



CFM Series

E1 Indoor Units

Management System Technical Description and Configuration Guide

Software Version 3.xx

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1 Introduction

Proprietary notice

The specifications or information contained in this document are subject to change without notice due to continuing introduction of design improvements. If there is any conflict between this document and compliance statements, the latter will supersede this document.

The following document is dedicated to the CFM series E1 Indoor Units describing the built-in management system, configuration functionality, hardware features, etc.

This document describes particularly the following E1 Indoor Unit models:

- CFM-4-2E1
- CFM-8-4E1/CFM-8-MUX equipped with E1 module(s)
- CFM-16-8E1
- CFM-34-16E1.

The E1 Indoor Unit (IDU) is part of SAF Tehnika's CFM series digital microwave radio product family providing:

- Means of interconnecting Outdoor Unit (ODU or Radio) and user equipment;
The CFM-4-2E1 IDU is intended for use with the CFM-L4 Radio; the CFM-8-4E1, CFM-16-8E1 and CFM-34-16E1 IDUs are intended for use with the CFM-LM radios.
- Local management functionality.

This document covers versions **3.xx** for the management controller software of the aforementioned IDUs; the most recent management software version is **3.65**.

The CFM-4-2E1 IDU provides the multiplexing of two E1 channels into a single 4 Mbps stream.

The CFM-8-4E1 IDU and the CFM-8-MUX IDU (if equipped with four E1 modules) provide the multiplexing of four E1 channels into a single 8 Mbps stream.

The CFM-16-8E1 IDU provides the multiplexing of eight E1 channels into a single 16 Mbps stream.

The CFM-34-16E1 IDU provides the multiplexing of sixteen E1 channels into a single 34 Mbps stream.

The E1 Indoor Units support 1+1 configuration, please refer to the CFM-34-SWB IDU documentation for detailed information, see Chapter 9 for references.

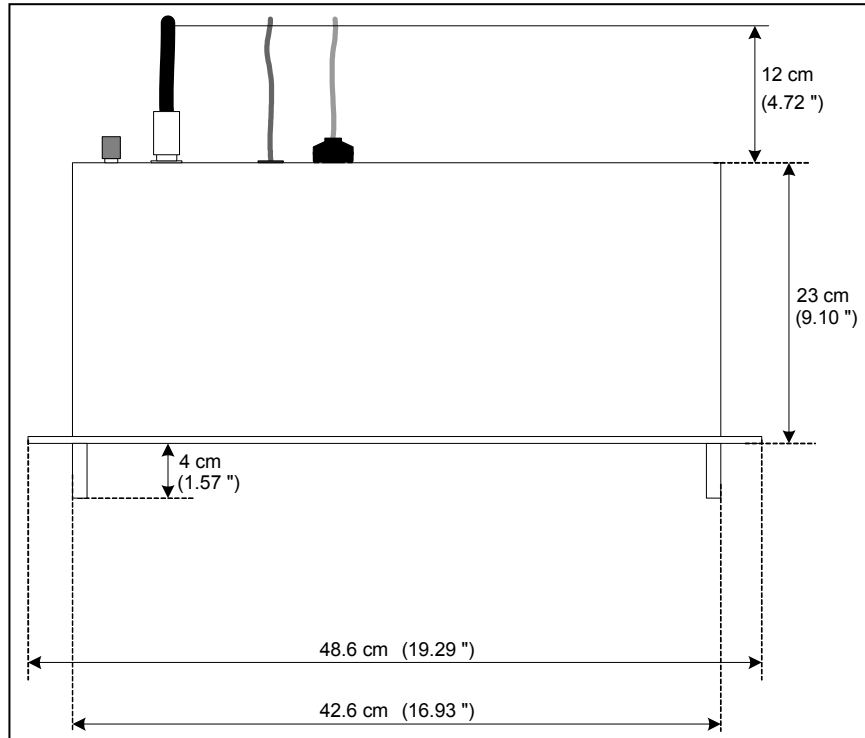
Revision history

Revision	Date	Comments
1.0	October, 2003	
1.1	December, 2003	
1.2	February, 2004	
1.3	December, 2004	

2 Indoor Unit Appearance

2.1 Installation Notes

The E1 IDU is implemented as 19" rack mountable aluminium 1U high unit, the depth of the unit is 230 mm without front panel handles and 270 mm with handles.



A maximum of 350 mm deep rack is required for the IDU to be mounted, from mounting points of front panel, including space behind the unit for cables to RF, Grounding point, Ethernet and Serial management interfaces. Roughly 10 cm to 12 cm of supplementary space is required (mainly depending on the RF cable type) behind the IDU for management interface cables and RF cable.

2.2 Hardware Features

The E1 IDU contains:

- Multiplexer board;
- Management board;
- Power Supply module;
- LCD and Keypad modules.

All the aforementioned boards and modules are interconnected with flat ribbon cables and snap-on connectors.

All E1 IDU models provide the following interfaces:

- Port to Outdoor Unit, (ODU), N-type Female connector;
- E1 traffic ports;
- RS-232 serial management port;
- 10Base-T Ethernet management port for Web or Telnet console, or SNMP trap manager;
- LCD/keypad;
- Traffic port and management port activity LEDs;
- Power connector.

2.2.1 Ports

Table 1.

Front panel connectors and ports	
Connector or label	Description
+48V (power socket)	Power connector, IDU should be powered from 20 – 60 VDC power source. Both "+" or "-" poles of the power source could be grounded, one should make sure if the chosen grounding wire is connected to ground on IDU power connector;
IN/OUT (or Rx/Tx accordingly)	E1 interface ports (BNC, RJ-45 or DB-25 type connectors)
Rear panel connectors and ports	
Connector or label	Description
RF, - N-type connector (female)	Radio Unit port; Use 50 Ω coaxial cable with N-type male connectors on both sides to connect the ODU to the IDU, such as RG-213, LMR-400 or equivalent;
DB9 type connector	RS232 management port for connection of ASCII console or analog line modem (DB9 female type connector);
RJ-45 socket	10Base-T Ethernet management port for Web/Telnet terminal
DB9 type connector	Auxiliary port (RS-232)
DB25 type connector	Alarm port. <i>This feature is optional.</i>

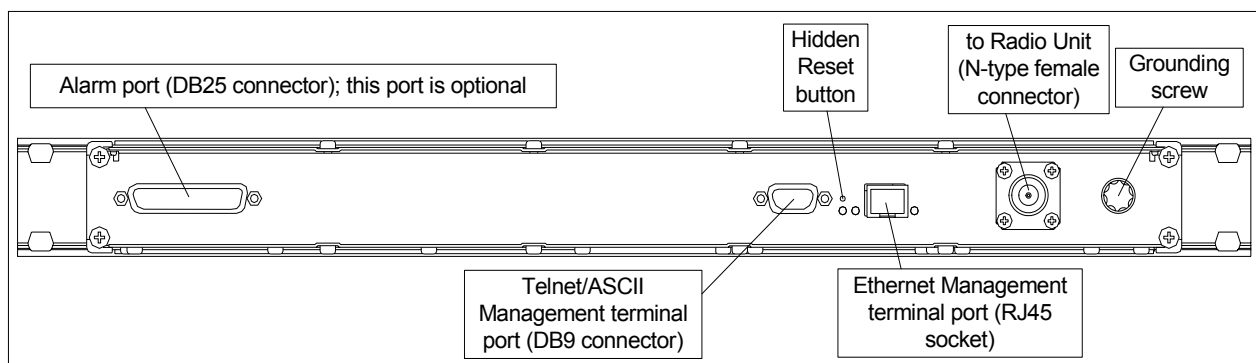


Figure 1. The rear panel connectors and sockets

2.2.2 IDU LEDs

Table 2. Front panel LEDs

Label(s)	Color	Description	
RA	Red	Radio Alarm LED indicates issue with ODU and IDU-ODU connection, - Rx signal level lower the predefined value, - Rx alarm level, for default value of the Rx alarm level see Chapter 3.11; the RA LED will also switch on if the Radio loopback is active and/or if the transmitter power is switched off; (Rx=OK & TxOut=OK & Humidity=Low & RF Cable=OK) If not lit – operating properly. The RA LED is updated one time per second.	
SL	Red	Red Synch Lost LED indicates the loss of E2 Multiplexer synchronization; If not lit – operating properly; The SL LED is updated one time per second.	
1, 2, 3, 4 E1 port status LEDs for 4E1, 8E1, and 16E1 IDUs (see Figure 2)	Red/ Yellow	Constant Red, – indicates LoS (Loss of Signal); Constant Yellow – the loopback for the current interface is switched on; Flickering Red, – indicates line code error, the LED flashes for a short time when a bipolar violation in HDB3 line code has been detected; Red and Yellow flickering alternatively, – receiving AIS from LAN.	
E1 port status LEDs for CFM-4-2E1 and CFM-8-4E1 IDUs	Tx	Green	Steady green light indicates the E1 module is ready to transmit data to the equipment connected to E1 port. In case if Multiplexer synchronization is lost (S.L. LED is lit), Tx LED goes off and AIS signal is transmitted from E1 port to CPE.
	Rx	Green	Steady green light indicates the E1 line signal on the input of E1 port.
	AIS	Red	Steady red LED indicates the AIS signal is being received from the CPE.
	LB	Red	“LoopBack” LED (red) indicates that the loopback mode is set in the interface.

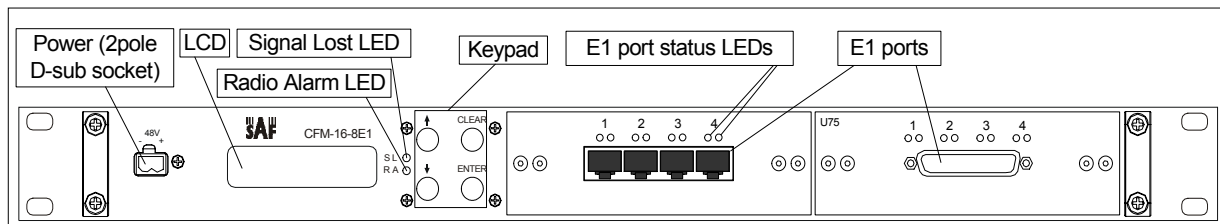


Figure 2. The front side LEDs, connectors and sockets (CFM-16-8E1 IDU)

Table 3. Rear panel LEDs

LED	Description
A	If blinking (with a period of about 1 sec.), indicates operation of the management module CPU;
B	If lit, indicates that Ethernet link is established with the management terminal;
C	If blinking, indicates data interchange between the IDU and the management terminal;
Note: A, B and C correspondence to LEDs is shown in the figure below.	

The rear panel LEDs refer to the operation of Ethernet port on the management module board (A, B, C).

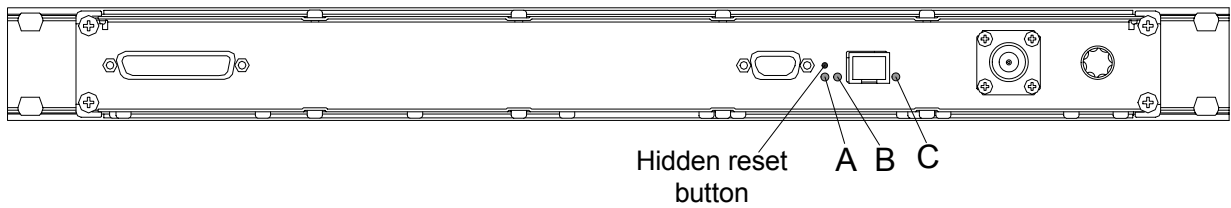


Figure 3. The rear panel LEDs

2.3 E1 Indoor Unit models

The E1 IDUs differ in types of traffic interfaces, maximum total capacity, and modularity; modular IDUs are equipped with traffic interface module(s), see Chapter 2.4 for more information on modules. The following E1 Indoor Unit models are available.

CFM-4-2E1 IDU, fixed configuration, provides two E1 traffic interfaces with both RJ-45 (balanced, 120 Ω) and BNC (unbalanced, 75 Ω) port connectors; the CFM-4-2E1 IDU also provides 10Base-T Ethernet and RS-232 serial management ports, both are located on the rear panel.

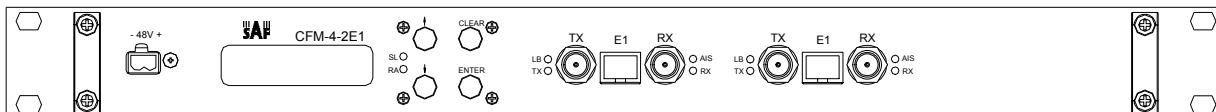


Figure 4. The CFM-4-2E1 IDU (front panel)

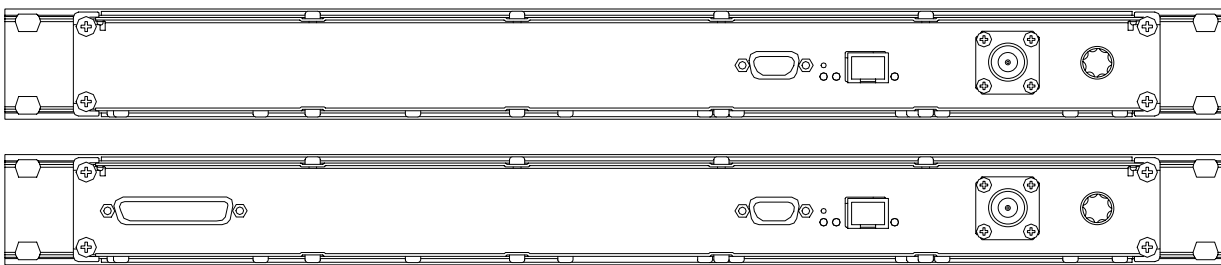


Figure 5. The rear panel of the CFM series E1 Indoor Unit: a – without Alarm port, b – with Alarm port (DB25 connector)

CFM-8-MUX IDU, this IDU model is actually a modular multiplexer which can be equipped with various interface modules (E1, V.35 or 10Base-T); the CFM-8-MUX can be equipped with 1 up to 4 E1 interface modules, each E1 module provide both 120 Ω balanced and 75 Ω unbalanced interfaces with RJ-45 and BNC port connectors accordingly; the CFM-8-MUX IDU also provides 10Base-T Ethernet and RS-232 serial management ports, both are located on the rear panel.

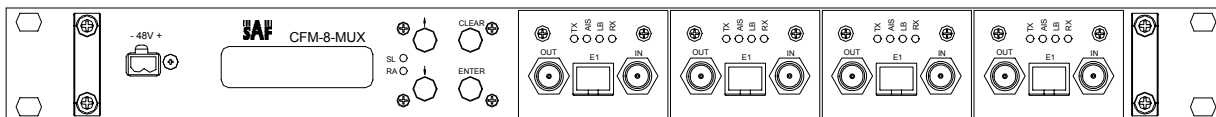


Figure 6. The CFM-8-MUX IDU with four E1 modules installed (front panel)

CFM-8-4E1 IDU, modular configuration, can be equipped with one 4xE1 interface module providing four E1 traffic ports, - either with 120 Ω interface with RJ-45 or DB25 port connectors, or 75 Ω interface with DB25 port connector (refer to Chapter 2.4.2 for information about 4xE1 interface modules); the CFM-8-4E1 IDU also provides 10Base-T Ethernet and RS-232 serial management ports, both are located on the rear panel.

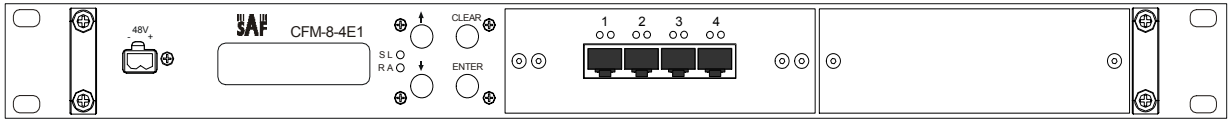


Figure 7. The CFM-8-4E1 IDU (front panel)

CFM-16-8E1 IDU, modular configuration, can be equipped with one or two 4xE1 interface module(s) providing up to eight E1 traffic ports (refer to Chapter 2.4.2 for information about 4xE1 interface modules); the CFM-16-8E1 IDU also provides 10Base-T Ethernet and RS-232 serial management ports, both are located on the rear panel.

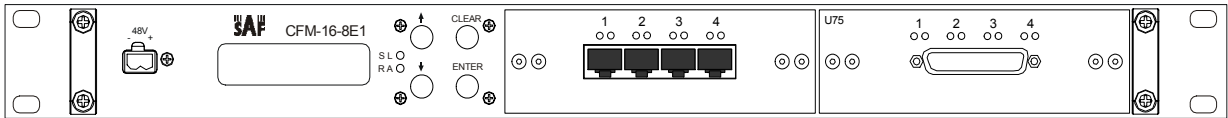


Figure 8. Front panel of the CFM-16-8E1 IDU with two 4xE1 modules installed

The **CFM-34-16E1** IDU, fixed configuration, provides sixteen E1 traffic interfaces on RJ-45 port connectors, there are two types of CFM-34-16E1 IDUs available, - with 120 Ω balanced interfaces on RJ-45 connectors (16 ports), and with 75 Ω unbalanced interfaces with DB-25 connectors (4 ports, 4 E1 interfaces per port); the CFM-34-16E1 IDU also provides 10Base-T Ethernet and RS-232 serial management ports, as well as alarm port on the rear panel.

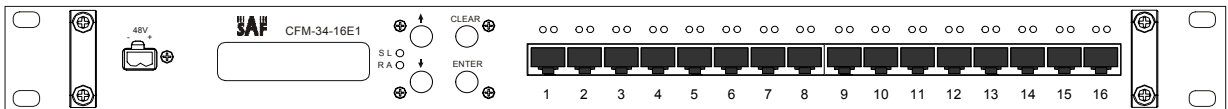


Figure 9. The CFM-34-16E1 IDU with RJ-45 port connectors (front panel)

2.4 Interface Modules

2.4.1 E1 Interface Module

The E1 (G.703) interface module is intended for use with the modular indoor units, i.e. CFM-4-MUX, CFM-8-MUX and CFM-16-MUX.

2.4.2 4xE1 Interface Modules

4xE1 interface modules are intended for use with the modular E1 indoor units (not multiplexer units like CFM-8-MUX), each 4xE1 module provides four E1 traffic interfaces. The 4xE1 modules differ by the type of electrical and physical interface implemented; there are three types of 4xE1 modules available:

- 4xE1 module with balanced 120 Ω interface with RJ-45 socket,
- 4xE1 module with unbalanced 75 Ω interface with DB25 connector,
- 4xE1 module with balanced 120 Ω interface with DB25 connector.

Figure 8 shows the IDU equipped with two 4xE1 modules, - with RJ-45 120 Ω interface and DB25 75 Ω interface.

Only modular E1 IDUs can be equipped with 4xE1 module(s), currently the following modular E1 IDU models are available:

- CFM-8-4E1, can be equipped with a maximum of one 4xE1 module,
- CFM-16-8E1, can be equipped with a maximum of two 4xE1 modules (maximum capacity 8 Mbps).

2.5 Balancing Unit

The E1 Indoor Units which has only one type of traffic interface, either RJ-45 or BNC, can be supplemented with the Balancing Unit (BU) to change the traffic interface between RJ-45 120 Ω balanced and BNC 75 Ω unbalanced.

The BU is a passive device.

The BU changes up to 16 E1 traffic ports from RJ-45 120 Ω balanced (symmetrical) electrical interface to BNC 75 Ω unbalanced (asymmetrical) and vice versa. The ports are independent.

The BU is 2U high rack mountable unit (depth: 0.34 m, weight: 0.83 kg).

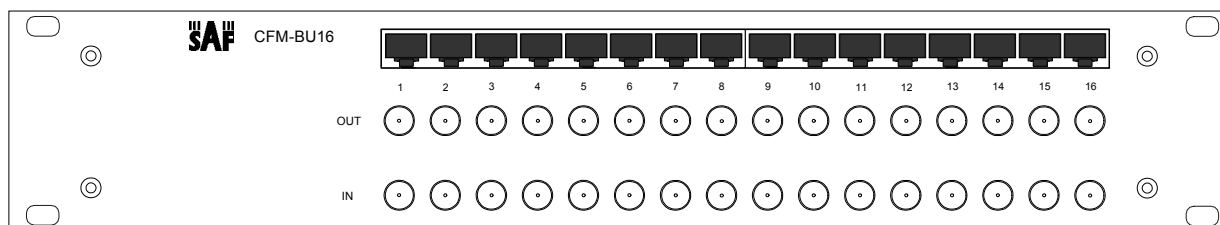


Figure 10. 16-port Balancing Unit

2.6 Labelling

The IDU label is found at the rear panel:

- P/N – product number, the last two numbers denote the product version;
- S/N – serial number.

The combination of product number and serial number uniquely identifies each unit.



Figure 11. Labels of the CFM series E1 Indoor Units

3 Management Interfaces

3.1 LCD/Keypad

LCD and keypad provides most basic method to locally configure and monitor the local CFM terminal (IDU+ODU).

LCD display is constantly backlight and is able to display 2 lines of 16 symbols in each line.

LCD operates in two modes, "**Status display**" and "**Setup**", please refer to Flow Chart 1, page 37.

Keypad consists of 4 buttons:

ENTER is used to confirm the choice of displayed item or entered data as well as to switch from "*status display*" to "*setup*" mode.

CLEAR is used to cancel the choice or to move to previous menu level

↑ ↓ Up/Down buttons are used:

- To switch between options for menu items displayed

- To choose parameter to set up and to set its value.

3.1.1 "Status Display" Mode of the LCD Management Interface

Once the IDU is powered up, it automatically enters "Manual Display" mode, displaying two parameters at a time statically (use up/down buttons to scroll through parameters). These parameters are listed in the Table 4.

Table 4. Parameters displayed in "Status Display" mode

Parameter	Values and description
Tx=23362.5MHz	Parameter indicates Tx frequency of the Radio.
Rx=22354.5MHz	Parameter indicates Rx frequency of the Radio.
TxPower=+15dBm	Parameter indicates Tx power of the Radio.
Rx=OK	Rx parameter indicates various states of IDU receiver and ODU: "OK" indicates IDU receives acceptable signal from ODU; "Low" indicates received signal level is too low for IDU to operate properly; "Error" indicates internal fault in ODU receiver, please contact sales representative or manufacturer; "Loopback" indicates radio loopback mode: Rx = Tx frequency
RxLev=-66dBm	Parameter RxLev indicates level of the received signal, values from -40 dBm to -90 dBm provide proper operation of the system.
Cable=-5 dB	Parameter indicates signal attenuation in ODU-IDU cable, values of 0 ... -20 dB provide proper operation of IDU.
TxOut=Ok	Parameter indicates operation status of ODU transmitter: "Ok" indicated proper operation; "Error" indicates internal fault in ODU transmitter, please contact sales representative or manufacturer.
TxPLL=Ok	Parameter indicates operation status of ODU Tx synthesizer Loop (PLL lock): "Ok" indicated proper operation; "Error" indicates internal fault in ODU transmitter, please contact sales representative or manufacturer.
RxPLL=Ok	Parameter indicates operation status of ODU Rx Syntheser Loop (PLL lock): "Ok" indicates proper operation; "Error" indicates internal fault in ODU receiver, please contact sales representative or manufacturer.
t= 23C	Indicates ODU internal temperature
Humidity=Low	Parameter indicates humidity level inside ODU, "Low" indicate acceptable moisture levels; "High" indicate too high level of humidity, condensing.
Restart=00	Parameter indicates number of ODU management controller restarts since counter was reset on power up.
IDU t= 31C	Parameter indicates temperature inside IDU.
RF Cable – OK	Parameter indicates power consumption of the ODU unit: "OK" indicates acceptable level; "Short" indicates short circuit in cable; "Off" indicates too low power consumption by ODU. This is most likely due to the brake in the cable. If the cable is intact, the ODU is faulty.
RxAlarmLev =-77	Indicates the Rx level (in dBm) at which the Radio Alarm is switched on.
UpTime=5371	Indicates the system up-time in seconds.
DownTime=4	Indicates the system down-time (when SL alarm is on) in seconds.
BBLoopback=OFF	Indicates if the base-band loopback is switched on or off.
PW max =19	Indicates the maximum transmitting power for current ODU.

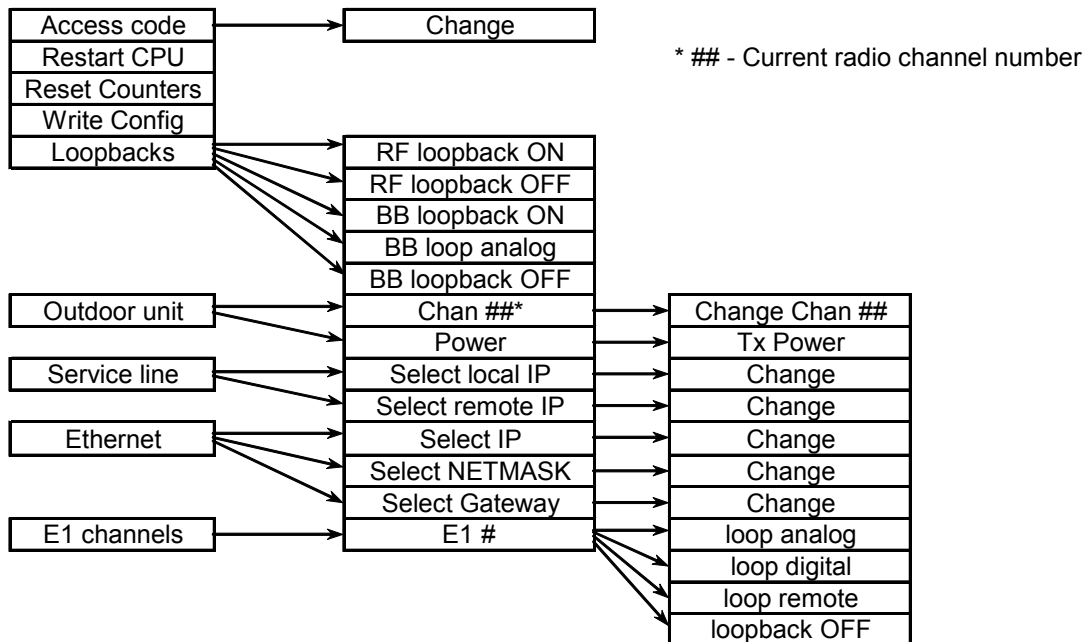
3.1.2 "Setup" Mode of the LCD Management Interface

The following table describes parameters available for change from the IDU LCD in **Setup** mode. Algorithm of LCD operation is shown on Flow Chart 1, page 37.

Table 5

Parameter	Values and description
Change Chan ##	<p>"Change Chan" item provides ODU Tx and Rx frequency setup functionality:</p> <p>If this item is chosen LCD display shows, for example:</p> <pre>Change Chan 163 Tx=23583.000MHz</pre> <p>where "163" - currently used Tx channel number, and "Tx" - frequency appropriate to channel.</p> <p>Channel numbers and corresponding Tx/Rx frequency values are found in the document "<i>Channel plans</i>", see chapter 9.3 for details.</p> <p>Operator sets desired channel number scrolling through values with "Up" or "Down" buttons and confirming the choice with "Enter" button.</p>
Tx Power +5dBm	<p>"TxPower" parameter sets the ODU Transmitter power rate. The default setting is "OFF", allowing safe deployment of the equipment avoiding interference risk with other radio equipment.</p>
Select local IP	Sets the IP address of the serial port of service channel for the local IDU management module (near-end terminal), see Chapter 3.7.
Select remote IP	Sets the IP address of the serial port of service channel for the remote IDU management module (far-end terminal).
Write config	Saves all settings in EPROM of management controller.
RF loopback OFF	Turns off the baseband loopback (any), BB loopback ON sets the digital baseband loopback, BB loop analog sets the analog loop.
BB loopback OFF	Turns off the baseband loopback (local), analogically - BB loopback ON turns the baseband loopback on.
Restart CPU	Restarts management module CPU for the new IP settings to take effect. Resets all management counters.
Loop analog	Switch on/off the E1 interface loop (analog, digital or remote)
Select IP	Default value - 192.168.205.010 or 92.168.206.010
Select NETMASK	Default value - 255.255.255.000 Important!: Do not enter address "255.255.255.255"
Select Gateway	Default value - 255.255.255.255 (No gateway specified)
	<p>IP (IP address), Netmask and Gateway parameters provide the means of addressing management board of IDU in order to control and manage IDU locally and monitor ODU both locally and remotely.</p> <p>Note: It is necessary to restart the management CPU for any changes in IP settings (including SNMP terminal and service channel IP settings) to take effect.</p>
Access Code	Specify the panel access code (a number from 0 - 200) to enable any adjustments from IDU.
Reset counters	Reset up-time and downtime counters, see page 22 for details.

Setup mode menu tree



3.2 Reset Functions

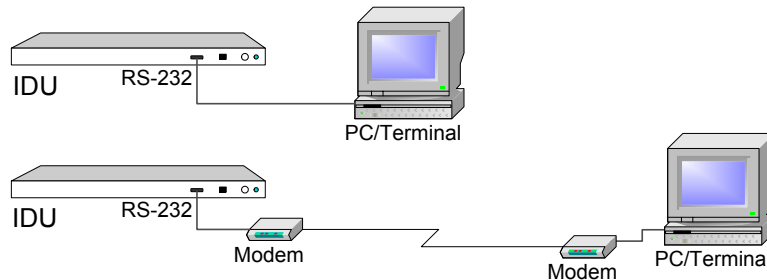
Depending on the method used, the user may reset the whole terminal (IDU+ODU) or the management controller individually, see table below for details.

Reset through the LCD menu system using "Restart CPU" option or from the Telnet/ASCII console using "restartcpu" command	Restarts the management module. Resets all management counters.
Reset action using hidden button at the rear side of the IDU (see Figure 3)	Restarts both the multiplexer module and the management module. Resets all management counters. Note: This may require a pin, at least 15 mm long, approx. 1.5 mm in diameter.
Unplugging of power supply	Restarts the multiplexer module and the management module. Resets all management counters.

3.3 RS-232 Serial Management Port

RS-232 serial management port of the IDU will provide terminal management via connected PC or other terminal device or modem.

The terminal connected to the serial management port provides the same management functionality as Telnet interfaces (refer to Chapter 3.3.1). In order to interconnect the IDU and the management terminal directly through serial ports, a straight through modem cable is needed. The serial port of the management terminal should be configured as 19200 8-N-1, no data flow control.



If using modems, the management terminal is connected with the IDU remotely through a telephone line. In this case the modem, *which is connected with the IDU*, should be configured as stated below:

- Auto answer on first ring ON
- Echo offline commands OFF
- Suppress result codes
- DTR override

The modem configuration then should be saved (typically with AT&W string).

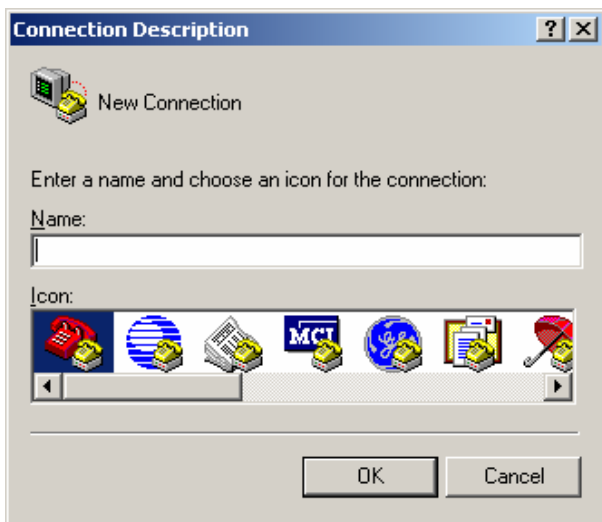
```
Telnet - 192.168.205.50
Connect Edit Terminal Help
Telnet server. Press CTRL/D to end session

Login: telnet
Password:
saf>e1 1 loop analog
1 Analog loopback on
saf>e1 2 loop digital
saf>e1 8 loop remote
saf>e1 1 stat
LOS                OFF
Analog loopback    ON
Remote loopback    OFF
Digital loopback    OFF
Bipolar violations OFF
AIS                OFF
saf>e1 2 stat
LOS                ON
Analog loopback    OFF
Remote loopback    OFF
Digital loopback    ON
Bipolar violations OFF
AIS                OFF
saf>e1 8 stat
LOS                ON
Analog loopback    OFF
Remote loopback    ON
Digital loopback    OFF
Bipolar violations OFF
AIS                ON
saf>ver
U3.03 2001.11.19
(c) 2000 SAF
SAF 10 GHz microwave
saf>
```

Telnet/ASCII Console Command Interface

In order to connect the PC to the RS232 management port using *Hyper Terminal* program (this program is included in any Windows version), proceed as described below.

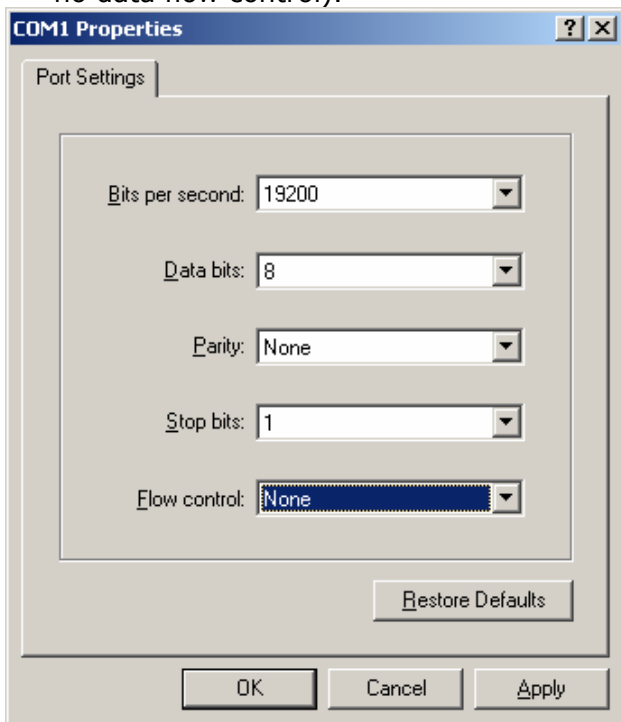
1. Connect PC to the RS232 serial port by means of "straight through" or modem serial cable (null-cable).
2. Run "Hyper Terminal" program.
3. Make a *New connection*, enter connection name.



4. Choose port (COM1 or COM2).



- Set port settings (bits per second: 19200, data bits: 8, parity: none, stop bits: 1, no data flow control).



- Press OK
- Press Enter. Password is disabled by default.
If successfully connected, the prompt should appear as in the picture below; see Chapter 3.3.1 for available commands.



3.3.1 Command Line Interface for Telnet/ASCII consoles

The command line management interface offers the widest configuration and monitoring functionality. The following tables summarize all available commands for Telnet and ASCII management terminals.

Common commands	
Command	Description
Time	Show current date and time.
Time <YYYY-MM-DD HH:mm:ss>	Set the date and time on the IDU. Refer to section <i>Real-time clock</i> , page 24.
Name <deviceName>	Assigns a name to the IDU; The default name is "SAF". Refer to section <i>IDU name</i> , page 23.
Write	Save all settings in the EPROM. This command saves all current settings in EPROM, including those in the script.
Ping <IPaddress>	This command is for troubleshooting purposes to verify the service channel connectivity, - sends a special packet to the remote IDU and then waits for a reply.
BBloop {on analog off} [duration]	Set baseband loopback, "on" – set digital loopback (dual), "analog" – set analog loopback (non-dual), "off" – suspend baseband loopback. Duration can be from 1 to 10 minutes, it is equal to 1 min. by default. Example: <i>BBloop on 3</i>
RFloop {on off} [duration]	Set RF loopback, "on" – set loopback, "off" – suspend loopback. Duration can be from 1 to 10 minutes (equal to 1 min. by default). Example: <i>rfloop on 3</i>
Webrefresh <period>	Refreshes the contents of WEB interface with a period specified with <i>refreshperiod</i> parameter. The period is given in seconds; the minimum period is 2 seconds. Example: <i>webrefresh 5</i> – the web page will be updated after every 5 seconds.
RxAlarmLevel <alarmLevel>	Set the Rx signal level at which the Radio Alarm is switched on. For default value see Chapter 3.11. Example: <i>rxalarmlevel -55</i>
DisableWDT	Disable watchdog timer.
ResetWDT	Reset watchdog timer (restarts management controller, resets all management counters).
ClearCounters	Reset up-time and down-time counters, see page 22 for details.
Exit	Close Telnet session (same as to press Ctrl+D)
Disable {telnet www snmp rip}	"telnet" – Disable Telnet interface "www" – Disable Web interface "snmp" – Disable SNMP interface "rip" – Disable RIP Note: after the command is entered, it is necessary to save the configuration in EPROM (use write command) and restart the IDU for changes to take effect.

Configuring security parameters	
Command	Description
Enable password <password>	Specify a password to prevent unauthorized access to the ASCII PC terminal (connected through RS232 serial port). Refer to section <i>Security commands</i> , page 23.
Panel access <accesscode>	Specify a password to prevent unauthorized configuration through the IDU management interface. The password can be a number from 0 – 200.
WWWuser <username> <password>	Specify a password (1 - 20 symbols) to prevent unauthorized access to the Web terminal.
Telnetuser <username> <password>	Specify a password (1 - 20 symbols) to prevent unauthorized access to the Telnet terminal.
Enable rfweb {yes AnyString}	Enables configuration of ODU parameters (frequency, Tx power) from the Web terminal. In order to enable it, use "yes" with small caps; to disable use any string instead of "yes" argument except the empty string ("").

Configuring ODU parameters	
Command	Description
Chan <channel#>	Set the ODU Tx and Rx frequency. Channel numbers and their corresponding Tx/Rx frequency values are found in the document "Channel plans", see chapter 9.3 for details.
Txpower {-10 -9 ... 0 +1 +2 ... +20 off}	Set the ODU Transmitter power [dBm]. The default setting is "OFF".

Configuring IDU parameters	
Command	Description
RestartCPU	Restart CPU of the management controller for the new IP settings to take effect. Resets all management counters.
IP addr <IPaddress>	Set the IP address of Ethernet management port (requires to restart the management module CPU). Important! Do not enter address "255.255.255.255"
IP mask <IPnetmask>	Set the IP netmask of Ethernet management port (requires to restart the management module CPU).
IP gw <IPaddress>	Set the IP address of the default gateway (requires to restart the management module CPU).
IP seraddr <IPaddress>	Set the IP address of the serial port of service channel for the local (near-end) IDU management module (requires to restart the management module CPU).
IP remaddr <IPaddress>	Set the IP address of the serial port of service channel for the remote (far-end) IDU management module (requires to restart the management module CPU).
Route add <destinationIPaddr> Mask [netmask] <gateway> [metric]	Add a static route to the routing table. The variable "metric" is set to 1 by default. Example: Route add 192.168.205.0 Mask 255.255.255.0 155.13.79.13 5
Route delete <destinationIPaddr> [netmask]	Delete a static route from the routing table.
SNMP community read <communityname>	Specify the SNMP community name of the agent to enable parameters to be read (not configured). The default community name to read parameters is <i>saf-public</i>
SNMP community write <communityname>	Specify the community name of the agent to enable parameters to be written (configured). The default community name for writing parameters is <i>saf-private</i>
SNMP trap <IPaddress>	Set the IP address of the management terminal with the installed Trap Manager software, based on SNMP platform (requires to restart the management module CPU).
E1 <chan.# 1-8> loop {analog digital remote Off}	Switch on/off the analogue, digital or remote loop for the specified E1 channel. Only one loopback can be active at a time for a single E1 channel, when other is switched on, the current one is switched off.
E1 <chan.# 1-2> impedance {75 120}	Set the interface – BNC (75) or RJ-45 (120), for CFM-4-2E1 only. You may also type "low" instead of "75" or "high" instead of "120".
E1 <chan.# 1-8> stat	Display status list of the specified E1 channel. Example: saf>el 7 stat LOS ON Analog loopback OFF Remote loopback OFF Digital loopback OFF Bipolar violations OFF AIS ON

Verifying Configuration	
Command	Description
Stat	Show parameters, - lists all the parameters that are displayed in the status display mode of the IDU LCD.
Mac	Verify the MAC address of the Ethernet management port.
Ver	Show version of the IDU.
ODU	Show version of the ODU.

Commands for script editing	
Command	Description
Cfg show	Show the configuration script stored in RAM.
Cfg load	Load the configuration script from EPROM into RAM.
Cfg clear	Clear the script stored in RAM.
Cfg delete <stringNumber>	Clear a single string in the configuration script. This command is useful for script editing.
Cfg write	Save current script in EPROM. This command saves the current script and settings that are specified in it in EPROM.
Cfg factory yes	Reset the configuration by loading the script with default settings. This command performs the following actions (in the following order): <ol style="list-style-type: none"> 1. clears the current script from EEPROM, 2. creates and stores in EEPROM the new script with the following settings: <ul style="list-style-type: none"> - IP addr 192.168.205.010 or 192.168.206.010 - IP mask 255.255.255.000 - IP gw – 255.255.255.255 (default gateway - none) - IP seraddr – (SLIP configuration, - IP address of the local serial port) - IP remaddr – (SLIP configuration, - IP address of the remote serial port) - Enable rfweb yes (enable configuration from Web terminal) - SNMP trap 255.255.255.255 (none) - RxAlarmLevel <#> (# - default value, default value depends on IDU, see Chapter 3.11) 3. restarts the management controller
Syntactic notes: <ul style="list-style-type: none"> - Commands are in bold font. - All arguments (variables) are in <i>italic</i> font. - Subcommands and keywords are in regular font. - Arguments in square brackets ([]) are optional but required arguments are in angle brackets (<>). - Alternative keywords are grouped in braces ({ }) and separated by vertical bars (). 	

General

The management module has RAM and EPROM chips onboard. When IDU is booted up or management module CPU is restarted, bootstrap is loaded from the EPROM into RAM. The bootstrap contains all the parameters that were previously stored in EPROM using **write** and/or **cfg write** commands. These parameters are stored in EPROM in the form of script and when booting up, the script parameters are loaded into RAM. These parameters can be freely changed thus changing the contents of RAM. If the IDU is shut down without saving the current configuration in EPROM, the original configuration is restored from EPROM on the next boot-up. Here is an example of script:

```
SAF>cfg show
01: ip remaddr 192.168.0.11
02: ip seraddr 192.168.0.10
03: Chan 144
04: snmp community read safpub
05: snmp trap 255.255.255.255
06: route add 62.85.14.0 MASK 255.255.255.0 192.168.12.22
```

The script can be edited, e.g., strings can be added by simply entering the required command (the script will be supplemented with the new string or the instant string entry will be updated) and deleted using "**cfg delete** <string#>" command line. The changes of parameters can be saved in EPROM using **cfg write** command line. To end Telnet/ASCII session press Ctrl+D.

The management software feature system up-time and down-time timers. The downtime counter counts the seconds when the *Synch Lost* alarm is on whereas the up-time counter returns the system up-time, - time when SL alarm is off; the time is displayed in seconds. These counters are reset using **clear counters** command from Telnet or ASCII console or from IDU, - selecting "Reset Counters" in the setup mode. The management module has a watchdog timer (WDT) built in which manages the automatic restart of the management system if it freezes. Besides the **restartCPU** command the management system can be reset using **restartWDT** command which breaks off check words to WDT thus causing the management system to restart. The watchdog timer can be switched off using **disableWDT** command (from Telnet or ASCII console) and can be switched on only by restarting the system using hidden reset button or unplugging power (refer to *Reset Functions*, page 15).

Radio parameters

The radio parameter values (transmit frequency and power) are stored internally in Flash memory of the Radio unit, the Radio operates exactly with those values stored in its Flash memory. When the radio parameter is modified during the equipment is in operation, the corresponding radio parameter value in the Radio Flash memory is overwritten with the new one and applied in operation. Also, each time the equipment is booted, the radio parameter values written in the IDU bootstrap are uploaded to the Radio and the previously stored radio parameter values in Flash memory are overwritten with those in the IDU bootstrap. Hence the radio parameter configuration in the IDU bootstrap has a higher priority as they will override the values stored in the Radio on the equipment restart.

Consequently, the radio parameter configuration could be stored in the IDU bootstrap for the purpose to be able to quickly change the Radio unit later. Normally it is not necessary for the IDU bootstrap to contain strings that configure radio parameters.

IDU name

The IDU name permanently appears in the prompt string of the Telnet or ASCII terminal software, it can also be seen on the IDU LCD by pressing "**clear**" button while in *status display* mode as well as on the Web browser window.

The name of the IDU can only be assigned using Telnet or ASCII terminal, this cannot be done using IDU management interface.

The command line "**Name** <deviceName>" assigns a name to the IDU. The name can be a maximum of 16 symbols long. If using space(s), the argument should be in double quotes.

Example: Name "SAFterm2 14 7"

Security commands

For ASCII, Telnet and Web terminals only one user is supported. The default username and password for Telnet terminal is:

- Username: telnet
- Password: saf

The default username and password for Web terminal is:

- Username: SAF
- Password: test

Take note of upper case and lower case type, it should be taken into account for both username and password!

The passwords may contain spaces, if using space(s) the password should be entered in quote marks.

For ASCII, Telnet and Web terminals the password can be changed simply re-entering the appropriate security command while logged on. To log off press Ctrl+D, the logging off is possible only if the password is specified. To disable password enter the password command appropriate for the specific terminal type followed by empty string, e.g., *enable password ""*.

Important!

The specification of password (or username and password) should always be followed by saving the configuration script (using "write" or "cfg write" commands) otherwise the password request will be ignored after the restart of CPU.

The panel access code for the access from IDU panel can be specified from the Telnet/ASCII terminal only. When the access code is specified the adjustment and configuration of any IDU/ODU parameters and loopbacks from IDU LCD is not available unless the correct access code is set up at the IDU (refer to section "*Setup Mode of the LCD*"). The specification of access code should also be followed by saving the configuration script otherwise the access code value will be set to zero (none) on the CPU restart. The panel access code can be changed simply entering the new access code (number from 0 – 200) using *panel access* command. In order to disable the panel access code enter 0 (zero) value.

There is no default password set for ASCII terminal (a terminal connected to RS232 management port) nor the access code from IDU panel is specified, - it is set to 0. Currently there are no possibilities to bypass password of any type of terminal, for instance if the user has forgotten it. The boot recovery functionality for such cases will be available in the upcoming software versions.

Real-time clock

The real-time clock does not provide any extra functionality at the moment, however in the upcoming management terminal software versions it will be used for the building of event logs.

It is not available on the LCD of the IDU, the date and time can be viewed using **Time** command when using ASCII or Telnet CLI terminal.

Date and time parameters can be set using **Time** <YYYY-MMM-DDD HH:mm:ss> command line.

3.4 Ethernet Management Port

The Ethernet management port of the IDU terminal is intended as main source of management connectivity and will provide the broadest range of management functionality:

- Web management via integrated Web server of management board;
- SNMP management via integrated SNMP agent of management board;
- Telnet server and CLI interface.

Ethernet interface could be used:

- To connect IDU to PC/Laptop to manage IDU;
- To LAN to constantly monitor IDU;
- To router or any other TCP/IP packet network termination unit to have IDU as part of network for management information.

3.4.1 SNMP Interface

In order to receive SNMP traps from the IDU management controller, the IP address of the management PC with the installed Trap Manager software (based on SNMP platform) should be specified from a Telnet or ASCII console.

The IP address of the SNMP Trap Manager can be specified using the "SNMP trap <IPaddress>" command.

The default value is **255.255.255.255** (no SNMP Trap Manager specified).

The Trap Manager address should be configured for each IDU, from which it is necessary to receive information on parameters, counters and alarms. The information is sent as SNMP Trap packets through the mediation of UDP protocol. If the Trap Manager terminal cannot be accessed, - for example, if there is no device connected to the Ethernet management port or IP settings of the management port are improper, a longer delay (about 10 sec.) may appear on the IDU startup. SNMP management functionality is available from any SNMP browser, by means of compiling SAF MIB to browser's MIB base.

SAF MIB is available from:

- SAF Tehnika Web site: www.saftehnika.com,
- From SAF Tehnika tech support, email: techsupport@saftehnika.com,
- Contacting SAF Tehnika or distributors.

```
***** SNMP QUERY STARTED *****
1: bbOperation.0 (integer) ok(2)
2: bbLinkCapacity.0 (integer) 16384
3: bbLinkCapacityDescription.0 (octet string) MUX 2M+2M+2M+2M+2M+2M+2M
4: bbLoopback.0 (integer) off(0)
5: bbSyncLostAlarm.0 (integer) on(1)
***** SNMP QUERY FINISHED *****
```

Sample of SNMP query of the CFM-16-8E1

The following table describes all variables defined in the MIB.

Variable Name	Variable Type	Value List	Description
termProduct	String		Textual name of terminal type
termDescription	String		Textual description of terminal
termLocation	String		IDU name
termVersion	String		Textual version of management software
termOperation	Integer (32 bit)	none(0) booting(1) ok(2) testing(3) error(4)	Terminal (IDU) operational status: <i>none</i> - not initialized; <i>testing, illegalSpeed, error</i> - reserved
termIduTemperature	Integer (32 bit)		Temperature within IDU (range: -128..127)
termRfCablePowerStatus	Integer (32 bit)	off(0) ok(1) short(2) error(3)	Indicates power consumption of the ODU: <i>ok</i> - acceptable level, <i>short</i> - short circuit in cable, <i>off</i> - too low power consumption, <i>error</i> - internal fault
termUpTime	Integer (32 bit)		System up-time in seconds
termDownTime	Integer (32 bit)		System down-time in seconds
bbVersion	String		Textual version of the Base-band controller software
bbOperation	Integer (32 bit)	none(0) booting(1) ok(2) testing(3) loopback(4) illegalSpeed(5) error(6)	Operational status of the Base-band modem: <i>none</i> - not initialized <i>loopback</i> - Base-band loop is set on <i>testing, illegalSpeed, error</i> - reserved
bbLinkCapacity	Integer (32 bit)		Base-band link capacity in Kbps
bbLinkCapacityDescription	String		Comment on Base-band link
bbLoopback	Integer (32 bit)	off(0) digital(1) analog(2)	Base-band loopback
bbSyncLostAlarm	Integer (32 bit)	none(0) on(1)	Sync Lost Alarm, <i>none</i> - off
inputA	Integer (32 bit)	off(0) on(1)	Input A
inputB	Integer (32 bit)	off(0) on(1)	Input B
inputC	Integer (32 bit)	off(0) on(1)	Input C
inputD	Integer (32 bit)	off(0) on(1)	Input D
outputA	Integer (32 bit)	off(0) on(1)	Power alarm (output)
outputB	Integer (32 bit)	off(0) on(1)	Synch lost alarm (output)
outputC	Integer (32 bit)	off(0) on(1)	Radio alarm (output)
outputD	Integer (32 bit)	off(0) on(1)	TxPLL alarm (output)
rfRxState	Integer (32 bit)	low(0) ok(1) error(2) loopback(3)	Reception status: <i>low</i> - Rx signal level <i>ok</i> - normal <i>error</i> - internal fault in the Radio <i>loopback</i> - RF loop is set on
rfRxLevel	Integer (32 bit)		Received signal level [dBm]
rfCableAttenuation	Integer (32 bit)		Signal attenuation in ODU-IDU cable (0...-20 db - proper operation)

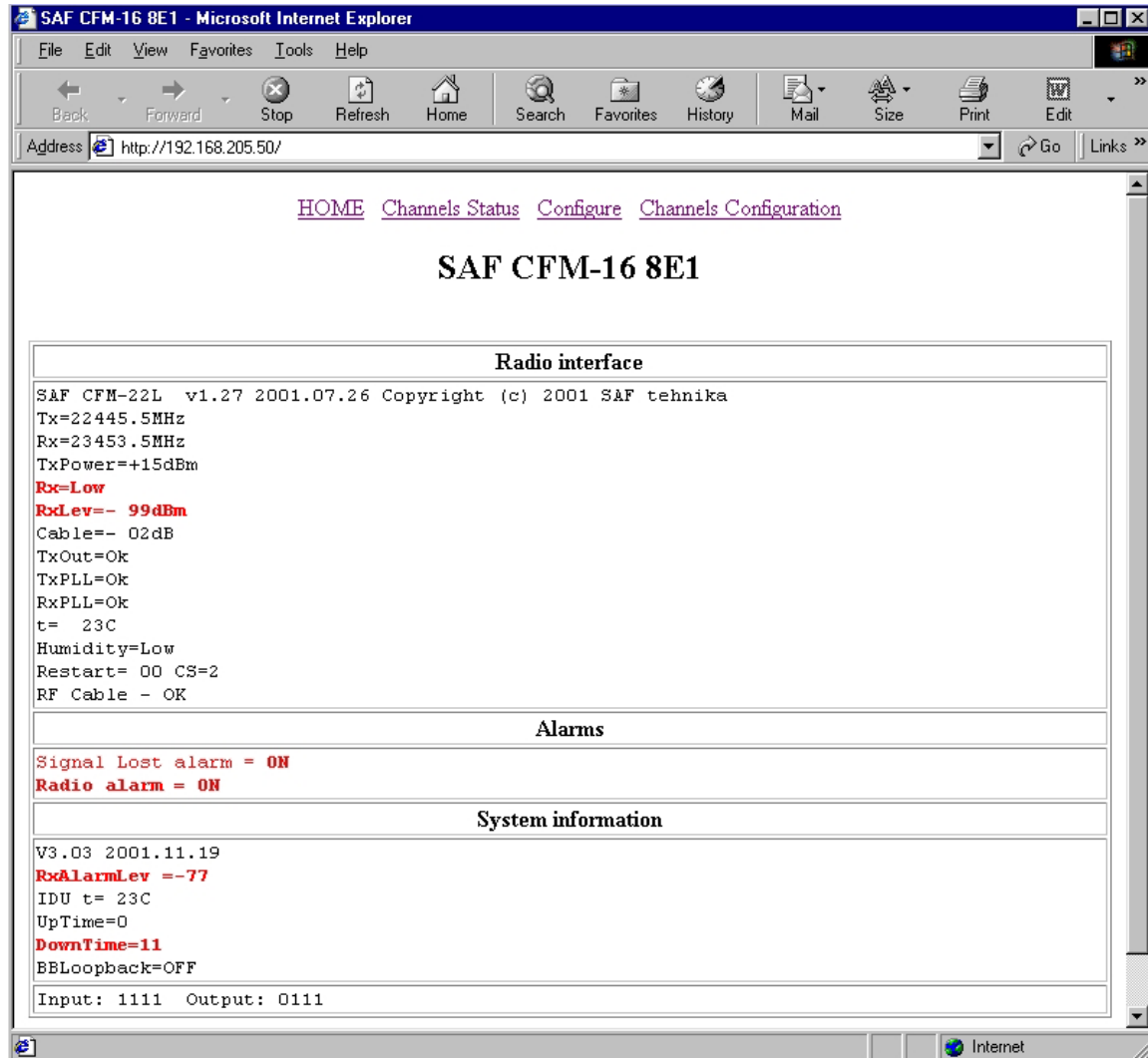
rFTxOut	Integer (32 bit)	error(0) ok(1) off(2)	Operation status of the ODU transmitter: <i>ok</i> – proper operation <i>error</i> – internal fault (no data from ODU) <i>off</i> – Tx power = off
rFTxPLL	Integer (32 bit)	error(0) ok(1)	Operation status of ODU Tx syntheser loop (PLL lock): <i>ok</i> – normal operation <i>error</i> – internal fault in ODU transmitter
rFRxPLL	Integer (32 bit)	error(0) ok(1)	Operation status of ODU Rx syntheser loop (PLL lock): <i>ok</i> – normal operation <i>error</i> – internal fault in ODU transmitter
rfOduTemperature	Integer (32 bit)		Internal temperature of ODU (°C)
rfOduHumidity	Integer (32 bit)	low(0) high(1)	Humidity level inside ODU: <i>low</i> – acceptable moisture level
rfLoopback	Integer (32 bit)	off(0) on(1)	RF loopback
rfRxAlarmLevel	Integer (32 bit)		Rx level (in dBm) at which the Radio Alarm is switched on
ch1los	Integer (32 bit)	off(0) on(1)	Channel 1 LOS alarm
ch1ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 1 (to the CPE)
ch1loopback	Integer (32 bit)	off(0) on(1)	Channel 1 loopback
ch2los	Integer (32 bit)	off(0) on(1)	Channel 2 LOS alarm
ch2ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 2
ch2loopback	Integer (32 bit)	off(0) on(1)	Channel 2 loopback
ch3los	Integer (32 bit)	off(0) on(1)	Channel 3 LOS alarm
ch3ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 3
ch3loopback	Integer (32 bit)	off(0) on(1)	Channel 3 loopback
ch4los	Integer (32 bit)	off(0) on(1)	Channel 4 LOS alarm
ch4ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 4
ch4loopback	Integer (32 bit)	off(0) on(1)	Channel 4 loopback
ch5los	Integer (32 bit)	off(0) on(1)	Channel 5 LOS alarm
ch5ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 5
ch5loopback	Integer (32 bit)	off(0) on(1)	Channel 5 loopback
ch6los	Integer (32 bit)	off(0) on(1)	Channel 6 LOS alarm
ch6ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 6
ch6loopback	Integer (32 bit)	off(0) on(1)	Channel 6 loopback
ch7los	Integer (32 bit)	off(0) on(1)	Channel 7 LOS alarm
ch7ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 7
ch7loopback	Integer (32 bit)	off(0) on(1)	Channel 7 loopback
ch8los	Integer (32 bit)	off(0) on(1)	Channel 8 LOS alarm
ch8ais	Integer (32 bit)	off(0) on(1)	Transmission of AIS signal via channel 8
ch8loopback	Integer (32 bit)	off(0) on(1)	Channel 8 loopback

3.4.2 Web Interface

The implementation of Web interface for the E1 IDU provides monitoring and configuring capabilities similar to ones available from the IDU LCD, front panel LEDs, and from the Telnet/ASCII console, please refer to description of status parameters described in section "Status Display" Mode of the LCD, page 12 and front panel LEDs in Chapter 2.2.2, page 6.

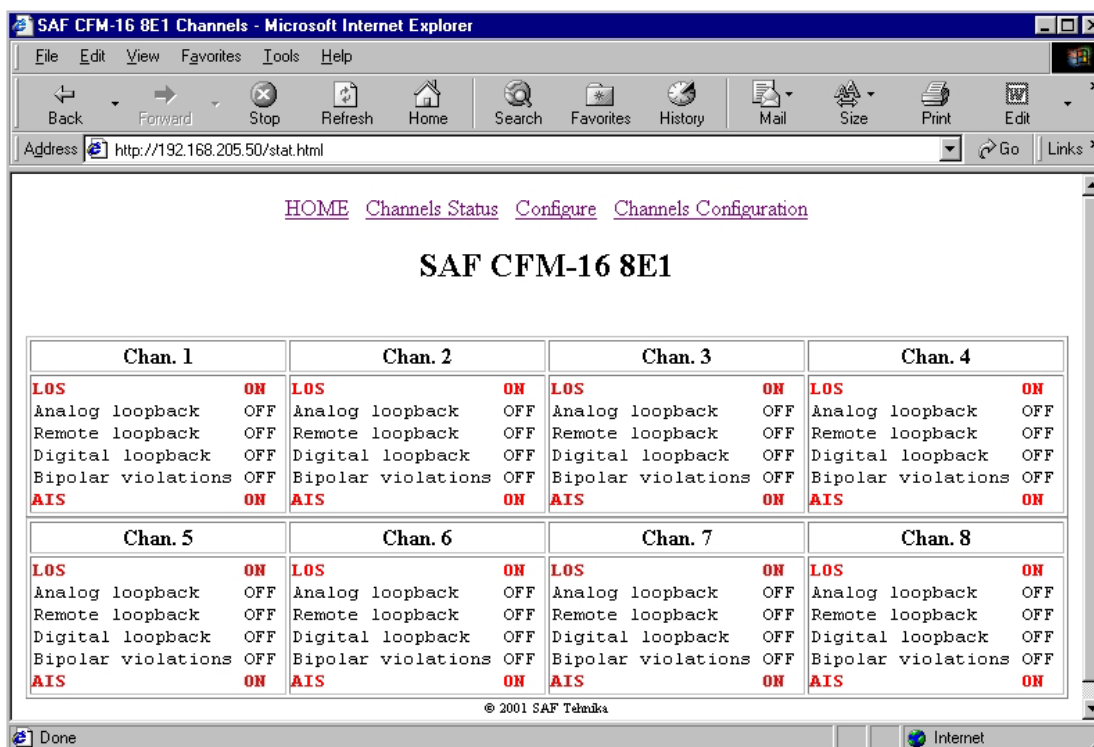
The Web interface functionality is available via the Ethernet management port only.

Web interface is accessible by any standards based Web browser.



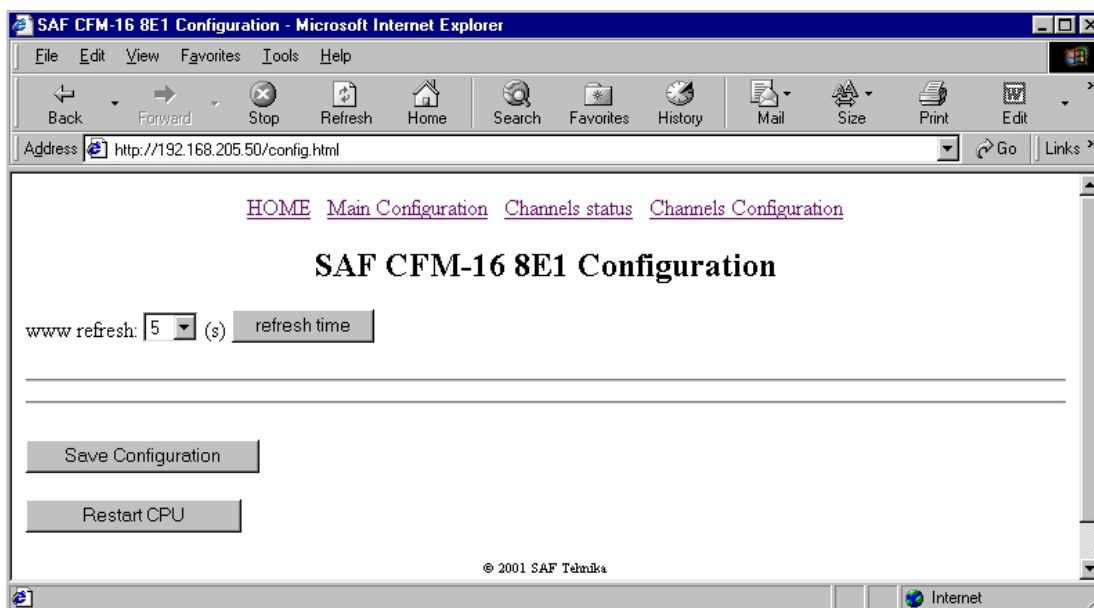
The 16 Mbps 8E1 IDU Main Web management window: it shows the Radio characteristics, main system settings, and alarm status. Entries, which are highlighted in red, indicate that specific parameters do not comply with the norms of normal operation, all other parameters are satisfactory

To check the status of each E1 channel, click on a *Channels Status* link to open the channel status window.



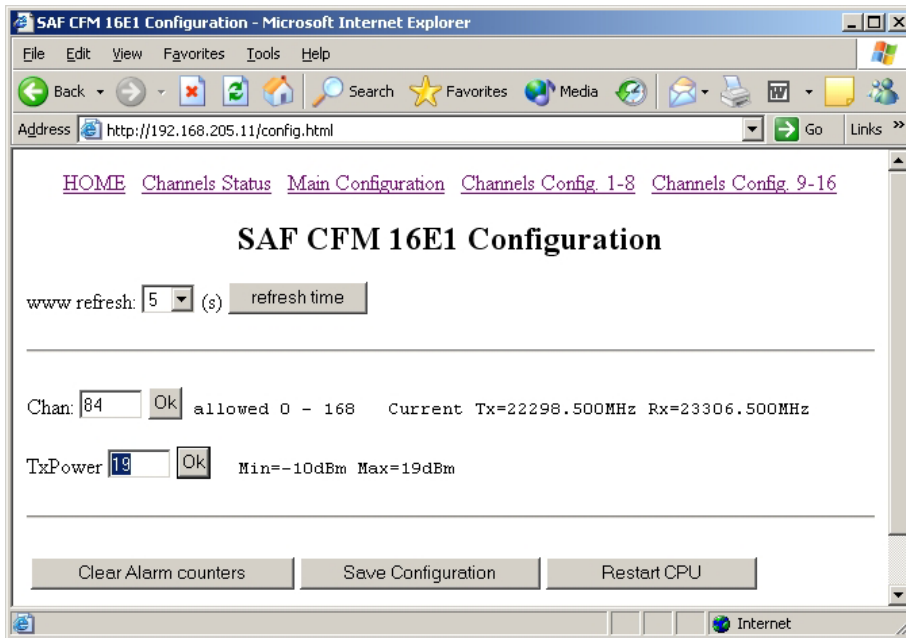
The 16 Mbps 8E1 IDU Channel Status Web management window

In order to save the configuration, restart the CPU or change the Web page refresh time, go to the *Main configuration* window (see the Figure below). When clicked on link to any of the configuration windows for the first time, you will be prompted to enter User Name and Password. The default username is **SAF** (in capital letters) and the default password is **test**.



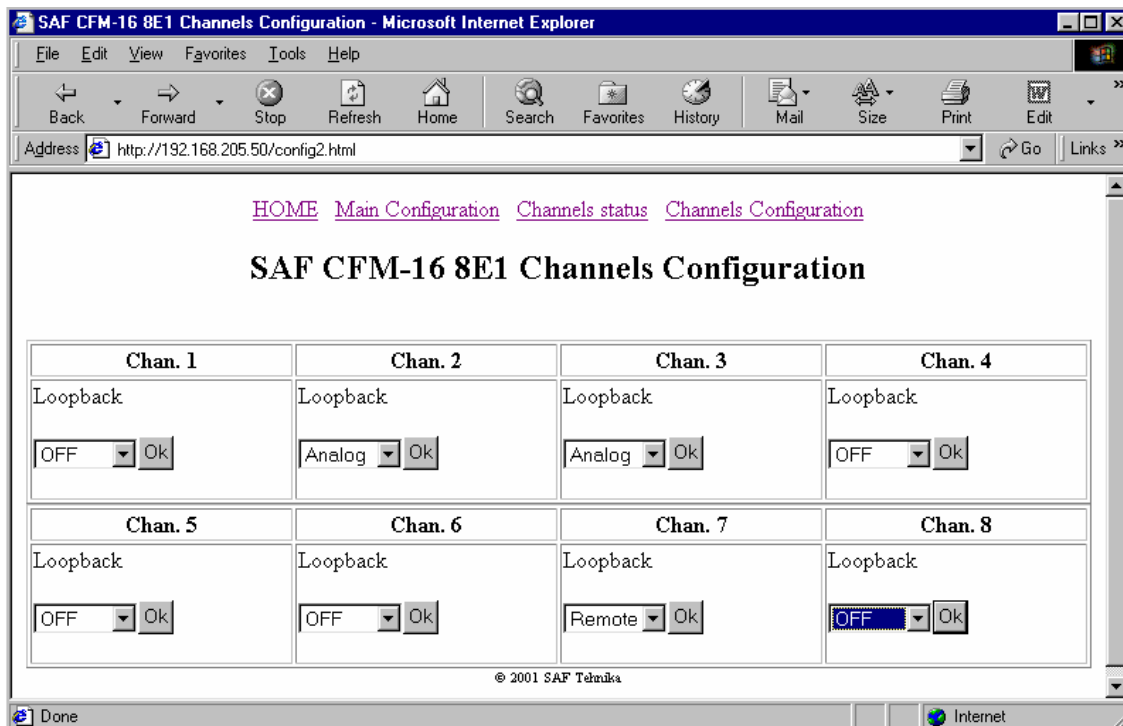
The 16 Mbps 8E1 IDU Main Configuration Web management window (Radio parameter configuration is disabled)

The *Main Configuration* window also offers to configure the Radio parameters: the frequency channel and the transmit power. The radio parameter configuration from Web page is factory-set as disabled. It can be enabled with *enable rfweb* command from Telnet or ASCII console.



The 16 Mbps 8E1 IDU Main Configuration Web management window extended with the Radio parameter configuration

To set the E1 interface loopback access the *Channels Configuration* window via *Channels Configuration* link.



The 16 Mbps 8E1 IDU Channels Configuration Web management window

3.5 RS-232 Auxiliary Serial Port

The RS232 auxiliary port is accessible on the CFM-16-8E1 IDU only.

The auxiliary channel is an extra channel available through the RS232 serial interface for connection of external equipment. The usage of this channel is on the user's own discretion.

The auxiliary port should be configured as 9600 8-1-N, none of the data flow controls should be used.

3.6 Alarm Interface Port

The Alarm port is available for all types of E1 IDUs as an optional feature.

The Alarm port comprises the set of *outputs* of relay switches intended for the CFM site supervision and the user *inputs* to connect an external device that requires to be supervised. Each output of the relay switch can be used either as NO type (normally open) or NC type (normally closed).

The following alarms are available through the alarm port as parallel relay *outputs*:

- A: Power alarm. If there are no problems with DC power supply to any component of the site, the relay is closed (active relay state or initial state); if power supply failure – relay is opened (passive relay state).
- B: SL – *Synch Lost* alarm, ON - relay is closed (active state), OFF – relay is opened (passive state).
- C: RA – *Radio Alarm*, ON - relay is closed, OFF – relay is opened (normal operation).
- D: TxPLL – Tx Phase-locked Loop failure, ON - relay is closed, OFF – relay is opened (normal operation).

There are four parallel *inputs* of the alarm port available: input A, input B, input C, input D. These inputs are used for connection of an external device which supplies DC voltage on input, - "0" or "1"; the alarm status triggers if input voltage is changed between "0" and "1"; refer to Chapter 6 for electrical specifications.

The alarm port inputs and outputs can be supervised via SNMP manager and/or Web console.

For information on Alarm port pinouts and electrical specifications, please refer to Chapter 6.

3.7 Configuring Management Service Channel

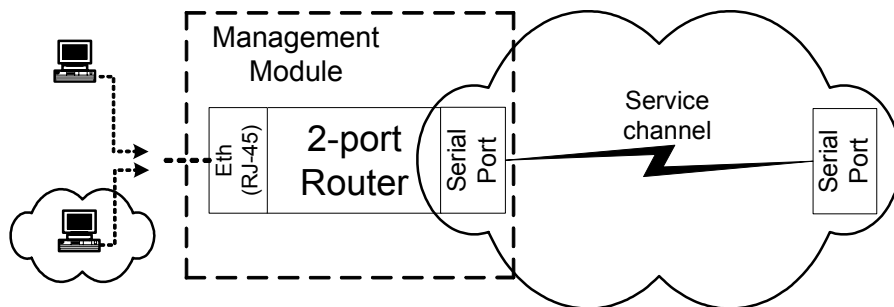
Before using the Management Service Channel, the mandatory precondition is to properly configure the following parameters:

- IP addresses of the **local** and **remote** service channel virtual **serial port** (also referred as service channel IP addresses): the IDU Management Module has a virtual serial port onboard that is used to receive/transmit the management information from/to the other virtual serial port on the far-side via service channel, both of these ports have their IP address.
- IP address and net-mask of the Management Module
- IP address of the gateway or host that is locally connected to the IDU.

The console is connected to the IDU via Ethernet console port located on the Management Module. The console should be configured so as to have routing information to the virtual serial port (service channel port) of the local IDU, - it should either run the RIP thereby automatically obtaining the routing information, or a static route should be added.

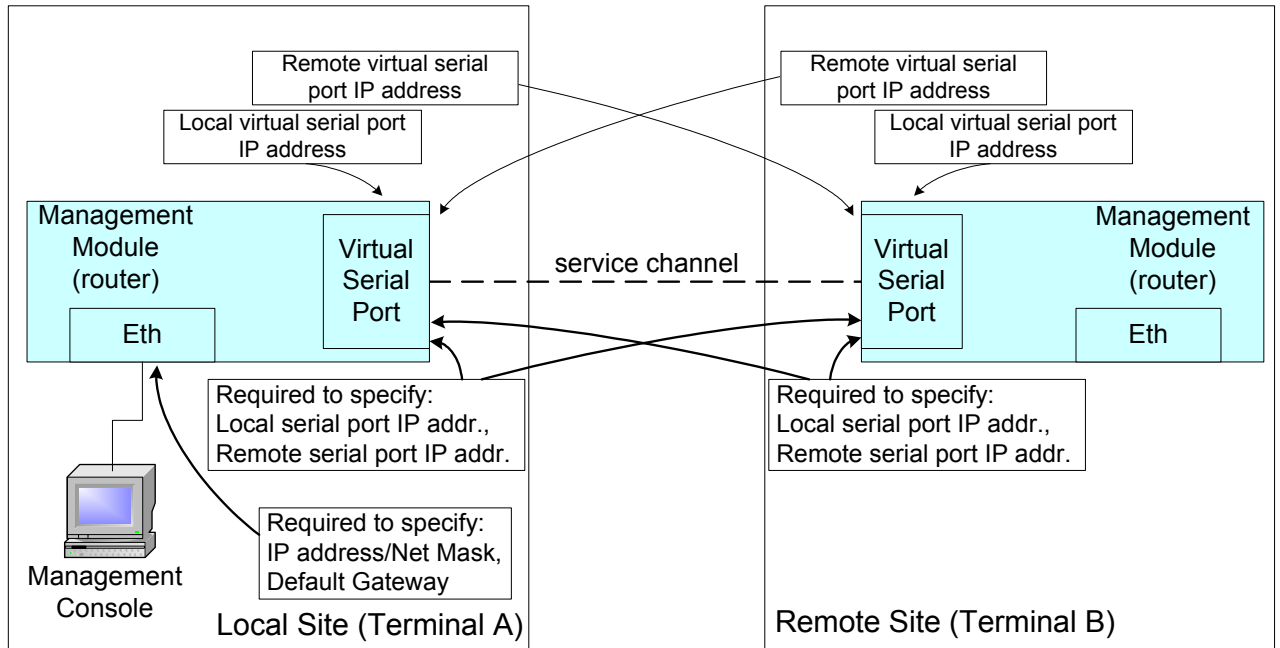
The routing requires determining IP addresses of service channels (virtual serial port IP addresses). Since the Management Module operates as a router between two subnets running the RIP 2, normally it is not necessary to configure the routing by adding static routes.

Virtual serial port IP addresses can be picked from the "private internet" addresses, e.g., 10.X.X.X or 192.168.X.X. Both of these addresses should be different from those used for addressing the IDU, the principle is shown in the picture below, here each cloud depicts a subnet.



The configuration of local and remote virtual service channel IP addresses should conform the following principle:

	Terminal A	Terminal B
Local virtual serial port IP address	IP 1	IP 2
Remote virtual serial port IP address	IP 2	IP 1



See examples on the next page.

Examples of service channel configuration

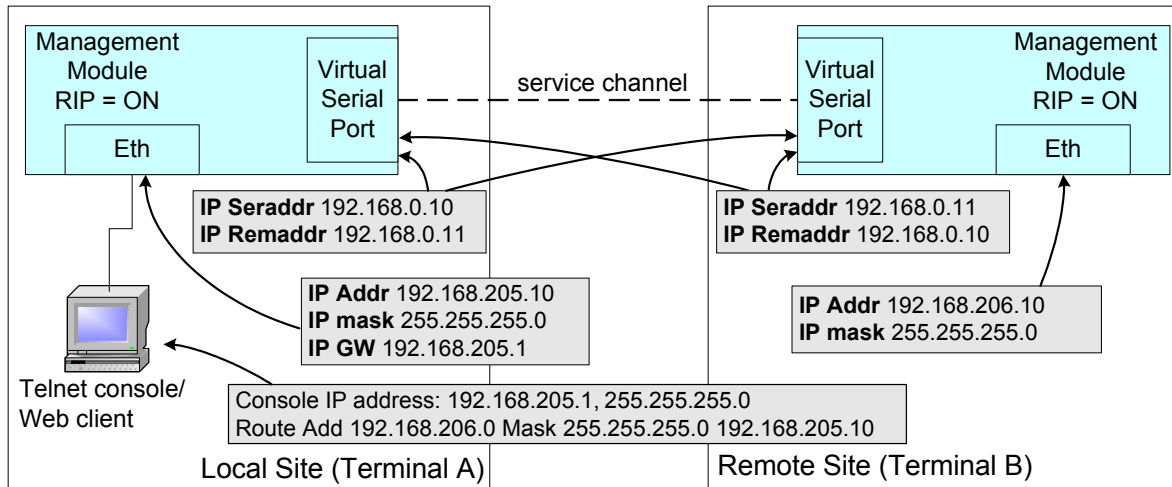


Figure 12.

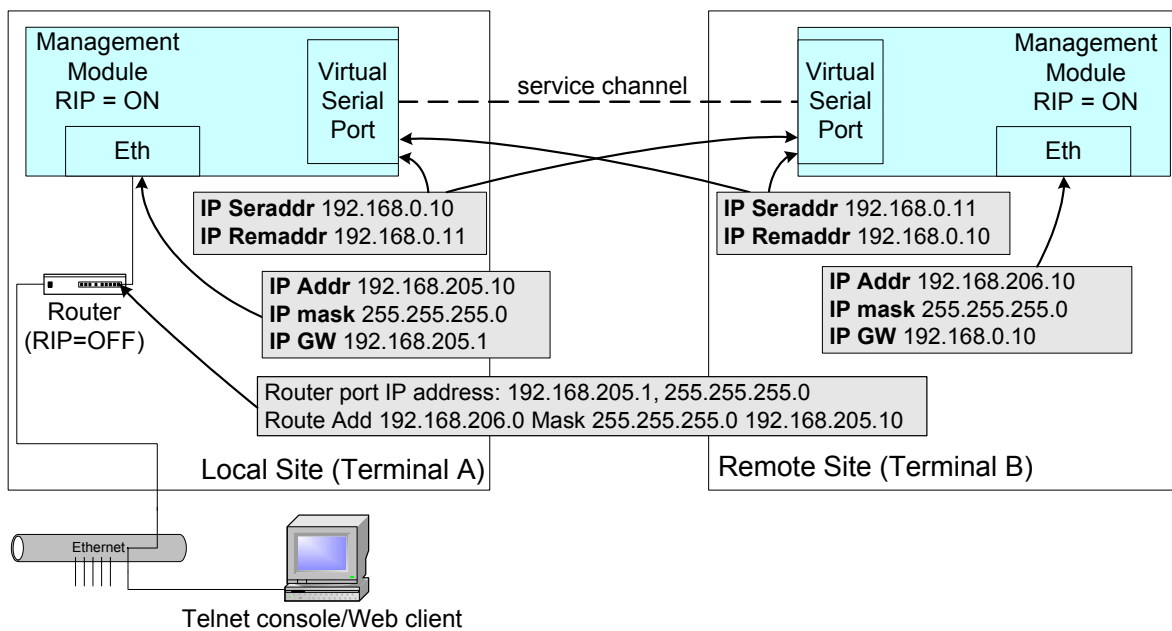


Figure 13.

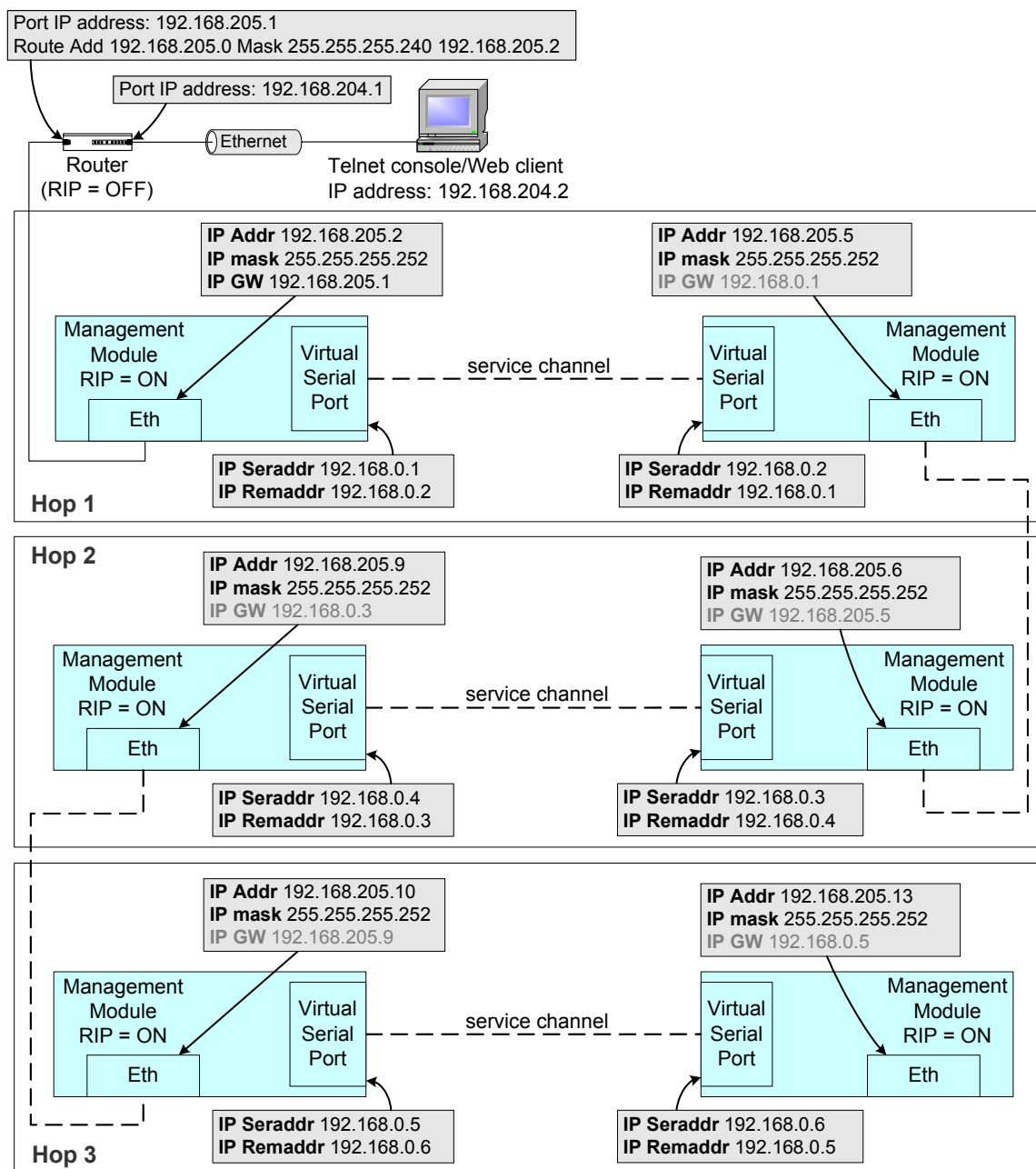


Figure 14. The IP configuration of the management channel via three hops with the RIP II switched on in each IDU; since the management controllers are running RIP II, there is no necessary to specify gateway (see configuration strings in grey)

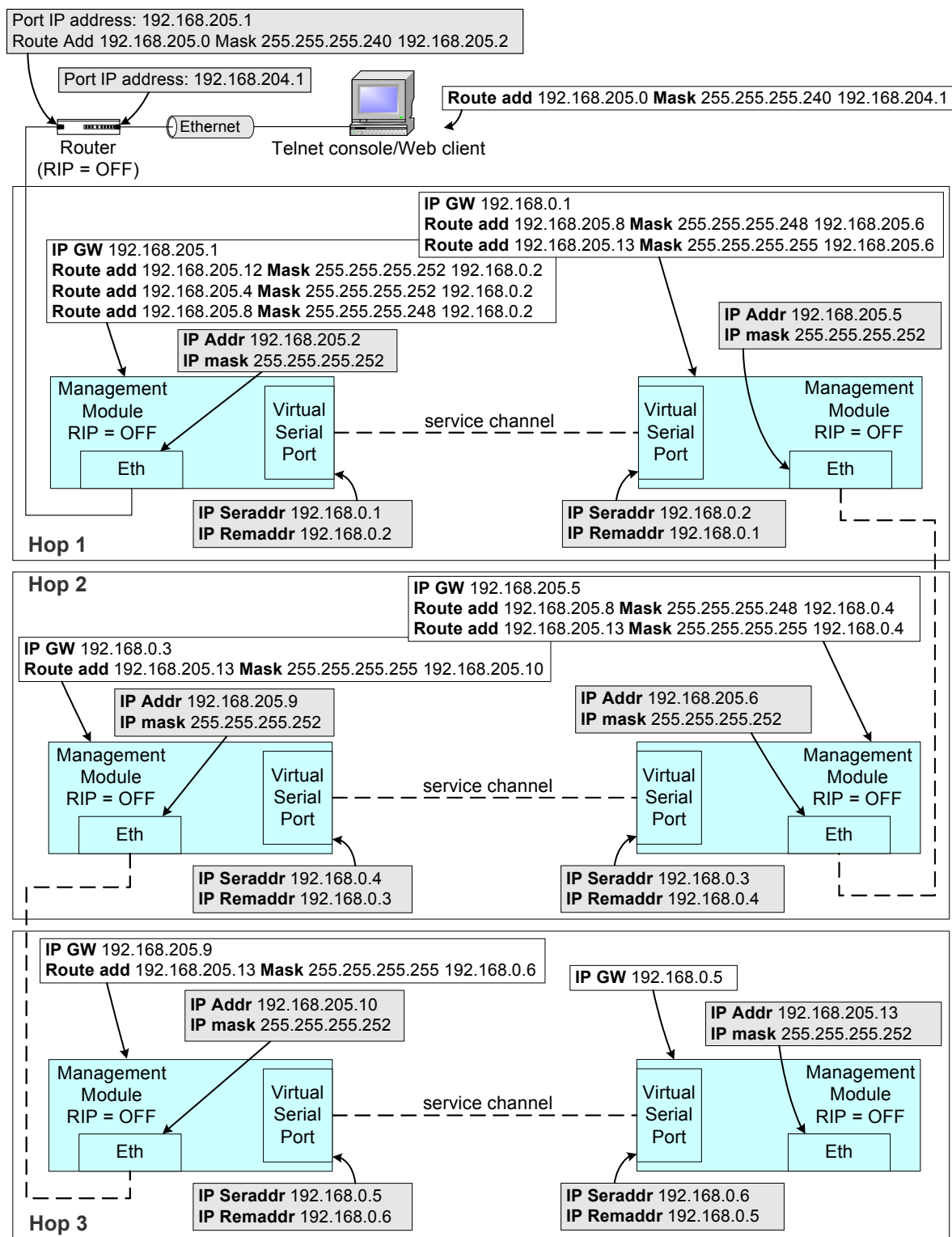
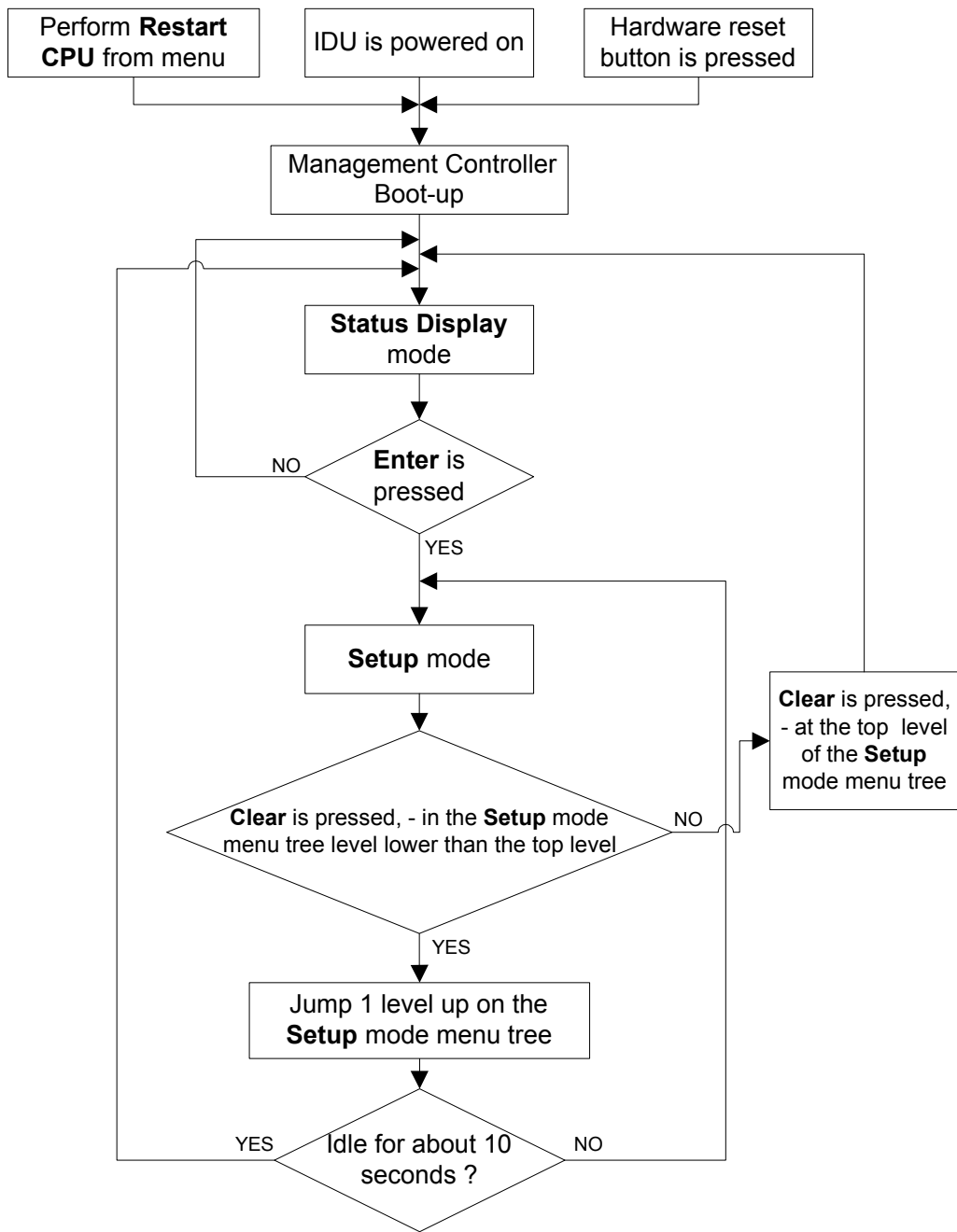


Figure 15. The IP configuration of the management channel via three hops with the RIP II switched off in each IDU; for proper routing between IDU management modules, the default gateway and static routes must be set for each module

3.8 Algorithm of LCD Operation



Flow Chart 1. Using LCD

3.9 Replacing the Indoor Unit

Before replacing the IDU, verify the configuration of Radio if possible, - inspect the channel and transmit power settings. Then configure the new IDU in one of the following ways:

- delete the bootstrap via Telnet or ASCII console using *cfg clear* command, or
- configure Radio channel and transmit frequency as needed (from LCD or via management console);

In order to replace the faulty IDU while in operation, take the following steps:

- Disconnect the faulty IDU from the Radio:
 - disconnect the N-type female connector;
 - unplugging of power is optional;
- Connect the new IDU:
 - if the new IDU is previously configured (the transmit power and channel settings are made and the configuration is saved), the Radio will apply these settings after the management controller will be restarted,
 - if configuration script (bootstrap) is empty or does not contain entries on channel and transmit power, the Radio will keep the configuration that was last received from IDU;
- Restart the management controller, for instance, using **RestartCPU** option on the LCD.

3.10 Updating Management Software

Updates to management software for management controller board are available as uploadable files from SAF Tehnika company, sales partners or Web site.

Upload functionality is provided through management controller software monitor function and is available via RS-232 serial port.

The upload can be performed using

- PC/Laptop connected to IDU serial port, using 'SAF Firmware Uploader' program, found on the documentation CD, the instructions how to use this software can be found in its installation directory.
- PC/Laptop connected to serial port of IDU, using any terminal emulation program with text file transferring functionality; the instructions how to update software using this method are given in "Management Software Update Guide".

3.11 Default Settings

Parameter/description	Parameter name or command line		Default value/setting
	Telnet / ASCII	LCD	
Tx/Rx channel	Chan	Chan	In the middle of the band covered by Radio
Transmitter power	Txpower	Tx Power	Off
Rx signal level by which the Radio Alarm is turned on	RxAlarmLevel	RxAlarmLev	CFM-4-2E1: -80 dBm, CFM-8-4E1: -77 dBm, CFM-16-8E1: -74 dBm, CFM-34-16E1: -71 dBm
Management controller IP address	IP addr	IP	192.168.205.10 or 192.168.206.10
Management controller IP address netmask	IP mask	Netmask	255.255.255.0
IP address of the gateway to the service channel	IP gw	Gateway	255.255.255.255
IP address of the local virtual serial port of service channel	IP seraddr	Local IP	192.168.0.10
IP address of the remote virtual serial port of service channel	IP remaddr	Remote IP	192.168.0.11
IDU name	Name	-	SAF
SNMP community name of the agent to read	SNMP community read	-	saf-public
SNMP community name of the agent to write	SNMP community write	-	saf-private
IP address of the SNMP trap manager	SNMP trap	-	255.255.255.255 - trap manager not specified
Web page refresh time	Webrefresh	-	5 seconds
Username and password for ASCII console	Enable password	-	(disabled)
Access number for LCD/Keypad	Panel access	-	0 (disabled)
Username and password for Web terminal	WWWuser	-	Username: SAF Password: test
Username and password for Telnet terminal	Telnetuser	-	Username: telnet Password: saf
Configuration of Radio parameters from the Web terminal	Enable rfweb	-	(disabled)

4 Configuring Radio Parameters

4.1 Default Radio Settings

The Radio units are shipped with disabled Transmitter (TxPower OFF) and channel is set to one in the middle of respective A or B side of the Low or High subband (Radio types: LA, HA, LB, HB), or in the middle of the whole Low or High subband (Radio types: L and H).

4.2 Configuring Tx Frequency

The Tx frequency of the CFM LM and the CFM L4 type ODUs can be adjusted in the following ways:

- 1) It can be set through "Set Channel" item of IDU LCD menu system.

If this item is chosen, display indicates:

Channel = xxx Tx = xxxxx.x MHz

Where "Channel" corresponds to Tx channel number and "Tx frequency" indicates appropriate frequency in MHz.

Operator sets desired channel number scrolling through values with "Up" or "Down" buttons and confirming the choice with "Enter" button.

- 2) The Tx frequency can be set using "**Chan**" command from Telnet or ASCII terminal, example: *Chan 22*
22 – channel number

Since the telemetry data is transmitted between the ODU and the IDU, the concordance of Tx frequency to Low or High band side is detected automatically, and when the Tx channel is configured from the IDU LCD, the LCD displays frequencies within the subband (Low or High) that is covered by the Radio. However, if the ODU covers only a half of the subband (e.g., LA, HA, LB or HB, - depends on the duplexer filter within the ODU), the user should only choose from those Tx frequencies (channels) that are covered by the half of the subband specific to the Radio. If a fault occurs in the ODU that prevents the transmission of telemetry data, the IDU LCD shows "**No data from ODU**".

The Rx frequency is set automatically by Tx frequency.

4.3 Configuring Tx Power Setting

The Tx Power level of the CFM series ODU can be adjusted in the following ways:

- 1) It can be set through **Set TxPower** item of IDU LCD menu system.
- 2) The Tx Power can be adjusted using **Txpower** command from Telnet or ASCII terminal, example: *Txpower +10*

The Tx Power can be adjusted from -10 dBm to +20 dBm in steps of 1 dBm as well as turned off (Txpower off).

The default setting is "OFF", allowing safe deployment of the equipment without risk of frequency conflicts with other installed radio equipment.

4.4 RSSI Port

RSSI (Received Signal Strength Indicator) port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter which is connected to the RSSI port. The output of the RSSI port is DC voltage and varies depending on received signal level.

5 Performing Loop-back Tests

5.1.1 Basaband and Radio Loopbacks

Base-band and Radio (RF) loopbacks can be set on a fixed time interval only; if using LCD/Keypad, the base-band and RF loop test is set for 1 minute. If setting base-band or RF loop from Telnet or ASCII console, the duration of the loopback mode can be specified from 1 to 10 minutes.

Radio loopback

The radio loop is set in the ODU. Radio loopback mode is a special ODU operation mode, where the Rx frequency during the loopback mode is set equal to the Tx frequency. During radio loopback mode, the signal is transmitted and looped back through the duplexer filter to the receiver block. The radio loopback is not dual.

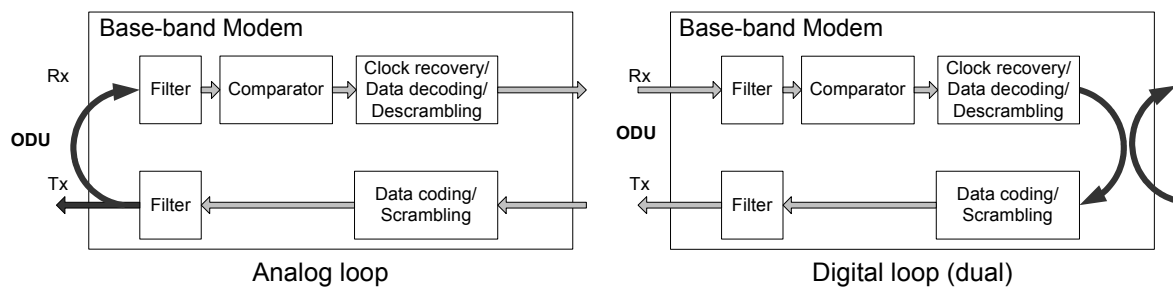
Important notes:

1. Because of the frequency characteristic of the duplexer filter, in order to set the radio loop, the ODUs operating in the Low band side must be switched to the highest available frequency channel, but the ODUs operating in the High band side must be switched to the lowest available frequency channel;
2. Before setting the radio loop, the transmitter power should be switched to maximum level;
3. In CFM-18-LM and CFM-18-L4 ODUs the radio loopback mode is not available.

Baseband loopbacks

The baseband loop is set in the baseband modem in the IDU. There are two types of **baseband loopbacks** (both can not be activated simultaneously):

- Digital baseband loopback: the signal from the ODU and from the multiplexer in the baseband modem is looped back to the receiving device; the digital baseband loopback is dual (see figure below);
- Analog baseband loopback: the modulated signal on the baseband modem output is looped back to the receiving device and also passed further to the ODU.



5.1.2 E1 Interface loopbacks

Only one type of loopback can be set at a time each E1 port.

The E1 interface module supports analog and digital loopback modes as depicted in Figure 16, and Figure 19.

The E1 IDUs support the following E1 port loopback modes:

- Analog loop, - Figure 16,
- Digital loop, - Figure 17,
- Remote loop, Figure 18.

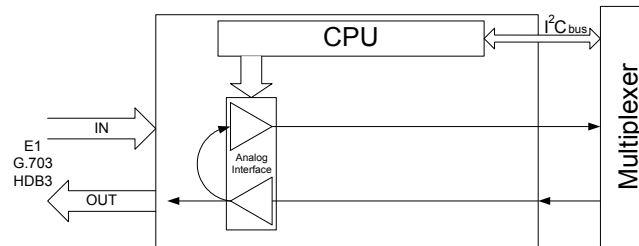


Figure 16. The E1 interface analog loopback: this mode is supported by E1 IDUs and modular IDUs complemented with E1 interface module

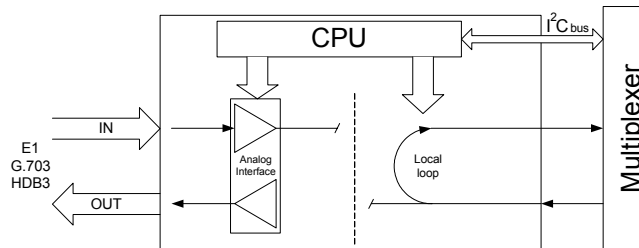


Figure 17. The E1 interface digital loopback, supported by the E1 IDUs only

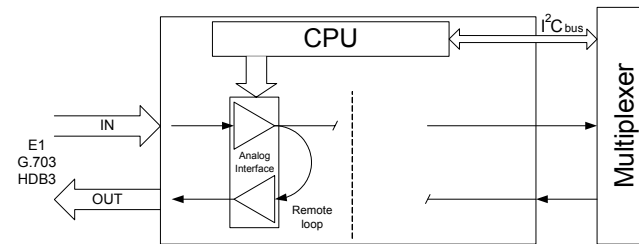


Figure 18. The E1 interface remote loopback, supported by the E1 IDUs only

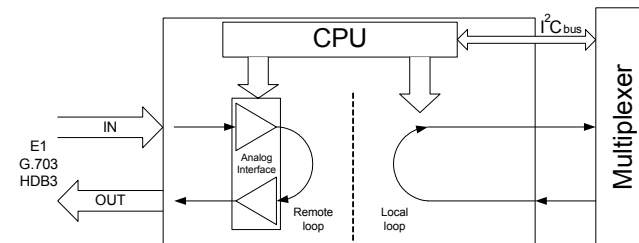


Figure 19. The E1 interface digital loopback, this mode is supported by the E1 interface module only

5.1.3 Setting Loopback from IDU LCD/Keypad

From the IDU LCD the baseband loop and the RF loop tests are set on a fixed 1 min. time interval as default value, the E1 interface loopback has no time limitation.

- **Baseband loopback:**
From status display mode proceed as follows: Press "ENTER" to enter setup mode → select "Loopbacks" → select "BBloopback ON" or "BBloop analog" → select "Yes".
- **RF loopback:**
From status display mode proceed as follows: Press "ENTER" to enter setup mode → select "Loopbacks" → select "RFloopback ON" → select "Yes".
- **E1 interface loopback:**
From *status display mode* proceed as follows: Press "ENTER" to enter setup mode → select "E1 #" (# - channel number, see the front panel of IDU) → select "Loop" → select "Analog" for analog loopback (non-dual), "Digital" for digital loopback or "Remote" for the remote loopback → confirm.

Only one loopback mode can be active at a time. The digital loopback mode is dual since there are two loops closed - remote and local.

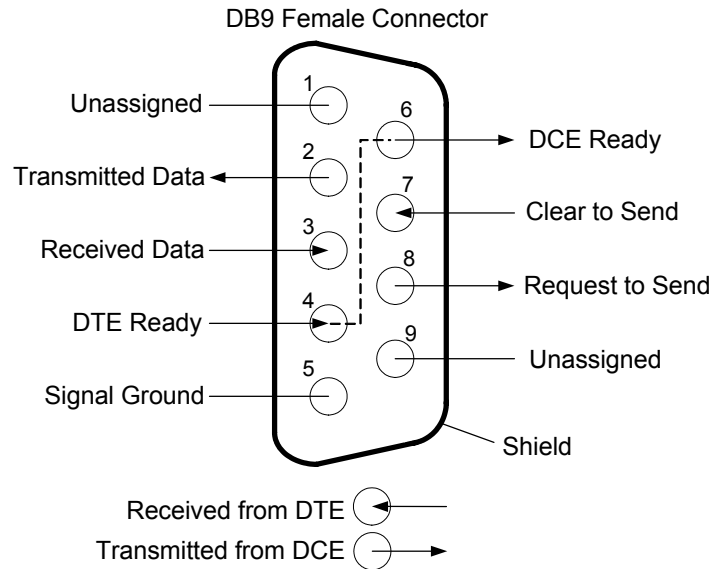
5.1.4 Setting Loopback from Telnet/ASCII Terminals

- **E1 interface module loopback: E1 # Loop** {Analog|Digital|Remote|Off}
The duration is unlimited.
- **Baseband loopback: BBloop** {on | analog | off} [*duration*]. If using argument "ON" the dual digital baseband loopback is activated, if using argument "analog" the non-dual analog loopback is activated. Duration is set in minutes from 1 to 10. If duration is not specified the loopback will be set on 1 minute.
- **RF loopback: RFloop** {on | off} [*duration*]. Duration (optional) is set in minutes from 1 to 10. If duration is not specified the loopback will be set on 1 minute.

6 Pinouts

- Standard Ethernet patch cables should be used with management Ethernet port of the IDU;
- Any "straight through" or modem serial cable could be used with RS-232 Telnet/ASCII management port and RS-232 auxiliary port.
- The cable for alarm interface port should be produced by own in conformity with the specifications given in page 47.

RS-232 management port pinouts



E1 balanced (120 Ω) RJ-45 traffic port pinouts

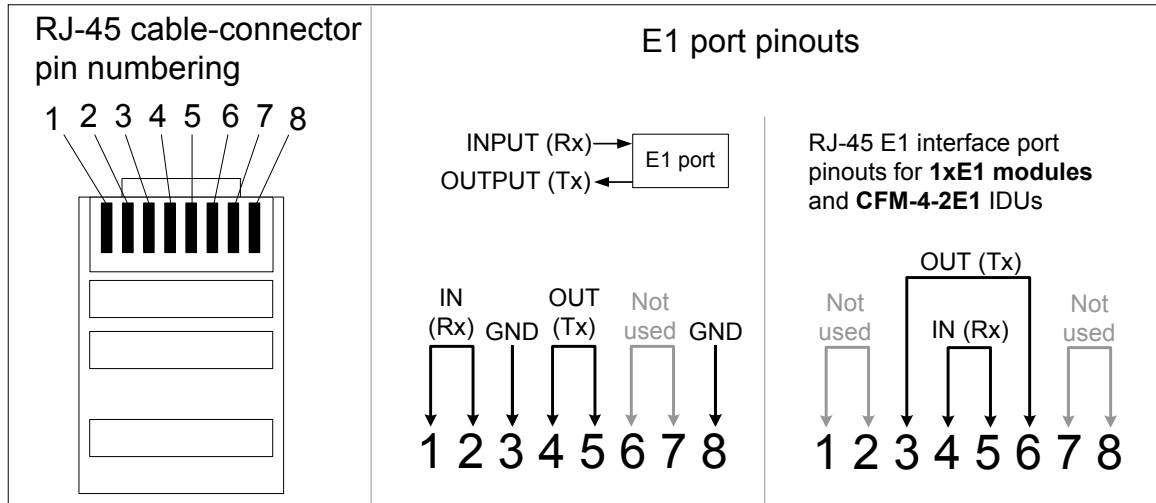


Figure 20. E1 traffic port pinouts: notice that port (cable) pinouts for E1 modules and CFM-4-2E1 IDUs differ from the E1 port pinouts of the other type of CFM series E1 IDUs

E1 balanced (120 Ω) DB25 traffic port pinouts

According to Figure 21:

- 14, 15 INPUT CH1
- 3, 4 OUTPUT CH1
- 17, 18 INPUT CH2
- 6, 7 OUTPUT CH2
- 20, 21 INPUT CH3
- 9, 10 OUTPUT CH3
- 23, 24 INPUT CH4
- 12, 13 OUTPUT CH4

All other pins are GND.

E1 unbalanced (75 Ω) DB25 traffic port pinouts

According to Figure 21:

- 1 INPUT CH4
- 2 OUTPUT CH4
- 4 INPUT CH3
- 5 OUTPUT CH3
- 7 INPUT CH2
- 8 OUTPUT CH2
- 10 INPUT CH1
- 11 OUTPUT CH1

All other pins are GND.

Alarm interface port specification

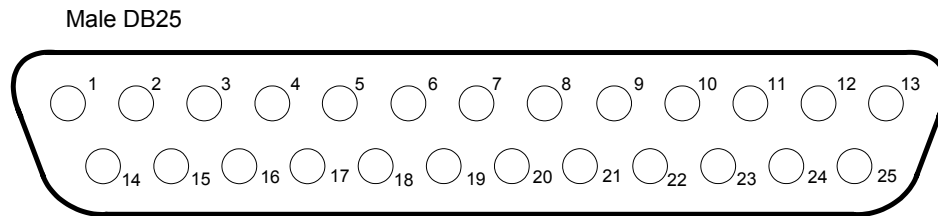


Figure 21. DB25 Male connector pin layout

The pin assignments for relay outputs are the following:

	Output A		Output B		Output C		Output D	
Pair of pins	1-2	2-14	3-4	4-16	5-6	6-18	7-8	8-20
Type: NC* or NO**	NO	NC	NO	NC	NO	NC	NO	NC

NC* - Normally Closed

NO** - Normally Open

Input pins:

	Input A	Input B	Input C	Input D
Pin	10	11	12	13
GND pins (closest)	22	23	24	25

Electrical specifications of the outputs of the alarm interface port:

Rated load: 0.5 A at 125 VAC; 2 A at 30 VDC

Max. switching current: 2 A

Max. switching voltage: 250 VAC, 220 VDC

Max. switching capacity: 62.5 VA, 60 W

Electrical specifications of the inputs of the alarm interface port:

Impedance: 4,7 k Ω ,

U_{0"} = 1...2 V DC,

U_{1"} = 2,4...48 V DC.

7 Mechanical Data

IDU model	Weight [kg]	Dimensions HxWxD [mm]
CFM-4-2E1	1.8	44x482x284
CFM-8-MUX w/ 4 E1 modules	2.0	44x482x284
CFM-8-4E1	1.8	44x482x284
CFM-16-8E1	1.9	44x482x284
CFM-34-16E1 (w/ RJ-45 connectors)	1.8	44x482x284

8 SAF Tehnika A/S Contacts

Most up to date contacts of SAF Tehnika A/S could be found at Web site www.saftehnika.com.

SAF Tehnika A/S technical support could be reached at:

- Email: techsupport@saftehnika.com
- Telephone: +371 7046840
- Fax: +371 7020009

9 References

All the documents comprised in this chapter can be ordered from SAF Tehnika or its sales representatives.

9.1 Technical Descriptions

There are two technical descriptions available:

- *SAF CFM LM Series Microwave Radio System Product Family: Technical Description*; This document is a generic technical description of the CFM-LM ODU and IDUs that are compatible with it, it comprises the installation and commissioning issues and respective accessories, functional descriptions, technical data, a.o.
- *SAF CFM L4 Series Microwave Radio System Product Family: Technical Description*; This document is a generic technical description of the CFM-L4 radio and IDUs that are compatible with it, it comprises the installation and commissioning issues and respective accessories, functional descriptions, technical data, a.o.

9.2 Configuration Guides

Configuration guides provide the necessary information regarding the configuration of SAF Tehnika's CFM products, these documents describe the management system, this is also partly covered in the CFM-LM/L4 Product Family Technical Description.

The following configuration guides are available:

- *CFM Series E1 Indoor Units: Management System Technical Description and Configuration Guide*
- *CFM-34-REBM Modular Fast Ethernet Bridge: Indoor Unit Management System Technical Description and Configuration Guide*
- *CFM-4-REB and CFM-8-REB Ethernet Bridge: Indoor Unit Management System Technical Description and Configuration Guide*
- *CFM Modular Multiplexer: Indoor Unit Management System Technical Description and Configuration Guide*
- *CFM-34-SWB E1 1+1 Indoor Unit: Installation and Configuration Manual*

9.3 Channel Plans

This document contains all available frequency channel plans for bands from 7 GHz to 38 GHz.

9.4 Management Software Update Guide

This guide provides the user of the CFM series equipment with the information required to update the management software via RS232 port, using terminal emulation program.

- *SAF CFM Series Microwave Radio System Indoor Unit Management Software Update Guide*