

## Chapter 3 Bus Extender Board used with CPU PM511

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### 3.1 General

The bus extender used with CPU PM511 is DSBC 174. PM511 incorporates a bus extender function that makes it possible to connect it directly to DSBC 174. This bus extender could be used in three different configurations:

- Single CPU configuration
- Redundant CPU configuration with single bus cable and extenders.
- Redundant CPU configuration with redundant bus cables and extenders.

DSBC 174 should be placed in the last position of the I/O subrack if single bus extender is used and in the last and second last if redundant bus extenders are used.

DSBC 174 could also be used as a replacement for DSBC 173A but must in this case be strapped accordingly to be fully compatible with DSBC 173A.

The following functions are supported:

- Bus clock signals, generated for the backplane bus on the I/O subrack.
- Supervision of functions such as fans and redundant regulators.
- LED's on the DSBC 174 front, indicating status of the I/O subrack.

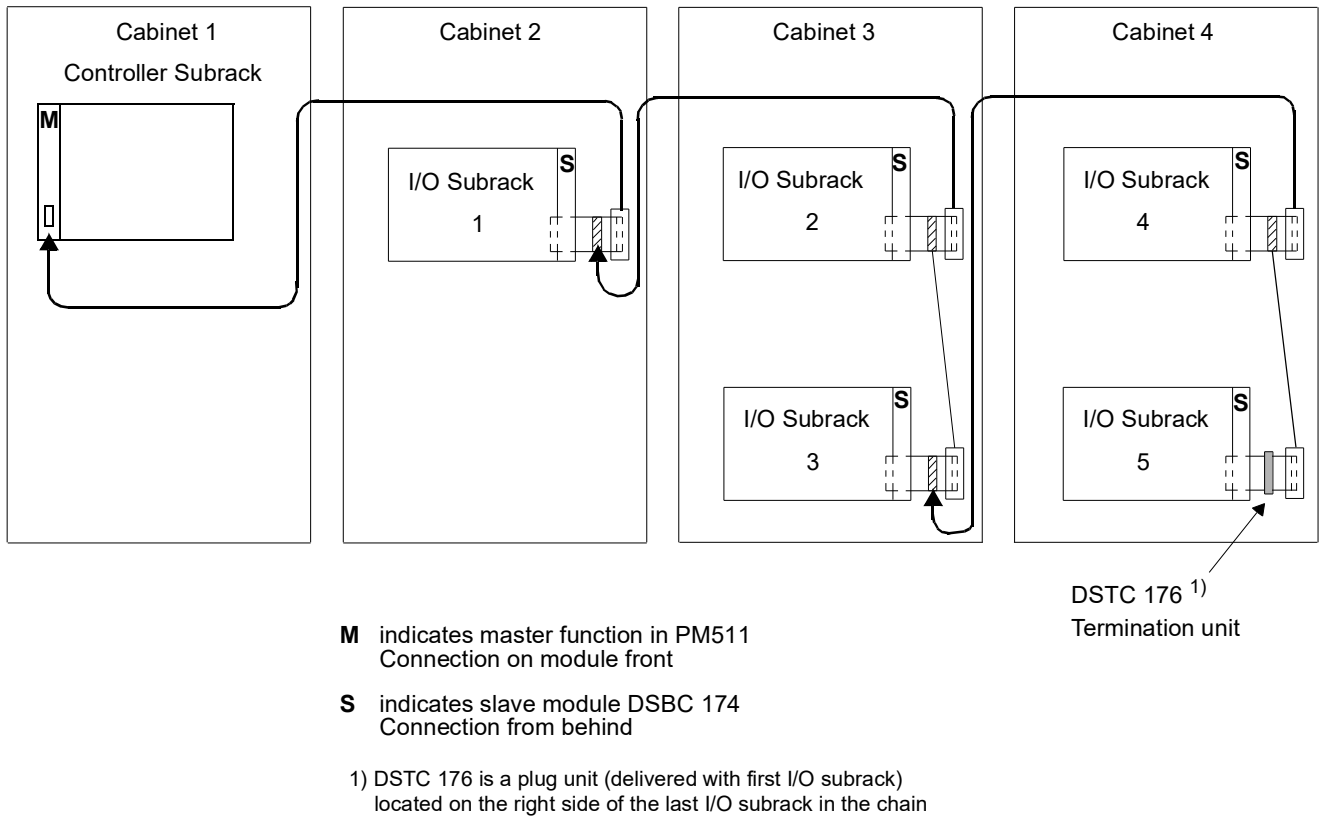


Figure 3-1. Example of How to Connect a Single PM511 to DSBC 174 in a RE Cabinet

The bus extender (see Figure 3-1) consists of:

- One master interface on PM511
- One to five slave boards, DSBC 174, each located in a separate I/O subrack
- Standard cables which connect between the PM511 and the first DSBC 174, and between the I/O subracks.

The maximum length of the bus extension is 12 m, that is, the total length of the bus cables used.

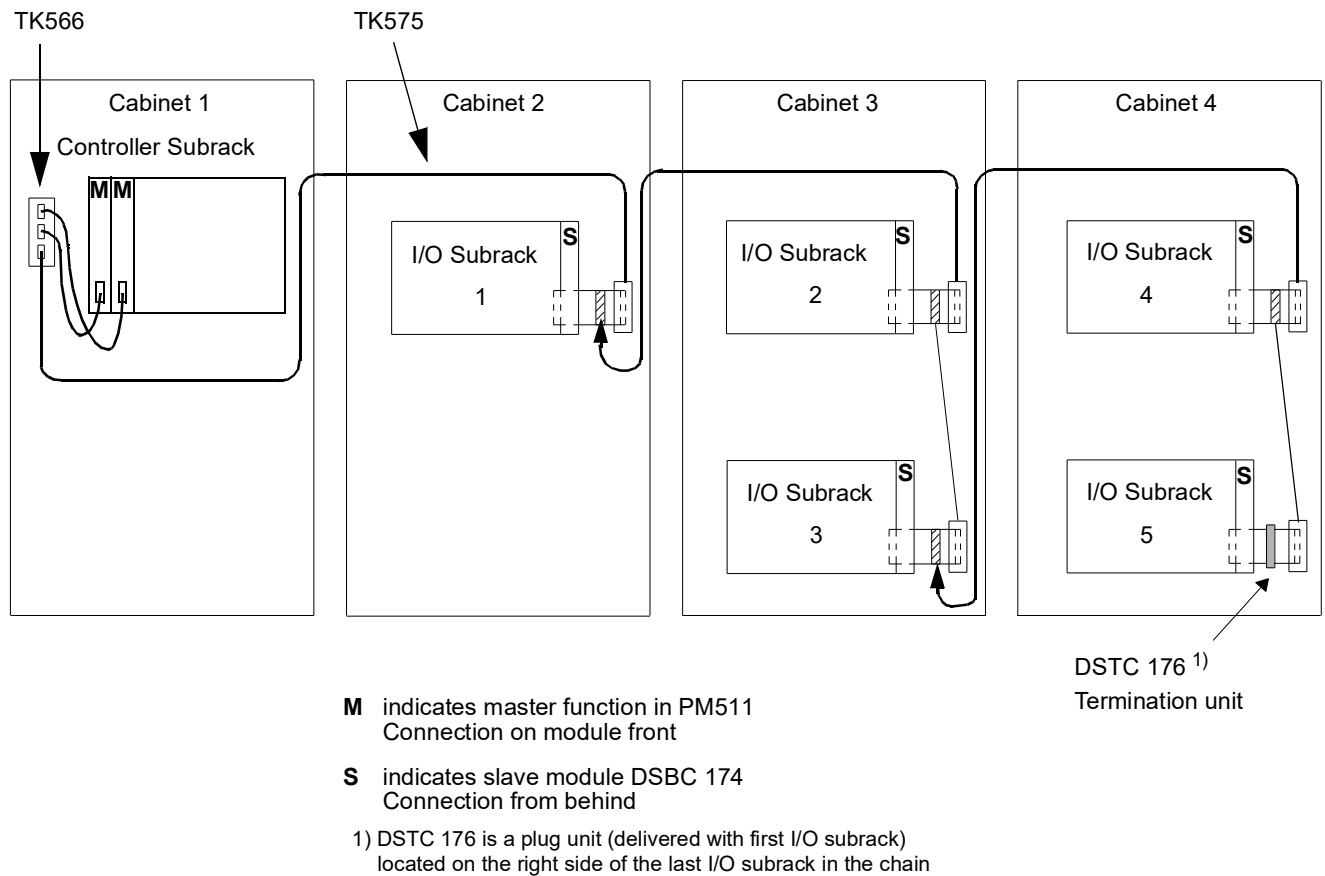


Figure 3-2. Example of How to Connect Redundant PM511's to DSBC 174 in a RE Cabinet

The bus extender (see Figure 3-2) consists of:

- Two master interface on PM511's
- One TK566 interconnector to allow the two PM511 to share cable and bus extension.
- One to five slave boards, DSBC 174, each located in a separate I/O subrack.
- Standard cables which connect the two PM51s via TK566 to the first DSBC 174, and between the I/O subracks.

The maximum length of the bus extension is 12 m, that is, the total length of the bus cables used.

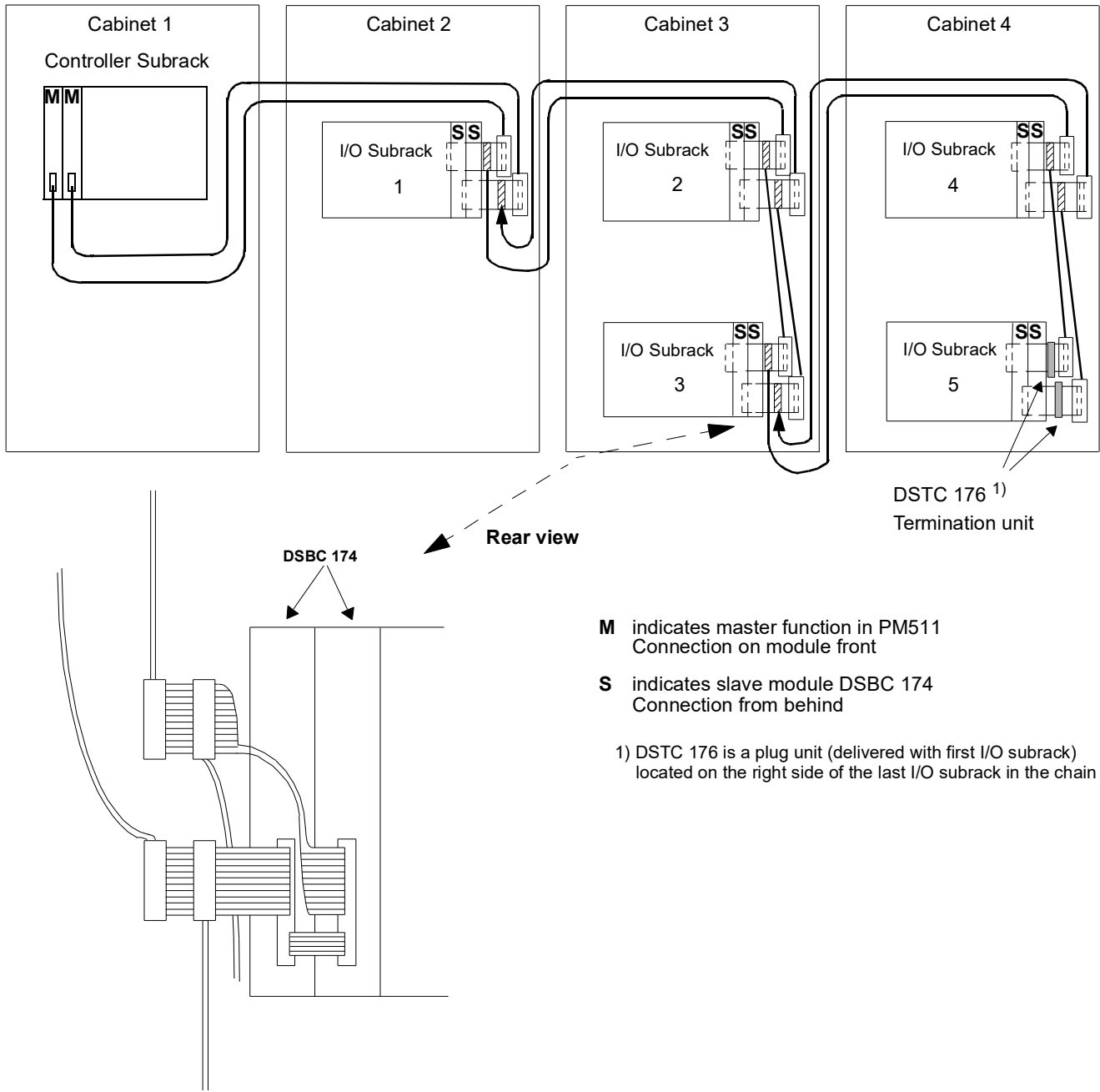


Figure 3-3. Example of How to Connect Redundant PM511's to Redundant DSBC 174's in a RE Cabinet

The bus extender (see Figure 3-3) consists of:

- Two master interface on PM511
- Two to ten slave boards, DSBC 174, two and two located in a separate I/O subrack
- Standard cables which connect between the PM511's and the first two DSBC 174, and between the I/O subracks.

The maximum length of the bus extension is 12 m, that is, the total length of the bus cables used.

### 3.2 Front Panels

Figure 3-4 show the front panel of the bus extender board DSBC 174

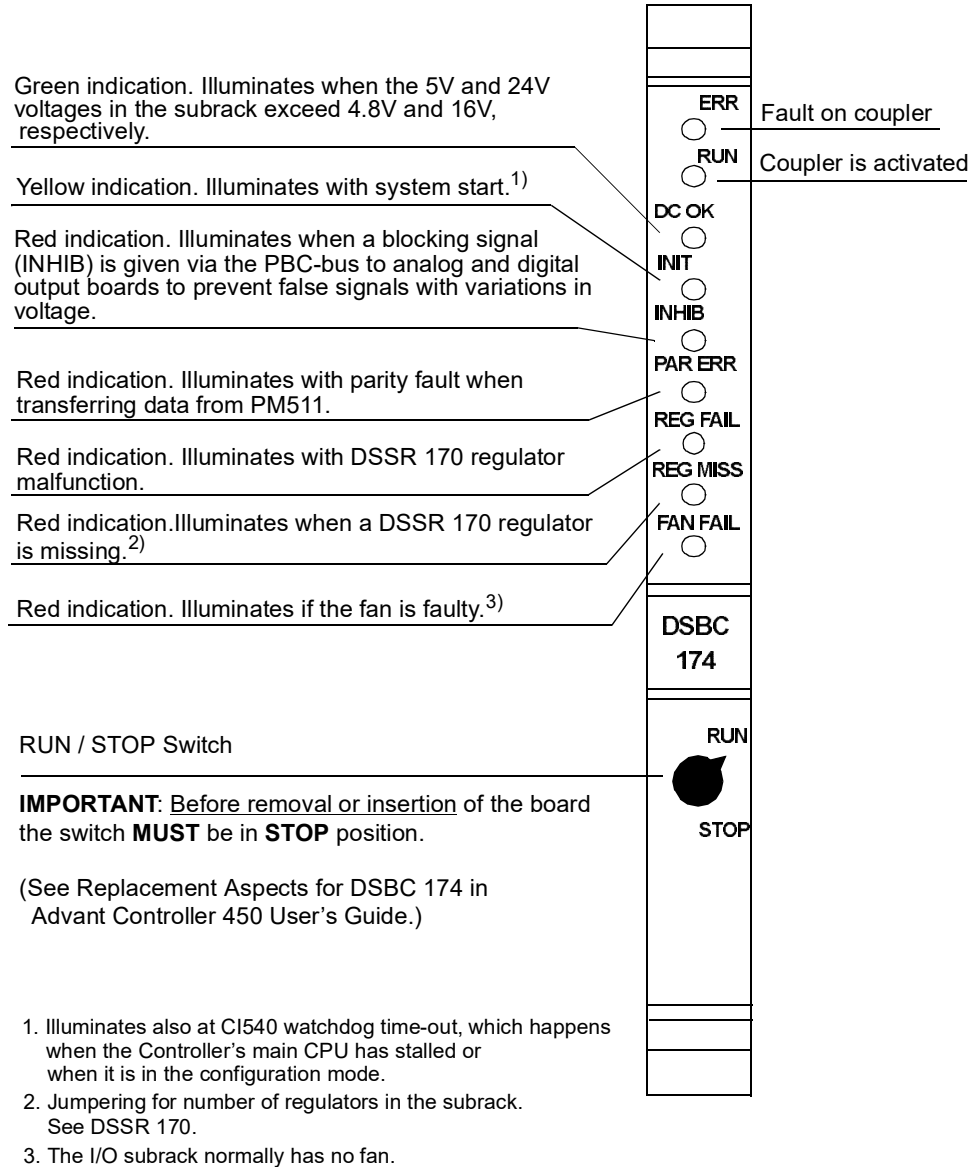


Figure 3-4. Front Panel of the Bus Extender Board DSBC 174

### 3.3 Jumpering

There are no jumpers on PM511. The bus extender board DSBC 174's jumpers are shown in the Table 3-1 and Figure 3-5 below.

Table 3-1. Jumpering of the Bus Extender Board DSBC 174

| Jumper Function      | Jumper Groups for DSBC 174 |
|----------------------|----------------------------|
| Bus Extender Address | S1                         |
| Production Test      | S4                         |
| DSBC 174/173A Mode   | S3                         |

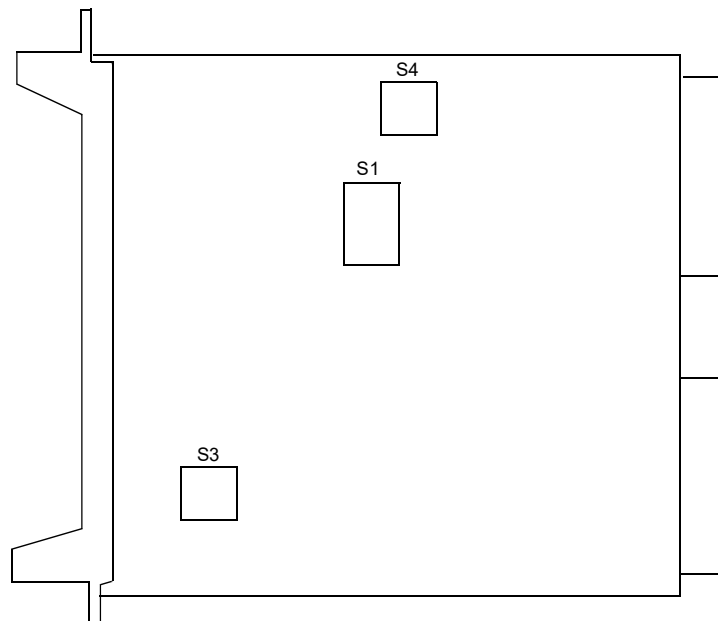


Figure 3-5. Bus Extender Board DSBC 174, Location of Jumper Groups

### 3.3.1 Bus Extender Address Jumper

The bus extender address jumper is used to give each of the I/O racks connected to an Advant Controller 450 a unique address. The most significant address bit (7) is used to distinguish between right and left bus extender when redundant bus extenders are used. Five addressbits (6-2) are used to indicate the I/O rack number. Address bits 1 and 0 are not used.

Table 3-2. Examples of Bus Extender Address Jumpering on DSBC 174

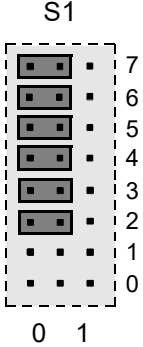
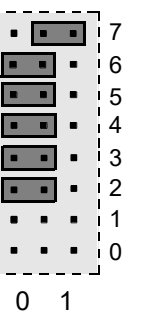
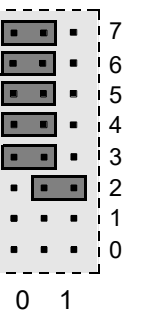
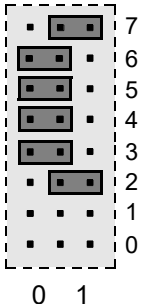
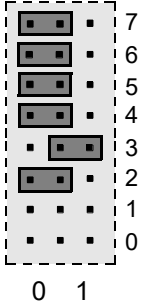
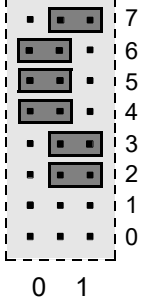
| Function                                                                                               | DSBC 174                                                                              |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Single bus extender in first I/O rack<br>or<br>left bus extender of redundant pair in first I/O rack   |    |
| Right bus extender of redundant pair in first I/O rack                                                 |  |
| Single bus extender in second I/O rack<br>or<br>left bus extender of redundant pair in second I/O rack |  |



Table 3-2. Examples of Bus Extender Address Jumping on DSBC 174 (Continued)

| Function                                                                                                      | DSBC 174                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Right bus extender of<br>redundant pair in second<br>I/O rack                                                 | <p style="text-align: center;">S1</p>    |
| Single bus extender in<br>third I/O rack<br>or<br>left bus extender of<br>redundant pair in third I/O<br>rack | <p style="text-align: center;">S1</p>   |
| Right bus extender of<br>redundant pair in fourth I/O<br>rack                                                 | <p style="text-align: center;">S1</p>  |

### 3.3.2 Production Test Jumper

The jumper group S4 on the bus extender board DSBC 174 is used for production test purposes only. It shall always be set according to Figure 3-6.



Figure 3-6. Production Test Jumper S4 on DSBC 174

### 3.3.3 Bus Extender Mode Jumper

The jumper group S3 on the bus extender board DSBC 174 is used to select operation mode. If the board should be used in DSBC 173A mode as a direct replacement for a DSBC 173A all three jumper positions should be strapped. In other cases all three should be left empty. When the board is strapped for DSBC 173A compatibility the bus extender address jumpers have no meaning. See Table 3-3.

Table 3-3. Bus Extender Mode Jumper on DSBC 174

| Function                                                     | DSBC 174                              |
|--------------------------------------------------------------|---------------------------------------|
| DSBC 174 Mode<br>(Normal position)                           | <p style="text-align: center;">S3</p> |
| DSBC 173A Mode<br>(Used as direct replacement for DSBC 173A) | <p style="text-align: center;">S3</p> |

## 3.4 Optical Bus Extension

### 3.4.1 General Description

The optical bus extension is a complement to the normal S100 I/O bus extension used in the products Advant Controller 450.

**NOTE**

You can not use this optical bus extension in Advant Controller 410.

With the optical bus extension I/O subracks can be placed up to 500 meters from the central subrack of the controllers/process stations.

The optical bus extension is a serial link designed for point-to-point connection (multidrop configuration is not possible) of up to 5 I/O subracks in the far-side. Between the I/O subracks in the far side, the normal bus extension is used.

The optical bus extension consists of two modems, TC560V1 in the near-side and TC561V1 in the far- side. Between the modems there is a serial link containing two optical fibres, one for sending and one for receiving signals.

**NOTE**

Together with PM511 and DSBC 174, TC560V1 and TC561V1 (and not TC560 and TC561) has to be used as they support redundant configurations.

In the near-side up to 5 “nodes”, I/O subracks with DSBC 174 or TC560V1, can be connected with the normal bus extension.

All supervision signals connected to the DSBC 174 in the far-side are transferred via the optical bus extension to PM511.

The modems can be powered by two independent 24V d.c. supplies internally connected to each other via diodes.

Two additional Supervision Signals (FA, FB) are generated internally from two 24 V Digital Inputs on the far-side, and transferred to two 24 V Digital Outputs on the near-side. In this way, a supervision of the power supply voltages on the far-side can be carried out on the near-side.

### 3.4.2 Bus Extension Configuration for S100 I/O Subracks

#### 3.4.2.1 Bus Extension with Single Bus Extender

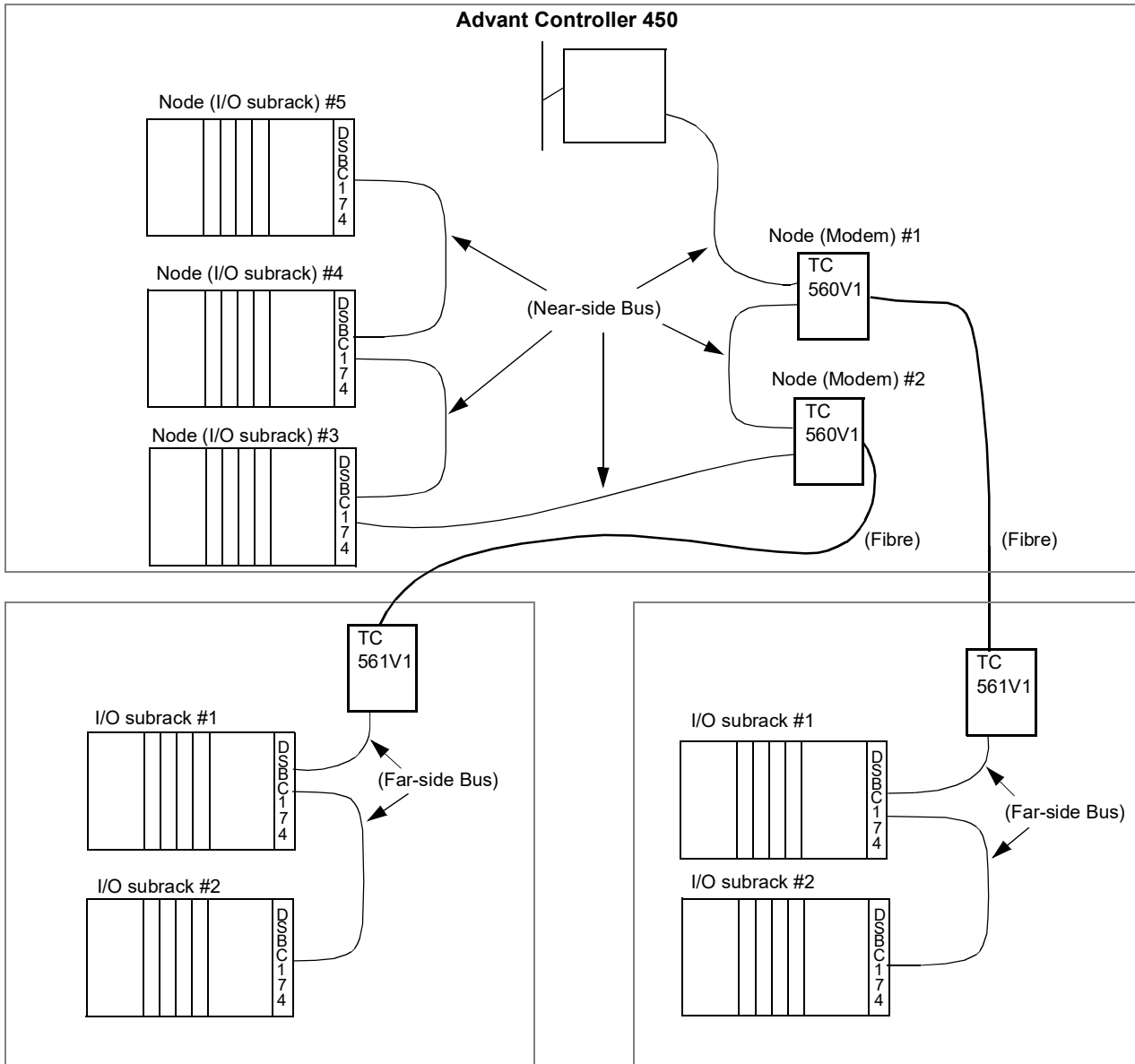


Figure 3-7. Example of Optical Bus Extension with Advant Controller 450

Advant Controller 450 and I/O Subracks chained together with Bus Extension Cables **and** Optical Bus Extensions.

### 3.4.2.2 Bus Extension with Redundant Bus Extenders

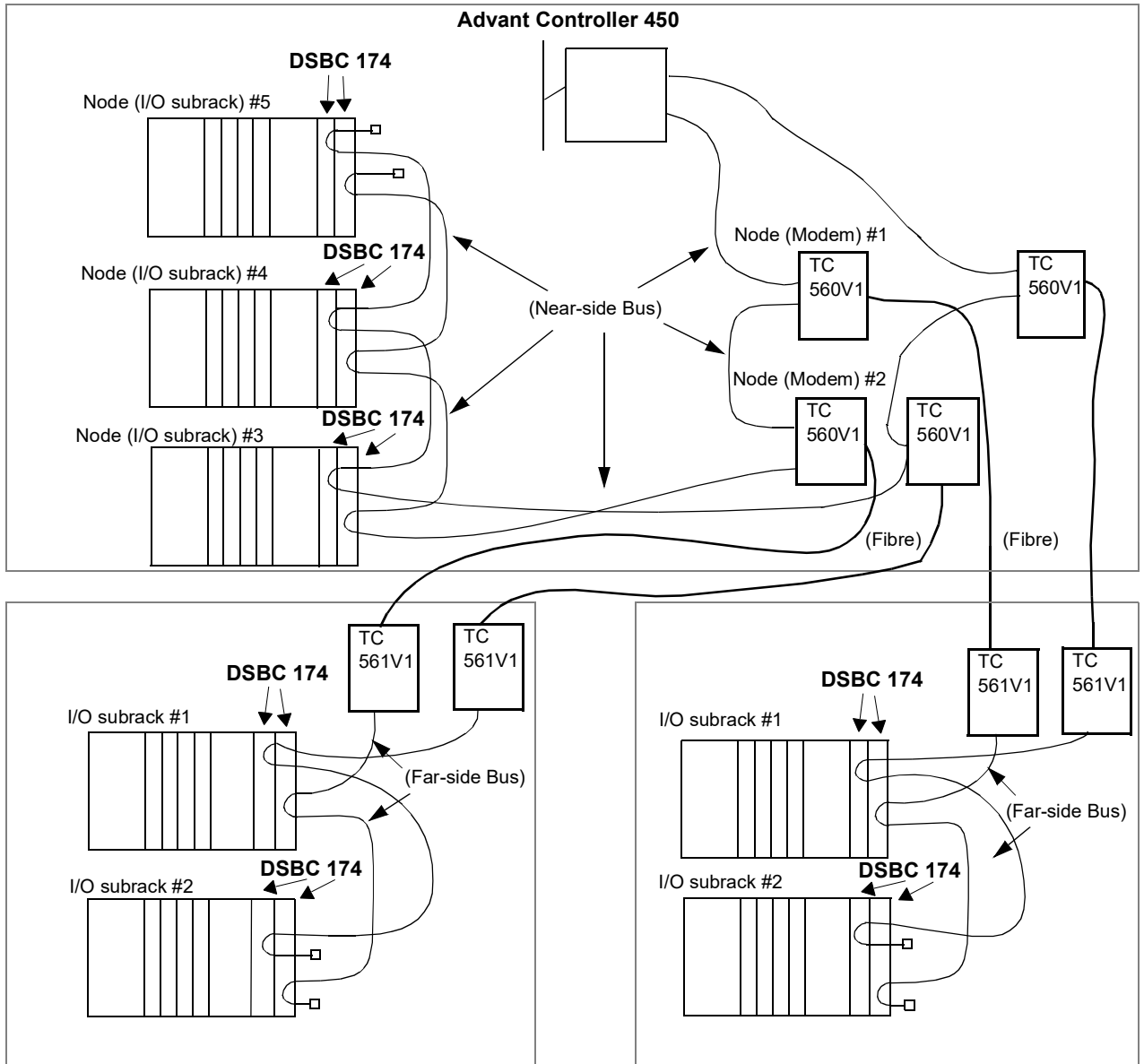


Figure 3-8. Example of Optical Bus Extension with Advant Controller 450 and Redundant Bus Extenders

Advant Controller 450 and I/O Subracks with redundant bus extenders chained together with Bus Extension Cables **and** Optical Bus Extensions.

### 3.4.2.3 Components

The following components are tied to the optical bus extension:

|           |                |                             |
|-----------|----------------|-----------------------------|
| TC560V1   | Modem          | (Near-side)                 |
| TC561V1   | Modem          | (Far-side)                  |
| TK560     | Interconnector | (Near-side)                 |
| TX560     | Terminator     | (Near-side)                 |
| TK580     | Cable Assembly | (Near-side; 1,8m)           |
| TK580V007 | Cable Assembly | (Near-side; 0,7m)           |
| TK575     | Cable Assembly | (Near-side, Far-side; 3,5m) |

### 3.4.2.4 Boundary Conditions

Boundary Conditions (See Figure 3-9 - Figure 3-10)

#### Near-side Bus

- Max total bus cable length: 12 m
- Max no. of DSBC 174 and TC560V1: 5
- TK560 as well as TX560 shall be mounted on front of TC560V1. (See also Figure 3-14)<sup>1</sup>.
- In case of maintenance, TK560 as well as TX560 may be removed from TC560V1.
- It is recommended that any DSBC 174 on the near-side shall be connected *after* the TC560V1s on the bus (see Figure 3-10).
- The above recommendation implies that if any DSBC 174 is connected on the near-side, the Terminator DSTC 176 applies instead of TX560.
- The connection between PM511 and TK560 (or TX560) takes place by means of TK580.
- The connection between TK560 and DSBC 174 takes place by means of TK575.

#### Serial Link

- Medium: Optical Fibre (dual)
- Type: 62,5/125  $\mu\text{m}$  (50/125  $\mu\text{m}$  also possible)
- Connection: Bayonet ST Connector Receptables (on TC560V1/TC561V1)
- Max. length: 500 m

#### Far-side Bus

- Max total bus cable length: 12 m
- Max no. of DSBC 174: 5
- The connection between TC561V1 and DSBC 174 takes place by means of TK575.

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1. Due to this, the clearance distance from the front of TC560V1 shall be not less than 90 mm.

### 3.4.2.5 Supply Voltage Status Transfer

Supervision of the power supply voltages on the far-side (24VA and 24VB) is done by connecting 24VA and 24VB through a Diode/Voting Unit (either DSSS 170 or DSSS 171) to the inputs FA and FB of TC561V1, and the outputs FA and FB of TC560V1 on the near-side to either TC520. If more than one optical bus extension are connected to the same PM511, the outputs from the TC560V1s may be connected in parallel in a wired-or configuration (see also Figure 3-11 and Figure 3-13).

Power Status (See Figure 3-11).

#### Near-side Outputs

- 24V Digital outputs, 2 channels (non-isolated) FA and FB
- Short-circuit proof; min. load 2,2 kOhm (corresponding to max. 10 mA).
- Connection: 3-pin jackable plints (cable area = 0.5 - 2,0 mm<sup>2</sup>)

**NOTE**

Each Near-side output is controlled by a corresponding Far-side input.

**NOTE**

Near-side outputs may be chained together in a “wired-or” configuration.

#### Far-side Inputs

- 24V Digital inputs, 2 channels (non-isolated) FA and FB
- Input switching level: 13.0V +/- 1.0V
- Connection: 3-pin jackable plints (cable area = 0.5 - 2,0 mm<sup>2</sup>).

When employing either the Diode Unit DSSS 170 or the Voting Unit DSSS 171, (see also Section 3.4.2.6 Powering the Modems), the corresponding Status Connections are:

*Table 3-4. Status Connections*

| STATUS    | TC560V1/TC561V1 | DSSS 170          | DSSS 171/DSBB 188    |
|-----------|-----------------|-------------------|----------------------|
| Sup. 24VA | X1+X2: 1 (FA)   | X3: 14 (24VFAILA) | X6+X7: 1 (FAIL24V_A) |
| Sup. 0VA  | X1+X2: 3 (0V)   | X3: 5             | X1: b (0V_A)         |
| Sup. 24VB | X1+X2: 2 (FB)   | X3: 16 (24VFAILB) | X6+X7: 2 (FAIL24V_B) |
| Sup. 0VB  | X1+X2: 3 (0V)   | X3: 6             | X2: b (0V_B)         |

### 3.4.2.6 Powering the Modems

Power requirements of TC560V1 or TC561V1 (See Figure 3-12):

- Supply: +24V d.c.
- Voltage range: 18 - 30V.
- Can be connected to two independent power sources (internally united by means of diodes).
- Power consumption, Near-side: 5.6W (Digital output channels: NOT included)
- Power consumption, Far-side: 6.6W (Digital input channels: negligible)
- Connection: 2-pin jackable plints (cable area = 0.5 - 2,0 mm<sup>2</sup>).

**NOTE**

For supervision reasons, the +24V Supply on the near-side shall correspond to that of the Central Subrack, and the +24V Supply on the far-side shall correspond to that of the I/O Subrack(s). This implies that when employing either the Diode Unit DSSS 170 or Voting Unit DSSS 171, (see Section 3.4.2.5 Supply Voltage Status Transfer), the corresponding Power Connections are:

*Table 3-5. Power Connections*

| POWER | TC560V1/TC561V1 | DSSS 170 | DSSS 171/DSBB 188 |
|-------|-----------------|----------|-------------------|
| 24VA  | X1: 5 (24V)     | X3: 1    | X1: a (24V_A)     |
| 0VA   | X1: 6 (0V)      | X3: 5    | X1: b ( 0V_A)     |
| 24VB  | X2: 5 (24V)     | X3: 3    | X2: a (24V_B)     |
| 0VB   | X2: 6 (0V)      | X3: 6    | X2: b ( 0V_B)     |

### 3.4.2.7 LED Indications

LED Indications on TC560V1 or TC561V1(See Figure 3-13)

- RF = Remote Failure (Red)<sup>1)</sup>
- P = +5V\_OK (Green)
- INH = INHIBIT (Yellow)
- INIT = INIT (Yellow)
- TX = Transmission (Yellow)
- RX = Reception (Yellow).

**NOTE**

The same LED Indicators are found on Near-side (TC560V1) as well as Far-side (TC561V1).

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1. This is a sum error indication for all five Remote Status Signals (REGMISS, REGFAIL, FANFAIL, FA, FB),



### 3.4.2.8 Use and Maintenance Guidelines

#### NOTE

In case of maintenance, such as replacement of a unit (TC560V1 or TC561V1) or replacement of Optical Fibre, ***it is recommended to disconnect the power of the relevant unit before carrying out any such maintenance.***

See Replacement Aspects for TC560V1 or TC561V1 in Advant Controller 450 User's Guide.

This implies that if TK560 or TX560 is to be disconnected from (or connected to) TC560V1, this should be done only after the power of TC560V1 has been disconnected.

If maintenance of a far-end unit (TC561V1) takes place, this may be done without disconnecting the power of the near-end unit (TC560V1), and vice versa.

If the power of a TC560V1 is to be disconnected, then the Status-signals (FA, FB) of that unit must also be disconnected, since the two 24 V Digital Outputs only work properly with a 24 V Supply connected.

#### CAUTION

Never disconnect an Optical Fibre of a unit under running condition, since this may cause disturbances on the on-going data traffic between the CPU and the I/O devices.

#### CAUTION

When using Cable Assembly TK575, always make sure that Cable Lug M3 has a good ground connection to the relevant subrack.

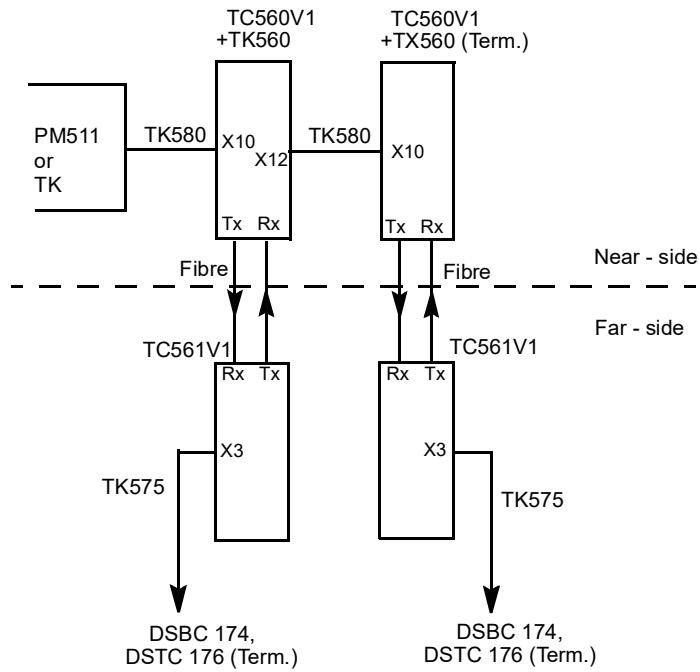


Figure 3-9. Advant Controller 450 with TC560V1 on Near-side

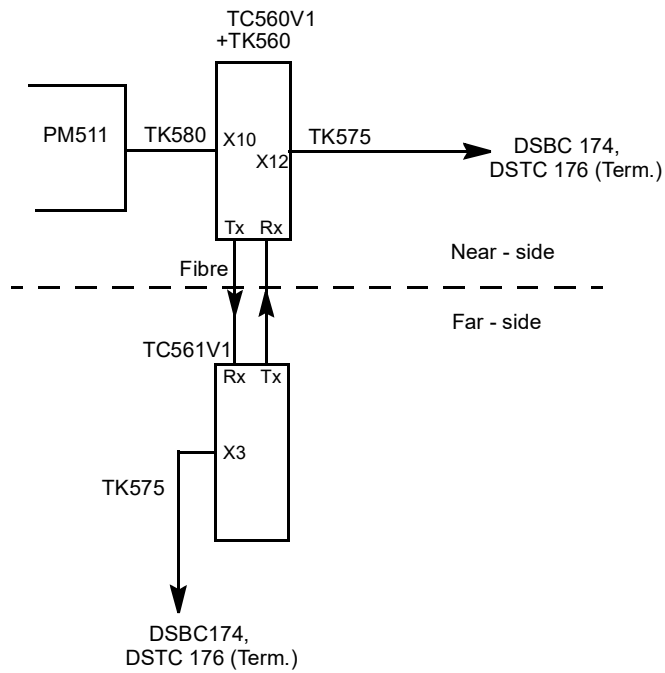


Figure 3-10. Advant Controller 450 with both TC560V1 and I/O Subracks on Near-side

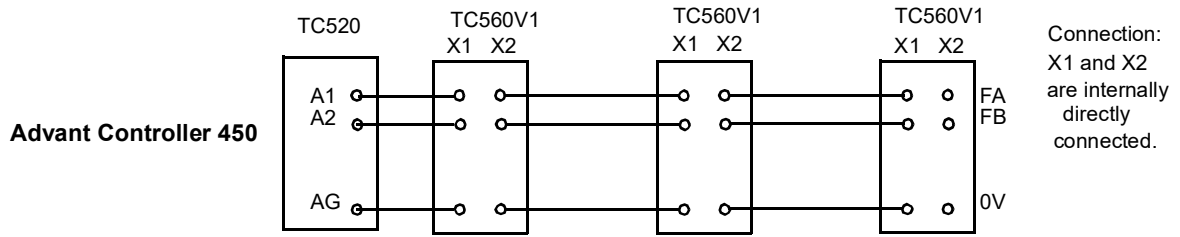


Figure 3-11. Connection of Supervision Signals from TC560V1

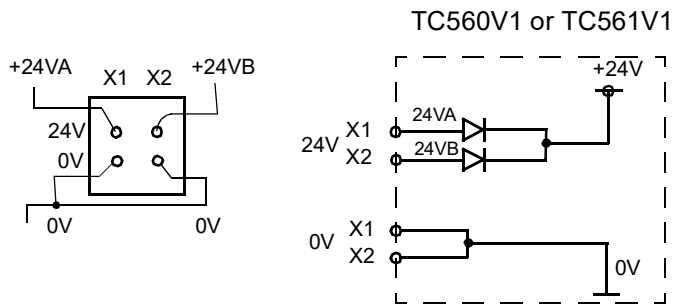


Figure 3-12. Connection of Supply Voltage to the Modems

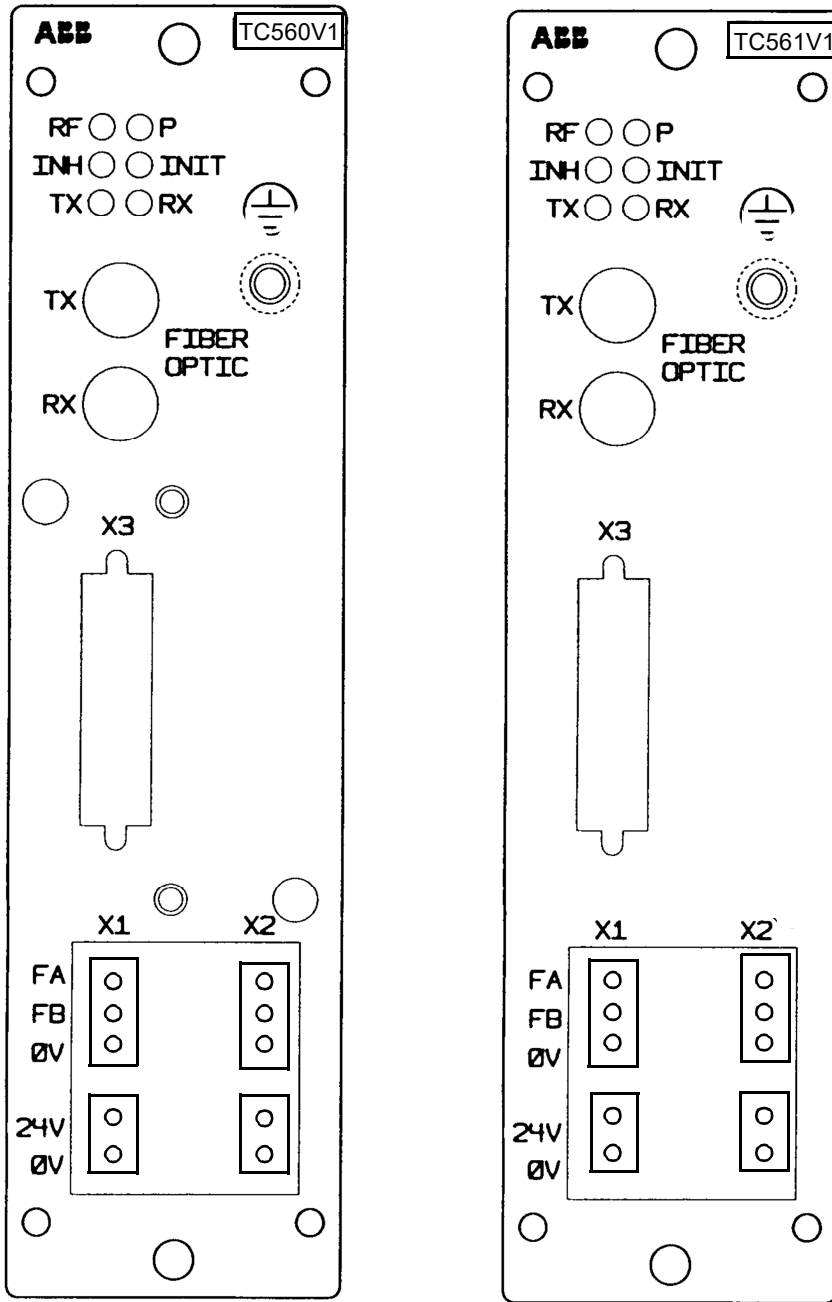


Figure 3-13. Front Plates of TC560V1 and TC561V1

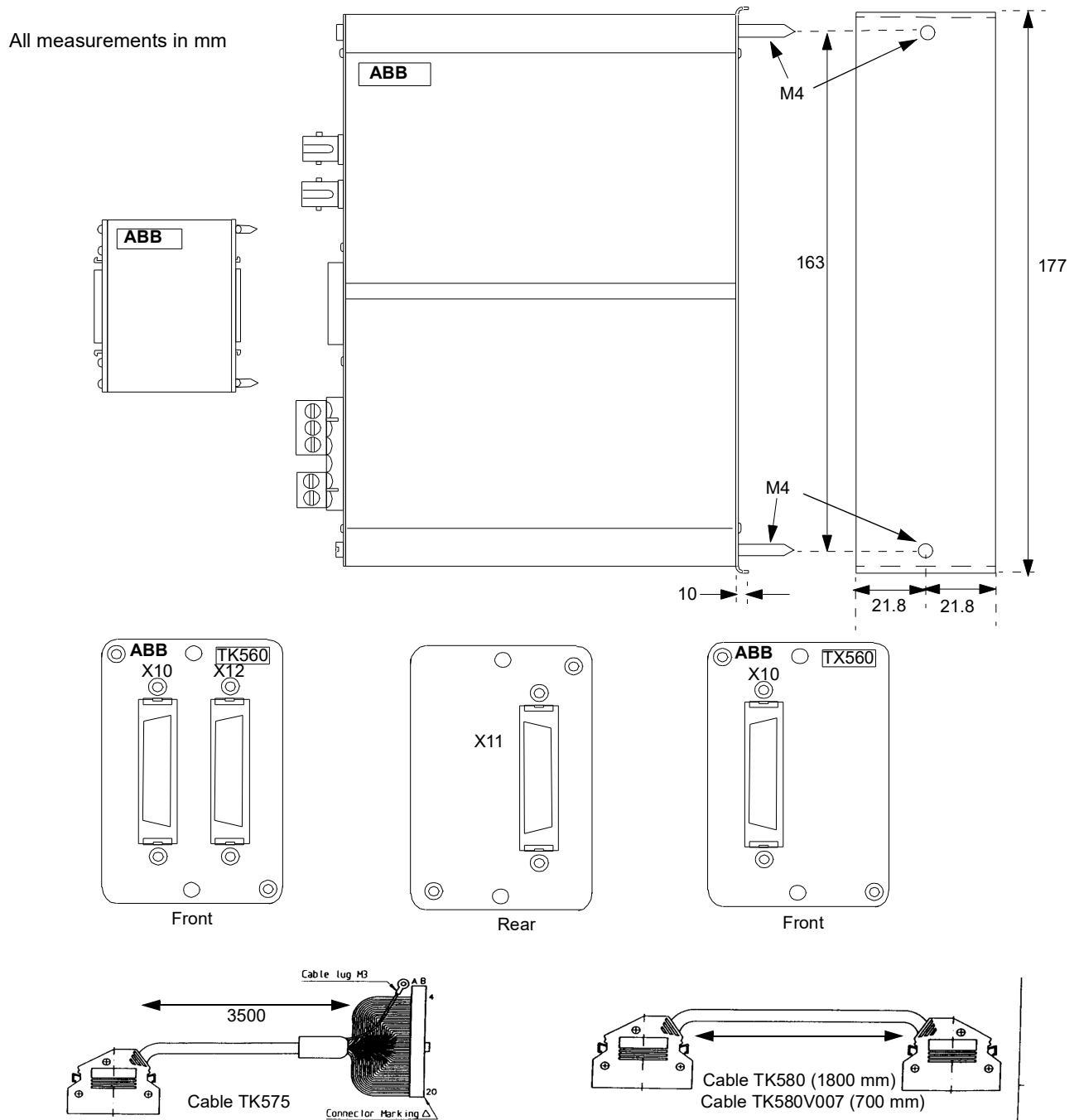


Figure 3-14. Mechanics

