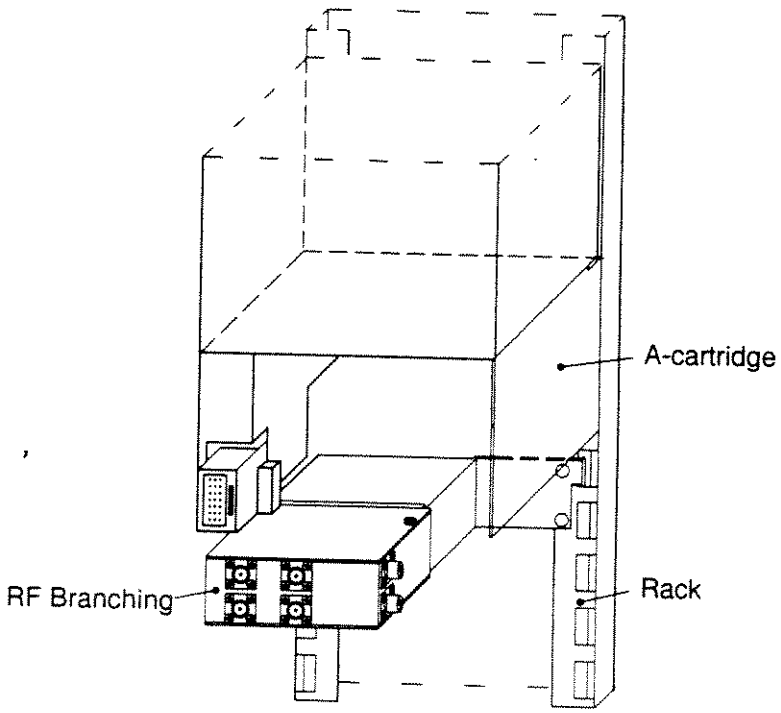
In redundant operation (HSB or HSB + space diversity) RF branching is installed immediately below cartridge A.

Before installing

The power supply connector coming from the protection bus cable is connected to the RF branching before installation.

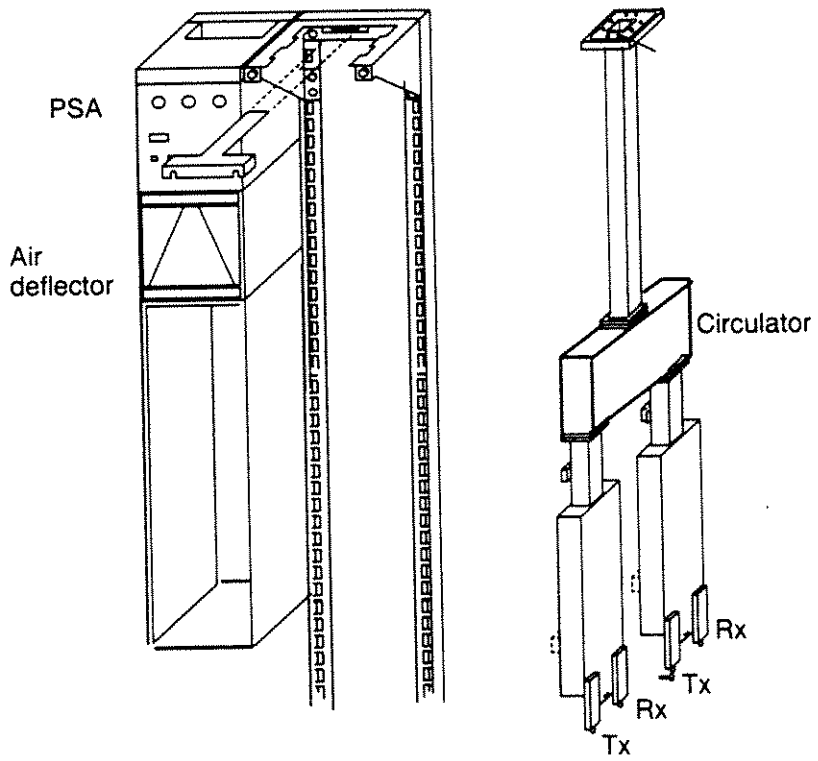
Installation

The RF branching is suspended by it's brackets at the first hole below cartridge A and locked in place by two screws (M4x6).



INSTALLING THE CIRCULATOR

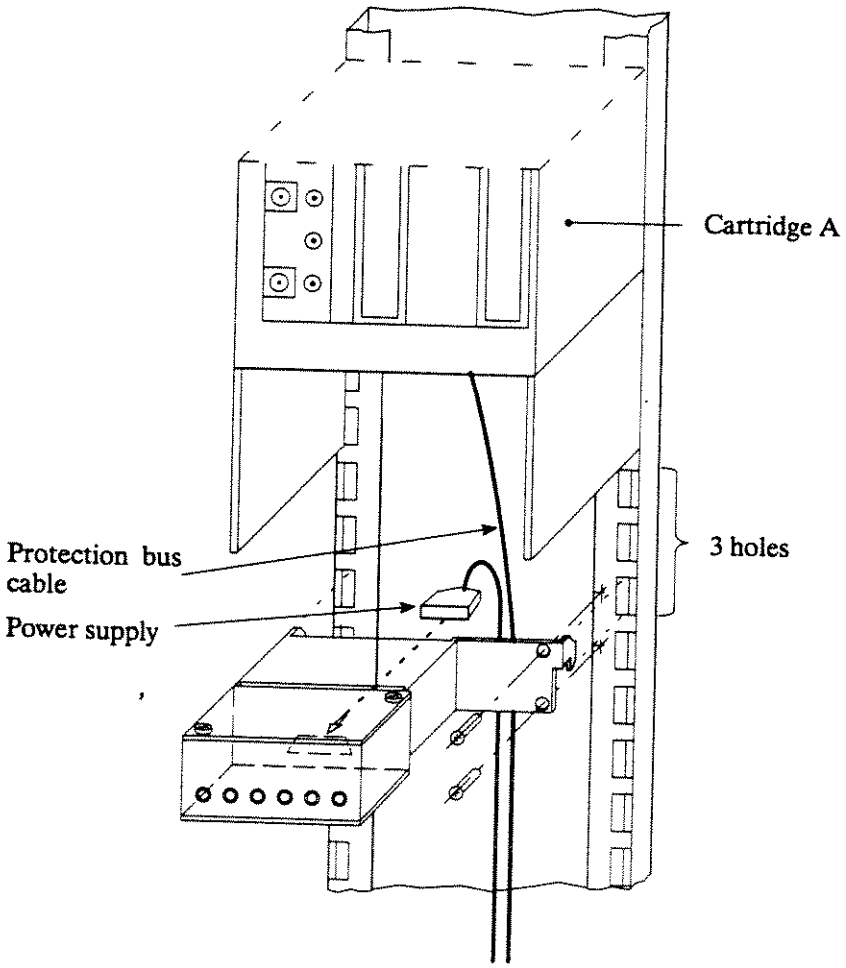
In redundant operation (frequency diversity) circulator connects the filters from the two radios to one waveguide.



INSTALLING THE BASEBAND BRANCHING

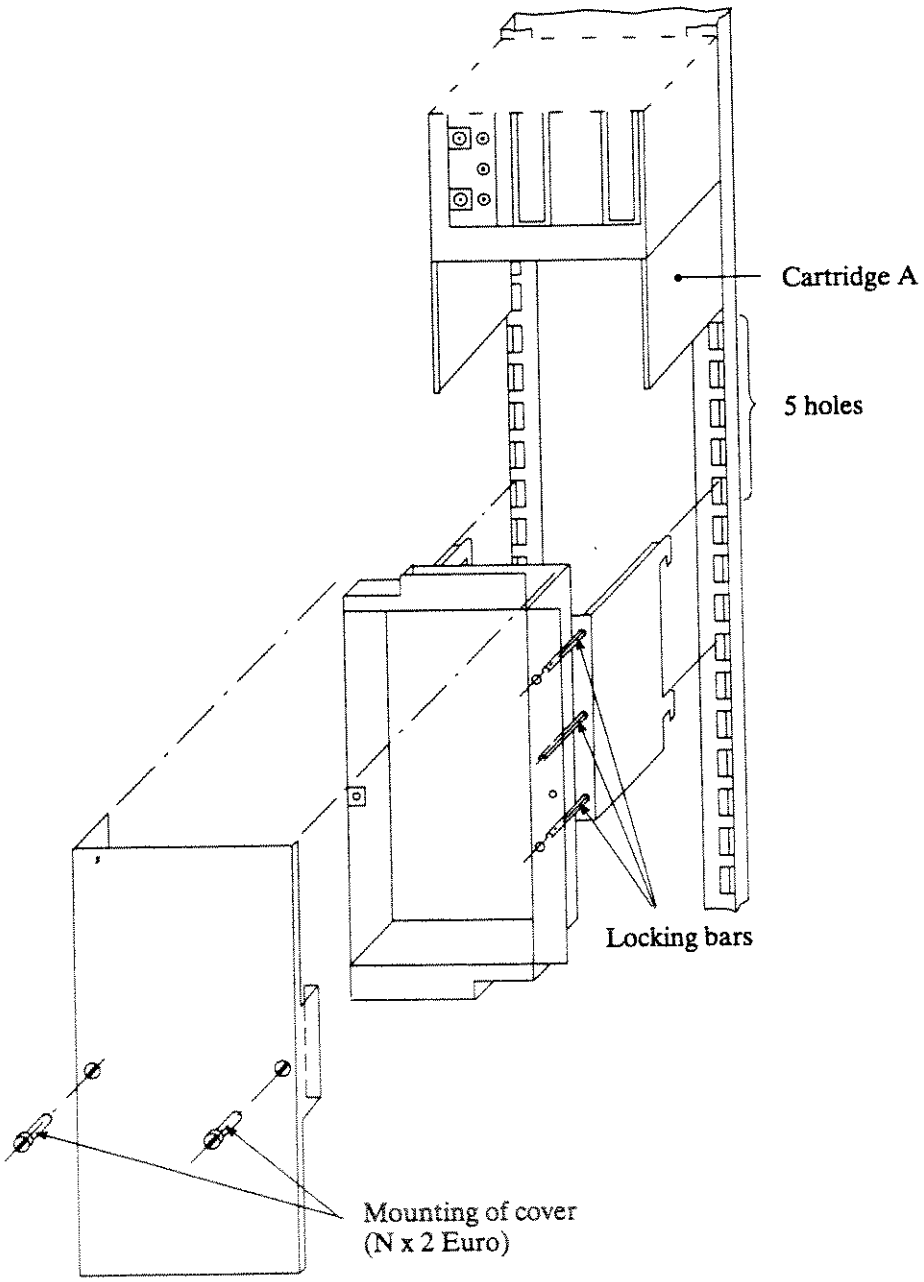
1 x 34 Mbit/s

The mounting of the 1 x 34 Mbit/s baseband branching is illustrated in Figure. The power supply is first connected to the branching from the protection bus cable, and the branching is then suspended by its mounting bracket to the 3rd hole as counted from the lower edge of radio A and locked in place by two screws (M4x6).



N x 2 Mbit/s

The installation of the N x 2 Mbit/s baseband branching is shown in Figure. The cover of the branching equipped with Euroconnectors is first opened at the two knurled–head screws. Suspend the branching so that the upper hooks of the mounting bracket are placed in the 5th hole as counted from the lower edge of cartridge A. The branching is then locked in place by tightening the locking bars with a screwdriver.

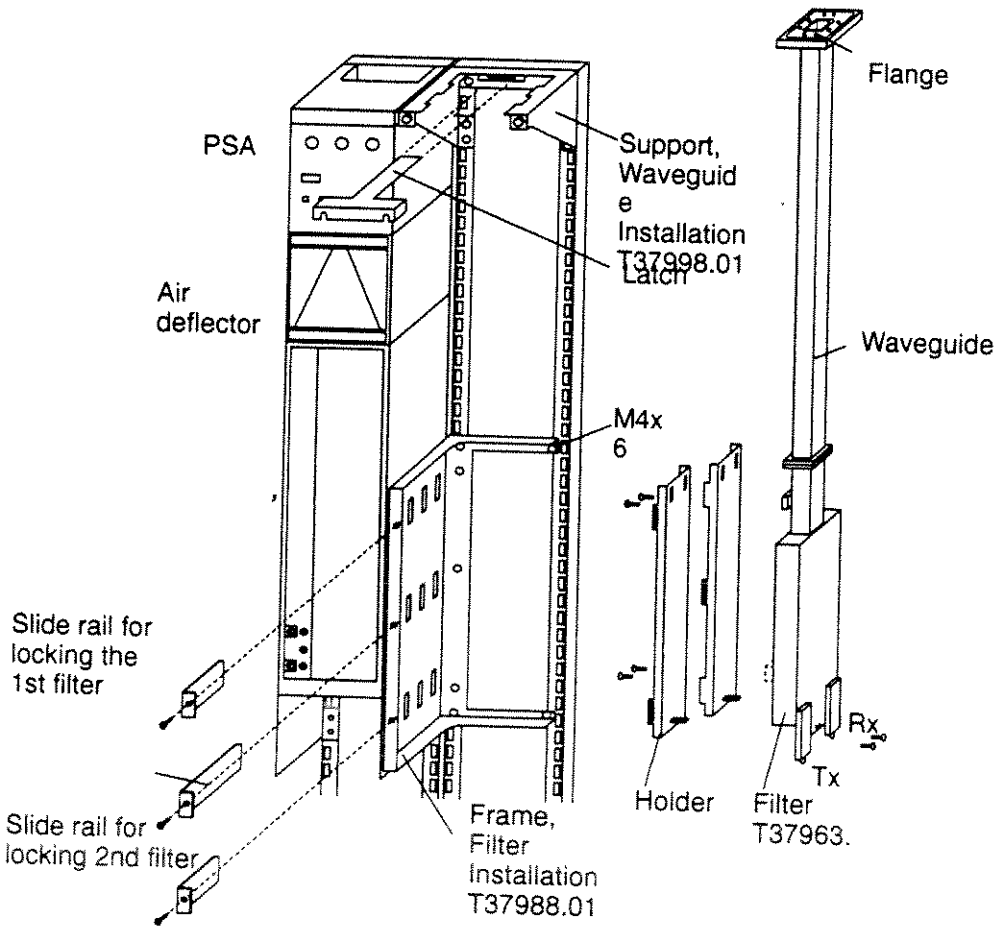


INSTALLING THE ANTENNA BRANCHING

The filter contains the waveguide filters of the receiver and transmitter side by side. They have a common antenna line flange and separate SMA connectors at the other end.

The filter is mounted with screws to the holder included in Filter Installation parts which is then fixed on the frame with slide rails. The frame is installed on the TM4 rack rail (there is a similar rack rail in the 19" and wall installation also) so that its lower edge is at the level of the radio's lower edge in the adjacent rack (usually).

In single use, the filter and waveguide can be installed in the same rack as the radio if the radio is placed upside down (slim 1 method). In that case the Power Supply Adapter cartridge must be installed below the radio.

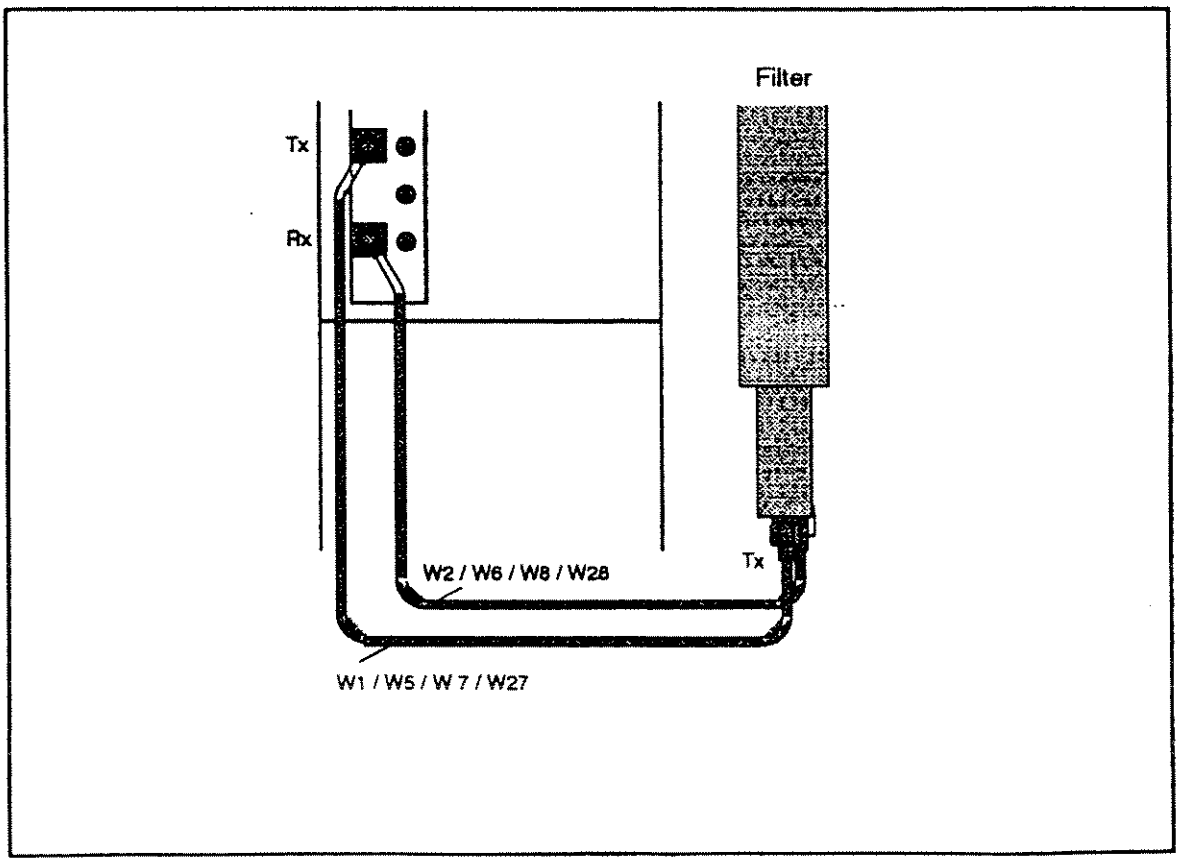


INSTALLING THE RF CABLES

The purpose of the RF cables is to connect the Rx and Tx connectors of the radio to the High and Low connectors of the antenna filter, to the RF branching or to the circulator. The cables are different depending on whether the transmission frequency is above (Tx–High) or below (Tx–Low) the reception frequency.

The RF cables may be carefully bent to correct shape if they do not fit exactly. Before tightening the connectors with the wrench, make sure that they are straight, otherwise they may get damaged.

SINGLE USE



RF cables, single use (plus polarization diversity and space diversity)

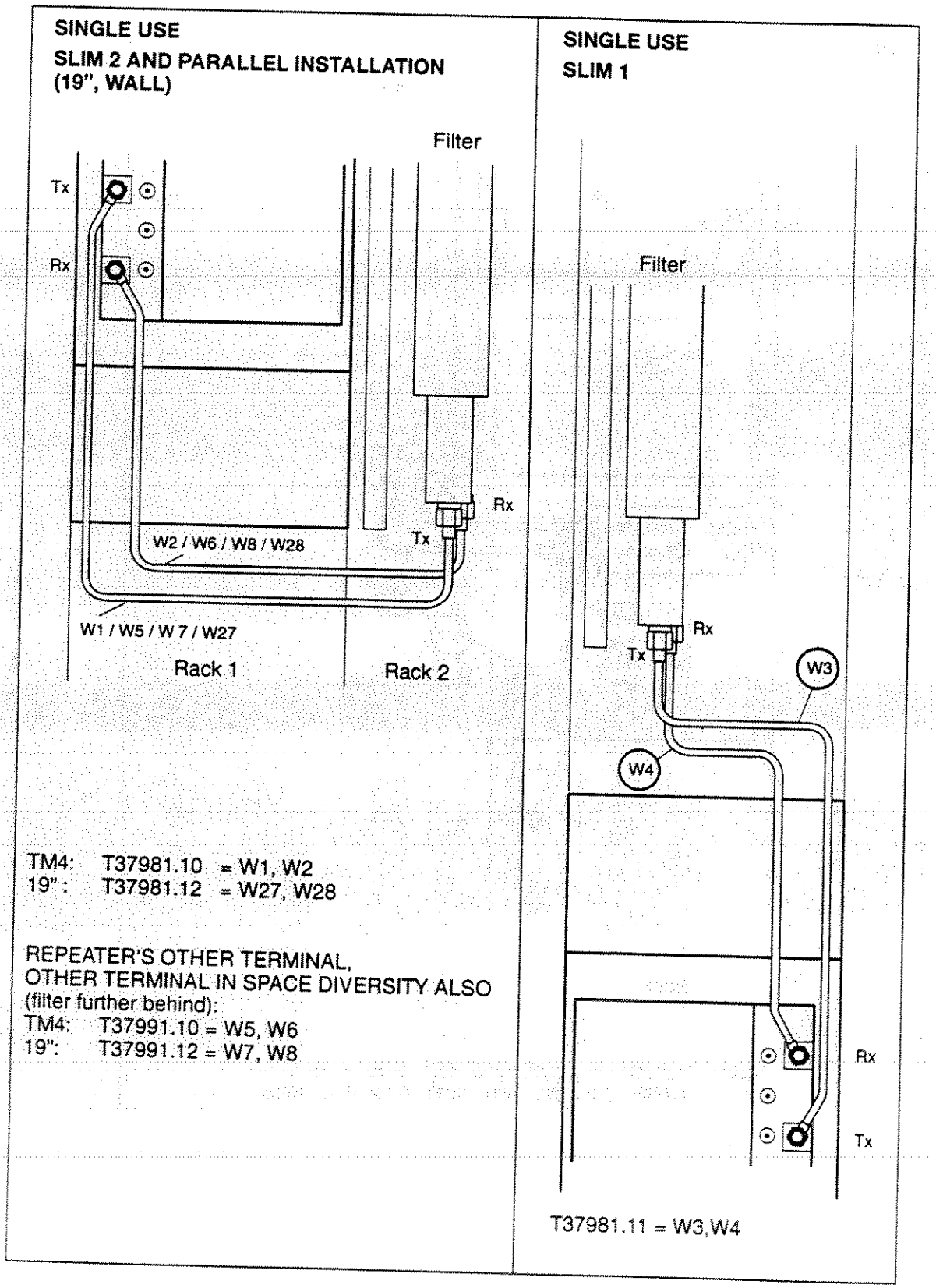


Figure 1 RF cables, single use (one rack or two adjacent racks)

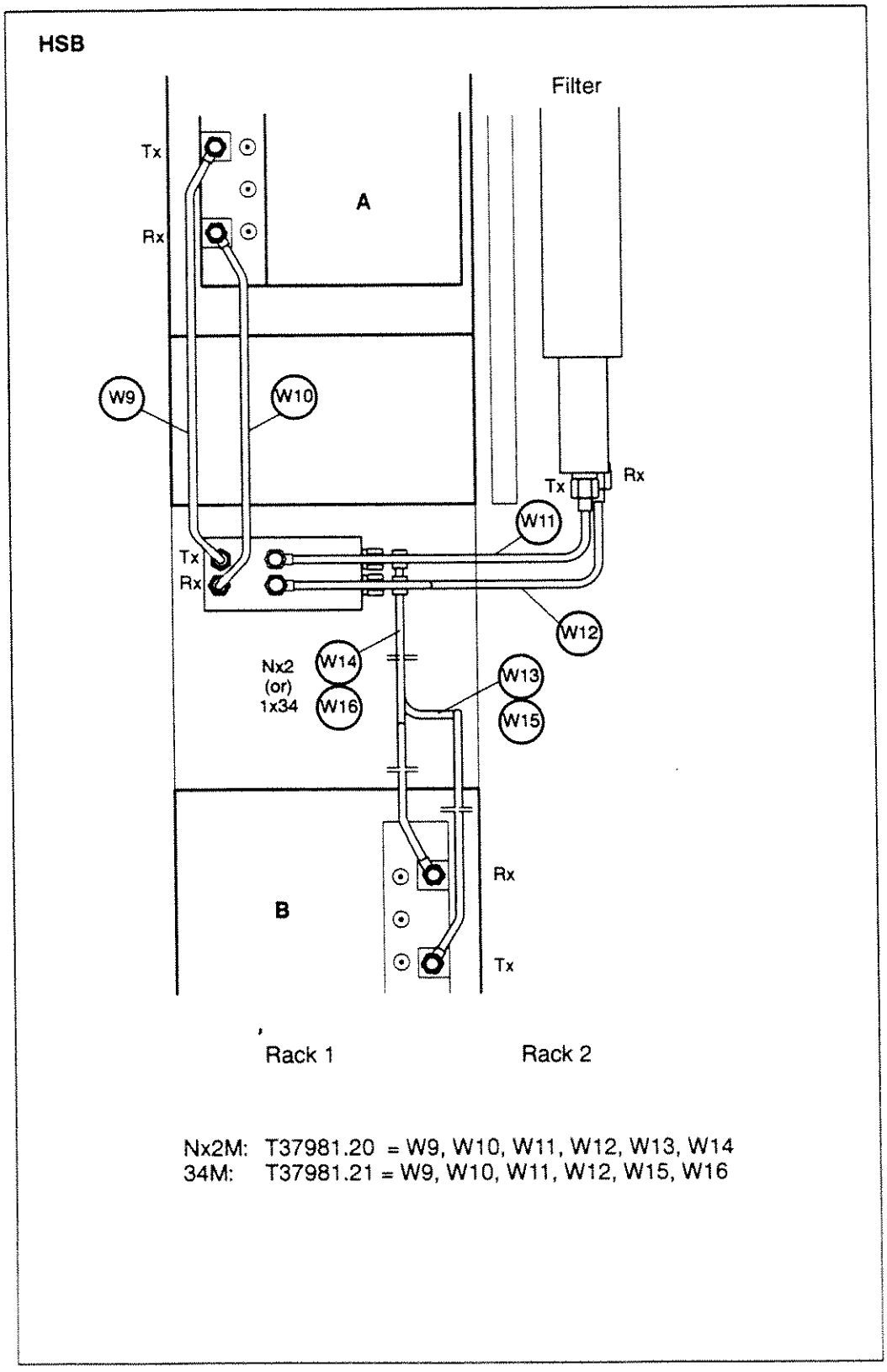


Figure 2 RF cables, HSB, TM4 rack installation

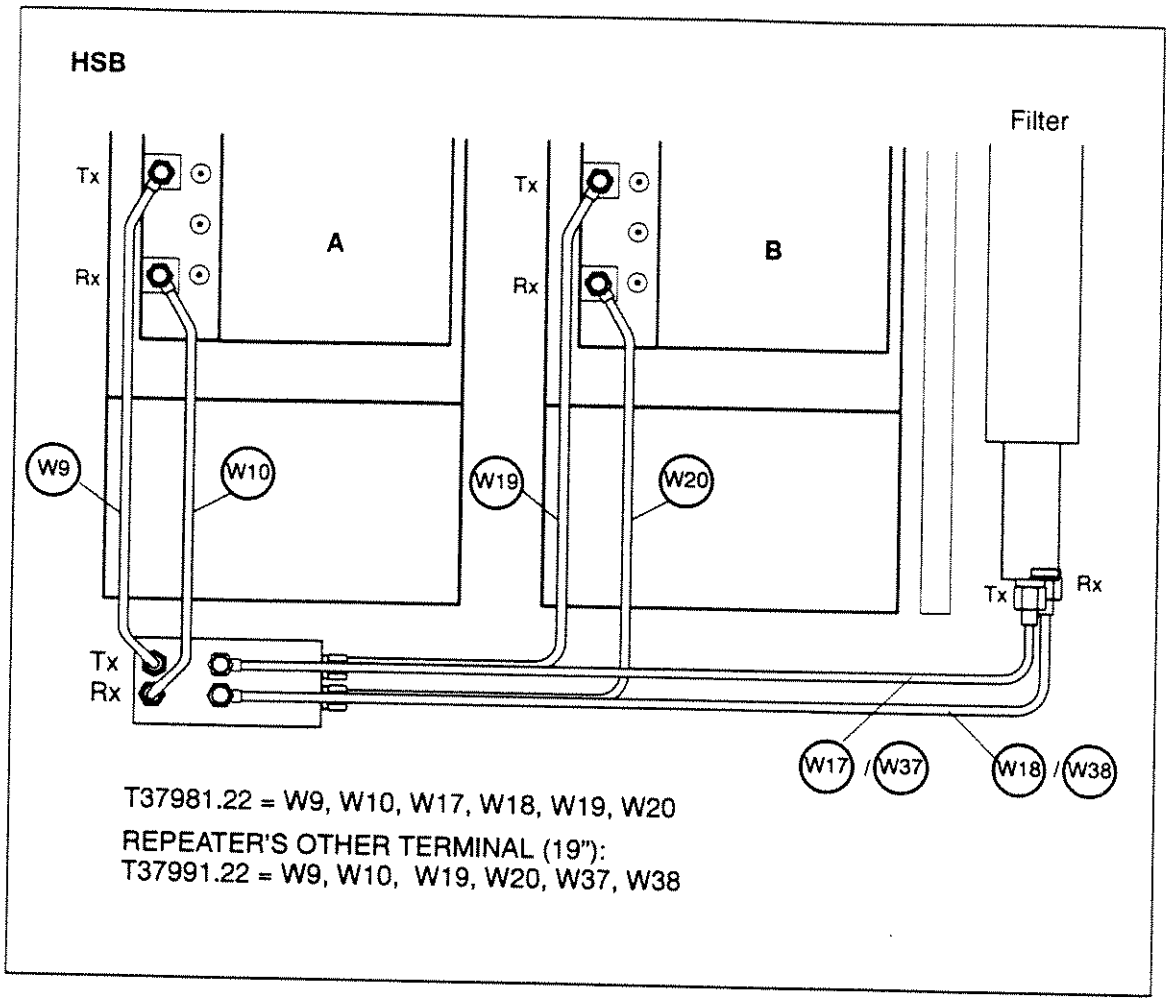


Figure 3 RF cables, HSB, 19" and wall installation

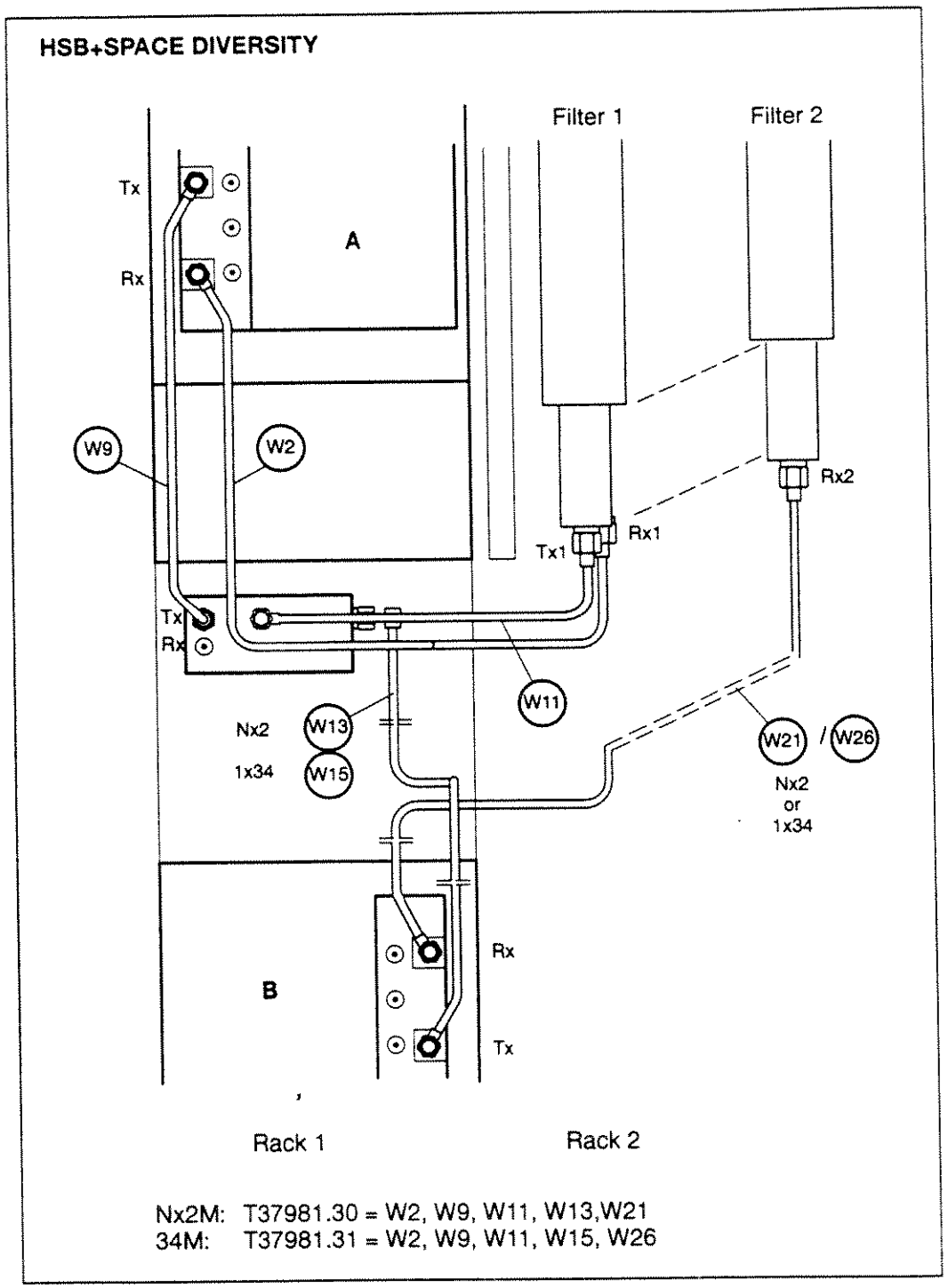


Figure 4 RF cables, HSB + space diversity, TM4 rack installation

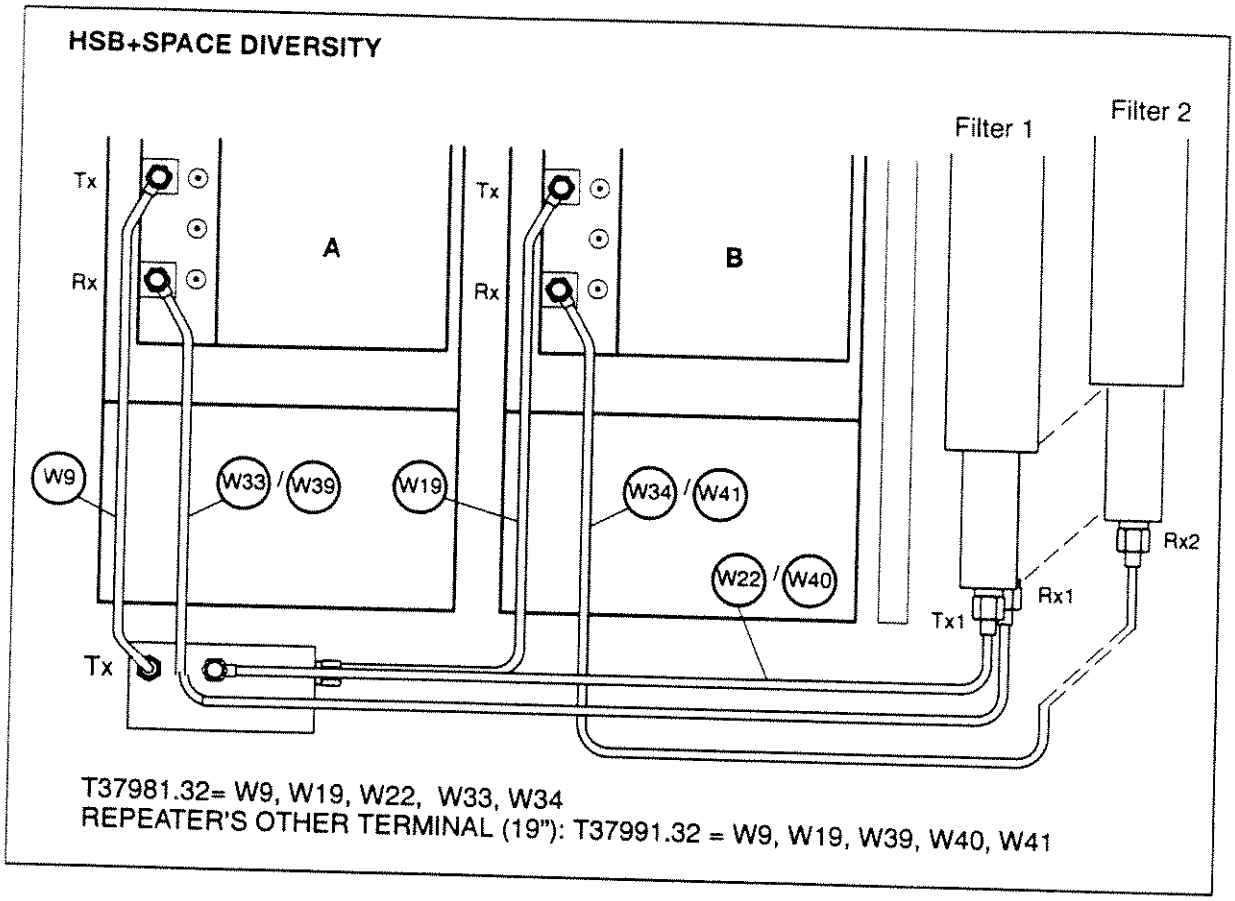


Figure 5 RF cables, HSB + space diversity, 19" and wall installation

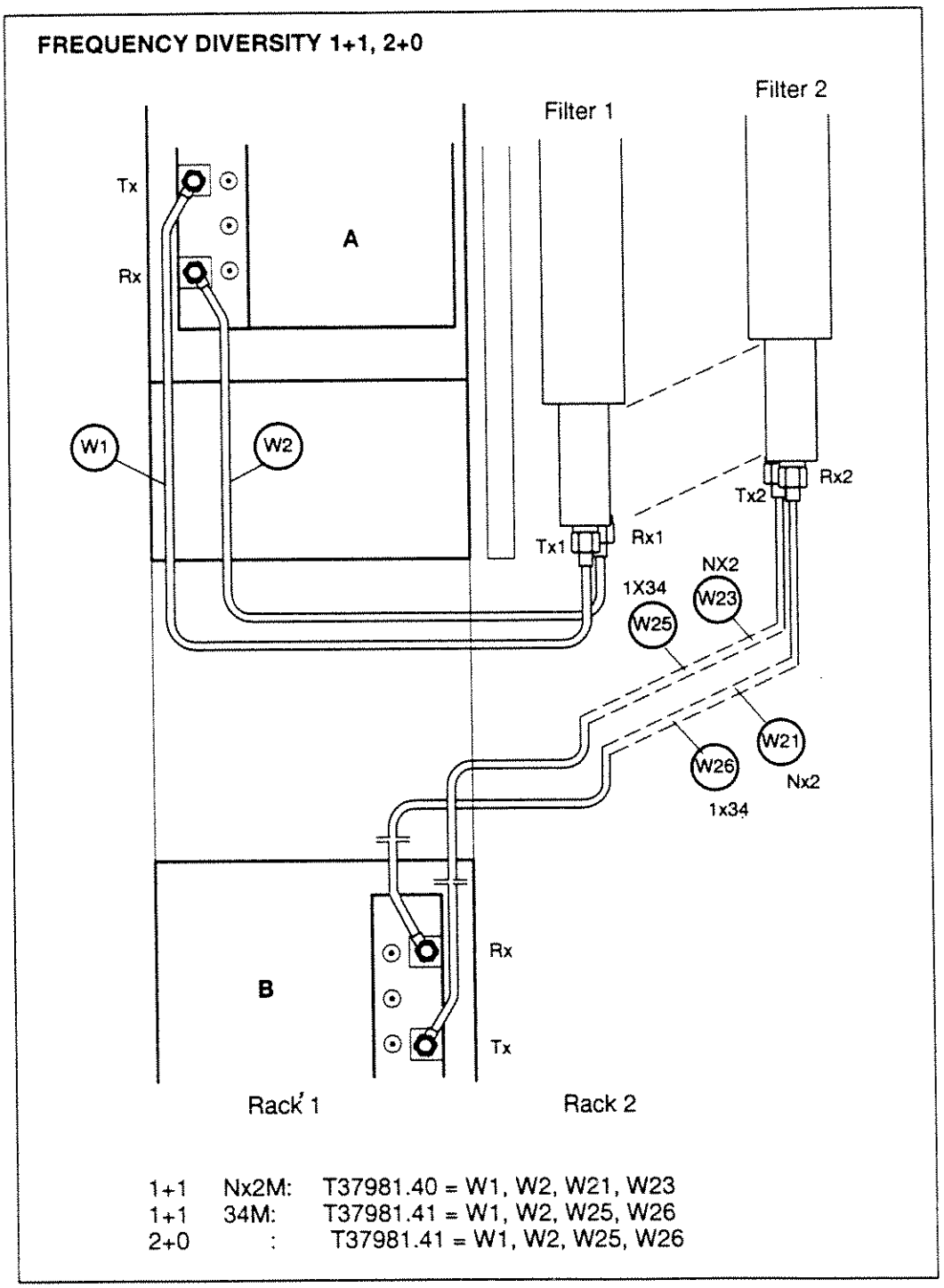


Figure 6 RF cables, frequency diversity, TM4 rack installation

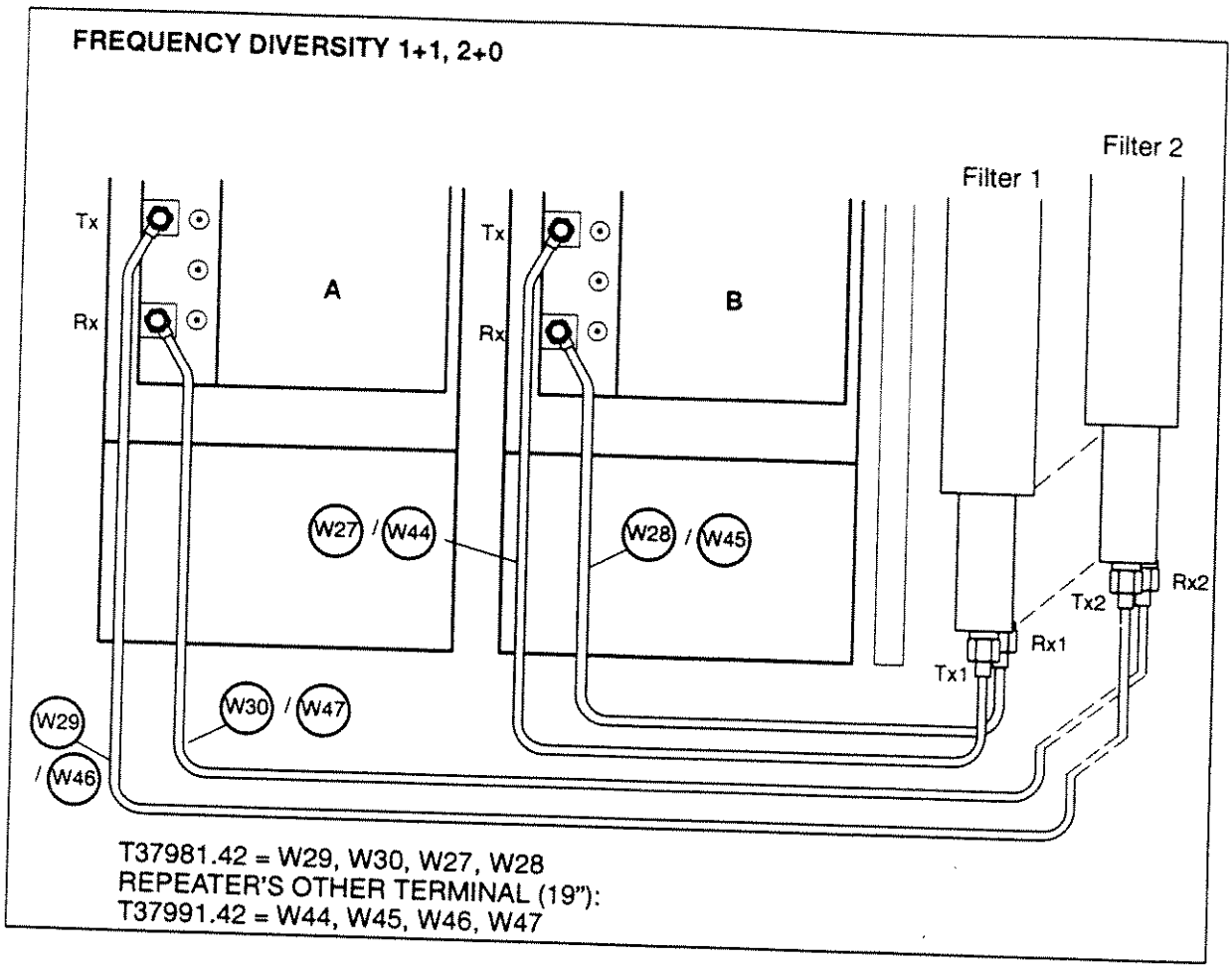


Figure 7 RF cables, frequency diversity, 19" and wall installation

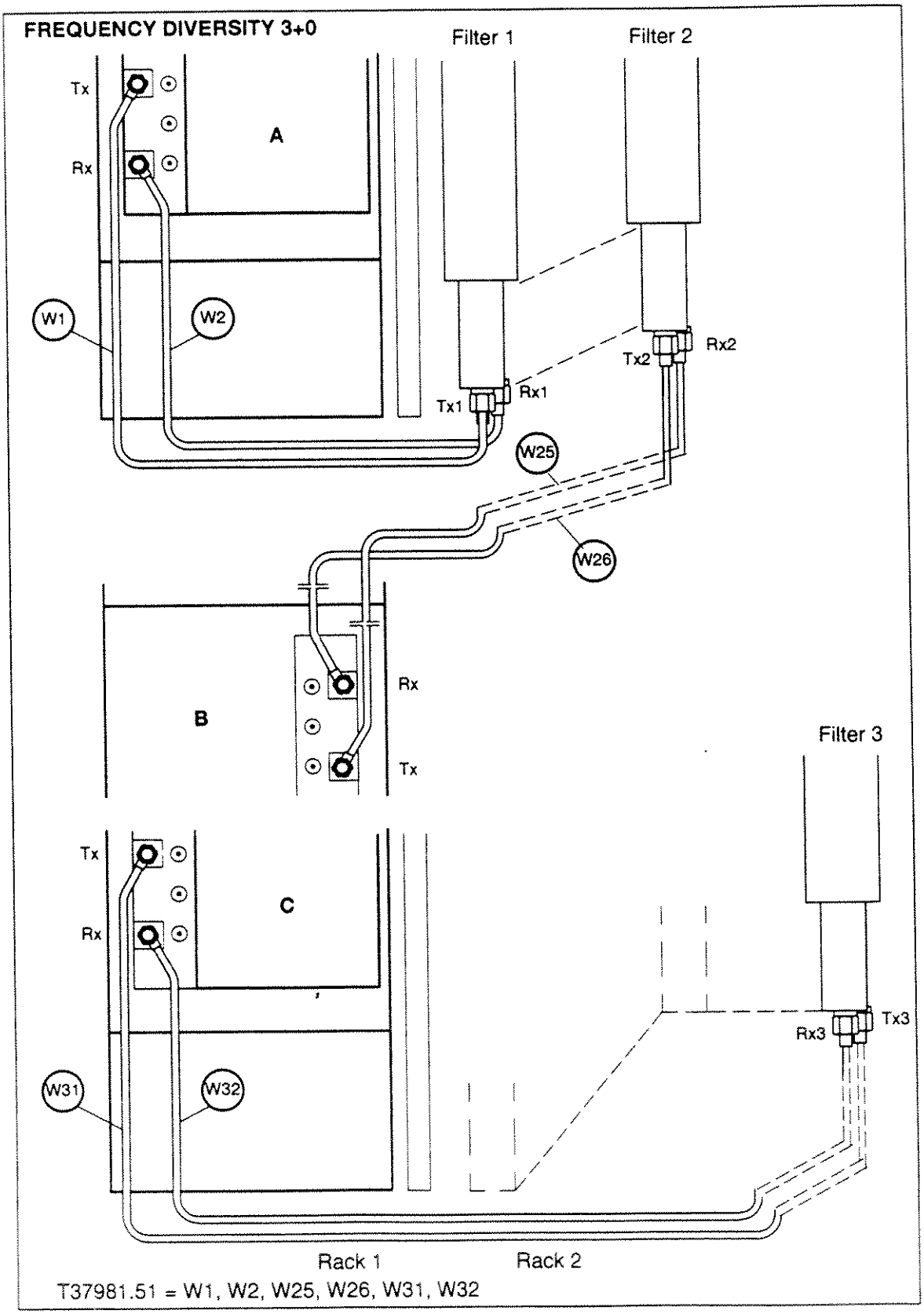
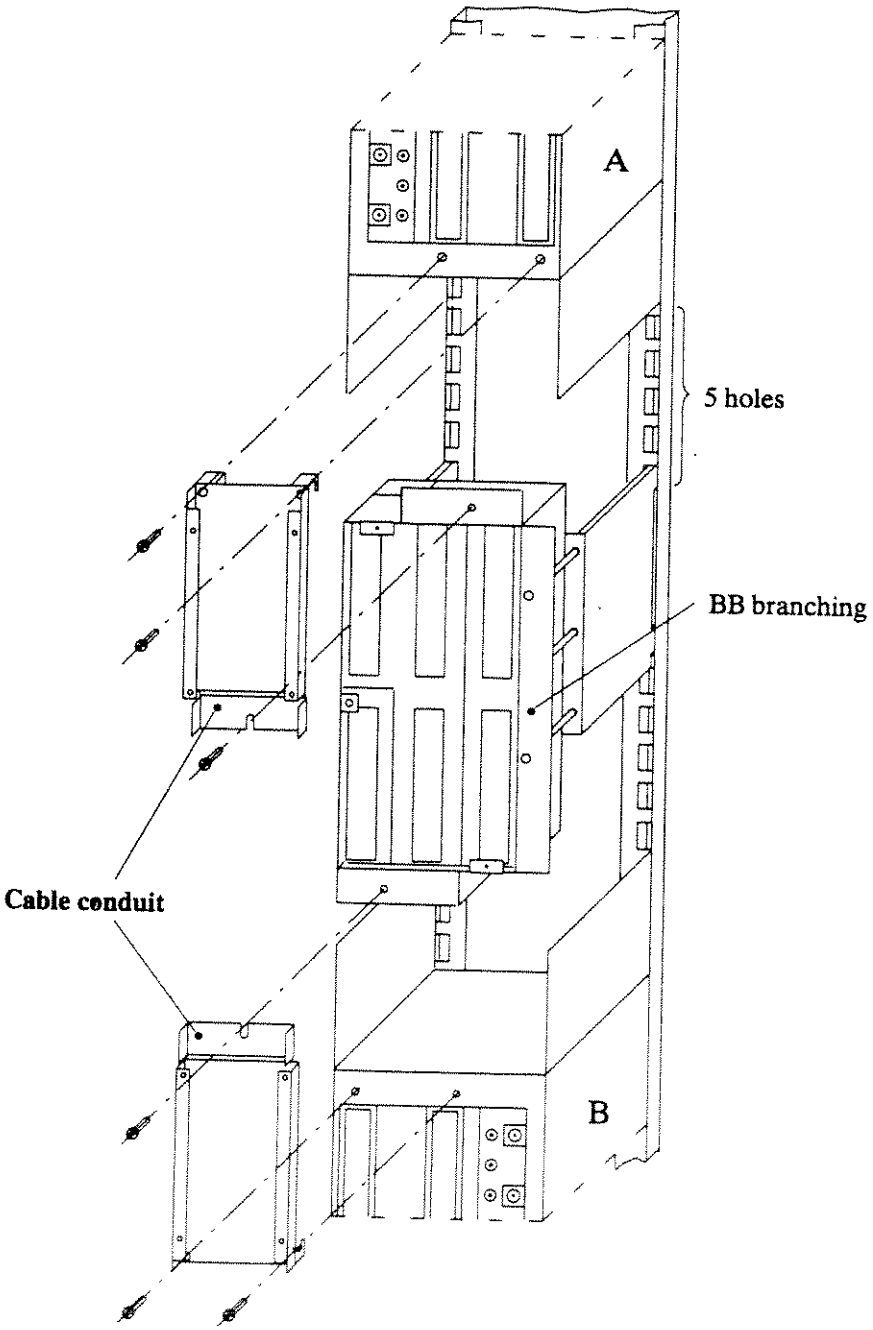


Figure 8 RF cables, frequency diversity 3+0, TM4 rack installation

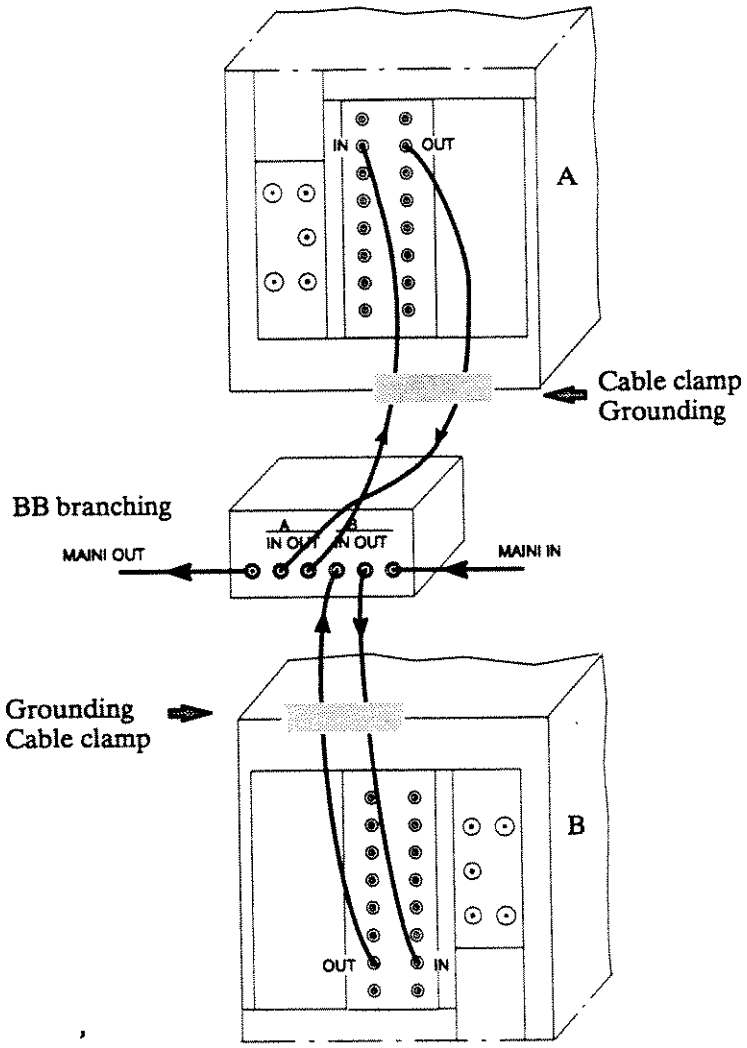
INSTALLING THE BASEBAND CABLES

Cable conduit

Before cabling the N x 2 Mbit/s baseband branching, a cable conduit is installed between the branching and both cartridges as shown in Figure. Both conduits are fastened with three screws (M3x6).

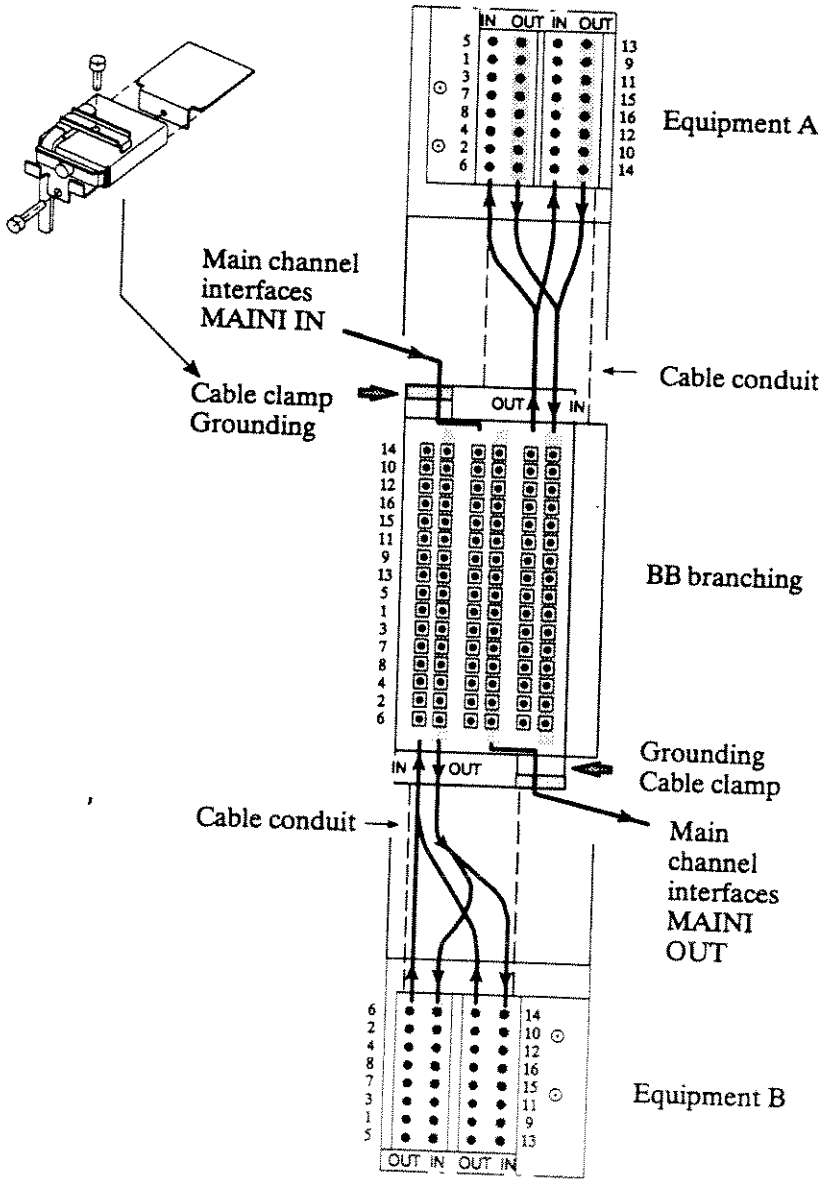


CABLING THE 1 X 34 MBIT/S BB BRANCHING

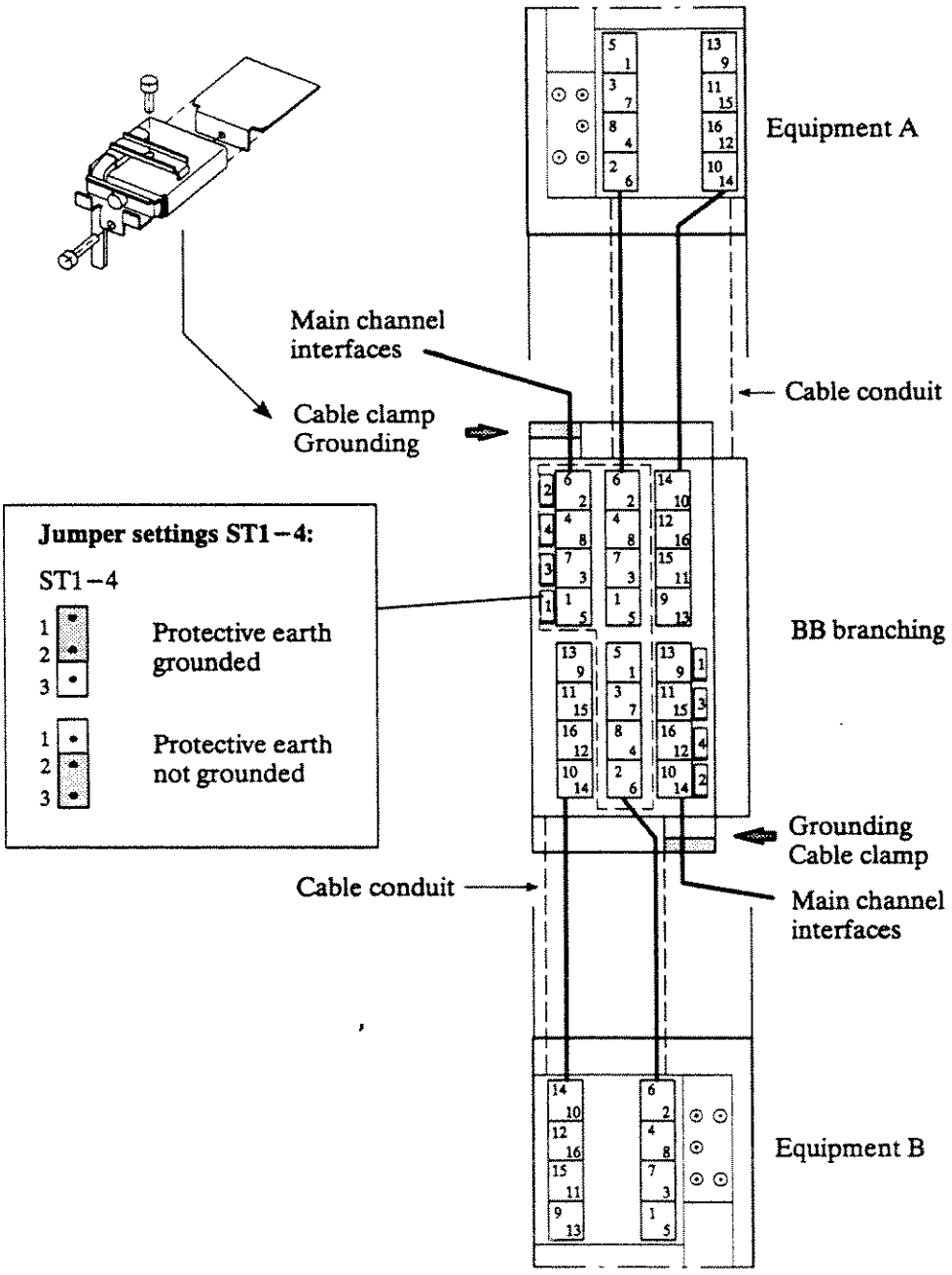


BB CABLING, N X 2 MBIT/S, SMB CONNECTORS

The N x 2 Mbit/s baseband branching equipped with SMB connectors is cabled as shown in Figure. The interface numbers and signal directions of the cables are indicated in the figure. Each cable is taken along the conduit to the corresponding connector on the radio relay equipment.



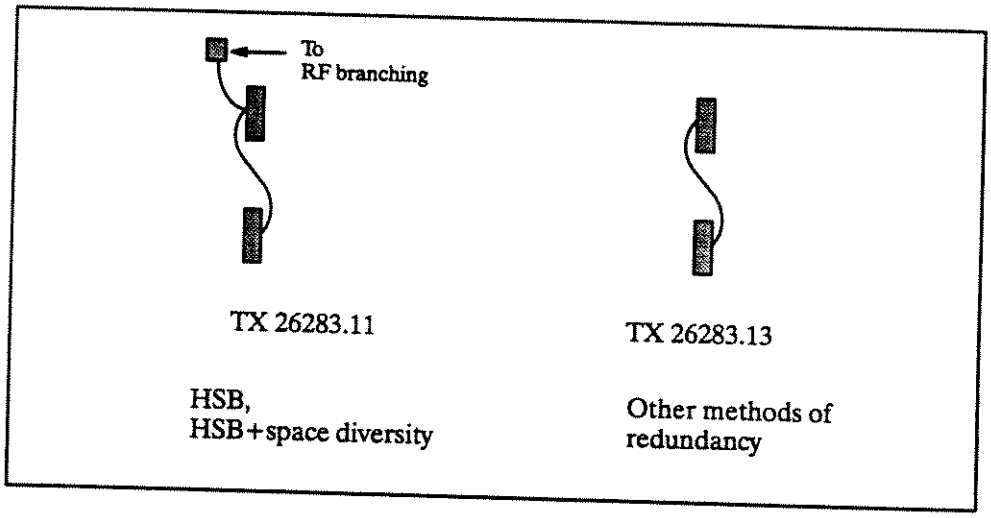
BB CABLING, N X 2 MBIT/S, EUROCONNECTORS



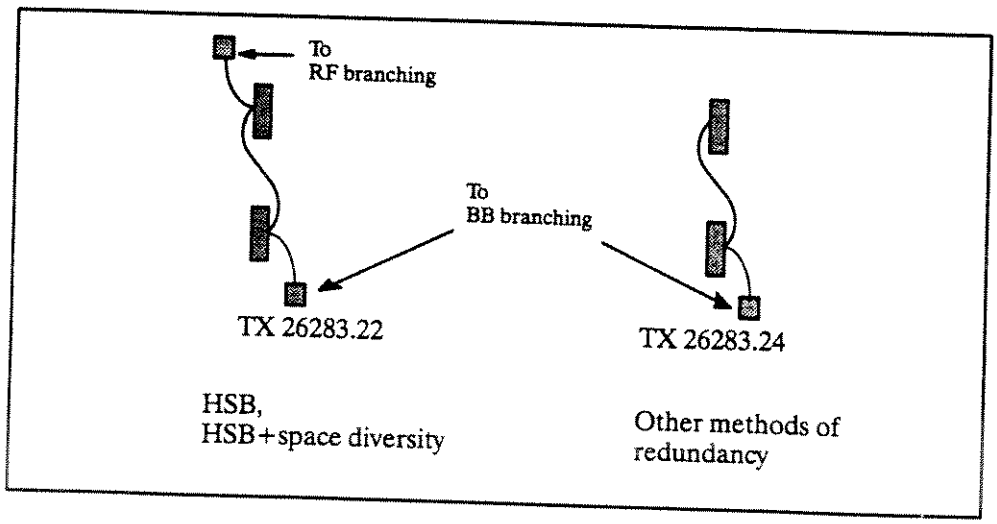
CONNECTOR SETS

CABLING OPTIONS FOR PROTECTION BUS

N x 2 Mbit/s



1 x 34 Mbit/s



RF CABLE OPTIONS

The following tables contain RF cable set options according to operating mode. The terminal station cables are T37981.**.

TM4 rack (slim)	Terminal station and repeater stations's "A" and "B"	
Operating mode	**2M**	**34 M**
Single use, slim 1	T37981.11	T37981.11
Single use, slim 2	T37981.10	T37981.10
HSB	T37981.20	T37981.21
HSB + space diversity	T37981.30	T37981.31
Space diversity, 2Tx	T37981.40	T37981.41
Frequency diversity 1+1,	T37981.40	T37981.41
Frequency diversity 2+ 0	T37981.41	T37981.41
Frequency diversity 3+ 0	T37981.51	T37981.51

Table 1 Selection table for the RF cables T37981.**, TM4 rack

Operating mode	Term. station and repeater station's "A"; 19" and wall	Repeater station's other terminal, "B"; only 19"
Single use	T37981.12	T37991.12
HSB	T37981.22	T37991.22
HSB + space diversity	T37981.32	T37991.32
Space diversity, 2Tx ,	T37981.42	T37991.42
Frequency diversity 1+1, 2+0	T37981.42	T37991.42
Frequency diversity 3 + 0	T37981.52	–

Table 2 Selection table for the RF cables T37981.** and T37991.**, 19" and wall installation

BASEBAND CABLE OPTIONS

The following table contains the BB cable set options in redundant operation mode according to installation method, capacity and connector type. The complete number of the cable set is TX 26282.xx, where xx is found in the table.

Capacity Mbit/s	Installation method				Number of cables	
	TM4 rack		Other (side–by–side)			
	EURO	Coax.	EURO	Coax.	EURO	Coax.
2 x 2	.10	.11	.30	.31	4	8
4 x 2	.14	.13	.34	.33	8	16
8 x 2	.14	.15	.34	.35	8	32
16 x 2	.16	.17	.36	.37	16	64
1 x 34		.29		.39		4

CABLE OPTIONS FOR MAIN CONNECTORS

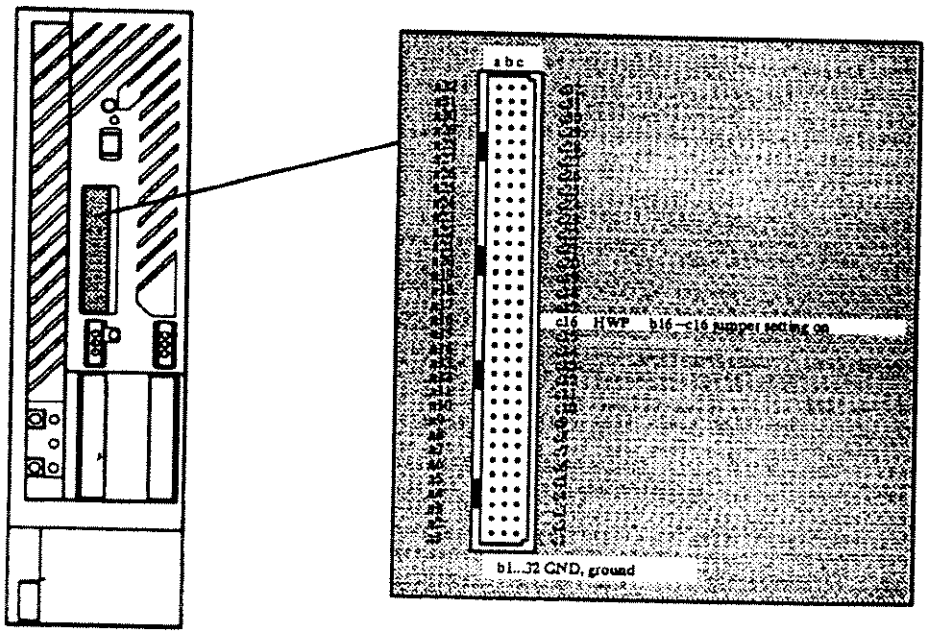
The connector sets TX 26285.xx include the required main and auxiliary data channel connectors. The last two numbers (xx) of the connector set code TX 26285.xx are found in the following table.

Capacity Mbit/s	Connector type	
	EURO	Coax.
2 x 2	.10	.11
4 x 2	.12	.13
8 x 2	.14	.15
16 x 2	.16	.17
1 x 34		.19

HARDWARE SETTINGS

HWP JUMPER SETTING

Part of the radio relay equipment settings can be made only if the so–called Hardware Protection Pin (HWP), a jumper setting in the primary baseband unit BBU, is in place. These settings are usually dependent on the equipment configuration and are **normally performed only in connection with installation or service.**



THE FUNCTIONS REQUIRING THE USE OF HWP

- **CALIBRATIONS**
  - Voltage reference
    - Modify
  - Input level
    - Threshold level
      - + 13 dB
      - + 29 dB
      - + 39 dB
  - AGC changeover
    - Own
    - Protective

- **EQUIPMENT SETTINGS**
  - Operating mode
  - Station type
  - Capacity
  - Line code
  - Scrambling

- **MAIN CHANNEL INTERFACE**
  - Activate interface
  - Deactivate interface
  - Default settings

- **RADIO FREQUENCIES**
  - Tx frequency
  - Rx frequency
  - Tx band
  - Rx band

- **RF POWER**
  - Nominal power
    - Modify

SOFTWARE SETTINGS

TRANSMISSION CONFIGURATION

- **CHECKING AND SETTING THE FREQUENCY**
- correct transmission and reception frequency for each hop
- **DIRECTING THE ANTENNA**
- The antenna is directed with the aid of the AGC voltage which is proportional to the input level.
- **CHECKING AND SETTING THE TRANSMISSION POWER**
- **SETTING THE OPERATING MODE AND STATION TYPE FOR THE RADIO RELAY EQUIPMENT**
  - Single use
  - Space diversity 2 Tx
  - Hot satndby
  - Hot standby + space diversity
  - Frequency diversity
  - Warm standby
  - BB branching ON
  - BB branching OFF
- **SETTING THE CAPACITY**
  - 2 x 2 Mbit/s
  - 4 x 2 Mbit/s
  - 8 x 2 Mbit/s
  - 16 x 2 Mbit/s
  - 1 x 34 Mbit/s
- **COMMISSIONING THE INTERFACES**
  - the main channel interfaces:
    in use
    out of use
    connection to the radio frame channel

- **SETTING THE ADAPTIVE POWER CONTROL**
  - Remove
  - Set
  - Fading margin
  - Regulation delays

LOCAL ALARM CONFIGURATION

- **RACK ALARM FUNCTIONS**
- **PROGRAMMABLE OUTPUTS FUNCTIONS**
- **ALARM CONSEQUENCES**

MANAGEMENT NETWORK CONFIGURATIONS

- **SERIAL SPEED:**
  - 75...9600 Bit/s
- **ADDRESS:**
  - 1...4093
- **TIMEOUT FOR CONTROLS:**
  - 1...1000 min
- **DATAHYBRID CONFIGURATION:**
  - on / off

A REDUNTANT PAIR SETTINGS

In a redundant pair, the settings listed below must be the same in both pieces of equipment. If they are not, the equipment acting as master will give a setting alarm.

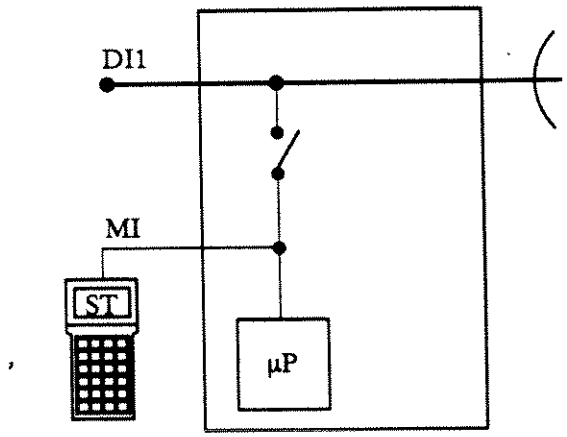
- **EQUIPMENT SETTINGS**
  - Operating mode
  - Station type
  - Capacity
  - Changeover
- **MAIN CHANNELS**
  - Line code
  - Scrambling
- **RADIO FRAME CHANNELS**
  - Main channel interfaces
  - Repeater bus
- **RF POWER**
  - Minimum attenuation
  - Nominal power
- **ADAPTIVE POWER CONTROL**
  - Remove
  - Set
  - Fading margin
  - Regulation delays
- **BATTERIES**
  - Set nominal voltage
  - Set equipping

DATAHYBRID

- In"ON"−state; output (MOA/B) is always active
  in OFF−state; output (MOA/B) is active only when
  requested by Service Terminal or TMC (tri−state)

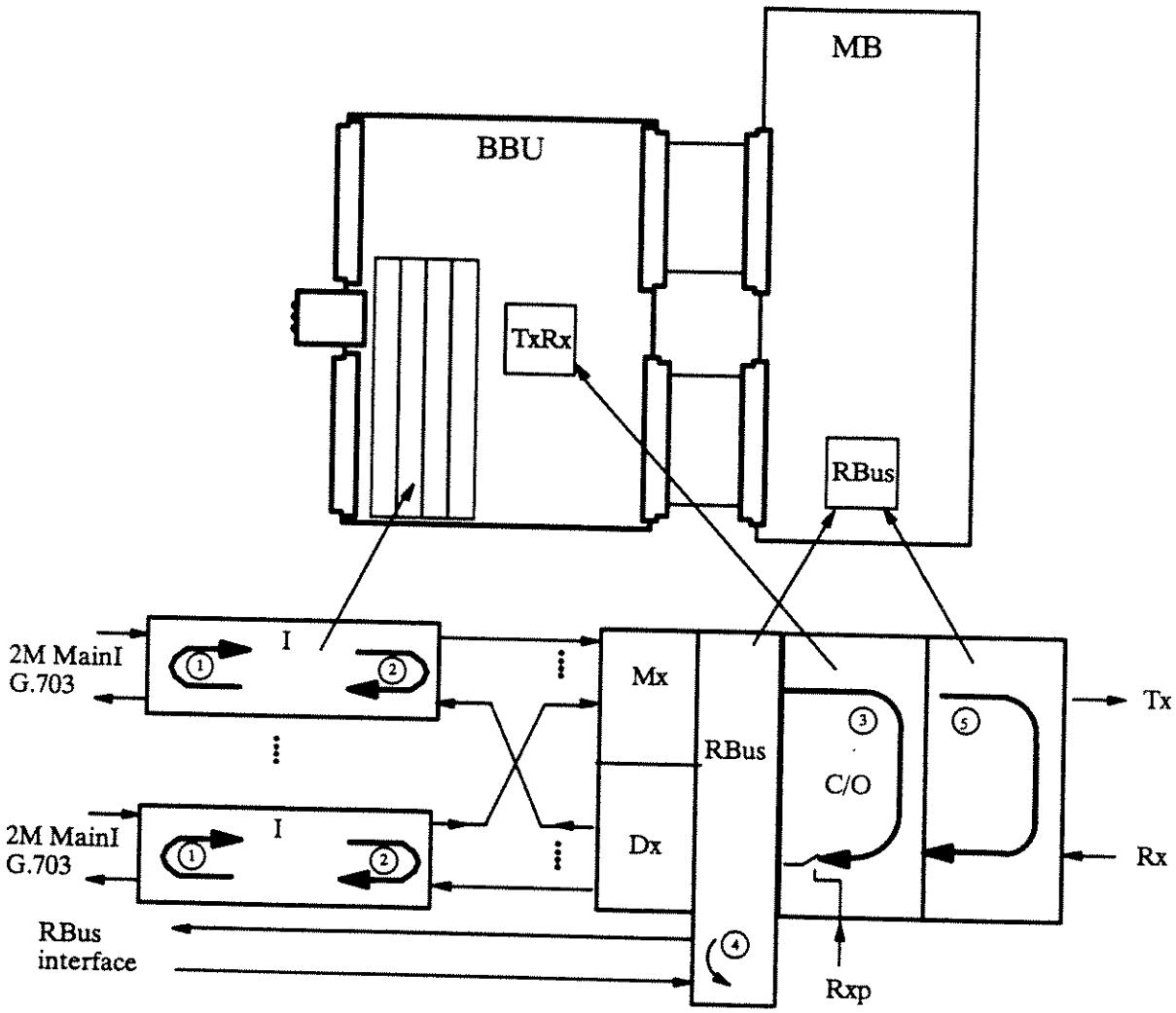
- PIN grounding sets the datahybrid to "OFF"−state

- Datahybrid goes also to "OFF−state if:
  - received **main** signal missing
  - frame alignment missing
  - equipment loop in main system



DR11619FA1

LOOPS



① Far-end loop (channel-specific)
② Near-end loop (channel-specific)
③ Multiplexer/demultiplexer loop (common to all channels)
④ RBus Far-end loop; loops all repeater bus channels
⑤ Baseband loop; loops all channels of main channel interfaces and RBus and auxiliary data channel interfaces

I Main channel interface
Mx Multiplexer
Dx Demultiplexer
C/O Changeover device
Rxp Signal from redundant terminal
RBus Repeater bus

DR11592EC2

AUXILIARY CHANNELS

P1–connector in the BB–unit:

— Auxiliary data channels DI1...DI4
— A service telephone channel TI1, TI2
— A programmable interface PI1...PI5

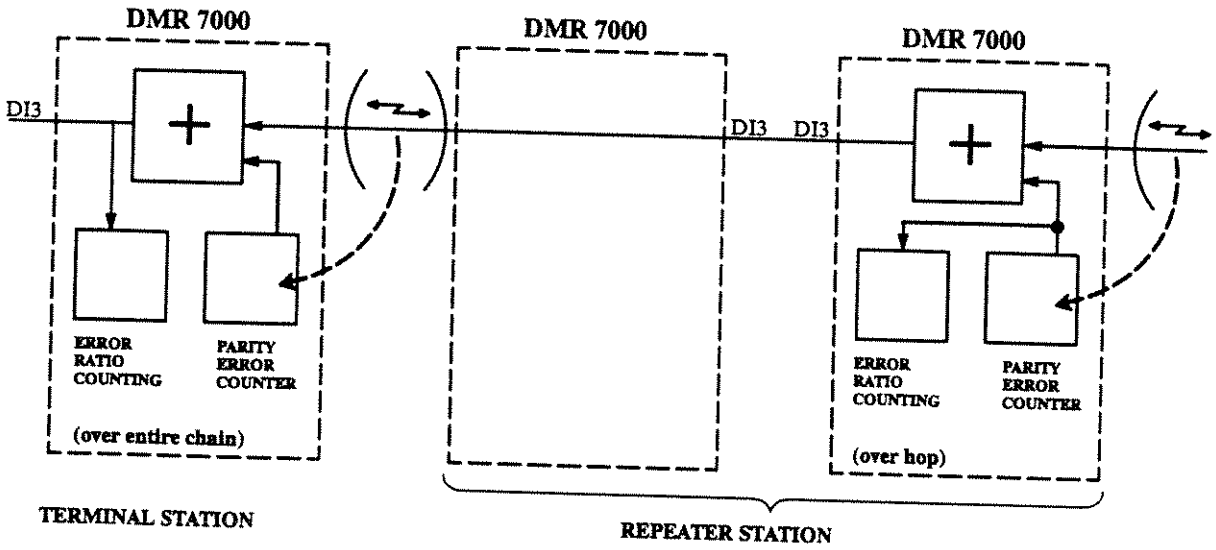
Auxiliary data channels DI1...DI4 (V.11)

The capacity of channel DI1 is always 9600 bit/s. The capacities of the channels DI2...DI4 are determined by the main channel capacity as follows:

Main channels	DI2, DI3, DI4	Sampling
2x2, 4x2	1200 bit/s	8 kHz
8x2	2400 bit/s	16 kHz
16x2	4800 bit/s	32 kHz

Auxiliary data channel DI1 is normally used as the transmission management system (TMS) channel.

CHAINING THE PARITY ERROR COUNTER

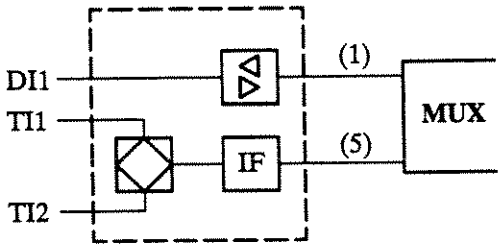


The auxiliary data channel DI3 may be dedicated to the transfer of parity information. The output of the channel may be selected as either the DI3 data received from the radio frame or this data added to the parity error pulse of the hop. At the end of the radio relay chain, this line parity may be used to monitor the transmission quality over the entire chain.

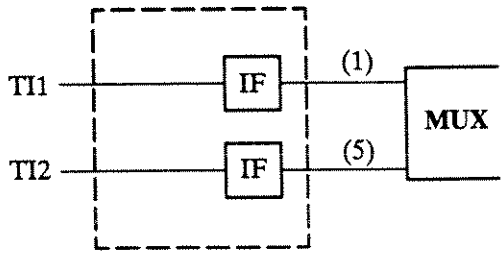
SERVICE TELEPHONE INTERFACE

The service telephone interface may use either 1 or 2 channels. The choice is determined by the selection of service telephone hybrid circuit board. The radio relay equipment is ordered equipped with either alternative. The auxiliary data channel DI1 is set by the service terminal for either TMS or service telephone operation.

One service telephone channel
(and auxiliary data channel DI1)



Two service telephone channels
(DI1 not available)



PROGRAMMABLE INTERFACE PI

The programmable interface consists of five input/output pairs (PI1...PI5) located at connector P1 on the primary baseband unit. They are mainly used to receive external switch signals and to control external equipment. The states of the external signals can be read in the central monitoring room with the transmission management computer (TMC) or locally with the service terminal. They will also activate an alarm in the equipment.

When set into so-called channel use, the programmable interface may be used to convey slow switch signals along the radio relay equipment chain. The principle is that the signal fed into the interface at one end of the radio hop is received in the same form at the other end. Of the five input and output pairs, three may be set into channel use (numbers PI3, PI4, PI5).

When signal PI3 of the programmable interface has been set for channel use, it has a special purpose: it is used to convey the link chain alarm (= S alarm), in which case it is not an actual channel. Figure 21 illustrates the passage of the link chain alarm. Any alarm generated in the equipment is added to the signal obtained from the radio path or the input of PI3.

The link chain alarm is connected through the equipment station without causing other alarms (default setting). The state of the link chain alarm may be read at any point of the chain with the service terminal. In addition, it may be set to cause an A+S or B+S alarm at a specific station which turns on the service LED. This arrangement gives immediate notification of a traffic interruption somewhere in the chain.

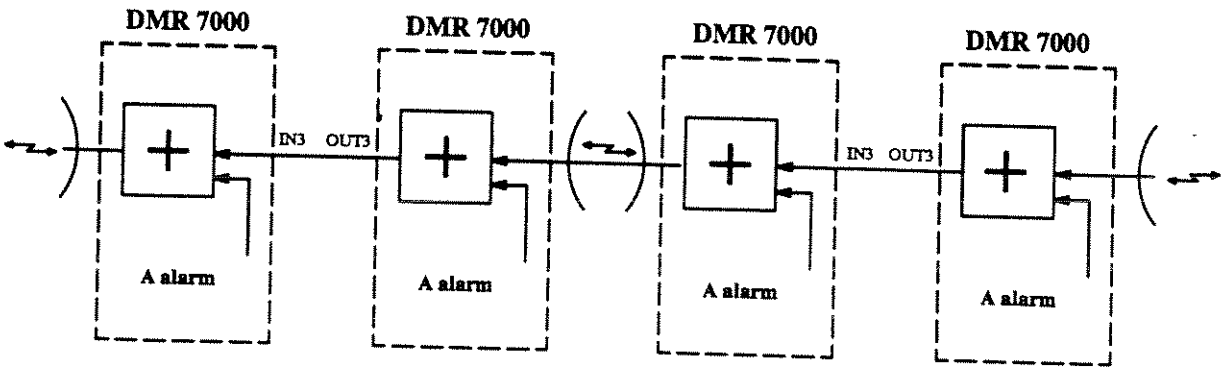
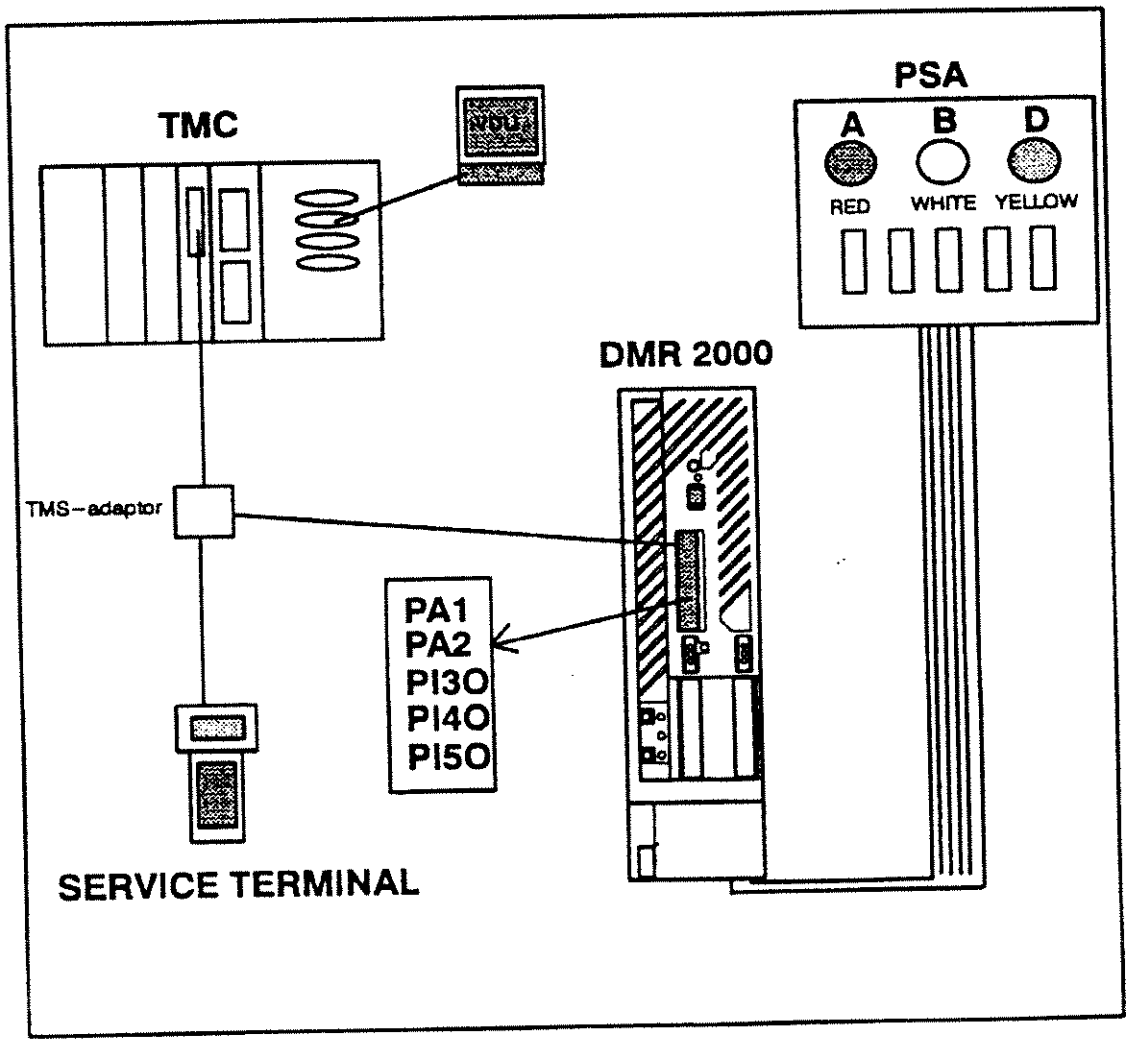
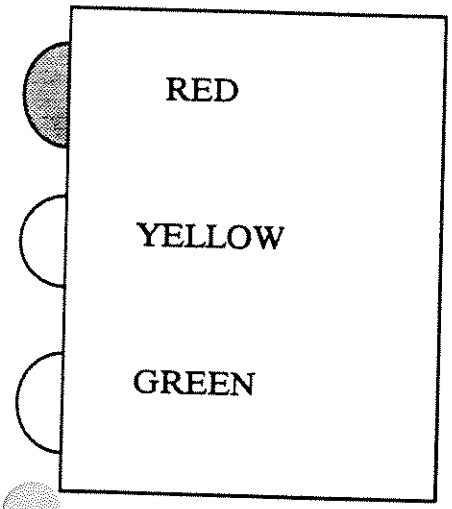


Figure 1 Link chain alarm

ALARM INDICATION SYSTEM



EQUIPMENT SPECIFIC ALARMS



= Activated in the event of traffic interruption

= B alarm (yellow LED): activated when communication is retained but the operation of the equipment has deteriorated over the set limits. In redundant operation, the loss of redundancy will cause a B alarm

= ST communicates with the unit.

DMR 7000, ALARM LIST

No. (dec)	Name	Fault	Fault code (dec)	Change-over	– AIS	Alarm	Note:
00	Battery:	– power supply fault	000	BBRF		B (B,)	1
01	+5 V:	– power supply fault	000	BBRF		B (B,)	1
02	−5.2 V:	– power supply fault	000	BBRF		B (B,)	1
03	+10.3 V:	– power supply fault	000	RF		B (B,)	1
04	Ext volt:	– ext. alarm	240			B (B,)	
05	CPU faults:	– fault in eq.	128	BB		B (B,)	
06	Setting error:	– operating error	144			B (B,)	
07	Prot bus:	– fault in eq.	128	BBRF			(B,)
08	Loss of redund:	– fault in eq.	128	BB			(B,AS)
09	MAINI IN 1:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
10	MAINI IN 1:	– buffer overflow	113	BBTX		AS	(B,AS)
11	MAINI OUT 1:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
12	MAINI OUT 1:	– buffer overflow	113	BBRX	/L	AS	(B,AS)
13	MAINI IN 2:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
14	MAINI IN 2:	– buffer overflow	113	BBTX		AS	(B,AS)
15	MAINI OUT 2:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
16	MAINI OUT 2:	– buffer overflow	113	BBRX	/L	AS	(B,AS)
17	MAINI IN 3:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
18	MAINI IN 3:	– buffer overflow	113	BBTX		AS	(B,AS)
19	MAINI OUT 3:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
20	MAINI OUT 3:	– buffer overflow	113	BBRX	/L	AS	(B,AS)
21	MAINI IN 4:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
22	MAINI IN 4:	– buffer overflow	113	BBTX		AS	(B,AS)
23	MAINI OUT 4:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
24	MAINI OUT 4:	– buffer overflow	113	BBRX	/L	AS	(B,AS
25	MAINI IN 5:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
26	MAINI IN 5:	– buffer overflow	113	BBTX		AS	(B,AS)
27	MAINI OUT 5:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
28	MAINI OUT 5:	– buffer overflow	113	BBRX	/L	AS	(B,AS
29	MAINI IN 6:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
30	MAINI IN 6:	– buffer overflow	113	BBTX		AS	(B,AS)
31	MAINI OUT 6:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
32	MAINI OUT 6:	– buffer overflow	113	BBRX	/L	AS	(B,AS
33	MAINI IN 7:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
34	MAINI IN 7:	– buffer overflow	113	BBTX		AS	(B,AS)
35	MAINI OUT 7:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
36	MAINI OUT 7:	– buffer overflow	113	BBRX	/L	AS	(B,AS
37	MAINI IN 8:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)
38	MAINI IN 8:	– buffer overflow	113	BBTX		AS	(B,AS)
39	MAINI OUT 8:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)
40	MAINI OUT 8:	– buffer overflow	113	BBRX	/L	AS	(B,AS

No. (dec)	Name	Fault	Fault code (dec)	Change over	–	AIS	Alarm	Note:
41	MAINI IN 9:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
42	MAINI IN 9:	– buffer overflow	113	BBTX		AS	(B,AS)	
43	MAINI OUT 9:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
44	MAINI OUT 9:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
45	MAINI IN 10:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
46	MAINI IN 10:	– buffer overflow	113	BBTX		AS	(B,AS)	
47	MAINI OUT 10:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
48	MAINI OUT 10:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
49	MAINI IN 11:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
50	MAINI IN 11:	– buffer overflow	113	BBTX		AS	(B,AS)	
51	MAINI OUT 11:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
52	MAINI OUT 11:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
53	MAINI IN 12:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
54	MAINI IN 12:	– buffer overflow	113	BBTX		AS	(B,AS)	
55	MAINI OUT 12:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
56	MAINI OUT 12:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
57	MAINI IN 13:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
58	MAINI IN 13:	– buffer overflow	113	BBTX		AS	(B,AS)	
59	MAINI OUT 13:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
60	MAINI OUT 13:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
61	MAINI IN 14:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
62	MAINI IN 14:	– buffer overflow	113	BBTX		AS	(B,AS)	
63	MAINI OUT 14:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
64	MAINI OUT 14:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
65	MAINI IN 15:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
66	MAINI IN 15:	– buffer overflow	113	BBTX		AS	(B,AS)	
67	MAINI OUT 15:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
68	MAINI OUT 15:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
69	MAINI IN 16:	– no incoming line sig.	061	BBTX	/L	AS	(B,AS)	
70	MAINI IN 16:	– buffer overflow	113	BBTX		AS	(B,AS)	
71	MAINI OUT 16:	– no out. line sig.	046	BBRX	/L	AS	(B,AS)	
72	MAINI OUT 16:	– buffer overflow	113	BBRX	/L	AS	(B,AS	
73	Near end:	– loop to interface	021	BBTX	/L	AS	(B,AS)	
74	Mux forced:	– forced control on	141				(B,AS)	
75	Tx osc:	– oscillator fault	137	BBTX		AS	(B,AS)	
76	Rep bus frame:	– frame error	080	BBTX	/R	AS	(B,AS)	2
77	Rep bus clock:	– fault in eq.	128	BBTX	/R	AS	(B,AS)	2
78	Muxdemux:	– loop to terminal	017	BBTX		AS	(B,AS)	
79	RF loop:	– loop to terminal	017			AS	(,AS)	
80	Tx AIS:	– forced control on	141	BBTX	x	AS	(B,AS)	

No. (dec)	Name	Fault	Fault code (dec)	Change over		AIS	Alarm	Note:
81	Tx pow off:	– forced control on	141			AS	(,AS)	
82	Transm select:	– forced control on	141				(B,AS)	
83	Booster:	– fault in tx	153			B	(B,)	
84	Transmitter:	– incorrect out. sig. level	043			B	(B,)	
85	Transmitter:	– high reflected power	044			B	(B,)	
86	Synth lock:	– fault in tx	153	RFTX		AS	(B,AS)	
87	Synth pow:	– fault in tx	153			B	(B,)	
88	Synth lock:	– fault in rx	154			B	(B,)	3
89	Receiver:	– incorrect incoming sig. level	059	RFRX		B	(B,)	
90	Synth pow:	– fault in rx	154			B	(B,)	
91	Receiver:	– sync fault in carrier recovery	123			B	(B,)	
92	Receiver:	– sync fault in clock recovery	124			B	(B,)	
93	Propag redund:	– forced control on	141				(B,AS)	
94	Rx frame:	– frame alignment lost	081	RFRX	x	AS	(,AS)	4
95	Rx clock:	– fault in eq.	128		x	AS	(,AS)	
96	c/o buffer own:	– buffer overflow	113		x		(B,)	7
97	c/o buffer prot:	– buffer overflow	113		x		(B,)	7
98	AIS:	– AIS osc. fault	136			B	(B,)	
99	Error ratio:	– BER > 1E–3	099	RFRX	x	A,B		4, 5
100	Error ratio:	– BER > 1E–5	101			A,B		4, 5
101	Rx bb sw:	– forced control on	141				(B,AS)	6
102	Far end:	– loop to equipment	022	BBRX	/L	AS	(B,AS)	
103	Rx AIS:	– forced control on	141	BBRX	x	AS	(B,AS)	
104	Far end:	– far–end rec. fault	182	RFTX		AS,BS,S		5
105	Far end:	– far–end sending fault	181		x	AS,BS,S		5
106	Far end:	– S alarm rec.	075			AS,BS,S		5
107	Forced slave:	– forced control on	141				(B,AS)	
108	HWP pin:	– installation error	142			B	(B,)	8
109	Prod test:	– test mode	023			B	(B,)	8
110	AGC calibr:	– operating error	144				(B,)	
111	In level calibr:	– operating error	144			B	(B,)	
112	Progr if 1:	– ext. alarm	240			B	(B,)	
113	Progr if 2:	– ext. alarm	240			B	(B,)	
114	Progr if 3:	– ext. alarm	240			B	(B,)	
115	Progr if 4:	– ext. alarm	240			B	(B,)	
116	Progr if 5:	– ext. alarm	240			B	(B,)	

EXPLANATIONS AND NOTES

No. — Alarm number (refers also to the supervision block number (SB)).

Name, fault — Corresponds to the fault display text for the alarm.

Fault code — Fault code in decimal format.

Changeover — The letter abbreviations refer to the unit to which changeover is caused by the fault in question:

BB	primary baseband unit
RF	radio sections
TX	Tx direction of unit in question
RX	Rx direction of unit in question

AIS — Indicates the faults or causes leading to the connection of the AIS in the faulty direction:

x	AIS in the faulty direction
/L	AIS only separately for each main channel
/R	AIS only separately for each repeater bus

Alarm — The alarm generated by the fault in question. Single use without parentheses. The parentheses contain two alarms of the redundant operating mode, where the first alarm corresponds to the situation in which the redundancy has not yet been lost and the second alarm corresponds to the situation in which the redundancy has been lost and the signal can usually not been transferred to the line or transmission path.

NOTE:

1 Changeover cannot be inhibited by setting.

2 For repeater station operation only.

3 A fault breaking the communication is indicated in the following stages which generate an AS alarm.

4 Only a B alarm is activated in the slave (unless this alarm has been inhibited).

5 Alarm selectable by settings regardless of operating mode.

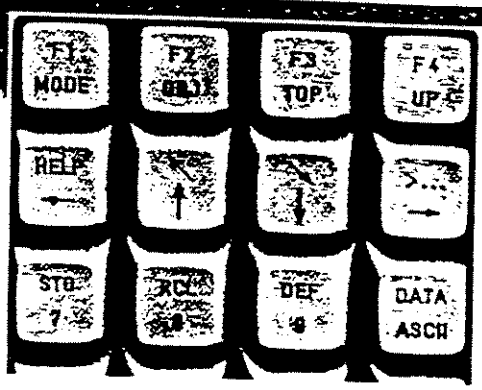
6 AS alarm always active in slave, since the slave has been forced to feed data to the line at the same time as the master.

7 AIS is switched only when an over−/underflow alarm is active simultaneously in both buffers of the changeover device.

8 The alarm cannot be inhibited by setting.

Service Equipment

ervice
erminal



NOKIA

NOKIA TELECOMMUNICATIONS

OPERATOR'S GUIDE FOR SERVICE TERMINAL

Page 1

CONNECTION TO EQUIPMENT

THE SERVICE TERMINAL IS CONNECTED TO THE OBJECT EQUIPMENT BY MEANS OF THE INTERFACE CABLE TX 21750 (FIG. BELOW).

CONVERSION FROM HEX TO ASCII

20	Space								
21	!	34	4	47	G	5A	Z	6D	m
22	"	35	5	48	H	5B	[	6E	n
23	#	36	6	49	I	5C	\	6F	o
24	$	37	7	4A	J	5D	]	70	p
25	%	38	8	4B	K	5E	^	71	q
26	&	39	9	4C	L	5F	_	72	r
27	'	3A	:	4D	M	60	`	73	s
28	(	3B	;	4E	N	61	a	74	t
29	)	3C	<	4F	O	62	b	75	u
2A	*	3D	=	50	P	63	c	76	v
2B	+	3E	>	51	Q	64	d	77	w
2C	,	3F	?	52	R	65	e	78	x
2D	-	40	@	53	S	66	f	79	y
2E	.	41	A	54	T	67	g	7A	z
2F	/	42	B	55	U	68	h	7B	{
30	0	43	C	56	V	69	i	7C	|
31	1	44	D	57	W	6A	j	7D	}
32	2	45	E	58	X	6B	k	7E	→
33	3	46	F	59	Y	6C	l	7F	■

START UP

POWER CAN BE TURNED ON (OFF) BY MOMENTARILY PRESSING THE SWITCH TO THE RIGHT (ON) OR TO THE LEFT (OFF). AND THEN RELEASING IT.

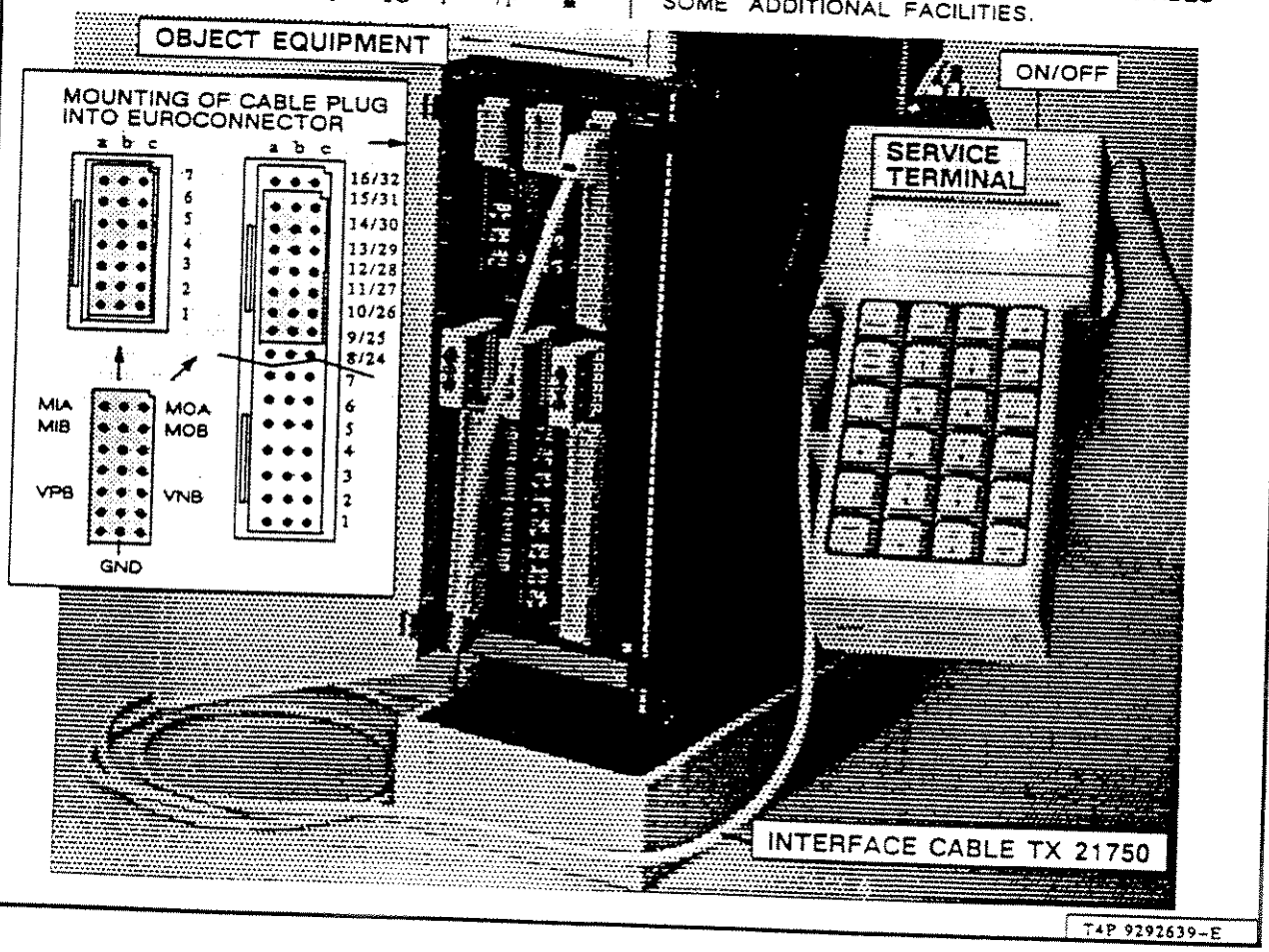
MODE SELECTION

THE EQUIPMENT OPERATION MODE IS FOR THE SERVICE OF NOKIA ND EQUIPMENT. THE SERVICE TERMINAL CAN BE CONNECTED TO THE ND EQUIPMENT LOCALLY OR VIA THE SERVICE BUS.

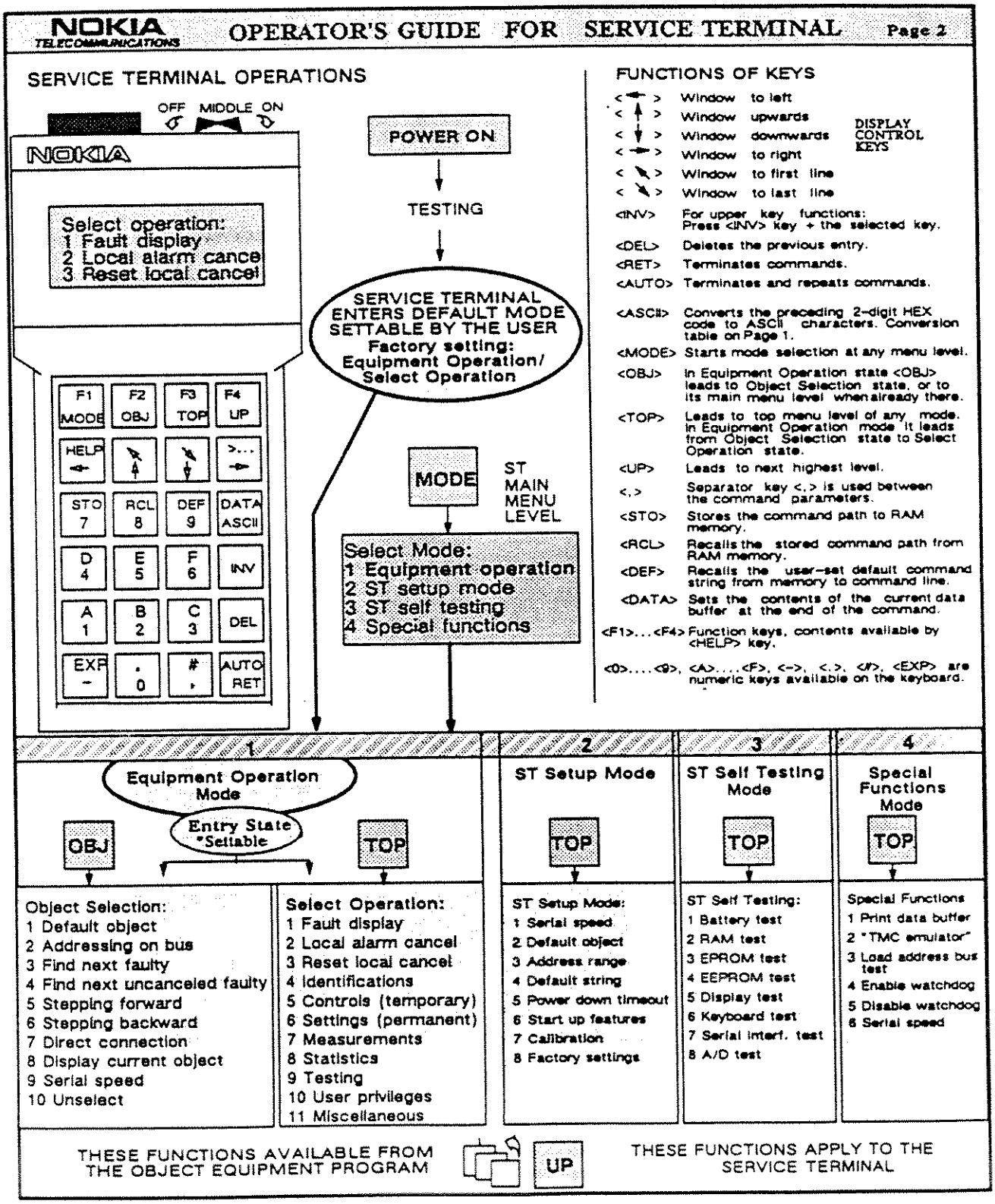
IN THE ST SETUP MODE ALL USER-SET OPTIONS FOR THE SERVICE TERMINAL ITSELF CAN BE DISPLAYED OR CHANGED.

IN THE ST SELF TESTING MODE THE HARDWARE OF THE SERVICE TERMINAL CAN BE TESTED.

THE SPECIAL FUNCTIONS MODE PROVIDES SOME ADDITIONAL FACILITIES.

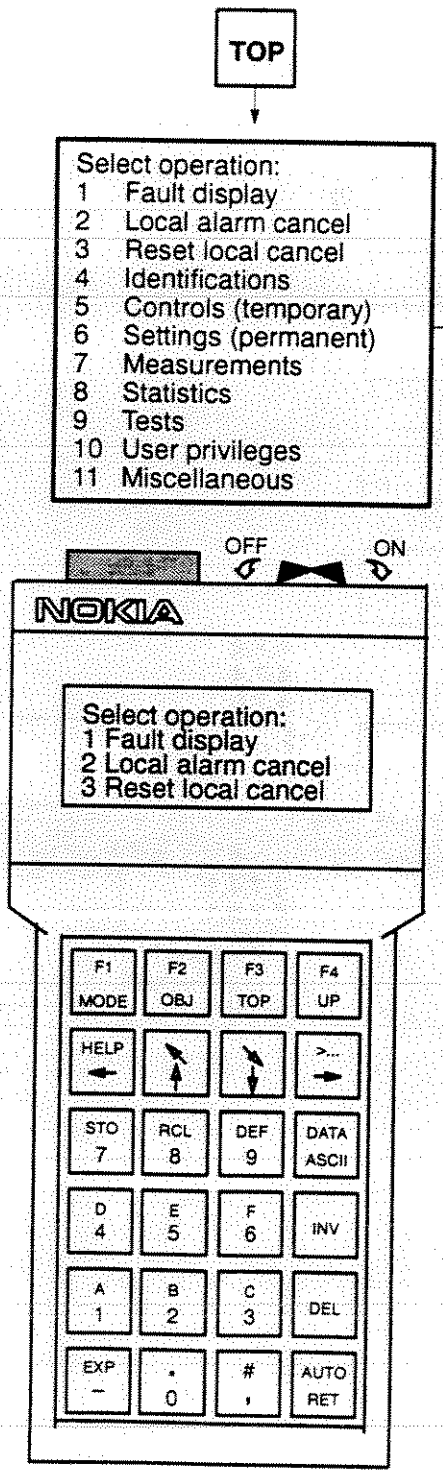


T4P 9292639-E


NOKIA TELECOMMUNICATIONS
OPERATOR'S GUIDE FOR SERVICE TERMINAL
Page 2
SERVICE TERMINAL OPERATIONS
OFF MIDDLE ON
NOKIA
Select operation:
1 Fault display
2 Local alarm cance
3 Reset local cancel
POWER ON
TESTING
SERVICE TERMINAL ENTERS DEFAULT MODE SETTABLE BY THE USER
Factory setting:
Equipment Operation/
Select Operation
MODE
ST MAIN MENU LEVEL
Select Mode:
1 Equipment operation
2 ST setup mode
3 ST self testing
4 Special functions
F1 MODE
F2 OBJ
F3 TOP
F4 UP
HELP
STO 7
RCL 8
DEF 9
DATA ASCII
D 4
E 5
F 6
INV
A 1
B 2
C 3
DEL
EXP
AUTO RET
FUNCTIONS OF KEYS
DISPLAY CONTROL KEYS
< > Window to left
< > Window upwards
< > Window downwards
< > Window to right
< > Window to first line
< > Window to last line
<INV> For upper key functions: Press <INV> key + the selected key.
<DEL> Deletes the previous entry.
<RET> Terminates commands.
<AUTO> Terminates and repeats commands.
<ASCII> Converts the preceding 2-digit HEX code to ASCII characters. Conversion table on Page 1.
<MODE> Starts mode selection at any menu level.
<OBJ> In Equipment Operation state <OBJ> leads to Object Selection state, or to its main menu level when already there.
<TOP> Leads to top menu level of any mode. In Equipment Operation mode it leads from Object Selection state to Select Operation state.
<UP> Leads to next highest level.
<,> Separator key <,> is used between the command parameters.
<STO> Stores the command path to RAM memory.
<RCL> Recalls the stored command path from RAM memory.
<DEF> Recalls the user-set default command string from memory to command line.
<DATA> Sets the contents of the current data buffer at the end of the command.
<F1>...<F4> Function keys, contents available by <HELP> key.
<0>....<9>, <A>....<F>, <->, <.>, </>, <EXP> are numeric keys available on the keyboard.
1
Equipment Operation Mode
OBJ
Entry State *Settable
TOP
Object Selection:
1 Default object
2 Addressing on bus
3 Find next faulty
4 Find next uncanceled faulty
5 Stepping forward
6 Stepping backward
7 Direct connection
8 Display current object
9 Serial speed
10 Unselect
Select Operation:
1 Fault display
2 Local alarm cancel
3 Reset local cancel
4 Identifications
5 Controls (temporary)
6 Settings (permanent)
7 Measurements
8 Statistics
9 Testing
10 User privileges
11 Miscellaneous
2
ST Setup Mode
TOP
ST Setup Mode:
1 Serial speed
2 Default object
3 Address range
4 Default string
5 Power down timeout
6 Start up features
7 Calibration
8 Factory settings
3
ST Self Testing Mode
TOP
ST Self Testing:
1 Battery test
2 RAM test
3 EPROM test
4 EEPROM test
5 Display test
6 Keyboard test
7 Serial interf. test
8 A/D test
4
Special Functions Mode
TOP
Special Functions
1 Print data buffer
2 "TMC emulator"
3 Load address bus test
4 Enable watchdog
5 Disable watchdog
6 Serial speed
THESE FUNCTIONS AVAILABLE FROM THE OBJECT EQUIPMENT PROGRAM
UP
THESE FUNCTIONS APPLY TO THE SERVICE TERMINAL

SERVICE TERMINAL

Operation mode:
Equipment operation



1) Identification defined by user

1 *DMR 7000 (OK) 1)

2 done

3 done

4 Identifications:
1 Eq type
2 Eq name
3 User manual
4 Station ID
5 Unit ID
6 Program
7 Modify IDs

For sub-level go to page 2

5 Controls:
1 Eq to normal state
4 Measurement point
5 Loops
7 Forced controls

page 3

6 Settings:
0 Display vital settings
1 Service options
3 Fault consequences
5 Calibrations
6 Default settings
7 Equipment settings

page 5

7 Measurements:
1 Error ratio
2 Input level
3 Input level min/max
4 Supply voltages
5 Other voltages

page 18

8 Statistics:
1 Signal quality
2 Error counters

page 19

9 Tests:
2 Main channel states
3 Main channel test
5 Unit indicators
6 Rack alarms

page 19

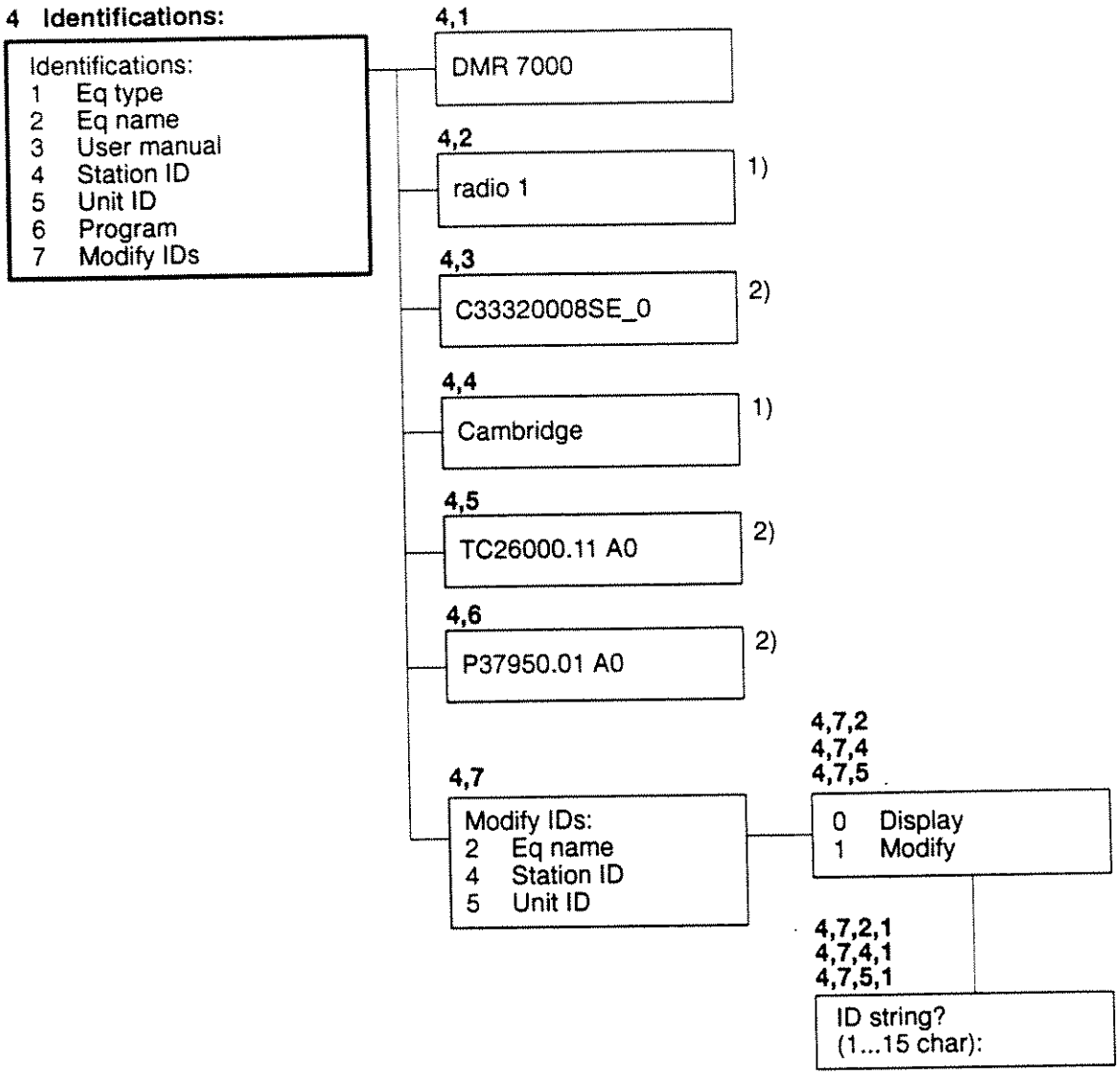
10 User privileges:
1 Password for privileges
2 PIN for privileges
3 Cancel privileges
4 Setting parameters

page 20

11 Miscellaneous:
0 Changeover status
1 CPU alarms
99 Calibration data

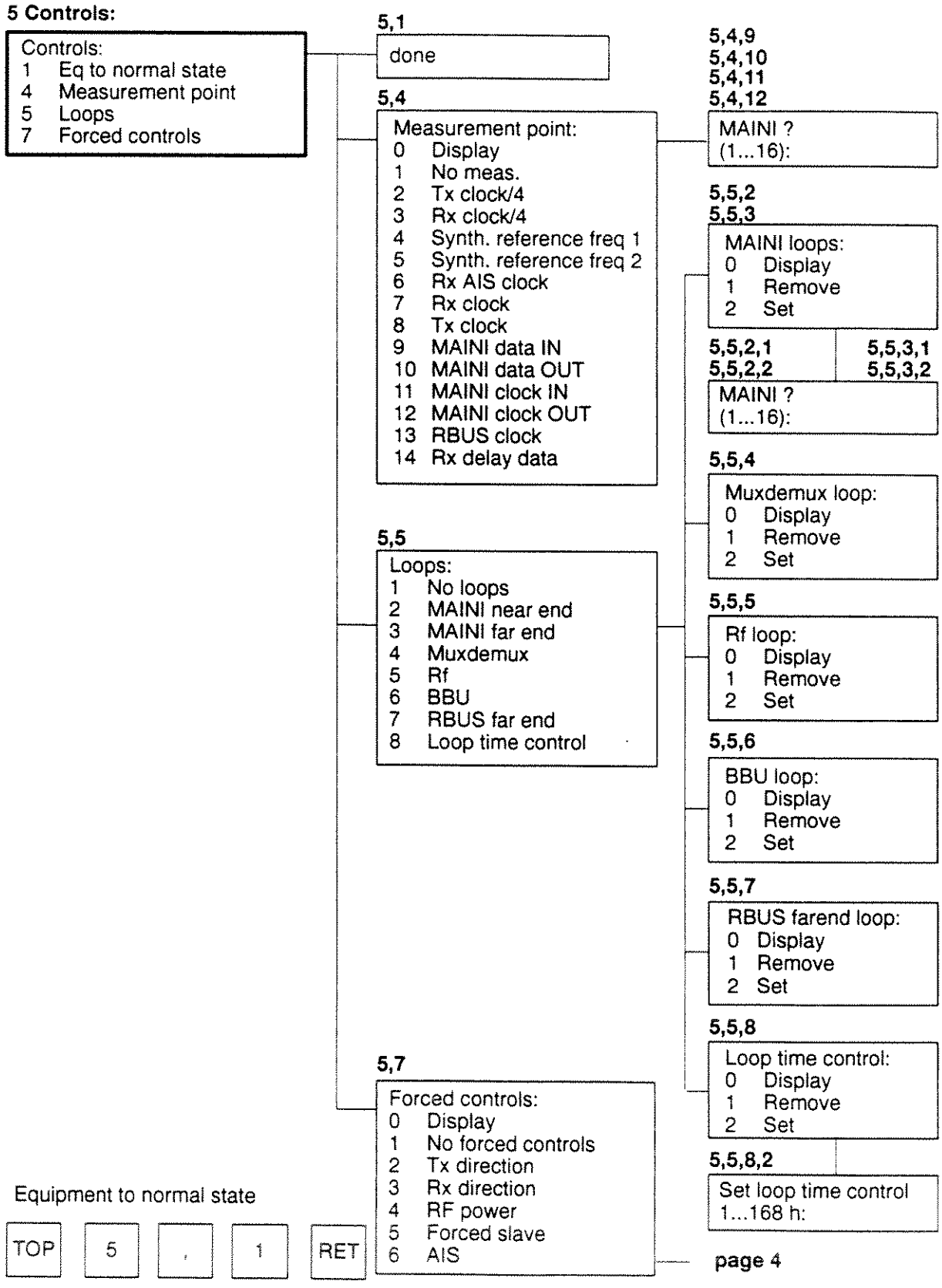
page 20

IDENTIFICATIONS



1) Identification defined by user
2) Example

CONTROLS (temporary)



CONTROLS (temporary): 5,7 Forced controls

5 Controls:

Controls:
1 Eq to normal state
4 Measurement point
5 Loops
7 Forced controls

5,7

Forced controls:
0 Display
1 No forced controls
2 Tx direction
3 Rx direction
4 RF power
5 Forced slave
6 AIS

5,7,2

Tx direction:
1 Mux norm.
2 Mux own
3 Mux prot.
4 Transmitter norm.
5 Transmitter own
6 Transmitter prot.

5,7,3

Rx direction:
1 Receiver norm.
2 Receiver own
3 Receiver prot.
4 Rx bb switch norm.
5 Connect Rx bb switch

5,7,4

RF power (Tx):
1 Normal
2 RF power OFF

5,7,5

done

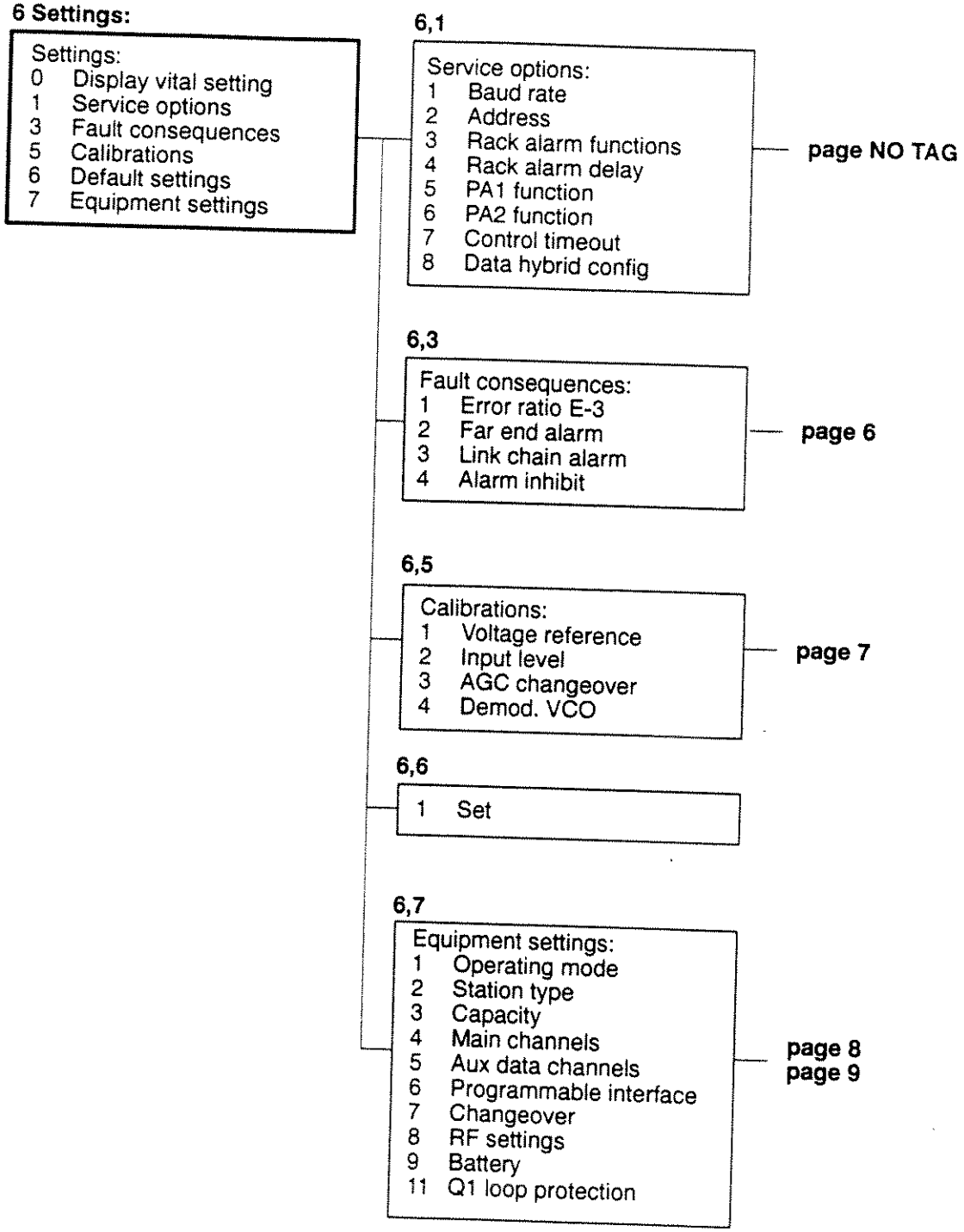
5,7,6

AIS:
1 Normal
2 Tx AIS
3 Rx AIS

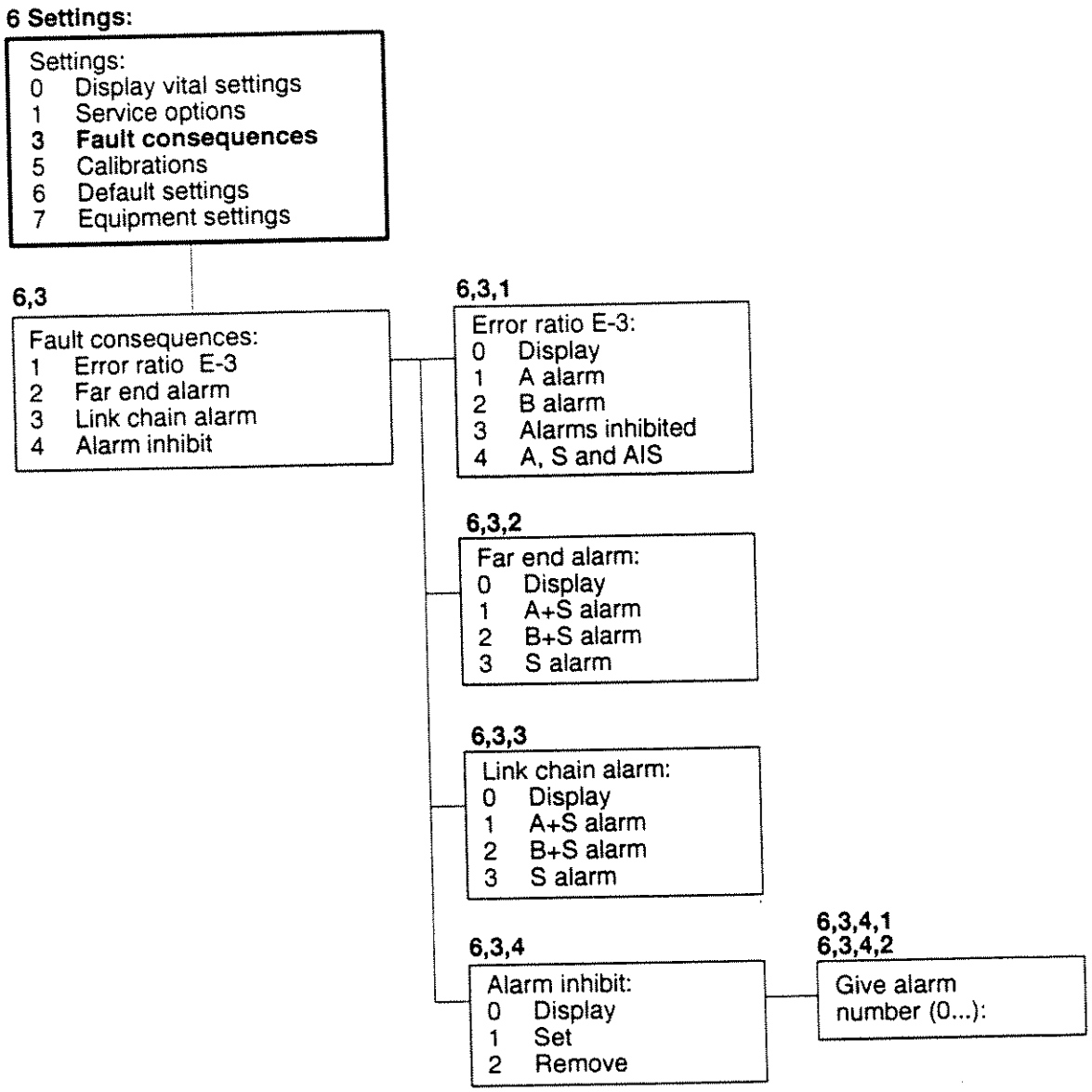
Equipment to normal state

TOP | 5 | , | 1 | RET

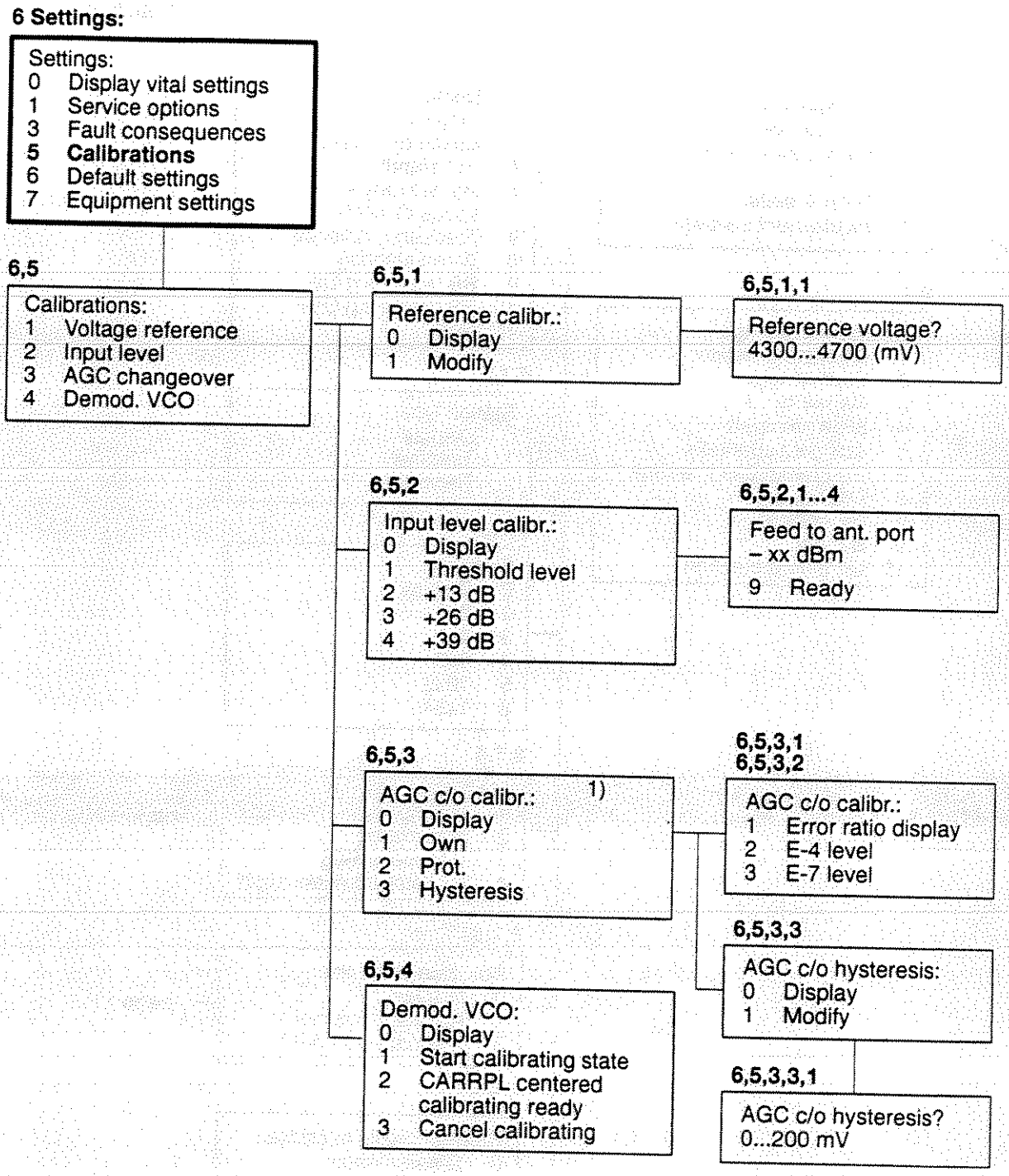
SETTINGS (permanent)



SETTINGS (permanent): 6,3 Fault consequences



SETTINGS (permanent): 6,5 Calibrations

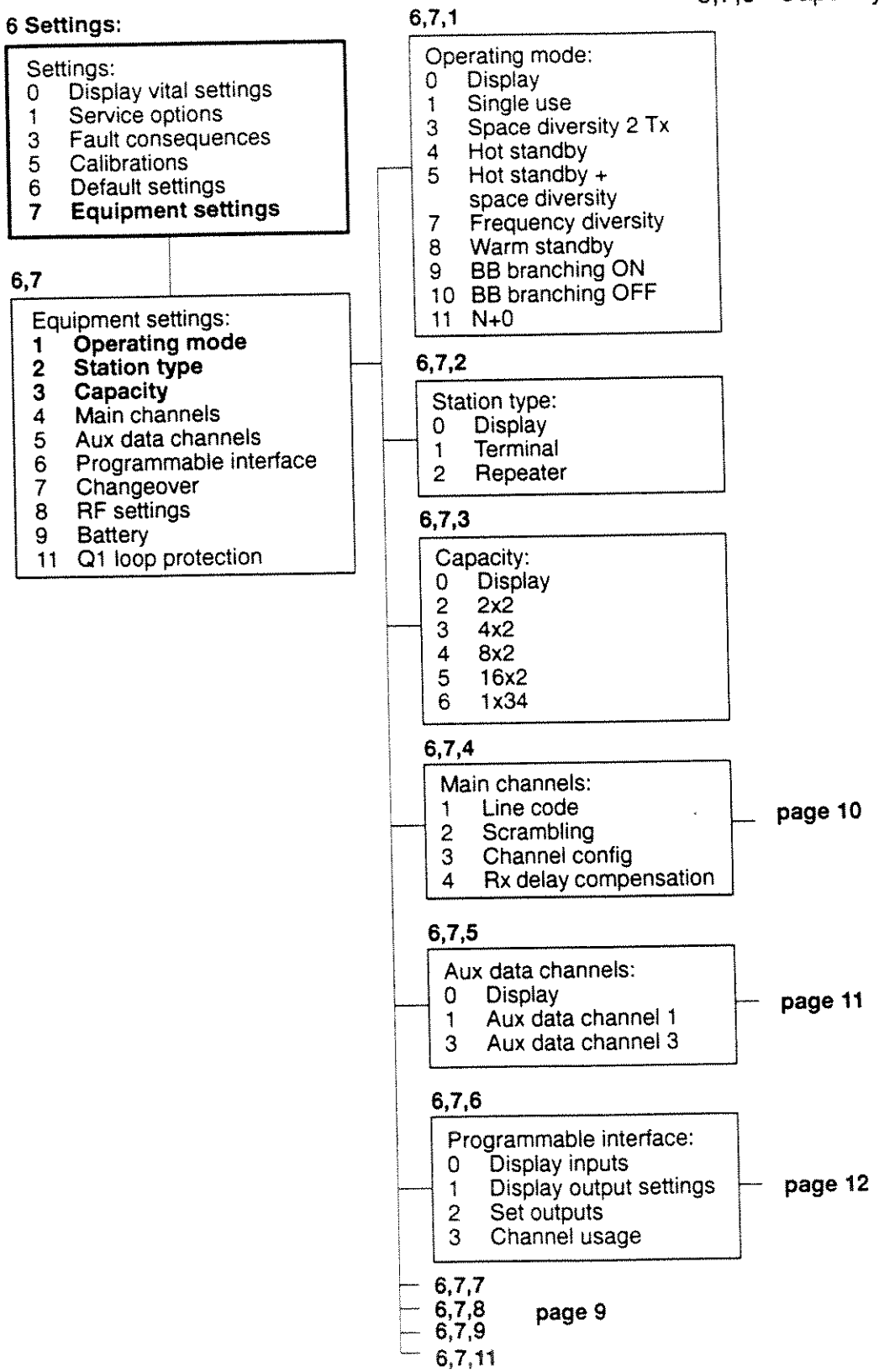


1) Equipment to normal state

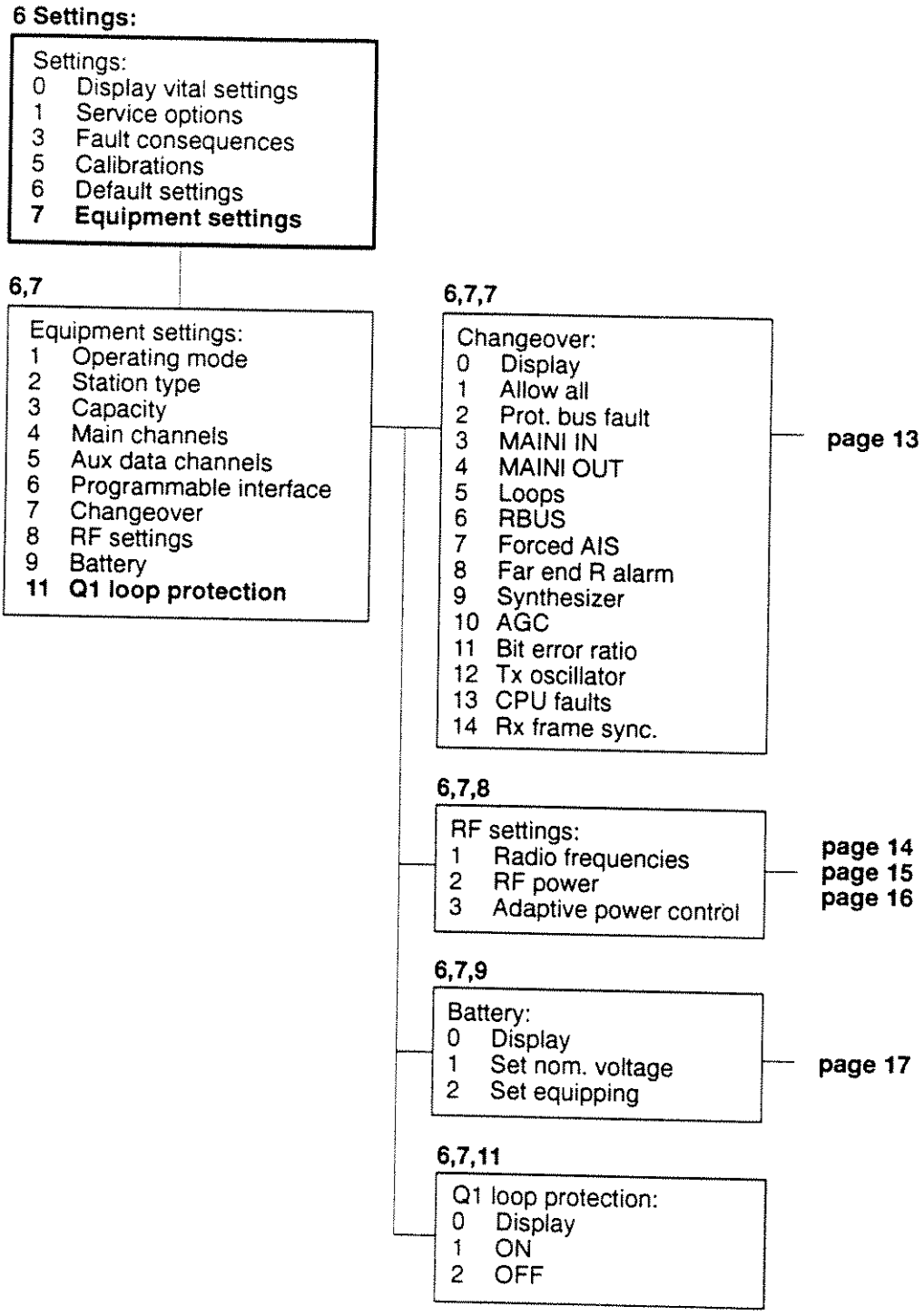
TOP 5 , 1 RET

SETTINGS (permanent): 6,7 Equipment settings

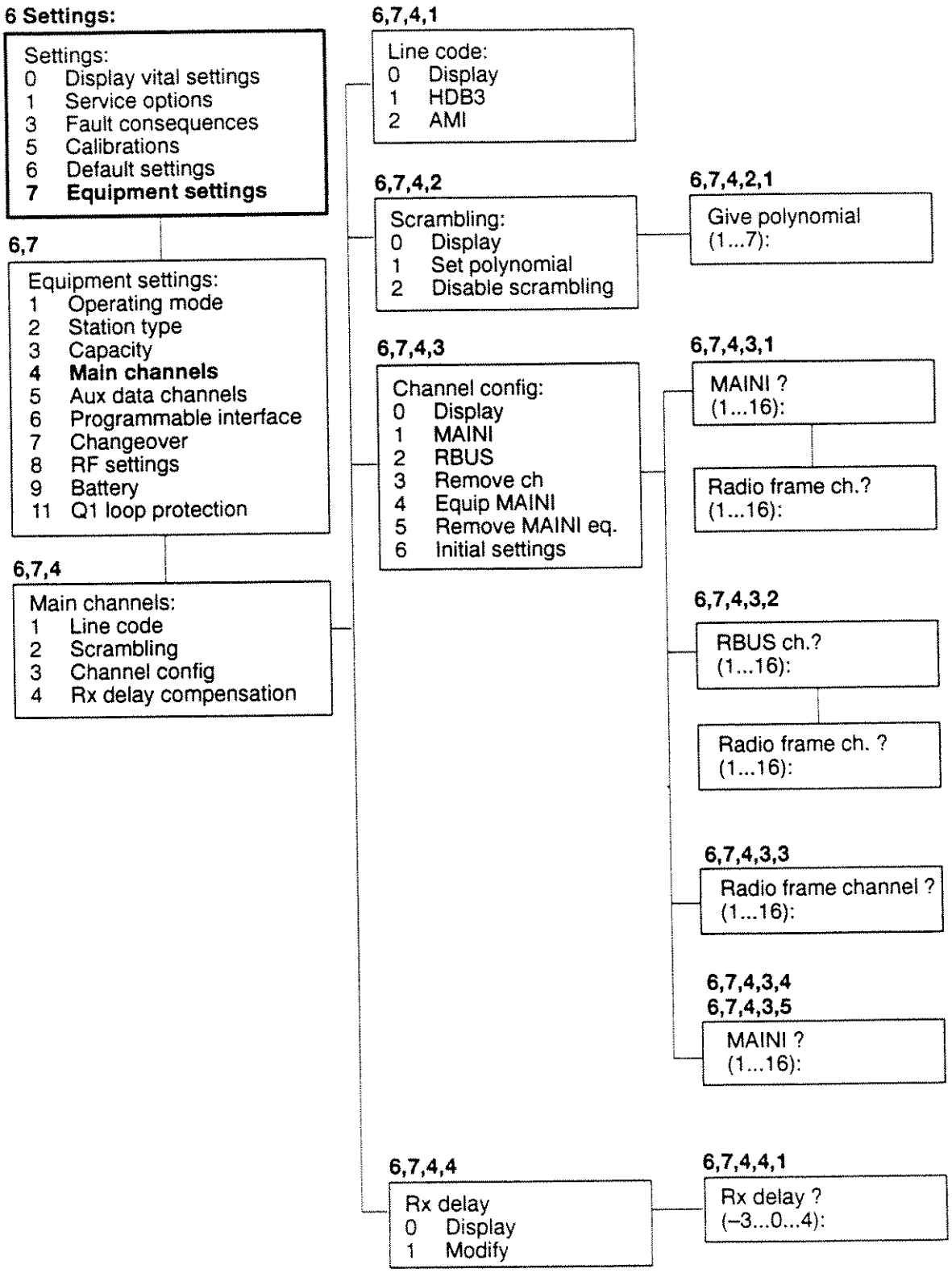
6,7,1 Operating mode
6,7,2 Station type
6,7,3 Capacity



SETTINGS (permanent): 6,7 Equipment settings



SETTINGS (permanent): 6,7 Equipment settings 6,7,4 Main channels



SETTINGS (permanent): 6,7 Equipment settings

6,7,5 Aux data channels

6 Settings:

Settings:
0 Display vital settings
1 Service options
3 Fault consequences
5 Calibrations
6 Default settings
7 Equipment settings

6,7

Equipment settings:
1 Operating mode
2 Station type
3 Capacity
4 Main channels
5 Aux data channels
6 Programmable interface
7 Changeover
8 RF settings
9 Battery
11 Q1 loop protection

6,7,5

Aux data channels:
0 Display
1 Aux data channel 1
3 Aux data channel 3

6,7,5,1

Aux data channel 1:
1 TMS
2 Service telephone

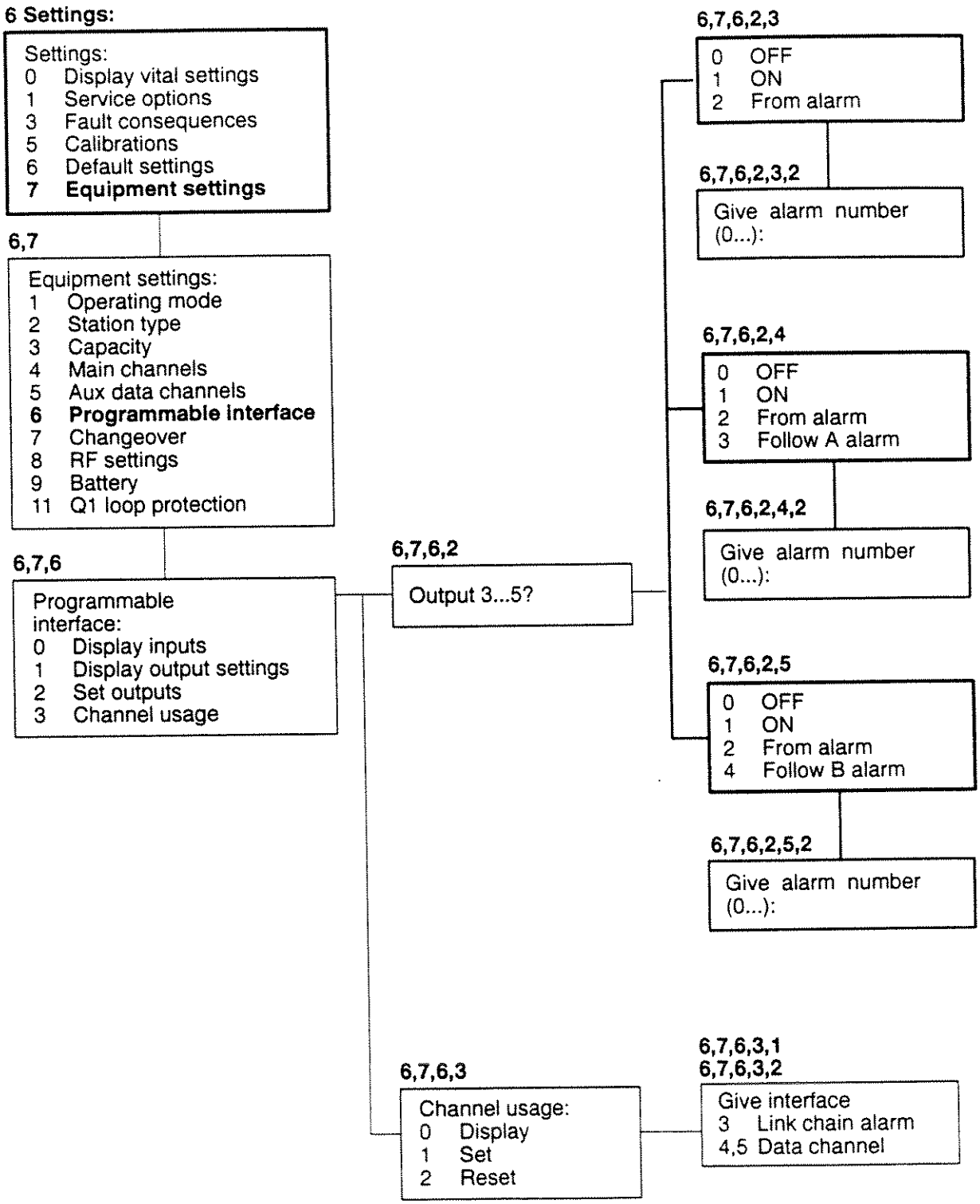
1)

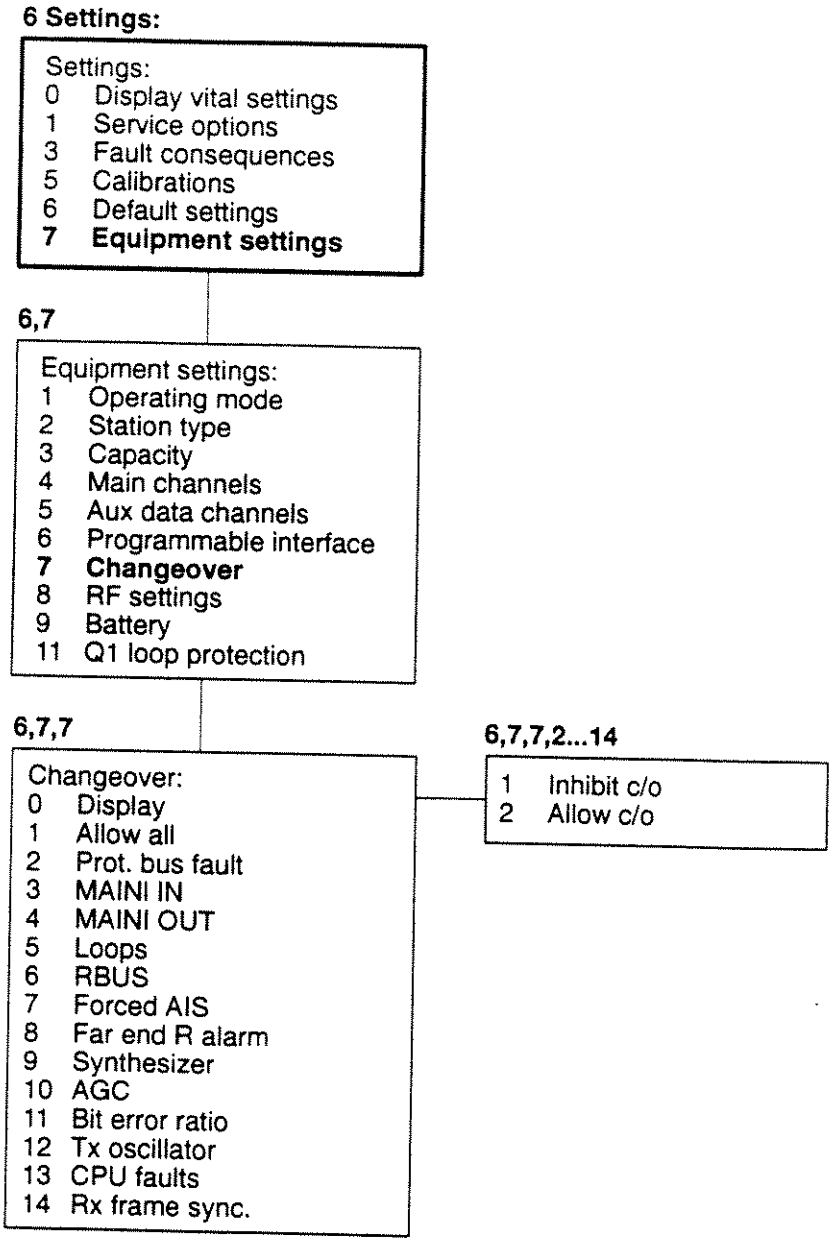
6,7,5,3

Aux data channel 3:
1 Channel usage
2 Terminal station line parity
3 Repeater station line parity

1) Not in use

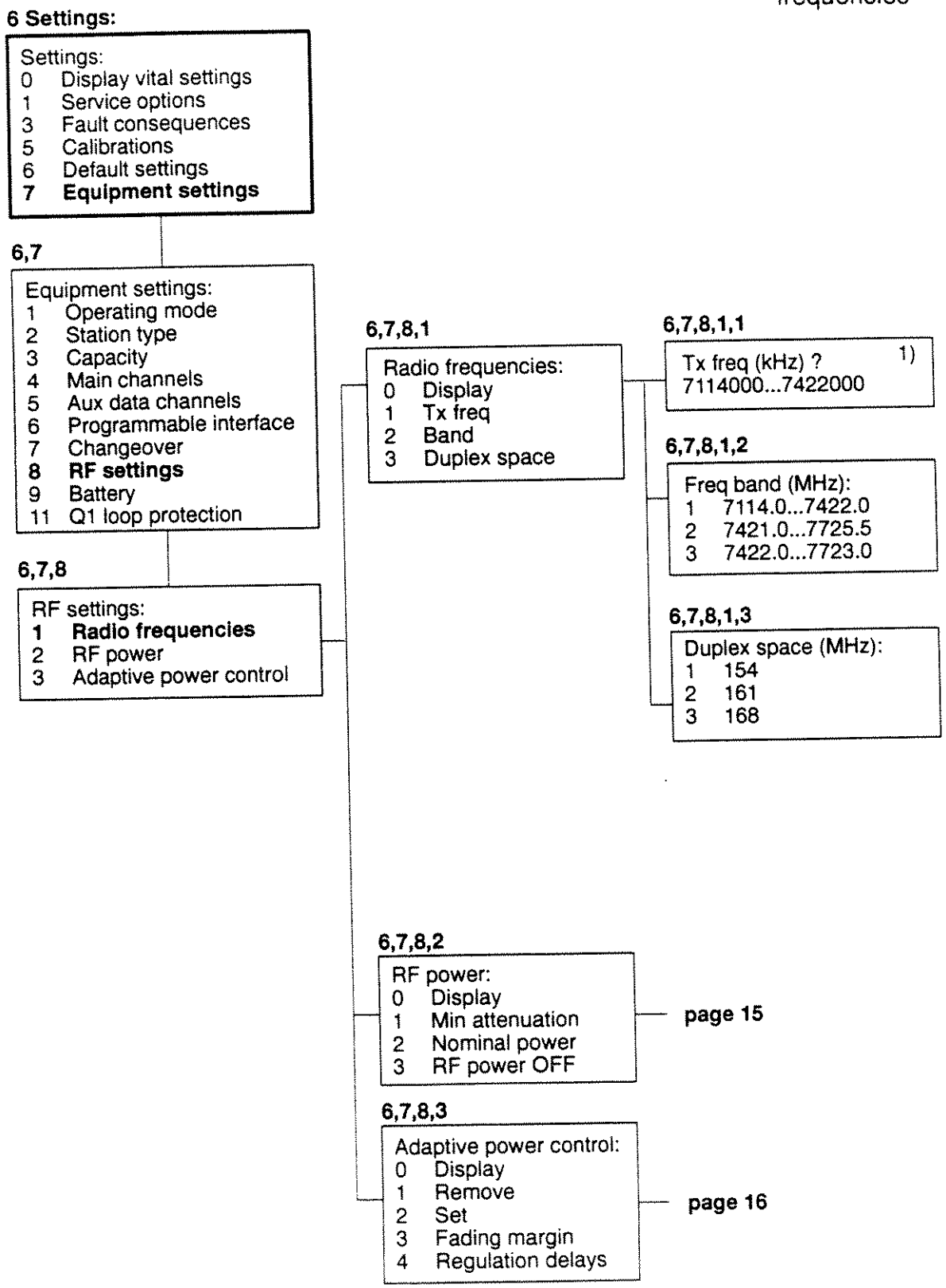
SETTINGS (permanent): 6,7 Equipment settings 6,7,6 Programmable interface




6 Settings:
Settings:
0 Display vital settings
1 Service options
3 Fault consequences
5 Calibrations
6 Default settings
7 Equipment settings
6,7
Equipment settings:
1 Operating mode
2 Station type
3 Capacity
4 Main channels
5 Aux data channels
6 Programmable interface
7 Changeover
8 RF settings
9 Battery
11 Q1 loop protection
6,7,7
Changeover:
0 Display
1 Allow all
2 Prot. bus fault
3 MAINI IN
4 MAINI OUT
5 Loops
6 RBUS
7 Forced AIS
8 Far end R alarm
9 Synthesizer
10 AGC
11 Bit error ratio
12 Tx oscillator
13 CPU faults
14 Rx frame sync.
6,7,7,2...14
1 Inhibit c/o
2 Allow c/o

SETTINGS (permanent): 6,7 Equipment settings

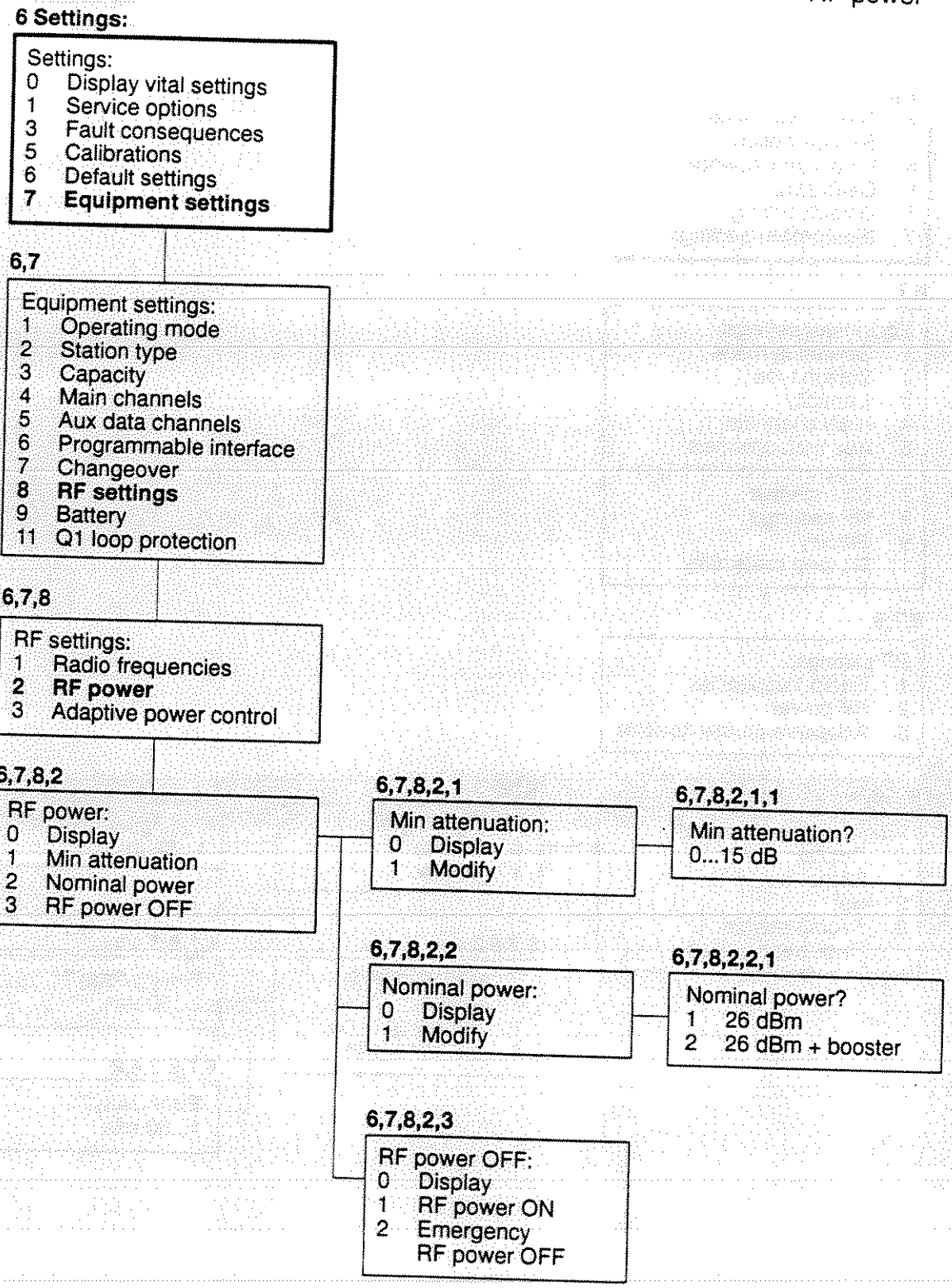
6,7,8 RF settings: Radio frequencies



1) Example

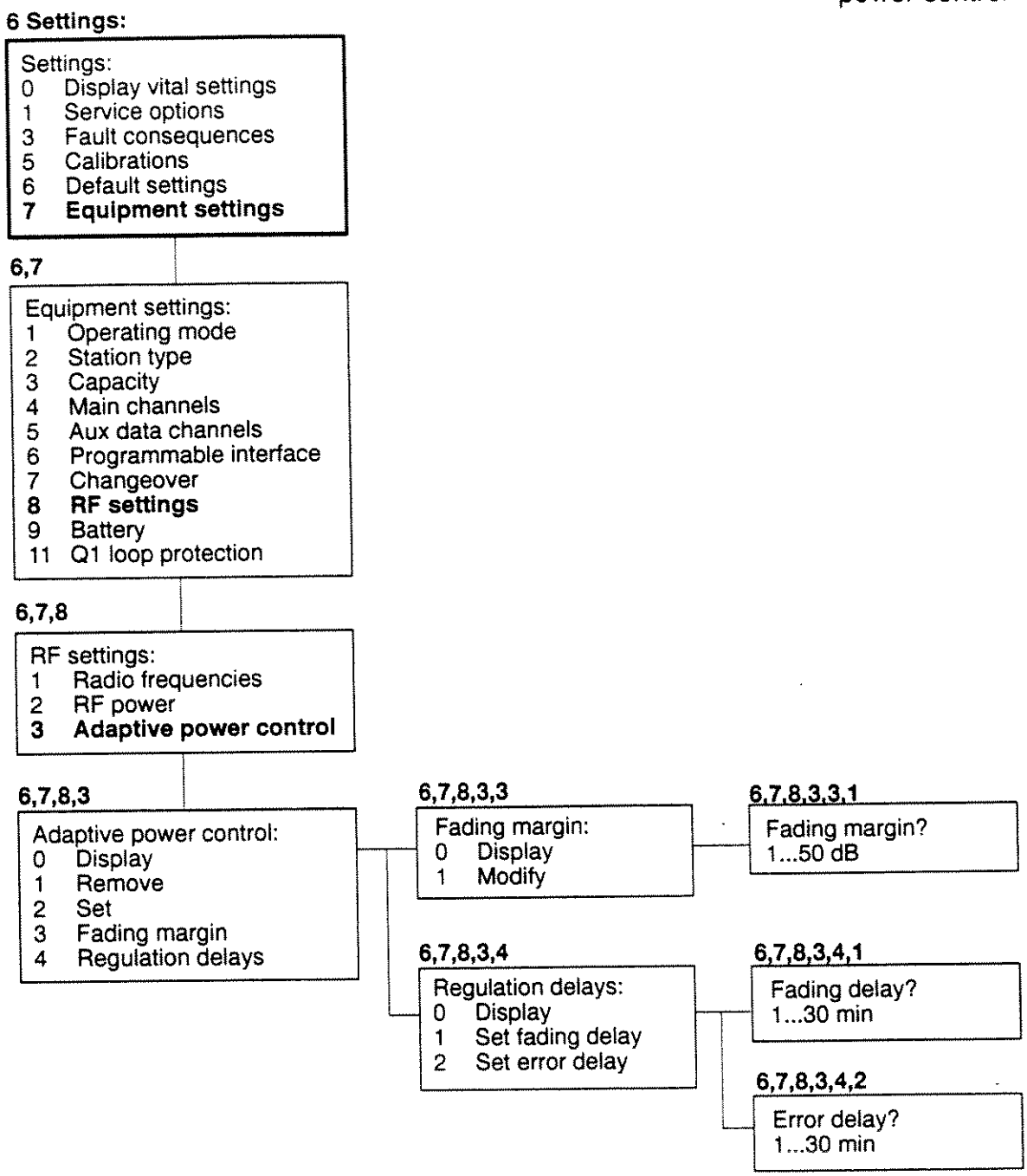
SETTINGS (permanent): 6,7 Equipment settings

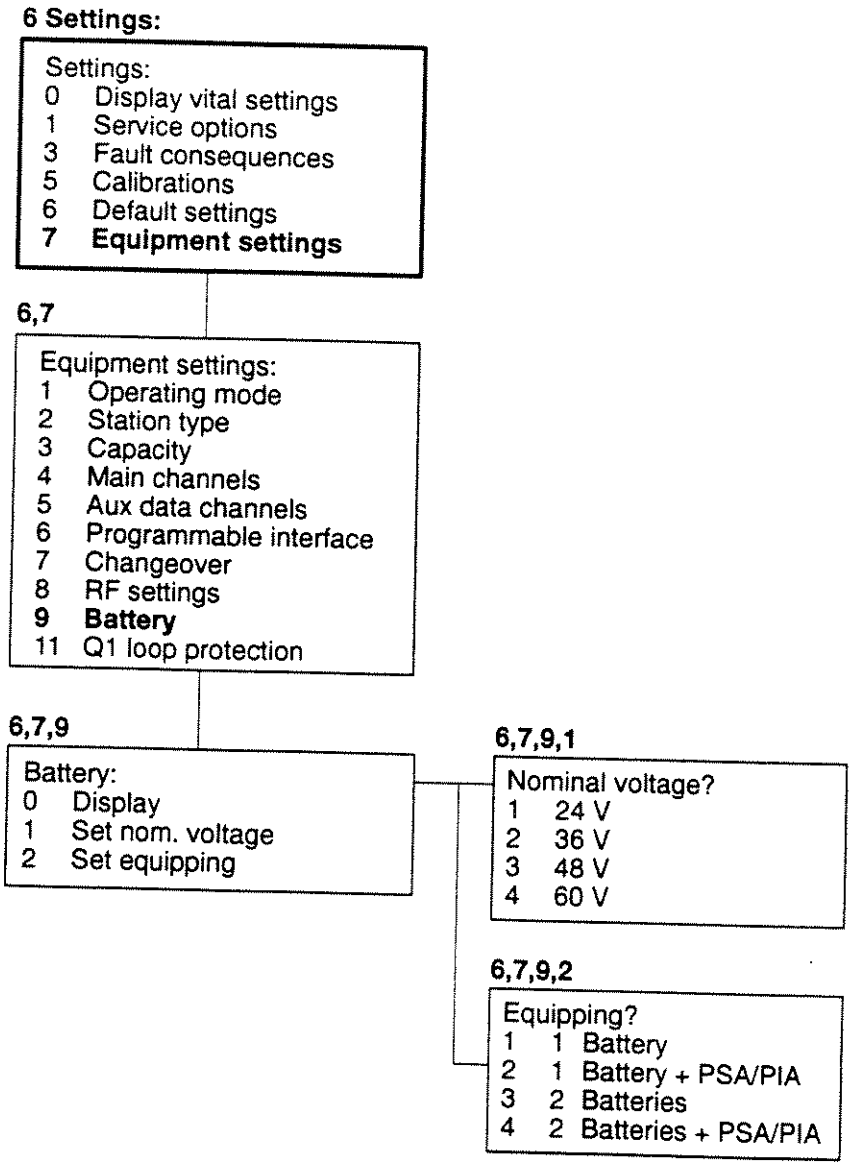
6,7,8 RF settings: RF power



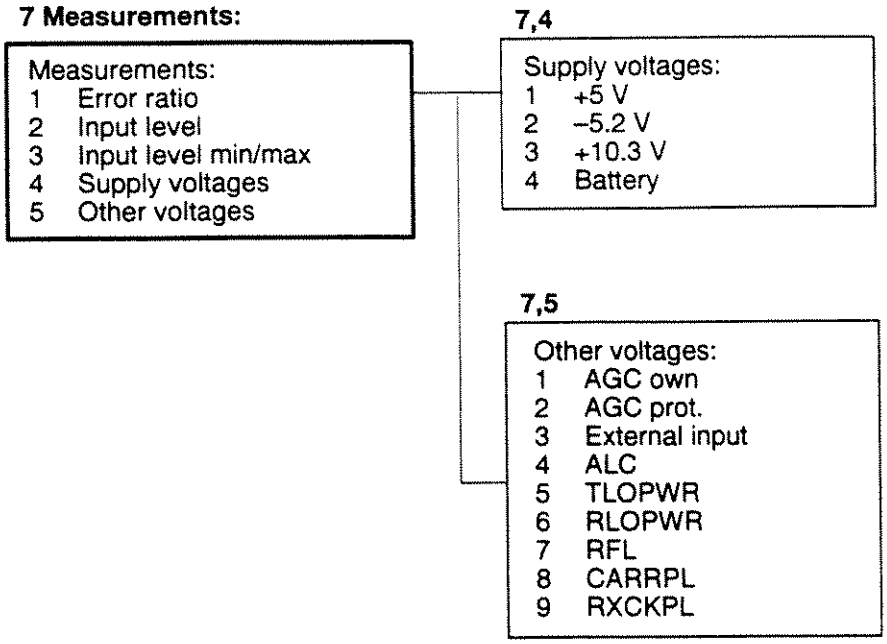
SETTINGS (permanent): 6,7 Equipment settings

6,7,8 RF settings: Adaptive power control

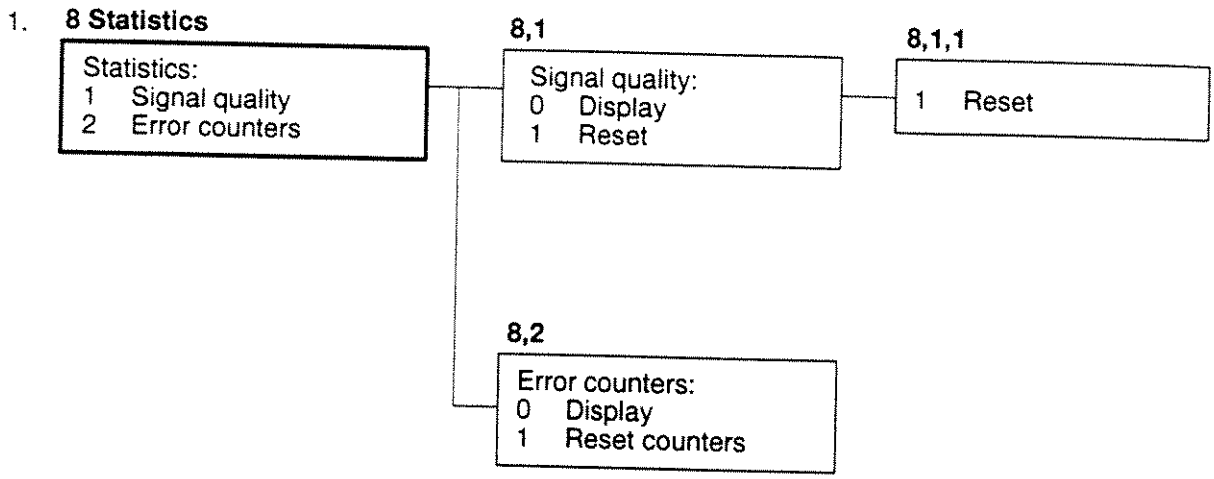



6 Settings:
Settings:
0 Display vital settings
1 Service options
3 Fault consequences
5 Calibrations
6 Default settings
7 Equipment settings
6,7
Equipment settings:
1 Operating mode
2 Station type
3 Capacity
4 Main channels
5 Aux data channels
6 Programmable interface
7 Changeover
8 RF settings
9 Battery
11 Q1 loop protection
6,7,9
Battery:
0 Display
1 Set nom. voltage
2 Set equipping
6,7,9,1
Nominal voltage?
1 24 V
2 36 V
3 48 V
4 60 V
6,7,9,2
Equipping?
1 1 Battery
2 1 Battery + PSA/PIA
3 2 Batteries
4 2 Batteries + PSA/PIA

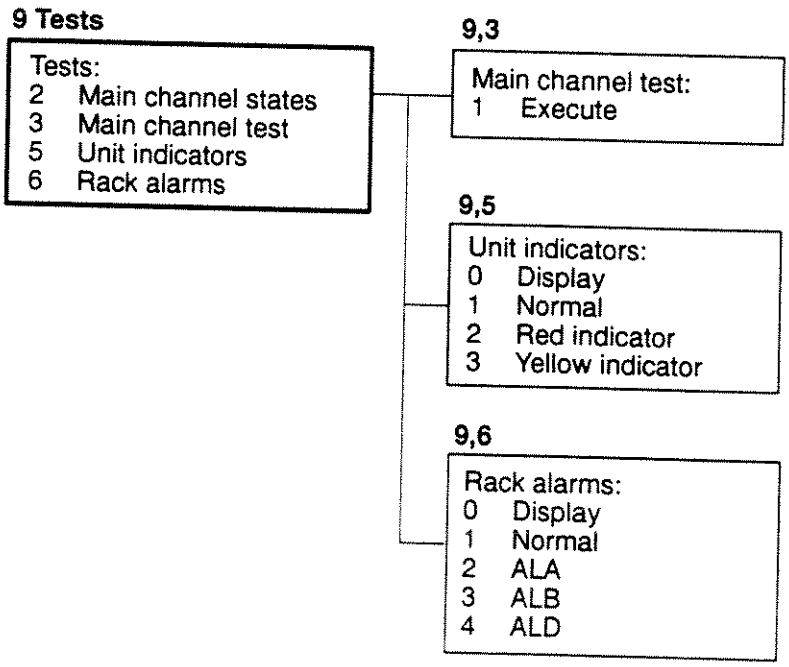
MEASUREMENTS



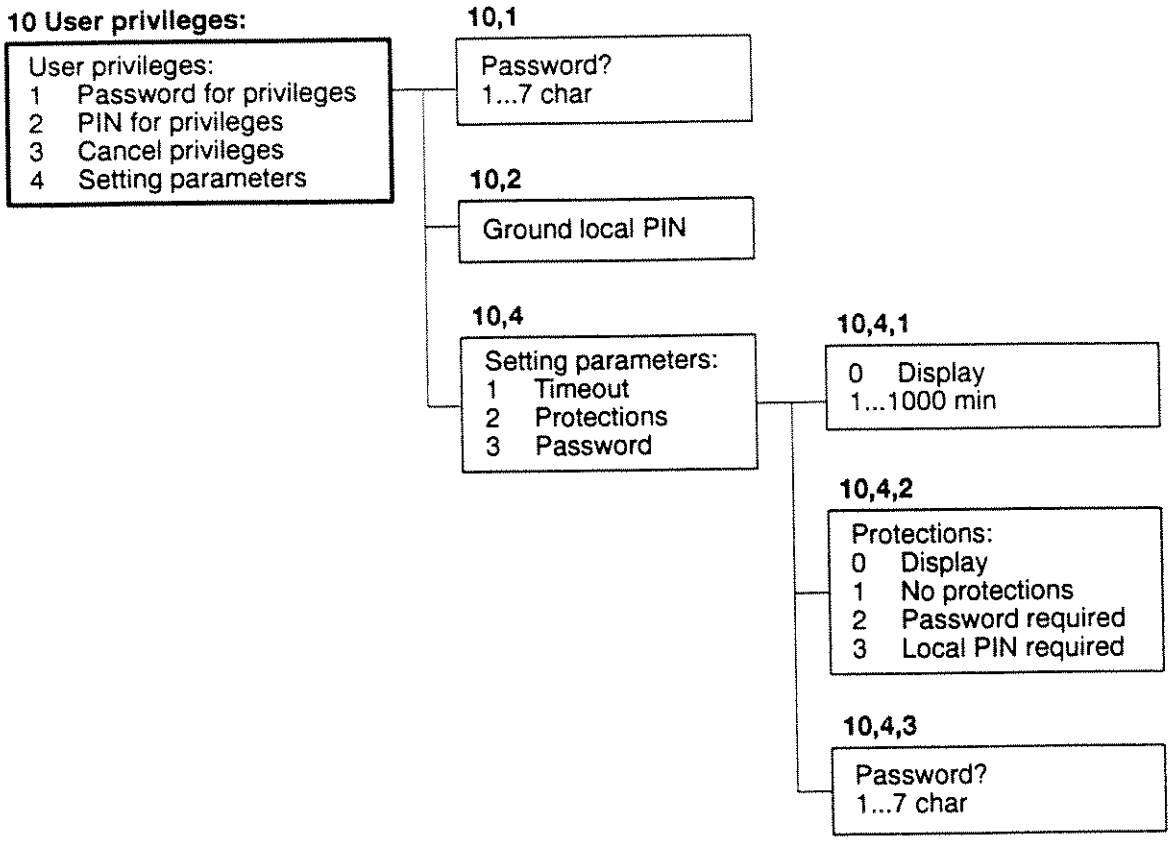
STATISTICS



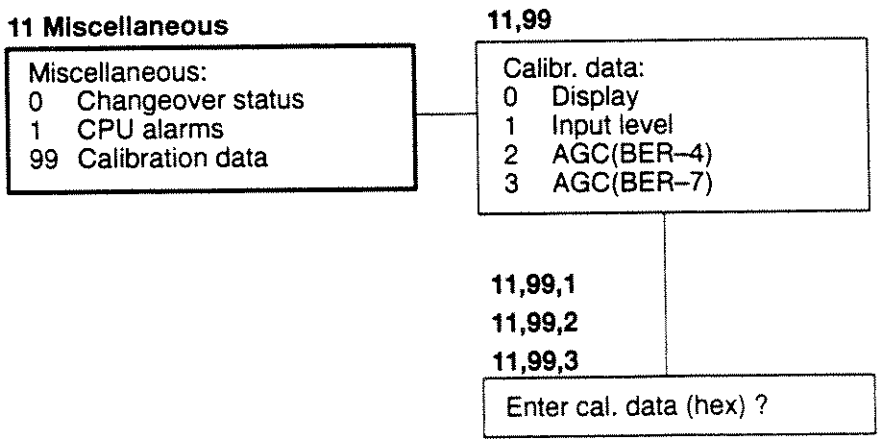
TESTS



USER PRIVILEGES

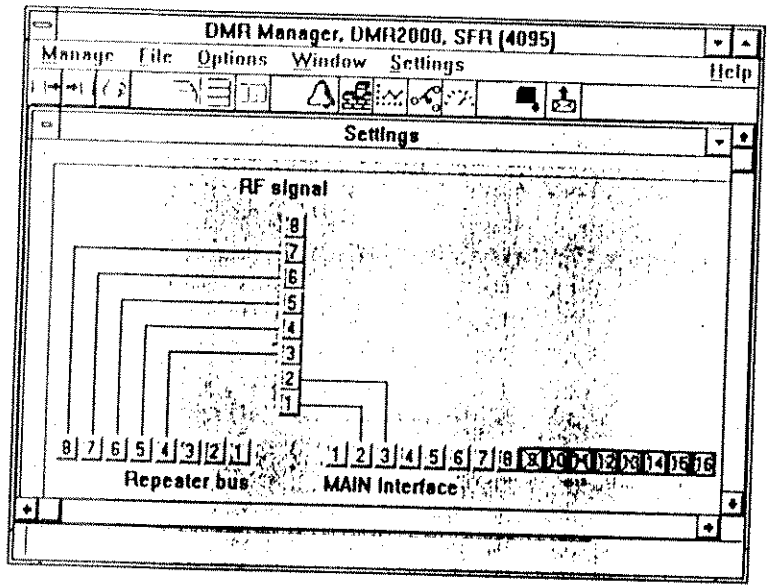


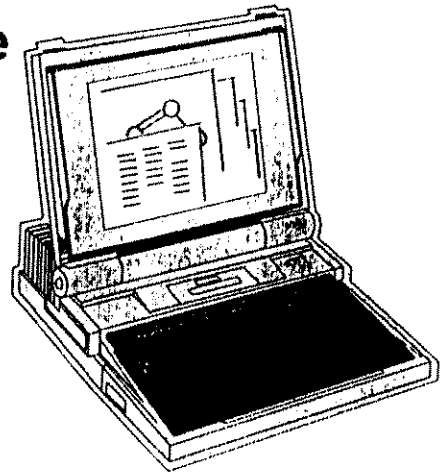
MISCELLANEOUS



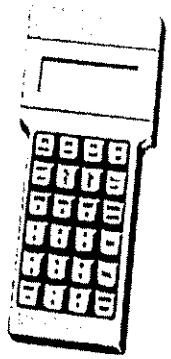
COMMISSIONING AND MAINTENANCE

- Locally or remotely with DMR Manager or hand-held Service Terminal





DMR Manager



Service Terminal

Introduction to the DMR Manager

This chapter introduces you to the DMR Manager, its main functions and the system requirements it sets on your computer.

The DMR Manager is a PC program for managing a DMR node, the radio relay equipment produced by Nokia. With the help of this manager, you can monitor and control the state of each node in the network.

The DMR Manager runs on a PC-compatible computer under Microsoft Windows.

2.1 Node Manager System Architecture

The DMR Manager is a management product using Nokia's Node Manager System Environment (NMSE). All management systems conforming to the NMSE can operate at the same time on the same standard PC. The NMSE supports a wide range of node managers using different communications software to manage different kinds of equipment.

2.2 General Features

The DMR Manager can manage one node at a time. However, several instances of the DMR Manager can be run in parallel to allow simultaneous management of several nodes.

The main functions you can perform using the DMR Manager are the following:

- Taking new DMR nodes into use
- Node configuration

- Easy commissioning from the PC
- Monitoring of alarm states
- Changing password in Manager
- Saving DMR node settings on the hard disk of the PC for backup purposes
- Printing DMR node settings on a printer
- Making cross-connections in graphical or in text form

2.3 User Interface

The DMR Manager serves as a simple-to-use interface between the user and the DMR node. The user interface consists of an application window, which contains all the other windows which display different views of the node being managed. The different windows are:

- Alarms
- Settings
- Testing
- Controls
- Performance
- Calibration
- Miscellaneous

The DMR Manager also provides on-line help on the use of the DMR Manager software.

2.4 User Roles

There are two kinds of users of DMR Manager. An Administrator can manage the DMR completely and in addition can add or remove users to / from the user database. A User can also manage the node but cannot add or remove users. Different users can have different passwords.

2.5 Security Considerations

Node Security

The DMR node can be protected against unauthorized access by using a password or a PIN connection (see the *Operating Manual of the managed node*). When the protection has been activated on a node, you can use the DMR Manager to give the password or to get the privileges by grounding the PIN. See the menu option **Manage → Node Security....**

Note Remember to cancel the privileges when they are no longer needed, see **Manage → Node Security... Cancel → Privileges**.

Some of the settings in the node may also be HWP protected (see the *Operating Manual of the managed node*).

Manager Security

The DMR Manager also requires a user name and a password to be entered before the program can be started (see section 4.3 *Setting a Password for the DMR Manager*).

Note It is strongly recommended to keep the DMR Manager installation disk(s) and this manual in a safe place in order to prevent unauthorized access to any DMR node and also to prevent unauthorized use of the Manager.

2.6 System Requirements

This section describes the hardware and software requirements of the computer for running the DMR Manager.

- An 80386-based or better IBM PC-compatible computer
- 4 MB RAM, 8 MB recommended
- 4 MB hard disk space exclusively for the DMR Manager software, 10 MB recommended
- A VGA-compatible or better graphical display, a colour display is recommended
- A high density 3.5" floppy drive
- A mouse, trackball, or equivalent pointing device
  - driver software
  - mouse port
- A V.24/V.28 (RS-232C) serial port for communication with the node
  - node manager cable (RS-232C)
- MS-DOS Version 5.0 or later
- Microsoft Windows 3.1 or later version, running in enhanced mode

The DMR Manager communicates with a DMR node via a serial port connected from the back of the computer to the PC Interface Unit (or

equivalent V.11/V.28 converter) and the PC Interface Unit connected to the front connector of the managed node. A PC Interface Unit, or an equivalent interface converter with required cabling is thus needed, and optionally a graphics printer supported by Windows.

2.7 Copyright Notice

2.8 Product Codes

2.8.1 DMR Manager Programs

P38200.01	DMR Manager Program, 1 copy
P38200.02	DMR Manager Program, 5 copies
P38200.03	DMR Manager Program, 10 copies
P38200.04	DMR Manager Program, 25 copies
P38200.05	DMR Manager Program, 50 copies

2.8.2 Interface Accessories

Select one of the cabling options presented below to connect the PC and the DMR node (see Figures 2-1 and 2-2):

Cable Set 1

The 25-pin COM serial port of the PC is used and the power for the interface converter is taken from the COM port.

TU 25740	RS-232C to X.21 Interface Converter
TX 25741.01	Interface Cable: From TU 25740 to 25-pin COM serial port of the PC
TX 25741.02	Interface Cable: From TU 25740 to the node

or

TU 25739	NE Manager Support Package including: TU 25740 + TX 25741.01 + TX 25741.02

Cable Set 2

The 9-pin COM serial port of the PC is used and the power for the interface converter is taken from the COM port.

TU 25740	RS-232C to X.21 Interface Converter
TX 25741.04	Interface Cable: From TU 25740 to 9-pin COM serial port of the PC
TX 25741.02	Interface Cable: From TU 25740 to the node

Cable Set 3

The 9-pin COM serial port of the PC is used and the power for the interface converter is taken from an external power supply.

TU 21722	PC-TMC Support Package including: 1. PC–IU: RS-232C to X.21 Interface Converter 2. Interface Cable: From PC-IU to 9-pin COM serial port of the PC 3. Interface Cable: From PC-IU to the node

Interconnecting Cable

The 25-pin COM serial port of the PC is used and connected to Nokia TMS Adapter (TU 21710):

TX 25742	Interface Cable: From the 25-pin COM serial port of the PC to the node

Cable Set 4 (for DMR 18–38CE only)

The 25-pin COM serial port of the PC is used and the power for the interface converter is taken from the COM port.

TU 25740	RS-232C to X.21 Interface Converter
TX 25741.01	Interface Cable: From TU 25740 to 25-pin COM serial port of the PC
T38093.01	Interface Cable: From TU 25740 to the DMR 18–38CE node

Cable Set 5 (for DMR 18–38CE only)

The 9-pin COM serial port of the PC is used and the power for the interface converter is taken from the COM port.

TU 25740	RS-232C to X.21 Interface Converter
TX 25741.04	Interface Cable: From TU 25740 to 9-pin COM serial port of the PC
T38093.01	Interface Cable: From TU 25740 to the DMR 18–38CE node

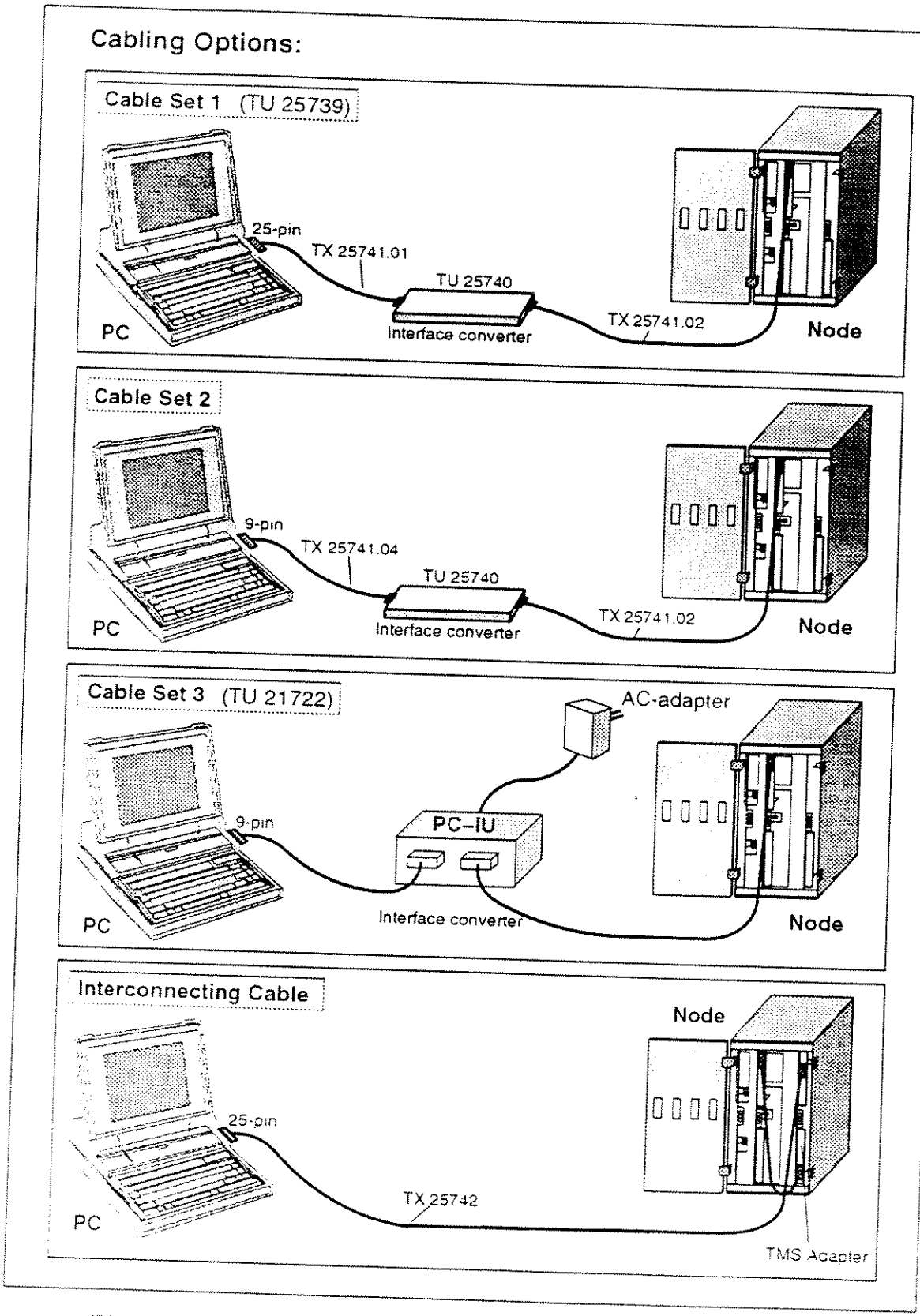


Figure 2-1 Connecting the PC to the node (to be continued on next page)

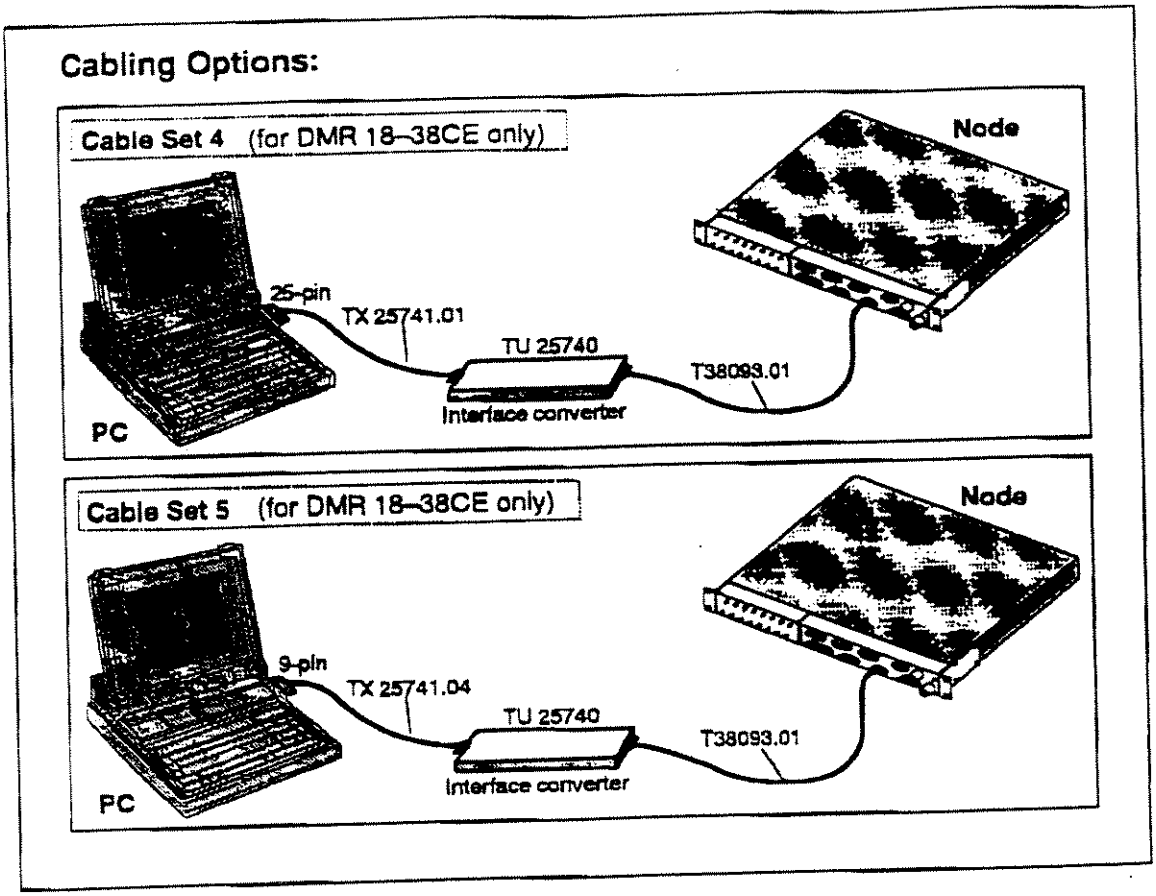


Figure 2-2 Connecting the PC to the node (continued from the previous page)

2.8.3 Manuals

C33018.20	DMR 2000 Operating Manual
C33320.20	DMR 7000 Operating Manual
C33273.20	DMR 18–38W Operating Manual
C33314.20	DMR 18–38C Operating Manual
C33323.20	DMR 18–38CE Operating Manual
C33317.20	DMR 18–38S Operating Manual
C33318.20	DMR 18–38I Operating Manual
C33309.20	DMR Manager User's Manual (Included in each purchase of a DMR Manager software)

2.9 Compatibility with DMR Nodes

Compatible Node Type	Node Program	Release
DMR 2000	TS 26100.00	A0...A4 B0...
DMR 7000	P37950.01	A0...
DMR 18–38W	TS 26101.01 TS 26102.01	A0 B0... A0... B0 C0... D0...
DMR 18–38C	P38035.01	A0... B0 C0...
DMR 18–38CE	P38036.01	A0... B0... C0...
DMR 18–38S	P38035.01	A0... B0 C0...
DMR 18–38I	P38135.01	B0...

Table 1 DMR Manager release B, compatibility with DMR nodes

Future releases of Nokia's node programs and DMR equipments will be supported by later releases of the DMR Manager.