Installation

SK- FDDI Concentrator II SK-5000S
Installation Instructions

SysKonnect

SK-FDDI Concentrator II SK-5000S

Installation Instructions - FDDI Concentrator Base Unit and Line-cards

This manual applies to the SysKonnect SK- FDDI Concentrator II product line (base unit and linecards; model numbers SK-50xx). The contents of this manual are subject to change.

English
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We would like to receive comments on this publication. Please address your comments to:

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For technical questions related to the SK products described here, please contact the Product Support Team in Germany or the USA (see the file SUPPORT.INF on the delivered CD-ROM or the section on Product support for technical questions in the manual).

Warranty and Software License Conditions

Please read the current warranty and license conditions which can be found in the SysKonnect Installation Guide on the supplied CD-ROM.

Latest Information

For the latest information on this product, refer to the Readme files on the supplied CD-ROM, the Release Notes, and the WWW pages published on our Web site (http://www.syskonnect.com)

These sources may include changes that were incorporated after this manual was printed.

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Safety Information – Read this first!

Caution

Caution
Stacked (or bolted) devices should always be lifted from the bottom. Any group of individual devices that are mechanically joined by a snap-on mechanism should never be lifted by holding the topmost device.

Warning!

Warning!
Electrical current from power, phone and communications cables can be hazardous.

To avoid potential shock hazards:
Do not connect or disconnect any power cables during an electrical storm.
The power cord of the device must be connected to a properly wired and grounded (earthed) receptacle. Any equipment attached to this product must also be properly wired and connected to grounded receptacles.
Do not connect the receptacles to the telephone line.
Do not open the device.

Follow the instructions given below when connecting, disconnecting, opening or transporting the device.

To connect	**To disconnect**
Set all network switches to OFF.	Set all network switches to OFF.
If the device has a separate AC power outlet, attach the power cord on the device side first.	Disconnect the power cord from the power supply. Note: Installations in Great Britain are subject to special regulations
Connect all signal transmission cables to the appropriate ports/jacks. Note: Installations in Great Britain are subject to special regulations	Disconnect all signal transmission cables from the corresponding ports/jacks.
Attach the power cord to a properly grounded outlet.	Finally, if the device has a separate AC power outlet, disconnect the power cord on the device side.
Turn on the device(s).	

Electrical installations must conform to the safety regulations of the country in which they are operated.

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1 Notes

References in this publication to SysKonnect (SK) products, programs, or services do not imply that they will be made available in every country in which SK operates, nor are they intended to state or imply that only SK's product, program, or service may be used. Any functionally equivalent add-on product that does not infringe on SK's intellectual property rights may also be used instead. Note, however, that it is the user's responsibility to verify the proper functionality of all any such add-on products that was not developed by or purchased from SK.

SysKonnect Service in the World Wide Web

An increasing number of SysKonnect services are now being offered on the Internet via the World-Wide Web (URL: http://www.syskonnect.com). This includes product information, company data, contact addresses, etc. Many support issues can also be quickly resolved or clarified here with the provided information.

Product support for technical questions

Technical information on SysKonnect products can be obtained from:

	America, Pacific	**Europe**
Open	24 hours via pager	Mo-Do 8:00 h -18:00 h Fr 8:00 h -15:30 h (CET)
Tel.	+1 866 782 2507 (toll-free in USA) +1 408 787 5395 (pager)	+49 7243 502 330
Fax	+1 408 752 9029	+49 7243 502 364
WWW	http://www.syskonnect.com	http://www.syskonnect.com
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Address	SysKonnect Inc. A Marvell®Company 700 First Avenue; Sunnyvale, CA 94089 (USA)	SysKonnect GmbH A Marvell®Company Siemensstr. 23 D-76275 Ettlingen

2 Fundamentals

Structuring FDDI Networks

The following section assumes that you are familiar with FDDI networking. For additional information, please refer to the numerous FDDI networking terms and concepts described in the Glossary and in FDDI / SMT Concepts.

Concentrator Configurations

The SK-FDDI Concentrator II can be configured individually by means of various plug-in modules (also called *linecards*).

The following modules are currently available:

Product Designation		Ports	
SK-5041A	SK-FDDI 6M	6 MIC	optical
SK-5043E	SK-FDDI 8S	8 SC	optical
SK-5021B	SK-FDDI 12U	12 UTP	electric
SK-5041G	SK-FDDI 2M8U	2 MIC/ 8 UTP	opt. / electric
SK-5043I	SK-FDDI 2S8U	2 SC/ 8 UTP	opt. / electric

Up to two 2 modules can be plugged into the base unit. The number of ports currently available in a base unit would thus be a minimum of 6 (with one SK-5041A installed) and a maximum of 24 (with two SK-5021B modules installed).

All module types can be combined with one another, provided the following rules are observed:

- Port A (No. 1) and Port B (No. 2) are essentially located at the bottom left of the SK-FDDI Concentrator II. In standalone mode, all ports are automatically configured as M ports.
- The operating mode of the device (DAS, SAS, standalone) is set via software.
- For network security reasons, connections to A and B ports should be made with fiber-optic cable (with MICs or SC connectors) if possible.

In order to set up the cabling clearly and to reduce the possibility of errors when connecting concentrator ports, it is advisable to mark or code all ports and jacks. Appropriate stickers have been included to identify the port types (A/B/M/S). MIC ports and connectors can also be keyed mechanically (key/lock mechanism; see also the section Port Identification (Optional) on page 29).

Maximum Number of Stations on a DAS-Concentrator

Card in Slot 1➔ (Port types) Card in Slot 2 ➓	SK-5041A (6 MIC)	SK-5043E (8 SC)	SK-5021B (12 UTP)	SK-5041G (2 MIC/ 8 UTP)	SK-5043I (2 SC/ 8 UTP)
None	4	6	10	8	8
SK-5041A	10	12	16	14	14
SK-5043E	12	14	18	16	16
SK-5021B	16	18	24	20	20
SK-5041G	14	16	20	18	18
SK-5043I	14	16	20	18	18

When installing an SAS concentrator (see below), the maximum number increases by 1 in each case; if the unit is installed as a standalone device (see below), by 2 stations.

The concentrators can be used to structure the network in four different ways (basic operating modes):

- Integration of class B stations
- Cascaded concentrators
- Standalone mode : FDDI ring within the concentrator
- Dual Homing
  Apart from the standalone mode, these operating modes may be combined with one another.

Integration of Class B Stations

When used as a dual attached concentrator, the SK-FDDI concentrator can integrate up to 22 Single Attachment Stations (SAS, Class B stations) to the FDDI ring.

The following figure (Configuration A) shows that the concentrator converts the original ring into a tree structure. In this configuration, there are two different connection types:

- One A and one B port connect the concentrator to the dual ring. The concentrator operates as a Class A station in the dual ring.
- Up to 22 M ("master") ports connect the concentrator, which is the "master", to the S ("slave") ports of workstations. In accordance with the FDDI standard, these are called Class B stations and are not connected to the dual ring.

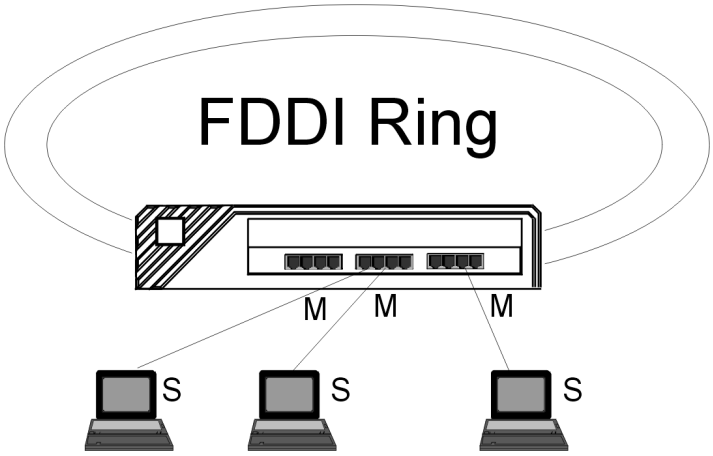


Figure 1. Configuration A Class B connection

Cascaded Concentrators

When used as a single attachment concentrator, the SK-FDDI Concentrator II can connect up to 23 workstations or other concentrators (or other Class B stations) in an FDDI ring. A tree structured physical network can be built by cascading concentrators.

The following port types are configured in the concentrator:

- One S port ("slave"), which connects to the concentrator higher in the tree structure

and

- Up to 23 M ports ("master") can be used to connect FDDI stations or additional concentrators.

If the concentrator is to be operated as a single attachment concentrator, ports 1 and 2 of the concentrator must be converted into an M and an S port, respectively. When using MIC cabling, the port keys (key tabs) for these ports must also be replaced by the key tabs for S and M ports. The changing of fiber port keys is described in the section Keying MIC Ports Correctly (Optional) on page 29, and editing the concentrator's configuration is described in the section Defining the Concentrator Type on page 36.

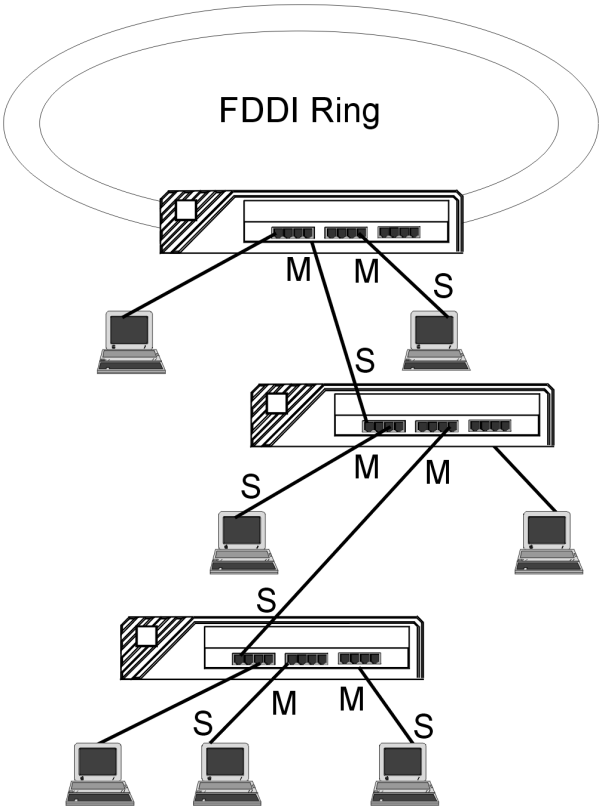


Figure 2. Configuration B; Cascaded Concentrators

Standalone Mode: "The Ring within the Concentrator"

The SK-FDDI Concentrator II can be used *standalone* to integrate up to 24 Class B stations in a separate FDDI ring. The stations are connected to an FDDI ring within the concentrator. All ports are configured as M ports.

When configured standalone, ports 1 and 2 of the concentrator will be configured as M ports. The keys of MIC ports of type A and B should be replaced with M keys. The changing of fiber port keys is described in section Keying MIC Ports Correctly (Optional) on page 29, and editing the concentrator's configuration is described in section Defining the Concentrator Type on page 36.

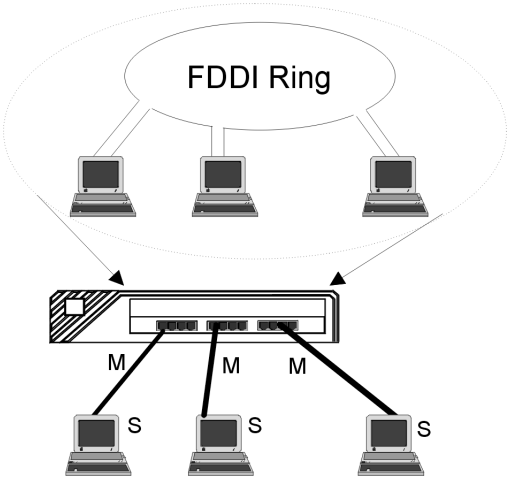


Figure 3. Configuration C; Standalone Mode

Dual Homing (Redundancy)

In FDDI, there is a fault tolerant connection called Dual Homing, where a workstation with a DAS network interface card (or another Class A station) is connected to two FDDI concentrator ports. When two different concentrators are used for this connection, the dual homed device is protected against cable failure and concentrator failure because there are redundant data paths to the device.

In a dual homed connection, the A and B ports of the Class B station are connected to M ports on the concentrators.

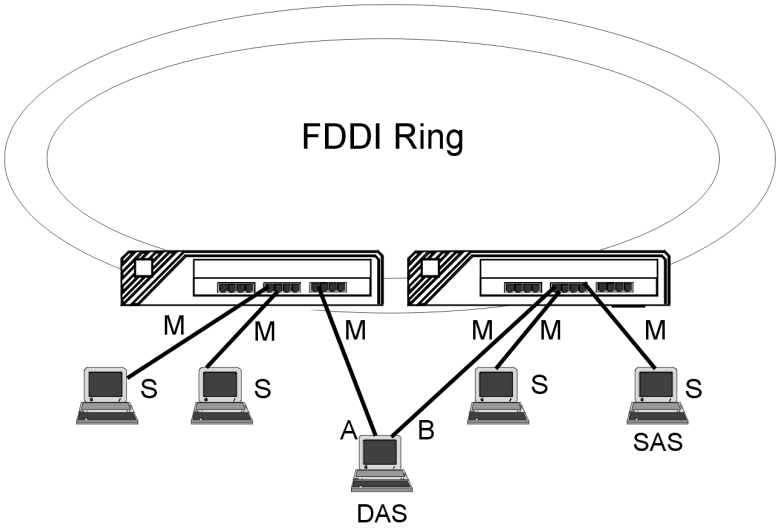


Figure 4. Configuration D; Dual Homing

The following figure shows an overview of all structuring options.

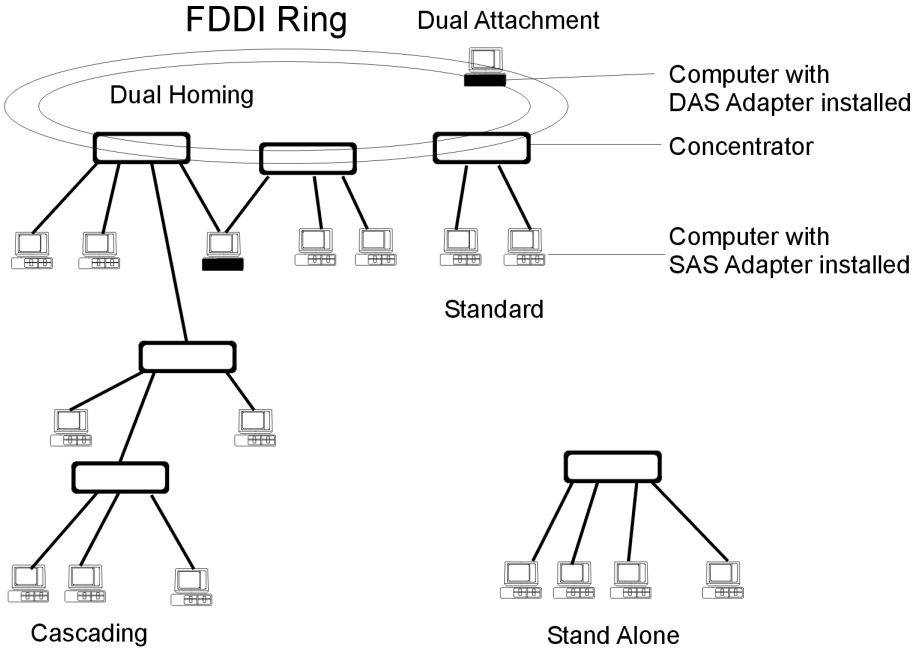


Figure 5 . Network Structuring Overview

Overview of the SK-FDDI Concentrator II

Features

- Optimum flexibility due to modular structure - allows mixed cabling
- Scaleable
- Automatic self-test
- Comprehensive diagnostic software
- Comprehensive management and statistical functions
- Optical displays using LEDs
- Configurable operating system
- Configurable as DAS, SAS or standalone device (via software!)
- 1 base unit; 5 types of linecards
- Configurable UTP, MIC and SC ports
- On-board WWW server for management functions
- SNMP agent
- Easy software updates via TFTP
- Snap-on mechanism for easy and secure mechanical attachment to other devices of the SK Snap-on family of products: FDDI Concentrator II, Ethernet Switch, Fast Ethernet Hub.
- Elegant design
- Fits 19" rack mounting systems

The SK-FDDI Concentrator II is a network infrastructure system that integrates stations with the Fiber Distributed Data Interface (FDDI), e.g. computers that have SK-NET FDDI NICs installed, into an FDDI network.

The modular structure of the concentrator system allows for optimum flexibility, which means that you can select the exact port configuration that is needed for your cabling and connectors (MIC, SC, (S-)UTP/RJ-45). When your network or workgroup subsequently expands, the

concentrator can expand with it up to 24 ports. The system consists of a base unit, in which two linecards can be installed.

At present, there are five types of linecards that offer various port combinations. Optical ports are used to connect multimode glass fiber cable, and MLT-3 ports are used for connecting Category 5 Twisted Pair (UTP or S-UTP) cable in accordance with the ANSI TP-PMD specification.

	Optical Transceivers (Ports)		**MLT-3 Ports**
Name / Model	MIC	SC	UTP
SK-5041A	6	-	-
SK-5043E	-	8	-
SK-5021B	-	-	12
SK-5041G	2		8
SK-5043I	-	2	8

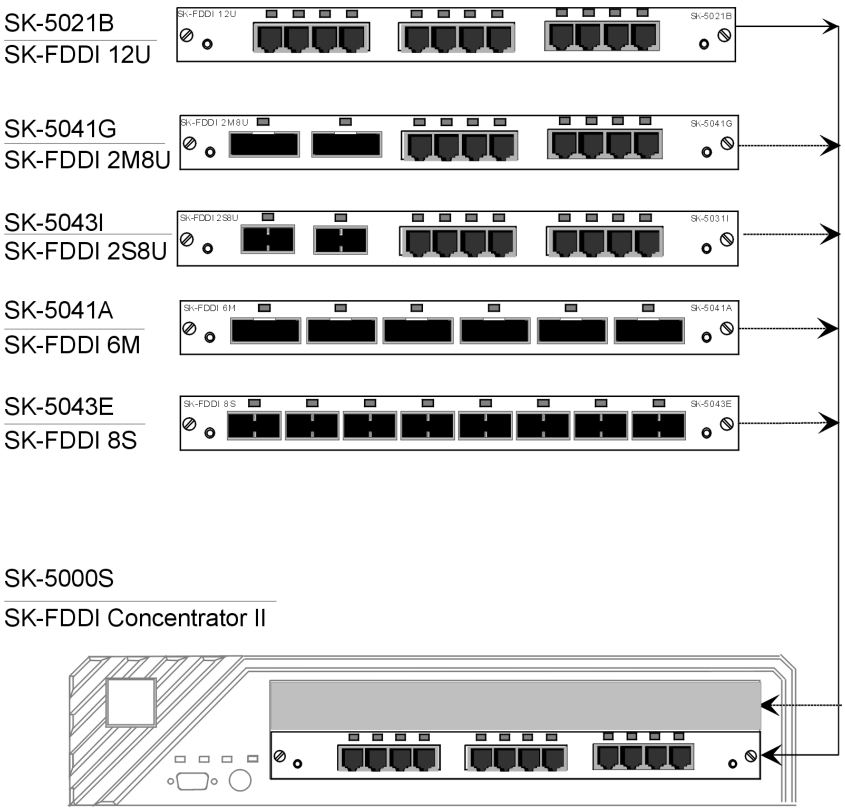


Figure 6. Modular Structure

The SK-FDDI Concentrator II is supplied with an SNMP agent for in-band network management, automatic self-test and extensive diagnostic software.

It can be used to integrate *Single Attachment Stations* (SAS or Class B stations) as well as additional concentrators in a FDDI network.

Device Overview

The following diagram shows the arrangement of switches, ports, and mechanical and control elements on the device. All materials supplied with the delivery package are described in the section Step 1. Unpacking and Checking the Shipment on page 23.

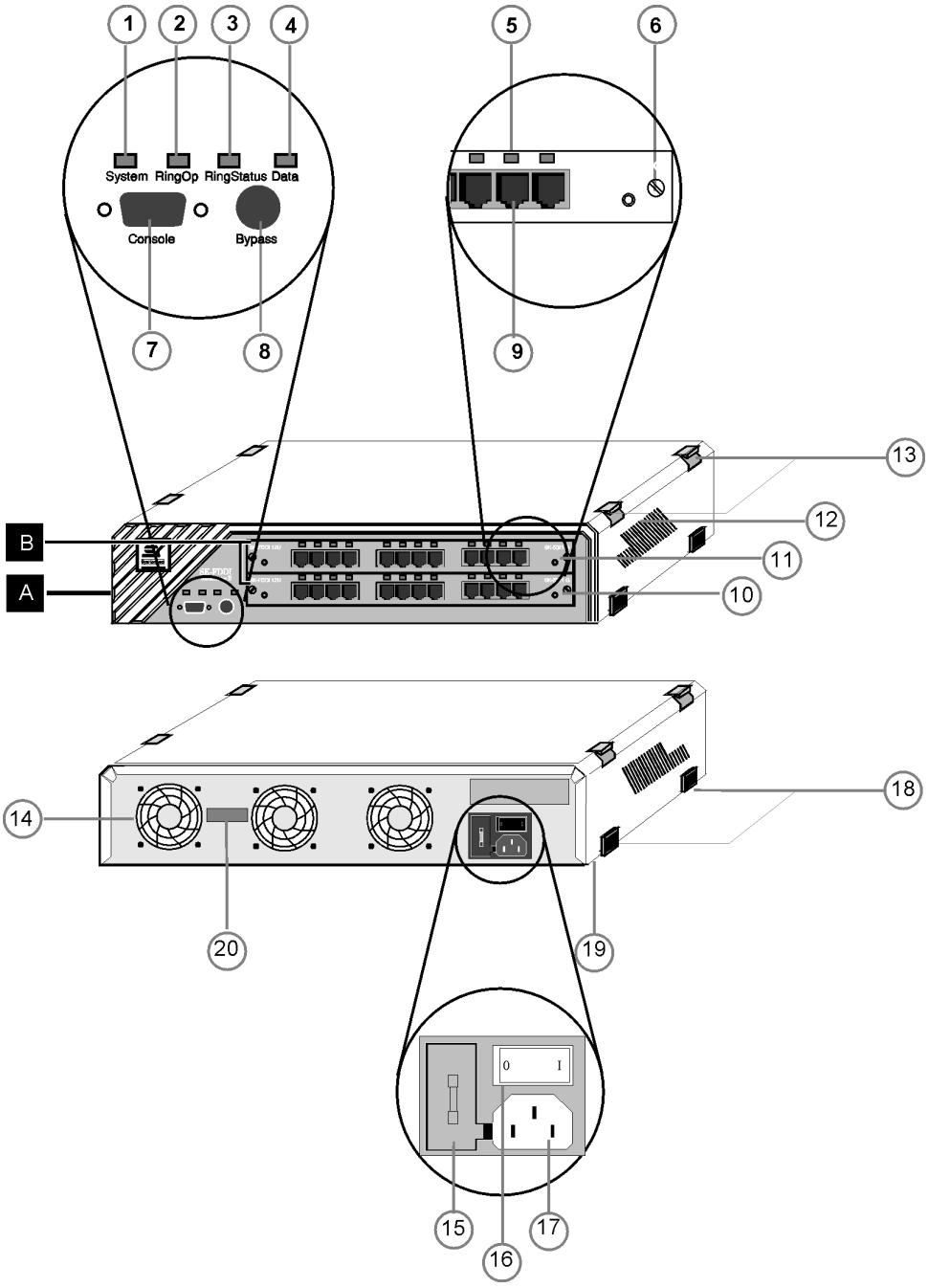


Figure 7. Overview of the SK-FDDI Concentrator II

Status LEDs

1. System
2. RingOP
3. Ring Status
4. Data
5. Port

Connectors

6. Console (SubMin D9 port for V.24 connection)
7. Optical bypass (MiniDIN6)
8. Concentrator port (depending on linecard: RJ45, MIC or SC connectors)

Chassis

A Base unit (SK-5000)

B Linecard(s)

9. Screws to attach linecard
10. Lower slot for linecards (must be occupied to operate the device)
11. Upper slot for linecards (may be free or occupied as in the diagram, depending on configuration)
12. Air vent
13. Anchor for chassis to be mechanically attached to the concentrator (with snap-on feet)
14. Cooling fans
15. Fuse block (max. T 3.2 A)
16. Main power switch (On/Off)
17. Connector for main power supply (IEC 320 C14) 200-240 V/l 00-120 AC
18. Snap-on feet for free-standing concentrator or to mechanically attach devices of the SysKonnect SNAP line of products (Concentrator, Switch, Hub, etc.).
19. (Bottom:) Name plate
20. Serial Number

Supplied Software

The concentrator is supplied together with the operating system software and the WWW server (Firmware). A backup copy can be found on the supplied CD-ROM.

The CD-ROM contains:

- Concentrator-Firmware, including
  - Operating system (SMT)
  - Diagnostic programs
  - SK-FDDI Concentrator II MIB, MIB II, SysKonnect MIB, FDDI MIB
- Readme files
- Readme Viewer for convenient selection of Readme files
- DEE, a simple terminal emulation program to enable communication between the PC and concentrator via the Console interface.
- SK-FDDI Concentrator II Installation Instructions

3 Installation

Recommended Procedure

If you are installing the concentrator for the first time (out of the box), it is recommended that you proceed in the following order:

1. Unpack the product and check the shipment to ensure that nothing is missing
2. Install the linecard(s)
3. Install the rack mount plates (if 19" rack installation is desired)
4. Install the concentrator as a desktop unit or in a 19” rack
5. Connect the power supply
6. Connect the ports
7. Turn on the device and run the self-test
8. Configure the software

The concentrator is preconfigured as a DAS unit. If the default factory settings (see Default Values) do not need to be changed, step 8 can be dropped. We recommend to configure an IP address for the concentrator.

Prerequisites

To enable quick and easy installation, it is advisable to set up a network plan in advance, taking the following points into account:

- How is the overall network to be structured?
- Which are the individual stations to be connected to the concentrator ports, and what is the required cabling (cables, jacks, plugs)?
- Which additional components (optical bypass, cable with corresponding jacks/plugs) are required?

Bear in mind that the network could expand quickly, so it is important to document all aspects of the installation well and archive this information at a suitable location so that the installation can be easily reconstructed even after some years. It is therefore advisable to also include an inventory of the current network status after the installation using the above network plan. If necessary, contact your network administrator for details. If you are the network administrator or planner yourself, it is up to you to determine which method is most suitable. This manual merely deals with the technical steps required for the installation and operation of the product.

Step 1. Unpacking and Checking the Shipment

Check your SK-FDDI Concentrator II shipment against the following list and make sure that you have received the complete product without any obvious transport damage.

The delivery package includes:

Base Unit

- Packaging materials
- SK-FDDI Concentrator II (SK-5000S)
- CD-ROM (including License and Warranty Notes)
- Release Notes
- Mounting plates for installation in 19” racks
- Power cable

- V.24 cable
- ESD wriststrap (packed in an envelope)

Linecards

- Packaging materials
- Linecard
- For MIC linecards: keytabs for A, B, M and S ports
- Labels to identify A, B, and S ports
- Release Notes

Step 2. Installing Linecards

The device should never be on when performing configuration tasks

Warning!

Warning!
Electrical current from power, phone and communications cables can be hazardous
To avoid potential shock hazards unplug the power cable before installing/removing linecards!

Caution

Caution!
Electrostatic discharges could damage the device and linecards!
Open the antistatic bag just before installing the network card.

Follow these instructions:

- Hold the antistatic packaging of the linecard at least 2 seconds against the concentrator chassis or the faceplate of an extension slot on your computer. This reduces the static charge in the packaging and your body.
- Do not touch any lines on the circuit board or contacts at the transceiver connectors (ports, connection jacks for the network), and make sure that no-one else touches the circuit board.
- Do not place the linecard directly on the computer or concentrator chassis or on other metal parts.
- Avoid unnecessary movement, since this can increase the electrostatic charge.
- Never use force when working with the circuit board.
- If you need to place the circuit board somewhere after removing it from the antistatic bag, make sure that you place it on the antistatic bag and on a level surface.
- It is best to wear an antistatic armband (delivered with the concentrator) when installing the linecard. This armband can be connected (with an electric conductor) to the concentrator chassis or a grounded cable. Do not connect the armband to the earth of your power supply, since this could potentially be live under unfavorable conditions!

The lower insertion slot must always be filled. The first two ports from the left are automatically configured as A and B ports in DAS mode (or as (S/) M ports in SAS and Standalone modes)

To install the Concentrator, follow these instructions:

1. Insert the circuit board of the linecard between the guide rails in the lower module slot, making sure that the component side faces the top. Use the labels printed on the faceplate as an orientation if required.
2. Slide the module into the chassis until it snaps into place, i.e. until the backplane connectors have mated and the module´s front panel is flush with that of the chassis. See the following diagram.

3. Tighten the knurl screws of the module by hand or by using a flat-head screwdriver.

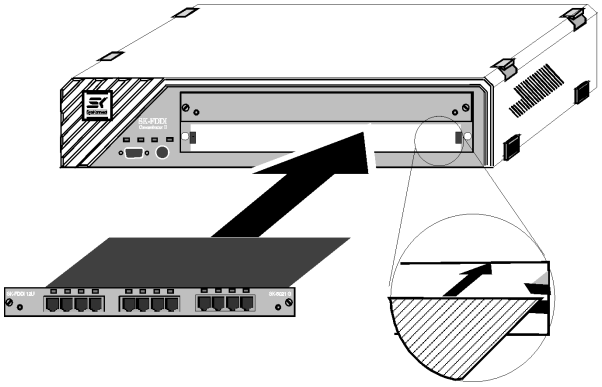


Figure 8. Inserting a Linecard

4. To install a linecard in the upper insertion (if desired), remove the front plate as follows: Remove the knurl screws on the left and right side of the slot cover on the front plate with a screwdriver of by hand. See the following diagram.

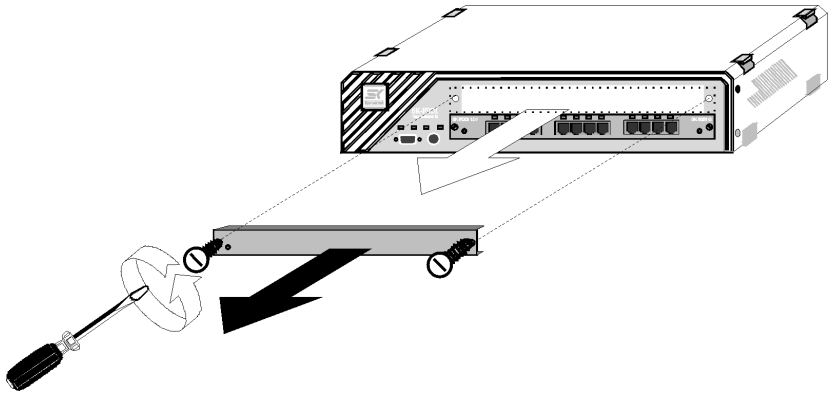


Figure 9. Remove the Cover Plate

5. Repeat the first three steps for the second linecard.

Step 3. Installing or Mounting the Concentrator

Caution

Caution!
Insufficient cooling and airflow could damage the device!

Extremely overheated devices are a potential fire hazard if brought into contact with easily flammable materials!

To avoid damaging the device and fire hazards due to overheating:
When operating the concentrator, make sure that it has sufficient space for proper air circulation and cooling.
The fans at the back of the concentrator must not be obstructed .
The air vents on the side must not be covered.
Make sure that there is enough clearance to walls or other devices.
When installing the concentrator in a closed 19” rack, ensure that the dimensions allow for an unobstructed air flow.

Installing the Concentrator as a Desktop Unit

The SK-FDDI Concentrator II is supplied as a desktop unit, so no further assembly is required in this case.

The concentrator has a *snap-on chassis*, which matches those of the newer SysKonnect infrastructure components *SnapSwitch* and *SnapHub*. This means that it is equipped with snap-on feet that allow it to be easily attached to other devices from the Snap-on product line.

Attaching the Concentrator to other SysKonnect Devices

The following instructions are based on the assumption that all units involved have a snap-on chassis. The device to be added is referred to as the new unit, and the existing device or stack of devices is called the bottom unit.

Caution

Caution!
Exerting too much force (weight) could loosen the snap-on mechanism!
Stacked devices must always be lifted by holding the bottom unit.
Any stack consisting of single units that are inter-locked by means of the snap-on mechanism should never be lifted by holding any of the upper units.

To attach the Concentrator to other SysKonnect devices, follow these instructions:

1. Open all snap-on feet (Pos. 18) on the new unit so that the black rubber insertion tips are visible from the side. The snap-on feet should now be flush with the chassis.
2. Place the new unit on top of the bottom unit.
3. Align the chassis so that the snap-on feet (Pos. 18) are exactly on top of the anchors (Pos. 13) on the bottom unit.
4. Press down the top unit so that the snap-on feet and the anchors on the bottom unit lock.

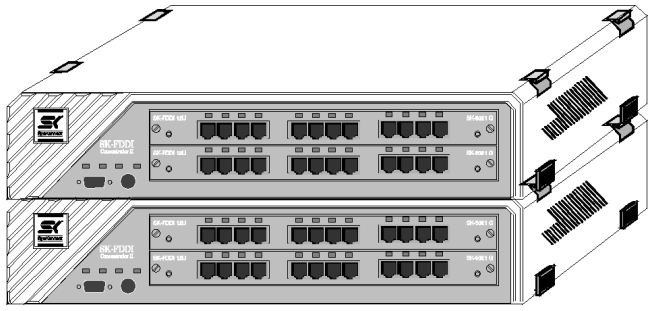


Figure 10. Stacked Snap Casings

The devices will now be mechanically attached to form a stack.

Installing the Concentrator in a 19” Rack Unit

You will need a Phillips #1 screwdriver to mount the chassis. The rack mount plates are included in the delivery package of the concentrator.

To mount the chassis, proceed as follows:

1. Use the screwdriver to remove the front two screws on the left and right side of the chassis. Keep these screws handy, since they are needed later for the installation.

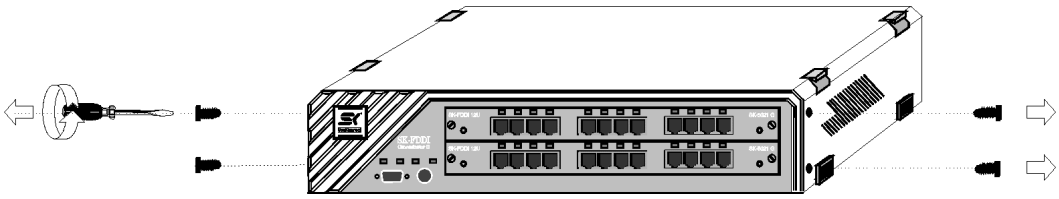


Figure 11. Removing the Screws from the Chassis

2. Align the holes in the rack mount plate with the screw holes in the chassis so that the front bent piece on the rack mount plates (which differ for the left and right side) are flush with the front panel of the device.
3. Fasten the rack mount plates to the chassis using the screws removed in step 1.

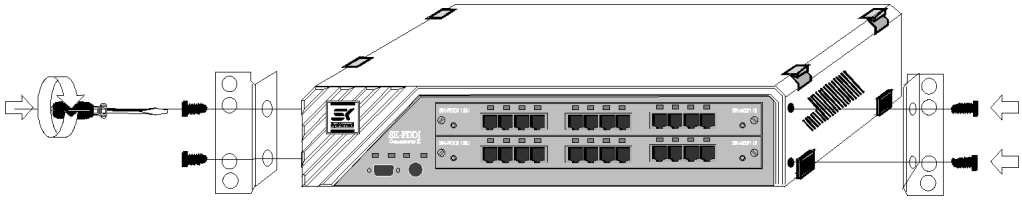


Figure 12. Fastening the Side Plates for a 19” Rack

4. When inserting the chassis into the 19” rack, ensure that the air vents are not obstructed. Make sure that there is enough clearance from the wall, since the cooling fans are located at the back of the device. These fans should never be covered.

   The front holes of the concentrator´s rack mount plates must be aligned with the drill holes in the 19” rack mounting system. See the installation instructions provided by the manufacturer of the 19-inch rack for further details.

Step 4. Connecting the Device to a Power Supply

The concentrator can be operated with 100...120 V or 200...240 V (external) AC power. The unit is equipped with a power supply that automatically adjusts to the required voltage (115/230 V AC conversion).

Warning!

Warning!
Electrical current from power, phone and communications cables can be hazardous.

To avoid potential shock hazards:
Do not connect or disconnect any cables during an electrical storm!
Do not perform any installation, maintenance or reconfiguration work during an electrical storm!
the unit and all add-on devices should always be connected to a grounded (earthed) power supply!
The unit should be installed and operated only under the permitted environmental conditions!
Make sure that it is protected against excess humidity and contact with liquids!
Do not connect the receptacles to the telephone line!
Do not open the device!

Proceed as follows:

1. Keep the power cable handy and inspect its plug. If the supplied power cable is not suitable for your country, contact your SK reseller to obtain one.
2. First attach the power cable to the power supply on the unit (Pos. 17).
3. Then connect the plug to a grounded outlet of your main power supply (115/230 V~, 50/60 Hz).

Step 5. Connecting FDDI Ports

Port Numbering

The ports are numbered sequentially from left to right, moving upwards from the bottom to the top.

The ports on the linecards are provided with two sets of numbers at the factory (e.g. 1/13) to reflect their optional use in the upper or lower slot.

- If the linecard is installed in the lower slot, the first number applies (e.g. 1).
- If the linecard is installed in the upper slot, the second number applies (e.g. 13).
  This numbering system is also significant when managing the concentrator via the User Interface and for diagnostics and statistical functions.

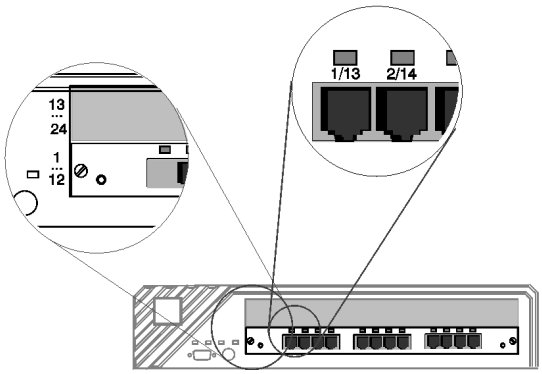


Figure 13. Port numbers

Lower Slot /Lower Linecard

The lower slot of the concentrator must always be occupied. The extreme left port is thus assigned the number 1. Since each linecard can have up to 12 ports, the lower slot can be filled with port 1 to port 12 in the maximum case.

Upper Slot

Regardless of the number of ports installed in the lower slot, the numbering for ports in the upper slot always begins with No. 13 on the left. Since up to 12 ports can be installed here as well, the maximum port number at the top right is 24.

Example

If the lower slot has an SK-FDDI 2M8U (Linecard SK-5041G) module and the upper slot has an SK-FDDI 6M (Linecard SK-5041A) module installed, the concentrator will have ports 1 to 10 (below) and ports 13 to 18 (above). The “missing” numbers 11, 12 and 19 to 24 appear in the management menus as unoccupied or may be dropped.

Port Assignments in Different Operating Modes

The port type of ports 1 and 2 depend on the operating mode:

- In DAS mode, port 1 is automatically the A port, port 2 the B port.
- In SAS mode (cascaded), port 1 is the S port, port 2 is an M port.
- In Standalone mode, ports 1 and 2 are M ports.
  The remaining ports are all of type M.

Port Identification (Optional)

A number of labels are included with the product to allow you to identify the ports in accordance with their type (see above).

DAS-Mode

The add-on modules are supplied in the following configuration:

Product		A-Port	B-Port	M-Ports
SK-5041A	SK-FDDI 6M	Nr. 1	Nr. 2	Nr. 3...6 (13...18)
SK-5043E	SK-FDDI 8S	Nr. 1	Nr. 2	Nr. 3...8 (13...20)
SK-5021B	SK-FDDI 12U	Nr. 1	Nr. 2	Nr. 3...12 (13...24)
SK-5041G	SK-FDDI 2M8U	Nr. 1	Nr. 2	Nr. 3...10 (13...22)
SK-5043I	SK-FDDI 2S8U	Nr. 1	Nr. 2	Nr. 3...10 (13...22)

SAS Mode

In contrast to the DAS mode (see above table), port 2 is an M port, and port 1 is an S port in SAS mode. The remaining assignments are the same as those in the above table.

Standalone Mode

All ports are of type M.

Keying MIC Ports Correctly (Optional)

The provision of a proper key for each port is one method of supporting structured cabling in a FDDI network. If the concentrator is being used in the default operating mode as a Dual Attachment Concentrator (DAC), the port keys need not be changed.

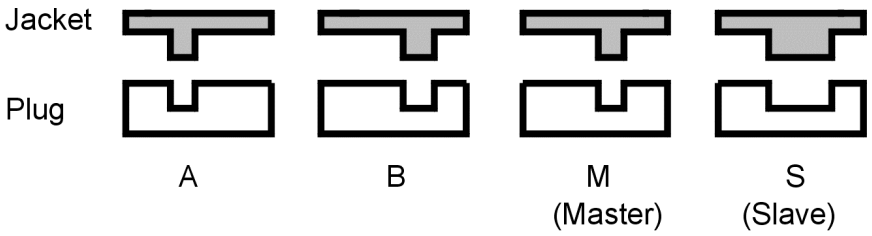


Figure 14. Plug/Jack Keying (Lateral View)

To prevent cabling errors, the fiber-optic transceivers and connectors should be properly keyed. Additional keys for replacement are included in the SK-Concentrator kit.

If the keys need to be exchanged, proceed as follows:

1. Carefully remove the colored plastic key tab with a pair of thin pliers. Gently pull the tab straight out (see the following figure).

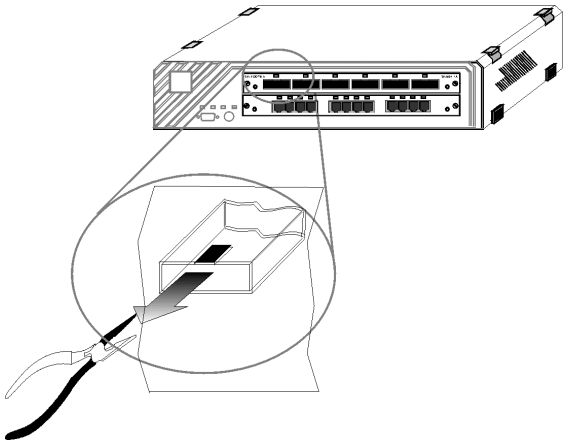


Figure 15. Removing the Plastic Key

2. From the plastic bag with spare keys supplied with the concentrator, select the desired plastic key tab.
3. Place the plastic key exactly over the intended slot of the transceiver's chassis.
4. With a pair of pliers, very carefully insert this key (Note: The plastic casing and the slot that holds the key tab are very delicate. Be careful not to damage the plastic casing.)

If no plastic key is reinserted if the wrong key is inserted, you won't have the benefits of a clear transceiver/cabling coding system.

Connecting Cables to Ports

The actual cabling for the individual port types is handled by similar methods, but the cables themselves have special features with respect to their form, unidirectional design and cable type.

Special features of MIC-Ports

MIC ports have a unidirectional design that prevents them from being inserted incorrectly (so no crossover between transmit/receive lines can occur). Furthermore, the port type can be marked on both the jack and plug side (see above) to minimize the possibility of manual connection errors.

You will need one Multimode 65/125µm fiber-optic cable per port with at least 1 MIC jack.

Special features of SC-Ports

In this case, neither the transmit/receive line nor the port type are physically coded, so special attention must be paid to ensure that the connection between the station and concentrator is made correctly. Each of the individual ports consists of 2 plugs (i.e. a transmitting and a receiving half).

You will need two 65/125µm fiber-optic cables per port with at least 1 SC jack each.

Special features of RJ-45-Ports

These ports are used for cabling with UTP (or S-UTP) cables and for transmissions based on the MLT-3 signaling standard. The jacks are usually designed to be unidirectional to prevent incorrect insertion. It is, however, important to ensure that the jacks on the concentrator side and the station or patch panel side have been correctly wired. Depending on the task involved, the cable used may be crossed or uncrossed (these expressions are related to the connection between the transmit and receive pairs):

To connect	**Cable**
Concentrator - Uncrossed patch panel	Crossed
Concentrator - Crossed patch panel	Uncrossed
Concentrator - Network adapter (NIC)	Crossed
Concentrator - Concentrator	Crossed

The decisive factor is to ensure that the number of crossovers across the entire cable stretch between the ports of the concentrator and station is odd.

You should also make sure that the RJ-45 jacks of the station cabling are not confused with those of telephone cables, since the latter connections may carry harmful voltage levels.

You should also make sure that the RJ-45 jacks of the station cabling are not confused with those of Token Ring and Ethernet installations.

Cabling

Warning!

Warning!
Electrical current from power, phone and communications cables can be hazardous

To avoid potential shock hazards:
Do not connect or disconnect any power cables during an electrical storm!
Do not connect the receptacles to the telephone line!

Depending on the mode of operation, port 1 and 2 may be reserved for FDDI ring connection or Master/slave connection of cascaded concentrators. The following instructions, however, also apply for these cases.

Proceed as follows:

1. If relevant, remove the plastic protectors for the ports to be cabled
2. Insert a plug into the transceiver of the station to be cabled (either directly to the NIC or via the corresponding port in the patch panel/wiring closet).
3. Connect the other plug of the cable used in step 1 to the desired concentrator port (Pos. 9). In the case of SC connectors, connect the transmit jack of the station with the receive jack of the concentrator or vice versa. If required, verify the connection via the LED display (Pos. 5) when the concentrator is running.
4. Document the established connection by a suitable method.
5. Repeat steps 1 to 4 for all connections.

When the concentrator is running, the cabling can be verified by checking the LEDs for the ports. In many cases, an LED display is also present on the network adapter of the corresponding station.

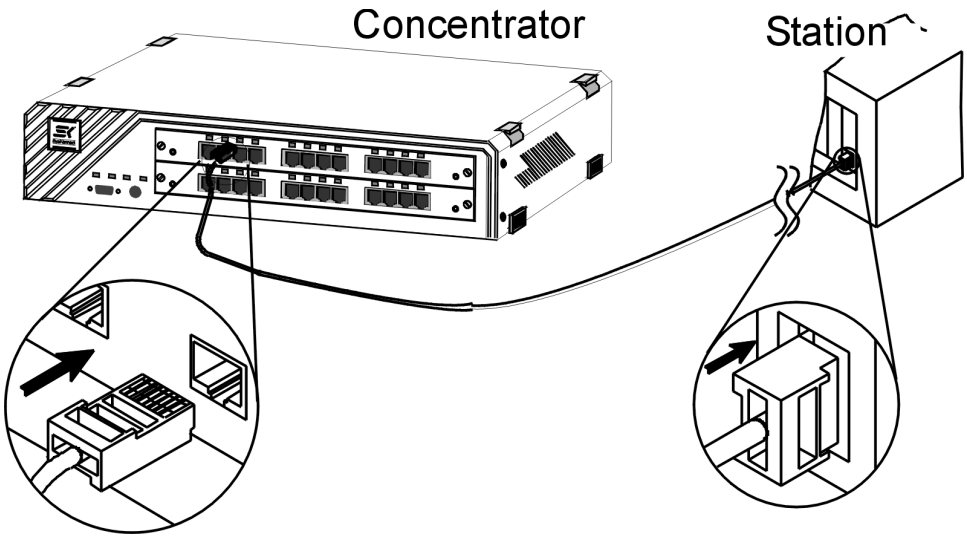


Figure 16. Connecting UTP Cables

Connecting an Optical Bypass (Optional)

To increase data security in the event of a failure or when the concentrator is turned off, an optical bypass can be installed in fiber-optic networks. This bypass provides an alternative route for the data stream to bypass the corresponding concentrator when required. You will find more details on how this works in Appendix G. FDDI / SMT Concepts and also in the documentation for your optical bypass.

To install the optical bypass, proceed as follows:

1. Connect the optical bypass using a 6-pin DIN plug with the MiniDIN6 jack of the concentrators (labeled Bypass, Pos. 8).
2. For the rest of the installation (e.g. connection to primary ring, secondary ring, power supply), follow the installation instructions supplied with your optical bypass.

Step 6. Running a Self-Test

Before the final installation, we suggest that you run the self-test of the concentrator.

To do this:

1. Turn on the device.
2. First, all LEDs should light up briefly in yellow. This is the period in which a bootcode memory test is performed.
3. The status LEDs (Pos. 1...4) will then light up cyclically for a few seconds, and a steady yellow light will be displayed on the LEDs for each port (Pos. 5). This indicates that the self-test is in progress.
4. After approximately five seconds, the self-test should be complete. If the test is successful, the status LEDs will stop blinking and display their applicable values. The port LEDs should display a steady green light if the corresponding ports have been correctly connected with the required connectors. If no cable has been connected to a given port, the LED for that port should be blinking.

If the status LEDs do not stop cycling or the port LED of one of the connected ports does not light up in green, an error has occurred. If this is the case, refer to the section Interpreting and Eliminating Displayed Malfunctions on page 44 or contact SysKonnect´s Product Support.

The network driver of the connected FDDI station must be loaded when checking the connection via Port LED.

Step 7. Software Settings (optional)

The SK-FDDI Concentrator II is supplied with installed operating software. This means that the concentrator will be immediately ready for operation (Plug & Play) as soon as the mechanical and electrical installation is complete.

Note, however, that if you want to fully exploit the management and convenient features of the concentrator, you should also make the individual software settings described below.

If the concentrator is inserted in a FDDI ring (as a DAS or SAS station), you should assign it an IP address. This step is, however, also advisable for devices that are initially intended to be used only in standalone mode. This is because the IP address is needed in order to use the built-in Web server, for example.

Important Defaults:

Parameter	Factory setting
IP-Address	0.0.0.0
User / Password	root / rootp
FDDI Configuration (SMT station type)	Concentrator as DAS-Station
Hostname for WWW	(no entry)
Default Gateway	0.0.0.0
IP Subnet Mask	0.0.0.0

The IP address is assigned by means of the supplied control program (User Interface). This program is run from a computer or a VT100 terminal that is connected to the concentrator 's console port via a V.24 cable (enclosed in the delivered package). An appropriate terminal emulation program for data transmission is included with the delivery package (refer to the CD-ROM).

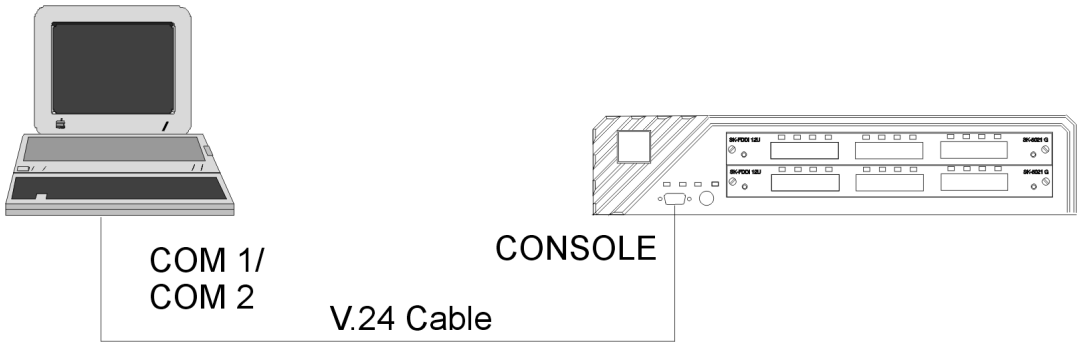


Figure 17. Connecting a PC/Terminal to the Concentrator

Setting Up Data Transmissions via the Console Interface

VT100 (compatible) terminal:

Connect the VT100 terminal (or a PC via the COM1 or COM2 port) to the Console interface of the concentrator using the supplied V.24 cable.

PC

Proceed as follows:

1. Connect the COM1 or COM2 port of the PC to the Console interface of the concentrator using the supplied V.24 cable.
2. Start the terminal emulation program. If no terminal emulation program has been installed on the PC, use the program DEE.COM (which is on the supplied CD-ROM). If required, check the Help file DEEREAD.TXT for details.
3. Set the following parameters (if not already set by default):
   - 9600 Baud (PC: The corresponding COM port must support this data transmission rate.)
   - 8 data bits
   - 1 stop bit
   - No parity

Booting the Concentrator and Starting the User Interface

Prerequisite: The concentrator must be attached to a terminal (or a computer with a terminal emulation) via the Console interface (Pos. 7) as described above.

1. Press the <Enter> key twice. A login prompt appears.
2. Log in under the name `root`.
3. Enter `rootp` as the password and press the <Enter> key.
   The main menu of the User Interface appears.

Assigning an IP Address

If the concentrator is run as a SAS or DAS station under a network management software program, it is absolutely essential that a valid IP address be assigned. An IP address is also required to use the built-in WWW server.

To assign an IP address, proceed as follows:

1. Starting with the main menu of the User Interface, select the CONFIGURATION item and then the EDIT IP CONFIGURATION item.
2. Enter the IP address for this concentrator in the input field in accordance with your network plan. If required, ask the network administrator for this information. Make sure that you use the excact input format required and also enter the hyphens. Then press the <Enter> key.
3. Depending on your requirements, enter the appropriate values for the IP SUBNET MASK, IP DEFAULT GATEWAY and HOSTNAME FOR WWW SERVER parameters and confirm each of the (possibly altered) parameters with the <Enter> key. More details on these parameters can be found in the section Parameter Reference in the Appendix.
   Note: In order to exit the menu and save the parameter configuration, even the unchanged parameters will need to be confirmed with the <Enter> key.
   This brings up the CONFIGURATION menu.
4. If you want to exit the User Interface, press the <Esc> key and then select EXIT from the displayed main menu.

If you want to continue by setting up a user name and password, follow the instructions in the section below.

Setting Up Users and Passwords

In general, passwords should be assigned to all administrators of the overall network and/or the workgroup who are required to operate the concentrator. Up to 8 different administrators (users) can be assigned to each concentrator. Users can be split into two groups:

- Privileged users have extensive privileges, which include configuring and controlling the concentrator. They can execute all (i.e. even network-critical) functions of the User Interface, including Firmware updates (downloading new concentrator software).
- Normal users have restricted privileges. They can only use the User Interface options that do not involve substantial changes in the configuration.

Individual users can also be deleted from the user list. See the Parameter Reference in the Appendix for details.

The default factory-set password is `rootp`, and the default user name is `root`.

Since this configuration is the same for all supplied concentrators, the default settings should be replaced by personal entries as soon as possible for security reasons.

The following steps can also be performed by means of the corresponding WWW pages (see the section Controlling the Concentrator via WWW Pages, starting on page 38).

Proceed as follows:

Setting up a user name

1. If you have not already done so, start the User Interface or dial the Web page (log in with the user name `root`; password `rootp`) and select the CONFIGURATION menu.
2. From the CONFIGURATION menu, select the item EDIT USER CONFIGURATION (and activate it with the <Enter> key).

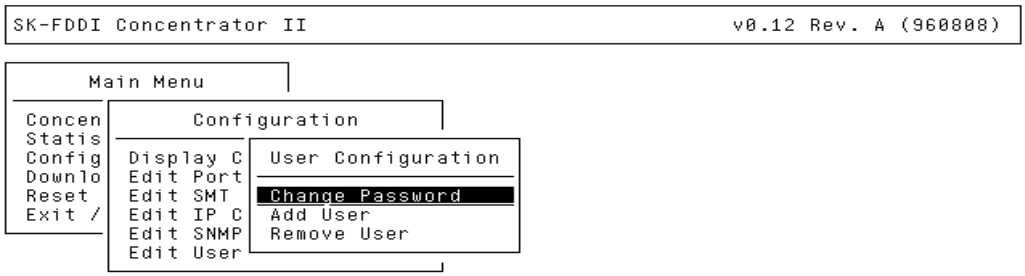


Figure 18. User Configuration Menu

3. Select the item ADD USER. A menu of the same name will appear.
   In the ADD USER menu, the item USER RIGHTS will be highlighted and set to the value NORMAL
4. Press the <Enter> key. The USER RIGHTS menu will appear.
   From the USER RIGHTS menu, select the PRIVILEGED setting.
   This will bring up the ADD USER menu again with the cursor already positioned in the input field for USER NAME
5. Enter the name to be used for the network administrator here.
6. Press the <Esc> key a few times to return to the main menu and confirm THE EXIT USER INTERFACE? prompt there with `Yes`.

Setting up the password

To set up the password, proceed as follows:

1. Log in with the new user name and no password (Press the <Enter>key instead). The main menu appears.
2. Select and activate the menu ITEM EDIT USER CONFIGURATION.
   This will open a submenu of the same name.
3. In this submenu, select CHANGE PASSWORD.
   This opens a dialog box with the prompt `Type old Password`.
4. Press the <Enter>key instead.
   A dialog box with the prompt `Type new Password` will appear.
5. Enter the desired password.
   Another dialog box with the prompt `Re-type new Password` will appear.
6. Enter the password again.
   You will now be returned to the EDIT USER CONFIGURATION menu.
7. Press the <Esc> key a few times to return to the main menu, and confirm the EXIT USER INTERFACE? prompt displayed there by selecting `Yes`.

If only one privileged user has been entered, and that user has forgotten his or her password, the DEFAULT CONFIGURATION file will need to be reloaded. See the section Forgotten Password? - First Aid on page 57.

Further (optional) configuration options are described in the next section.

Defining the Concentrator Type

The concentrator is factory-set to DAS mode. In this state, the first two ports at the bottom left are configured as A and B ports, and all other ports are configured as M ports.

If the concentrator is to be operated as a SAS station (subordinate device in a cascaded structure) or as a standalone unit, the default configuration must be changed by means of the User Interface.

Proceed as follows:

(The following steps are based on the assumption that the connection between the PC/terminal and the concentrator has been set up as described earlier and that the User Interface is accessible. An alternative to the description provided below would be to call and edit the corresponding Web pages.)

1. Start the User Interface
2. Select the following menus/menu items in succession:
   - MAIN MENU
   - CONFIGURATION
   - EDIT SMT CONFIGURATION
   - SMT STATION TYPE

   A choice list will appear with the default option DAS CONCENTRATOR and the additional options SAS CONCENTRATOR and STANDALONE..
3. Select the desired configuration and press the <Enter> key.
4. To exit this menu, do not press the <Esc> key. Instead, make sure that you first confirm or edit the remaining values in the EDIT SMT CONFIGURATION menu as required. When you press the <Enter> key in the last menu item, you will be returned to the CONFIGURATION menu above it.

   If this procedure is not observed, the modified settings may not be saved.
5. Exit the User Interface (by pressing the <Esc> key a few times until the main menu appears and by selecting `Yes` in response to the EXIT USER INTERFACE? prompt).

4 Management and Advanced Configuration

If you finished the configuration described in the previous chapter, the concentrator is ready for operation. The operational state is indicated via the parameter set of the User Interface or Web Pages and via the LEDs. (Refer to the paragraph Checking Functions Visually (via LEDs)).

The SK-FDDI Concentrator II is supplied with the operating software installed. There are four ways to monitor, configure and control the concentrator:

- via a terminal or a computer with a terminal emulation program.
  In this case, the concentrator is connected via its Console interface to a VT100 (or compatible) terminal or to a computer with the appropriate emulator software (see below) by using the enclosed V.24 cable.
- via the built-in WWW server from a workstation (see below).
  The computer involved must be connected to a network that provides access to the concentrator (ideally in the same LAN in which the concentrator is installed).
- via a Telnet session in the network.
  A correctly assigned IP address is required in this case. The user interface is the same as for the VT100 version.
- using SNMP with an appropriate network management software.
  The required MIBs are provided on the supplied CD-ROM. The operation of the management software should be described in the accompanying manuals.

The following discussion is restricted to the first two methods indicated above. Although these two methods differ significantly in terms of how data is transferred and their respective graphical interfaces, the same control and monitoring functionality is offered by both access options. In other words, the same functions are available in both cases within the same menu structure.

The latest information on the SK-FDDI Concentrator II and the software can be found in the Readme files on the CD-ROM or obtained via SysKonnect's online support (WWW). The contents of the Readme files can be conveniently viewed with the Readme Viewer (see Reference Readme Viewer). The Readme files on the CD-ROM are specific to the supplied software.

Examples of Management Functions

- Changing the concentrator type and thus the port configuration:
  If an A port is to be converted to an M port, for example, the internal software configuration data must be modified. In order to work with and display the configuration, the User Interface program needs precise information about the operating mode.
- Assigning an IP address and a default IP route (default for SNMP management).
- Editing or configuring SNMP or SMT parameters.
- Testing concentrator hardware with the integrated diagnostics program (only via V.24 connection).
- Loading new SK-FDDI Concentrator II software.
- Displaying statistics.

Controlling the Concentrator via the Console Interface

In order to access the terminal controller of the concentrator, you will need:

- a VT100 (or compatible) terminal or a PC with a terminal emulation program. Note: The program DEE, which is included on the CD-ROM supplied with the Concentrator II, provides a simple terminal emulation (see the corresponding Readme file for installation instructions)
- a V.24 link between the terminal/PC and the Console port of the concentrator. The installation must be carried out as described in the section Setting Up Data Transmissions via the Console Interface.
- a valid user name and password to access the concentrator functions.

To call the User Interface, proceed as follows:

1. (Only for PCs:) Start the terminal emulation program
2. Press the <Enter> key at the terminal/PC twice.
3. Enter your user name and password.
   The software in the delivery package is preset for the user `root` and the password `rootp`. This default user has extended privileges.

For security reasons, this combination should be modified by the administrator before the concentrator is installed on the network and other users can access it. More information on this subject is provided in the preceding section Setting Up Users and Passwords.

4. Access the desired menus and/or parameters. These parameters are described in detail in Appendix E. Parameter Reference.

The parameters are displayed in real-time, i.e. changes that occur during the display are also reflected in it. In contrast to the WWW pages, the values displayed here are always current.

Controlling the Concentrator via a Telnet Session

In order to manage the concentrator via a Telnet session, you will need:

- the IP address of the concentrator or an alias, both of which can be assigned in the CONFIGURATION / EDIT IP CONFIGURATION menu (see the section Main Menu).
- access to the network in which the concentrator is located.
- a valid user name and password to access the concentrator functions.

The individual menus are called as described in the preceding section and in the appendix Parameter Reference.

Controlling the Concentrator via WWW Pages

In order to access the built-in WWW server, you will need:

- a WWW Browser, e.g. Netscape Navigator, MS Internet Explorer (Version 3.0 and above are recommended in both cases)
- the IP address of the concentrator or an alias, both of which can be assigned in the CONFIGURATION / EDIT IP CONFIGURATION menu (see the section Main Menu).
- a valid user name and password to access the concentrator functions.

The first IP address configuration must be made via Console Interface and User Interface because the Web Pages require a valid IP address.

In order to call the internal Web page, proceed as follows:

1. Start your WWW Browser. This can be done from any computer that can access the network in which the Concentrator II is installed.
2. Enter the IP address or the alias of the concentrator (see above) as the URL. This will bring up the Welcome page of the SK-FDDI Concentrator II.

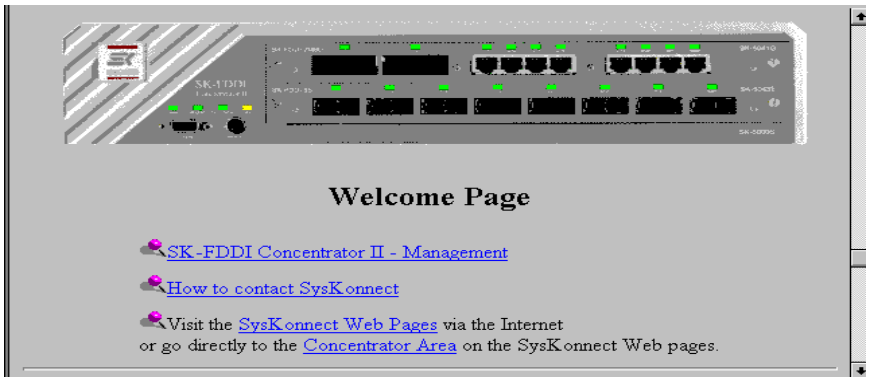


Figure 19. Welcome Page of the WWW-Server

Most browsers allow you to set a bookmark. If you save this page as a bookmark, you can then access it later at any time by simply selecting the bookmark instead of explicitly specifying the IP address.

3. To use the management functions, select SK-FDDI CONCENTRATOR II. The following dialog box appears.

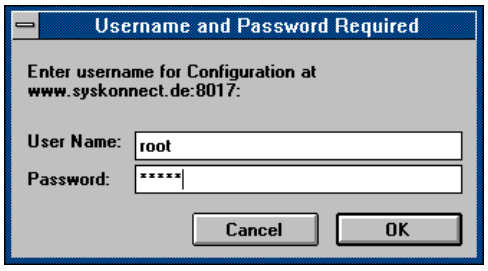


Figure 20. Dialog box to request a password

4. Enter your user name and password in the appropriate fields.
   The software in the delivery package is preset for the user `root` and the password `rootp`. This default user has extended privileges.

For security reasons, this combination should be modified by the administrator before the concentrator is installed on the network and other users can access it. See the section Setting Up Users and Passwords for details.

5. Access the desired menus and/or parameters. The menu structure and displayed parameters are essentially in the same format as in the User Interface. Detailed descriptions can be found in the appendix Parameter Reference.

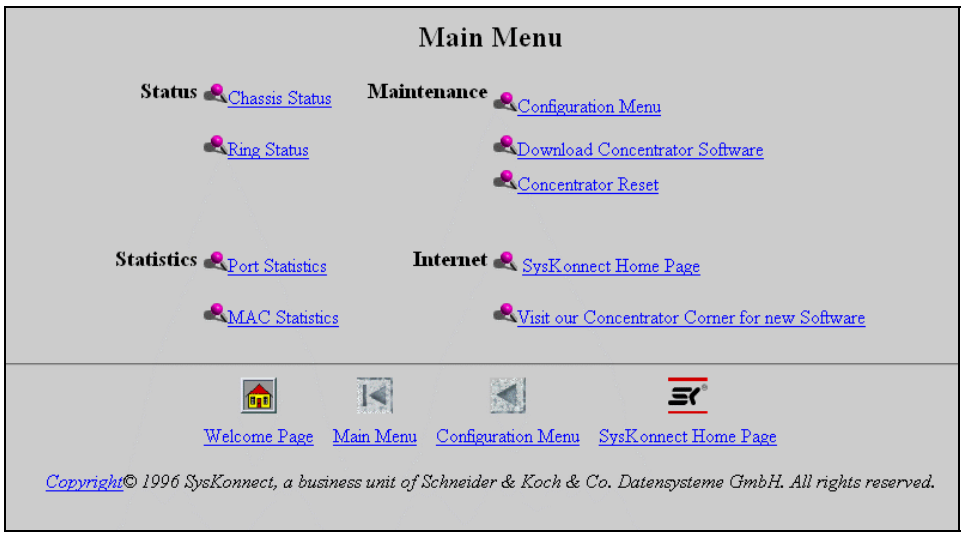


Figure 21. Welcome Page of the SK-FDDI Concentrator II

The WWW pages are currently only static displays. If you want to check the changes that have occurred in the parameter values, you will need to update the corresponding page. This can be done by clicking on the UPDATE THIS PAGE button.

Functionality

The wide variety of control, configuration and statistical functions can be seen in the following table. Special attention was paid to ensure that the individual menus were arranged in a clear and logical structure. In order to familiarize yourself with the functionality and thus enable a quick analysis and error recovery in an emergency, it is advisable to dedicate some time to study the individual menus.

We therefore suggest that you occasionally call the corresponding menus and read the explanations in the Appendix or the Help texts.

The following table shows the menus and their submenus of the webinterface:

Menu	Submenu	Submenu	Displayed parameters (some can be set)
Status	Chassis Status		Voltage, Fan, Temperature Main Board, Temperature Power Supply
	Ring Status		LED Ring OP, LED Ring Status, LED Data, Upstream Neighbour, Downstream Neighbour, MAC Timers: (T-Req, T-Neg, T-Max, T-Min, TVX Value)
Statistics	Port Statistics		Port, Type, State, LCTFail-Ct, Lem-Ct, LemReject-Ct, LemEstimate, PortFlag
	MAC Statistics		Ring Operational Counters (RingOp Changes, RingOp Ratio, RingOp Changes Threshold), MAC Frame Counters (Transmit, Receive, LLC, SMT), MAC Frame Error Counters (Frames Aborted, CRC Error, Frames Lost, Frames Too Long, TVX Expired, FORMAC Error)
Maintenance	Configuration Menu	Display current configuration	MAC Address, Linecard Configuration, SMT Configuration, IP Configuration, SNMP Configuration, User Administration, Software Configuration
		Edit Port configuration	Port Type, PMD Class, Connector, State, Ler Cutoff, Ler Alarm, Cutoff Config
		Edit SMT Configuration	SMT Station Type, MAC TVX Value, MAC TReq Value, PCM LCT_Short Error Threshold, Ring Operation Change Threshold, SMT PMF Authorization

Menu	Submenu	Submenu	Displayed parameters (some can be set)
			Station ID, SMT PMF Authorization Password
		Edit IP Configuration	IP Address, IP Subnet Mask, IP Default Gateway, Hostname for WWW
		Edit SNMP Configuration	SNMP Agent State, System Contact, System Location, System Name, Public Community, Private Community, SNMP Trap Address
		Edit User Configuration	Change Password, Add User, Remove User
	Download Concentrator Software		TFTP Download File
	Concentrator Reset	Yes No	
Internet	SysKonnect Homepage		
	Visit our Concentrator Corner for new Software		

Detailed descriptions can be found in Parameter Reference.

5 Service Measures and Trouble-shooting

Removing a Stacked Unit

Caution

Caution!
Stacked (or bolted) devices should always be lifted from the bottom. Any group of individual devices that are mechanically joined by a snap-on mechanism should never be lifted by holding the topmost device.

If you want to disconnect one or more units from a stack of devices, proceed as follows:

1. Press the chassis horizontally downward against the lower unit. This should release the upper unit from the anchor on the lower unit
2. Lift off the upper unit.
3. Remove any other units that may need to be released by following steps 1 and 2 above. To restack the units, refer to the instructions in the section Attaching the Concentrator to other SysKonnect Devices.

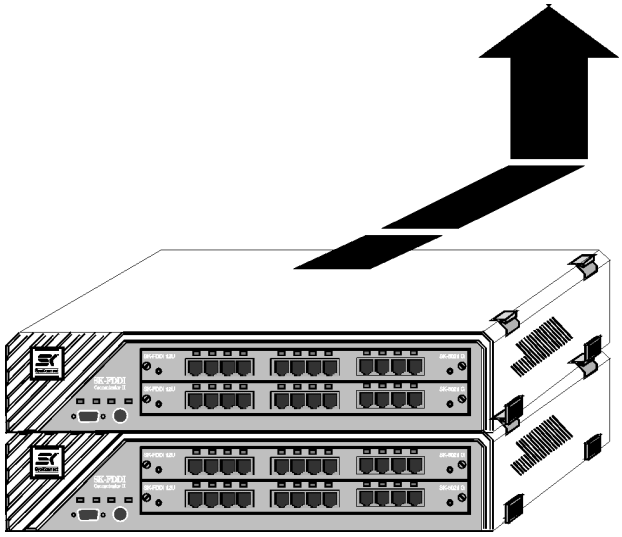


Figure 22. Disconnecting a Unit from a Stack

Cleaning

It is usually sufficient to wipe the device with a dry soft cloth. If the device has heavy stains that need to be removed with a liquid cleaner, follow the instructions below:

Warning!

Warning!
Contact between liquids and electrical devices can be hazardous and could result in short circuits!
To avoid potential shock hazards:
Do not submerge the device in liquids or use a steam cleaner.
Do not open the device.
Turn the device OFF.

- Do not use strong cleaning solutions or strong acids / bases. Any heavily diluted com-mer-cially available household cleaner or dishwashing liquid should be adequate. The cloth used to clean the device should not be too moist.
- Make sure that no liquid seeps into the inside of the device (e.g. through the air vents or cooling fans).
- The ports on the device must not be exposed to contact with any liquids (reinsert the protective caps if required).

Checking Functions Visually (via LEDs)

Status LEDs	green	yellow	yellow blinking	off
System	Device is ready	Diagnostic test in progress	Error detected during test	No connection/ malfunction
RingOP	Ring is opera-tional	Trace		No connection/ malfunction
Ring Status	A and B active S-Port aktive (SAS Mode)	A or B in wrap mode (only in DAS mode)	-	No connection/ malfunction
Data	Transmit	Receive	-	No connection/ malfunction

Port LEDs	off	green	steady yellow	changing yellow/green	blinking yellow rap-idly
1...24 (max.)	Port inactive	Port and con-nection O.K	Port in wait state	Port Alarm, but connec-tion O.K.	Port tempo-rarily down *)

*) The port was temporarily shut down, since the Link Error Rate was exceeded. The concentrator will try to auto-matically start up the port again after the time specified in the Cutoff Time parameter (via the User Interface, see Parameter Reference).

LED Displays During Normal Operation

When the concentrator is first turned on, the displayed LEDs have a special meaning, since a self-test is performed. (see the section Step 6. Running a Self-Test). After some time, the LEDs should display the following pattern:

Status LEDs	Farbe
System	green (steady)
RingOP	green (steady)
Ring Status	green (steady)
Data	off/green/yellow (alternating, since the device alternately pauses/transmits/receives data)
Port LEDs	**Color**
1...24	green (steady)*

* if stations are properly connected and their network drivers are loaded

Interpreting and Eliminating Displayed Malfunctions

Display	Check	yes	no
All LEDs off	Check whether the fans are working	Perform a reset	Check power supply Check and replace fuse(s) if required
Status LEDs in cyclic mode	The self-test is running. Does the status change after a maximum of 2 minutes?	Compare the new LED status with the required status	Perform a reset. If the behavior does not change after several attempts, initiate repair proceedings.
Single status-LED off	Check whether the LED blinks during the self-test after a reset.	Run diagnostics	Very rare, but a defective LED may be involved. Initiate repair proceed-ings.
Status LED blinking yellow	Analyze messages from diagnostic test; observe message win-dow		
Port LED blinking despite connected cable	Are the connectors at the concentrator and patch panel securely locked?	Check the rest of the connection path to the station; verify integrity of connec-tors and cable with a tester	Click connectors into place
	Is an SC cable con-nected?	Check whether reversing the con-nector causes the display to switch. Could it be that the second SC cable does not end at the same station?	-
	FDDI Station: network driver started / properly configured at the oper-ating system?		Install the station's net-work interface properly, start the driver

Before you initiate repair proceedings, consult the Release Notes and our Product Support. It is conceivable that minor changes in LED behavior may simply be the result of recently intro-duced software updates.

Testing Internal Components (Except Ports)

The installed diagnostics module tests the most important internal components of the con-centrator.

No additional test equipment is required to test the internal components of the concentrator. Only a loopback cable or a second SK-FDDI station is needed to test the transceiver.

To start the diagnostics module:

1. Reset the concentrator software.
   The following prompt appears:

```
Boot Code v1.04 (970317)
========================

<serial number 4f000b>
The following modules are available:
```

```
      (m1)  Software Update Loader v1.04 (970317)
      (m2)  Boot Code Update Loader v1.04 (970317)
      (m3)  Configuration File Loader v1.04 (970317)
      (m4)  Diagnostics Tool v1.00 beta 04 (970220)
      (m5)  Concentrator Software v1.00 beta 02 (970402)
After 5 seconds the module
     Concentrator Software v1.00 beta 02 (970402)
will be started automatically.

      Please select module:
```

2. To start the diagnostics module, enter the appropriate program module number, here `m3`, within the next 5 seconds.

The module numbers may change after software updates.

```
Starting selected module     (4) Diagnostics Tool v1.00 (970221)


      Diagnostics Tool v1.00 (970221)
      -------------------------------
(0)   Exit
(1)   Run all tests without any loopback cable
(2)   Run all tests with all loopback cables installed
(3)   Run advanced diagnostics

      Please select function [0] :
```

3. Enter `1`. This begins the diagnostics for the internal components of the concentrator. After the tests have been successfully completed, the following confirmation will appear on the screen:

```
Check MFP                    .......... o.k.
Check optical bypass         .......... present
Test bypass switch                .......... o.k.
Check MFP timer              .......... o.k.
Check FORMAC Plus registers  .......... o.k.
Buffer RAM check via MDR (128kB) ..........   o.k.
Test MMU    ..... A20 swapping system detected!..... o.k.

Test Board register               .......... o.k.
QuadElm tests                     .......... o.k.
Check twsi devices                     .......... o.k.
Motherboard temp: 31.5
Power Supply voltage: 4.968
Check PLC in slot 1               .......... o.k.
Check PLC in slot 2               .......... o.k.
Check PLC in slot 3               .......... o.k.
Check PLC in slot 4               .......... o.k.
Check PLC in slot 5               .......... o.k.
Check PLC in slot 6               .......... o.k.
Check PLC in slot 7               .......... o.k.
Check PLC in slot 8               .......... o.k.
Check PLC in slot 9               .......... o.k.
Check PLC in slot 10              .......... o.k.
Check PLC in slot 13              .......... o.k.
Check PLC in slot 14              .......... o.k.
```

```
Check PLC in slot 15              .......... o.k.
Check PLC in slot 16              .......... o.k.
Check PLC in slot 17              .......... o.k.
Check PLC in slot 18              .......... o.k.
Test single port #1               .......... o.k.
Test single port #2               .......... o.k.
Test single port #3               .......... o.k.
Test single port #4               .......... o.k.
Test single port #5               .......... o.k.
Test single port #6               .......... o.k.
Test single port #7               .......... o.k.
Test single port #8               .......... o.k.
Test single port #9               .......... o.k.
Test single port #10              .......... o.k.
Test single port #13              .......... o.k.
Test single port #14              .......... o.k.
Test single port #15              .......... o.k.
Test single port #16              .......... o.k.
Test single port #17              .......... o.k.
Test single port #18              .......... o.k.
Test single QuadELM #1            .......... o.k.
Test single QuadELM #2            .......... o.k.
Test single QuadELM #3            .......... o.k.
Test single QuadELM #4            .......... o.k.
Test single QuadELM #5            .......... o.k.
Test single Linecard #1           .......... o.k.
Test single Linecard #2           .......... o.k.
Test whole Chassis                     .......... o.k.
FORMAC loopback intern            .......... o.k.
FORMAC loopback over PLC               .......... o.k.
FORMAC loopback over PDT/R             .......... o.k.
FORMAC loopback over fiber (PB/PS) ......    inactive    (no    cable
installed)
Claim loopback PLCs               .......... o.k.
Transmit synchr frames            .......... o.k.
Transmit asynchr frames           .......... o.k.
```

If errors have occured during these tests, contact your authorized reseller.

Checking Port Functions and Network Access

Hardware Connections

There are three types of cable setups to test port functionality and network access with the diagnostics module:

Connection: Concentrator - NIC

1. Connect the concentrator port to be tested to using a suitable (and correctly wired) cable with the port of an SK-NET FDDI NIC.
2. Run the SK-NET FDDI card's diagnostics software and set the card in *Repeat mode*. If you are using FDDI PCI network adapters, this can be done by adding the parameter `-a` to the start command for the diagnostic program, e.g. `skfpdiag -a`. Then enter `R` for repeat mode (see also the Installation Instructions for SK-NET FDDI NICs).

   In Repeat mode, all incoming data packets are retransmitted unchanged. FDDI signaling patterns and connection status report requests are handled correctly (i.e. modified).

   The setup is now ready for testing

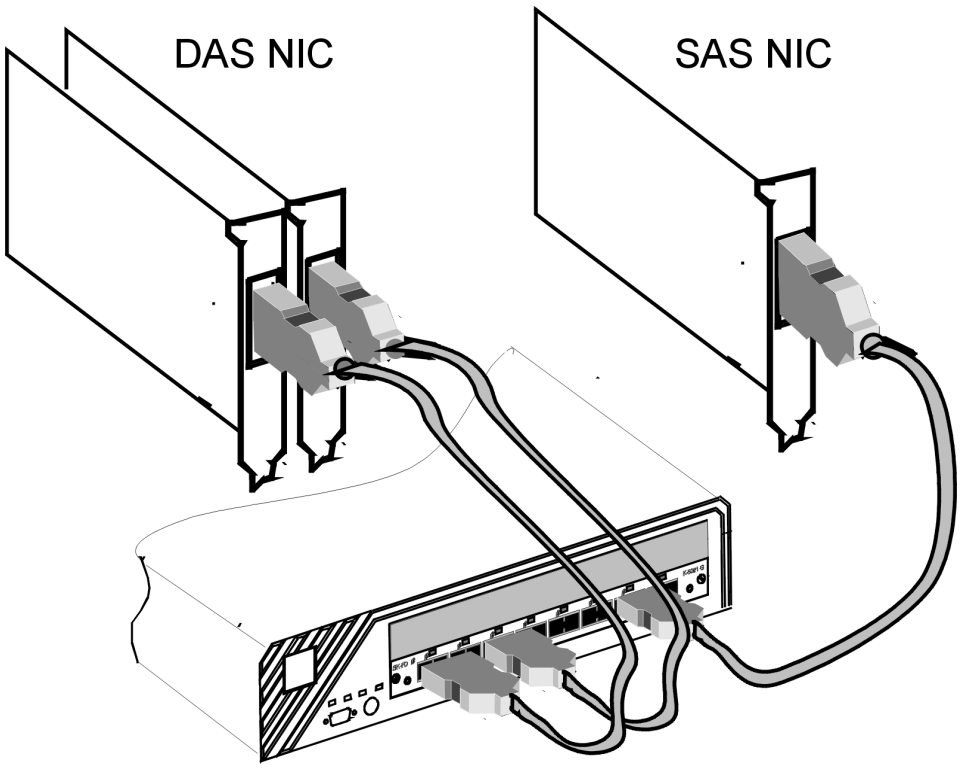


Figure 23. Test Setup with SK-FDDI Concentrators and NICs

Connection: Concentrator - Concentrator

1. Use a second SK-FDDI concentrator and connect each port of the concentrator to be tested with the second concentrator. The ports need not be connected to the corresponding concentrator ports on second concentrator; i.e. port MI of the first concentrator can, for example, be connected to any free M port of the second concentrator.
2. Start the FDDI HARDWARE DIAGNOSTICS on the second concentrator via the Console interface by entering the appropriate module number, here `m4`. The selection menu for diagnostics appears.
3. Select ADVANCED DIAGNOSTICS.
4. Turn on Repeat mode by entering the command `repeat`.
   The setup is now ready for testing.

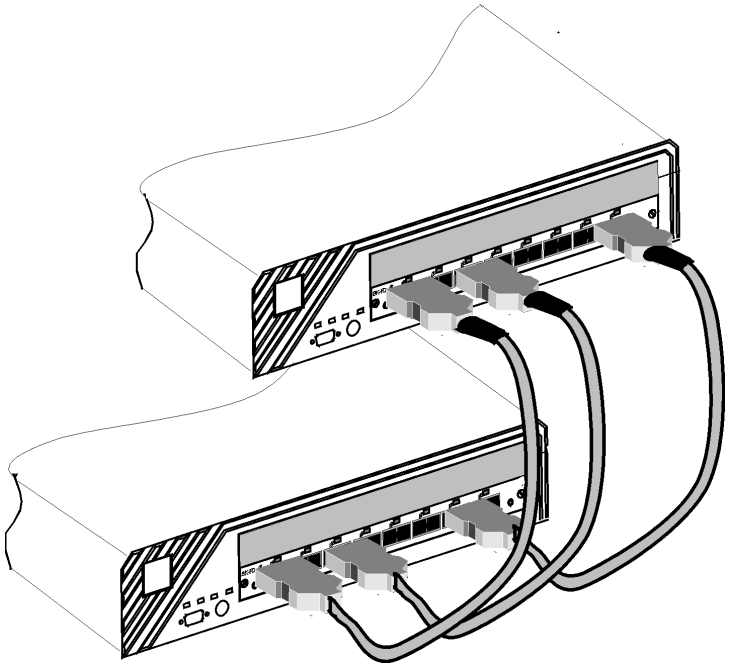


Figure 24. Test Setup with two SK-FDDI Concentrators

Loopback Plug

A loopback plug or cable allows a thorough check of the PLC (Physical Layer Controller) and the transceiver. The FDDI signaling, connection and status information remain unchanged. A loopback adapter for MLT-3 ports connects the transmit and receive lines at or behind the plug. The pinouts for an MLT-3 connector are described below.

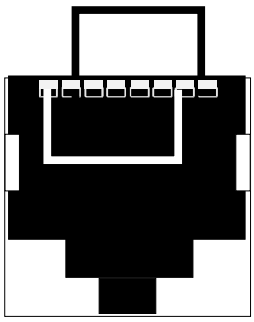


Figure 25. Structure of a Loopback Plug

Proceed as follows:

1. Connect the loopback cable or plug to all UTP ports of the linecard.
2. Connect the loopback plug to all MIC (optical) ports of the linecard.
3. If SC ports are available, connect the left and right plugs of the same port.
   The setup is now ready for testing.

Testing all Ports

The ports of the SK-FDDI concentrator can be differentiated by their labels. The number of ports to be tested at a time depends on the concentrator configuration (6...24 Ports installed) and the test setup. The diagnostics module must be configured with information on the installed test cabling.

If loopback cables have been installed on all ports:

1. Reset the concentrator software.
   The following prompt appears:

```
Boot Code v1.04 (970317)
========================
<serial number 4f000b>
The following modules are available:

      (m1)  Software Update Loader v1.04 (970317)
      (m2)  Boot Code Update Loader v1.04 (970317)
      (m3)  Configuration File Loader v1.04 (970317)
      (m4)  Diagnostics Tool v1.00 beta 04 (970220)
      (m5)  Concentrator Software v1.00 beta 02 (970402)
After 5 seconds the module
      Concentrator Software v1.00 beta 02 (970402)
will be started automatically.

      Please select module:
```

2. To start the diagnostics module, enter the appropriate module number, here `m4`, within the next 5 seconds. Note that the appropriate software module number (m4) might have changed after previous software upgrades.

```
Starting selected module     (4) Diagnostics Tool v1.00

      Diagnostics Tool v1.00 beta 04 (970220)
      ---------------------------------------

(0)   Exit
(1)   Run all tests without any loopback cable
(2)   Run all tests with all loopback cables installed
(3)   Run advanced diagnostics

      Please select function [0] :1
```

3. Select (2) RUN ALL TESTS WITH ALL LOOPBACK CABLES INSTALLED. This starts the tests, and the test results are displayed on the screen.

```
Check MFP                    .......... o.k.
Check optical bypass               .......... not present
Check MFP timer                    .......... o.k.
Check FORMAC Plus registers        .......... o.k.
Buffer RAM check via MDR (128kB)   .......... o.k.
Test MMU               ..... A20 swapping system detected!..... o.k.
Test Board register                .......... o.k.
QuadElm tests                      .......... o.k.
Check twsi devices                 .......... o.k.
Motherboard temp: 25.5
Power Supply voltage: 5.008
Check PLC in slot 1                .......... o.k.
Check PLC in slot 2                .......... o.k.
Check PLC in slot 3                .......... o.k.
Check PLC in slot 4                .......... o.k.
Check PLC in slot 5                .......... o.k.
Check PLC in slot 6                .......... o.k.
Check PLC in slot 7                .......... o.k.

Check PLC in slot 8                .......... o.k.
Test single port #1                .......... o.k.
Test single port #2                .......... o.k.
Test single port #3                .......... o.k.
Test single port #4                .......... o.k.
Test single port #5                .......... o.k.
Test single port #6                .......... o.k.
Test single port #7                .......... o.k.
Test single port #8                .......... o.k.
Test single QuadELM #1             .......... o.k.
Test single QuadELM #2             .......... o.k.
Test single Linecard #1            .......... o.k.
Test whole Chassis                 .......... o.k.
FORMAC loopback intern             .......... o.k.
FORMAC loopback over PLC           .......... o.k.
FORMAC loopback over PDT/R         .......... o.k.
FORMAC loopback over fiber (PB/PS) .... inactiv (no cable installed)
Claim loopback PLCs                .......... o.k.
Transmit synchr frames             .......... o.k.
Transmit asynchr frames            .......... o.k.
```

Testing Individual Ports (Advanced Diagnostics)

The Advanced Diagnostics Mode is reserved for highly experienced network administrators and should be used with extreme caution.

For example, the command

```
diag C
```

deletes the configuration. Since this also deletes the IP address, the device will no longer be addressable via the World Wide Web. The configuration can then only be restored in the User Interface via the Console interface by manually reentering all parameters.

In order to test individual ports with a connected loopback cable or ports connected with an external FDDI port in Repeat mode, proceed as follows:

1. Reset the concentrator software
   The following prompt appears:

```
Boot Code v1.04 (970317)
========================

<serial number 4f000b>
The following modules are available:
      (m1)  Software Update Loader v1.04 (970317)
      (m2)  Boot Code Update Loader v1.04 (970317)
      (m3)  Configuration File Loader v1.04 (970317)
      (m4)  Diagnostics Tool v1.00 beta 04 (970220)
      (m5)  Concentrator Software v1.00 beta 02 (970402)
After 5 seconds the module
      Concentrator Software v1.00 beta 02 (970402)
will be started automatically.

      Please select module:
```

2. To start the diagnostics module, enter the approriate module number, here `m4` within the next 5 seconds.

```
Starting selected module     (4) Diagnostics Tool v1.00
      Diagnostics Tool v1.00 beta 04 (970220)
      ---------------------------------------
(0)   Exit
(1)   Run all tests without any loopback cable
(2)   Run all tests with all loopback cables installed
(3)   Run advanced diagnostics

      Please select function [0] :1
```

3. Select (3) RUN ADVANCED DIAGNOSTICS.
4. Enter the following line: `slot [slot number]`
   Where `[slot number]` is the number of ports that you want to test. For example, `slot 3` for 3 ports.
5. Then enter the following command:
   `cable [Mode]`
   This selects the type of cable for the slot selected in step 4). Following cable, you should specify one of the following values for the `[Mode]`:
   `p` for a loopback cable
   `r` for a connection with the port of a NIC or a second concentrator that is being operated in Repeat mode by means of its own diagnostics module.
   `no` if no cable is attached

For example, enter `cable p` if a loopback cable is installed at the port

6. Repeat steps 4 and 5 for all slots to be tested.
7. To obtain an overview of the tested configuration, enter `show`
8. To start all tests, enter `diag a`
9. If required, you can also perform further diagnostics operations. These options are discussed in the sections below.

Using Extended Diagnostic Options

An overview of the parameters for the advanced diagnostics described above can be obtained at any time by entering `h` or `?`.

The following Help information is displayed on the screen:

```
Diagnostics Tool v1.00
======================================

Enter 'diag a'    to perform all internal tests
Enter 'h'         for help
>>h
command line syntax : [time] [loop count] command parameter ..
commands :
eval expr         /* evaluate expression       */
dm [adr [len]]          /* display memory      */
sm adr val [val ..]     /* set memory words          */
sb adr val [val ..]     /* set memory bytes          */
dmr word_addr           /* dump RBC memory           */
slot slot_number  /* set current slot          */
allcable p|r|no   /* set lb-cable for all slots      */
cable p|r|no            /* set loopback cable for slot */
show              /* show cable configuration  */
default                 /* reset all defaults        */
diag command            /* diagnostics               */
dy test_no        /* Do one single y test      */
mac_address       /* Show MAC address          */
config                  /* display configuration     */
repeat                  /* put all slots in repeat mode    */
force             /* force line states on slot */
strong                  /* switch to strong Port tests     */
ls                /* display line states on slot     */
reset             /* reset CPU via RST         */
rambuffer 32|128  /* set RAM buffer size       */
plc_c_reg slot value    /* Set PLC-C register value  */
fassert slot value      /* Set fassert register value      */
fdeassert slot value    /* Set fdeassert register value    */
help              /* display help              */
h                 /* display help              */
?                 /* display help              */
```

All parameters must be specified fully in combination with the commands listed above. Otherwise, an error message will appear:

Example: If you enter `>> eval`, the following error message appears:

```
>> eval
      ^number expected
```

Diagnostic Module Commands

The following commands can be used in the diagnostic module:

`show`	displays the current configuration for attached diagnostic cables
`default`	resets the configuration for all connectors to "cable no" (no cable attached) and sets the current slot to "slot 1" (default setting).
`repeat`	switches all ports to "repeat" mode. This command is used if another concentrator is to be checked using this concentrator as the repeater.
`force [i/m/h/q]`	sends one of the following signal patterns to the current connector: `i` Idle `m` Master `h` Halt `q` Quiet This command is used if the performance of the FDDI cable is to be tested. To exit this mode, enter any key except those above.
`ls`	displays the line state signal of the selected slot. Enter: `loop -1 ls`, and the output will be regularly updated. To exit this mode, press any key.
`diag`	activates a second command line interpreter which can run certain diagnostic functions. Enter `diag a` to start all tests. Enter `diag h` to display the available test functions. Example:

```
>>diag h
Available diagnostic commands :
a      all tests           l      LED tests
t      MFP-timer           c      Linecard checks
f      FORMAC registers    q      QuadElm checks
r      Buffer Memory       2      twsi and microwire
P      all PLCs            i      incremental Port
p      current slot PLC    C      Config EEPROM
y      FORMAC loopback     h      help
m      MFP and opt. bypass        ?      help
x      send & rec long frame      s      stop on error
Y      send loop           S      don't stop on error
o      FORMAC+ RING_OP     R      reset on error
F      FORMAC+ dump        .      print char. on/off
E      Clear buffer        L      Loop forever
b      Built-in register
```

`reset`	Leaves the diagnostic module and resets the concentrator. After execution, the concentrator will present the STARTUP menu.

Sample Diagnostics Run: Invalid Test Setup

In this example, slots 1, 2 and 3 are configured with cable r (cables connected to concentrators or network cards in repeat mode). Slot 3 does NOT have a cable installed, so an error message is expected. The diagnostics are started with the `diag a` command. The user's entries in this dialog follow the >> prompt. The responses from the diagnostic program are shown below the user inputs.

```
>>slot 2
Current slot set to 2
>>cable r
Slot 2 is connected to another station in repeat mode
>>slot 1
Current slot set to 1
>>cable r
Slot 1 is connected to another station in repeat mode

>>slot 3
Current slot set to 3
```

```
>>cable r
Slot 3 is connected to another station in repeat mode
>>show
Slot 1 is connected to another station in repeat mode
Slot 2 is connected to another station in repeat mode
Slot 3 is connected to another station in repeat mode
Slot 4 has no cable installed
Slot 5 has no cable installed
Slot 6 has no cable installed
Slot 7 has no cable installed
Slot 8 has no cable installed
>>diag a
Check MFP                    ..........       o.k.
Check optical bypass               ..........  not present
Check MFP timer                    ..........  o.k.
Check FORMAC Plus registers        ..........  o.k.
Buffer RAM check via MDR (128kB)   ..........  o.k.
Test MMU    A20 swapping system detected!.....       o.k.
Test Board register                ..........  o.k.
QuadElm tests                      ..........  o.k.
Check twsi devices                 ..........       o.k.
Motherboard temp: 26.0
Power Supply voltage: 5.008
Check PLC in slot 1                ..........  o.k.
Check PLC in slot 2                ..........  o.k.
Check PLC in slot 3                ..........  o.k.
Check PLC in slot 4                ..........  o.k.
Check PLC in slot 5                ..........  o.k.
Check PLC in slot 6                ..........  o.k.
Check PLC in slot 7                ..........  o.k.
Check PLC in slot 8                ..........  o.k.
Test single port #1                ..........  o.k.
Test single port #2                ..........  o.k.
Test single port #3                ...
timeout     E191 MAC doesn't go to Ring_Op
MOD1:7080   MOD2:0600   FM_STMCHN:4040    TxS/RxS:  claim  token/listen
ST1U:0000   ST1L:000F   ST2U:4000   ST2L:0000
WPXSF:0000  RPXSF:000E  SACL:0001   SABC:0002   EACB:001F
RPR:0020    WPR:0021    SWPR:0020   EARV:0486

RPXS:0003   WPXS:0490   SWPXS:048F  EAS:08ED
RPXA0:08EE  WPXA0:08EF  SWPXA0:08EE EAA0:0D54
MIR0:0000   MIR1:0000
*** 1 ERROR found ***
Start time  : 00:00:09:54
Elapsed time      : 00:00:01:35
```

To correct the test configuration error in this example, the cable for slot 3 can be changed by entering the following commands:

```
>> slot 3

>> cable no
```

If any errors are displayed during the network access test, verify that the test cabling information supplied to the diagnostic program is correct. For an overview of all your entries, use the `show` command. If the external tests use another concentrator in repeat mode, verify that repeat mode was activated during the tests.

If the error message persists after repeated tests, contact your authorized SK reseller.

Replacing the Fuses

The fuses protect the concentrator against damage from any unusual electrical operating conditions such as a surge or a short circuit in the power supply (possibly due to storms).

Should a fuse blow, it will need to be replaced before the concentrator can be made operational again. The concentrator requires two fuses. Make sure you always replace bad fuses only with the correct type of fuse.

For 200-240 V/ 100-120 V operation: max. 3.2 A time lag fuse

The fuses are located in a fuseholder at the back of the chassis.

Warning!

Warning!
Electrical current from power, phone, and communications cables can be hazardous.

To avoid a shock hazard:
Do not connect or disconnect any cables or perform any installation, maintenance or reconfiguration during an electrical storm!
Disconnect the device from the power line!

To replace the fuse(s), proceed as follows:

1. Unplug the power cord from the wall outlet and from the connector on the back panel of the unit.
2. Carefully pry open the fuseholder (position 15) by inserting a screwdriver in the gap on the left of the power socket and turning it in the direction indicated in the Figure below.

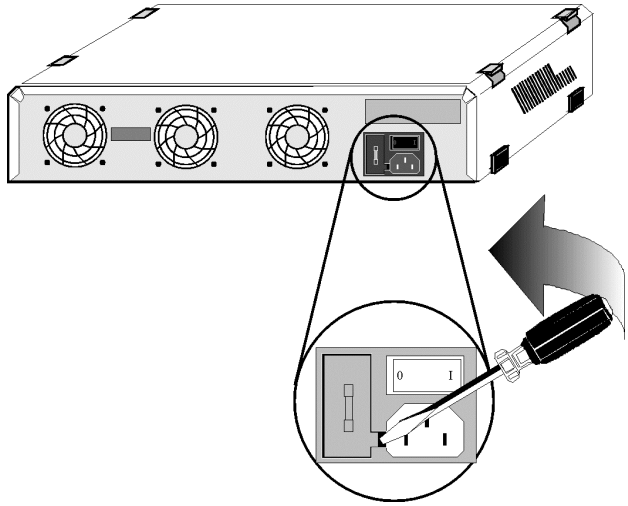


Figure 26. Extracting the Fuseholder

3. Pull out the fuseholder and remove it completely from the back panel (see Figure below). The three different elements of the fuseholder will now be visible: a rectangular-shaped black fusebox (A), a transparent plastic plate (B) with metal contacts and the fuses (C). A thin plastic clasp, which holds the plastic plate with a locking mechanism, will be visible in the black fusebox.

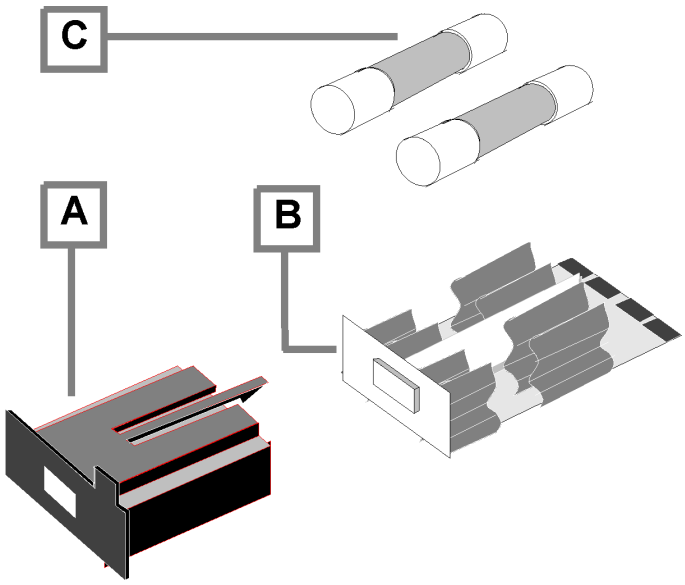


Figure 27. Elements of the Fuseholder

4. Carefully press the plastic clasp in the black fusebox outwards with one hand and push out the transparent plastic plate from the fusebox with the other. You will now see the metal clasps containing the two fuses.

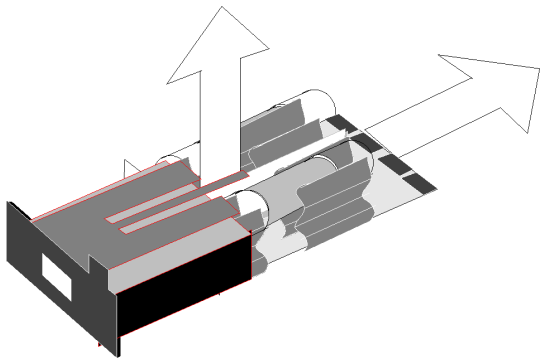


Figure 28. Open the Fuseholder

5. Remove the damaged fuse(s) by hand or by using a screwdriver

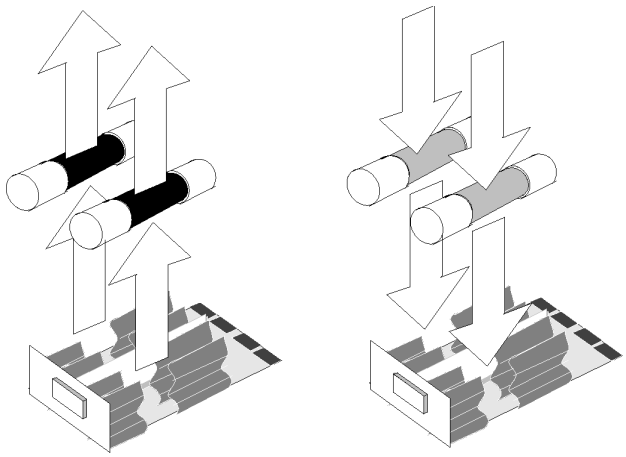


Figure 29. Replacing the Fuse(s)

6. Insert one (or two) new fuse(s) of the same type (max. 3.2 A, -time lag).

7. Reinsert the plastic plate (B) into the fusebox (A) until the plastic clasp snaps into place. Then press the complete fuseholder back into the back panel of the unit until the cover is flush with the panel.
8. Reconnect the power cord to the unit and to the wall outlet.

Forgotten Password? - First Aid

If you are set up as a normal user

The system administrator or workgroup administrator has extended privileges and can either create a new user name for you or assign a new password, which you can then overwrite

If you are the (only) system administrator and forgot your password

If there is another user with extended privileges, he or she can assign a new user name and delete the old one.

If there is no other user with extended privileges, you will need to perform a reset (see section Performing a Reset).

Bear in mind,

- that the FDDI ring in the DAS mode of the concentrator will be interrupted or reconfigured and could thus result in a loss of data on the network. It is therefore best to select a “low-load” period for this operation.
- that customized parameter settings will be lost, since they are associated with a corresponding password-protected configuration file.

Proceed as follows:

1. Force a reset by turning off the power switch of the concentrator.
2. Turn on the device. The opening screen appears, and the self-test begins
3. Call the configuration file loader via the Console Interface (V.24 connection to the concentrator Proceed analogous to the Update process described in the paragraph Upgrading the Software, page 59. The factory-set default parameters will now be loaded (see Appendix B. Default Values, page 65). The concentrator will then enter the ready state.
4. If required, reset the customized parameter settings via the user interface (or WWW; see the corresponding sections and Appendices).

Obtaining Information: Contacting our Support Engineers

SysKonnect Service on the World-Wide Web

An increasing number of SysKonnect services are now being offered on the Internet via the World-Wide Web (URL: http://www.syskonnect.com). This includes product information, company data, contact addresses, etc. Many support issues can also be quickly resolved or clarified here with the provided information.

Product Support for Technical Questions

Technical information on SysKonnect products can be obtained from:

	Amerika, Pazifik	**Europa**
Hours	24 Stunden über Pager	Mo-Do 8:00 h -18:00 h Fr 8:00 h -15:30 h CET
Tel. **Fax**	+1 866 782 2507 (toll-free in USA) +1 408 787 5395 (pager) +1 408 437 3866	+49 7243 502 330 +49 7243 502 364
WWW	http://www.syskonnect.com	http://www.syskonnect.com
E-Mail	support@syskonnect.com	support@syskonnect.de
Address	SysKonnect Inc. A Marvell®Company 700 First Avenue Sunnyvale, CA 94089 (USA)	SysKonnect GmbH A Marvell®Company Siemensstr. 23 D-76275 Ettlingen

Make sure that you have the following information ready. It will help speed up the process of finding a solution.

Information	**see**	**Field for your entries**
Combination of installed line-cards	Front panels	
Version of concentrator operating software (SMT version)	Messages on calling the User Interface or WWW pages	
Changes to default settings	User Interface statistics, compared with the section on Default Values	
Unusual LED displays	Front panel, LEDs, see Interpreting and Eliminating Displayed Malfunctions	
Serial number of device	Label at the backside (Pos. 20)	

Initiating Repairs (RMA Procedure)

If you want to return a damaged product directly to SysKonnect:

1. Call or send a Fax to the following numbers.

	Europe	**US, Pacific**
Phone:	(+49) or (0)* 72 43 / 502 330	(+1) 866 782 2507
Fax:	(+49) or (0)* 72 43 / 502 364	(+1) 408 752 9029
	*within Germany	

2. Normally via fax, you will receive an RMA number and a form.
3. Fill in the form with the required information.
4. Send us the defective product
   - packed in the anti-static bag,
   - together with the filled-in form,
   - in the original (or equivalent) packaging. Write the RMA number that you received from SysKonnect clearly on the package.

Products damaged due to electrostatic discharges or inappropriate packaging will not be repaired under warranty.

Upgrading the Software

Upgrades for the concentrator operating software can be installed both via the Console interface and the built-in Web server.

When the TFTP server used for concentrator operating software update is connected to the Internet, a connection is set up to a SysKonnect server. Although SysKonnect does not charge for the contents of its Web pages, the data transmission may involve marginal costs (depending on the transmission speed). These charges may need to be paid to the network provider and/or the phone company, but do not involve SysKonnect.

The method used to update is similar in both cases (console, WWW):

In the first phase, an Update file is transferred to a TFTP server. This file is then loaded on the concentrator via a TFTP connection.

Saving the Update File on a Computer

The Update file can be obtained via the Web (http://\www.syskonnect.de/SK-5000S) or from the SK Mailbox (Germany/Europe: 07243 502 586 or ISDN 07243 502 6091).

1. Establish a connection to the SysKonnect server via the World Wide Web or a Mailbox program.
2. Select the latest file from the appropriate directory (DRIVERS \ CONCENTRATORS AND SWITCHES) and copy it to your computer. The name and path for this file is collectively referred to as the DOWNLOAD FILE in the next phase.
3. If your computer is not to be used as the TFTP server, copy the file to the TFTP server. Note the path and filename (which now becomes the DOWNLOAD FILE).

Loading the Update File on the Concentrator

The description provided below is based on the assumption that you are already somewhat familiar with the user interfaces involved. Detailed instructions on procedural steps can be found in the sections Controlling the Concentrator via the Console Interface on page 38 and Controlling the Concentrator via WWW Pages on page 38.

Using the Web

1. Preparing for data transfer: start the Browser.
2. Invoking the program: enter the IP address of the concentrator as the URL in the Browser or, if available, go to the corresponding bookmark.
3. Enter your user name and password to log on. The main page is displayed.
4. Select the option DOWNLOAD in the main page. An input mask appears.
5. Select DOWNLOAD FILE or specify it more precisely.
6. The number of transferred Kbytes can be determined by clicking on the RELOAD DOWNLOAD STATE button. This number is updated every second.
7. Following the transfer, return to the home page using the corresponding button.

The new software version will be available only after a reset.

Using the Console Interface via TFTP

1. Preparing for data transfer: connect the concentrator (Console interface) and computer (COM port) with the supplied V.24 cable and start the terminal emulation.
2. Enter your user name and password to log on. The main page is displayed.
3. Select the option DOWNLOAD in the home page. An input mask appears.
4. Specify the TFTP server address to which the new software was copied.
5. Select DOWNLOAD FILE and specify its file name.
6. The number of transferred Kbytes is shown. This number is updated every second.
7. Close the individual menus of the User Interface until the main screen appears.

The new software version will be available only after a reset. See the following section for details.

Via Console-Interface without TFTP

During the upgrade the concentrator is not operational.

1. Connect the V.24 interface of the concentrator to the corresponding interface of the PC via the V.24 cable (enclosed in the shipment).
2. At the PC, start the terminal emulation program. The communication parameters to the concentrator are 9600 bps, 8 data bits, no parity and 1 stop bit.
3. Press the <Enter> key twice.
4. Enter reset to interrupt the concentrator's operation or switch the concentrator off and on.
   The following message is displayed:

```
Boot Code v1.04 (970317)
========================
<serial number 4f000b>
The following modules are available:
      (m1)  Software Update Loader v1.04 (970317)
      (m2)  Boot Code Update Loader v1.04 (970317)
      (m3)  Configuration File Loader v1.04 (970317)
      (m4)  Diagnostics Tool v1.00 beta 04 (970220)
      (m5)  Concentrator Software v1.00 beta 02 (970402)
After 5 seconds the module
      Concentrator Software v1.00 beta 02 (970402)

will be started automatically.

      Please select module:
```

5. Enter the module number of the Software Update Loader module (in this case: m1). Note that the module numbers might have changed after a previous update:

```
Starting selected module (1)
Software Update Loader V1.04
============================
WARNING: software download will delete the following modules:
      (m3)  Configuration File Loader v1.04 (970317)
      (m4)  Diagnostics Tool v1.00 beta 04 (970220)
      (m5)  Concentrator Software v1.00 beta 02 (970402)
please confirm with uppercase YES
```

6. Enter `YES` (in uppercase.)
   The following message is displayed:

```
Erasing memory - please be patient ... done
Ready to receive download - please send file
(use FILE UPLOAD function in terminal emulator)
```

7. At this point, you need to perform a binary upload of the concentrator's software image file. The software image file for the concentrator is SKCONC.SK9. The binary upload function in DEE is accessed by pressing the <ctrl> and <F1> keys.
   The DEE program answers:
   `filename:`
8. Enter the path and file name, usually: `A:\SKCONC.SK9`

Any keystroke aborts the loading process!

9. The load procedure of the program usually takes up to 45 minutes.
   After having successfully updated the software, the following message is displayed
   `Hit any key to restart`
10. Press any key
11. The concentrator is reset and the entry menu of the concentrator appears (analogous to the above Reset process). If no module is selected within five seconds, the concentrator switches to its normal operating state by starting the Station Management module.

Performing a Reset

A reset is required when the concentrator is in an undesirable state or when its software is updated. This can be forced in different ways:

- by using the network switch (0/I, pos. 16).
- via the User Interface or WWW user interfaces by selecting the RESET option in the main menu or from the home page.

Performing a reset when the network is operational normally results in a loss of data. This is because the data traffic of at least those stations which are connected to the device is interrupted for the time required to reset. In accordance with the FDDI standard, the entire network (FDDI dual ring) is reconfigured to a single ring. If another reset is performed on some other concentrator in the ring at the same time, the ring will be broken. Consequently, to minimize the undesirable effects on the overall network, it is advisable to connect an optical bypass and, if possible, to initiate the reset at times when the load on the network is low (generally at night or during breaks in companies).

Appendix A. Technical Specifications

Processor	Motorola 68000
LAN Controller	AMD Supernet II
RAM /EPROM	256 K / 2 MB
Dimensions (Width x Height x Depth)	430 mm x 88,8 mm (2 HE) x 290 mm (incl. plastic feet, but not angle bracket for 19“ rack unit)
Weight*	Casing: 5,85kg Linecards: SK-FDDI 6M: 0,45kg SK-FDDI 8U: 0,35kg SK-FDDI 12U: 0,45kg SK-FDDI 2M8U: 0,45kg SK-FDDI 2S8U: 0,40kg
Cable connections for network	Depending on installed linecards: max. 24 STP/UTP via RJ-45 max. 12 LWL via MIC max. 16 LWL via SC
Other interfaces	Optical bypass via MiniDIN6 RS-232 (CONSOLE) via SubMinD9
Power supply	100...120 V / 220...240 V~, 50 / 60 Hz via built-in power supply
Power consumption*	65 W...120 W
Electro-magnetic frequency EMF	FCC Class A EN 55022 Class A, EN 50082-
Security	EN60950:1992 +A1:1993 +A2:1993 + A3:1995 IEC950:1991 +A1:1992 +A2:1993 + A3:1995
Temperature	Storage: 1° C...60° C Transport: -20° C...60° C Operation: 10° C...40° C
Relative humidity (non-condensing)	Storage: 10% .. 80% | max. 29° C Transport: 10% .. 95% | max. 29° C Operation: 10% .. 80% | max. 27° C

*(depending on installed modules or active ports)

Appendix B. Default Values

Logically Sorted by Menu

Parameter	Default Value	Menu
Upstream Neighbour	00-00-00-00	Ring Status
Downstream Neighbour	00-00-00-00	Ring Status
T-Req	0 ms	Ring Status
T-Neg	0 ms	Ring Status
T-Max	0 ms	Ring Status
T-Min	0 ms	Ring Status
TVX Value	0 µs	Ring Status
Port	1...24	Port Statistics
Type	1:B 2:A others: M	Port Statistics
State	Off	Port Statistics
LCTFail-Ct	0	Port Statistics
LemReject-Ct	0	Port Statistics
LemEstimate	1E-00	Port Statistics
PortFlag	NoAlarm*	Port Statistics
Port	1...24	Config. Menu/ Edit Port Configuration
Type	1: B, 2:A , sonst: M	Config. Menu/ Edit Port Configuration
Ler-Cutoff	1E-7	Config. Menu/ Edit Port Configuration
Ler-Alarm	1E-12	Config. Menu/ Edit Port Configuration
Cutoff-Time	0 s	Config. Menu/ Edit Port Configuration
SMT Station Type	DAS Concentrator	Config. Menu/ Edit SMT Configuration
MAC TVX Value	2700 µs	Config. Menu/ Edit SMT Configuration
MAC TReq Value	150 ms	Config. Menu/ Edit SMT Configuration
PCM LCT_Short Error Threshold	1 bit.	Config. Menu/ Edit SMT Configuration
RingOp Changes Thresh-old	0	Config. Menu/ Edit SMT Configuration
SMT PMF Authorization Station ID	00-00-00-00-00-00-00-00	Config. Menu/ Edit SMT Configuration
SMT PMF Authorization Password	00-00-00-00-00-00-00-00	Config. Menu/ Edit SMT Configuration
IP Address	0.0.0.0	Config. Menu/ Edit IP Configuration
IP subnet mask	0.0.0.0	Config. Menu/ Edit IP Configuration
IP default Gateway	0.0.0.0-	Config. Menu/ Edit IP Configuration
Hostname for WWW	-	Config. Menu/ Edit IP Configuration
SNMP Agent State	Enabled	Config. Menu/ Edit SNMP Configuration
System Contact	Sys Contact	Config. Menu/ Edit SNMP Configuration
System Location	Sys Location	Config. Menu/ Edit SNMP Configuration
Private Community	private	Config. Menu/ Edit SNMP Configuration
Public Community	public	Config. Menu/ Edit SNMP Configuration
System Name	Sys Name	Config. Menu/ Edit SNMP Configuration
SNMP Trap Address	0.0.0.0	Config. Menu/ Edit SNMP Configuration

Alphabetically Sorted by Parameters

Parameter	Default Value	Menu
Cutoff-Time	0 s	Config. Menu/ Edit Port Configuration
Downstream Neighbour	00-00-00-00	Ring Status
Hostname for WWW	-	Config. Menu/ Edit IP Configuration
IP Address	0.0.0.0	Config. Menu/ Edit IP Configuration
IP default Gateway	0.0.0.0-	Config. Menu/ Edit IP Configuration
IP subnet mask	0.0.0.0	Config. Menu/ Edit IP Configuration
LCTFail-Ct	0	Port Statistics
LemEstimate	1E-00	Port Statistics
LemReject-Ct	0	Port Statistics
Ler-Alarm	1E-12	Config. Menu/ Edit Port Configuration
Ler-Cutoff	1E-7	Config. Menu/ Edit Port Configuration
MAC TReq Value	150 ms	Config. Menu/ Edit SMT Configuration
MAC TVX Value	2700 ms	Config. Menu/ Edit SMT Configuration
PCM LCT_Short Error Threshold	1 bit.	Config. Menu/ Edit SMT Configuration
Port	1...24	Port Statistics
Port	1...24	Config. Menu/ Edit Port Configuration
PortFlag	NoAlarm*	Port Statistics
Private Community	private	Config. Menu/ Edit SNMP Configuration
Public Community	public	Config. Menu/ Edit SNMP Configuration
RingOp Changes Thresh-old	0	Config. Menu/ Edit SMT Configuration
SMT PMF Authorization Password	00-00-00-00-00-00-00-00	Config. Menu/ Edit SMT Configuration
SMT PMF Authorization Station ID	00-00-00-00-00-00-00-00	Config. Menu/ Edit SMT Configuration
SMT Station Type	DAS Concentrator	Config. Menu/ Edit SMT Configuration
SNMP Agent State	Enabled	Config. Menu/ Edit SNMP Configuration
SNMP Trap Address	0.0.0.0	Config. Menu/ Edit SNMP Configuration
State	Off	Port Statistics
System Contact	Sys Contact	Config. Menu/ Edit SNMP Configuration
System Location	Sys Location	Config. Menu/ Edit SNMP Configuration
System Name	Sys Name	Config. Menu/ Edit SNMP Configuration
T-Max	0 ms	Ring Status
T-Min	0 ms	Ring Status
T-Neg	0 ms	Ring Status
T-Req	0 ms	Ring Status
TVX Value	0 µs	Ring Status
Type	1:B 2:A Sonstige: M	Port Statistics
Type	1: B, 2:A , sonst: M	Config. Menu/ Edit Port Configuration
Upstream Neighbour	00-00-00-00	Ring Status

Appendix C. CE and FCC Certifications, Notes

CE Conformance

The manufacturer SysKonnect GmbH, Ettlingen, guarantees that the products

- SK-FDDI Concentrator II (SK-5000S)
- SK-5041A
- SK-5043E
- SK-5021B
- SK-5041G
- SK-5043I

comply with the following European standards:

- Power safety: EN60950:1992 +A1:1993 +A2:1993 + A3:1995

IEC950:1991 +A1:1992 +A2:1993 + A3:1995

- Electromagnetic emissions: EN 55022 Klasse A, EN 50082-1

The corresponding documents are archived with the manufacturer.

Compliance with the set protection limits has been verified with a standard commercial system configuration. Note that all network components must be installed and cabled properly to guarantee practical compliance with these limits for the whole system. All instructions from manufacturers of other network components must also be taken into account.

EN 55022

The operation of Class A equipment (in accordance with EN 55022) in residential areas could cause interference to radio communications. In such cases, users may be required to take appropriate measures to correct the interference at their own expense.

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. SysKonnect is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modificalions to this equipment.

Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian Department of Communications (DOC) Compliance Statement

This equipment does not exceed Class A limits per radio noise emissions for digital apparatus, set out in the Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the owner or operator to take whatever steps are necessary to correct the interference.

Avis de conformite aux normes du ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe A d'émission de bruits radioélectriques pour les appareils numériques, telles que prescrites par le Règlement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entrainer le brouillage des réceptions radio et télé, ce qui obligerait le propriétaire ou l'opérateur a prendre les dispositions nécessaires pour en éliminer les causes.

Appendix D. Connectors and Pin Assignments

Optical Bypass (Mini DIN 6 Connector)

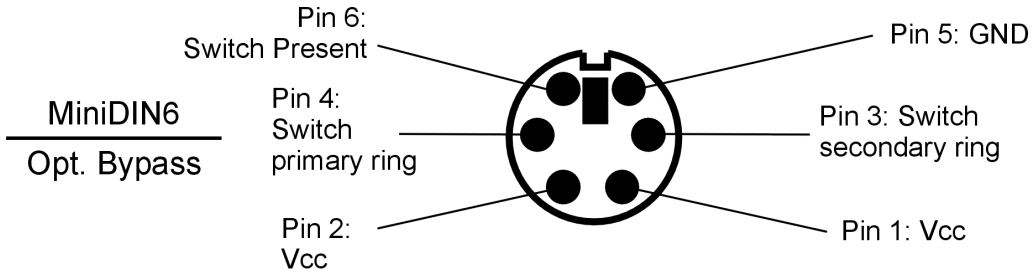


Figure 30. Connector for Optical Bypass

MLT3 Ports (RJ-45 Connector)

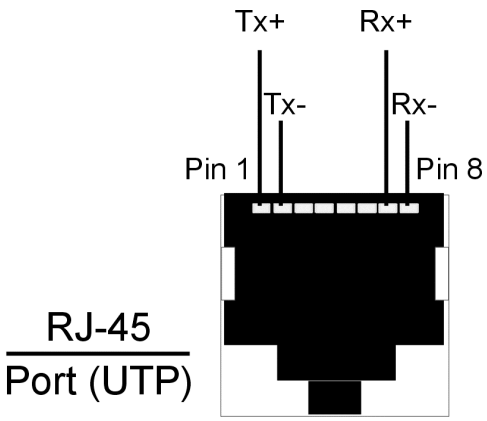


Figure 31. Port for UTP (RJ-45)

Category 5 cable for FDDI require 1 ↔ 7 and 2 ↔ 8 crossovers.

The RJ-45 pin assignments for FDDI differ from the RJ-45 pin assignments for 10Base-T Ethernet and Token Ring.

Loopback Plug

The diagnostic module of the SK-FDDI concentrator supports testing of the concentrator transceiver with the use of loopback cables and plugs. The drawing below shows the pin assignments for an MLT-3 RJ-45 loopback plug.

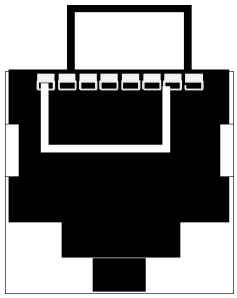


Figure 32. UTP Loopback Plug

Console, RS-232 (SubMin D9 Connector)

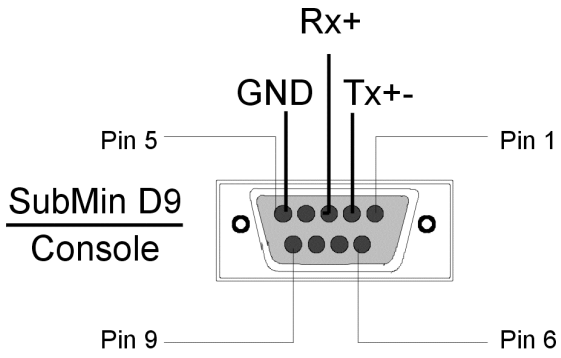


Figure 33. CONSOLE Interface

Cable for Console Connection

If you want to connect the SK-FDDI concentrator to your PC via the Console interface, you will need the supplied V.24 cable. If required, verify the pin assignments on your PC or terminal by checking the associated documentation.

Appendix E. Parameter Reference

The following overview (tree diagram) illustrates the hierarchic structure of the menus and parameters that can be accessed (and modified in some cases) via the user interface of the management program. The individual parameters are explained in more detail in the sections that follow.

Main Menu

Status	Chassis Status	Power Supply Voltage Fan (1-3) Temperature Main Board Temperature Power Supply
	Ring Status	LED Ring OP LED Ring Status LED Data Upstream Neighbour Downstream Neighbour MAC Timers: T-Req, T-Neg, T-Max, T-Min/ TVX Value
	BOOTP Status	
Statistics	Port	Port/Type State LCTFail-Ct Lem-Ct LemReject-Ct LemEstimate PortFlag
	MAC	Ring Operational Counters: RingOp Changes, RingOp Ratio, RingOp Changes Thres-hold MAC Frame Counters: Transmit Ct, Receive Ct, LLC Receive Ct, SMT Receive Ct MAC Frame Error Counters: Frames Aborted Ct, CRC Error Ct, Frames Lost Ct, Frames Too Long Ct, TVX Expired Ct, FORMAC Error Ct
	Reset all Counters	Yes No
Configuration	Display Configuration	MAC Address Linecard Configuration SMT Configuration IP Configuration SNMP Configuration User Administration Software Configuration

	Edit Port Configuration	Port/Type PMD Class Connector State Ler Alarm, Ler Cut Off LerAlarm Cutoff Conf
	Edit SMT Configuration	SMT Station Type MAC TVX Value MAC TReq Value PCM LCT_Short Error Threshold RingOp Changes Threshold SMT PMF Authorization Station ID SMT PMF Authorization Password
	Edit IP Configuration	IP Address IP Subnet Mask IP Default Gateway Hostname for WWW
	Edit SNMP Configuration	SNMP Agent State System Contact System Location System Name Public Community Private Community SNMP Trap Address
	Edit User Configuration	Change Password Add User Remove User
Download	TFTP Server IP Address Download	
	Exit / Logout	
Reset	No Yes	
Exit / Logout	No Yes	

Main Menu

Figure 34. Main Menu

The main menu appears directly after login and contains the following menu items:

Parameter	Description
Concentrator Status	When selected, a window appears and you can choose to display the Chassis Status or the Ring Status.
Statistics	When selected, a window appears and you can choose to display the Port Statistics or the MAC Statistics or you can reset all counters that are available in the Statistics menu.
Configuration	Provides access to Port, SMT, IP, SNMP, User Configuration menus.
Download	Only users with 'extended privileges' are allowed to enter this option. If non-privileged users (users with 'normal' privileges) try to enter this option, an appropriate error screen appears. Download TFTP Server IP Address: [0.0.0.0] Download File: [ ] As a 'privileged' user, you must specify the IP address of the TFTP server and the name of the download file. For more information, refer to section Download.
Reset	Only 'privileged' users can reset the concentrator, make configuration changes or update the software. To prevent unintentional resets, you must confirm this command. All connections will be terminated when the concentrator is reset. Reset Concentrator? No Yes If normal users try to use this option, an error message appears.
Exit / Logout	To quit the User Interface and to log out, select this option. Exit User Interface? No Yes If the configuration has been changed essentially, you will be informed that a reset should be done to use the new configuration set. In any case you must confirm to log off before this operation can be concluded.
(Command Line Interpreter)	The command line interpreter is a hidden option. Only 'privileged' users are allowed to enter this option (via the 'F4' key). If it is selected, a window will appear, and you can run commands for advanced diagnostics, statistics, and debug instructions. The commands of the software used in the previous SK-FDDI Concentrator model line are available here. Enter `h`, `?`, or `help` to get a list of the available topics. Enter `exit` to leave this window.

Concentrator Status

Figure 35. Concentrator Status Menu

Chassis Status

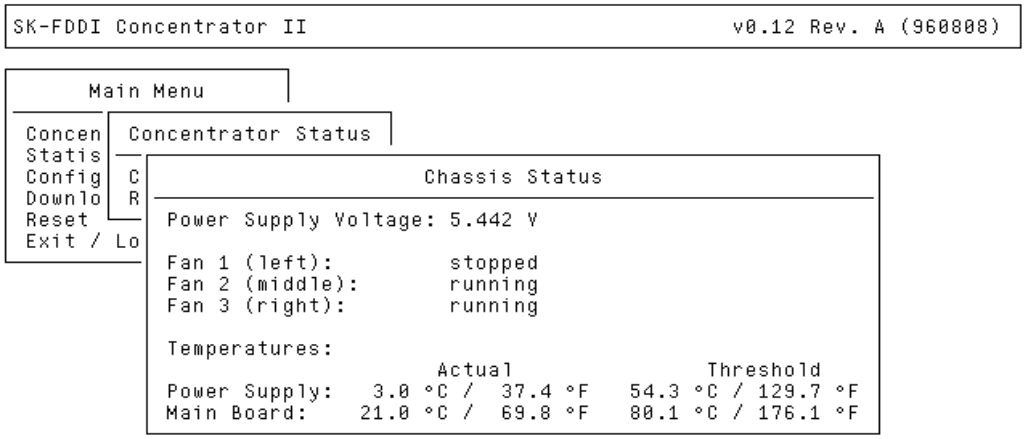


Figure 36. Chassis Status Menu

The Chassis Status displays the currently measured values of devices that are essential for proper operation of the concentrator. This screen is updated every few seconds.

Parameter	Description
Power Supply Voltage	There is no alert range for this measurement, because if this fails the concentrator will stop automatically.
Fan Status (if available)	May be running or stopped. The "stopped" state is the alert state and will be displayed in blinking and bold letters.
Power Supply Temperature	Its current value and its alert state threshold are displayed.
Main Board Temperature	Its current value and its alert state threshold are displayed.

Ring Status

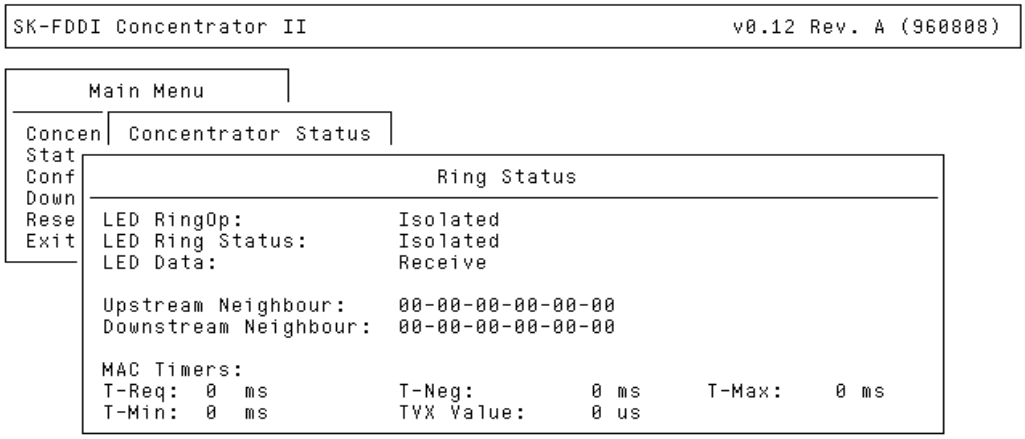


Figure 37. Ring Status Menu

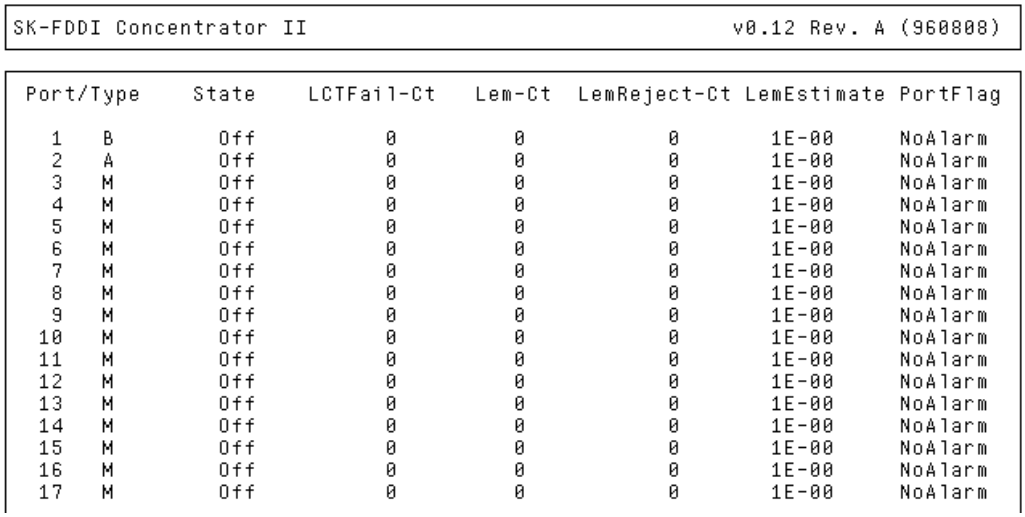
The Ring Status menu contains essential information on current ring parameters. The screen is updated every few seconds.

Parameter	Description
LED RingOp	An interpreted value of the RingOp LED. It shows whether the FDDI ring is operational, non-operational or in a fault state. Unlike the LED, this parameter shows the exact fault state which can be one of the following: Detect, Non_Op_Dup, Ring_Op_Dup, Directed and Trace. A fault state is displayed in blinking and bold letters.
LED Ring Status	An interpreted value of the LED labeled Ring Status. It shows the exact CF-State of the station. It may be one of the following: Isolated, C_Wrap_A, C_Wrap_B, C_Wrap_S and Thru. None of theses states are alert states. The LED is however green in states “Thru”, “C_Wrap_S” and all states of the Standalone concentrator. The LED is yellow in the states "C_Wrap_A" and "C_Wrap_B" and off otherwise.
LED Data	Current status of the Data LED which can be None, Receive, Transmit.
Upstream Neighbour	Canonical MAC address of the upstream neighbor as described in the SMT 7.3 standard.
Downstream Neighbour	Canonical MAC address of the downstream neighbor as defined in the SMT standard.
T-Req	Requested Token Rotation Timer (TRT) of this concentrator as defined in the SMT 7.3 standard.
T-Neg	Current negotiated Token Rotation Timer of the ring as defined in the SMT 7.3 standard.
T-Max	Maximum value of the Token Rotation Timer as defined in the MAC standard.
T-Min	Minimum value of the Token Rotation Timer as defined in the MAC standard.
TVX Value	Valid Transmission Timer of the concentrator as defined in the MAC standard.

Statistics

Figure 38. Statistics Menu

Port Statistics



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Port	Type	State	LCTFail-Ct	Lem-Ct	LemReject-Ct	LemEstimate	PortFlag
1	B	Off	0	0	0	1E-00	NoAlarm
2	A	Off	0	0	0	1E-00	NoAlarm
3	M	Off	0	0	0	1E-00	NoAlarm
4	M	Off	0	0	0	1E-00	NoAlarm
5	M	Off	0	0	0	1E-00	NoAlarm
6	M	Off	0	0	0	1E-00	NoAlarm
7	M	Off	0	0	0	1E-00	NoAlarm
8	M	Off	0	0	0	1E-00	NoAlarm
9	M	Off	0	0	0	1E-00	NoAlarm
10	M	Off	0	0	0	1E-00	NoAlarm
11	M	Off	0	0	0	1E-00	NoAlarm
12	M	Off	0	0	0	1E-00	NoAlarm
13	M	Off	0	0	0	1E-00	NoAlarm
14	M	Off	0	0	0	1E-00	NoAlarm
15	M	Off	0	0	0	1E-00	NoAlarm
16	M	Off	0	0	0	1E-00	NoAlarm
17	M	Off	0	0	0	1E-00	NoAlarm

Figure 39. Port Statistics Menu

The Port Statistics menu is entered via the Statistics menu. This screen is updated every few seconds.

Parameter	Description	Normal Values	Alarm Values
Port	Port number	1...24 ports. Only actually installed ports are displayed.	---
Type	SMT Standard: fddiPORTMy-Type	A, B, S, M	---
State	SMT Standard: fddiPORTPCMState: The state of this port's Physical Connection Management (PCM) state machine.	Off, Active, NoConn (= Not Connected, represents the states Break, Connect, Next, Signal, Join, and Verify), Maint (= Maintenance)	Trace (bold and flash)
LCTFail-Ct	SMT Standard: fddiPORTLCTFail-Ct. The count of the consecutive times the link confidence test (LCT) has failed during connection management.	a counter with maximum 10 digits	---
Lem-Ct	SMT Standard: fddiPORTLem-Ct. The aggregate link error monitor error count, set to zero only on station initialization.	a counter with maximum 10 digits	---
LemReject-Ct	SMT Standard: fddiPORTLem-Reject-Ct. A link error monitoring count of the times that a link has been rejected.	a counter with maximum 10 digits	---
LemEstimate	SMT Standard: fddiPORTLer-Estimate-Ct. A long term average link error rate. It ranges from 1E-4 to 1E-15.	< LerAlarm	> LerAlarm (normal display)
PortFlag	SK specific Port states: NoAlarm: No LerAlarm, No Cut Off Alarm: LerAlarm (LemEstimate > LerAlarm) CutOff: (LemEstimate > LerCutOff) Port was disconnected	NoAlarm	Alarm (bold), CutOff (bold and flash)

MAC Statistics

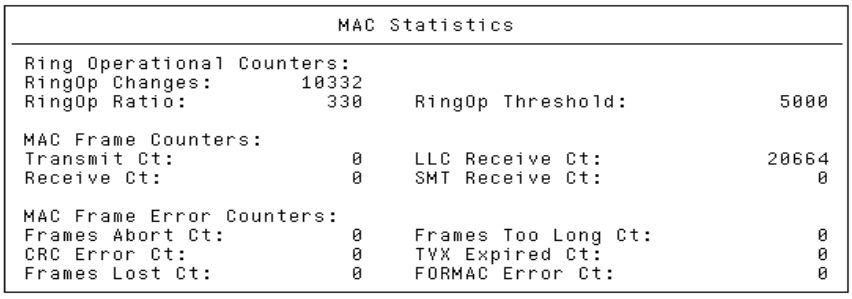

Figure 40. MAC Statistics Menu

This menu displays MAC specific counters and timer values. The information is subdivided into the ring operational changes, a MAC Frame Counter section and a MAC Frame Error Counter section. This screen is updated every few seconds.

Name	SMT-Standard-Reference	Description
Ring Operational Counters		
RingOp Changes	fddiMACRingOp-Ct	The number of times the ring has changed from the 'Ring Operational' state to the 'Ring Not Operational' state or vice versa.
RingOp Ratio	---	This counter displays the current RingOp changes ratio in "RingOp Changes per second". The time interval in which this ratio is measured is 1 second.
RingOp Threshold	---	A threshold value for the RingOp Ratio. If the ringOp ratio exceeds the RingOp Threshold, a Trap is sent to the current SNMP Manager.
MAC Frame Counters		
Transmit Ct	fddiMACTransmit-Ct	The number of frames transmitted by the MAC.
Receive Ct	fddiMACFrameCt	The number of frames received by the MAC.
LLC Receive Ct	---	The number of LLC frames received by the MAC.
SMT Receive Ct	---	The number of SMT frames received by the MAC.
MAC Frame Error Counters		
Frames Abort Ct	---	The number of frames aborted during reception. The frame may be flushed or the receive buffer may be overrun.
CRC Error Ct	---	The number of frames discarded because FCS does not match the calculated checksum while repeating the frame. A CRC Error may be detected by any station on the ring. The station sets the E-indicator bit when a CRC error is detected.
Frames Lost Ct	fddiMACLost-Ct	The number of detected format errors during frame reception, causing frame to be stripped.
TVX Expired Ct	fddiMACTvxExpired-Ct	A count that should as closely as possible match the number of times that TVX expired.
Frames Too Long Ct	---	The number of times the frame length exceeds the FDDI frame size. These frames are discarded.
FORMAC Error Ct	fddiMACError-Ct	The number of defect frames that were detected by this MAC, but not detected by another MAC.

Configuration

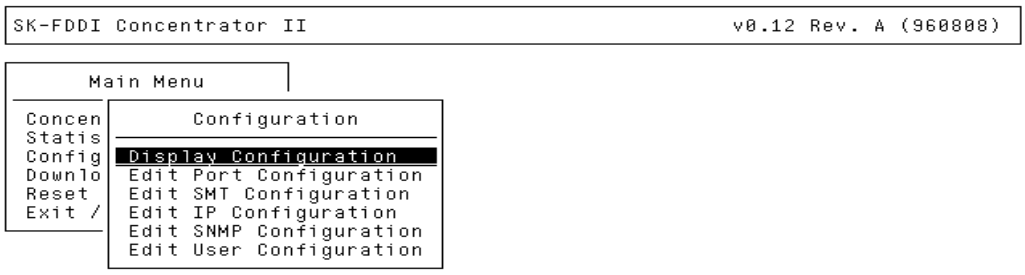

Figure 41. Configuration Menu

The configuration menu has the following items:

- DISPLAY CONFIGURATION
- EDIT PORT CONFIGURATION
- EDIT SMT CONFIGURATION
- EDIT IP CONFIGURATION
- EDIT SNMP CONFIGURATION
- EDIT USER CONFIGURATION

You can modify the port, SMT, and IP configuration only as a 'privileged' user, since the concentrator must be reset to activate the modifications of some parameters. (The Reset operation requires extended privileges.) When you leave the SMT or IP configuration after you have modified one of these parameters, a message appears to inform you that the configuration has been changed and that the concentrator must be reset to activate the modifications.

An error message screen appears if one of the configuration items has been confirmed by pressing the <Enter> key and a parameter was specified in a wrong format or out of range. It is required to correct the parameter or to leave the window via <Esc> (which suppresses all changes made in the appropriate menu).

To edit a configuration, proceed as follows:

1. Move the highlighted bar to the appropriate configuration menu item.
2. Press the <Return> key . Another screen is displayed, including the editable configuration parameters.
3. From this menu, select the parameter that you want to modify by moving via the Up / Down (cursor control) keys.
4. Enter the desired changes.
5. Repeat step 3 and 4 for all parameters to be modified.
6. To quit the menu and to establish the modifications, move to the last menu item and press the <Return> key.

   Otherwise, your modifications will not be activated.

   To quit the menu discarding all modifications, press the <Esc> key.

An error message is displayed if you try to set values that are out of range or in an invalid format. In this case, all modifications of the corresponding port menu are suppressed. For information on valid values, refer to the tables included in this appendix.

If you want to modify a parameter displayed with a highlighted bar, press the <Return> key. Another screen is displayed where you can modify parameters in the same way as described above.

When you modify a parameter, its name, its valid range and its current value are displayed. The number of users who can modify the concentrator configuration simultaneously is not limited.

When you exit one of the configuration menus, the modified parameters are saved immediately to the system configuration file without any message or any required user action. Therefore the configuration data is always saved when the configuration menu is redisplayed.

Display Configuration

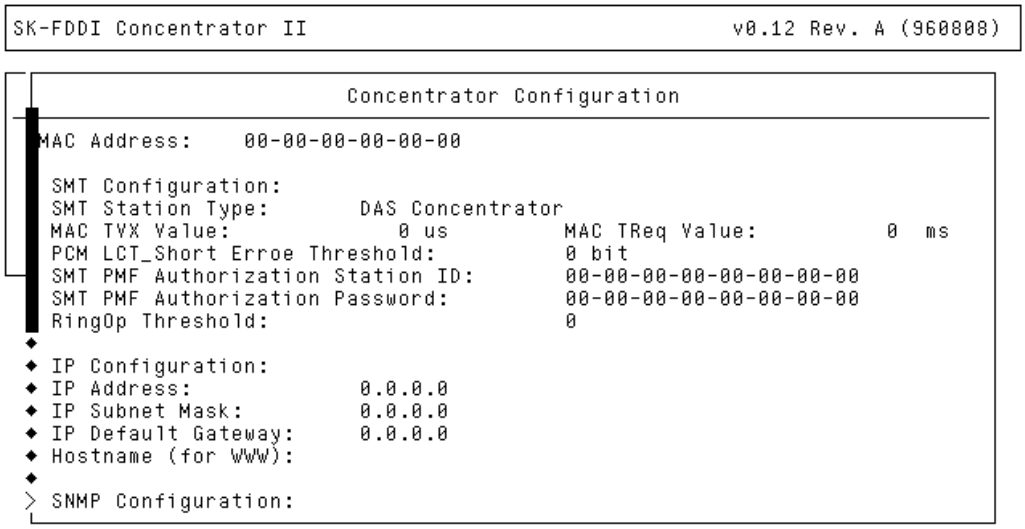

Figure 42. Display Configuration Menu

The concentrator's MAC address, the SMT, IP, and SNMP configuration are displayed. Furthermore the list of configured users and user rights are displayed. The user passwords and the port configuration are not displayed here. The configuration cannot be changed via this menu.

You can scroll this menu via cursor control, PgUp and PgDn keys.

Edit Port Configuration

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Port	Type	PMD Class	Connector	State	Ler-Cutoff	LerAlarm	Cutoff Conf
1	B	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
2	A	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
3	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
4	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
5	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
6	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
7	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
8	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
9	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
10	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
11	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
12	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
13	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
14	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
15	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
16	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s
17	M	LCF-PMD	MIC	Off	1E-12	1E-07	9 s

Figure 43. Edit Port Configuration Menu

This menu displays a configuration table of all ports. It is updated every few seconds.

You can scroll this screen via the cursor control, PgUp and PgDn keys.

Privileged users can modify the editable fields of a port. The following parameters are editable by the (privileged) user:

- PORT START or STOP: The user can start or stop the port with this option. Please note that the port state in the Port Configuration Table does not show the state START and STOP The displayed state depends on the hardware. If you stop a port, it will remain in the OFF state until restarted by a privileged user.
- LER ALARM, as shown in the Port Configuration Table.
- LER CUT OFF, as shown in the Port Configuration Table.
- CUTOFF CONFIG, as shown in the Port Configuration Table.

For detailed port information and for editing, move the cursor (highlighted bar on the screen) to the corresponding port number and press the <Return> key.

To establish modifications refer to the instructions given in the Configuration section.

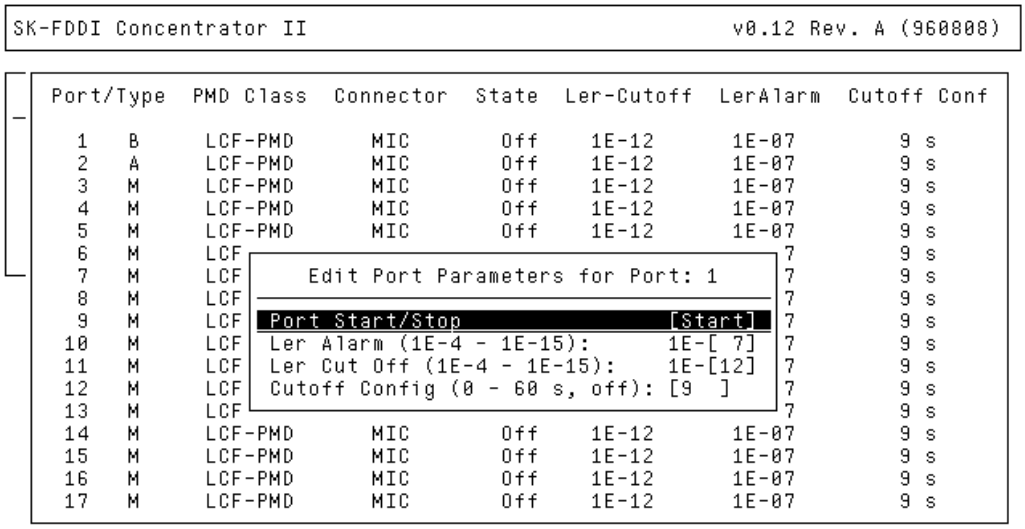

Figure 44. Edit Port Parameter Configuration Menu

Parameter	Description	Values	Edit-able
Port	Port number. Ports which are not present will not be displayed.	1...24	No
Type	SMT: fddiPORTMyType. Port type.	A, B, S, M	No
PMD Class	SMT: fddiPORTPMDClass. Indicates the type of Physical Medium Depend (PMD) entity with this port.	Multimode, TP-PMD (UTP)	No
Connector	Connector Type	MIC, SC MIC and UTP MIC	No
State	SMT Standard: fddiPORTPCMState The state of this Port's Physical Connection Management (PCM) state machine.	Display Values: Off, Active, NoConn (= Not Connected, represents the states Break, Connect, Next, Signal, Join, and Verify), Maint (= Maintenance), Trace. Editable Values: Start: start the Port (go to state Not Connected) Stop: stop the port (go to state Off)	Yes *) Start and Stop
Ler-Cutoff	SMT:fddiPORTLer-Cutoff. The link error rate estimation at which a link connection will be broken and the port will be cut off from the FDDI ring for the configured Cutoff Time. *)	1E-4...1E-15, default: 1E-7	Yes
LerAlarm	SMT: fddiLerAlarm. The estimated link error rate at which a link connection will generate an alarm.	1E-4...1E-15, default: 1E-7	Yes
Cutoff Conf	SK specific: specifies the time which a port will be cut off from the ring when the link error rate reaches the LerCutoff value NOTE: Do not specify this option for SMT standard compliance tests, because this option is an extension to the SMT standard.	0...60 s, off.*) default: off Standard compliance value: 0	Yes

*) The value "off" means the port remains in off state and must be restarted by management action after the link error rate reaches the CutOff value.

Edit SMT Configuration

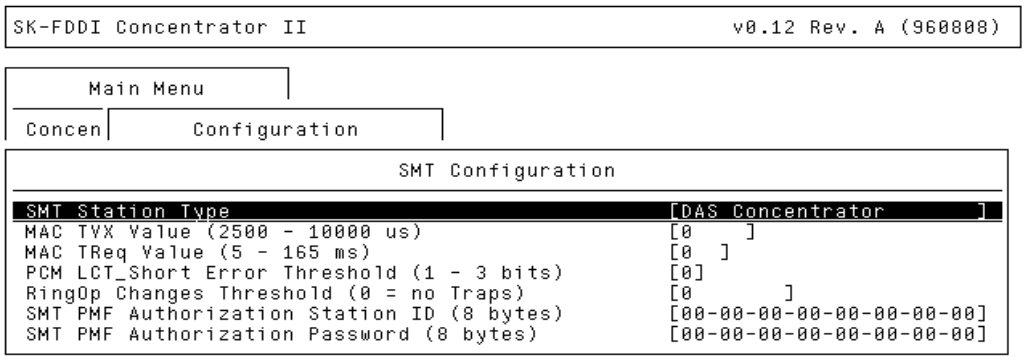

Figure 45. Edit SMT Configuration Menu

You can edit the SMT configuration as a ‘privileged’ user only. You can modify the following parameters:

Parameter	Description	Values
SMT Station Type	The station type determines the attachment of the concentrator to the FDDI ring.	DAS Concentrator (A+B, max. 22 M Ports) SAS Concentrator (S, max. 23 M Ports) Stand-alone Concentrator (max. 24 M Ports) Default: DAS Concentrator
MAC TVX Value	SMT: fddiMACTvxValue. Timer Valid Transmission: Expected time between valid transmissions. If expired, the ring will recover.	2500...10000 µs, default value 2700 **µ**s
MAC TReq Value	SMT: fddiMACT-Req. The requested token rotation time.	5...165 ms, default value 150 ms
PCM LCT_Short Error Threshold	This parameter provides write access to the concentrators short Link Confidence Threshold (LCT). The value specifies the bit error rate which will be accepted during the link confidence test to establish the connection.	1...3 bits, default value 3 bit. Must be set to 1 bit to pass the ANTC test suite.
RingOp Changes Threshold	If the RingOp Ratio exceeds the RingOp Threshold, a trap will be sent to the currently configured SNMP manager.	0...99999999, 0 means no traps at all default: 0
SMT PMF Authorization Station ID	FDDI-MIB: fddiPRPMFStation. If this parameter is specified, only this station is allowed to modify the concentrator’s MIB with PMF set frames.	Length 8 bytes, format: X’ yy-yy-xx-xx-xx-xx-xx-xx’ ‘yy’ is implemented specifically ‘xx’ is the station address in MSB bit representation
SMT PMF Authorization Password	FDDI-MIB: fddiPRPMFPasswd. If this parameter is specified, the received PMF set frames will be discarded if they come without the configured authorization password.	8 bytes hexadecimal string

To establish modifications refer to the instructions given in the Configuration section.

Edit IP Configuration

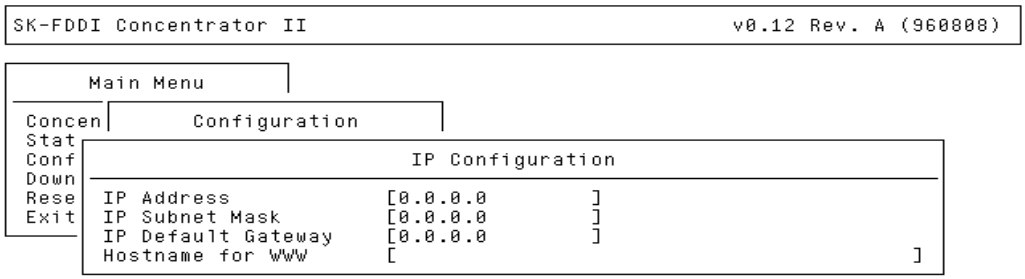

Figure 46. Edit IP Configuration Menu

You can modify the IP configuration as a ‘privileged’ user only. When you leave this menu after you have changed the concentrator's IP Address, a message is displayed asking you to reset the concentrator to activate the modifications.

The following parameters can be configured:

Parameter	Description
IP Address	The IP address of the concentrator. If the address is 0.0.0.0 , the TCP/IP stack is not started and the concentrator cannot respond to SNMP requests, accept Telnet connections and send SNMP traps!
IP subnet mask	must be properly configured if the IP address is not 0. If a wrong subnet mask is entered, a screen showing the default subnet mask for the configured IP address is displayed.
IP default Gateway	This address is important when communicating with IP stations that do not reside on the same IP subnet. The IP gateway must therefore reside on the same IP subnet as the concentrator. If this is not the case, an error message is displayed.
Hostname for WWW	If specified, this variable is used for URLs in Web pages instead of the IP address. This variable can contain dots. In other words, not only a simple hostname but also a hostname including the domain name may be specified. Note: Blanks at the end will be truncated.

To establish modifications refer to the instructions given in the Configuration section.

Edit SNMP Configuration

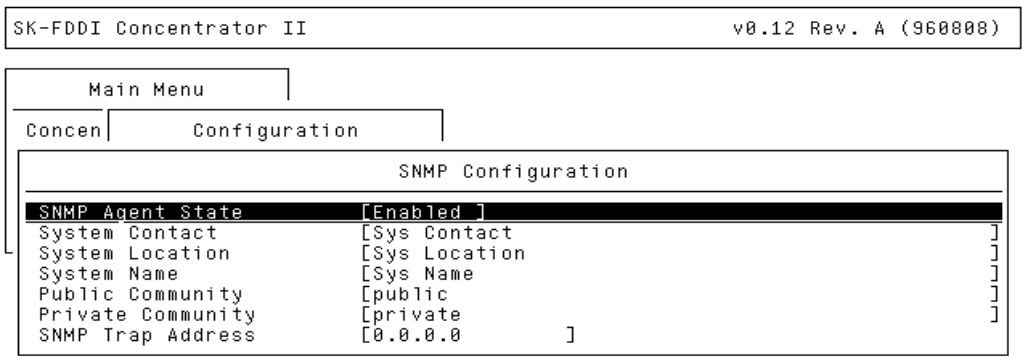

Figure 47. Edit SNMP Configuration Menu

To modify the parameter SNMP AGENT STATE, move to this parameter (appears with a high-light bar) and press the <Return> key. Another menu is displayed. To select an option, move via the UP / DOWN (cursor control) keys and press the <Return> key. To activate modifications, refer to the instructions given in the Configuration section.

Parameter	Description	Format
SNMP Agent State	The state of the concentrator's SNMP agent	values: Enabled / Disabled
System Contact	RFC1213: sysContact. The textual identification of the contact person for this managed node, together with information on how to contact this person	47 bytes ASCII string *)
System Location	RFC1213: sysLocation. The physical location of this node (e.g., `telephone closet, 3rd floor')	47 bytes ASCII string *)
System Name	RFC1213: sysName. An administratively assigned name for this managed node. By convention, this is the node's fully qualified domain name.	47 bytes ASCII string *)
Public Community	The read community for the SNMP agent	47 bytes ASCII string *)
Private Community	The read / write community for the SNMP agent	47 bytes ASCII string *)
SNMP Trap Address	IP address where SNMP trap frames should be sent to.	IP address

*) Blanks at the end of the string are cut

Edit User Configuration

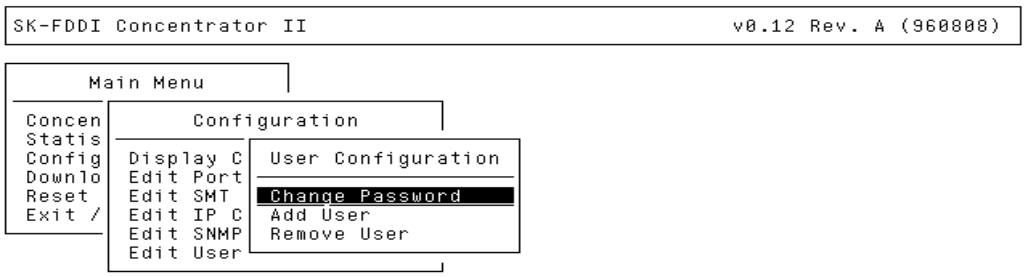

Figure 48. Edit User Configuration Menu

Parameter	Description
Change Password	You can change your password here. Enter your old password. If you succeeded, enter the new password. Re-type the new password to make sure that you typed it correctly. You can press the <Esc> key to cancel this process at any time. If you fail to type the old password or to retype the new password, an error message is displayed asking you to repeat the last step.
Add User	Only 'privileged' users are allowed to enter this function. As a 'normal' user you will get an error message if you try to enter a new user. To add an user, specify the user rights and the user name. While typing

Parameter	Description
	the user name space characters will be replaced by underscore characters. A maximum of 8 users can be administrated by the concentrator. In the concentrator's default configuration, the user `root` is defined with 'extended privileges'. The password is `rootp`. The following error messages may be displayed when creating a user: The user already exists. Specify an other user name. User list full. Unable to create user.
Remove User	Only as a 'privileged' user, you are allowed to enter this function. As a 'normal' user, you will get an error message if you try to enter this menu. For removal of users, the user list can be displayed. From the user list, select and delete the appropriate user. Before the user is actually deleted, you must confirm another message. You cannot delete your own user name. Any trial will result in an error message.

Download

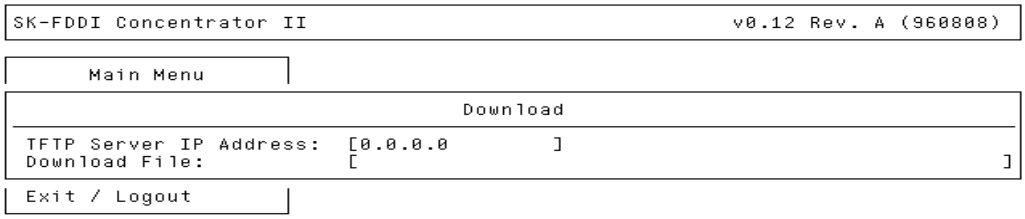

Figure 49. Download Menu

Only users with privileged user rights are allowed to enter this option. If you try to enter with normal user rights, an appropriate error message is displayed.

After the privileged user has specified the IP address of the TFTP server and path and name of the file to download, the connection to the TFTP server will be built up and the download will be started. During download, a message informs about the <Software Class> of the download file and about the amount of bytes which have already been loaded.

The software classes are:

Concentrator Software	New version of the Concentrator Software including a Diagnostic Module.
Extended File System	More files for the web server
Boot Code Update	Will be executed at concentrator boot time instead of the build-in boot code.
Configuration File	A file that contains configuration information. User lists may not be downloaded this way.

For more information about the download and the software classes see next page.

After the download is terminated without any errors this success messages appears:

```
Download Completed Successfully. Please 'reset' to activate the
downloaded software. <Press any key to continue>
```

If an error occurs during the download process, the download will be terminated and the error message will be displayed in a separate window. You have to quit the error message. The following error messages may appear:

Error Message	Reason	Required Action for proper Operation
The specified IP address has not a valid format!	The specified IP address has not the correct format or is not a valid IP address.	Re-type the correct IP address.
TFTP Server not found!	The TFTP server is not responding.	Verify that the TFTP server is started and connected to the network. Then try
TFTP Server: Download File not found!	The specified file to download was not found.	Type in the correct file name and try again.
TFTP Server: Access Violation!	The download file was found, but read protected.	Make the download file at the TFTP sever readable.
Connection timed out!	The connection to the TFTP server is terminated, because the connection time is exceeded.	Make sure the TFTP server is connected to the network and try again.
Download already in use!	Another user has entered the download item.	Try to coordinate your activities with the other user.

Reset

Only as a privileged user, you can reset the concentrator to establish configuration changes or software updates. To prevent unintentional resets, you must confirm this command. All connections will be terminated when the concentrator is reset.

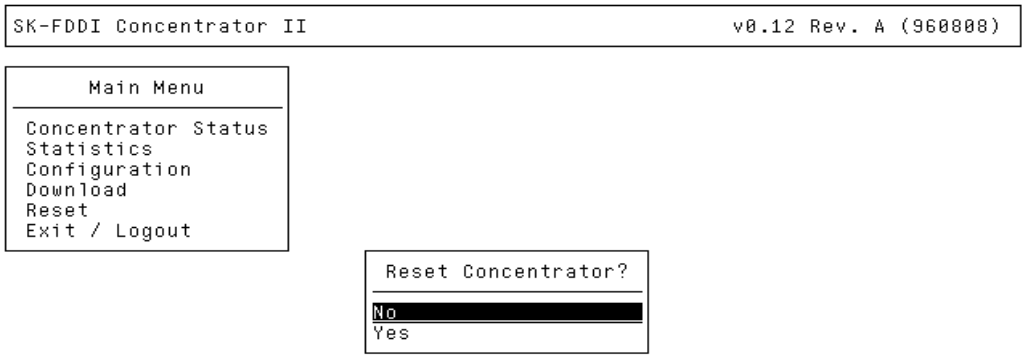

Figure 50. Reset Confirmation Screen

If normal users try to use this option, an error message appears.

Exit / Logout

To quit the User Interface and to log out, select this option.

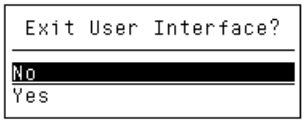

Figure 51. Logout Confirmation Screen

If the configuration has been changed essentially, you will be informed that a reset should be done to use the new configuration set. In any case you must confirm to log off before this operation can be concluded.

Appendix F. Reference Readme Viewer

Starting and Using the Readme Viewer

The Readme Viewer requires DOS version 5.0 or higher or an operating system that can run DOS executables, e.g. Windows, OS/2, etc.

To start the Readme Viewer from a DOS command line, enter

```
A> Readme
```

and press the <Enter> key. The following startup screen will be displayed:

Figure 52. Readme Viewer Copyright Note

Press the <Enter>-key. A selection menu with a list of the documented programs and topics will appear.

Use the ↑ key and the ↓ key to select a topic, and press the <Enter> key. The corresponding Readme file will be displayed on the screen.

The Readme files, installation instructions and hints usually cover several pages. To scroll through the file, use the ↑, ↓, Page↑, and Page↓ keys. Pressing the <Esc>-key will return you to the selection menu.

Readme Viewer - List of Keys Used

Key	Usage
Esc - *Key*	Return to the previous menu or Exit the Readme Viewer
In the main selection menu:	
↑ or ↓	Select the program, topic, etc.,...
<Enter> *key*	Installation instructions, hints, etc. are displayed.
While reading a Readme File	
Page ↓ or ↓	Page forward
Page ↑ or ↑	Page backward
← or →	Shift the displayed area to the left or right
Esc -*Key*	Return to the selection menu

Follow the instructions given in the files.

Appendix G. FDDI / SMT Concepts

Overview

In order to meet the demands of local high-speed networks, the American National Standards Institute (ANSI) began the process of standardizing a Fiber Distributed Data Interface (FDDI) in the early 1980s. The FDDI standard was ultimately finalized and approved by the technical committee X3T9.5 of the American National Standard Institute (ANSI) between 1987 and 1989.

FDDI was designed by this committee to guarantee reliable connections between hundreds of nodes with a data transmission rate of up to 100 Mbit/s. The underlying network architecture is Token Ring, which is implemented as a pair of counter-rotating logical rings (the FDDI dual ring). The physical medium for transmitting data frames was originally intended to be only optical fiber channels, but several companies subsequently defined other industry standards for the use of shielded twisted pair cables (Greenbook and SDDI). An additional standard was then also been defined by ANSI to allow the use of both shielded and unshielded twisted pair cables as the physical transmission medium. This standard, which is known as TP-PMD or MLT-3, is now the recognized standard.

The ANSI X3 committee defined four components of FDDI. According to the 802 reference model of the Institute of Electrical and Electronics Engineers (IEEE), FDDI provides the link between the Logical Link Control Layer and the signal transmission medium. The FDDI network is physically a dual ring configuration. Usually, only the primary ring is used for transmission. The secondary ring is redundant, i.e. only to be used in the case of malfunctions.

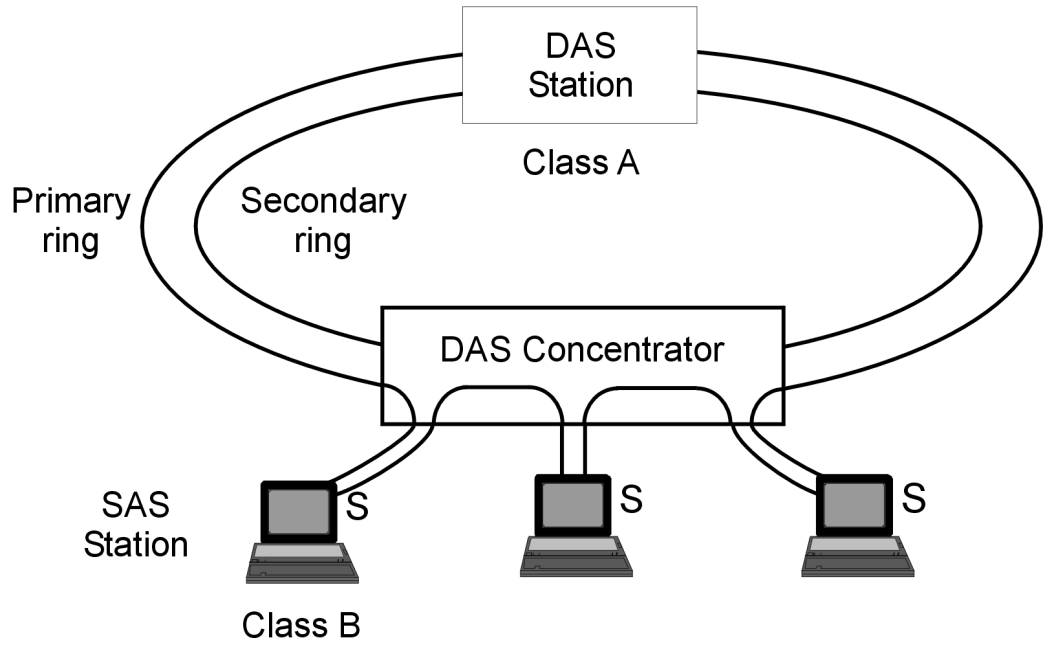

Figure 53. FDDI Ring

Two station types are distinguished in an FDDI ring: Class A and Class B stations. The maximum extension of the dual ring is 100 km (62.2 miles). Up to 500 Class A stations can be attached to an FDDI ring.

FDDI Over Twisted Pair Cable

The installation of the first FDDI networks raised the question of whether the existing network infrastructure could be used at least to some extent. This requirement resulted in the idea of using the transmission bandwidth of FDDI on existing copper media. The goal was to enable the transmission of FDDI packets in both environments (i.e. optical fiber and copper cables).

Since the early implementations of FDDI on shielded twisted pair cable, the following standards and pseudo standards have evolved:

- Green Book - STP The derivative of the early "Big Five" specification.
- SDDI - IBM's proposed standard, which was backed by eleven vendors allowing FDDI transmission on the installed base of token ring cables.
- MLT-3 - The standardized specification incorporating the benefits of the old Green Book specification with an Unshielded Twisted Pair (UTP) specification. The MLT-3 specification is the final ANSI specification on FDDI.

SysKonnect products support fiber-optic and MLT-3 cabling, both of which have been standardized by the ANSI committee. To enable the use of concentrators or NICs based on SDDI, a special SysKonnect adapter cable is available (SK-NET FDDI Impedance Matching Workarea Cable or SK-NET FDDI Impedance Matching Equipment Cable).

FDDI according to ANSI

The SK-FDDI Concentrator is compatible with ANSI's (American National Standards Institute) X3T9.5 specification and the Open System Interconnection Model (OSI Reference Model) of the International Standard Institute (ISO). FDDI consists of four components:

- Station Management (SMT)
- Media Access Control (MAC)
- Physical Layer (PHY)
- Physical Medium Dependent (PMD)

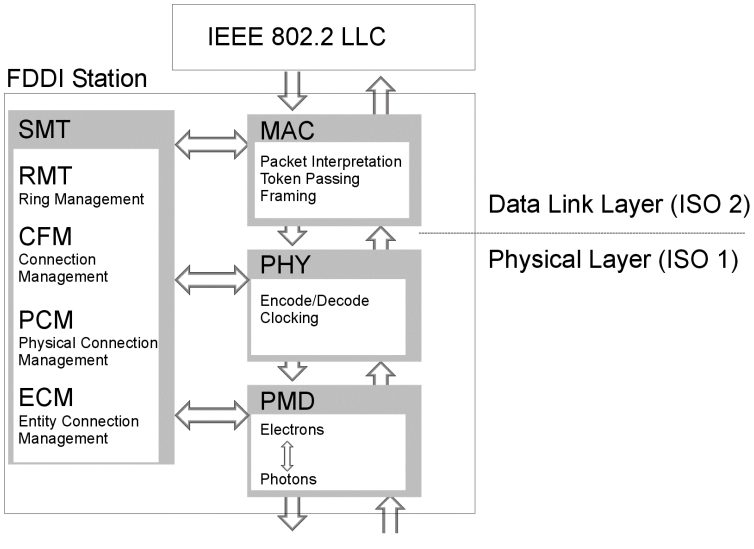

Figure 54. The four components of FDDI

- The FDDI standard describes only the first layer and parts of the second layer of the OSI Reference Model, i.e.:
  the MAC Layer (Media Access Control) and
- the first layer of the OSI model, which is split into two protocols:

- the PHY (Physical Layer Control) layer and
- the PMD (Physical Medium Dependent) layer

Station Management (SMT) is fully integrated in the FDDI protocol. The Logical Link Control protocol of the IEEE 802.3 standard builds on the FDDI protocol.

Station Management (SMT)

The most important part of the FDDI standard is Station Management (SMT). SMT specifies the local portion of the system management application process for FDDI, including the control required for proper operation of a node in an FDDI ring. SMT provides services such as connection management, station insertion and removal, station initialization, configuration management, isolation and reintegration of a malfunctioning station in the ring, communication protocols for external diagnostic/configuration tools, scheduling policies, and collection of statistics.

In a multi-vendor network, it is up to each vendor to implement the full SMT functionality on their network adapters. FDDI thus offers a premier suite of management services, which can be exploited by management tools and programs. In addition, SMT provides the capability of remotely analyzing and changing the configuration of each node in an FDDI ring without loading additional drivers on these nodes.

The main tasks performed by SMT are configuration of the FDDI ring, bit error control, and management services during normal operations.

Station Management consists of four main components:

- Ring Management receives status information from the MAC layer and transmits the information to the appropriate higher layers.
- Connection Management controls the process of establishing connections between the FDDI stations.
- Configuration Management controls the integration and removal of stations in the FDDI ring.
- SMT Frame Services control the FDDI ring via special SMT data packets generated by the SMT software. As already mentioned above, different station types exist in the FDDI ring.

For further information on Station Management, refer to Draft Proposed American National Standard documentation X3T9/92-067 X3T9.5/84-49 REV7.2

Media Access Control Layer

The MAC protocol controls access to the network and transmission of data to the attached stations. This is achieved by encapsulating the data in MAC frames. Checksums allow the determination of transmission faults. The MAC protocol layer also determines or recognizes the individual station addresses. Access to the network is enabled by the so-called *token passing* method.

Physical Layer

This protocol layer performs data encoding/decoding, clock generation and synchronization of the data stream. FDDI uses the 4B/5B code combined with a «Non Return to Zero" (NRZI) coding for data transmission.

Physical Medium Dependent Layer (PMD)

The PMD Layer provides the services needed to transmit a bit stream from one station to another. It specifies the optical signals and the wave shapes in the optical fiber as well as the Media Interface Connector (MIC). Moreover, it defines the optical bypass. The maximum attenuation must not exceed 11 dB for the entire cabling between the stations (including con-

nectors, splices and the optical bypass). The PMD Layer specifies the 62,5/125 micrometer graded-index fiber or, alternatively, the 50/125 and the 100/140 micrometer graded-index fiber as the transmission medium. For distances between neighbored ports exceeding 2 km, the FDDI standard provides the use of monomode fiber. With monomode fiber and the appropriate transceiver ports, data can be transmitted over distances of about 40 km.

Media Interface Connector (MIC)

FDDI stations are connected to the fiber network via the MIC. The dimensions and mechanical design of MICs have been specified by the ANSI committee.

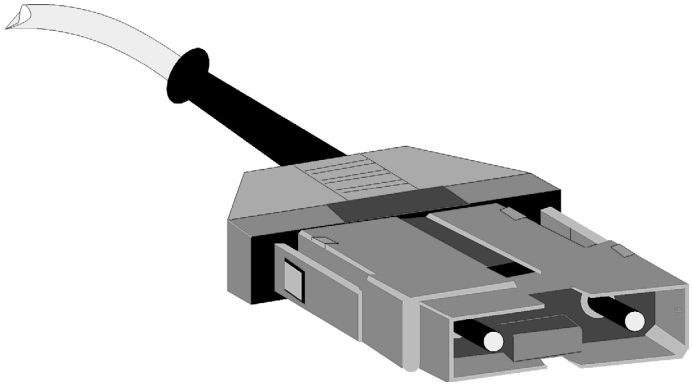

Figure 55. Media Interface Connector (MIC)

The MIC has an asymmetrical design in order to ensure correct installation. Furthermore, it is keyed by means of a tab to prevent mixing up the A and B ports and the master (M) and slave (S) links.

Definition of an FDDI-Rings

An FDDI network can be installed in several different configurations. Note that the internal logical flow of data always forms a ring. As already mentioned above, the basic way to configure an FDDI network is to build a dual counter-rotating ring. This ring is composed of a set of Dual Attachment Stations with the port A of one station connected to the port B of the neighboring station.

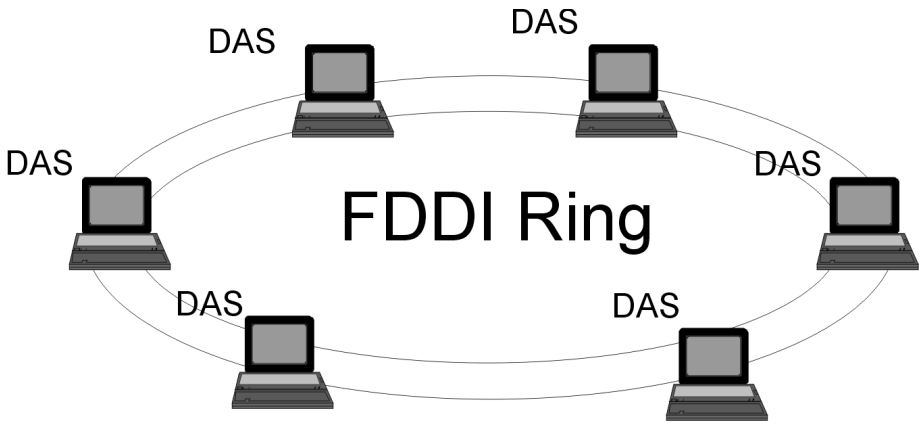

Figure 56. FDDI Dual RIng

The maximum number of nodes in such a ring (or in any other FDDI topology) is 500. The maximum distance between two neighboring stations depends on the transmission medium.

Medium	max. distance
Multimode Fiber:	2 km
Monomode Fiber:	60 km
Green Book:	100 m
SDDI:	100 m
TP-PMD (MLT-3):	100 m

In contrast to an IEEE 802.5 Token Ring network, there is no centralized active ring monitoring (except in FDDI´s synchronous mode: in this case a central Synchronous Bandwidth Allocator SBA is active). Due to the services of SMT and the use of the token passing mechanism (timed token rotation protocol as the physical access protocol), the individual nodes agree upon a token rotation time before the ring comes up.

Therefore, and based on reasons of the SMT Ring Management, the ring does not become operational for a short time when a new station is inserted into the ring. During the recovery of the ring, all stations get the node addresses of their ring neighbors.

A special case of FDDI network configuration is a single tree. The root of this tree is a Null Attachment Concentrator (NAC). For more stations to be included in this FDDI topology, the concentrators can be cascaded. A tree does not give you the possibility of redundant network connections between all nodes, since no FDDI dual ring is present in this case.

You can, however, attach a Dual Attachment Station (DAS) or a Dual Attachment Concentrator (DAC) to two different M ports of one or more concentrators. This is called dual homing and creates a fault tolerant connection for the dual homed station or concentrator.

This is an example of a simple tree configuration:

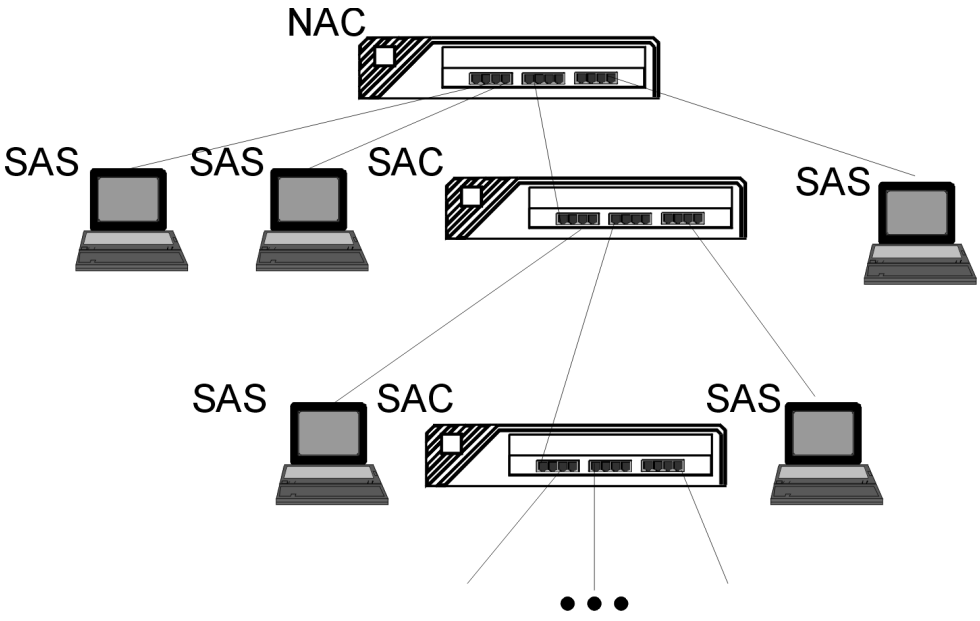

Figure 57. FDDI Tree of Nodes

Concentrators with the physical connections of type GreenBook at port S (A or B in case of a DAC) cannot be cascaded.

No limit for the maximum cascade depth is defined in the SMT specification. The figure below shows a mixed configuration, i.e. a ring of trees. One station is dual-homed:

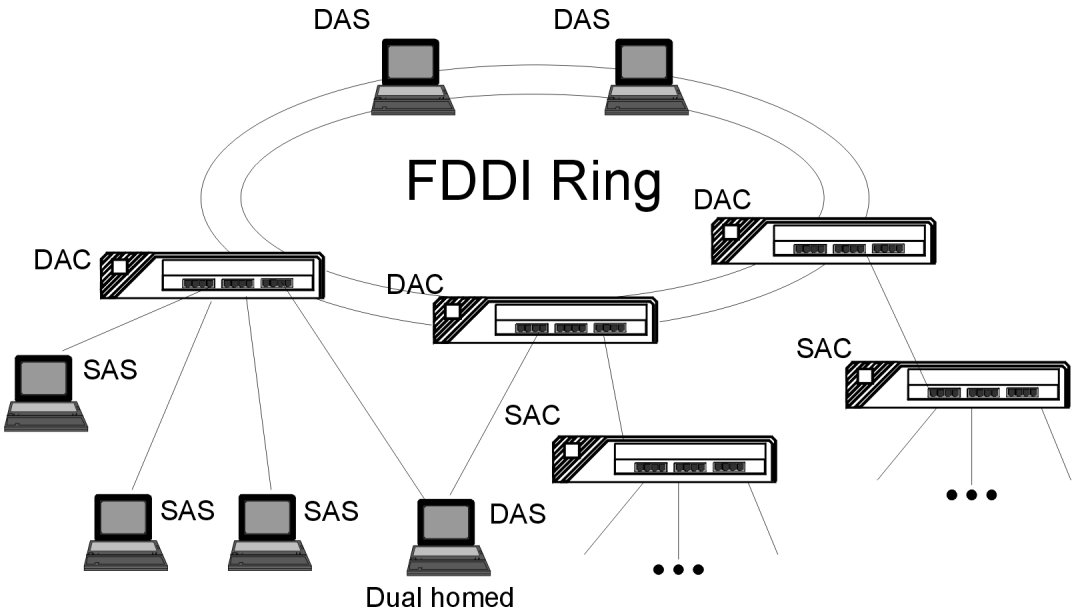

Figure 58. FDDI Ring of Trees

Note that there is always only one active dual ring allowed per FDDI network. Legal FDDI connection topologies can be constructed by following the connection rules for ports.

The types of ports (A, B, M, or S) at both ends of a physical connection determine the characteristics of that connection. These characteristics include whether the connection will be accepted or rejected, whether SMT will be notified of potential connection problems, and the connection mode that will be established. Connections may be rejected to prevent the establishment of illegal or undesirable configurations.

Sample Configurations

The following figures illustrate some possible configurations with respect to the type of connections, token paths and fault situations.

It is important to note again the arrangement of the Primary In/Out and Secondary In/Out lines at the ports of type A and B. This will help you to understand the placement of the MAC instances in the internal path configurations of the nodes.

Primary In: Incoming signals on the primary path/ring

Primary Out: Outgoing signals on the primary path/ring

Secondary In: Incoming signals on the secondary path/ring

Secondary Out: Outgoing signals on the secondary path/ring

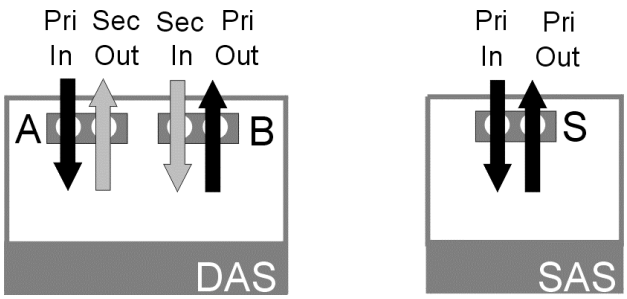

Figure 59. Incoming and outgoing data on A and B ports

First a normal situation: a dual ring with three DASs and one DAC. At the M ports of the concentrator two SASs are connected:

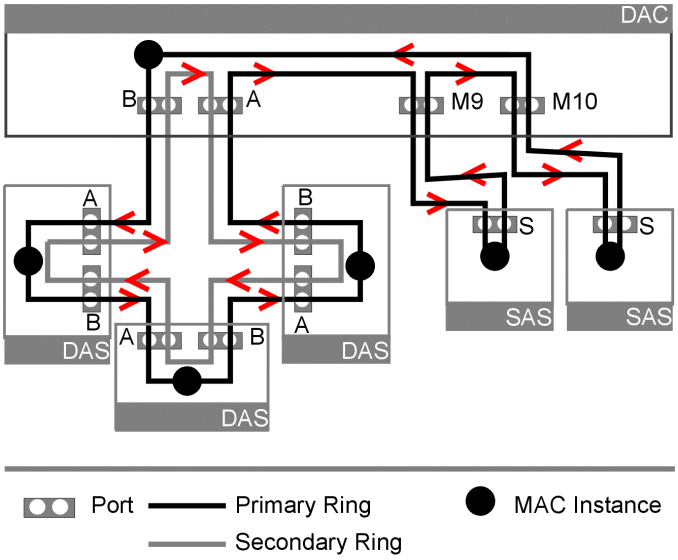

Figure 60. Example of an FDDI connection

Note that only one of the two counter-rotating rings (the primary ring) is active at a given time, although each DAS is able to send and receive data on the primary and secondary ring. As you can see, the active MACs are attached to the Primary In and Primary Out of each node.

Ring Interrupts

In the case of a cable or device failure, the adjacent stations will detect the fault and go into a peer wrap state. This is a change of the internal path configurations of the involved stations. The secondary ring takes over the tasks of the absent ring element. The logical token ring is still alive:

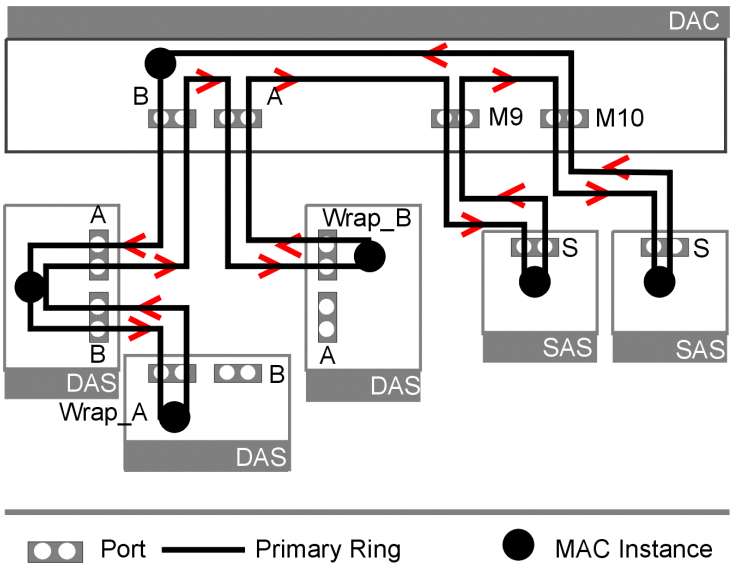

Figure 61. Example of a peer wrap condition

The SMT mechanisms in the FDDI nodes can manage these situations by monitoring the network status. The most important part for this is the Ring Management within the SMT instance in the nodes. When a fault occurs at two or more locations, the ring splits into several separate segments. An SMT monitor program will only be able to analyze the logical ring into which the station with the program is inserted. But the two stations adjacent to the fault location(s) will inform you by their peer wrap state, where the problem resides.

To prevent ring segmentation on fiber-based networks, optical bypass switches can be used to bypass a faulty station. Note that an optical bypass is of limited use if there are multiple cable faults on the network.

When a Single Attachment Station with its single port of type S is connected to a port A or B of a Dual Attachment Station or concentrator, there is a wrap situation on the ring, too. An FDDI ring should work in this configuration, but there is no dual ring and no fault tolerance anymore:

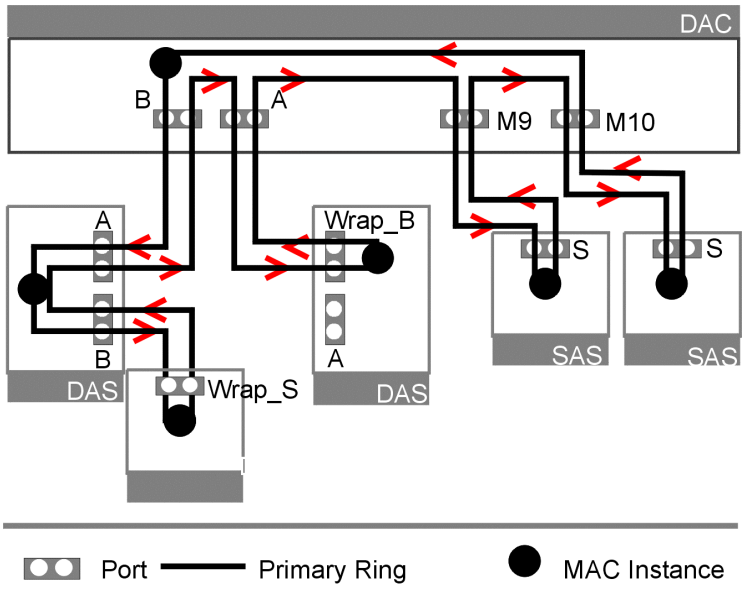

Figure 62. Inserting an SAS into the FDDI dual ring

2 SAS-Stations

A special case is the connection of two Single Attachment Stations to a ring with only two nodes:

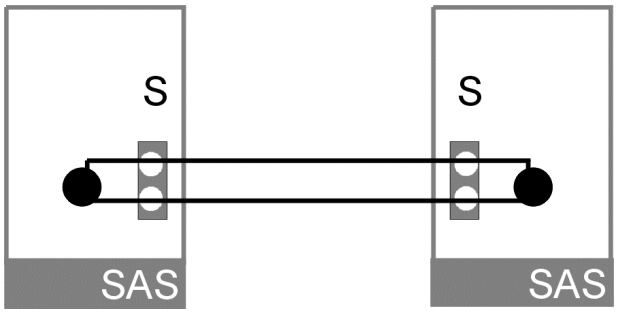

Figure 63. FDDI ring with only two nodes

Twisted Rings

Finally, let us look at another undesirable ring configuration. Connecting two A ports or B ports together creates twisted primary and secondary rings:

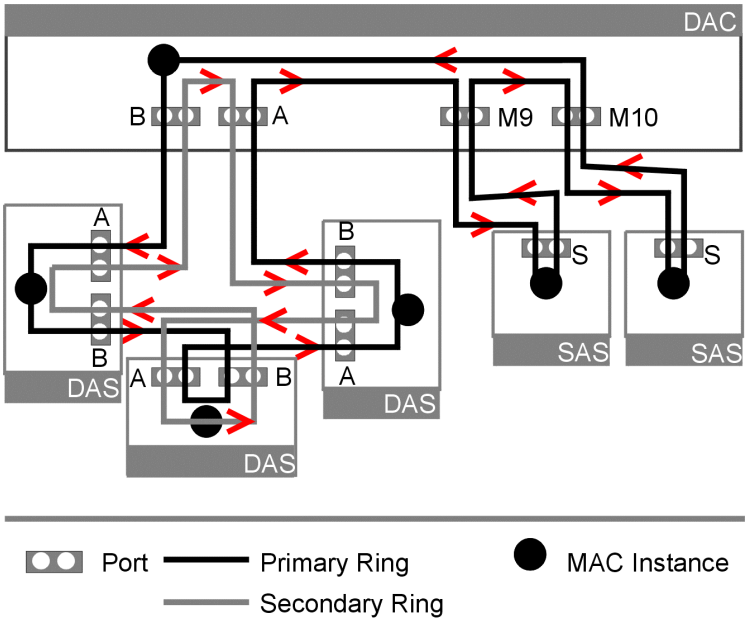

Figure 64. Twisted rings

The dual ring should remain intact, but the stations between the twist locations (in our case this is only one DAS on the bottom) have their MACs inserted into the secondary ring. This causes many problems, because everything seems to be fine in the network functionality of all the nodes in such a network, but the nodes with their MAC inserted in the primary ring do not see the ones with the MAC inserted into the secondary ring. In fact, there are actually two FDDI rings in this configuration.

Connection Rules

The common rules for connecting two ports together are described in each node's Connection Policy, which comprises a set of SMT rules that specify which connections are valid, undesirable or not allowed. For example, configurations like the one shown above can be avoided by defining the A-A port connection and B-B port connection as illegal in the connec-

tion policy of each node, but this may be handled differently by different vendors. SysKonnect´s FDDI stations treat A-A and B-B port connections as undesirable; other vendors may follow a different approach.

Note, however, that all FDDI nodes must accept even undesirable connections if the partner node wants such a connection. It is only when the connection policies of both partners have a particular type of connection marked as undesirable that the connection will not be established.

Node Configurations

A number of different node configurations are possible. The SMT standard defines some special node configurations and also specifies their functionality in detail:

- Single Attachment Stations (SAS)
- Single Attachment Concentrators (SAC)
- Dual Attachment Stations (DAS)
- Dual Attachment Concentrators (DAC)
- Null Attachment Concentrators (NAC)

SAS

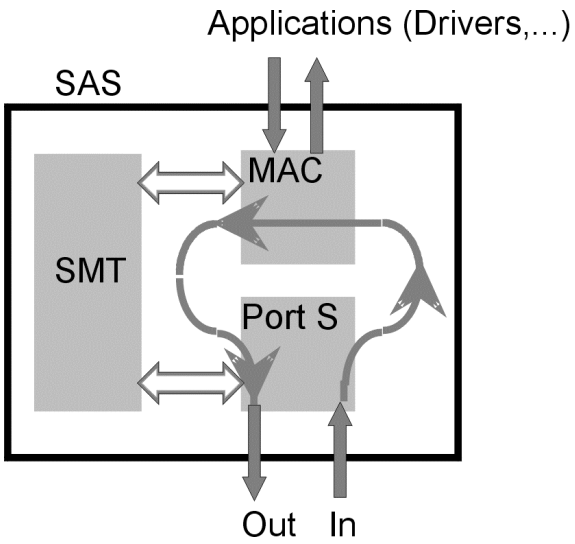

Figure 65. SAS configuration

This is the internal configuration of a Single Attachment Station (SAS). An SAS contains only one port and one MAC instance. The type of the port is S, and it is connected to an M port of a concentrator. These instances are inserted into the only path (the primary path) in the following order:

In → PORT S → MAC → Out

DAS

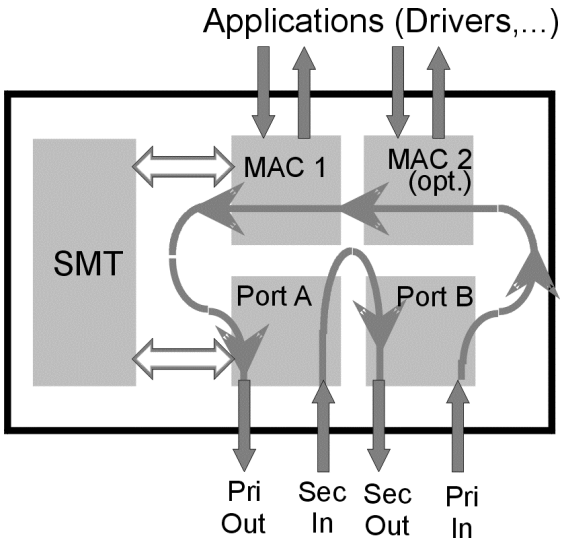

Figure 66. DAS configuration

The above figure shows the internal configuration of a Dual Attachment Station (DAS). A DAS contains two port instances of type A and B. The two ports are inserted in a double ring, so such a station is said to be rooted. This station can, however, also be used like an SAS by connecting only port A to an M port of a concentrator. In this case, port B should also work as a pseudo-S port, but this aspect is vendor-specific and may be handled differently by other vendors.

If both ports are connected to the M port of one or two different concentrators, the station is said to be dual-homed. Dual homing is a way to connect a station to a concentrator in a fault tolerant way: when the connection of (pseudo-S) port A is lost, the station can switch to the connection through port B. So a dual-homed station always has only one active port.

An optional MAC 2 instance could be connected to achieve double the transmission rate, provided the FDDI dual ring is operating correctly (these configurations are not seen very often). In most cases, the only existing MAC instance is always connected to the line in of port A (where the Primary In resides) and line out of port B (the Primary Out). Note that the MAC instances are usually placed before the last port instance in the primary path (as shown below). There are no MAC instances on the secondary path. This will also be evident from the following examples. These instances are inserted under fault free conditions in the primary path of the FDDI ring in the following order:

In → PORT A (Pri In) → MAC → PORT B (Pri Out) → Out

NAC

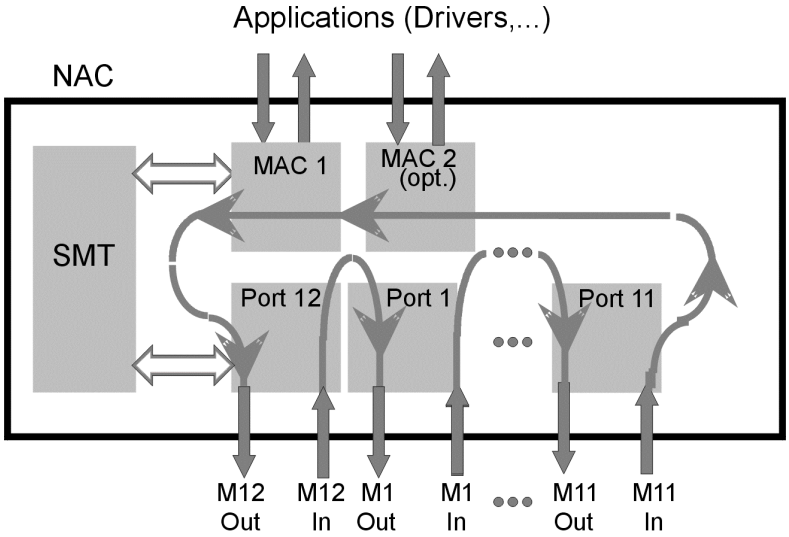

Figure 67. NAC configuration

The above diagram illustrates the internal configuration of a Null Attachment Concentrator (NAC). A NAC contains several port instances of type M. The example shows a concentrator with 12 M ports, e.g., a SK-FDDI concentrator configured as a NAC. The M ports are connected to the S ports of Single Attachment Stations.

This concentrator cannot be inserted directly in a FDDI dual ring or connected to an S port of another concentrator. It forms an FDDI standalone ring. Since all ports are of type M, there is no secondary path in this FDDI node, i.e. neither a Primary In/Out nor a Secondary In/Out.

An optional MAC 2 instance could be connected to achieve double the transmission rate, provided the FDDI dual ring is operating correctly (these configurations are not seen very often). In most cases, the only existing MAC instance in this node is placed before the last port instance. This is the reason for the “odd” order of port instances in the figure above. All described instances of the NAC are traversed in the following order:

In → PORT M1 → ... → PORT M11 → MAC → PORT M12 → Out

SAC

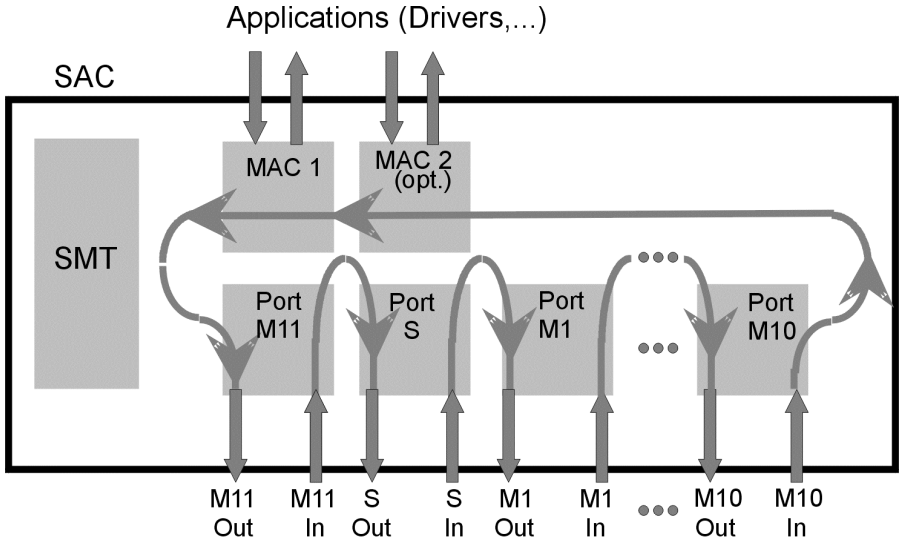

Figure 68. SAC configuration

The above diagram illustrates the internal configuration of a Single Attachment Concentrator (SAC). A SAC contains one port instance of type S and several port instances of type M. This example shows a concentrator with 11 M ports, e.g., a SK-FDDI concentrator configured as a SAC. The M ports are connected to the S ports of Single Attachment Stations. The S port is connected to an M port of another concentrator. In this configuration, the concentrator could be integrated in a cascade of concentrators.

An optional MAC 2 instance could be connected to achieve double the transmission rate, provided the FDDI dual ring is operating correctly (these configurations are not seen very often). In most cases, the only existing MAC instance is placed before the last port. This is the reason for the “odd” order in the figure above. The primary path enters the SAC at port S, coming from the M port of another concentrator.

All described instances of the SAC are traversed in the following order:

In → PORT S → PORT M1 → ... → PORT M10 → MAC → PORT M11 → Out

DAC

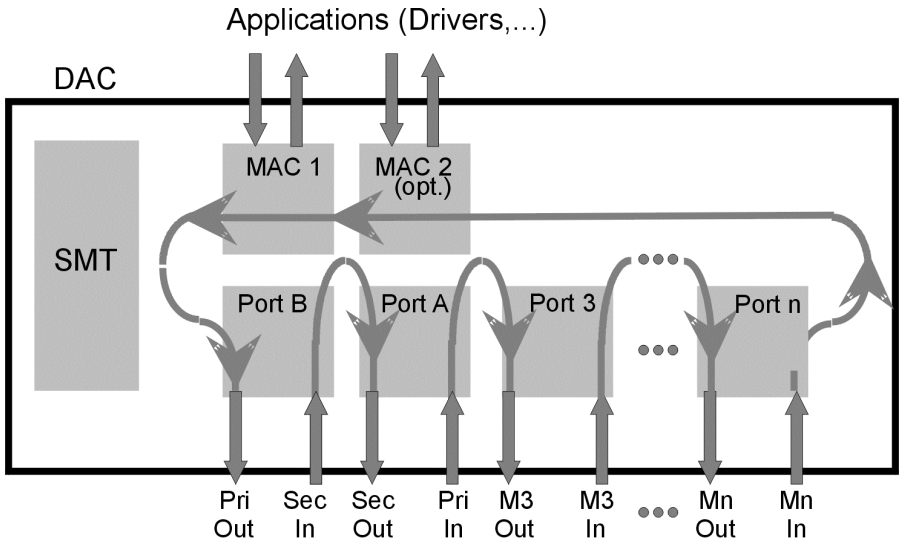

Figure 69. DAC configuration

Die obige Abbildung zeigt den inneren Aufbau eines Dual Attachment Concentrator (DAC). The above diagram illustrates the internal configuration of a Dual Attachment Concentrator (DAC). A DAC contains two port instances of type A and B and several port instances of type M. This example shows a concentrator with 10 M ports, just like a SK-FDDI concentrator. The M ports are connected to the S ports of Single Attachment Stations. The two ports A and B are inserted in a FDDI dual ring; consequently, such a concentrator is said to be rooted. This FDDI node could also be used as a SAC by connecting only the A port to an M port of another concentrator. In this case, port B should also work as a pseudo-S port, but this aspect is vendor-specific and may be handled differently by other vendors.

If both ports (A and B) are connected to an M port of one or two different concentrators, the concentrator is said to be dual-homed. *Dual homing* is a way to connect a station to a concentrator in a fault tolerant way: when the connection of (pseudo-S) port A is lost, the station can switch to the connection through port B. So a dual-homed station always has only one active port.

An optional MAC 2 instance could be connected to achieve double the transmission rate, provided the FDDI dual ring is operating correctly (these configurations are not seen very often). In most cases, the only existing MAC instance is placed before the last port (this is the

B Port because of its Primary Out function). This is the reason for the odd order in the figure above. It also explains why the B Port is arranged on the left of the A Port on a SysKonnect concentrator. The internal structure of the SK-FDDI concentrator corresponds to the figure above.

All described instances are inserted under fault-free conditions on the FDDI ring in the following order.

In→PORT A (Pri In) →PORT M1→...→PORT Mn → MAC →PORT B(Pri Out)→Out

FDDI Nodes

A FDDI network consists of a set of logically connected individual nodes. The physical connection from a FDDI node to the transmission medium and the Token Ring architecture of FDDI are described in ISO standards:

- ISO 9314-1 (FDDI Token Ring Physical Layer Protocol PHY),
- ISO 9314-2 (FDDI Token Ring Media Access Control MAC) and
- ISO 9314-3 (FDDI Token Ring Physical Layer, Medium Dependent PMD)

Each FDDI node consists of several objects or instances to manage the functionality of this node in the FDDI ring:

SMT-Instance

There is always one single SMT instance in a node. These instances are implemented by the network adapter driver or a ROM driver, which performs all the tasks of the SMT described above. For these tasks the following logical parts of SMT exist:

- das Ring Management (RMT)
- das Configuration Management (CFM)
- das Connection Management (CMT)
- das Physical Connection Management (PCM)
- das Entity Coordination Management (ECM)

These parts coordinate the other objects in the node. The SMT also holds general information about the state and configuration of the node.

MAC-Instances

Each node contains one or several MAC instances. MAC is the abbreviation for Medium Access Control. A MAC specifies the lower sublayer of the Data Link Layer for FDDI, including the access to the medium, addressing, data checking, and data framing. Normally, there is only one MAC instance in a node. Each MAC holds counters about received and transmitted frames and several important timers required for the FDDI ring management.

The connected MACs of FDDI nodes build a logical ring. Therefore, the MAC instances also hold the information about the ring neighbors of each MAC. With this information, SMT based management tools are able to generate a map of the FDDI ring with all nodes in correct order. This is the sometimes called the FDDI Ring Map..

PORT-Instances

A port instance is a pair of a PHY entity and a PMD entity in a node, which may be connected to the transmission medium and provide one end of a physical point to point connection with another node. PORT instances consist of the physical connection to the ring and SMT holds information about this connection for each port in a node. There are four different types of ports: A, B, M, and S.

There is no limit to the number of PORT instances within one single node. A Dual Attachment Station (DAS), which is inserted directly into the main FDDI dual ring, has two port instances (A and B). Port A connects to the primary ring on the incoming cable and the secondary ring on the outgoing cable. Similarly, port B connects to the incoming cable of the secondary ring and the outgoing cable of the primary ring. A properly formed dual ring is composed of a set of Dual Attachment Stations with the port A of one station connected to the port B of the neighboring station.

A concentrator has at least one port of type M (Master), which is normally attached to the S port (Slave) of a Single Attachment Station (SAS). SAS stations have only one port and cannot be inserted in the main dual ring. They can only be attached to a concentrator´s M port..

Path Instances

A path is the part of a logical ring, which passes trough an FDDI node. There are three different kinds of path instances:

Primary Path: these are the parts of the primary FDDI ring. In case of faults on the primary ring, all communication is switched to the secondary ring, and the primary path is inserted into this ring. There are also situations, where in parts of the ring the primary paths of certain stations are inserted into the secondary ring.

Secondary Path: these are the parts of the secondary FDDI ring. There are also situations, where in parts of the ring the secondary paths of certain stations are inserted into the primary ring.

Local Path: this represents the segment(s) of ring(s) other than the primary and secondary ring that pass through the station. Local paths do not exist in normal FDDI configurations.

There are at most one primary and one secondary path instance in a node, and up to 256 local path instances. There can be several PORT and MAC instances inserted in each path instance. This configuration determines the flow of data through an FDDI node. SMT holds the information about the configuration of each path.

The FDDI MIB

Each FDDI node keeps the information about the internal parts of SMT (SMT, MAC, PORT and path instances) in a Management Information Database (MIB). The SMT managed object classes are defined using the formats defined in the ISO Draft International Standard 10165/4 “Structure of Management Information Part 4; Guidelines for the Definition of Managed Objects”, dated June, 15. 1990.

As described above, MAC, PORT, and PATH objects may have multiple instances within the MIB of one node. In order to support implementations with flexible internal configurations, a MAC or PORT object instance in the MIB may not necessarily be associated with a physical resource of that type within the station.

Some attributes in the MIB are mandatory and have to be present in the MIB of all nodes, others are optional.

Some attributes of the MIB are read-only, others can be set by the local system Management entity or via the Parameter Management Protocol (PMF). This is one of the internal SMT protocols and will be described later. PMF is a mandatory feature of SMT 7.3. Stations that do not support PMF GET operations are not compliant with SMT 7.3.

FDDI Frames

In general, a physically complete FDDI frame consists of the following data fields:

FDDI Frame

PA	SD	FC	DA	SA	..DATA..	FCS	ED	FS
MAC Header					Data	MAC Trailer		

MAC Header		
PA	Preamble	2 or more bytes
SD	Start Delimiter	1 byte
FC	Frame Control	1 byte
DA	Destination Address	6 bytes
SA	Source Address	6 bytes
Frame Data		
DATA	Frame Data	bis zu 4478 bytes
MAC Trailer		
FCS	Frame Check Sequence	4 bytes
ED	End delimiter	4 bits
FS	Frame Status	12 or more bits

A network adapter driver such as the UPPS DLI receives only the FC, DA, SA and DATA fields. All other fields are initialized and handled by the hardware of the FDDI network adapters.

SMT frames (the frames of our special interest), have an SMT PDU (Protocol Data Unit) as their DATA field:

SMT Frame

PA	SD	FC	DA	SA	SMT Header	SMT Info	FCS	ED	FS

FC Field

The FC field in SMT frames has the following significance:

FC = 0x41	SMT-Info
FC = 0x4F	Next Station Addressing - NSA

The NSA FC value 0x4F is used as an identifier in Neighbor Information Frames (NIF) for requests and announcements of the neighbor notification protocol (see chapter SMT protocols). The FC value 0x41 (SMT-INFO) identifies all response, request and announcement frames, including NIFs not handled by the neighbor notification protocol.

DA and SA Fields

These are the Destination and Source Address fields in the MAC header. See the chapter on Addressing for further details.

SMT Header Field

This is the header field for the SMT protocol, which is described in detail in the SMT Protocol section (below). The SMT header field is always 20 bytes in length.

SMT Info Feld

This is the field with the actual data. The SMT subprotocols will be described in the next chapter. The SMT Info field has a variable length, which depends on the contents of the SMT header. The theoretical maximum length of the SMT Info field is 4458 bytes:

MaxSMTInfo	=	MaximumFrame -	-MACHeader -	-MACTrailer -	-SMTHeader
	=	4500	-16	-6	20
	=	4458			

In the SMT specification, the maximum SMT Info field length of 4332 bytes is chosen (except for ECHO frames) for consistency with other standards. Nevertheless, SMT should be capable of receiving and processing frames of the maximum size supported by the FDDI MAC and PHY standards.

SMT Protocol

There are ten different subprotocols in the SMT standard. All data frames transmitted and received via these protocols have the same SMT protocol header.

SMT Header

SMT Header

Frame Class	Frame Type	Version ID	Transaction ID	Station ID	Pad field	SMT Info field length
1 byte	1 byte	2 bytes	4 bytes	8 bytes	2 bytes	2 bytes

Frame Class

The Frame Class field identifies the SMT subprotocol used in this frame.

Neighbor Information Frames (NIF)	Code 0x01
Status Information Frames (SIF) - Configuration	Code 0x02
Status Information Frames (SIF) - Operation	Code 0x03
Echo Frames (ECF) (RAF)	Code 0x04
Resource Allocation Frames	Code 0x05
Request Denied Frames (RDF)	Code 0x06
Status Report Frames (SRF)	Code 0x07
Parameter Management Frames (PMF) - Get	Code 0x08
Parameter Management Frames (PMF) - Set	Code 0x09
Extended Service Frames	Code 0xFF

Frame Type

The Frame Type field designates whether the frame is an announcement, a request, or a response to an earlier request.

Announcement	Code 0x01
Request	Code 0x02
Reply	Code 0x03

Version Id

The Version Id field identifies the structure of the SMT Info field. For correct handling of SMT frames, the SMT frame header format is identical across all protocol versions (up to and including the station ID field).

Transaction ID

The Transaction ID in the SMT header is used to pair SMT responses with their requests. The algorithm to define valid IDs for requests is implementor-defined. All response frames should have the same transaction ID as the corresponding request frames.

Station ID

The Station ID field is the unique identifier of the FDDI station that sent the SMT frame. In standalone FDDI rings, this is the same address as in the SA field in the MAC header. The Station ID is represented in a 64-bit field. The two most significant bytes (MSB) are implementor defined; the last six bytes are a six-byte physical or MAC address.

PAD

The PAD field, which may be up to 4 bytes, is used to pad the header to double words of 4-byte length.

SMT Info

The SMT Info Field Length field indicates the length of the protocol data field SMT Info. One or more SMT parameters are transmitted in this field. These parameters can be attributes of the FDDI SMT MIB or special SMT parameters.

The following sections describe the frame-based subprotocols of SMT.

Neighbor Notification (NIF)

The Neighbor Notification Protocol performs the following functions:

It determines a MAC´s logical upstream and downstream neighbor addresses in the FDDI ring (UNA and DNA).

It detects duplicated fddiMACSMT addresses on a operational FDDI logical ring. When the ring is not operational, the RMT (Ring Management) process of SMT will perform this task. The existence of duplicate addresses in an FDDI ring is an illegal condition and causes a ring reset. This prevents “spoofing”, where a station could send frames under the sender of another station and thus obtain the access rights for the network resources of that station.

It generates a periodic frame handshake that verifies the operation of the local MAC receive and transmit paths. The timer for this is the MIB attribute fddiSMTT-Notify. The Neighbor Notification process is performed independently by every MAC instance in a node.

Status Report Protocol (SRF)

A station maintains a Status Report Protocol to periodically report on the station status. This is useful in managing an FDDI ring. This status information is transported in Status Reporting Frames (SRF).

The Status Report Protocol is implemented in the Status Report Transmitter. There is always only one instance of the Status Report Transmitter per station.

Parameter Management Protocol (PMF-Get und PMF-Set)

Remote management of station attributes is accomplished via Parameter Management Frames (PMF). The Parameter Management Protocol operates on all SMT MIB attributes, attribute groups and actions.

The Parameter Management protocol includes a consistency control mechanism that prevents one requester from changing an attribute or invoking an action with a PMF Set operation so long as a competing request is pending.

This consistency control mechanism is implemented with a SetCount maintained by each station. The SetCount attribute changes whenever an attribute is changed or an action is invoked via the PMF-Set protocol or by a Management Agent Process through the SMT local management interface. The SetCount is carried in all PMF response frames.

The Parameter Management Protocol provides support for an access control mechanism for Set operations. An authorization parameter may be included in Set requests. The length and contents of this parameter are defined by the implementor. The mechanism is similar to the use of passwords. Most FDDI network adapter drivers offer the possibility to define a Set Parameter password. This is the authorization parameter described here.

Station Status Polling (SIF)

A mechanism is provided for the aggregate station status to be obtained remotely through a polling (request/response) protocol. This protocol is carried out using the SMT Status Information Frames (SIF). Two classes of status information are defined: SIF Configuration, which carries several station connection and configuration parameters, and SIF Operation, which carries some station statistics information.

Echo Protocol (ECF)

The SMT Echo protocol is provided for SMT-to-SMT loopback testing on an FDDI ring. It is carried out using SMT ECHO frames, which may contain any amount of data up to the maximum frame size supported by FDDI. Echo data is implementation-specific.

The length of the Echo data is constrained only by the maximum frame size supported by the FDDI MAC standard. When the MAC, SMT, and SMT_Parameter headers are taken into account, the maximum remaining data length for an ECHO frame is 4454 octets.

MaxEchoData = MaxSMTInfo - SMT_ParameterHeader

= 4458 - 4

= 4454

Synchronous Bandwidth Allocation (SBA)

The Synchronous Bandwidth Allocation protocol provides a deterministic mechanism to allocate synchronous bandwidth and prevents the over-allocation of synchronous and total bandwidth.

The SBA uses Resource Allocation Frames (RAF) and provides the following functions:

- manage the allocation of the limited synchronous bandwidth resource.
- monitor the amount of synchronous bandwidth allocated for use.
- monitor the ring for over-allocation of synchronous bandwidth.
- monitor for and recover from ring instability due to over-allocation of the total bandwidth.

The protocol performs the allocation functions through a request-response frame exchange between a station wishing to use synchronous bandwidth and a synchronous bandwidth management process. Monitoring is done by the management process requesting allocation information from stations using synchronous bandwidth.

The SBA protocol is used by each MAC in a station that issues synchronous frames.

Extended Services Protocol (ESF)

The Extended Service protocol is intended to enable the provision and testing of new SMT frame-based services.

All Extended Service frames carry an ESF_ID SMT parameter that uniquely identifies (through the use of IEEE-assigned Organizationally Unique Identifiers or OUIs) the extended service being offered. The protocol and semantics of these frames are specific to each service identified by the ESF_ID. If the recipient of an extended service protocol frame does not support the particular service specified by the ESF_ID, the frame is ignored.

The Extended Services protocol was defined for later extensions. No additional services have been implemented as yet.

Adressing

FDDI SMT only uses *48-bit addresses*. This is the basic structure of such an address:

FDDI SMT Address

I/G-Bit	U/L-Bit	46 Bits

The I/G bit is the Individual/Group address bit. For destination addresses, the value zero indicates an individual address; the value one, a group address. Individual addresses refer to a single MAC entity. Group addresses or Multicast addresses refer to multiple MAC entities. In the Source Address field of the MAC header, the I/G bit indicates the presence or absence of source routing information.

The U/L bit is the administration bit. The value zero indicates a universally administered address, the value one a locally administered address. Locally administered addresses are known from the NetBIOS-based networks and are used very seldom in FDDI networks (the 16-bit short part of the SMT addresses in the MIB, for example, are always administered locally). System administrators to ensure that that no locally administered addresses are duplicated in a LAN.

Transmission Order

The transmission order of destination and source addresses in FDDI is consistent with IEEE 802 networks. The first bit of the destination address transmitted is the I/G bit.

One of two transmission order rules is used by the IEEE 802 networks. For FDDI, data octets are transmitted high order bit first. IEEE 802.5 uses the same rule, but IEEE 802.3 and IEEE 802.4 transmit data octets low order bit first. Note that the FDDI PHY does not actually transmit individual bits, but transmits 4 bits at a time encoded in 5 bit symbols. The I/G bit of the MAC header address field is the high order bit of the first symbol transmitted.

The ANSI/IEEE 802.1 standard has defined the canonical form for representing 48-bit addresses as octet strings. The canonical form is a 6-octet string. The first octet contains the first 8 bits of the address, with the I/G bit as the least significant bit, the U/L bit as the next more significant bit, and so on.

Some documents (such as the SMT specification itself) use the Most Significant Bit (MSB) form for representing 48 bit addresses as 6-octet strings. The first octet contains the first 8 bits of the address, with the I/G bit as the most significant bit, the U/L bit as the next less significant bit, and so on.

Note that for canonical representation of addresses, hyphens are used between octets. For MSB representation of addresses, colons are used between octets.

SMT Multicasts

SMT defines the use of several IEEE assigned multicast addresses. SMT also uses a universally administered address to indicate that the value of an address attribute is not known. These addresses are identified by name.

Name	Canonical Representation	MSB Representation
SMT-Directed-Beacon-DA	01-80-C2-00-01-00	80:01:43:00:80:00
SMT-SRF-DA	01-80-C2-00-01-10	80:01:43:00:80:08
SMT-All-Concentrators	01-80-C2-00-01-20	80:01:43:00:80:04
SMT-SBA-DA	01-80-C2-00-01-30	80:01:43:00:80:0C
SMT-Unknown-Address	00-00-F8-00-00-00	00:00:1F:00:00:00

Appendix H. Glossary

Sources

The IBM Dictionary of Computing, IBM form number SC20-1699.; identified by the symbol (D) preceding the definition.

American National Dictionary for Information Processing Systems, copyright 1982 by the Computer and Business Equipment Manufacturers Association. These copies can be obtained from: American National Standards Institute ; 1430 Broadway, New York, New York 10018. These definitions are identified by the symbol (A) preceding the definition.

The ISO Vocabulary - Information Processing, and the ISO Vocabulary - Office Machines, developed by the International Standards Organization, Technical Committee 97, Subcommittee 1.

Definitions from published sections of these vocabularies are identified by the symbol (I) preceding the definition.

Definitions from draft proposals and working papers under development by the ISO/TC97 vocabulary subcommittee are identified by the symbol (T) indicating that final agreement has not yet been reached among its participating members.

The CCITT Sixth Plenary Assembly Orange Book, Terms and Definitions, published by the International Telecommunication Union, Geneva, 1978, and subsequent extensions.(identified by the symbol (C) preceding the definition).

Published and draft FDDI standards. These definitions may be subject to change as the standards evolve.

The source of each definition is included in parentheses.

- FDDI Media Access Control (MAC)
- FDDI Physical Layer Protocol (PHY)
- FDDI Physical Layer Medium Dependent (PMD)
- FDDI Station Management, Entwurf (SMT)
- Single Mode Fiber Physical Layer Medium Dependant (SMFPMD)

For abbreviations, the definition usually consists only of the words that represent the letters; for complete definitions, see the entries for the words.

Expressions and Definitions

Adapter	(D) (1) A part that electrically or physically connects a device to a computer or to another device. (2) A printed circuit board that modifies the system unit to allow it to operate in a particular way. See also card.
Attachment	(D) A port or a pair of ports, optionally including an associated optical bypass, that are managed as a functional unit. A dual attachment includes two ports: a port A, and a port B. A single attachment includes a Port S.
Application	(D) (1) The use to which an information processing system is put; for example, a payroll application, a network application. (2) A collection of software components used to perform specific types of user-oriented work on a computer. (3) In the AS/400 system, the collection of CSP/AE objects that together can be run on the system. An application consists of a program object, up to five map group objects (depending on how many different devices are supported), and any number of table objects.
bits per second (bps)	(D) In serial transmission, the instantaneous bit speed with which a device transmits a character.
bps	Bits per second
Bypass	(D) (1) The ability of a station to be optically isolated from the network while maintaining the integrity of the ring. (SMFPMD) (PMD) (2) The ability of a node to optically isolate itself from the FDDI network while maintaining the continuity of the cable plant.
Card	(D) (1) An electronic circuit board that is plugged into a slot in a system unit. See also adapter. (2) A plug-in circuit assembly.
Circuit	(D) (1) One or more conductors through which an electric current can flow. See physical circuit, virtual circuit. (2) A logic device.
Concentrator	(D) (1) An FDDI node that provides additional attachment points for stations that are not part of the dual ring. (SMFPMD) (PMD) (2) An FDDI node that has additional points beyond those required for its own attachment to an FDDI network. These additional ports are for attaching other FDDI nodes (including other concentrators) in a tree topology. A concentrator always supports the physical layer and may or may not support the data link layer.
Configuration	(T) The arrangement of a computer system or network as defined by the nature, number, and the chief characteristics of its functional units. The term may refer to a hardware or a software configuration.
Connectivity	(D) (1) The capability of a system or device to be attached to other systems or devices without modification. (2) The capability to attach a variety of functional units without modifying them. (3) In ACF/TCAM, the state of two subareas that have an operative explicit route between them.
Customization	(D) (1) The process of designing a data processing installation or network to meet the requirements of particular users. (2) The process of defining and activating a configuration and changing system parameters to meet user requirements.
DAS	Dual attachment station.
Data link	(D) A telecommunication line is only the physical medium of transmission; for example, a telephone line or microwave beam. A data link includes the physical medium of transmission, the protocol, and associated devices and programs - it is both logical and physical.

Data packet	(C) A packet used to transmit user data over a virtual circuit at the DTE/DCE interface.
Default	(D) Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.
DLI	Data Link Interface.
DOS	Disk Operating System.
Driver	(D) (1) A system or device that allows a functional unit to operate. (2) A circuit that increases the signal current for sending data over long cables or to many other circuits. (3) A circuit that sends small electronic signals to a device.
Dual Attachment Station (DAS)	(D) A station that offers a dual attachment to the FDDI network and is capable of accommodating a dual (counter-rotating) ring.
Dual Attachment Concentrator	(D) A concentrator that offers a dual attachment to the FDDI network and is capable of accommodating a dual (counter-rotating) ring.
Dual ring (FDDI dual ring)	(D) A pair of counter-rotating logical rings.
Dual station (or dual attachment station, DAS)	A station that offers two attachments to the FDDI network which are capable of accommodating a dual (counter-rotating) ring. It may offer additional attachments (see concentrator).
EISA	Extended Industry Standard Architecture.
FCC	Federal Communications Commissions.
FDDI	Fiber Distributed Data Interface.
FDDI network	A collection of FDDI nodes, arranged in the shape of a star, tree, ring, or a ring with several trees. This topology is sometimes called a dual ring of trees.
Fiber	(D) (1) Dielectric material that guides light; waveguide (multimode and single-mode fiber).
Fiber optic cable	(D) (1) A jacketed cable containing one or more optical fibers and special connectors.
Fiber optics	The technology whereby optical signals from light-generating transmitters are propagated through optical fiber waveguides to light-detecting receivers.
Hard disk	(D) A rigid magnetic disk such as the internal disks used in the system units of IBM personal computers and in external hard disk drivers. Synonymous with fixed disk, nonremovable disks.
ISA	Industry Standard Architecture.
KB	1024 Bytes.
Kbps	1000 bits per second.
LAPS	LAN Adapter and Protocol Support Program.
Link	(1) (I) The physical means of connecting one location to another for the purpose of transmitting and receiving data. (2) (D) In SNA, the combination of the link connection and the link stations joining network nodes; for example, (a) a System/370 channel and its associated protocols, (b) a serial-by-bit connection under the control of Synchronous Data Link Control (SDLC). A link connection is a physical medium of transmission. A link, however, is both logical and physical. Synonymous with data link.

Local Area Network (LAN)	(D) (1) A data network located on the user's premises in which serial transmission is used for direct data communication among data station. (2) See also wide area network. Notes: 1. Communication within a local area network is not subject to external regulation; however, communication across the LAN boundary may be subject to some sort of regulation. 2. A LAN does not use store and forward techniques.
Loopback plug	A test plug that connects the output of a controller or cable to the input of the controller or cable. A loopback test then verifies that the controller or cable output and input circuits are working correctly.
LSP	Local Area Network Support Program.
µm	Micrometer (1 / 1 000 000 meter).
MB	1 048 576 bytes.
Mbps	1000 000 bits per second.
Media Interface Connector (MIC)	An optical fiber connector which connects the fiber media to the FDDI attachment. The MIC consists of two halves, a plug and a receptacle.
MIC	(Media Interface Connector) A connector for FDDI fiber optic cable consisting of two parts: a plug and a jack.
Mouse	(D) (1) In computer graphics, a hand-held locator operated by moving it on a flat surface. A mouse generally contains a control ball or a pair of wheels. (2) In SAA usage, a device that a user moves on a flat surface to position a pointer on the screen. It allows a user to select a choice or function to be performed or to perform operations on the screen, such as dragging or drawing lines from one position to another.
NDIS	Network Device Driver Interface Specification
Network	(D) (1) An arrangement of nodes and connecting branches. Connections are made between data stations. (2) A configuration of data processing devices and software connected for information interchange.
ODI	Open Data-Link Interface.
Open Systems Interconnection (OSI)	(D) (1) The interconnection of open systems in accordance with specific ISO standards. *Note*: OSI architecture establishes a framework for coordinating the development of current and future standards for the interconnection of computer systems. Network functions are divided into seven layers. Each layer represents a group of related data processing and communication functions that can be carried out in a standard way to support different applications. (2) The use of standardized procedures to enable the interconnection of data processing systems.
Operating System/2	(D) A family of operating systems that control IBM Personal System/2 computing systems.
Option	(D) A selectable characteristic of a product.
OSI	Open systems interconnection.
OS/2	Operating System/2.
Packet	(I) A sequence of binary digits including data and call controls signals that is switched as a composite whole. The data, call control signals, and possibly error control information, are in a specific format.

Plug	(D) The removable half of an electrical connector.
Port	(D) (1) An access point for data entry or exit. (2) A connector on a device to which cables for other devices such as displays and printers can be attached. (3) A specific communications end point within a host. A port is identified by a porter number.
Problem determination	(D) The process of identifying the source of a problem; for example, a program component, a machine failure, telecommunication facilities, user or contractor-installed programs or equipment, an environment failure such as a power loss, or a user error.
Process plug	The plastic plug that protects an optical transceiver mechanically. Usually, a fiber base adapter or extender card is delivered with an inserted process plug.
PS/2	Personal System/2.
RAM	Random access memory.
Random Access Memory (RAM)	(D) A storage device into which data are entered and from which data are retrieved in a nonsequential manner.
Receiver	(D) An optoelectronic circuit that converts an optical signal to an electrical logic signal.
Receiver (optical)	(D) An optoelectronic circuit that converts an optical signal to an electrical logic signal. (SMT)
Ring	(D) (1) Two or more stations wherein information is passed sequentially between active stations, each station in turn examining or copying the information, finally returning it to the originating station. (SMFPMD) (PMD) (2) In FDDI usage, the term "ring" as in "FDDI ring" refers to a dual (counter-rotating) ring.
Server	(D) A functional unit that provides shared services to workstations over a network; for example, a file server, a print server, a mail server.
Single Attachment Concentrator	(D) A concentrator that offers a single attachment to the FDDI network.
Single Attachment Station	(D) A station that offers a single attachment to the FDDI network.
Single station (or single attachment station)	(D) A station that offers one attachment to the FDDI network.
Station	(D) An addressable node on an FDDI network capable of transmitting, repeating and receiving information. According to the OSI model, a station has exactly one SMT, at least one MAC, at least one PHY, and at least one PMD.
Transmit	(D) (1) The action of a station in generating a token, frame, or other symbol sequence and placing it on the outgoing medium. (MAC)
Transmitter	(D) (1) An optoelectronic circuit that converts an electrical logic signal to an optical signal.
Transceiver	(D) Physical Media Dependant Receiver/Transmitter Module.
Transceiver-protector	A plastic jacket that protects the optical transceiver mechanically. FDDI network cards for fiber-optic conductors usually have such protectors.

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