

## DN 2

# DYNAMIC NODE EQUIPMENT n x 2 Mbit/s

## Installation

### Contents

	Page
<b>1 GENERAL .....</b>	<b>3</b>
<b>2 JUMPER SETTINGS .....</b>	<b>4</b>
2.1 Jumper Settings on Motherboard .....	4
2.2 Jumper Settings of Units .....	5
2.2.1 Supply Voltages .....	5
2.2.2 Interfaces .....	7
2.2.3 Jumper Settings on CU .....	8
2.2.4 Jumper Settings on IU2 .....	10
2.2.5 Jumper Settings on BPU and EBPU .....	12
2.3 Check List for Jumper Settings .....	14
<b>3 CARTRIDGE EQUIPPING .....</b>	<b>15</b>
3.1 General .....	15
3.2 Power Supply and Rack Alarm Interfaces .....	15
3.3 Equipping Alternatives .....	16
3.4 Equipping of one Cartridge .....	17
3.5 Equipping of two Subracks .....	19
3.6 Extending the DYNACARD Bus .....	22
3.7 Types of Unit Suited for each Unit Location .....	23
<b>4 CABLING OF CU AND IU2 .....</b>	<b>25</b>
4.1 Front Connectors of CU and IU2 Units .....	26
4.2 Cabling of Service Connector .....	28
4.2.1 Cabling of Service Connector of CU .....	28
4.2.2 Cabling of Service Connector of IU2 .....	29
4.3 Cabling of 2048 kbit/s Interfaces .....	30
4.3.1 Units CU 24100 (IU2) and CC 24110 (CU) .....	30
4.3.2 Units CU 24101 (IU2) and CC 24111 (CU) .....	33
4.4 Marking of Cabling .....	34

<b>5</b>	<b>INSTALLATION EXAMPLES .....</b>	<b>37</b>
5.1	First Installation .....	37
5.2	Adding one Unit .....	37
5.3	Changing one Unit .....	38
5.4	Updating a 28-port Equipment to a 40-port Equipment .	39 (39)

## 1 GENERAL

This document describes the jumper settings, equipping and cabling of the DN 2 Equipment. The general principles for rack installation are found in the *Operating Handbook for TM4 Construction Practice*, and the instructions for installing and cabling the 19-inch subrack are included in the *Operating Instructions for the DN 2 19-inch Subrack*. The jumper settings and the instructions for cabling the channel units that may be configured in the equipment are found in the individual operating handbooks of each unit.

When the units of the equipment have been installed in their places, the equipment can be commissioned following the instructions given in the *Operation* part of this handbook.

**NOTE** Before starting the installation work, make sure that the units of the equipment are compatible.

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## 2 JUMPER SETTINGS

### 2.1 Jumper Settings on Motherboard

The units of the DYNACARD family, including the units of the DN 2 equipment, read their unit location numbers from the motherboard via the back connector. The number has been encoded on the motherboard with five address bits, the number of unit location numbers thus amounts to 32. The software, however, supports only 26 unit locations and therefore the units have to be inserted in unit locations 1...26. Hence, some of the motherboard address bits always remain constant. By means of jumper settings on the motherboard, these bits can be assigned a desired value.

Figures 1 and 2 illustrate the jumper settings in 20 T and 40 T cartridges, and Figure 3 shows the jumper settings and the addresses obtained by them in a 19-inch subrack. The address setting 17-n (n=20, 24, 32) is allowed only when the equipment is installed in two subracks. One subrack shall then have the address setting 1-n (n=4, 8, 16) and the other 17-n (n=20, 24, 32). When the equipment is installed in one cartridge/subrack, it is advisable to use the address setting 1-n (n=4, 8, 16).

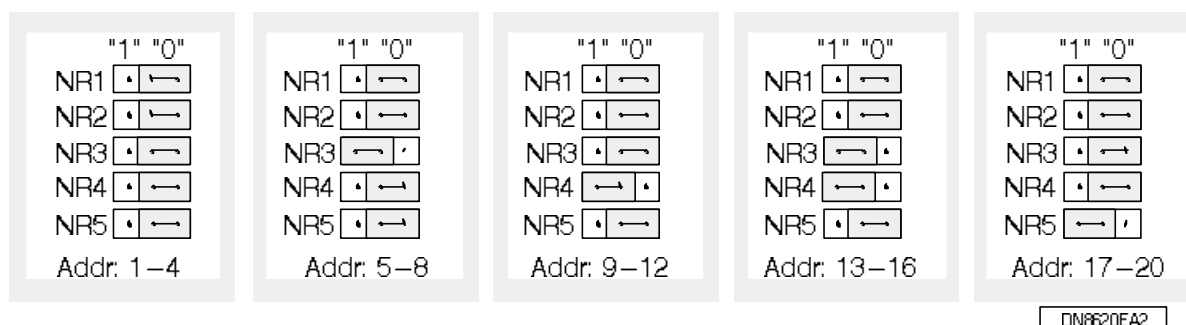


Figure 1 Jumper settings on a 20 T cartridge

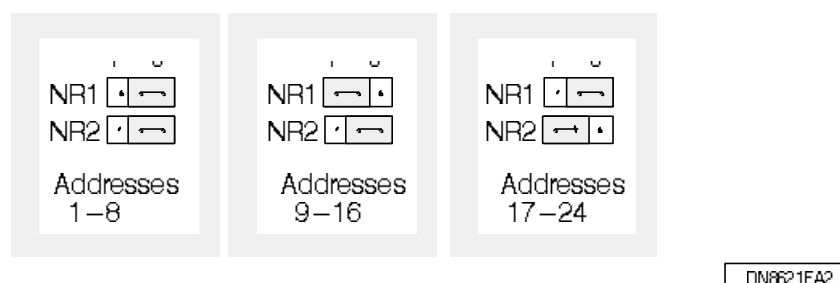
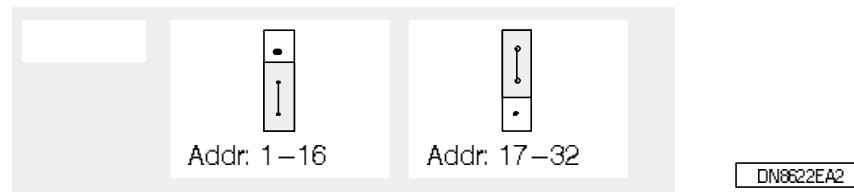


Figure 2 Jumper settings on a 40 T cartridge



*Figure 3 Jumper settings and meanings of jumpers on a 19-inch sub-rack*

By using separate DYNACARD bus extension cables it is possible, with certain restrictions, to interconnect two or three cartridges containing units that use the DYNACARD bus. In such a case, different unit location numbers (1–20) shall be used in each cartridge.

The DN 2 bus (the lower motherboard) can be extended to another cartridge by using extension cables. Channel units configured in the DN 2 can, however, be placed in the basic subrack only.

## 2.2 Jumper Settings of Units

### 2.2.1 Supply Voltages

**NOTE** No operating voltages shall be connected to the equipment until all jumper settings affecting the use of voltages have been properly made!

Meanings of the jumper settings are explained on the marking cards delivered with the units. The marking cards are also provided with some space for the user's own notes. The following sections describe the use of unit-specific jumper settings in the DN 2 units. The corresponding information related to any channel units that may be used is found in the channel unit documents.

### Supply Voltages for the Buses

The DN 2 uses five internal supply voltages that are supplied to all unit locations via the motherboards. The channel units connected to the equipment may require other supply voltages (see the Operating Handbooks of these channel units).

The supply voltages that are always necessary for the operation of the equipment are:

B1V:	Supply voltage for the upper part of the DN 2 bus, +2 V
B2V:	Supply voltage for the lower part of the DN 2 bus, +2 V
VP5:	DYNACARD bus supply voltage, +5 V

Some channel units require a supply voltage of –5 V and/or –12 V.

Voltage		BPU/EBPU	CU	IU2
+2 V	(B1V)	x		
+2 V	(B2V)	x		
+5 V	(VP5)	x	p	p
-5 V	(VN5)	p	x	
-12 V	(VNM)		x	

x recommended connection

p possible connection

*Table 1 Alternative connections for supply voltages*

**NOTE** Each of these supply voltages shall be connected to each cartridge/subrack through one unit. Make sure that these voltages are NOT connected from several units simultaneously! (When the equipment is installed in two cartridges/subracks, both subracks shall have their voltages connected separately.)

The VP5 can be connected in the IU2s up to unit version 03A. The BPU unit version 01A does not have a jumper setting for VN5.

When bus protection and two BPUs are used, the jumper settings in the BPUs must be made so that they do not feed the +2 V voltage to the same part of the DN 2 bus.

## Supply Voltage Alarms

The LEDs at the front edge of the BPU are used to indicate voltage alarms (a LED turns on in the event of a fault):

- uppermost LED: supply voltage of the unit; supply voltage of the DYNACARD bus if the VP5 is connected
- centre LED: supply voltage of the upper part of the DN 2 bus
- lowermost LED: supply voltage of the lower part of the DN 2 bus

The LEDs at the front edge of the EBPU are used to indicate voltage alarms:

- uppermost LED: supply voltage missing from the unit indicating the alarm; supply voltage missing from the EBPU in the other subrack; supply voltage of the DYNACARD bus if the VP5 is connected; DN 2 bus cable disconnected
- centre LED: supply voltage of the upper part of the DN 2 bus
- lowermost LED: supply voltage of the lower part of the DN 2 bus

The DN 2 bus voltage alarms can be affected by jumper settings (see Sub-section 2.2.5, *Jumper Settings on BPU and EBP*).

### **Service Terminal Charging Voltage**

The connectors for charging the Service Terminal battery are in the battery interfaces always belonging to the equipment configuration, in the PSA cartridge or in the PIA unit.

A battery voltage can be fed to the uppermost front connector of the IU2 interface units via a pin strip on the unit (see Sub-section 2.2.4 *Jumper Settings on IU2*).

## **2.2.2 Interfaces**

### **Functions of Jumper Settings**

The jumper settings for the 2 Mbit/s and synchronization interfaces of the CU and IU2s can be used to select the following functions:

- input interface impedance 120/75 ohms
- output interface impedance 120/75 ohms
- grounding of the input interface cable sheath

The impedance is selectable only when unit types CC 24110 and CU 24100 (Euroconnector versions) are used. When unit types CC 24111 and CU 24101 (coaxial connectors) are used, the impedance shall always be set to 75 ohms.

---

### 2.2.3 Jumper Settings on CU

#### 2048 kbit/s Interface

The 2048 kbit/s interface of the CU is used when the DYNACARD bus or the synchronization interface has been taken into use through an external cable.

The sheath of the input cable can be grounded to the equipment ground. In unit CC 24110 it is also possible to select whether the interface used is set as a 120-ohm balanced interface or a 75-ohm unbalanced interface.

Alternative	Jumper setting		Impedance	Sheath of input cable
	NR5	NR4		
a			120 ohms	Connected to equipment ground
b			75 ohms	Disconnected from equipment ground
c			75 ohms	Connected to equipment ground
d			120 ohms	Disconnected from equipment ground

DN8635EA2

Figure 4 2048 kbit/s interface of the CU, jumper setting alternatives

#### Synchronization Interface

The synchronization interface is used when the synchronization for the equipment is to be derived from an external clock or when the clock is transmitted to another equipment.

The sheath of the input cable can be grounded to the equipment ground. In unit CC 24110 it is also possible to select whether the interface used is set as a 120-ohm balanced interface or a 75-ohm unbalanced interface.

Alternative	Jumper setting		Impedance	Sheath of input cable
	NR3	NR2		
a			120 ohms	Connected to equipment ground
b			75 ohms	Disconnected from equipment ground
c			75 ohms	Connected to equipment ground
d			120 ohms	Disconnected from equipment ground

DN8636EA2

Figure 5 Synchronization interface of the CU, jumper setting alternatives



## Supply Voltages for the DYNACARD Bus

The CU can be set to feed the supply voltages to the DYNACARD bus. This can be done by interconnecting pins at pin strip NR1 by jumpers. The NR1 has been marked on the component board with texts indicating the voltage to be connected. In each cartridge/subrack, the jumper setting for each voltage shall be made in one unit only. The +5 V voltage, ie, the VP5, is essential for the DN 2. The channel units, on the other hand, may require other voltages. See Sub-section 2.2.1 *Supply Voltages*.

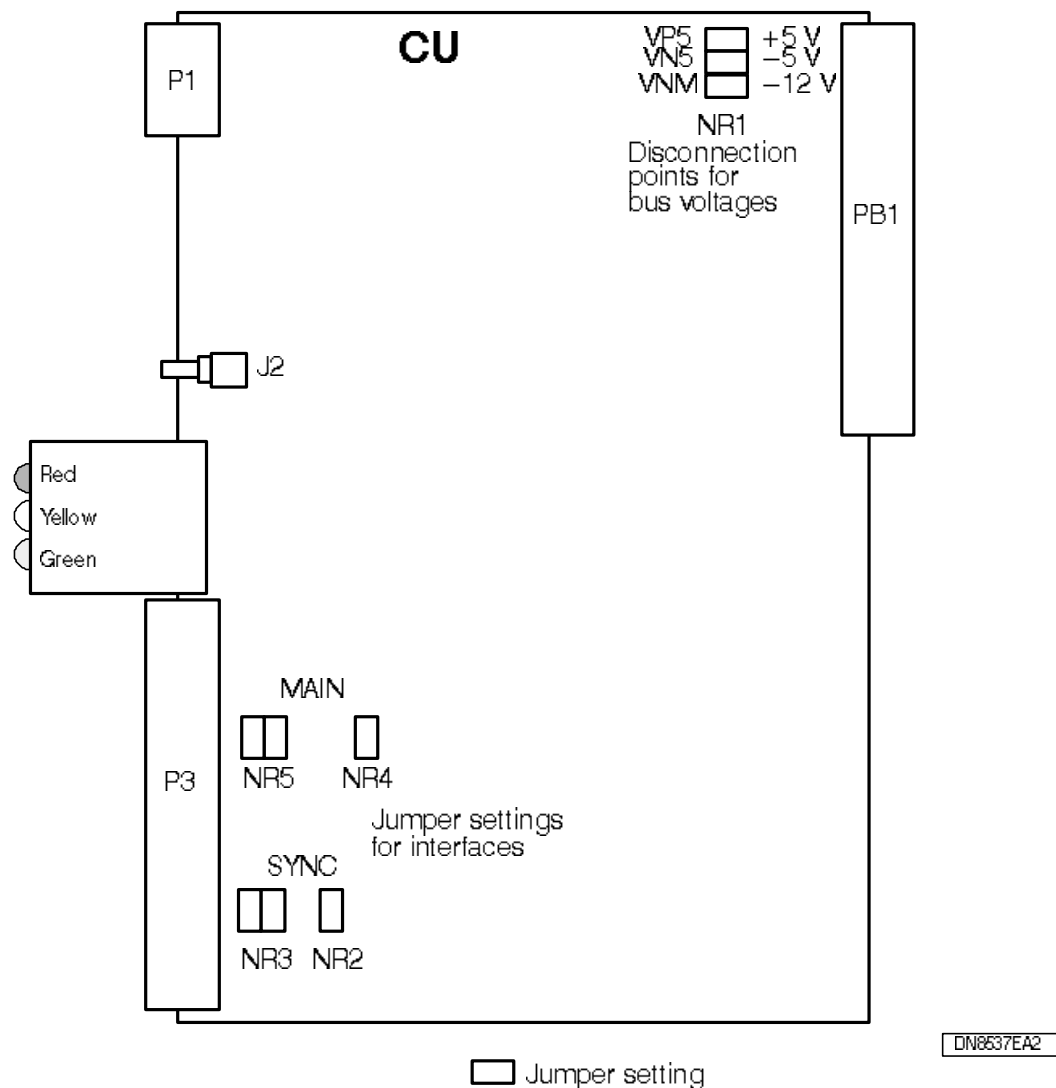






Figure 6 Locations of jumper settings on Control Unit CU

## 2.2.4 Jumper Settings on IU2

### 2048 kbit/s Interfaces

The sheath of the input cable can be grounded to the equipment ground. In unit CC 24100 it is also possible to select whether the interface used is set as a 120-ohm balanced interface or a 75-ohm unbalanced interface.

Alternative	Jumper setting NR4(NR2) NR5(NR3)	Impedance	Sheath of input cable
a		120 ohms	Connected to equipment ground
b		75 ohms	Disconnected from equipment ground
c		75 ohms	Connected to equipment ground
d		120 ohms	Disconnected from equipment ground

DN8638EA2

*Figure 7 2048 kbit/s interfaces of IU2, jumper setting alternatives. The pin strips NR4 and NR5 are intended for the setting of the upper 2048 kbit/s interface and the pin strips NR2 and NR3 are used for the lower interface.*

### Supply Voltage for the DYNACARD Bus

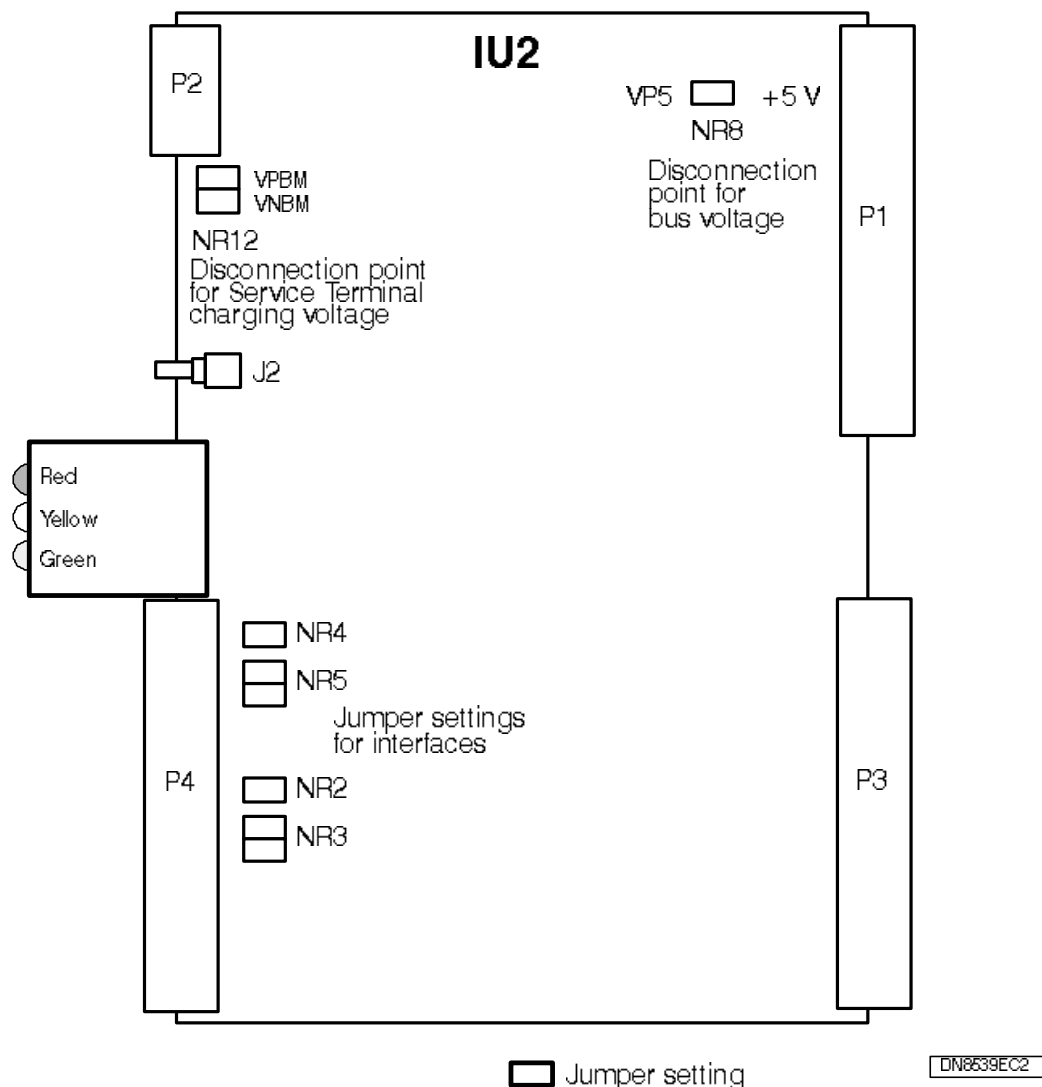
The IU2 can be set to feed the supply voltage to the DYNACARD bus by interconnecting the pins of pin strip NR8 with a jumper (up to unit version 03A). The NR8 is marked with text VP5 on the component board. In each cartridge/subrack, the jumper setting shall be made in one unit only. See Sub-section 2.2.1 *Supply voltages*.

## Service Terminal Charging Voltage

A battery voltage can be fed to the uppermost front connector of the IU2 interface units via the pin strip NR12 on the unit. The pin strip is provided with printed texts:

VPBM: positive battery voltage  
VNBM: negative battery voltage

When the jumpers are in, the battery of the Service Terminal connected to the front connector is charged. When the jumpers are removed, the battery voltage is disconnected from the front connector.



**Figure 8** Locations of jumper settings on Interface Unit IU2

### 2.2.5 Jumper Settings on BPU and EBPU

#### Supply Voltage for the DYNACARD Bus

The BPU/EBPU can be set to feed the supply voltages +5 V (VP5) and -5 V (VN5) to the DYNACARD bus. This is done by interconnecting the pins of pin strip NR5 with jumpers. The BPU unit version 01A does not have a jumper setting for the VN5.

**NOTE** In each cartridge/subrack, the jumpers should be set in on one unit only. (See Sub-section 2.2.1 *Supply Voltages*).

#### Supply Voltages for the DN 2 Bus

The DN 2 bus has been divided into two sections that are of equal size. Both of them require a supply voltage of +2 V. The supply voltages of the halves have been separated from each other on the motherboard.

The BPU/EBPU is set to feed the +2 V voltage to the DN 2 bus by setting the jumpers at pin strips NR1 (marked B1V) and NR2 (marked B2V) to connect the two uppermost pins to each other (marked ON).

If, for redundancy reasons, two separate BPUs are used to feed the upper and the lower section of the DN 2 bus, the jumper at the NR1 on one of the BPUs is set to ON position and the jumper at the NR2 to OFF position. On the other unit (in the same subrack), the jumper at the NR1 is set to OFF position and the jumper at the NR2 to ON position.













#### Supply Voltage Alarms of the DN 2 Bus

The two lower LEDs at the front edge of the BPU/EBPU are used for monitoring the supply voltages of the DN 2 bus. The centre LED alerts the user of a low or high voltage on the upper part of the bus and the lowest LED alerts of a low or high voltage on the lower part of the bus. The low voltage alarm can be disabled, if so desired, by setting the jumper at pin strip NR1C (marked B1AE) or NR2C (marked B2AE) to OFF position, in which case it is possible to enable the alarm in the feeding unit only (when two BPUs are used).

#### Warning

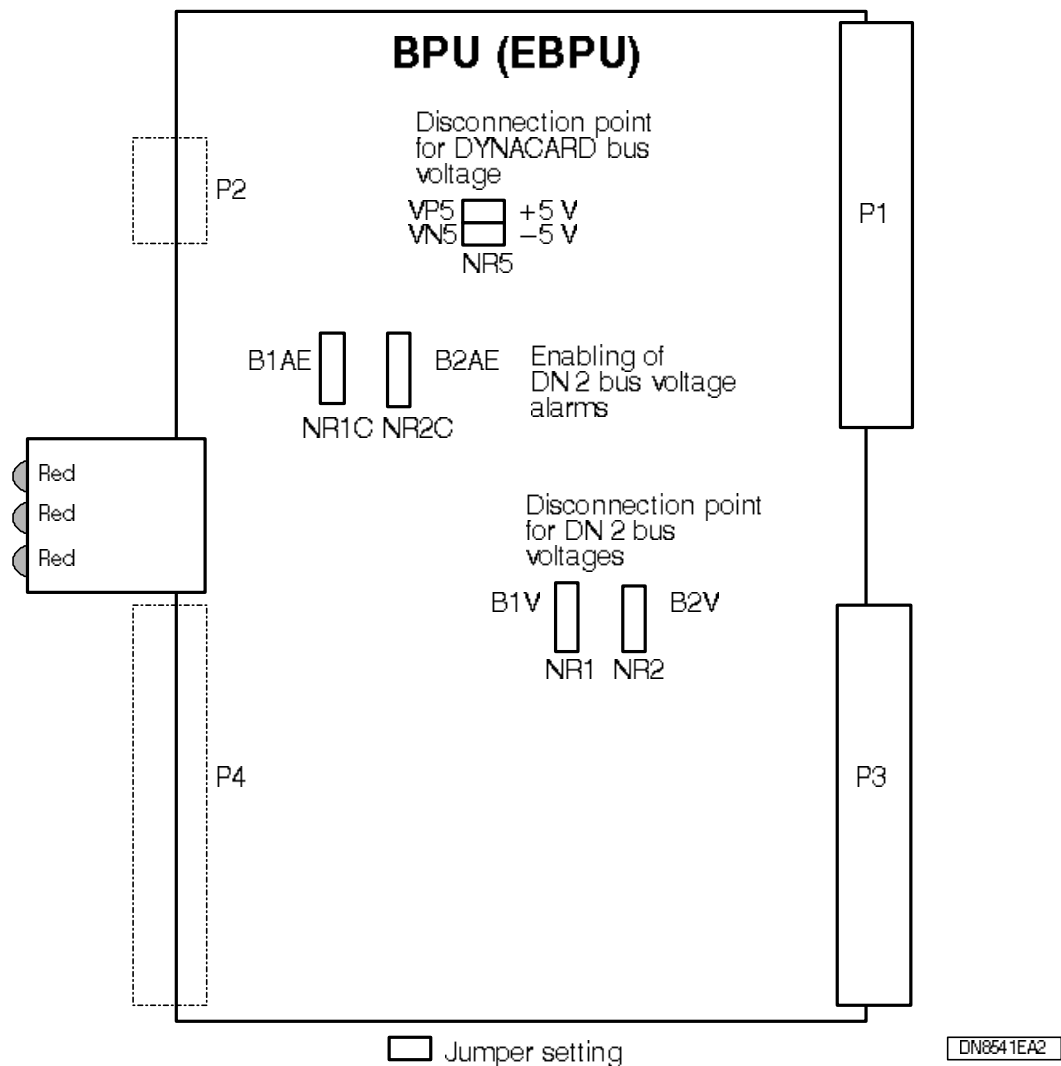
The jumpers at three-pin terminal strips NR1, NR2, NR1C and NR2C shall always be set to interconnect the two uppermost (ON position) or the two lowermost (OFF position) pins when the unit receives a battery voltage. This means that these jumpers shall NEVER be totally removed from the above-mentioned terminal strips.

---

Alternative	Jumper setting				DN 2 bus supply voltages fed:
	B1AE NR1C	B2AE NR2C	B1V NR1	B2V NR2	
a					to the whole bus
b					to the upper part of the bus
c					to the lower part of the bus

DN8540EB2

Figure 9 Jumper setting alternatives of the DN 2 bus supply voltages



DN8541EA2

Figure 10 Locations of jumper settings on the power supply unit BPU (EBPU)

### 2.3 Check List for Jumper Settings

Before the voltages are connected to the equipment, check that:

1. The DYNACARD bus supply voltage VP5 is connected in one and only one unit in each cartridge/subrack. (When the equipment is installed in two cartridges/subracks, both subracks shall have the VP5 connected separately.)
  2. The DYNACARD bus supply voltage VN5 is connected in one and only one unit (preferably in CU) in the basic cartridge/subrack.
  3. The DN 2 bus supply voltage B1V is connected in one and only one BPU. In a 40-port equipment, the supply voltage B1V must be connected in one and only one EBPU in each subrack.
  4. The DN 2 bus supply voltage B2V is connected in one and only one BPU. In a 40-port equipment, the supply voltage B2V must be connected in one and only one EBPU in each subrack.
  5. The DN 2 bus supply voltage alarm B1AE is enabled at least in one BPU. In a 40-port equipment, the supply voltage alarm B1AE must be enabled at least in one EBPU in each subrack.
  6. The DN 2 bus supply voltage alarm B2AE is enabled at least in one BPU. In a 40-port equipment, the supply voltage alarm B2AE must be enabled at least in one EBPU in each subrack.
  7. The interface impedances of the units have been set to comply with the cabling.
  8. Grounding of the input interface cable sheaths has been connected in the desired way.
  9. The Service Terminal battery charging voltages in the IU2s have been connected in the desired way.
  10. The unit addresses in the cartridges/subracks have been selected so that there are no overlapping addresses. The addresses start from address 1 in the basic subrack and from address 17 in the extension subrack.
-

### 3 CARTRIDGE EQUIPPING

#### 3.1 General

The DN 2 equipment is installed in subracks/cartridges that are mounted into racks. Installation and cabling of the TM4 rack are described in the *Operating Handbook for the TM4 Construction Practice*. Installation and cabling of the DN 2 19-inch subrack are described in the *Operating Instructions* of the subrack. The DN 2 equipment is usually installed in a 19-inch subrack (sixteen unit locations) but it can also be installed in a 20 T cartridge (four unit locations) or in a 40 T cartridge (eight unit locations).

The 28-port DN 2 equipment is installed in one cartridge/subrack, and the 40-port equipment is installed in two subracks interconnected with suitable cabling (see Section 3.5 *Equipping of Two Subracks*). The subracks of the 40-port equipment are named the basic subrack (unit locations 1–16) and the extension subrack (unit locations 17–26). The basic configuration can be modified by connecting two or three cartridges (or two subracks) to each other. Interconnection of the cartridges may involve extension of the DYNACARD bus, DN 2 bus or both. Extending the DYNACARD bus allows for the channel units to be installed also in the extension subrack, and when the DN 2 bus is extended, IU2s can be installed in the extension subrack. The equipping alternatives are shown in *Table 2*.

Each unit in the cartridge has an address based on the unit location it has been installed in. This address is used when the unit is controlled via the service interface using either the Service Terminal or the Transmission Management Computer (TMC). The address of the leftmost unit location is 1, the address of the next unit location is 2, etc.

#### 3.2 Power Supply and Rack Alarm Interfaces

When a CU, an IU2 or an (E)BPU is inserted into the cartridge/subrack, it is simultaneously connected to the central battery voltages and rack alarm buses via its back connector PB1 and the cartridge/subrack motherboard. At the same time, the unit is also grounded to the cartridge body.

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### 3.3 Equipping Alternatives

Table 2 shows the alternatives for equipping a DN 2 equipment in a 20 T cartridge, 40 T cartridge and 19-inch subrack. The basic alternatives can also be combined to create different combinations. The table shows also the number of units that can be contained in each configuration.

	CU	(E)BPU	IU2	PIA	CH	TOTAL
20 T	1	1-2	1-2	0	0-1	4
2 x 20 T <sup>1)</sup>	1	2-4	2-5	0-1	0-2	8
2 x 20 T <sup>2)</sup>	1	1-2	1-3	0-2	0-5*	8
3 x 20 T <sup>2)</sup>	1	1-2	1-3	0-3	0-9*	12
3 x 20 T <sup>3)</sup>	1	2-4	2-7	0-3	0-5*	12
40 T	1	1-2	1-6	0-1	0-5*	8
2 x 40 T <sup>1)</sup>	1	2-4	2-13	0-2	0-6*	16
2 x 40 T <sup>2)</sup>	1	1-2	1-7	0-2	0-13*	16
3 x 40 T <sup>2)</sup>	1	1-2	1-7	0-3	0-17*	21
3 x 40 T <sup>3)</sup>	1	2-4	2-14	0-3	0-13*	24
19"	1	1-2	1-14	0-1	0-13*	16
2 x 19" <sup>1)</sup>	1	2-4	2-20	0-2	0-13*	29

1) DN 2 bus extended with cable CX 24171.10

2) DYNACARD bus extended with cable TX 21178.xx

3) DN 2 bus and DYNACARD bus extended with cables CX 24171.10 and TX 21178.xx

\* The number of channel units that can be configured in the equipment is limited by the number of faults supervised in each channel unit and the number of supervision blocks relating to the faults.  
Installation always in locations 2...20.

Table 2 *Equipping alternatives for the DN 2 equipment*

#### NOTE

When the DN 2 bus is extended, the unit location 1 in the basic subrack and the unit location 17 in the extension subrack shall contain an IU2.

Extension of the DYNACARD bus is described in the *Operating Handbook for the TM4 Construction Practice*. The extension of the DYNACARD bus in the DN 2 equipment does not differ in any way from the same procedure in the DM 2 equipment.



### 3.4 Equipping of one Cartridge

*Figure 11* shows an equipping example. A20 T cartridge is provided with a DN 2 Dynamic Node Equipment consisting of two Interface Units (IU2), one Control Unit (CU) and a Bus Power Unit (BPU). One cartridge/sub-rack is sufficient for a DN 2 equipment with up to 28 ports.

It is recommended that the IU2s be installed in successive unit locations starting from unit location one, since the port numbering follows the numbering of unit locations (unit 1: ports 1 and 2, unit 2: ports 3 and 4 etc.). The cartridge/subrack used (4, 8 or 16 unit locations) is chosen to suit the equipment configuration.

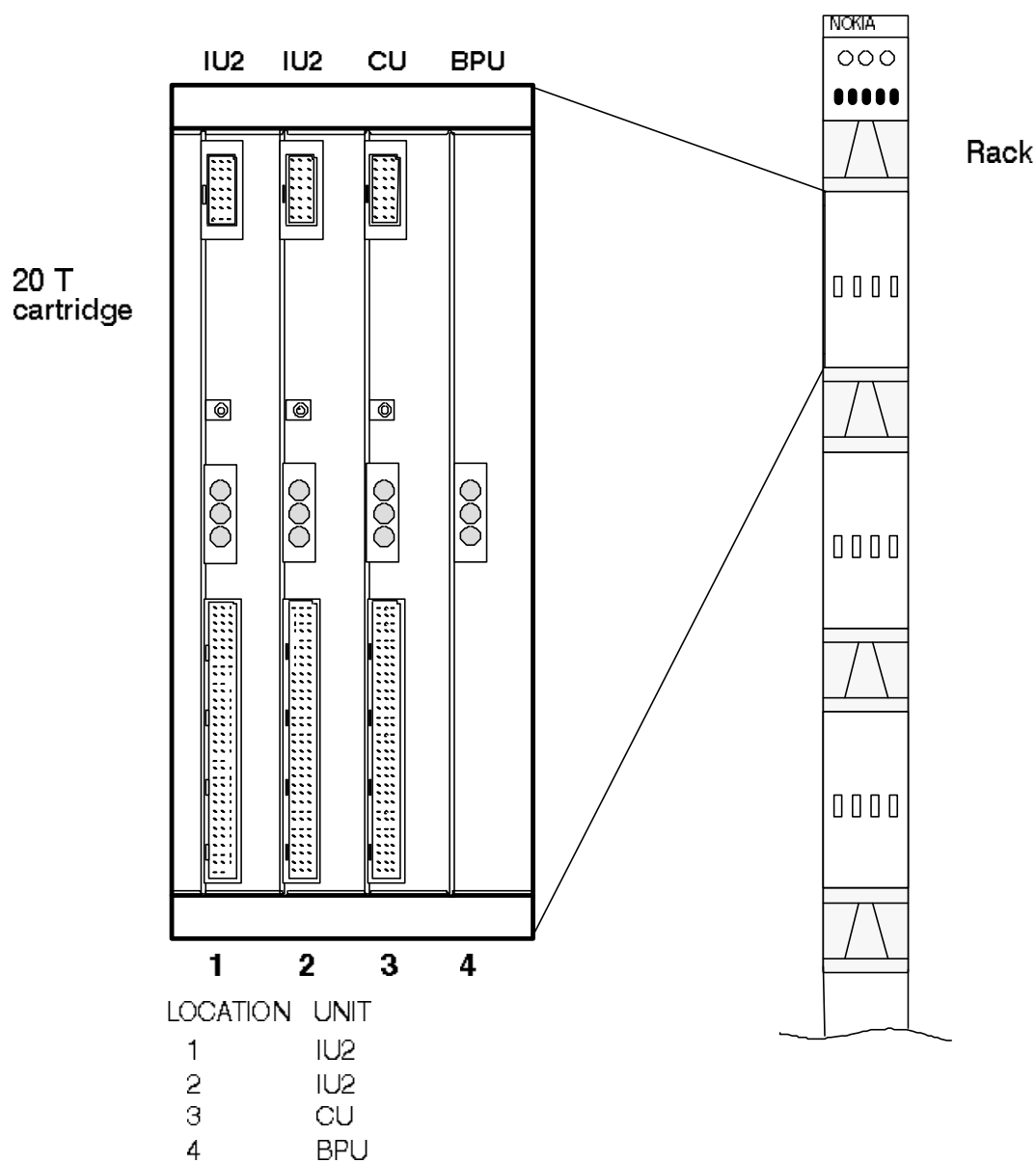
The BPU is inserted into the location at the extreme right. However, if the subrack contains a PIA (Power Interface Adapter), the PIA should be placed in the location at the extreme right and the BPU next to the PIA.

It is recommended that the CU be inserted to the right, next to the PIA and the BPU.

The channel units can be installed in those unit locations that are not occupied by the other units.

The EBPU can be used in a 28-port DN 2 equipment when the option of extending the buses is required. The red LED of the unit will be ON unless it is forced OFF by connecting the following pins of connector P4 to each other:

- c14 and a15
  - a1,c2,a3,c4,a5,c6,a7,c8,a9,c10,a11,c12,a13,c16,a17,c18 and a19
-



DN6528EC1

Figure 11 Equipping example, DN 2

### 3.5 Equipping of two Subracks

This section describes how two 19-inch subracks are combined to obtain a 40-port DN 2 equipment. However, the instructions are also applicable for combining two 40 T or 20 T cartridges.

The basic subrack and the extension subrack are combined into one 40-port equipment by installing cables between the EBPU's to interconnect the DN 2 buses of the two subracks (see *Figure 12*).

**To ease the installation, the set of cables delivered for a 40-port DN 2 equipment is accompanied by installation instructions C4R 860194-E CX 24171.10 DN 2 Bus Cables Installation Instruction.**

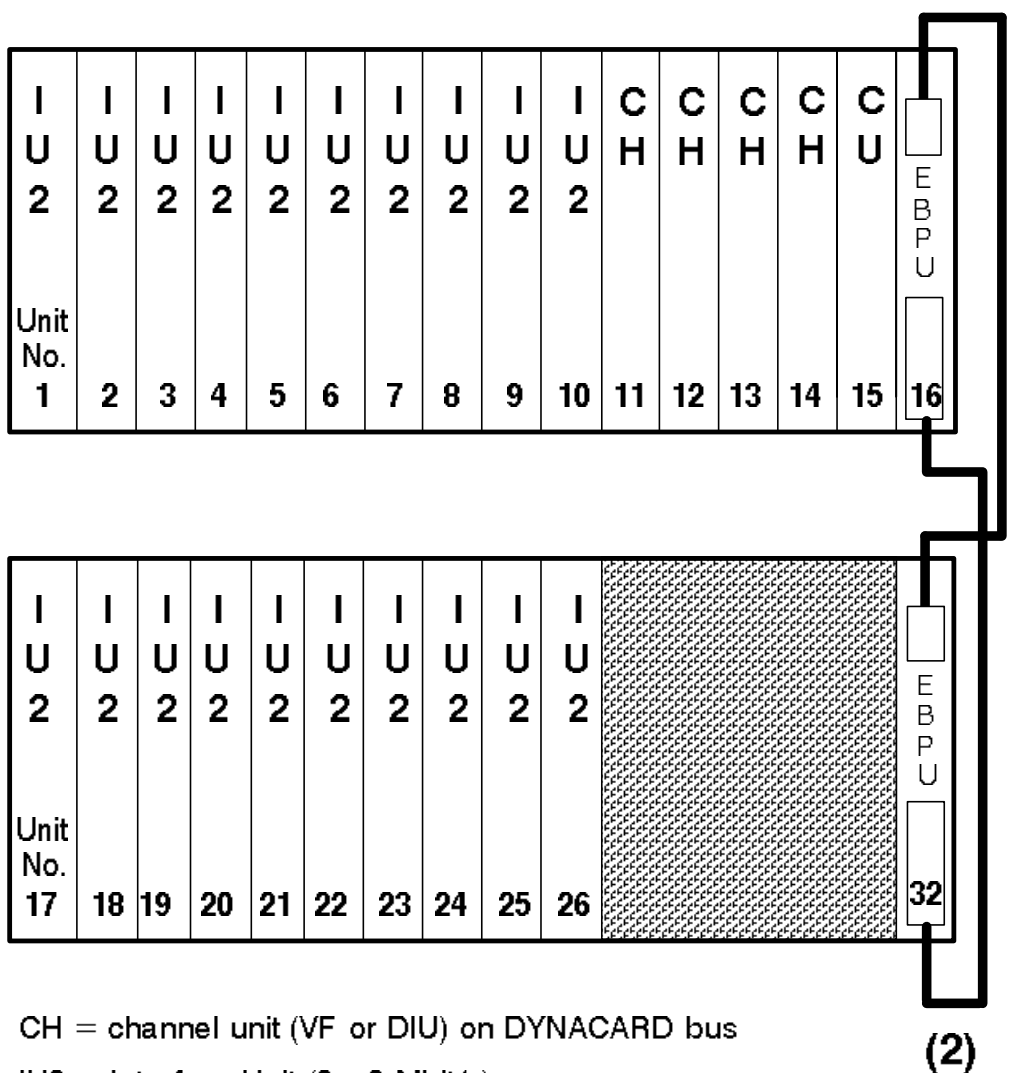
When you install units in a subrack, make sure that no units, excluding the EBPU and the PIA, are installed in unit locations > 26. The IU2s can be installed in locations 1–10 and 17–26 only (locations 1 and 17 must contain an IU2); channel units can be installed in unit locations 2–16. Bus protection is not available in a 40-port equipment.

Different equipping alternatives for a 28- and 40-port DN 2 equipment are shown in *Tables 3 and 4*. *Figures 12 and 13* give examples on different equipping alternatives for a 40-port DN 2 equipment as well as on cabling between the subracks.

---

Cable set CX 24171.10:

- (1) Cable for extending the command bus of the DYNACARD bus
- (2) DN 2 bus cable



CH = channel unit (VF or DIU) on DYNACARD bus

IU2 = Interface Unit (2 x 2 Mbit/s)

CU = Control Unit

DN6618EB2

Figure 12 40-port DN 2: channel units on DYNACARD bus, no PLA

Cable set CX 24171.10:

(1) Cable for extending the command bus of DYNACARD bus

(2) DN 2 bus cable

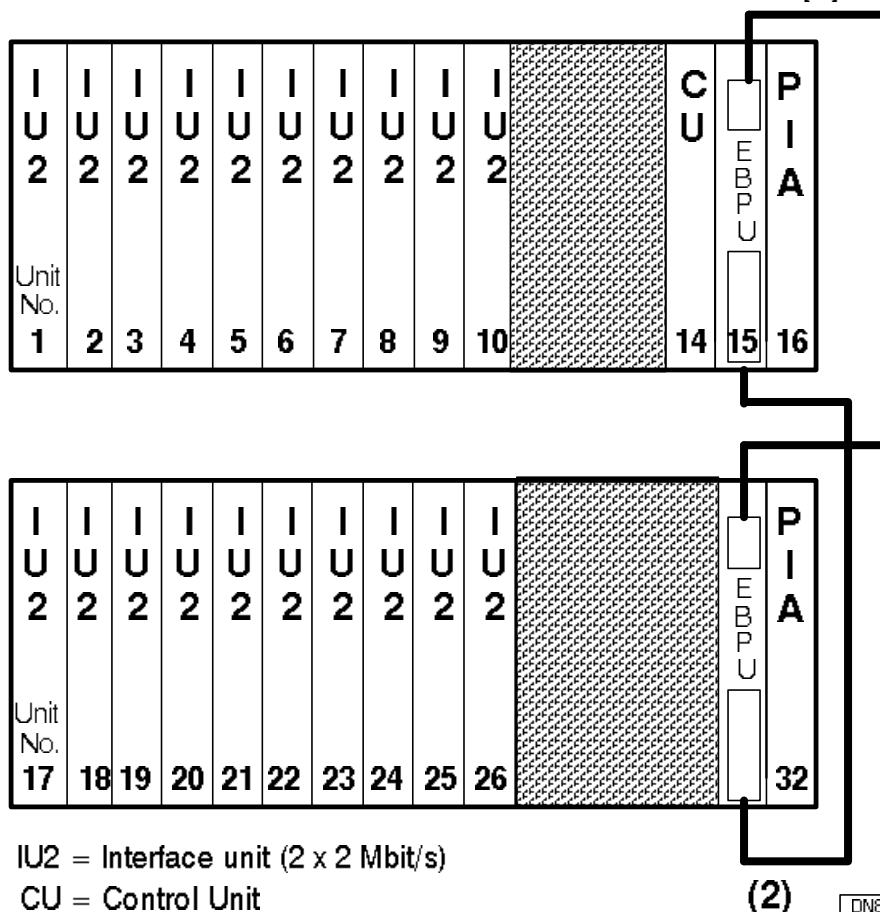


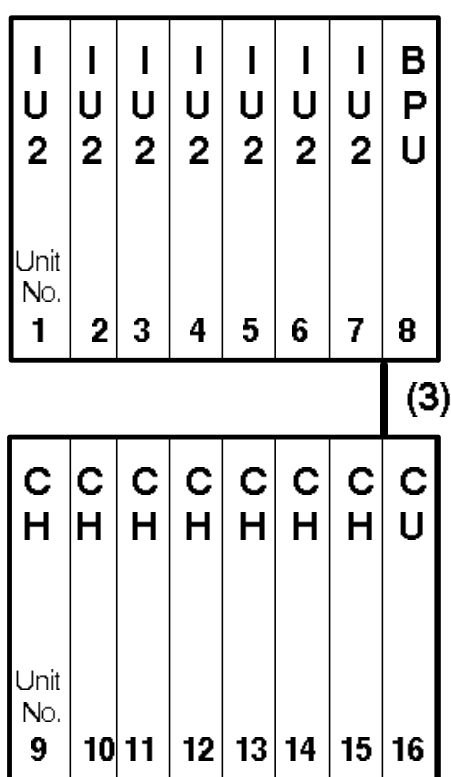
Figure 13 40-port DN 2: PIA and EBPU in the same subrack

### 3.6 Extending the DYNACARD Bus

This section describes how two cartridges of 40 T are connected to each other by extending the DYNACARD bus through cable set TX 21178.xx. These instructions are also applicable to those cases shown in *Table 2* where the DYNACARD bus is extended. It is important to remember that the basic subrack can contain any kinds of unit whereas the extension subrack can contain channel units or the CU only (see *Table 5*).

Cable set TX 21178:

(3) Extension cable for DYNACARD bus



DN8711EA1

CH = channel unit (VF or DIU) on the DYNACARD bus

IU2 = Interface unit (2 x 2 Mbit/s)

CU = Control unit

*Figure 14 Extending the DYNACARD bus*

### 3.7 Types of Unit Suited for each Unit Location

! = obligatory installation  
x = recommended installation  
p = possible installation

Type of unit	Unit location			
	1	2–10	11–15	16
IU2	!	x	x	p
CU		p	x	p
VF/DIU		p	x	p
(E)BPU		p	x	x
PIA		p	p	x
OTHER		(p)	(p)	(p)

Table 3 Types of unit suited for each unit location in one subrack

Type of unit	Unit location							
	1	2–10	11–15	16	17	18–26	27–31	32
IU2	!	x			!	x		
CU		p	x	p				
VF/DIU		p	x	p				
EBPU		p	x	x		p	x	x
PIA				x				x
OTHER		(p)	(p)	(p)		(p)	(p)	(p)

Table 4 Types of unit suited for each unit location when extension subrack is used

Type of unit	Unit location			
	Basic subrack		Extension subrack	
	1	2...	...20	21...
IU2	!	x		
CU		x	x	
VF/DIU		x	x	
(E)BPU		x		
PIA		x	x	x
OTHER		(p)	(p)	(p)

*Table 5*      *Types of unit suited for each unit location in cases when the DYNACARD bus is extended to the extension subrack*



## 4 CABLING OF CU AND IU2

This chapter explains the cabling of the CU and IU2 in the DN 2. The BPU requires no cabling (on the cabling of EBPU, see Section 3.5 *Equipping of Two Subracks*).

Cabling of other units is described in the installation instructions of the individual units. General cabling instructions complying with the TM4 Construction Practice, as well as instructions for mounting connectors onto cables, can be found in the *Operating Handbook for TM4 Construction Practice*.

Cabling is recommended to be performed using a 1/4 Euroconnector and two balanced pair cables:

- shielded balanced pair cable  
NOKIA KLVMAAM 2 x (2 x 0.4+0.4)+0.4  
NOKIA code 7130434
  - Euroconnector: 1/4, 3x7, wire-wrap, female  
NOKIA TX 21470
-

## 4.1 Front Connectors of CU and IU2 Units

The front connectors of the CU and IU2 unit types are illustrated in *Figures 15 and 16*.

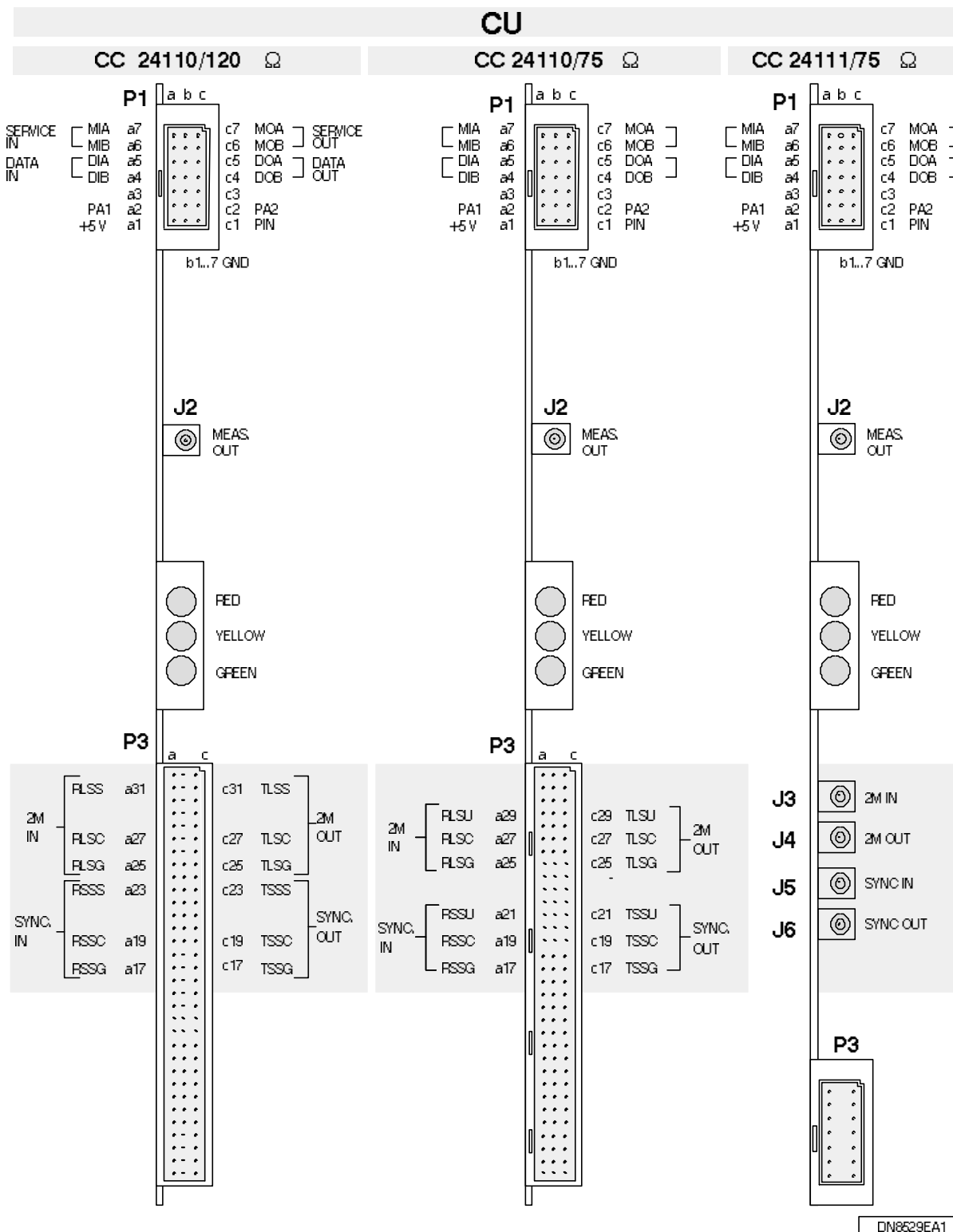


Figure 15 Front connectors of CU unit versions

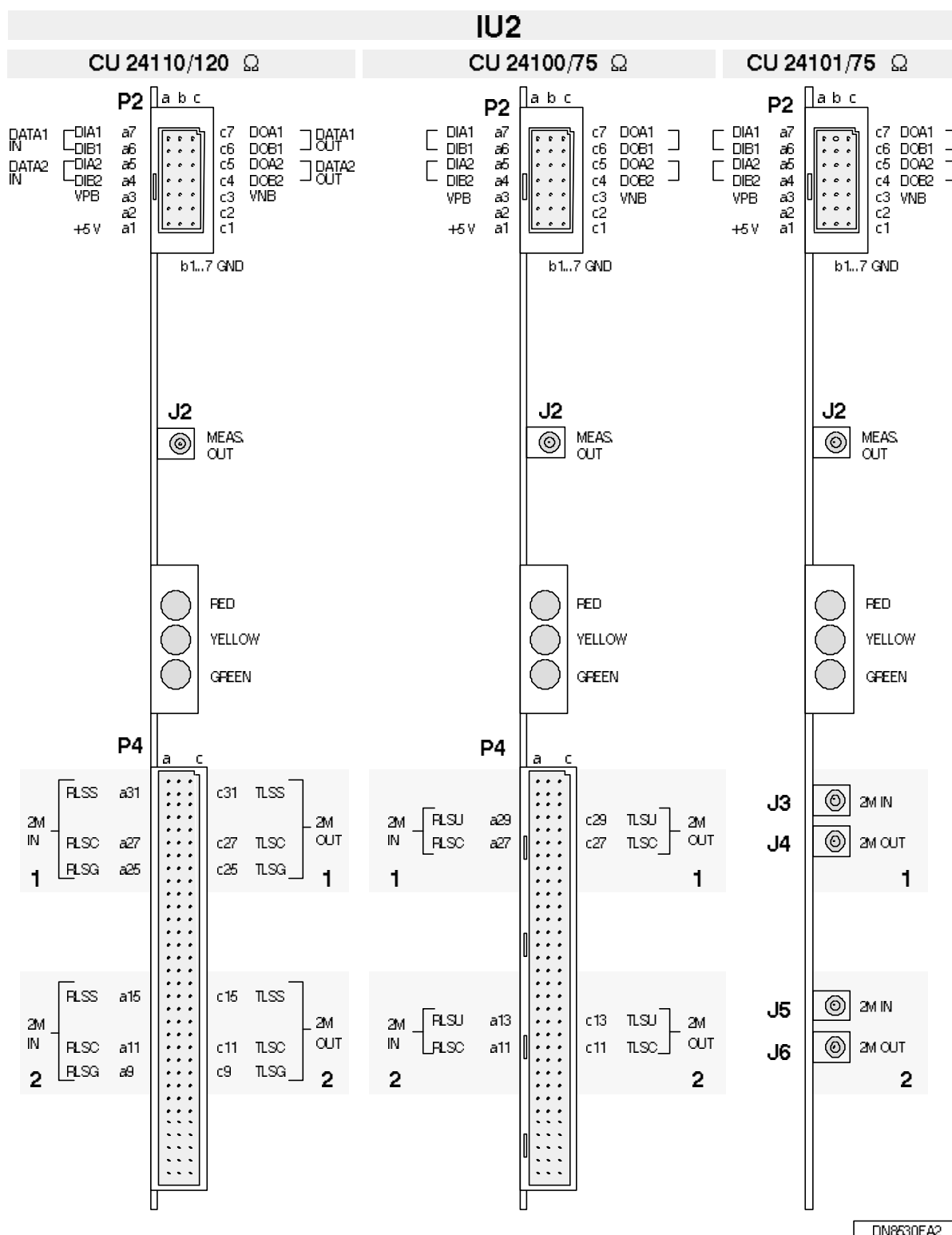


Figure 16 Front connectors of IU2 unit versions

## 4.2 Cabling of Service Connector

### 4.2.1 Cabling of Service Connector of CU

Service connector P1 is located on the CU. The connector includes the service interface (MI), auxiliary data channel interface (DI) and programmable alarm interfaces (PA1, PA2, PIN) of the DN 2 equipment.

The transmission management (with Service Terminal or centralized Transmission Management System, TMS) of the DN 2 takes place via the service interface. Via the auxiliary data channel interface, the auxiliary data channel, operating on sampling principle, can be taken into use in the equipment. The alarm interface consists of programmable alarm outputs (PA1, PA2) and a programmable alarm input (PIN).

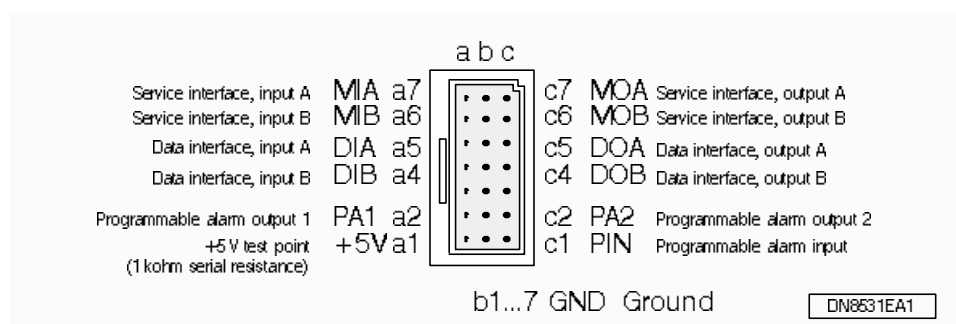


Figure 17 Interfaces of service connector P1 of CU

PIN	SYMBOL	CABLE	PAIR	COLOUR
a7	MIA	I	1	blue
a6	MIB			white
b7	GND			clear
c7	MOA	2	2	blue
c6	MOB			white
b6	GND			clear
a5	DIA	II	1	blue
a4	DIB			white
b5	GND			clear
c5	DOA	2	2	blue
c4	DOB			white
b4	GND			cleat

Table 6 Cabling of service connector P1 of CU

## 4.2.2 Cabling of Service Connector of IU2

Service connector P2 is located at the top edge of the IU2. The connector includes the auxiliary data channel interfaces 1 and 2. In addition, the connector receives a battery voltage for the Service Terminal. The battery voltage can be disconnected by jumper settings.

Via the auxiliary data channel interfaces, the auxiliary data channels, operating on sampling principle, can be taken into use in the equipment. The auxiliary data channels use the vacant bits B5–B8 of time slot TS0. The sampling frequency is 4, 8 or 16 kHz.

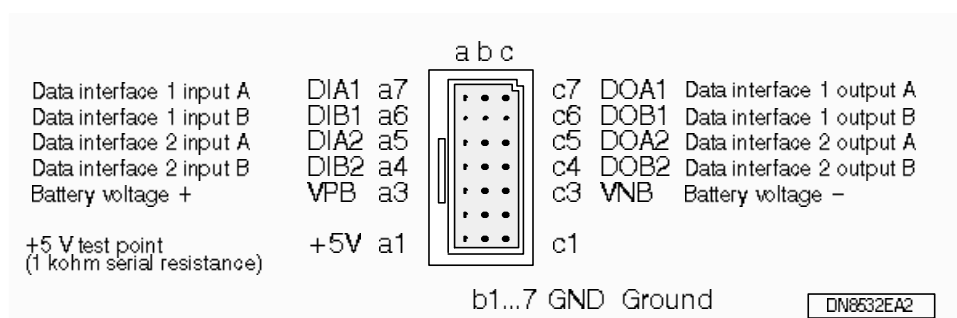


Figure 18 Interfaces of service connector P2 of IU2

PIN	SYMBOL	CABLE	PAIR	COLOUR
a7	DIA1	I	1	blue
a6	DIB1			white
b7	GND			clear
c7	DOA1	II	2	blue
c6	DOB1			white
b6	GND			clear
a5	DIA2	I	1	blue
a4	DIB2			white
b5	GND			clear
c5	DOA2	II	2	blue
c4	DOB2			white
b4	GND			clear

Table 7 Cabling of service connector P2 of IU2

### 4.3 Cabling of 2048 kbit/s Interfaces

The 2048 kbit/s interfaces of the DN 2 equipment are, depending on the unit type, either in one full-length Euroconnector (IU2: CU 24100, CU: CC24110) or in four coaxial connectors (IU2: CU 24101, CU: CC24111).

#### 4.3.1 Units CU 24100 (IU2) and CC 24110 (CU)

Connector P4 of the IU2 provides two 2048 kbit/s interfaces. The corresponding connector of the CU, P3, provides a 2048 kbit/s interface and the synchronization interface, see *Figures 15 and 16*, and *Tables 8 and 9*.

PIN	SYMBOL	USE
a31	RLSS1	Received 2048 kbit/s signal; 120 ohms
a29	RLSU1	Received 2048 kbit/s signal; 75 ohms
a27	RLSC1	Received 2048 kbit/s signal; common
a25	RLSG1	Received signal ground
c31	TLSS1	Transmitted 2048 kbit/s signal; 120 ohms
c29	TLSU1	Transmitted 2048 kbit/s signal; 75 ohms
c27	TLSC1	Transmitted 2048 kbit/s signal; common
c25	TLSG1	Transmitted signal ground
a15	RLSS2	Received 2048 kbit/s signal; 120 ohms
a13	RLSU2	Received 2048 kbit/s signal; 75 ohms
a11	RLSC2	Received 2048 kbit/s signal; common
a9	RLSG2	Received signal ground
c15	TLSS2	Transmitted 2048 kbit/s signal; 120 ohms
c13	TLSU2	Transmitted 2048 kbit/s signal; 75 ohms
c11	TLSC2	Transmitted 2048 kbit/s signal; common
c9	TLSG2	Transmitted signal ground

Table 8 2048 kbit/s interfaces 1 and 2 in IU2 (CU 24100)

PIN	SYMBOL	USE
a31	RLSS	Received 2048 kbit/s signal; 120 ohms
a29	RLSU	Received 2048 kbit/s signal; 75 ohms
a27	RLSC	Received 2048 kbit/s signal; common
a25	RLSG	Received signal ground
c31	TLSS	Transmitted 2048 kbit/s signal; 120 ohms
c29	TLSU	Transmitted 2048 kbit/s signal; 75 ohms
c27	TLSC	Transmitted 2048 kbit/s signal; common
c25	TLSG	Transmitted signal ground
a23	RSSS	Received synchronization signal; 120 ohms
a21	RSSU	Received synchronization signal; 75 ohms
a19	RSSC	Received synchronization signal; common
a17	RSSG	Received synchronization signal ground
c23	TSSS	Transmitted synchronization signal; 120 ohms
c21	TSSU	Transmitted synchronization signal; 75 ohms
c19	TSSC	Transmitted synchronization signal; common
c17	TSSG	Transmitted synchronization signal ground

Table 9      2048 kbit/s interface and synchronization interface in CU  
(CC 24110)

## Cabling

Cabling is recommended to be performed using 1/4 Euroconnectors and balanced pair cable, in which case one connector is required for each interface:

- shielded balanced pair cable  
NOKIA KLVMAAM 2 x (2 x 0.4+0.4)+0.4  
NOKIA code 7130434
- Euroconnector: 1/4, 3x7, wire-wrap, female  
NOKIA TX 21470

PIN		SYMBOL	CABLE PAIR	CABLE	
IU2:1	IU2:2			120 ohms	75 ohms
CU					
a31, a15		RLSS	1	blue	
a29, a13		RLSU			blue
a27, a11		RLSC		white	white
a25, a9		RLSG		clear	clear
c31, c15		TLSS	2	blue	
c29, c13		TLSU			blue
c27, c11		TLSC		white	white
c25, c9		TLSG		clear	clear

Table 10 Cabling of 2048 kbit/s interfaces

PIN	SYMBOL	PAIR	CABLE	
			120 ohms	75 ohms
a23	RSSS	1	blue	
a21	RSSU			blue
a19	RSSC		white	white
a17	RSSG		clear	clear
c23	TSSS	2	blue	
c21	TSSU			blue
c19	TSSC		white	white
c17	TSSG		clear	clear

Table 11 Cabling of 2048 kHz synchronization interface of CU



### 4.3.2 Units CU 24101 (IU2) and CC 24111 (CU)

Connectors J3, J4, J5 and J6 of the IU2 provide the 2048 kbit/s interfaces 1 and 2 of the DN 2 equipment. Connectors J3 and J4 of the CU provide the 2048 kbit/s interface, whereas connectors J5 and J6 contain the synchronization interface, see *Figures 15 and 16* and *Tables 12 and 13*.

Both the 2048 kbit/s interfaces and the synchronization interface require an SMB coaxial cable and coaxial connectors:

- coaxial cable RD 179 (NOKIA code 7134968)
- SMB connector, NOKIA TX 21475.05, for the RD 179 cable (EMC) manufacturer IMS MORAT, type 327.11.2420.051

---

#### CC 24101: 2M interfaces 1 and 2; 75 ohms

---

J3	RLS1	2048 kbit/s signal received by interface 1
J4	TLS1	2048 kbit/s signal transmitted from interface 1
J5	RLS2	2048 kbit/s signal received by interface 2
J6	TLS2	2048 kbit/s signal transmitted from interface 2

---

*Table 12      2048 kbit/s interfaces 1 and 2; 75 ohms*

---

#### CC 24111: 2M interface and synchronization interface; 75 ohms

---

J3	RLS	Received 2048 kbit/s signal
J4	TLS	Transmitted 2048 kbit/s signal
J5	RSS	Received synchronization signal
J6	TSS	Transmitted synchronization signal

---

*Table 13      2048 kbit/s interface and synchronization interface, 75 ohms*

---

## 4.4 Marking of Cabling

Cables are to be marked so that it is later possible to see where they lead. The markings should specify the equipments and connectors concerned. The cabling data, as well as data on jumper settings, are also recorded on a marking card delivered with the equipment.

One side of the marking card is intended for cabling data (see *Figure 19*), and the other side for data on jumper settings (see *Figure 20*). The card also provides some space for the settings of the service interface.

Instructions regarding the markings can be found in the *Operating Handbook for the TM4 Construction Practice*.

Properly filled in, the card also facilitates servicing, testing, and installation at a later stage.

---

MARKING OF THE CABLE  
END CONNECTED TO UNIT

MARKING INDICATING THE  
CONNECTION POINT FOR  
THE OTHER CABLE END

**DN 2 CU 24100**

Unit location: ☐

Equipm. ID: \_\_\_\_\_

Address: \_\_\_\_\_

**Cable identification:**

This end                      Other end

MARKING OF THE CABLE  
END CONNECTED TO UNIT

**DN2 IU CU24100**

DIA1 7  
DIE1 5  
DIA2 3  
DIE2 1

a b c

DOA1  
DOE1  
DOA2  
DOE2  
VNB

DI1 —  
DO1 —  
DI2 —  
DO2 —

○ MEAS

RLSx                      TLSx

R120                      T120

R75                        T75

RCOMM                      TCOMM

RGND                        TGND

a b c

RLS1 —  
TLS1 —  
RLS2 —  
TLS2 —

EXAMPLE  
OF MARKING

1 Rack row  
B Location of rack  
02 Cartridge location  
S Cartridge shelf  
(R = cables from above,  
S = cables from below  
into cartridge)

4 Unit location  
xxx Connector for the  
other cable end

—1B02S4xxx

DN8533EA3

Figure 19 Marking card, cabling

## DN 2 CU 24100

Unit location: ☐

Equipm. ID: \_\_\_\_\_

Address: \_\_\_\_\_

**Selections:**

☐ No connection

☒ Connection (with U-link)

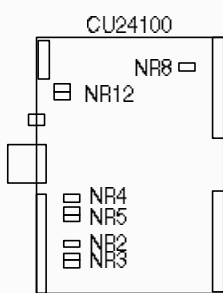
☒ Connected at factory

☒ Connection made at installation (fill the right box)

<p>SUPPLY VOLTAGE TO DYNACARD-BUS:</p> <p>VP5 <input checked="" type="checkbox"/> <input type="checkbox"/> NR8</p> <p>Alternatives: a: Other units b: In one unit per equipment</p>	<p>BATTERY VOLTAGE TO SERVICE TERMINAL:</p> <p>VPBM <input checked="" type="checkbox"/> <input type="checkbox"/> NR12 VNBM <input checked="" type="checkbox"/> <input type="checkbox"/></p> <p>Alternatives: a: Charging ST b: Not charging ST</p>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**INTERFACES:**

<p>T75 <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/></p> <p>R75 <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/></p> <p>RGND <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/></p> <p>Alternatives: a: 120 ohm symmetric interface b: 75 ohm asymmetric interface c: 75 ohm interface input signal ground connected to frame</p>	<p>NR2, NR4</p> <p>NR3, NR5</p>
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CU24100

Supply voltage:  
a ☒ b ☐

Battery voltage:  
a ☒ b ☐

Interface 1:  
a ☐ b ☐ c ☒

Interface 2:  
a ☐ b ☐ c ☒

DN8534EA3

Figure 20 Marking card, jumper settings

## 5 INSTALLATION EXAMPLES

The examples below list the procedures and checks that should be carried out when installing the unit and taking it into use in different situations.

### 5.1 First Installation

#### At installation stage

- Install the subrack in the rack.
- Prepare the required cables.
- Set jumpers on the units.
- Install the units in the subrack/cartridge and connect the cables.
- Read Section 2.3 *Check list for jumper settings*; check the jumper settings on the marking card and on the unit.

#### At commissioning stage (further information in part *Operation*)

- Read Sub-section *Compatibility of CU and IU2 settings* in part *Operation*.
- Connect voltages to the equipment.
- Assign the following settings using a Service Terminal Emulator. At least the following settings are necessary: equipment installation, network timing and 2M-interface parameters.
- Check all settings using the Service Terminal Emulator.
- Define the required connections using a DN 2 Manager.
- Test the connections and timing.
- Reset statistics using the Service Terminal Emulator.

### 5.2 Adding one Unit

#### At installation stage

- Prepare the required cables.
- Set jumpers on the new unit.
- Read Section 2.3 *Check list for jumper settings*; check the jumper settings on the marking card and on the unit.
- Install the unit in the subrack/cartridge and connect the cables.

#### At commissioning stage (further information in part *Operation*)

- Read Sub-section *Compatibility of CU and IU2 settings* in part *Operation*.
  - Assign the following settings using a Service Terminal Emulator. At least the following settings are necessary: equipment installation and 2M-interface parameters.
-

- Check all settings using the Service Terminal Emulator.
- Define the required connections using a DN 2 Manager.
- Test the connections (and timing).
- Reset statistics of the unit added using the Service Terminal Emulator.

### 5.3 Changing one Unit

#### **At installation stage**

- Remove the old unit from the subrack (but do not exclude the unit from the configuration via the service interface).
- Set jumpers on the new unit in the same places as on the old unit.
- Install the new unit in the subrack/cartridge.

#### **At commissioning stage** (further information in part *Operation*)

- Check that the settings and connections have been successfully saved into the new unit (reading and saving takes place automatically in the DN 2 if the unit containing the back-up copy of the unit is in its place and operational. The back-up copy is stored in the unit next to the unit to be changed (on the right).
  - If you change several units, wait for approximately 2 minutes before changing the next unit.
-

## 5.4 Updating a 28-port Equipment to a 40-port Equipment

### At installation stage

- Install the extension subrack in the rack.
- Prepare the required cables.
- Disconnect voltages from the basic subrack.
- Remove the IU2s from unit locations 11...16 in the basic subrack to unit locations 17...22 in the extension subrack.
- Remove the cables from unit locations 11...16 in the basic subrack to unit locations 17...22 in the extension subrack.
- Set jumpers on the new units (at least the EBPU).
- Install the new units in the extension subrack (at least the EBPU).
- If the basic subrack contains a BPU, replace it with an EBPU.
- Connect the basic subrack and the extension subrack to each other using DN 2 cables.
- Read Section 2.3 *Check list for jumper settings*; check the jumper settings on the marking card and on the unit.

### At commissioning stage (further information in part *Operation*)

- Read Sub-section *Compatibility of CU and IU2 settings* in part *Operation*.
  - Connect voltages to the equipment.
  - Perform equipment installation again because changing a unit location excludes from the configuration the units removed.
  - Using a Service Terminal Emulator, set the number of unit locations to 32.
  - Assign the required settings using a Service Terminal Emulator.
  - Define the required connections using a DN 2 Manager.
  - Test the connections and timing.
  - Reset statistics using the Service Terminal Emulator.
-