



CFM Modular Multiplexer

Indoor Unit Management System Technical Description and Configuration Guide

Software Version 3.xx

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1 CFM Multiplexer Indoor Unit Overview

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-4-MUX**, **CFM-8-MUX** and the **CFM-16-MUX** modular multiplexer Indoor Units describing the built-in management system, configuration functionality, hardware features, etc.

This document describes particularly the following Multiplexer Indoor Unit models:

- CFM-4-MUX (4 Mbps max WAN data rate, fixed slot speed 2x2 Mbps)
- CFM-8-MUX (8 Mbps max WAN data rate)
- CFM-16-MUX (16 Mbps max WAN data rate)

The CFM modular multiplexer IDU is part of SAF Tehnika's CFM series digital microwave radio product family and serves as Indoor Unit (IDU) providing:

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

Current document covers versions **3.xx** for the management controller software of the CFM series multiplexer IDUs. The most recent software version is **3.65**.

All multiplexer IDUs are modular devices offering the user capability to equip unit with desirable quantity of E1, V.35 and REB interface modules.

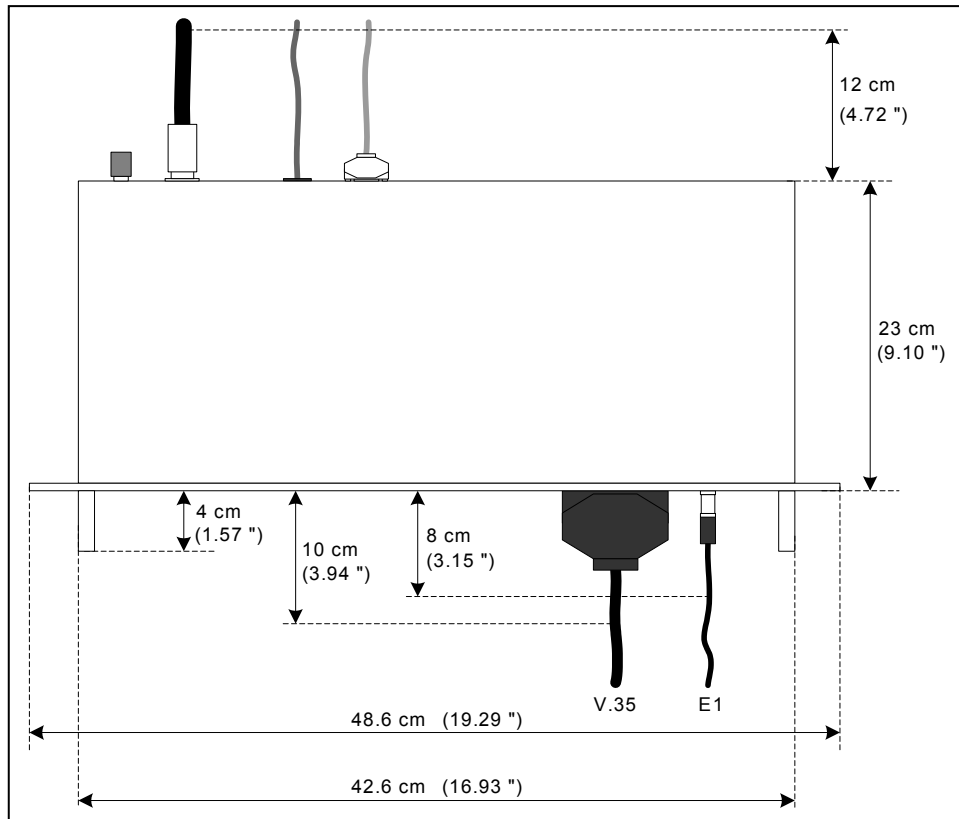
Revision history

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

2 Indoor Unit Appearance

2.1 Installation Notes

The CFM Multiplexer Indoor Unit 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. Some space is required in front of the IDU for traffic interface cables, roughly

- 10 cm are needed for V.35 interface cable;
- 8 cm are needed for E1 interface cable (COAX);
- 5 cm are needed for Ethernet interface cable and E1 RJ-45 type interface cable.

As a minimum of 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 CFM Multiplexer IDU contains:

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

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

The CFM-4-MUX IDU provides 2 slots for interface modules with fixed 2 Mbps capacity per each.

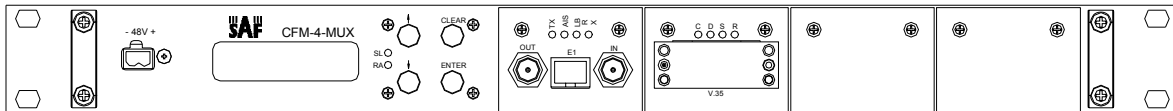


Figure 1. The CFM-4-MUX IDU equipped with two interface modules: E1/ V.35

The CFM-8-MUX IDU provides 4 slots for interface modules, the maximum capacity of the single slot is 8 Mbps.

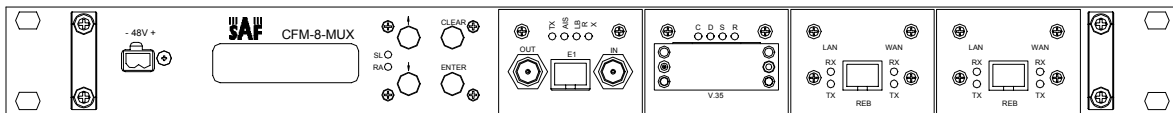


Figure 2. The CFM-8-MUX IDU equipped with four interface modules: E1/ V.35/ REB / REB

The CFM-16-MUX IDU provides 4 slots for interface modules, the maximum capacity of the single slot is 8 Mbps, the second slot (Slot 2) has a fixed capacity of 8 Mbps. Please see Table 6 in chapter 3.1.2 for detailed information about supported slot speeds

The numbering of slots is depicted in the Figure 3.

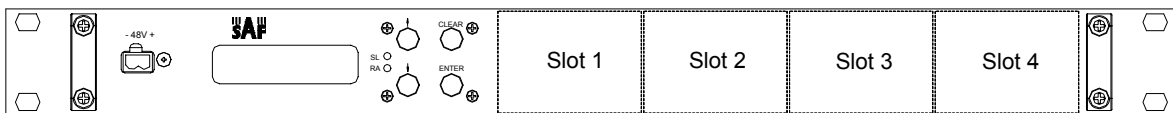


Figure 3. Numbering of multiplexer slots

The Multiplexer IDU provides:

- Interfaces:
 - Radio Unit (ODU), N-type Female connector;
 - The CFM-8-MUX and CFM-16-MUX IDUs provide 1 up to 4 different traffic interface ports for connection to data transmission equipment; the CFM-4-MUX IDU provides up to 2 different traffic interface ports;
 - RS-232 serial management port;
 - 10Base-T Ethernet management port;
- LCD display and corresponding keypad buttons to control LCD;
- Port activity LEDs;
- Power connector.

Table 1. Connectors

Port/connector	Front panel connectors
+48V (power socket)	Power connector, IDU should be powered from 20V – 60V DC 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.
	Rear panel connectors
RF (N-type connector)	N-type Female connector, the cable should be connected to the Radio Unit (ODU);
RS-232 (DB9 type connector)	RS232 management port for connection of ASCII console (or analog line modem for the remote connection of ASCII console). This port is also used to update management software.
Ethernet (RJ-45 socket)	10Base-T Ethernet management port (RJ-45 socket), - for Web or Telnet terminal.

Table 2. Front panel LEDs

Label	Color	Description
RA	Red	<p>Radio Alarm LED indicates problems with radio unit.</p> <p>The following problems cause the Radio Alarm to turn on:</p> <ul style="list-style-type: none"> - Rx signal level is lower the predefined value, - the corresponding parameter is RxAlarmLev on the LCD or RxAlarmLevel using Telnet/ASCII console. The default value for this parameter is -77 dBm; - The humidity within the radio is too high (possibly ODU is opened); - Transmitter malfunction (TxOut=Error) - RF Cable=Short - cable is faulty, RF Cable=Off - cable or Radio is faulty; <p>If not lit - operating properly (Rx=OK & TxOut=OK & Humidity=Low & RF Cable - OK & TxPLL=OK & RxPLL=OK).</p> <p>Note: the RA LED will also switch on if the Radio loopback is active and/or if the transmitter power is switched off.</p> <p>The RA LED is updated one time per second.</p>
SL	Red	<p>Red Signal Lost LED indicates the loss of E2 Multiplexer synchronization; If not lit - operating properly;</p> <p>The SL LED is updated one time per second.</p>
<p>Note: the rest of the front panel LEDs (if present) are located on interface modules and are described in section 3.1.3, page 15.</p>		

The rear side LEDs refer to the operation of Ethernet port on the management module board.

Table 3. Rear side 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;
<p>Note: A, B, and C correspondence to LEDs is shown in the figure below.</p>	

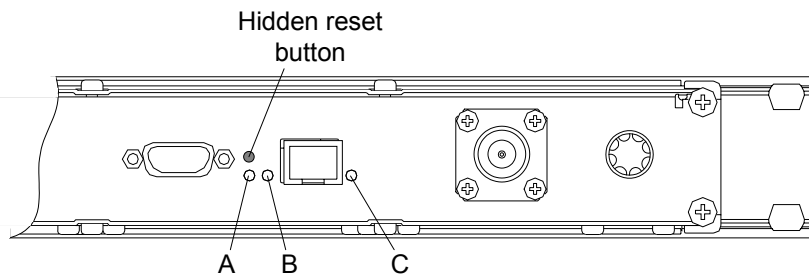


Figure 4. Rear panel LEDs

2.3 Interface Modules

2.3.1 V.35 Interface Module

The V.35 interface module is provided with M34 standard connector. The V.35 module terminates 2, 4, 6, or 8 Mbps from modular multiplexer (from modular Ethernet bridge multiplexer only 2 Mbps) and provides user selectable data rates of 64 kbps, 128 kbps, 256 kbps, 512 kbps, 1024 kbps, 2048 kbps, 4096 kbps, 6144 kbps or 8192 kbps to V.35 interface port with M.34 connector.

Note: the V.35 interface module should not be inserted in *slot 2* of the CFM-16-MUX IDU.

2.3.2 E1 Interface Module

The E1 interface module is a single port module provided with two types of interfaces:

- 120 Ω balanced interface, connector type: RJ-45;
- 75 Ω unbalanced interface, connector type: BNC, - requires a pair of coaxial cables with BNC type connectors.

Both interfaces are provided for termination of 2 Mbps (G.703) streams.

Table 4. E1 Interface module ports

Out, In	Two BNC connectors of the 75 Ω unbalanced port provide means to connect the customer equipment to the IDU; Tx data stream is transmitted over OUT (output) port; Rx data is to be received through IN (input) port.
RJ-45	RJ-45 connector for balanced 120 Ω E1 interface.

Note:

- use either IDU keypad or console to switch between BNC and RJ-45 ports, this is described in chapters 3.1.2 and 3.3.3 respectively.
- the E1 interface module should not be inserted in *slot 2* of the CFM-16-MUX IDU.

2.3.3 10Base-T REB Interface Module

The CFM series REB (Remote Ethernet Bridge) interface module contains a complete filtering Ethernet bridge. The REB module terminates any capacity of 2-4-6-8 Mbps from the multiplexer on a single 10 Mbps 10Base-T Ethernet port (UTP).

REB features:

- Automatic learning and aging,
- 256-frame buffer,
- 10 000 MAC address table,
- 15 000 frames per second filtering and forwarding rate.

The REB does not support auto-negotiation and does not support VLAN tagging.

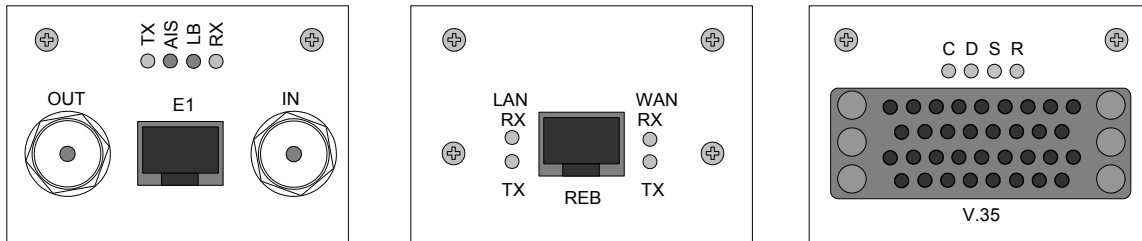


Figure 5. The front view of the interface modules: E1, REB, V.35

2.3.4 2-port 100Base-T REB Interface Module

The 2-port REB (Remote Ethernet Bridge) module is a high performance two port 10/100 Mbps Ethernet bridge with RJ-45 TP interfaces. Both TP interfaces have auto MDIX TX/RX swap function, and both ports support 10/100 Mbps Full/Half duplex modes with auto negotiation. The bridge supports 802.1Q VLAN packets.

The 2-port REB module is compatible with all CFM series Ethernet Bridge IDUs and 10Base-T REB Interface Module.

Features:

- 10M/100M Half/Full duplex auto-detect
- Store and forward architecture
- TP auto MDIX TX/RX swap
- 2048 MAC addresses table
- Aging function
- Supported packet length - up to 1522 bytes
- Supports 802.1Q VLAN

2.4 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 6. Labels of the CFM-8-MUX and the CFM-16-MUX IDU

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 each line.

LCD operates in two modes, "**Status display**" and "**Setup**", please refer to Flow Chart 1, page 43.

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 IDU 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 arrow buttons to scroll through parameters). These parameters are listed in the Table 5.

Table 5. 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, see Table 6 for details.
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 some internal fault in ODU receiver, please contact sales representative or manufacturer; "Loopback" indicates radio loopback mode: Rx = Tx frequency
RxLev= -66dBm	Parameter RxLev indicates the 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 Syntheser Loop (PLL lock): "Ok" indicates 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" indicated 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= 99	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 - OFF	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.
MUX 2M+2M+2M+2M	Indicates current MUX slot speed configuration.
UpTime=5371	Indicates the system up-time in seconds.
DownTime=4	Indicates the system down-time (SL alarm 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 IDU LCD Management Interface

The following table describes parameters available for change from IDU in **Setup** mode.

Algorithm of LCD operation is shown on Flow Chart 1, page 43.

Table 6

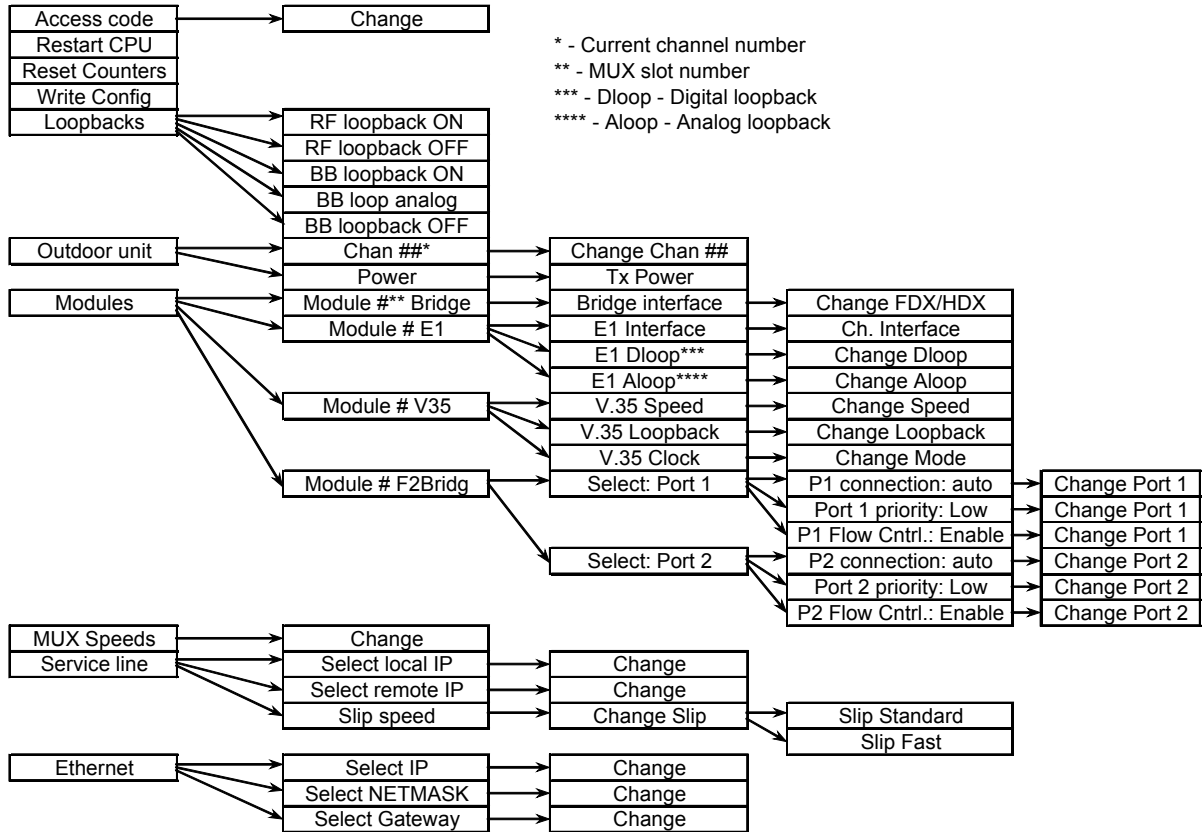
Parameter	Values and description
Change Chan # #	<p>"Change Chan" item provides ODU Tx and Rx frequency setup functionality:</p> <p>If this item is chosen LCD display shows, for example:</p> <pre>Change Chan 163 Tx=23583.000MHz</pre> <p>where "163" – number of currently used Tx channel and "Tx" - frequency 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. 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	<p>Sets the IP address of the serial port of service channel for the local IDU management module (near-end terminal), see section 0. Important!: Do not enter address "255.255.255.255"</p>
Select remote IP	<p>Sets the IP address of the serial port of service channel for the remote IDU management module (far-end terminal).</p>
Slip speed	<p>Sets the speed of the service channel, for more information see Chapter 3.3.3</p>
Write config	<p>Saves all settings in EPROM of management controller.</p>
RF loopback OFF	<p>Turns off the RF loopback (local), RF loopback ON turns the RF loopback on.</p>
BB loopback OFF	<p>Turns off the baseband loopback (any), BB loopback ON sets the digital baseband loopback, BB loop analog sets the analog loop.</p>
Restart CPU	<p>Reboots management controller (not the MUX) for the new IP settings to take effect. Resets all management counters.</p>

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<p>MUX speeds</p>	<p>Sets the data rate for each multiplexer slot; this option is available for the CFM-8-MUX and the CFM-16-MUX only. The CFM-4-MUX provides two module slots with fixed 2 Mbps capacity each, the speed of these two slots are not configurable. The slot speed configurations for 8 Mbps Multiplexer IDU are given in the following table:</p> <table border="1" data-bbox="597 401 1398 583"> <thead> <tr> <th>Designation</th> <th>Slot 1</th> <th>Slot 2</th> <th>Slot 3</th> <th>Slot 4</th> </tr> </thead> <tbody> <tr> <td>8M+0M+0M+0M</td> <td>8 Mbps</td> <td>0 Mbps</td> <td>0 Mbps</td> <td>0 Mbps</td> </tr> <tr> <td>6M+0M+0M+2M</td> <td>6 Mbps</td> <td>0 Mbps</td> <td>0 Mbps</td> <td>2 Mbps</td> </tr> <tr> <td>4M+0M+2M+2M</td> <td>4 Mbps</td> <td>0 Mbps</td> <td>2 Mbps</td> <td>2 Mbps</td> </tr> <tr> <td>2M+2M+2M+2M</td> <td>2 Mbps</td> <td>2 Mbps</td> <td>2 Mbps</td> <td>2 Mbps</td> </tr> </tbody> </table> <p>The numbering of slots is shown in the Chapter 2.</p> <p>The slot speed configurations for 16 Mbps Multiplexer IDU are given in the following table:</p> <table border="1" data-bbox="597 695 1398 877"> <thead> <tr> <th>Designation</th> <th>Slot 1</th> <th>Slot 2*</th> <th>Slot 3</th> <th>Slot 4</th> </tr> </thead> <tbody> <tr> <td>2M+8M+2M+2M</td> <td>2 Mbps</td> <td>8 Mbps</td> <td>2 Mbps</td> <td>2 Mbps</td> </tr> <tr> <td>4M+8M+2M+2M</td> <td>4 Mbps</td> <td>8 Mbps</td> <td>2 Mbps</td> <td>2 Mbps</td> </tr> <tr> <td>6M+8M+0M+2M</td> <td>6 Mbps</td> <td>8 Mbps</td> <td>0 Mbps</td> <td>2 Mbps</td> </tr> <tr> <td>8M+8M+0M+0M</td> <td>8 Mbps</td> <td>8 Mbps</td> <td>0 Mbps</td> <td>0 Mbps</td> </tr> </tbody> </table> <p>* - Slot 2 has fixed capacity of 8 Mbps</p>	Designation	Slot 1	Slot 2	Slot 3	Slot 4	8M+0M+0M+0M	8 Mbps	0 Mbps	0 Mbps	0 Mbps	6M+0M+0M+2M	6 Mbps	0 Mbps	0 Mbps	2 Mbps	4M+0M+2M+2M	4 Mbps	0 Mbps	2 Mbps	2 Mbps	2M+2M+2M+2M	2 Mbps	2 Mbps	2 Mbps	2 Mbps	Designation	Slot 1	Slot 2*	Slot 3	Slot 4	2M+8M+2M+2M	2 Mbps	8 Mbps	2 Mbps	2 Mbps	4M+8M+2M+2M	4 Mbps	8 Mbps	2 Mbps	2 Mbps	6M+8M+0M+2M	6 Mbps	8 Mbps	0 Mbps	2 Mbps	8M+8M+0M+0M	8 Mbps	8 Mbps	0 Mbps	0 Mbps
Designation	Slot 1	Slot 2	Slot 3	Slot 4																																															
8M+0M+0M+0M	8 Mbps	0 Mbps	0 Mbps	0 Mbps																																															
6M+0M+0M+2M	6 Mbps	0 Mbps	0 Mbps	2 Mbps																																															
4M+0M+2M+2M	4 Mbps	0 Mbps	2 Mbps	2 Mbps																																															
2M+2M+2M+2M	2 Mbps	2 Mbps	2 Mbps	2 Mbps																																															
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4M+8M+2M+2M	4 Mbps	8 Mbps	2 Mbps	2 Mbps																																															
6M+8M+0M+2M	6 Mbps	8 Mbps	0 Mbps	2 Mbps																																															
8M+8M+0M+0M	8 Mbps	8 Mbps	0 Mbps	0 Mbps																																															
<p>Modules</p>	<p>This item contains all the commands for configuration of the installed modules. See <i>Setup Mode Menu Tree</i> below for all commands available from "Modules" menu.</p> <p><i>Notes:</i></p> <p><i>E1 interface</i> – switch between 120 Ω and 75 Ω port of the E1 module;</p> <p><i>V.35 clock</i> – invert the RxC signal. For more information refer to <i>V.35 Interface Module Installation and Configuration Guide</i>.</p>																																																		
<p>Select IP</p>	<p>Default value - 192.168.205.010 or 192.168.206.010</p>																																																		
<p>Select NETMASK</p>	<p>Default value - 255.255.255.000 Important!: Do not enter address "255.255.255.255"</p>																																																		
<p>Select Gateway</p>	<p>Default value - 255.255.255.255 (No gateway specified)</p>																																																		
	<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>																																																		
<p>Access Code</p>	<p>Specify the panel access code (a number from 0 – 200) to enable any adjustments from IDU.</p>																																																		
<p>Reset counters</p>	<p>Reset up-time and down-time counters, see page 34 for details.</p>																																																		

Setup mode menu tree



3.1.3 Interface Module LEDs

V.35 Interface Module LEDs

There are four LEDs on V.35 module, see Table 7 for information how to read them.

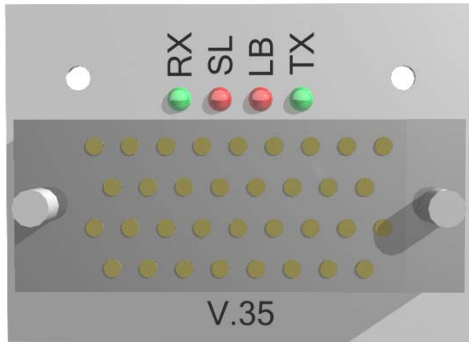


Table 7. V.35 interface module LEDs

LED	Color	Name	Function	Direction
TX	Green	Data Transmitting Active	Data activity - data is being transferred from module's front port to multiplexer.	V.35 → MUX*
SL	Red	Signal Loss	V.35 port failure.	
LB	Red	Loopback Active	Loopback on V.35 module is switched on, informing that the connection between V.35 port and MUX is interrupted.	Dual, - there are actually two loopbacks active, please refer to chapter 5.5. for information about V.35 module loopbacks.
RX	Green	Data Receiving Active	Data activity - data is being received from multiplexer and transmitted to module front port	MUX → V.35*

* - both TX and RX LEDs will flash simultaneously while the V.35 module loopback is switched on.

E1 Interface Module LEDs

Label	Color	Description
Tx	Green	Steady green light indicates the E1 module is ready to transmit data to the user equipment (DTE – Data Terminal Equipment) connected to E1 port. Normally Tx LED is switched on all the time. 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 that E1 port receives data from DTE.
AIS	Red	Steady red light indicates that E1 port receives AIS (Alarm Indication Signal) from DTE.
LB	Red	“LoopBack” LED (red) indicates loopback mode is activated in the module.

10Base-T REB Interface Module LEDs

There are two groups of LEDs on the front of the module:

- LRx, LTx
- WRx, WTx

WRx and WTx LEDs:

- **Flickering green WTx** LED indicates that data is being transmitted to WAN,
- **Flickering green WRx** LED indicates that data is being received from WAN.

LRx and LTx LEDs:

- **Switched off LRx** LED indicates that Ethernet link is ok, no data is being received from LAN,
- **Steady green LRx** LED indicates that data is being received from LAN,
- **Steady red LRx** LED indicates that Ethernet link is lost on LAN side,
- **Switched off LTx** LED indicates that no data is being transmitted to LAN,
- **Flash of orange LTx** LED indicates LAN collision in case if Ethernet port of the REB module operates in Half Duplex mode,
- **Flickering green LTx** LED indicates that data is being transmitted to LAN.

2-port 100Base-T REB Interface Module LEDs

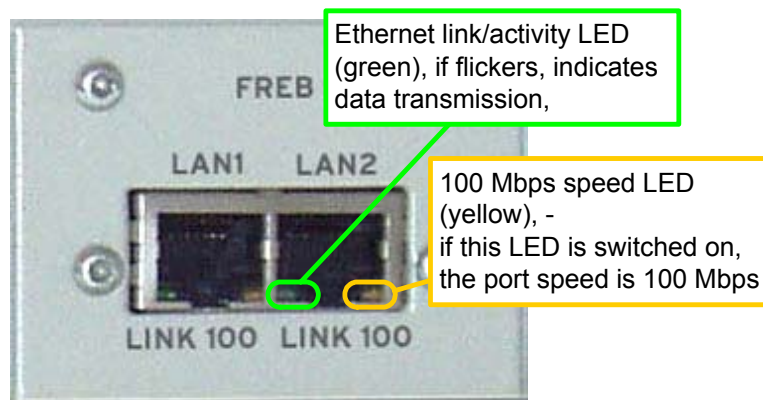


Figure 7. 2-port 100Base-T module LEDs

3.1.4 Reset functions

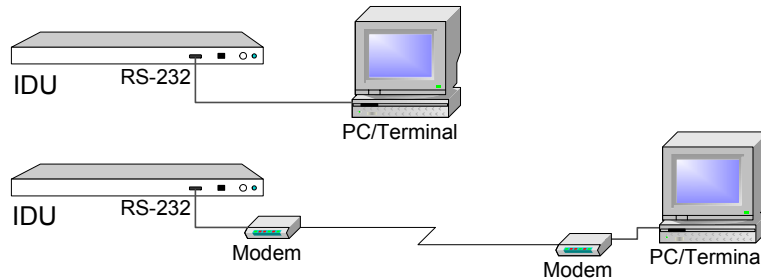
Depending on the method used, the user may reset the whole terminal (IDU+ODU) or the management controller individually, see table below for details.

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 4)	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.

3.2 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/ASCII interfaces (refer to paragraph *Command Line Interface*).



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

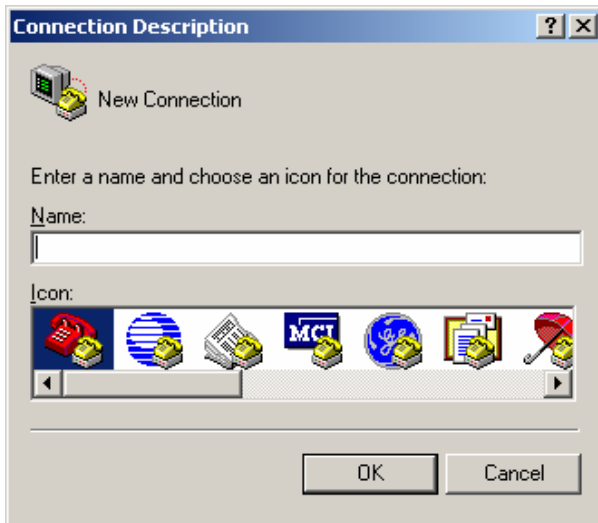
The modem configuration then should be saved (typically with AT&W string).

```
Telnet - 192.168.205.10
Connect Edit Terminal Help
SAF>mod 4 stat
Module U35 vers. 2
DSRi - ON
CTSi - ON
DCDi - ON
RTS - OFF
DTR - OFF
SCTE - OFF
TxD - OFF
RxD - ON
DSRo - ON
CTS0 - ON
DCD0 - ON
Local Loopback - OFF
Remote Loopback - OFF
TxC - Master
RxC phase - Normal
Speed 2048kb/s
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.

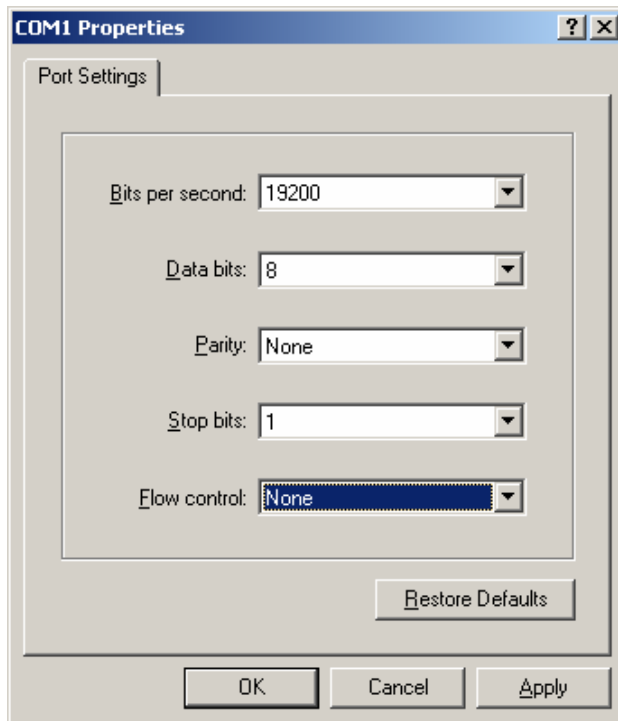
1. Connect PC to the RS232 serial port by means of "straight through" or modem serial cable (null-cable).
2. Run "Hyper Terminal" program.
3. Make a *New connection*, enter connection name.



4. Choose port (COM1 or COM2).

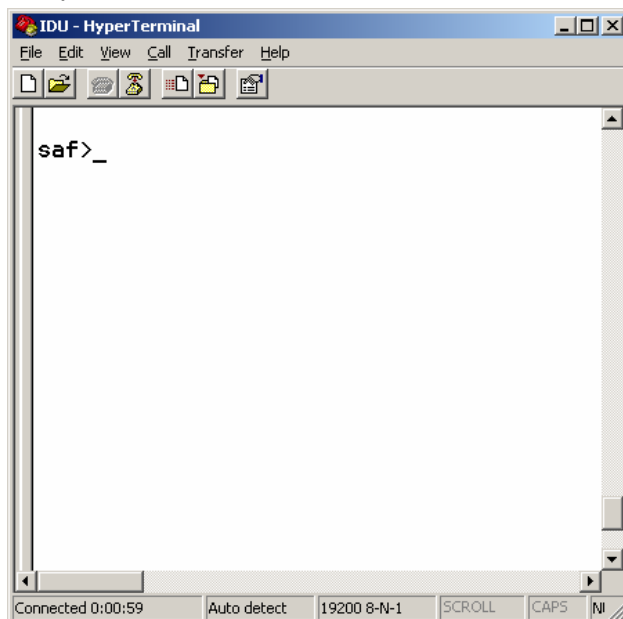


- Set port settings (bits per second: 19200, data bits: 8, parity: none, stop bits: 1, no data flow control).



- Press OK
- Press Enter. Password is disabled by default.

If successfully connected, the prompt should appear as in the picture below; see Chapter 3.3.3 for available commands.



3.3 Ethernet Port

The Ethernet management port of the CFM-8-MUX 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:

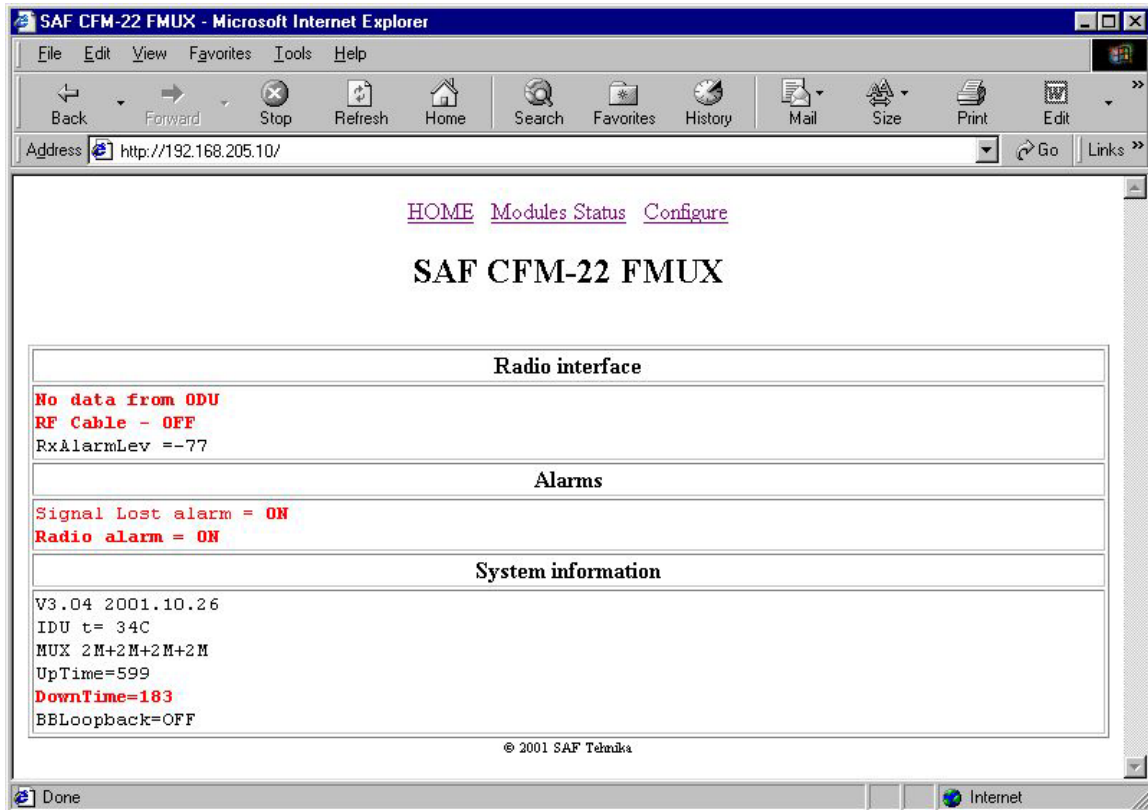
- To connect IDU to PC/Laptop to manage IDU;
- To LAN to constantly monitor IDU;
- To router or any other TCP/IP packet network termination unit to have IDU as part of network for management information.

3.3.1 Web Interface

The implementation of Web interface provides monitoring capabilities similar to ones available on LCD display, front panel LEDs and at Telnet/ASCII terminals, please refer to description of status parameters described in section 3.1.1, page 10 and front panel LEDs in Table 2, page 7.

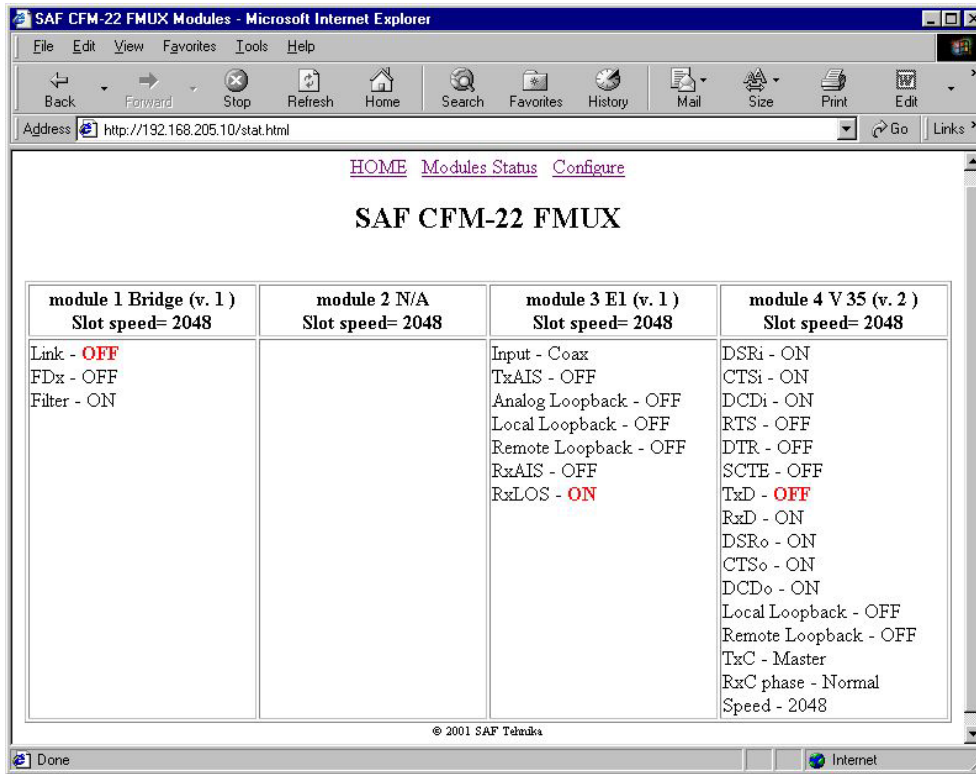
The Web interface functionality is available via the Ethernet management port only.

Web interface is accessible by any standards based Web browser.



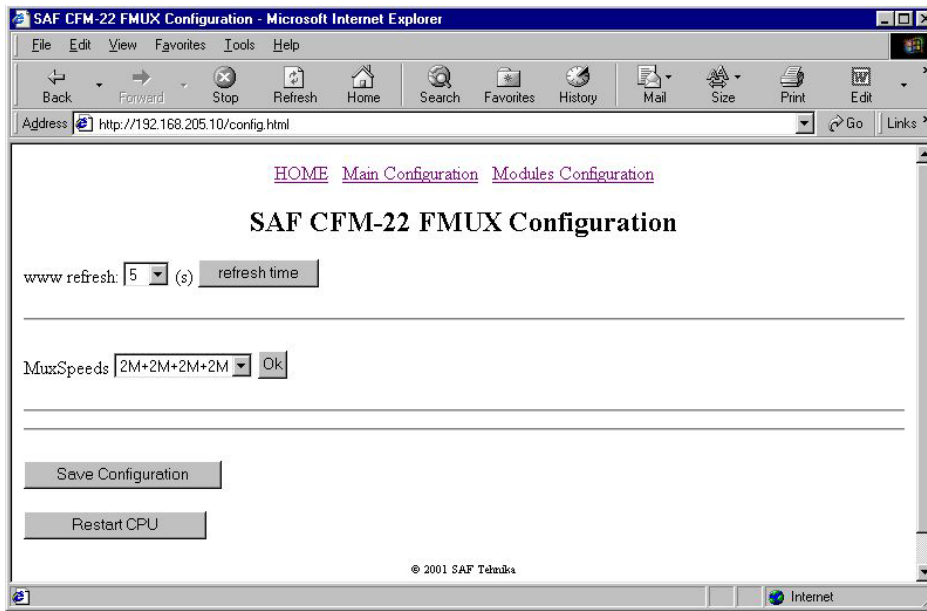
The CFM-8-MUX IDU Main Web management window: entries, which are highlighted in red, indicate that specific parameters do not comply with the norms of normal operation, all other parameters are satisfactory

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



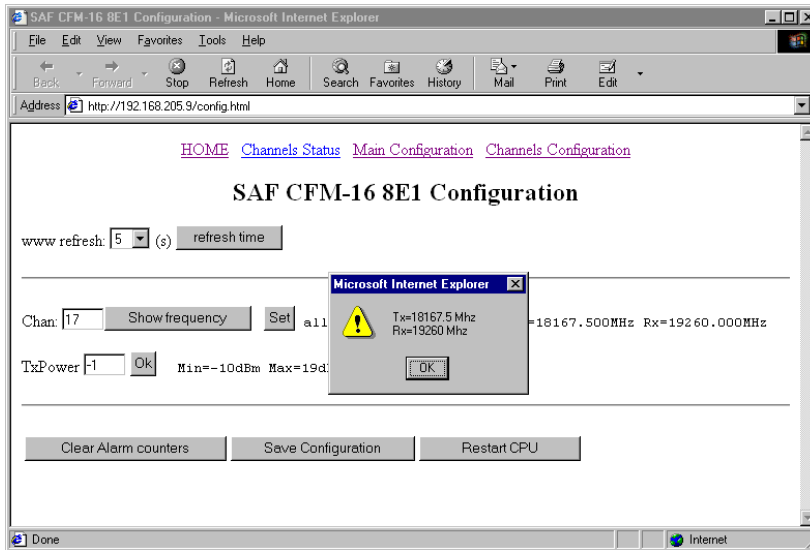
The CFM-8-MUX IDU Module Status Web management window

In order to save the configuration, change multiplexer slot speeds, restart the CPU or change the Web page refresh time, go to the *Main Configuration* window (see the Figure below). When clicked on the *Configure* link 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**.



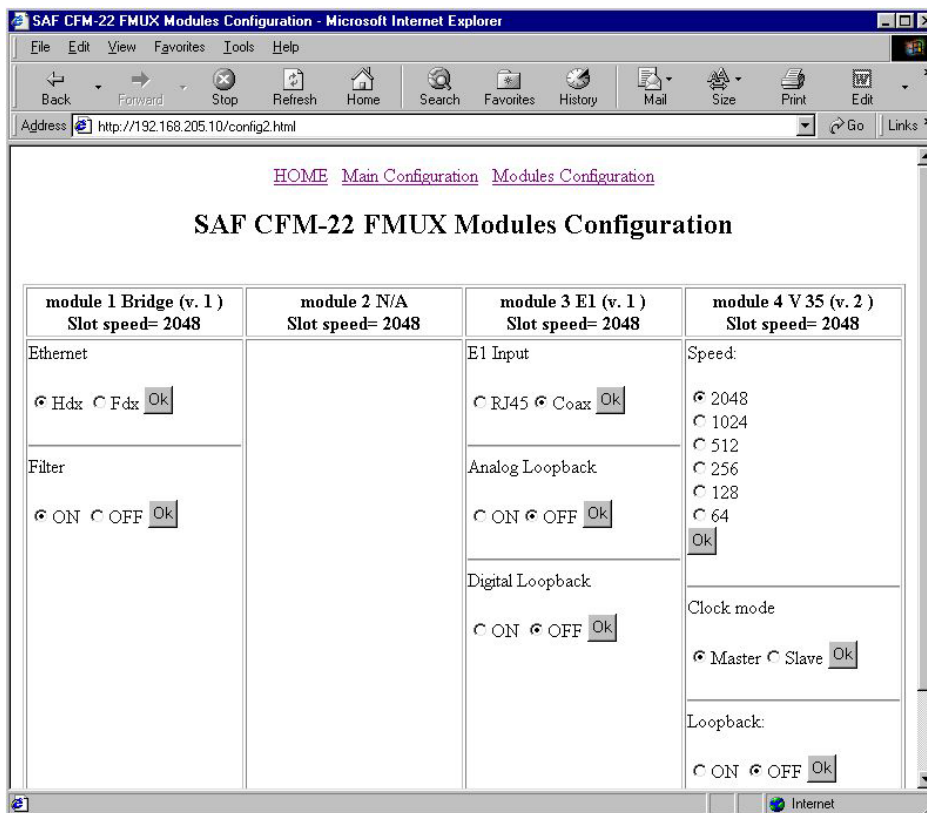
The CFM-8-MUX IDU Main Configuration Web management window (Radio parameter configuration is disabled)

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 CFM IDU Main Configuration Web management window extended with the Radio parameter configuration

To configure interface modules (speed, loopbacks, etc.) access the *Modules Configuration* window via *Modules Configuration* link.



The CFM-8-MUX IDU Module Configuration Web management window

3.3.2 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 *****
sysDescr.0 (octets) SAF SNMP and WWW management
sysObjectID.0 (oid) saf
sysUpTime.0 (timeticks) 0 days 00h:33m:34s.90th (201490)
productType.0 (int32) cfm-22(2)
productDescr.0 (octets) SAF CFM-22 FMUX
description.0 (octets) SAF 23GHz microwave radio
version.0 (octets) V2.16 2000.09.05
radioAlarm.0 (int32) on(1)
signalAlarm.0 (int32) none(0)
v_01.0 (octets) Tx=23362.5MHz
v_02.0 (octets) Rx=22354.5MHz
v_03.0 (octets) TxPower=+20dBm
v_04.0 (octets) Rx=OK
v_05.0 (octets) RxLev=-109dBm
v_06.0 (octets) Cable=- 26dB
v_07.0 (octets) TxOut=Ok
v_08.0 (octets) TxPLL=Ok
v_09.0 (octets) RxPLL=Ok
v_10.0 (octets) t= 23C
v_11.0 (octets) Humidity=Low
v_12.0 (octets) Restart= 99
v_13.0 (octets) IDU t= 27C
v_14.0 (octets) RF Cable - OFF
v_15.0 (octets) MUX 6M+0M+0M+2M
***** SNMP QUERY FINISHED *****
```

Sample of SNMP query of the CFM-8-MUX IDU unit

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)	The Sync Lost Alarm <i>none</i> – Off
rfOperation	Integer (32 bit)	none(0) booting(1) ok(2) testing(3) error(4) noDataFromODU(5)	Operational status of the Radio: <i>none</i> – not initialized <i>testing, error</i> – reserved <i>noDataFromODU</i> – no data is being received from ODU
rfAlarm	Integer (32 bit)	none(0) on(1)	Radio Alarm, <i>none</i> – off
rfVersion	String		Textual version of the Radio
rfSide	Integer (32 bit)	low(0) high(1)	Band side of the Radio: low or high
rfChannel	Integer (32 bit)		Channel number
rfTxFrequency	String		Tx frequency
rfRxFrequency	String		Rx frequency
rfTxPower	Integer (32 bit)		Transmitter power
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
m1Type		error(0) e1(33) v35(37) bridge(43) none(255)	Module type: <i>error</i> – internal fault <i>none</i> – no module installed or the module does not support data exchange with the management controller (e.g., due to the software)
m1Description	String		Description of the module
m1Version	String		Textual version of the module
m1Speed	Integer (32 bit)		Module data transfer speed in kbps
m1Operation	Integer (32 bit)	none(0) ok(2) loopback(4) illegalSpeed(5)	Operational status of the module: <i>none</i> – no data from the module <i>loopback</i> – loopback is switched on <i>illegalSpeed</i> – the speed configuration of the MUX slot does not mach the module speed
m1Rx	Integer (32 bit)	none(0) ok(1) noSignal(2) noLink(3) rxAIS(4)	Rx status of the module: <i>none</i> – not defined <i>noLink</i> – for the REB module only <i>rxAIS</i> – for the E1 module only

m1Tx	Integer (32 bit)	none(0) ok(1) noSignal(2) txAIS(4)	Tx status of the module: <i>none</i> – not defined <i>noSignal</i> – for V.35 module and REB module (same as no link or LOS alarm) <i>txAIS</i> – for E1 module only (usually switches on with the SL alarm)
m1Loopback	Integer (32 bit)	off(0) on(1) analog(2)	Loopback in the module
m1RxInput	Integer (32 bit)	other(0) coax(1) rj45(2) v35(3)	Rx input of the module: <i>other</i> – not initialised
m1TxMode	Integer (32 bit)	other(0) halfDuplex(1) fullDuplex(2)	Tx mode of the module (for the REB module only): <i>other</i> – not initialised
m1TxClockSource	Integer (32 bit)	other(0) master(1) slave(2)	Tx clock source of the module (for the V.35 module only): <i>other</i> – not initialised
m1TxClockPhase	Integer (32 bit)	other(0) normal(1) inverse(2)	Tx clock phase of the module (for the V.35 module only): <i>other</i> – not initialised
m1DataPolarity	Integer (32 bit)	other(0) normal(1) inverse(2)	Polarity of the data signal (for the V.35 module only) <i>other</i> – not initialised
Note: there are more variables with the "m2", "m3" and "m4" prefix in their names, they are analogical to those with the "m1" prefix; the "m1" denotes to the module in the slot 1, "m2" – module in the slot 2, etc.			

3.3.3 Command Line Interface for Telnet and 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 37.
Name <deviceName>	Assigns a name to the IDU; The default name is "SAF". Refer to section <i>IDU name</i> , page 36.
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, it is equal to 1 min. by default. Example: <i>Rfloop on 3</i>
Webrefresh <refreshperiod>	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 3.8. 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 34 for details.
Slip {slow fast}	Increases speed of the service channel between sites over the hop. This command is available for CFM-8-MUX and CFM-16-MUX IDUs only. The default setting is <i>slow</i> . Note: both IDUs on each site must be configured with the same service channel speed, otherwise service channel is not functioning. Also, if the service channel does not function properly when set to <i>fast</i> , revert to <i>slow</i> configuration.
Disable {telnet www snmp rip slip}	"telnet" – Disable Telnet interface "www" – Disable Web interface "snmp" – Disable SNMP interface "rip" – Disable RIP "slip" – Disable SLIP, this will disable the service channel; Notes: - 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 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 security parameters	
Command	Description
Enable password <password>	Specify a password to prevent unauthorized access to the ASCII console (connected through RS232 serial port). Refer to section <i>Security commands</i> , page 36.
Panel access <accesscode>	Specify a password to prevent unauthorized configuration from 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 IDU parameters	
Command	Description
RestartCPU	Restart CPU of the management controller for the new IP settings to take effect. Resets all management counters.
Muxspeeds {2M+2M+2M+2M 4M+0M+2M+2M 6M+0M+0M+2M 8M+0M+0M+0M}	Set the speeds of the appropriate Mux slots, four configurations are available. This command is available for the CFM-8-MUX and CFM-16-MUX IDUs only.
Mod {1 2 3 4} stat	Displays input/output status and configuration of ports for the specified module. Example for E1 interface module: SAF>mod 1 stat Module E1 vers. 2 E1 impedance 120 TxAIS OFF Enable Analog Loopback OFF Enable Local Loopback OFF Enable Remote Loopback OFF RxAIS OFF RxLOS OFF Example for REB interface module: SAF>mod 4 stat Module Bridge vers. 1 Link ON FDX ON Filter ON

Mod {1 2 3 4} detect	Detect and show current settings, - displays a list of settings of the respective interface module. The detection procedure is carried out each time when IDU is started up. This command is for diagnostic purposes only.
Mod dump	Show a list of modules and contents of their respective CPU registers (in hexadecimal system). This command is for diagnostic purposes only. Example: SAF>mod dump 21, 02, CD, FF, 00, 00, 00, 00, 78, 00, 00, FF, 00, 01, 77, 03, 25, 01, E0, E4, E4, FF, 08, FF, FF, FF, FF, FF, FF, FF, FF, 25, 02, E7, E6, E7, FF, 81, FF, FF, FF, FF, FF, FF, FF, FF, 2B, 01, 00, E0, FF, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00,
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 to the service channel (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 192.168.205.010 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 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).

Configuring E1 Interface Module parameters	
Command	Description
Mod {1 2 3 4} setE1 {Aloop Dloop Remote Off}	Set the analog or digital loopback in the module (<i>Aloop</i> - analog loopback; <i>Dloop</i> - digital loopback, <i>off</i> - disable current E1 module loopback). Example: Mod 3 setE1 Dloop
Mod {1 2 3 4} setE1 {120 75}	Set the impedance of E1 interface, 120 Ω or 75 Ω.
Mod {1 2 3 4} setE1 TxAIS {on off}	Enable/Disable the transmission of AIS signal (for testing purposes).

Configuring V.35 Interface Module parameters	
Command	Description
Mod {1 2 3 4} setV35 speed {64 128 256 512 1024 2048 4096 6144 8192}	Set the speed of V.35 interface (in kbps). The maximum V.35 interface speed in the CFM-4-MUX is 2048 kbps.
Mod {1 2 3 4} setV35 phase {normal inverse}	Invert the RxC clock signal (it is transmitted from V.35 module to user equipment)
Mod {1 2 3 4} setV35 polarity {normal inverse}	Invert the incoming and outgoing data signals (RxD – outgoing, TxD – incoming) between DCE (module) and DTE (user equipment).
Mod {1 2 3 4} setV35 loop {on off}	Set the loopback mode of V.35 interface module.
Mod {1 2 3 4} setV35 {Master Slave}	Set the sync status of V.35 interface module, ie. master or slave. Example: Mod 2 setV35 slave

Configuring REB Interface Module parameters	
Command	Description
Mod {1 2 3 4} setBridge {Hdx Fdx}	Set Ethernet LAN port mode, full duplex or half duplex. Example: Mod 3 setbridge fdx
Mod {1 2 3 4} setBridge filter {on off}	Switch on\off filtering mode for the bridge. By default filtering is switched on.

Configuring 2-port 100Base-T Ethernet Module parameters	
Command	Description
Mod {1 2 3 4} stat	<p>Displays bridge configuration, for example:</p> <pre>SAF>mod 1 stat Module Fast 2 Chan. Bridge vers. 2 Configuration Port 1 Speed: Auto Duplex: Auto Flow cntrl: Enabled Priority: Low Port 2 Speed: Auto Duplex: Auto Flow cntrl: Enabled Priority: Low Actual status Port 1 Link: Off Speed: 10Mb Duplex: Half Flow cntrl: On Port 2 Link: Off Speed: 10Mb Duplex: Half Flow cntrl: On</pre>
Mod {1 2 3 4} statistics	<p>Displays bridge port statistics, for example:</p> <pre>SAF>mod 1 statistics Module Fast 2 Chan. Bridge vers. 2 Statistics for last 1846 (sec.) Port 1 received packets: 0 Port 1 received bytes: 0 Port 1 transmitted packets: 0 Port 1 transmitted bytes: 0 Port 1 errors: 0 Port 1 collisions: 0 Port 2 received packets: 0 Port 2 received bytes: 0 Port 2 transmitted packets: 0 Port 2 transmitted bytes: 0 Port 2 errors: 0 Port 2 collisions: 0 WAN received packets: 0 WAN received bytes: 0 WAN transmitted packets: 0 WAN transmitted bytes: 0 WAN errors: 0</pre>
Mod {1 2 3 4} resetf2bridge	Clears port statistics for both ports.
Mod {1 2 3 4} setf2bridge {port1 port2} connection {auto 10fdx 10hdx 100fdx 100hdx}	<p>Configure port speed, example:</p> <pre>Mod 1 setf2bridge port2 connection 100fdx</pre> <p>Default value is <i>auto</i>.</p>
Mod {1 2 3 4} setf2bridge {port1 port2} priority {low high}	Configure port priority.
Mod {1 2 3 4} setf2bridge {port1 port2} flowcntrl {enable disable}	Enable or disable flow control for the specified port. This setting is applicable only for port(s) operating in full duplex mode.

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 in EPROM the current script as well as settings that are specified in it.
Cfg factory yes	<p>Reset the configuration by loading the script with default settings. This command performs the following actions (in the following order):</p> <ol style="list-style-type: none"> clears the current script from EEPROM, 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 3.8) restarts the management controller
<p>Syntactic notes:</p> <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 EEPROM 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 (script) in EPROM, the original configuration will be 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: muxspeeds 2M+2M+2M+2M
05: snmp community read safpub
06: snmp trap 255.255.255.255
07: 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 has a system up-time and down-time timer functionality built in. The down-time counter counts the seconds when the *Signal Lost* alarm is on whereas the up-time counter returns the system up-time (in seconds). These counters are resetted using **clear counters** command from Telnet/ASCII terminal 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 resetted using **restartWDT** command which breaks off check words to WDT thus causing the management system to restart. The watchdog timer can be turned off using **disableWDT** command (from Telnet or ASCII terminal) and can be turned on only by restarting the MUX and management module using hidden reset button or unplugging power (refer to 0).

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/ASCII terminal management windows, 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"*. The default name is "SAF".

Security commands

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

- Username (login): 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 "Setup" Mode of IDU LCD Management Interface). 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 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 terminal.

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

3.4 Configuring Management Service Channel

The CFM Multiplexer IDUs feature new SLIP-based service channel which offers much greater data rates in order to increase performance of the remote management. To maintain the compatibility with the previous modular multiplexer IDUs, the service channel can be switched to the previous version.

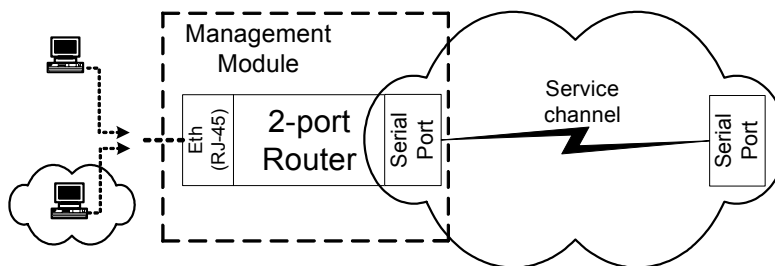
Before using the Management Service Channel, the mandatory precondition is to properly configure the following parameters:

- 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(s) should be added.

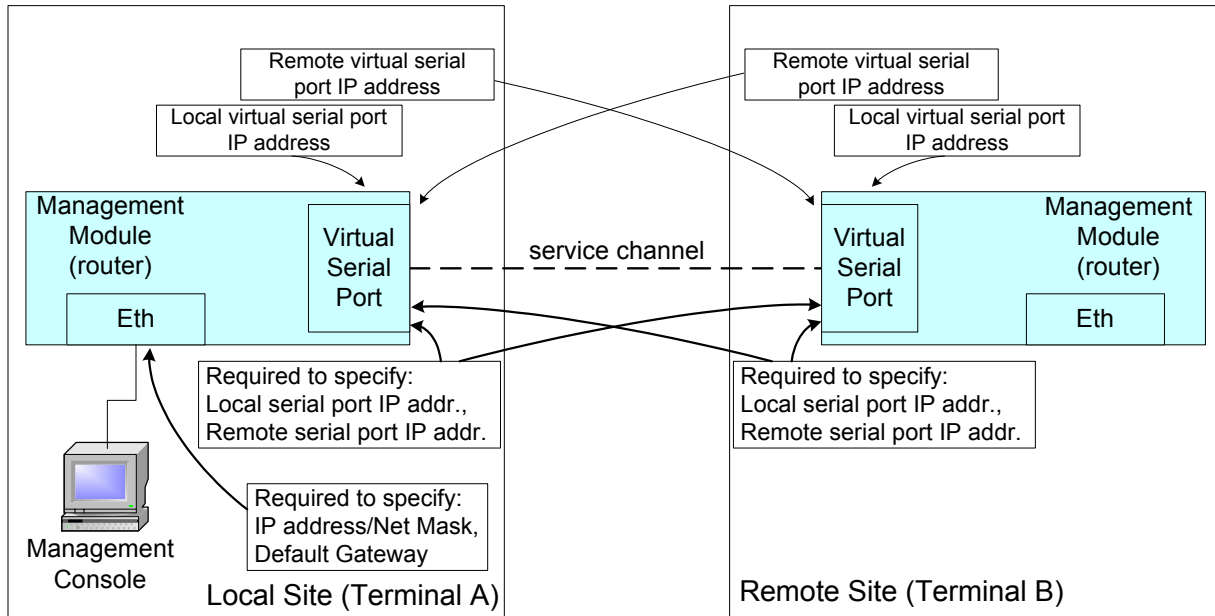
The routing requires determining IP addresses of service channels (virtual serial port IP addresses). Since the Management Module operates as a router between two subnets running the RIP 2, normally it is not necessary to configure the routing by adding static routes.

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

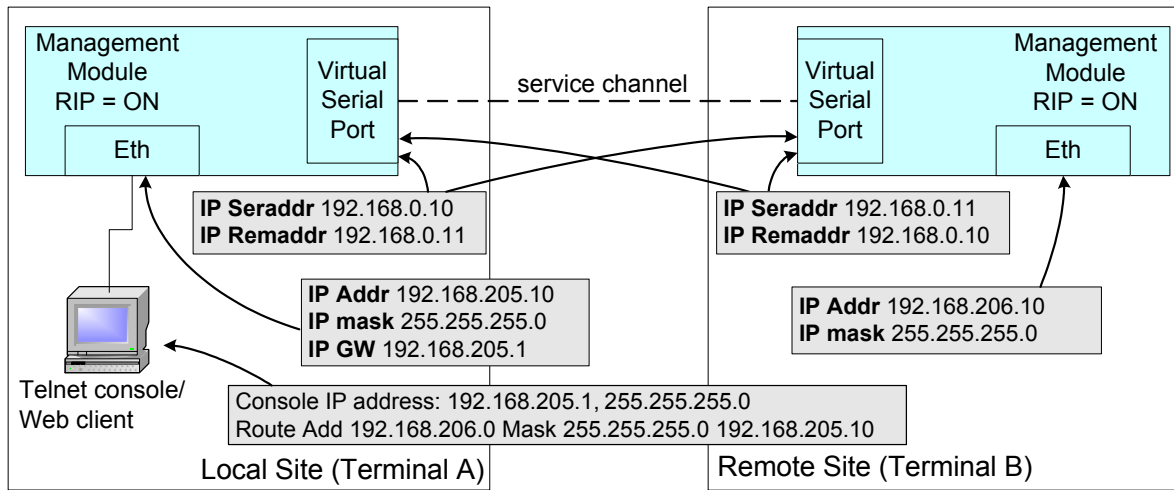


Figure 8

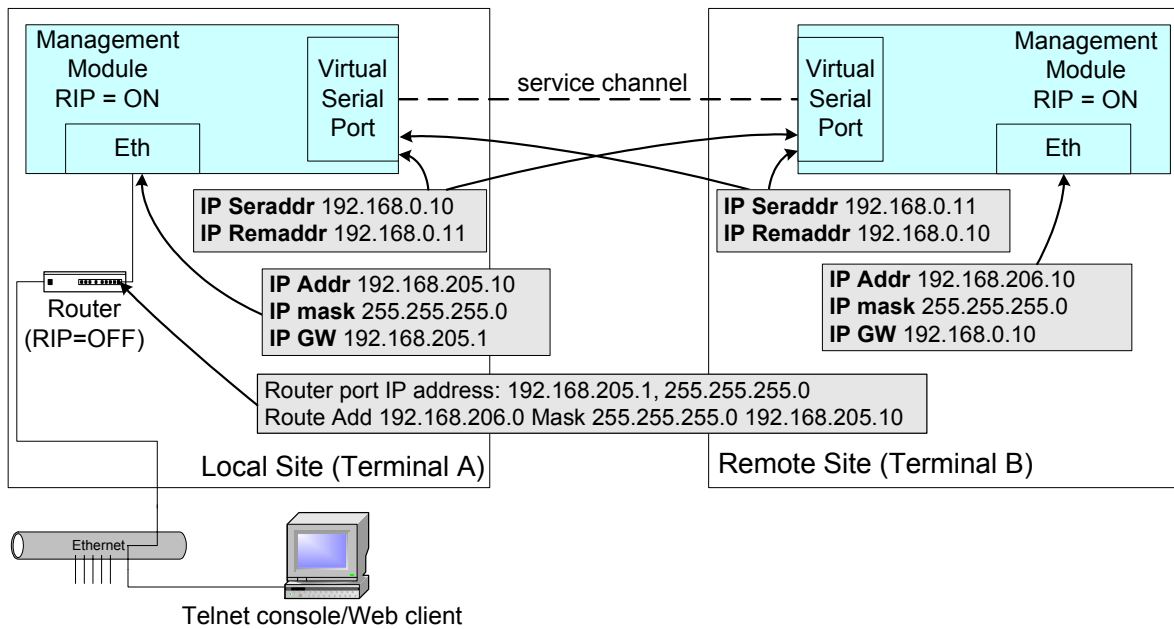


Figure 9

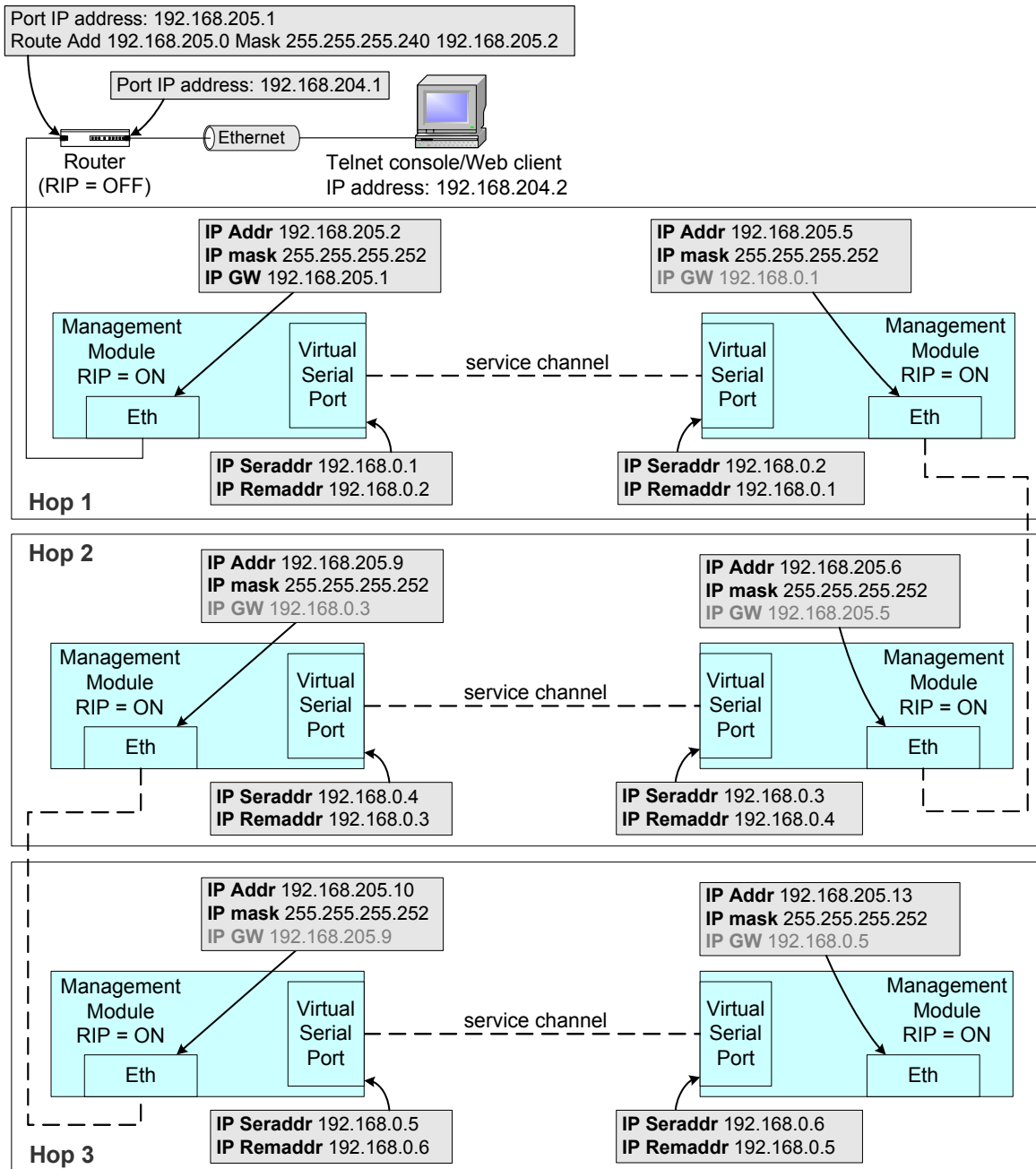


Figure 10. The IP configuration of the management channel via three hops with the RIP II switched on in each IDU; since the management controllers are running RIP II, there is no necessary to specify gateway (see configuration strings in grey)

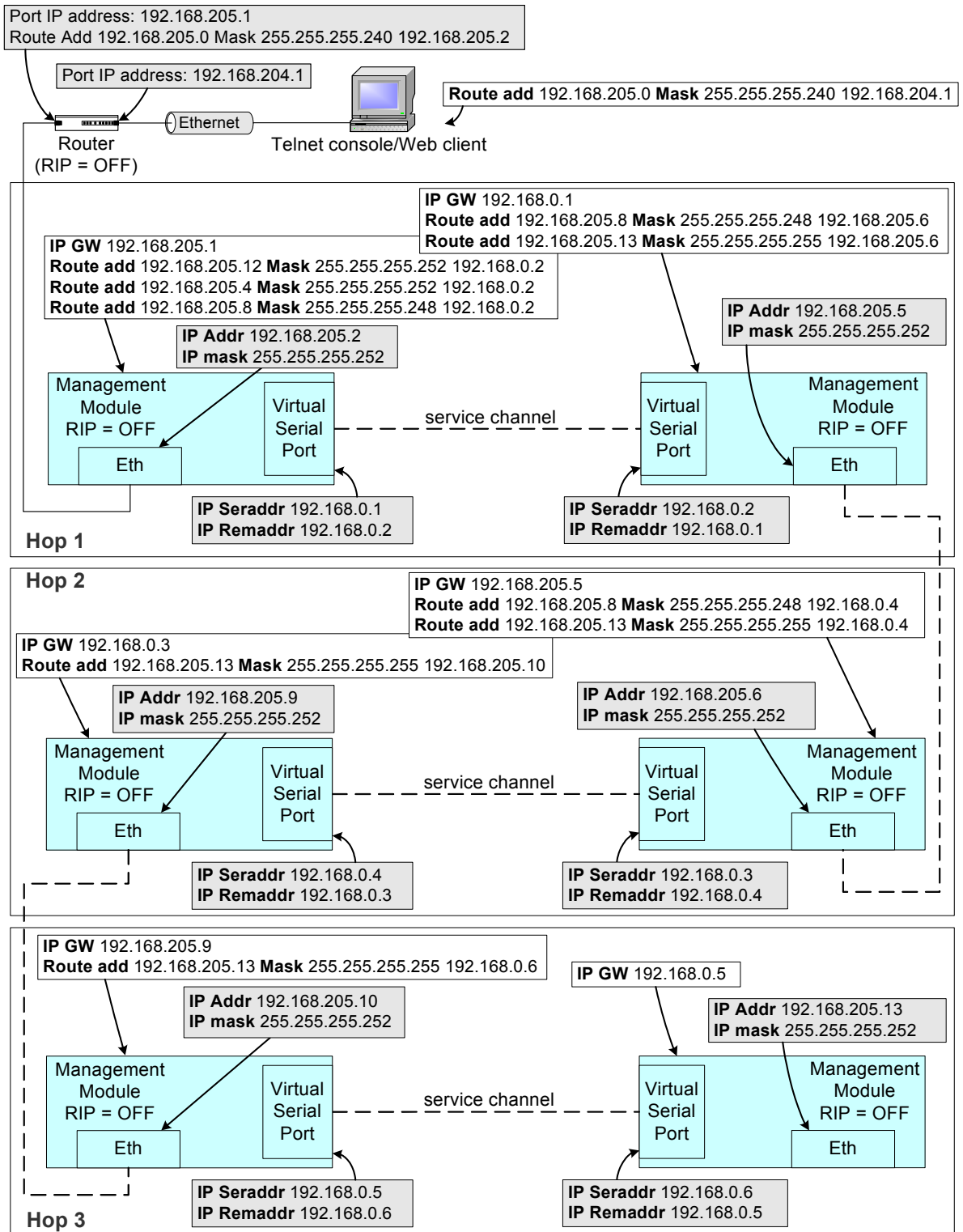
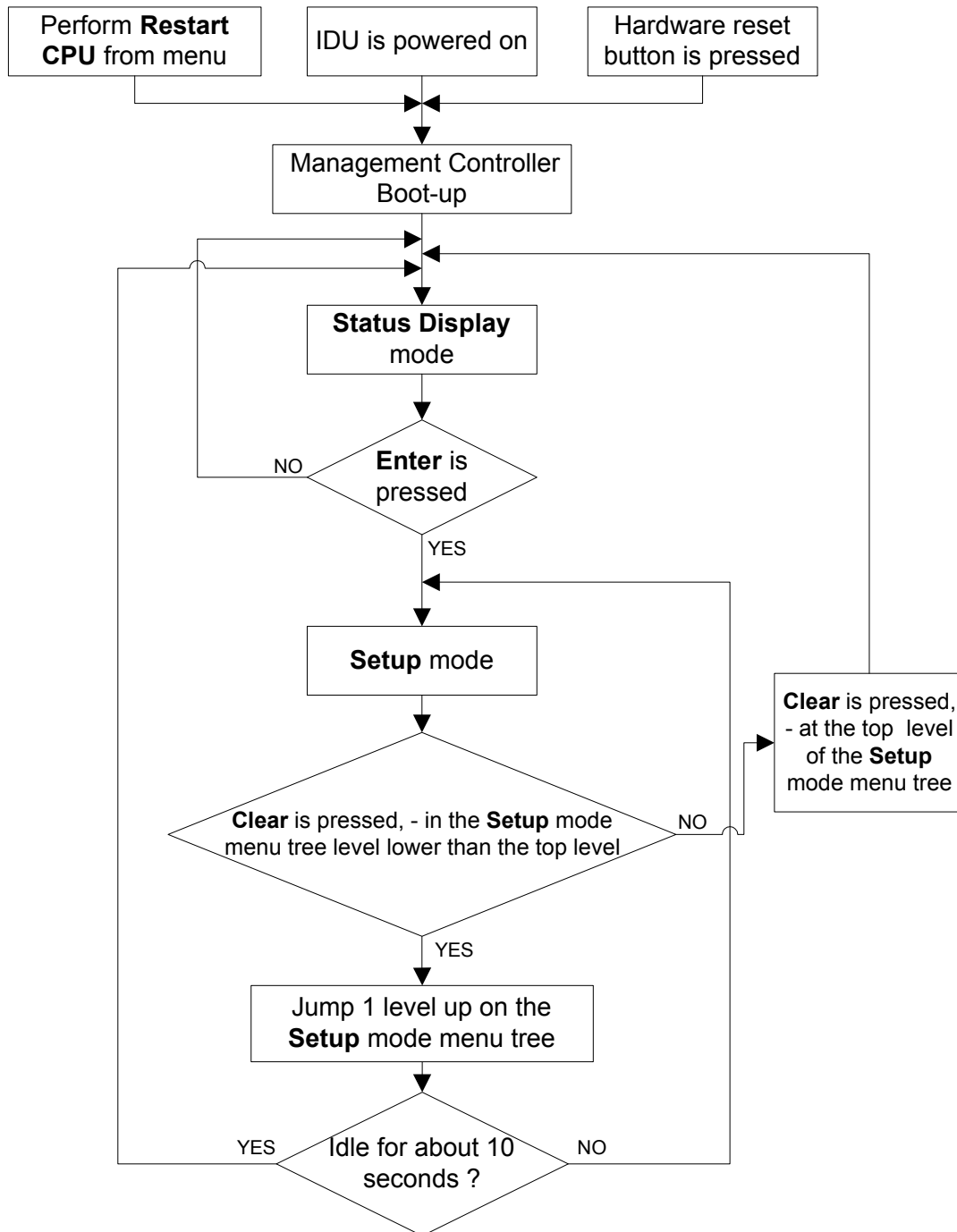


Figure 11. The IP configuration of the management channel via three hops with the RIP II switched off in each IDU; for proper routing between IDU management modules, the default gateway and static routes must be set for each module

3.5 Algorithm of LCD Operation



Flow Chart 1. LCD operation

3.6 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.

3.7 Updating Management Software

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

Upload functionality is provided via management controller software monitor function and is available on 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".

3.8 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	For CFM-8-MUX: -77 dBm; for CFM-16-MUX: -74 dBm
Fdx/Hdx port mode for Ethernet bridges (for Ethernet and Fast Ethernet bridge IDUs only)	Bridge	Bridge Ethernet	Hdx
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 ODU Settings

The Outdoor 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 ASCII or Telnet management 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

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*).

To avoid possible interference with other radio equipment, the default setting is "OFF".

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

Loopback tests are accessible using local or remote management methods.

All baseband and RF loopbacks (local and remote) for safety purposes can be set on a fixed time interval only.

5.1 Setting Loop Tests from IDU LCD/Keypad

From the IDU LCD all loop tests are set on 1 minute time interval.

- **Baseband loopback:**
From status display mode do the following: Press "ENTER" to enter setup mode → select "Loopbacks" → select "BBloopback ON" to set the digital baseband loops or "BBloop analog" to set the analog baseband loop → select "Yes".
- **RF loopback:**
From status display mode do the following: Press "ENTER" to enter setup mode → select "Loopbacks" → select "RFloopback ON" → select "Yes".
- **V.35 interface loopback:**
From *status display mode* do the following: Press "ENTER" to enter setup mode → select "Modules" → select "Module # V35" → select "V.35 Loopback" → "Change Loopback", switch over to ON and confirm.
- **E1 interface loopback:**
From *status display mode* do the following: Press "ENTER" to enter setup mode → select "Modules" → select "Module # E1" → select "E1 Aloop" for analog loopback (non-dual) or "E1 Dloop" for digital loopback → "Change", switch over to ON and confirm.
- **REB interface loopback:** not available.

5.2 Setting Loop Tests from Telnet/ASCII terminal

From the remote management terminal, the loopbacks can be activated using the following commands:

- **V.35 interface module loopback:**
Use command "Mod # setV35 loop {on|off}", # - MUX slot number
Example: `mod 3 setv35 loop on` (see also syntax notes on page 34).
- **E1 interface module loopback:**
"Mod # setE1 {Aloop|Dloop}", if argument is *Aloop* analog loopback is activated, whereas *Dloop* activates digital loopback (for details refer to Chapter 5.6), # - MUX slot number.
- **Baseband loopback:**
"BBloop {on|analog|off} [duration]". Duration is set in minutes as values from 1 to 10. If duration is not specified the loopback will be set on 1 minute. There are two baseband loop tests available:
 - Analog: if setting analog loopback, use "bbloop analog" command, analog loopback is not dual.
 - Digital: if setting digital loopback, use "bbloop on" command, digital loopback is dual.
- **RF loopback:**
"RFloop {on|off} [duration]", *duration* = 1 min by default.

5.3 Radio loopback

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

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:

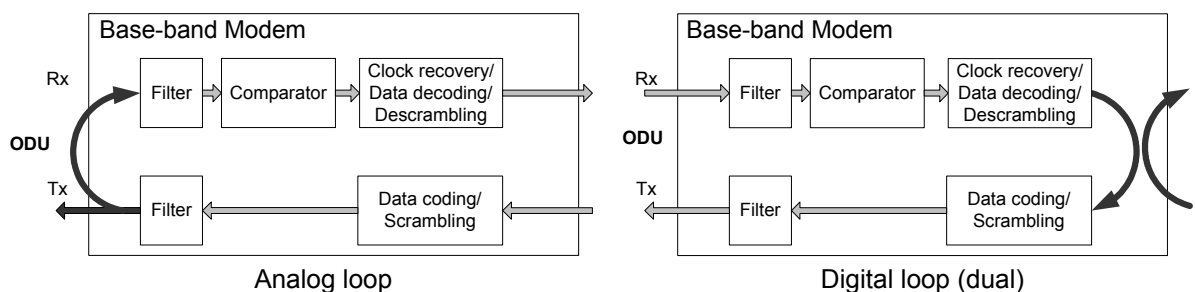
1. Because of the frequency characteristic of the duplexer filter, in order to set the radio loop, the ODUs operating in the Low band side must be switched to the highest available frequency channel, but the ODUs operating in the High band side must be switched to the lowest available frequency channel;
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.

5.4 Base-band loopbacks

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

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 (or Bridge board) 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.



5.5 V.35 Interface Module Loopback

The loopback mode of V.35 interface module is dual.

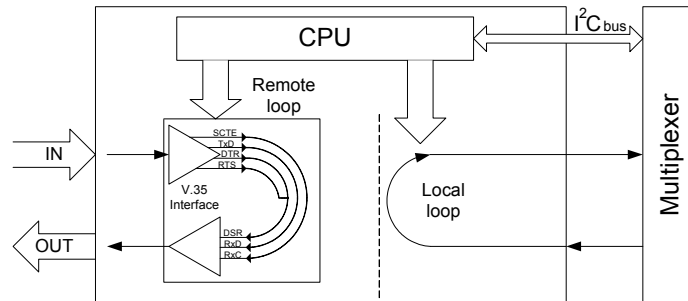


Figure 5.1. V.35 Interface Module Loopback

5.6 E1 Interface Module Loopbacks

The E1 interface module supports analog and digital loopback modes. Only one loopback can be active at a time for each E1 module.

The digital loopback mode is dual since there are two loops closed, remote and local (see figures below).

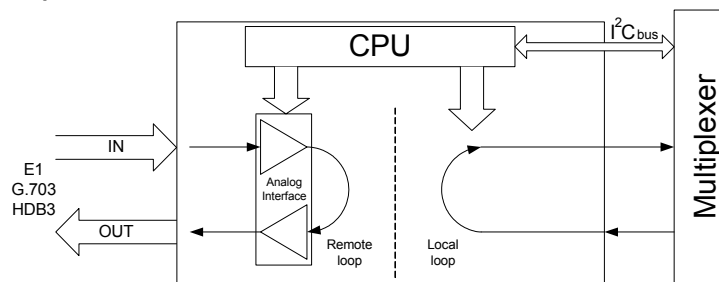


Figure 5.2. E1 Interface Module Digital loopback mode

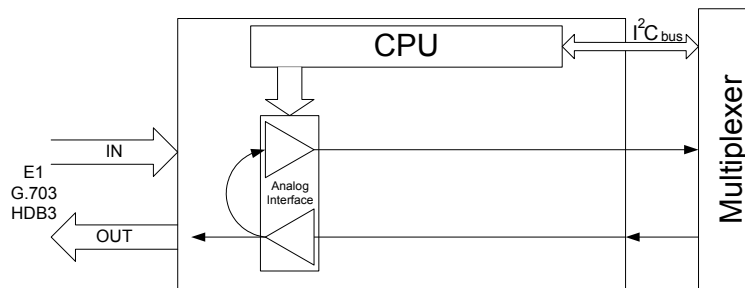
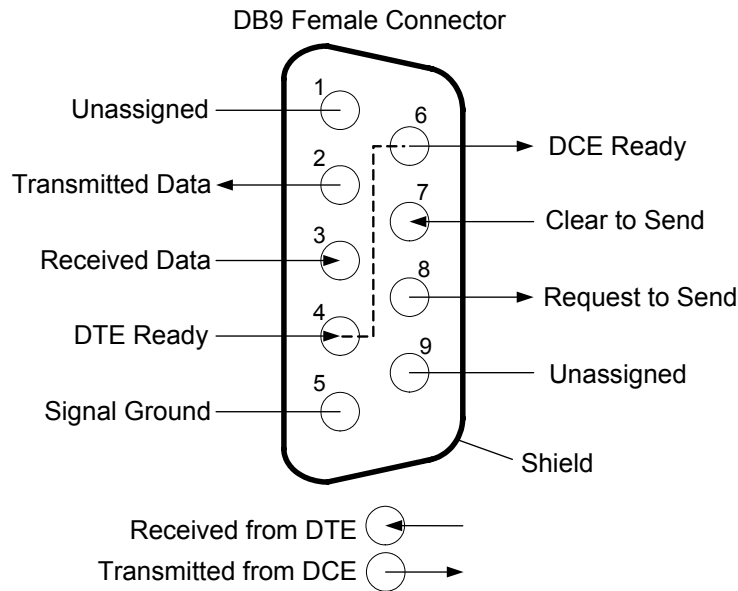


Figure 5.3. E1 Interface Module Analog loopback mode

6 Pinouts

RS-232 management port pinouts



Notes:

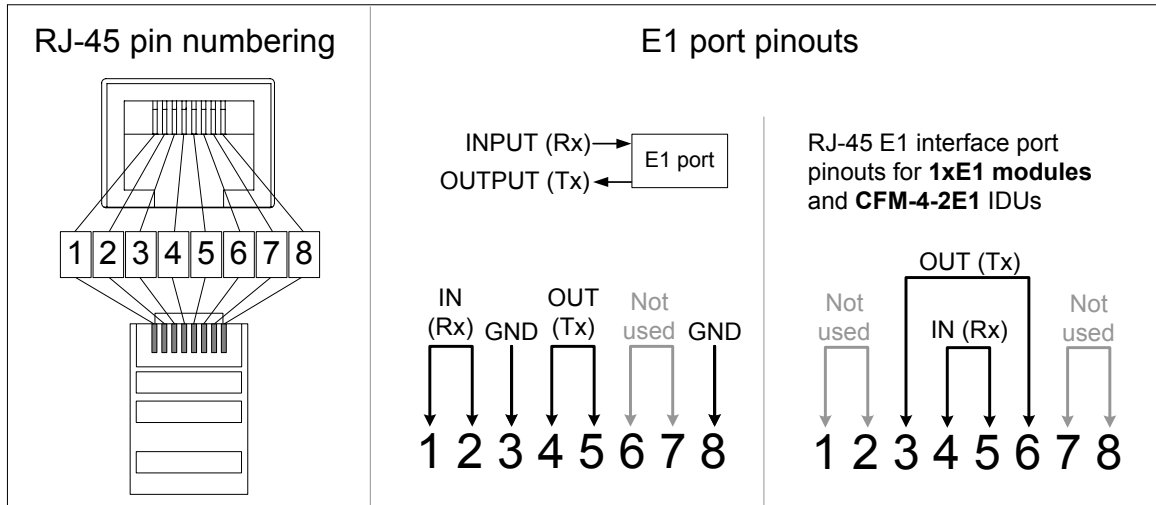
- Standard Ethernet patch cables should be used with management Ethernet port of the IDU;
- Any "straight through" or modem serial cable could be used with RS-232 management port of the IDU.

V.35 module port pinouts

Signal	M34 Pin	60 Pin Cisco*	Interconnectable pinouts at the Cisco equipment side:
P GND	A	46	48 & 49
S GND	B	45	50 & 51 & 52
RTS	C	42	53 & 54 & 55 & 56
CTS	D	35	
DSR	E	34	
DCD (RLSD)	F	33	
DTR	H	43	
TxD+	P	18	
TxD-	S	17	
RxD+	R	28	
RxD-	T	27	
SCTE+	U	20	
SCTE-	W	19	
RxC+ (SCR+)	V	26	
RxC- (SCR-)	X	25	
TxC+ (SCT+)	Y	24	
TxC- (SCT-)	AA	23	

Notes:
 * This information is for user's reference only
 P GND – Protection Ground
 S GND – Signal Ground

E1 module port pinouts



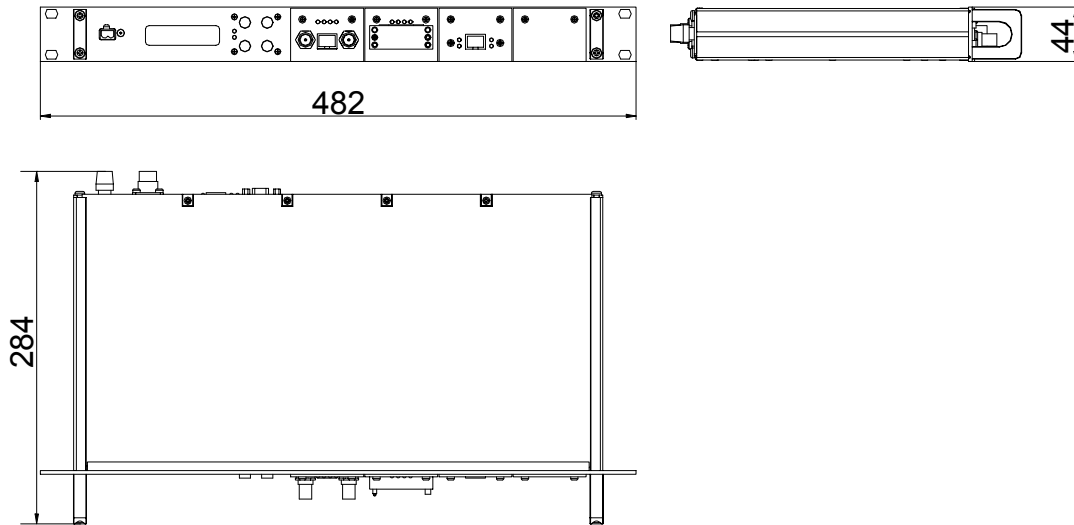
Ethernet interface pinouts

Ethernet device/port	Tx pins	Rx pins	Comment
10Base-T Ethernet management port (IDU rear panel)	1, 2	3, 6	As PC network cards
10Base-T REB module (1-port)	1, 2	3, 6	As PC network cards
2-port 100Base-T Ethernet module (FREB module)	Auto MDIX Tx/Rx swap		

7 Mechanical data

Dimensions of IDU

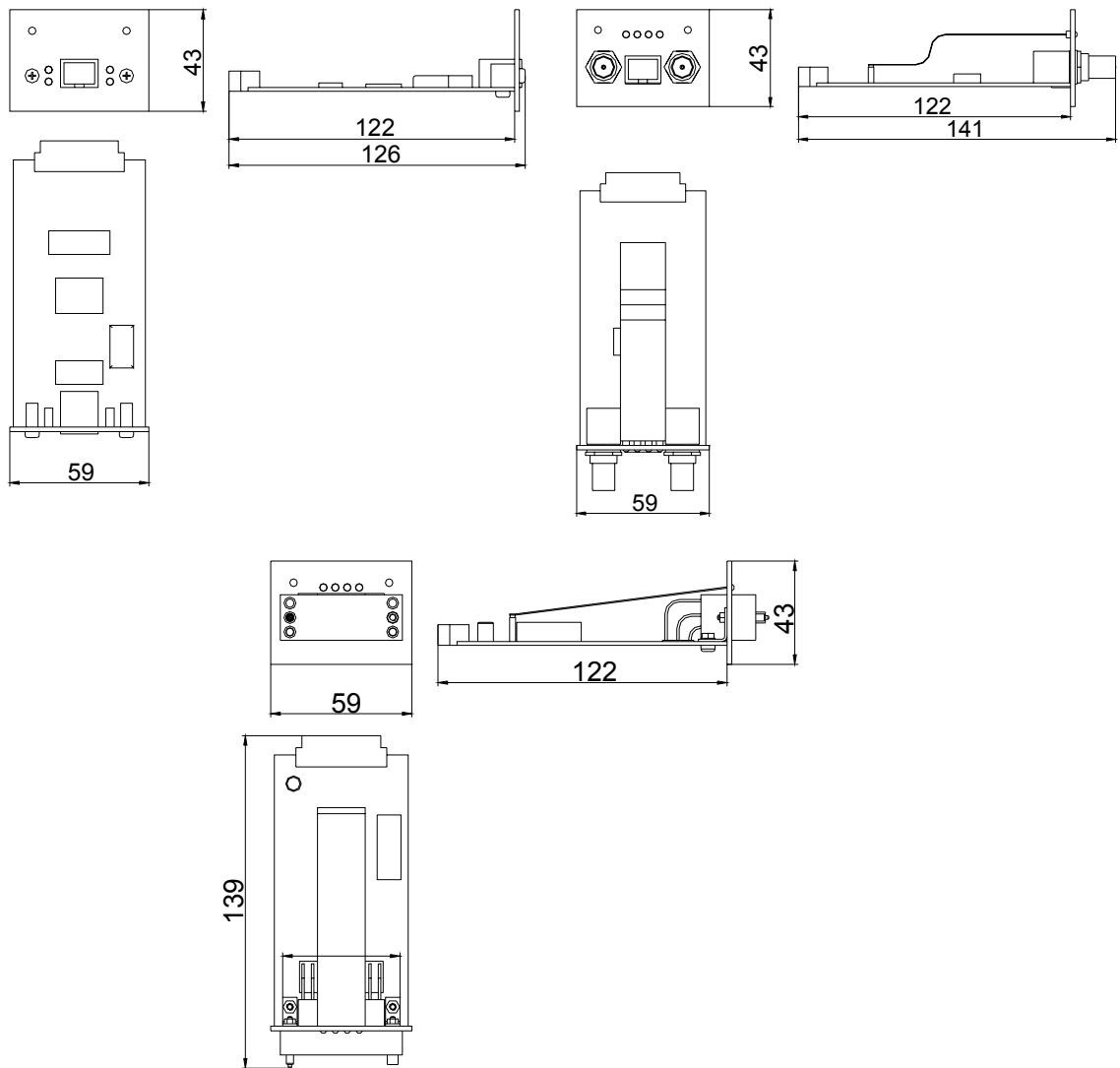
IDU model	Weight	Dimensions HxWxD
CFM-4-MUX	1.7 kg	44x482x284 mm
CFM-8-MUX	1.7 kg	44x482x284 mm
CFM-16-MUX	1.8 kg	44x482x284 mm



Dimensions of the IDU

Dimensions of IDU modules

Module	Weight	Dimensions HxWxD
REB	57 g	43x59x126 mm
E1	70 g	43x59x141 mm
V.35	86 g	43x59x139 mm



Dimensions of the modules: REB, E1 and V.35

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 representative.

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*

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 stored in the management controller Flash EPROM within the IDU.

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