NSSL Global TECHNOLOGIES

SatLink 8575 FLTx

User Guide

Revision 19.0.0-3 – November 9, 2021

Table of Contents

1 Introduction

The SatLink 8575 FLTx, shown in Figure 1, is a high-performance Forward Link transmitter for DVB-RCS2 based IP communication network hubs with DVB-S2X ACM. The device combines the functions of an IP traffic encapsulator, NCR generator, SI table inserter, and a DVB-S2X modulator with up-conversion to L-band. User traffic and SI tables are input to the unit via a standard Ethernet port. The compact unit supports symbol rates up to 64 Msps and high-throughput packet processing, making it well-suited for high-capacity DVB-RCS2 IP networks.

The SatLink 8575 FLTx is designed to be used in a controlled environment, where it will be installed as an integrated part of a customized SatLink Hub rack by the vendor or per vendor instructions, e.g., to operate as the FLS-00/FLS-01 units shown in the example SatLink Hub configuration shown in Figure 2.

This User Guide covers the installation and some of the operation of the SatLink 8575 FLTx. Runtime configuration for the SatLink 8575 FLTx is done using the SatLink NMS. For further information, please refer to ***104980 SatLink NMS and Hub Operators Guide***. The CLI commands entered via the unit console are essentially only required for the initial configuration, such as configuration of unit IP address and configuration of SNMP access.

Figure 1: SatLink 8575 FLTx

1.1 About This User Guide

The information given pertains to the following software (SW) and hardware (HW) versions:

Satlink 8575 FLTx Software

- SatLink 8575 FLTx Application Software, P/N 121290, version 19.0.0 or later

SatLink 8575 HW models

- SatLink 8575 FLTx, P/N 121295

The term 85xx is used as a reference including also other SatLink models with FLS transmitter function.

1.2 Installation and Configuration Overview

The SatLink 8575 FLTx must be installed and configured before it can be put into service in the SatLink Hub. The SatLink 8575 FLTx must be configured with a few parameters to enable it to be managed by the SatLink Hub NMS. The initial configuration of the SatLink 8575 FLTx is done by using the command line interface. For detailed information on SatLink 8575 FLTx configuration, please refer to section 6.2. The installation of the SatLink 8575 FLTx as part of the Forward Link System includes integrated NCR generator, IP encapsulator and L-Band modulator. For detailed information on system installation, please

refer to section ***6.2***. Figure 2 provides a overview of with the SatLink 8575 FLTx used both for the FLS-00 and the FLS-01 in 1:1 redundancy configuration in a typical SatLink Hub.

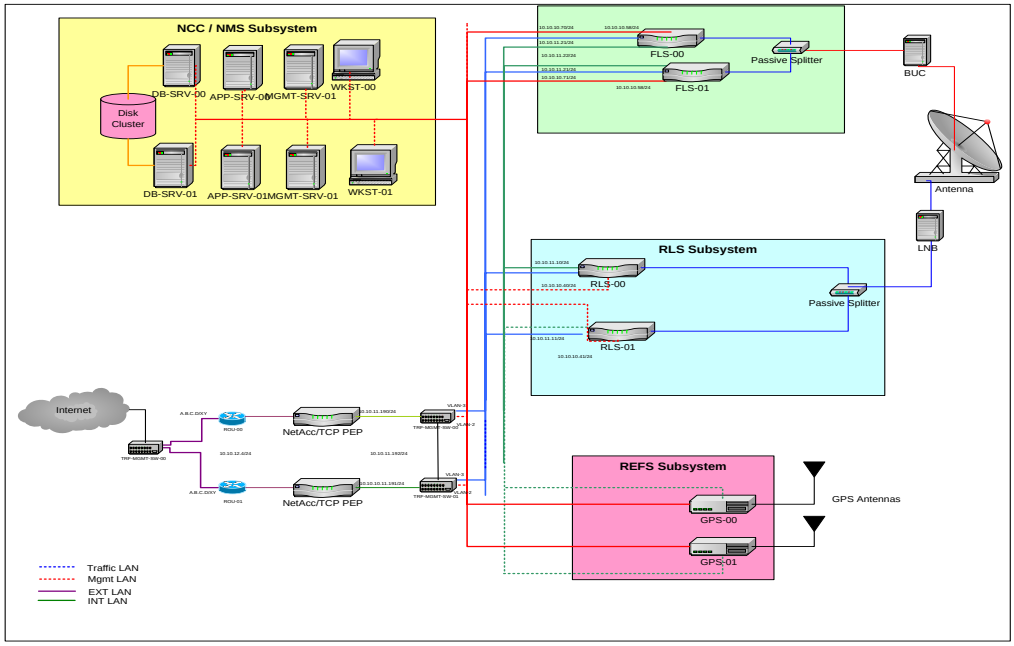


Figure 2 : Typical SatLink Hub Configuration

1.3 Symbols

NOTE
Additional information that the reader should pay special attention to.

Warning

System malfunction or damage may occur if the condition is not avoided.

2 Modifications and Use

Changes or modifications to the equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device, the SatLink 8575 FLTx, is equipped with the FCC ID as an e-label that can be viewed on the front LCD display of the unit when the unit is powered up, refer to Figure 1. Refer to section 5.3 for instruction about how to display the e-label on the LCD.

3 Unpacking

Check that the following items are in the box received, and then unpack the unit.

SatLink 8575 FLTx

- Main cord
- Screws for rack mounting

4 Installation

4.1 Before Installation

4.1.1 Safety Measures

Follow these guidelines to ensure general safety:

- Always comply with national and local electrical codes.
- Keep the installation area clear and dust free during and after installation.
- Keep tools and all components away from walk areas.
- Do not wear loose clothing, jewellery (including rings and chains), or other items that might get caught on the SatLink 8575 FLTx or the interconnecting cables.
- Do not work on the system or connect or disconnect cables during lightning storms.

Follow these guidelines when working with electrical equipment:

- Disconnect all power and external cables before installing or removing a SatLink 8575 FLTx.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not act in any way that creates a potential hazard to people or makes the equipment unsafe.
- Never install equipment that appears damaged.
- Carefully examine the work area for possible hazards, such as moist floors, unearthed power extension cables, and missing protective earth.

Should an electrical accident occur, do as follows:

- Be cautious – do not become a victim yourself.
- Turn off electrical power to the system.
- If possible, send another person to get medical aid. Otherwise, assess the condition of the victim and then call for help.
- Determine if the victim needs artificial respiration or external cardiac compressions; then take appropriate action.

4.1.2 Site Requirements

The SatLink 8575 FLTx shall be connected to 110/230 VAC, 50-60Hz power.

4.2 SatLink 8575 FLTx Front and Back Panels

4.2.1 SatLink 8575 FLTx Front Panel

Figure 3 : SatLink 8575 FLTx front panel

Item	Description
Error LED	Blinks when an error occurs. (Refer to Appendix C.2 Troubleshooting with LEDs for details on error codes)
SAT TX LED	Flashes when the transmitter starts sending L band signal.
LAN TX LED	Lights steadily when TRF port Ethernet traffic connectivity is OK. Flashes when Ethernet packets are transferred via the Ethernet traffic interface.
SAT RX LED	Not used
SAT TX LED	Not used
Pushbutton	Turns on the UID LED on the back panel and toggles the display.
Touch button w/light	Power-down and power-up

Table 2: SatLink 8575 FLTx Front Panel

See C.2 Troubleshooting with LEDs for LED behaviour during boot.

4.2.2 SatLink 8575 FLTx Back Panel

Figure 4 : SatLink 8575 FLTx Back Panel

Item	Description
On/off switch	Mains power, on (1) or off (0).
Power Connector	Connector for 110V/240V AC power
LAN MGMT Ethernet Connector	RJ45 connector for Management Ethernet interface. To be connected to the Management LAN in the SatLink Hub.
LAN TRF Ethernet Connector	RJ45 connector for Traffic Ethernet interface. To be connected to the Traffic LAN in the SatLink Hub.
TX COM Connector	RJ-45 connector for serial connection to Command Line Interface console. For initial configuration and debugging purpose only.
USB	USB-C connector for console, an alternative to TX COM
1PPS	50 Ω SMA female connector for 10 MHz reference signal input
10 MHz	50 Ω SMA female connector for 1PPS reference signal input
TX coaxial jack	Coaxial 50 Ω SMA Female- type jack to the BUC/Up Convertor
UID LED	LED for unit identification on the back panel side – activated by front pushbutton.

Table 4: SatLink 8575 FLTx Back Panel Description

4.3 Rack Mounting

The rack or cabinet should be properly secured to prevent tipping. Equipment installed in a rack or cabinet should be mounted as low as possible, with the heaviest units lower down, and lighter units toward the top.

Precautions:

- Ensure that the main circuits are properly grounded and use the power cord supplied with the SatLink 8575 FLTx to connect it to the power outlet.
- If the installation requires a different power cord than the one supplied, ensure that the cord used is certified as indicated by the stamped or embossed logo of the electrical safety authority.
- If the on/off switch on the back panel is difficult to reach when the unit is fitted in the rack, ensure that the power outlet into which it is plugged can be reached so it may be unplugged if necessary.
- Ensure that the unit does not overload the power circuit, wiring or over-current protection. To determine the possibility of overloading the supply circuits, add together the ampere ratings of all devices installed on the same circuit as the SatLink 8575 FLTx and compare the total with the rating limit for the circuit. The maximum ampere ratings are usually printed on units near their power connectors.
- Do not install the SatLink 8575 FLTx in a location where the operating ambient temperature may exceed 45°C.
- Ensure that the airflow around the sides and back of the SatLink 85xx is not restricted.

The SatLink 8575 FLTx can be mounted in a EIA-standard 19-inch telecommunications rack or cabinet.

Use a Torx screwdriver and attach the mounting brackets to the FLS with the screws supplied. Hold the unit securely, brackets attached, and move it vertically until rack holes line up with the bracket notches, then insert and tighten the four screws holding the brackets to the rack.

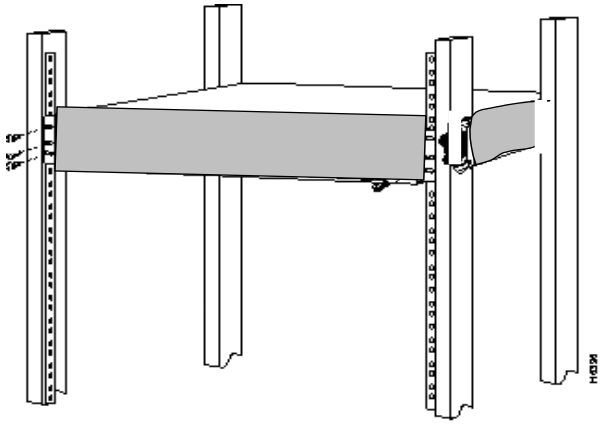


Figure 5 : Rack Mounting

4.4 Interface Connections

The SatLink 8575 FLTx is specified to operate with transmit power from -35 dBm to +10 dBm and with transmit frequency in range 950-2200 MHz on the transmit port.

Follow the procedure described below when installing the SatLink 85xx:

- Connect the BUC/Up Converter IF cable to TX connector.
- Connect the 10 MHz reference
- Connect the 1 PPS reference.
- Connect the Ethernet Management LAN and Traffic LAN cables to the respective ports.
- Connect a console

4.4.1 Main Connection

The SatLink 85xx models have internal power supply and consequently are connected directly to a 110/230 VAC 50/60Hz outlet using a standard 230 VAC power cord.

4.4.2 TX port of SatLink 8575 FLTx

TX Female SMA on the back panel of the SatLink 8575 FLTx shall be connected to the transmission unit at Hub i.e., the Block Up Converter, BUC.

Use only 50 Ω cables fitted with SMA male plugs for the TX cable.

4.4.3 Ethernet Connection to the Management- and Traffic Local Area Networks (LANs)

The SatLink 8575 shall be connected to the Management and Traffic LANs via the respective RJ-45 Ethernet connectors on the back panel.

- Plug one end of the Ethernet cables into the RJ-45 connector on the back panel.
- Plug the other end of the Ethernet cables to the Ethernet switches respectively for the Management- and Traffic Local Area Network (LAN) in the SatLink Hub.
- Make sure that the interfaces are connected to the right LANs.
- The mode of the port on the ethernet switch shall normally be Automatic Speed and duplex. If fixed mode is used, it MUST be set equal in the ethernet switch and in SatLink 8575.

4.4.4 10 MHz and 1PPS Interface

The unit shall be connected to an external 10MHz clock using a 50 Ω cable. The signal delivered shall be in the range of 1 Volt peak to peak +/- 0.5 Volt **(7dBm to 16.5 dBm**).

The unit shall be connected to an external 1 PPS clock using a 50 Ω cable. The 1PPS signal shall be a TTL signal with voltage between 0 V and 3 V. The low value of the 1 PPS shall be in the range of [0 V, 1 V] while the high value of the 1 PPS shall be in the range of [2 V, 3 V].

4.4.5 Console Interface

The Command Line Interface may be accessed from a local PC connected to the USB-C connector interface and via the RJ-45 connector TX COM interface. Tera Term or any compatible terminal emulation program can be used to access the CLI.

When installed in SatLink HUB, the RJ-45 TX COM is normally connected to a serial to ethernet converter (SENA switch), with compatible RJ-45 connector. If so, a standard (straight) ethernet patch cable should be used.

If a SENA switch is not available, the easiest is to connect via the USB-C connector. Windows 10 PCs should automatically detect the onboard usb to serial circuit when the cable is connected and create a COM interface.

COM interface parameters (same for RJ45 and USB-C):

- Baud rate: 115200
- Data: 8 bit
- Parity: None
- Stop: 1 bit
- Flow control: none

4.5 System installation

This chapter provides an overview for building a Forward Link System with the SatLink 8575 FLTx, which includes an integrated NCR generator, IP encapsulator, and L-Band modulator.

The following equipment can be used to build a Forward Link System:

- SatLink 8575 FLTx
- SatLink 8560 FLS
- Combiner (optional, used to combine several units accessing one uplink)
- Pickering switch (Pickering switch is used if the FLS is feeding multiple uplinks in N:1 redundancy mode).

SatLink 8575 FLTx can be installed on the following redundancy scheme,

- Non-redundant
- 1:1 redundant
- N:1 redundant

The redundancy system is maintained and controlled by FLSup, see section 8.

A SatLink 8575 FLTx can be used as spare for a SatLink 8560 FLS, but not the other way around, but note that there are different TX connectors and need for impedance match.

4.5.1 Installation of SatLink 8575 FLTx for Non-redundant scheme

For a non-redundant Forward Link System, the SatLink 8575 FLTx can be connected directly to the transmission unit, i.e., an Up Converter. However, it can also be connected to a Line Amplifier or Combiner depending on requirements.

4.5.2 Installation of SatLink 8575 FLTx for 1:1 redundancy scheme

For a 1:1 redundant Forward Link System, there are two SatLink 85xx transmitters connected to the same combiner. Both transmitters are connected to the combiner input ports, while the Combiner output port is connected to a transmission unit. Connections for the 1:1 redundancy scheme are shown in Figure 6.

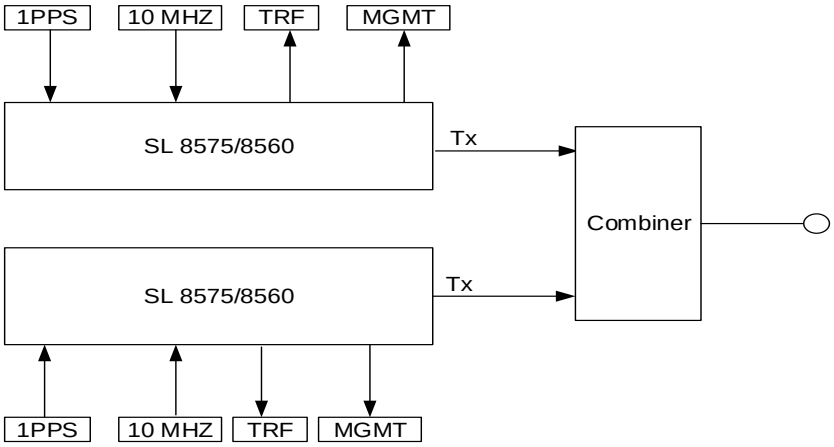


Figure 6 SatLink 8575/8560 transmitters in 1:1 Redundancy Scheme

4.5.3 Installation of SatLink 8575 FLTx for N:M redundancy scheme

On N:M redundant Forward Link System, a combiner is required if there are more than one SatLink 85xx transmitter connected to a single uplink. While Pickering switch is used whenever FLS are connected to multiple uplinks.

If two Primary SatLink 85xx are connected to same antenna, 2:1 redundant Forward Link System can be made by connecting both the Primary SatLink 85xx and the Spare SatLink 85xx to the same combiner. Figure 7 is illustrating this for the 2:1 redundancy scheme.

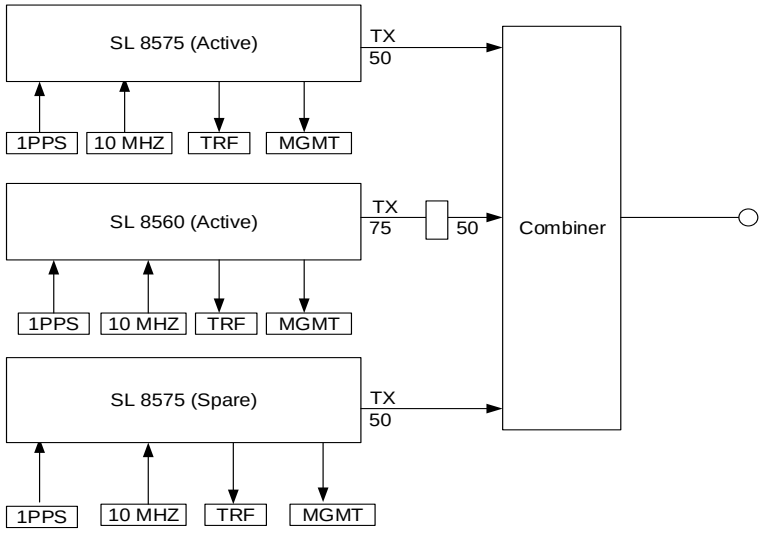


Figure 7: SatLink 8575/8560 Forward Link in 2:1 Redundancy Scheme

On N:M redundancy scheme with Pickering switch, this will handle the switching of the connection from Spare SatLink 85xx to the desired Primary SatLink 85xx during the switchover. The Pickering switch is

required in the N:1 redundancy scheme if there are more than one Primary SatLink 85xx connected to different antenna port, in this case:

- Different Up Converter (different HPA and Antenna),
- Different BUC (different antenna),

Use of different Tx Polarizations on the same satellite is handled as uplinks to different satellites. The Pickering switch is required for this scenario.

5 User interfaces

5.1 Using the Command Line Interface (CLI)

The command line interface can be accessed via either Telnet or the console ports for management of the unit as well as for showing status and reports. See 4.4.5 for how to connect to the console. If using telnet, note that the factory default IP-address of the MGMT interface is 10.10.10.79. Local Echo must be enabled in the Telnet Client if the input from the keyboard shall be displayed. Recommended Telnet clients are Tera Term or PuTTY.

When shipped from the factory, one user is pre-configured in the unit:

User name	Factory default password	Privilege level
root	admin123	1

Table 5: Default Username/Password

The SatLink 8575 FLTx has 2 console ports, but it is not possible to use both simultaneously. If accessing CLI through a port that is currently not active, the following will be printed:

"This console port is not active type "seize control" to activate it"

Then type "seize control" to activate your console. The RJ-45 port is by default the active console.

If the login prompt is not displayed type ENTER. The login prompt "`Login:`" should then be displayed. Then login with the root user:

```
Login: root
Password: admin123
```

Note: always use the ENTER key after commands.

All CLI commands is associated with a user Privilege Level between 1 and 5 where level 1 give access to most commands. The Privilege Level is decided by the CLI user profile, the default user root have Privilege Level 1. Additional users may be added with the CLI commands for user administration, see `'? user'`

5.1.1 Online Help

A list of available CLI commands can be displayed by typing `'?<ENTER>'` (question mark and the ENTER key). The CLI command groups will then be shown with the needed Privilege Level and a short explanation.

Example:

```
# ?
Command  (Privilege Level): Description / Syntax
------------------------------------------------------------------------
?                       (5): ? <submenu|command>
fls                     (5): Main commands for FLS
arp                     (5): Arp Management
device                  (5): Device configuration
dvb                     (5): DVB interface configuration
eth                     (5): Ethernet configuration
ip                      (5): IP configuration
log                     (5): Event log
misc                    (5): Miscellaneous commands
```

```
odu                     (5): ODU configuration
sw                      (5): Software status & licenses
user                    (5): User configuration
ncr                     (5): NCR configuration
tpserver                (4): TP server configuration
ipe                     (5): IPE Configuration
confset                 (5): Configuration Set status
neighbor                (5): IPv6 Neighbor Management
```

To list the commands in a sub-menu type `'? <sub-menu>'`

Example:

```
# ? ip
Command  (Privilege Level): Description / Syntax
vsn                     (5): To Configure the VSN functionality
show                    (5): ip show [-mcast|-trvlan]
tracert                 (5): ip tracert [<options>] <ipaddr>
set                     (2): ip set [-volatile] <ifnum> {<ipaddr> <mask>} |
                             {<mtu> <mtu value>} | nonum
addroute                (2): ip addroute <destaddr> <netmask> [<next hop>]
                             [<if>]
delroute                (2): ip delroute <destaddr> [<netmask> [<next hop>
                             [<if>]]]
intf                    (2): Interface configuration
mfc                     (5): IP Multi Field Classifyer (MFC) configuration
hc                      (5): Header compression configuration and status
udpsend                 (2): ip udpsend <options>
udprecv                 (2): ip udprecv <options>
```

Type '? <command>' to see the syntax for a specific CLI command.
Example:

```
# ?  ip set

USAGE:
  ip set [-volatile] <ifnum> {<ipaddr> <mask>} | {<mtu> <mtu value>}  | nonum

  -volatile The address will not be saved in persistent memory
  ifnum                 Interface number
  ipaddr                IP address for the interface
  mask                  Netmask for the interface
  mtu <mtu value>       The mtu value to be set for the interface
  nonum                 Use nonum instead of ipaddr and mask to remove the IP
address

Set the IP address and subnet mask for the specified interface.

Example:
  ip set 1 10.10.1.1 255.255.255.248  will set the LAN IP address to
                                      10.10.1.1 and the LAN netmask to
                                      255.255.255.248

See also:
  ip show, ip addroute, ip delroute
```

Online help notation:

- <parameter> : mandatory parameter
- [parameter] : optional parameter or command option
- {……} : used to group parameters
- | : or, used to indicate alternative parameter group or values
- - : prefixing command options

5.2 Logging of Events

The SatLink 8575 FLTx supports logging of events. Use the CLI command 'log show' to show the log from memory.

The events are divided in four different severity levels:

- Minor
- Normal
- Major
- Critical

Events with severity level Major will typically cause disruption in the data transfer, while events with severity level Critical typically will require user intervention to recover. In case of critical events, NMS will perform a switchover to the spare, if this is available.

To have access to the log of events also after the SatLink 8575 FLTx has been rebooted, the event above a specified severity level can be logged to file. See '? log file' for how to change the log to file configuration. The factory default settings are that logging of events with severity level Major and Critical to file is enabled.

5.3 LCD display

In the initial/stable (Home) state, the configured device name, see 6.2.7, is displayed in the first line, as shown in Figure 8. In this state, the second line will normally keep scrolling through a repeating sequence showing the following parameters (changing every 1-2 second):

- MAC address
- Management IP address
- Symbol rate (this parameter is shown when Tx is enabled, otherwise it is absent)

However, if there are any active alarms the second line are instead showing these.

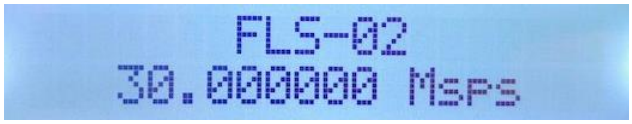


Figure 8: LCD display in initial/stable (Home) state, showing the symbol rate in the second line.

When in the initial/stable (Home) state, pressing the pushbutton *once* lights up the back panel UID LED, shows "UID LED ON" in the first line of the display, and shows the FCC ID in the second line of the display, as illustrated in Figure 9. When the pushbutton is pressed again within 30 minutes, or unconditionally after 30 minutes, the display returns to the initial/stable (Home) state described above.

Figure 9: LCD display indicating that the UID LED is activated and showing the FCC ID

The brightness and the contrast (affecting the viewing angle) of the display can be modified using the CLI command '`device lcd`'.

6 SatLink 8575 FLTx Configuration

6.1 Power-On and Logon

1) To view the boot processes of the SatLink 8575 FLTx, connect a PC as console to one of the console interfaces, see 4.4.5. Go to step 2.

2) Turn on the power of the SatLink 8575 FLTx.

3) When turning on the SatLink 8575 FLTx, first the Boot SW is loaded, but this is not visible on the console. The Error LED will blink until the boot loader have found and loaded the application firmware.

4) Then the CPU code and started. The Error LED and the SAT TX LED on the front of the SatLink 8575 will be on while firmware is starting and then be turned off. The CPU code will first initiate the file system, this normally take a few seconds, but can take several minutes if there are much to clean up (e.g., due to large files deleted just before last shutdown). Then the FPGA configuration file is read and loaded into the FPGA.

   The LCD display will be off until firmware is successfully activated.

   If watching the boot process on the console, a similar printout as the one below will be displayed.

```
SatLink 8575 FLTx
- Main board ID 120955, Revision R2.1
- SW ID 121290, Revision 19.0.0 Build 28+
- U-Boot 2018.09.v19.0.0.3 (Mar 09 2021 - 10:43:14 +0100)
File system initialisation ... done
Extract and load firmware from fls_301-19.0.0.28+.tgz
.....................................................................
.....................
Start loading.............................................done
Management Port  MAC Address    : 00:20:0e:10:a7:db
Traffic Port  MAC Address        : 00:20:0e:10:a7:dc
DVB Interface MAC Address        : 00:20:0e:10:a7:db
Retrieving configuration.....done
```

5) At this point, the Telnet server in the SatLink 8575 FLTx is started, and a Telnet session can be opened to manage the unit, see 5.1. From this point, the unit can also be managed via SNMP.

   The SatLink 8575 FLTx can handle at most three simultaneous Telnet connections including aborted connections. A Telnet session will be automatically terminated after 20 minutes if without any activity. If a Telnet session is refused, this can be due to all three connections being aborted. Please wait until the timeout has expired and try again.

6) The SatLink 8575 FLTx is now ready to be configured as described in the following sub-sections.

6.2 Initial Configuration of Parameters

The SatLink 8575 FLTx must be configured with a few parameters to enable it to be managed by the Hub NMS. To ensure the first-time installation is done based on factory default configuration, it is recommended to delete the existing configuration (`del config.txt`) and restart the unit. This will ensure that no unintended phantom configuration remains.

What needs to be configured by the unit installer are:

- IP addresses of the MGMT interface (1)
- Time Server IP address
- SNMP Configuration
- Ethernet Mode
- VSN Configuration
- Licenses
- Device name (for identification)

See 5.1 for general description of the command line interface.

Once this configuration has been completed, save the configuration using the CLI command # `save config`.

6.2.1 IP configuration

The SatLink 8575 FLTx has two Ethernet interfaces. One Ethernet interface is dedicated for management (MGT) while the other is dedicated for user data (TRF). When the configuration has been completed, each shall be connected to its respective Ethernet switch in the Hub rack.

1) Set the MGT-LAN IP address of the unit (management interface)
   – Enter the CLI command `'ip set 1 <aaa.bbb.ccc.ddd> <eee.fff.ggg.hhh>'`
   where <*aaa.bbb.ccc.ddd*> is the IP address and <*eee.fff.ggg.hhh*> is the netmask.

   Example:
   `# ip set 1 10.10.10.71 255.255.255.0`

   Note that this address must also be configured in WEBNMS, where also the virtual management and traffic address are set, see WEBNMS ***Hub Configuration -> Forward Link -> IP Encapsulator*** tab. These IP addresses are configured automatically on FLTx by FlSup on interface 13 and 15 with status as volatile. This enables moving the virtual IP addresses between FLS units when NMS performs FLS redundancy switcing.

   No need for setting address on interface 2 (TRF) but this can be done temporary to verify the connection.

2) Verify that the IP addresses and netmasks are set correctly for interface 1:
   – Enter the CLI command `'ip show'`

```
# ip show
Interfaces
If       IPAddress      SubnetMask   BroadCastAddr   MTU  Alias AdminStatus
 1     10.10.10.71   255.255.255.0    10.10.10.255  1500  eth0    1
 2             N/A             N/A 255.255.255.255  1500  eth1    1
 3             N/A             N/A             N/A  4074  air0    1
 4             N/A             N/A 255.255.255.255  4074  dvb0    1
13             N/A             N/A 255.255.255.255  1500  Vir3-eth0    1 - volatile
15             N/A             N/A 255.255.255.255  1540  Vir5-eth1    1 - volatile
Interface Statistics
   ------------ Input ----------------- ------------ Output ----------------
If    UCast   NUCast     Disc     Octets    UCast   NUCast     Disc     Octets
 1 71509360 15958802  1115808 1515909962 12433124       38        0 2559374301
 2 92994827  1447891  1133718 4079539050      285       30        0      18900
```

```
 3        0        0        0          0        0        0        0          0
 4        0        0        0          0 92977883        0        1 4153339425
13        0        0        0          0        0        0        0          0
15        0        0        0          0        0        0        0          0
IP  Receive  Deliver   Errors   Discards  Forward  Request  NoRoute   Discards
   175984568 72088725       10         10 93000148 12428587 10895668   10914069

Routing Table
       DestMask        RouteMask          NextHop  If
        0.0.0.0          0.0.0.0          0.0.0.0   4
     10.10.10.0    255.255.255.0          0.0.0.0   1
```

Ensure that the correct routes have been automatically defined to the MGMT (in this example, the destination mask 10.10.10.0 with route mask 255.255.255.0 is defined for the MGMT-LAN interface).

3) Test the MGMT interface by pinging the any device connected to the MGMT LAN e.g., the DB-server.
   – Enter the CLI command: `'ping 10.10.10.6'`

   After all local configuration is done and NMS have configured interface 13 and 15, test the TRF interface by pinging any device connected to the TRF LAN e.g., an RLS receiver
   – Enter the CLI command: `'ping 10.10.11.40'`

4) Save the IP configuration to Flash
   Enter the CLI command: `'save config'`
   – Example:

```
# save config
Saving Configuration. This will take ~20 secs
# Configuration Saved
```

6.2.2 Configuring the Time Server IP Address and Protocol

To retrieve the UTC time from a Time Protocol (TP) server, the SatLink 85xx is configured by default with the following parameters:

- Primary TP server IP address: 10.10.10.30
- Secondary TP server IP address: 10.10.10.31
- Selection of UDP or TCP option: UDP

Verify the settings by typing the CLI command `# tpserver show` and type `# save config` to save the configuration.

The configuration steps described below shall be followed if it is required to modify the default configuration:

1) Enter the CLI command `'tpserver ipaddr 1 <primary>'`, where `<primary>` is the primary TP server IP address.

2) Enter the CLI command `'tpserver ipaddr 2 <secondary>'`, where `<secondary>` is the secondary TP server IP address.

3) Enter the CLI command `'tpserver proto udp'` to select the protocol used to communicate with the TP server.

4) Type `'save config'` to save the configuration.

Example:

```
# tpserver ipaddr 1 10.10.10.30
# tpserver ipaddr 2 10.10.10.31
# tpserver proto udp

# tpserver show
Time Server Ip Address1                :        10.10.10.30
Time Server Ip Address2                :        10.10.10.31
Time Server Protocol                   :        UDP
```

6.2.3 SNMP Configuration and Management Access Control

SNMP configuration must be performed locally on the SL8575 FLTx using CLI to enable automatic configuration and monitoring of the SL85xx FLS from SatLink Hub NMS.

In a HUB with standard IP addresses use the following SNMP. Check with `'device snmp show'`:

```
# device snmp show
SNMP management access:
-----------------------
Community String         Access                IpAddress          Subnet
private                  Read/Write            0.0.0.0            0.0.0.0
public                   Read/Write            0.0.0.0            0.0.0.0
SNMP Trap Destination
Trap Dest Ip    Port       Community            Version
-------------------------------------------------------------------
10.10.10.25     162        public               SnmpV2
```

Note that NMS by default use community “public” for both supervision and configuration (defined in the NMS database).

If change needed:

1. Set the SNMP community public to Read/Write.

   ```
   # device snmp community public rw
   # device snmp community privat rw
   ```

2. Set SNMP trap destination address.

   ```
   # device snmp trapdest add 10.10.10.25 public
   ```

3. For increased security manager access can be limited using `'device manager add'`

After configuring the SNMP parameters, make sure that the SNMP access from NMS is working correctly. Do this by checking the FLS configuration using CLI command '`fls show`' and make sure that all the parameters are successfully configured.

6.2.4 Ethernet Mode

User CLI command `'eth show'` to check current ethernet mode.

```
# eth show
Interface Speed  Duplexity   Autoneg     Status          MAC
--------- -----  ---------   ------  ----------------  -------------
Mngt - 1   1000  Full Duplex   ON         UP           00:20:0e:10:a7:db
 Trf - 2   100   Full Duplex   ON         UP           00:20:0e:10:a7:dc
```

Speed and duplex:

Ethernet speed and duplex setting must always be set equally in FLS and the Ethernet switch. SatLink SL8575 FLTx support fixed setting for 100 Mbps, but Auto must be used for 1Gbps, so easiest to set both unit and switch to Auto mode. Use the following CLI command to set both traffic and management interfaces to Auto mode:

```
# eth mode <interface> 0
```

Never configure switch to Auto and unit to fixed speed - or the other way around.

Promiscuous/None-Promiscuous:

Note that SatLink SL8575 FLTx used in a SatLink Hub with SatLink Network Accelerator installed get all traffic, also IP multicast, as ethernet unicast, so promiscuous mode shall be disabled.

```
# eth promisc disable 1
```

The management interface shall always be set to non-promiscuous mode using CLI command

```
# eth promisc disable 0
```

6.2.5 VSN Configuration

To check if your Hub has VSN enabled, go to WebNMS ***Hub Configuration –> Virtual Networks***. If Virtual Network ID 0 and 1 has a different value than 0, the Hub has VSN enabled.

If VSN is enabled in the Hub, you must do the following configuration on your FLS to enable VSN on the FLS.

```
# ip vsn enable
# eth vlan –trf 4
```

6.2.6 Licenses

To use TX symbol rate higher that 5Msps or modulation other than QPSK, licenses are needed.
Type `'sw show'` to check what licenses are set. See `'? sw license'` for how to set the licenses.

6.2.7 Unit identification

The device name should be configured. This is displayed on the LCD and is reported in SNMP MIB 2 sysName. Also consider setting the location parameter to simplify identification/location of the unit via SNMP.

The CLI prompt is configurable, and this makes it easier to identify the unit when having several consoles open. E.g., use the same name as in NMS.

CLI commands (with example name and location):

```
# device name FLS-00
# device location  myhub rack 1
# prompt -name          (configures the CLI prompt with the chosen device name)
```

6.3 Transmission Line-up

The correct frequency and power level for the TX signal can be verified using CW transmission and connecting the output of the unit to the spectrum analyser. The following procedure can be used to verify the correct power and frequency level for TX signal:

1. Connect the Tx connector to the spectrum analyzer.
2. Turn off the transmission by using the CLI command `'fls off'`.
3. Start transmitting CW using the CLI command `'dvb tx cw on'`.

The frequency and power level of the CW displayed on the spectrum analyser should be the same as in WebNMS and local console for this FLS.

The following procedure is used to verify the power and frequency level for TX signal using PRBS transmission:

1. Connect the Tx connector to the spectrum analyser.
2. Turn off the FLS transmission using the CLI command `'fls off'`.
3. Start transmitting the PRBS using the command `'dvb tx on'`.
4. Check the status using the CLI command `'dvb tx show'`.

6.4 Configuring FLS Parameters through the SatLink NMS

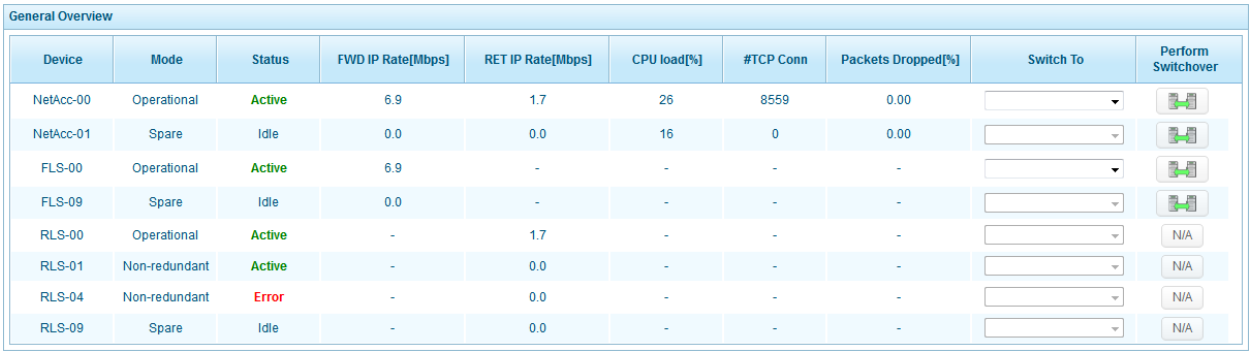
The following FLS parameters are controlled by the SatLink Hub NMS through FLSup and configured automatically to the SatLink 85xx FLS:

- IP addresses on virtual interfaces
- Redundancy parameters
- L-band transmit power level
- RF Tx frequency
- Transmit Symbol rate
- Transmit modulation and FEC (as MODCODs)
- Header Compression
- Max IP Rate
- FLS Stream Configuration and rate control record for streams and VSATs
- DVB route record
- Multicast Addresses
- FLS MFC
- Mode: DVB-S2 or DVB-S2X
- Frame length (normal or short)
- Roll Off
- Pilot

All the above is configured using WebNMS. For further information on configuring these parameters in WebNMS, please refer to doc 104980 ***SatLink NMS/Hub Operators Guide.***

6.5 Checking the FLS Status

After configuring the SatLink 85xx as per the procedure mentioned in the previous sections check the unit status in WebNMS. This is displayed on WebNMS Homepage as shown in the following figure:



General Overview

Device	Mode	Status	FWD IP Rate[Mbps]	RET IP Rate[Mbps]	CPU load[%]	#TCP Conn	Packets Dropped[%]	Switch To	Perform Switchover
NetAcc-00	Operational	Active	6.9	1.7	26	8559	0.00		
NetAcc-01	Spare	Idle	0.0	0.0	16	0	0.00		
FLS-00	Operational	Active	6.9	-	-	-	-		
FLS-09	Spare	Idle	0.0	-	-	-	-		
RLS-00	Operational	Active	-	1.7	-	-	-		N/A
RLS-01	Non-redundant	Active	-	0.0	-	-	-		N/A
RLS-04	Non-redundant	Error	-	0.0	-	-	-		N/A
RLS-09	Spare	Idle	-	0.0	-	-	-		N/A

Figure 10 : FLS Status Check on WebNMS

For further information on WebNMS Homepage monitoring, please refer to doc ***104980 SatLink NMS/Hub Operators Guide.***

It is recommended to log in to the unit CLI to verify that the unit is working correctly.

Type the CLI command `'fls show'` i.e.

```
# fls show
Transmission          : On
Operational Status    : OK,  managed by NMS
DVB Mode              : DVB-S2X ACM
DVB-S2 Stream type    : Generic Stream
Output power
            Nominal : -20.0 dBm
            Current : -20.0 dBm
Frequency             : 1.250000 GHz
Spectrum              : Normal
Symbol Rate           : 45.000000 Msps
Pilot                 : On
Roll off              : 0.35
ACM SNR Margin        : 1.0 dB
                                                    Required  High SNR Count
ACM MODCODs           : MODCOD                      SNR       Threshold
                          4 ( 8) QPSK-1/2-Normal    1.4       1.6
                          5 (10) QPSK-3/5-Normal    2.7       3.0
                          6 (12) QPSK-2/3-Normal    3.3       3.9


                  |DVB Routes|  Rate Control Records |         |
              MAC |Records   |      PID     MAC      |  Queues|
            ------+----------+----------+----------|--------|
   Defined:    12|        28|         9  |     17    |      -  |
   Active :     1|         1|         -  |      -    |      2  |
   Max    : 10000|     50000|        50  |  40000    |  40003  |
            ---------------------------------------------------
...
```

- The transmission status for the unit should be **On**.
- Operational status should be **OK**.
- Operational Status should be **OK, managed by NMS** .

7 Firmware version handling

7.1 Updating the SatLink 8575 FLTx firmware

The flash in the SatLink 85xx can store two firmware images, both the currently active firmware image and a backup firmware image.

Users with minimum privilege level 2 may use the CLI command `'sw upgrade'` to download a new firmware image from a TFTP server. After successful download of a new image, the current image will be stored as a backup before enabling the new firmware.

Execute the firmware upgrade by CLI command `'sw upgrade <filename> <server-ip-addr>'`. It is also possible to define and save default server address and filename see '? sw upgrade'. By default, TFTP are used, meaning that there must be a TFTP server running on the server specified. FTP can also be used.

Firmware upgrade should not be done when the FLTx is an active unit, so in a redundant configuration first de-active the unit by switching the service to a spare unit before upgrading. For a non-redundant set-up, FlSup should be temporarily disabled, and Tx temporarily disabled, by 'fls off''.

Example:

```
FLS-00 # sw upgrade fls_301-19.0.0.28.tgz 10.10.10.28
Software download in progress, please
wait.....................................................................................
.....................................................................................
.....................................................................................
.............................................. Download complete
.....................................................................................
.......................................... Extracting fls_301-19.0.0.28.elf from
fls_301-19.0.0.28.tgz -- might take upto 10 minutes
.....................................................................................
.....................................................................................
.............................................................. satlink301.elf file
found... renaming it
 Renaming fls_301-19.0.0.28.elf to satlink301.elf done
File Transfer complete
Configuration Saved
Restart after SW upgrade
Starting fls_301-19.0.0.28.tgz
```

About file names:
The main board in SatLink 8575 FLTx is called SL-301, that is why the filename start with fls_301. 19.0.0.28 is the firmware build number. For use in operational HUBs, ONLY use official released firmware builds. Extension .tgz indicates that the file is a compressed TAR (archive) file, meaning that the tgz file contains several files, mainly the CPU execution code and the FPGA configuration file.

The CPU code file is extracted from the tgz file and renamed to satlink301.elf, this is the file that the boot process primarily searches for and loads if found.

During firmware upgrade, the old tgz file is renamed to xxx.bak and the old CPU code file is renamed to satlink301.elf.bak. If satlink301.elf is not found, boot will load satlink301.elf.bak if this is found.

7.2 Restoring the Backup firmware image

If it is necessary to restore the backup firmware, the following steps must be executed. Please note that the current firmware image will be deleted when restoring the backup firmware. The unit will restore the firmware and restart automatically.

Example:

```
FLS-00 # sw restore
Warning: 'sw restore' cannot be done while unit is active!
FLS TX will be stopped

Restoring backup SW - version 19.0.0.27
Current SW version 19.0.0.28 will be deleted
Do you want to continue (Y/N)?y
Restoring backup SW
 Extracting fls_301-19.0.0.27.elf from fls_301-19.0.0.27.tgz -- might take upto 10
minutes
................................................................................
................................................................................
.............................................................. satlink301.elf file
found... renaming it
 Renaming fls_301-19.0.0.27.elf to satlink301.elf done
Backup SW restoredRestarting Unit. Connection will be closed
Reconnect when the unit has restarted (1-2 minutes)
FLS-00 # Restarting Unit
Starting fls_301-19.0.0.27.tgz
```

8 FLSup Functionality

FLSup is the NMS service that supervises the forward link subsystem (including modulators and redundancy switching).

The FLSup process performs the following tasks:

- Upload the configuration to the FLTx transmitter from the NMS after power on and after redundancy switching.
- Maintain TX power level if uplink power control is enabled,
- Maintain the configuration on Spare FLTx
- Monitor the health of Operational FLTx units and perform uplink switchover to Spare FLTx transmitter chains when problems are detected.
- Switch the uplink back to the Operational FLTx unit to release a Spare FLTx chain

Besides automatic switchover, FLSup will response to manual switchover or switchback requested by user. Referring to Figure 11, FLSup will maintain and control the redundancy switching between FLS-00 and FLS-09.

The status of FLS-00 is active and it is in operational mode. Whereas the status of FLS-09 is idle and it is in spare mode. FLSup triggers the automatic switchover as soon as it detects the status change (from active to error) on operational FLTx (FLS-00); i.e., if the primary FLS fails or reports an error. The switchover changes the status of spare FLTx (FLS-09) from idle to active and the primary FLTx (FLS-00) will show error status.

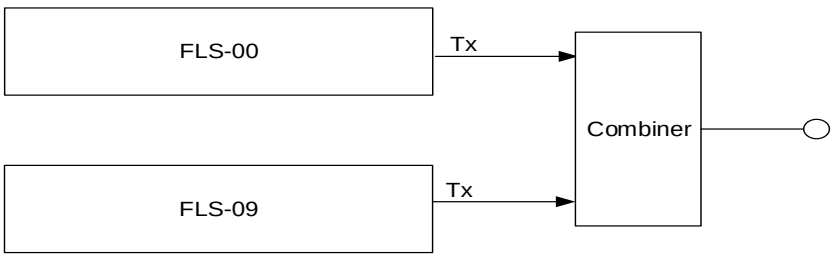


Figure 11: 1:1 FLS Redundancy Scheme

Once the error on primary FLTx is resolved, FLSup will update the status (from error to idle) for the primary FLTx (FLS-00). The status of the primary FLTx is changed from idle to active by doing manual switch back. To do the manual switch back, follow the below mentioned procedure:

1. From WebNMS homepage, select the Operational Idle FLS available on “Switch To” button belong to the Spare Active FLS.
2. Click “Perform Switchover” button.

By performing the manual switch back, the FLTx (FLS-00) will get back to its original mode and status i.e. operational and active.

Manual switchover:

The manual switchover is used only if the operational FLTx (FLS-00) needs some maintenance. The manual switchover can be done by following the below mentioned procedure:

1. From WebNMS homepage, select the Spare Idle FLS available on “Switch To” button belong to the Operational Active FLS.
2. Click “Perform Switchover” button.
3. Before maintenance is performed on Operational idle FLS (FLS-00), from WebNMS ***Hub Configuration -> Forward Link Configuration -> General*** tab, select the corresponding FLS and update the “Redundancy Mode” value from Operational to Maintenance.

After the maintenance on primary FLS is completed, it is recommended to change the mode on (FLS-00) from maintenance to operational before doing switchback. The status of primary FLS (FLS-00) needs to be changed (from idle to active) by doing manual switch back. To do the manual switch back follow the below mentioned procedure:

1. After maintenance is performed on Operational idle FLS (FLS-00), from WebNMS ***Hub Configuration -> Forward Link Configuration -> General*** tab, select the corresponding FLS and update the “Redundancy Mode” value from Maintenance to Operational.
2. From WebNMS homepage, select the Operational Idle FLS available on “Switch To” button belong to the Spare Active FLS.
3. Click “Perform Switchover” button.

9 Advanced Statistics/Status Monitoring

This chapter provides the operator with CLI examples and explanations for monitoring statistics and various statuses from the SatLink 8575 FLTx.

9.1 CLI Command fls show

This command can be used for retrieving the status for:

- Transmission
- Operational Status
- Output mode
- DVB Mode
- DVB-S2 Stream type
- Output power
- Frequency
- Symbol Rate
- Modulation and FEC (MODCODs)
- Pilot
- Roll-off
- Stream Rates
- Channel Rates
- Rates per MODCOD

DVB-S2X ACM mode

When the FLS is used in ACM mode, the actual MODCODs used are decided based on the MODCOD request from each VSAT. Each MODCOD has a defined minimum Required SNR, the VSATs use this to decide what MODCOD to request but note that the Required SNR may differ from what is shown in the SatLink 8575 FLTx for the same VSAT.

The IP rate free is calculated assuming idle capacity filled with lowest MODCOD. The used and free IP rate is reported to NetAcc so that it can shape the traffic according to current max IP rate.

```
FLS-00 # fls show
Transmission        : On
Operational Status  : OK,  managed by NMS
DVB Mode            : DVB-S2X ACM
DVB-S2 Stream type  : Generic Stream
Output power
            Nominal : -20.0 dBm
            Current : -20.0 dBm
Frequency           : 1.250000 GHz
Spectrum            : Normal
Symbol Rate         : 45.000000 Msps
Pilot               : On
Roll off            : 0.35
ACM SNR Margin      : 1.0 dB
                                                  Required  High SNR Count
ACM MODCODs         : MODCOD                      SNR       Threshold
                       4 ( 8) QPSK-1/2-Normal     1.4       1.6
                       5 (10) QPSK-3/5-Normal     2.7       3.0
                       6 (12) QPSK-2/3-Normal     3.3       3.9
                       7 (14) QPSK-3/4-Normal     4.5       4.7
                       8 (16) QPSK-4/5-Normal     5.0       5.2
                       9 (18) QPSK-5/6-Normal     5.4       5.6
```

```
                    12 (24) 8PSK-3/5-Normal        5.9       6.4
                    13 (26) 8PSK-2/3-Normal        6.9       7.1
                    18 (36) 16APSK-2/3-Normal      9.4       9.4
                    19 (38) 16APSK-3/4-Normal      10.6       11.0
                    20 (40) 16APSK-4/5-Normal      11.4       11.6
                    21 (42) 16APSK-5/6-Normal      11.9       12.2
                    24 (48) 32APSK-3/4-Normal      13.6       14.2
                    25 (50) 32APSK-4/5-Normal      14.8       16.8
                    68      QPSK-11/20-Normal      1.9       2.3
                    71      8PSK-23/36-Normal      6.5       6.7
                    72      8PSK-25/36-Normal      7.4       7.5
                    73      8PSK-13/18-Normal      7.7       7.7
                    77      16APSK-26/45-Normal    7.8       8.1
                    78      16APSK-3/5-Normal      8.4       8.5
                    81      16APSK-23/36-Normal    8.7       9.0
                    83      16APSK-25/36-Normal    9.5       9.9
                    84      16APSK-13/18-Normal    10.4       10.5
                    85      16APSK-7/9-Normal      11.0       11.2
                    86      16APSK-77/90-Normal    12.5       12.6
                    89      32APSK-32/45-Normal    12.8       13.0
                    90      32APSK-11/15-Normal    13.2       13.4
                    91      32APSK-7/9-Normal      14.2       14.5


                 |DVB Routes|  Rate Control Records |         |
              MAC |Records   |   Streams      MAC    |  Queues|
             -----+----------+-----------+-----------|--------|
   Defined:    28|       152|       13  |     76    |     -  |
   Active :     2|         2|        -  |      -    |      3 |
   Max    : 10000|     50000|       50  |  40000    |  40003 |
          ------------------------------------------------------


Stream Rates (kbps level 2):
 TS  Stream      Max  ScaledM  Current
  1   PCR        0        0        0
  2  1021        0        0     2050
  3    SI        0        0      660


Total Channel Rates (level 2):
     Symbol rate (ksps)       IP rate (kbps)
 Ch      Max  Current      Max  Current     Free (min free) OverShoot
  1    45000     2471    30000     2005    27788 (   40419)       0

Total Beam Rates (level 2):
 Current: 2710 kbps
press <n & CR>: next line  <q & CR>: quit <CR>: next page


 Rate per MODCOD (kbps)
   MODCOD   Payload    Padding
     0            0      37359  - empty frames
     8         2399       3570
    10            2         74
    12            0          0
    14            0          0
    16            0          0
    18            0          0
    24            0          0
    26            0          0
    36            0          0
```

```
      38            0          0
      40            0          0
      42            0          0
      48            0          0
      50            0          0
      68            0          0
      71            0          0
      72            0          0
      73            0          0
      77            0          0
      78            0          0
      81            0          0
      83            0          0
      84            0          0
      85            0          0
      86            0          0
      89            0          0
      90            0          0
      91            0          0
Max    : 43504 - 174143 kbps (dependent on MODCOD)
         155649 kbps with free capacity filled with best MODCOD

         IP rate: used 2030 kbps, free: 40744 kbps, IP Overhead: 1%
```

9.2 CLI Command ncr show

The CLI command '`ncr show`' is used to report the NCR state. In normal state, NCR Operational Status is reported as *ok* and NCR Generator state will be *on*.

```
FLS-00 # ncr show
NCR Generator State        :    On
NCR Operational Status     :    OK
NCR Delay offset 1         :    0 ticks
NCR Delay offset 2         :    0 ticks
Action on missing SI input :    None
NCR TX delay (HW)          :    0 ticks
Additional best MODCOD     :    Off
```

'`ncr show -si`' show statistic about SI tables from NCC, '`ncr show -snr`' show statistics about SNR/MODCOD requests from VSATs (via NCC).

9.3 CLI Command ip show

The CLI command '`ip show`' and can be used for displaying:

1. IP configuration
2. IP statistics per port
3. Routing table

```
FLS-00 # ip show
Interfaces
If       IPAddress      SubnetMask   BroadCastAddr   MTU           Alias    AdminStatus
 1     10.10.10.70   255.255.255.0    10.10.10.255  1500            eth0    1
 2             N/A             N/A 255.255.255.255  1540            eth1    1
 3             N/A             N/A             N/A  1540            air0    1
 4             N/A             N/A 255.255.255.255  1540            dvb0    1
13     10.10.10.58   255.255.255.0    10.10.10.255  1500        Vir3-eth0    1 - volatile
15     10.10.11.20   255.255.255.0    10.10.11.255  1540        Vir5-eth1    1 - volatile

Interface Statistics
```

```
   ------------- Input ----------------- ------------ Output ----------------
If    UCast   NUCast     Disc     Octets    UCast   NUCast     Disc     Octets
 1    80929     1873        0   56408846    48228       28        0   19685444
 2   209124     2498   112897  313564211        0       78        0       4758
 3        0        0        0          0        0        0        0          0
 4        0        0        0          0    93642     1168       42  140723622
13        0        0        0          0        0        0        0          0
15        0        0        0          0        0        0        0          0
IP  Receive  Deliver   Errors InDiscards  Forward  Request  NoRoute OutDiscards
     290034    40226        0          0   248400    48190     1417     114322

Routing Table
       DestMask        RouteMask          NextHop  If   RtType   Row-Status
        0.0.0.0          0.0.0.0          0.0.0.0   4   STATIC   ACTIVE
     10.10.10.0    255.255.255.0          0.0.0.0   1    LOCAL   ACTIVE
     10.10.11.0    255.255.255.0          0.0.0.0  15    LOCAL   ACTIVE
```

9.4 CLI command eth show

The CLI command '`eth show`' can be used for displaying:

1. Status of the PHY device
2. Ethernet statistics per interface

Example:

```
FLS-00 # eth show

Interface Speed  Duplexity   Autoneg     Status          MAC
--------- -----  ---------   ------  ----------------  -------------
Mngt - 1   1000  Full Duplex   ON         UP           00:20:0e:10:a7:db
 Trf - 2   100   Full Duplex   ON         UP           00:20:0e:10:a7:dc

Interface Statistic:
PHY device 1 :
Dir     Frames    Unicast  Multicast  Broadcast   Discards CRC errs
RX    55473566   38092401    4472403    9882482   22945010          0
TX     9850773    9756311          0      28028          0          -

PHY device 2 :
Dir     Frames    Unicast  Multicast  Broadcast   Discards CRC errs
RX   149224004  147809958     855842     558161         44          0
TX       27796        124          0      27672          0          -


VLAN Configurations
 VLAN Id    IF Index    Inter VLAN Comm

Ethernet User Priority to QoS Group mapping
 Priority  QoS Group    Packet Count
```

In this example:

- The status for the PHY device of the Management interface appears as 100 MBps full duplex, the CRC error counter is equal to 0, which indicates that the Ethernet link for management data is operational.
- The status of the PHY device for the Traffic interface appears as 1000 Mbps.

9.5 CLI Command ipe show

The CLI command '`ipe show`' will show the Traffic Stream information and Max rate configured for each VSAT. Max rate = 0 mean no rate shaping performed by FLTx. While FLSUP is running then FLS will get the IPE configuration from database.

Example:

```
FLS-00 # ipe show
                                MODCOD    SNR
VSAT MAC           QoS   MaxRate Min Max  offset
00:20:0e:00:9f:82   0    1000000   1  28    0.0
00:20:0e:10:21:73   0          0   1  28    0.0
00:20:0e:10:21:eb   0          0   1  28    0.0
01:00:5e:01:01:01   0          0   1  23    0.0
01:00:5e:05:06:07   0          0   1  23    0.0
MAC Rate Control record used: 6, Max: 40000

Stream MaxRate Delay Threshold
     0       0    10       180
  1020       0    10       180
  1021       0    10       180
  1025       0    10       180
  1120       0    10       180
  1121       0    10       180
  1122       0    10       180
  1220       0    10       180
  1221       0    10       180
  1222       0    10       180
  1320       0    10       180
  1321       0    10       180
  1322       0    10       180
Stream Rate Control record used: 13, Max: 50
Max Beam rate: 174143040

Queue Rate calc interval: 15 sec
Drop warning Threshold: BE: 50 MPP, VoIP: 50 MPP, ViC: 10 MPP, CD: 10 MPP,
```

9.6 CLI Command device show

The CLI command '`device show`' will show the hardware information for the FLTx, including MAC addresses of the Ethernet ports.

```
FLS-00 # device show

System Information:
    Name                : FLS-00
    Location            : Fornebu
    Contact             : NSSLGlobal Technologies
    System Up time      : 0 days, 00:32:39
    Core temperature    : 55.6 degrees C.
    CPU Load            : 14%
    System time(UTC)    : 19 May 2021 11:38:17

HW:
    Model               : SatLink 8575 FLTx
    Main board ID       : 120955 R2.1

MAC addresses:
    Management Port     : 00:20:0e:10:a7:db
    Traffic Port        : 00:20:0e:10:a7:dc
```

```
    Satellite (DVB)     : 00:20:0e:10:a7:db
```

9.7 CLI Command sw show

The CLI command ' `sw show`' is used to check the software details, like software version, software upgrade settings, and license details.

```
FLS-00 # sw show

SW versions:
    Boot                : U-Boot 2018.09.v19.0.0.3 (Mar 09 2021 - 10:43:14 +0100)
    Current Appl        : ID 121290, Revision - 19.0.0.28+
    Firmware            : 0.1.15

Manual SW upgrade settings:
    Server IP addr      : 10.10.1.1
    File name           : new.tgz

Licenses for SW options:
    TOOL
    Symbolrate   : 0.1 - 64 Msps
    Modulation   : QPSK (all FEC), 8PSK, 16APSK, 32APSK, 64APSK
    QoS          : QoS-4 (BE, VoIP, ViC, CD)
    State-full RTP compression
```

10 Definitions, Acronyms and Abbreviation

ACM	Adaptive Coding and Modulation
BUC	Block Up-Converter
CLI	Command Line Interface
CW	Continuous Wave
dB	DeciBel
dBm	DeciBel relative to 1 mW
DNS	Domain Name Service
DVB	Digital Video Broadcasting
DHCP	Dynamic Host Configuration Protocol
ETH	Ethernet
FLS	Forward Link System
FLTx	Forward Link Transmitter
FLSUP	Forward Link Supervisor
GPS	Global Positioning System
GSE	Generic Stream Encapsulator
HW	HardWare
Hz	Hertz
ID	IDentifier
IETF	Internet Engineering Task Force
IF	Intermediate Frequency
IP	Internet Protocol
ksps	Kilo Symbols Per Second
LAN	Local Area Network
LED	Light Emitting Diode
LNB	Low Noise Block
MAC	Medium Access Control (commonly the MAC address)
Mbps	Mega Bits Per Second
MGMT-LAN	Management Local Area Network
MIB	Management Information Base
Msps	Megasymbols Per Second
NCC	Network Control Centre
NCR	Network Clock Reference
PPS	Pulses Per Second (or packets per second)
QoS	Quality of Service
QPSK	Quaternary Phase Shift Keying
RF	Radio Frequency1
SMI	Structured Management Information
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
sps	Symbols Per Seconds
SW	Software
TCP	Transport Control Protocol
TFTP	Trivial File Transfer Protocol
TP	Time Protocol
TRF-LAN	Traffic Local Area Network
TX	Transmitter
UDP	User Datagram Protocol
VSN	Virtual Satellite Network

11 References

[1] SatLink NMS and Hub Operators Manual, NSSLGlobal Technologies document No. 104980
[2] RFC1213-Management Information Base for Network Management of TCP/IP-based internets: MIB-II
[3] Enterprise MIB for SatLink equipment, release 19.0.0

Appendix A. TFTP server

TFTPD32 is a freeware TFTP server for Windows.

Installation description:

1. Copy the TFTP server files to a PC connected to the Hub management LAN
2. Start the program
3. Select correct server interface if using a PC with more than one Ethernet card.
4. Select correct base directory (directory where the files to be downloaded are stored, and where uploaded files will be stored)
5. The TFTP server can now be accessed from the SatLink 85xx by using the CLI commands `upload` and `dload`.

TFTP upload from and download to the SatLink 85xx has been tested with version 3.23 of this TFTP server, but any TFTP server should work.

The SatLink 85xx can access a TFTP server from the management interface (MGMT-LAN) or from the user data interface (TRF-LAN), provided management over the user data interface is enabled.

Appendix B. Management via SNMP

The SatLink 85xx FLS transmitter unit can be monitored and managed using the standardized Simple Network Management Protocol (SNMP), this is how SatLink NMS FlSup interface the SatLink 85xx FLS, see 8.

The management information that can be collected and controlled by an SNMP management application is contained in so-called Management Information Databases (MIBs). The SatLink 85xx FLS transmitter unit supports two such MIBs:

- MIB-II (relevant parts)
- Proprietary SatLink FLS transmitter MIB

MIBs are components in the Internet Engineering Task Force (IETF) defined Structure of Management Information (SMI). SMI version 2 as defined by IETF STD58 is supported.

B.1 SNMP Version Compliance

The SatLink 85xx FLS unit supports SNMP version 2c as defined by IETF in RFC 1901 and RFC 3417.

In accordance with SNMPv2c, the access rights associated with the attached “community” name are checked when an SNMP message arrives. The predefined access rights for the given “community” name, together with the predefined maximum access rights of the object ID(s) addressed by the SNMP message determines the effective access rights. The SatLink 85xx FLS transmitter unit is also equipped with optional enhanced SNMP access control as described later.

B.2 MIB-II supported by SatLink 85xx FLS transmitter

The SatLink 85xx FLS transmitter supports relevant parts of MIB-II (RFC1213). The following object groups of MIB-II are supported:

- System
- Interface
- IP[1]
- ICMP
- UDP

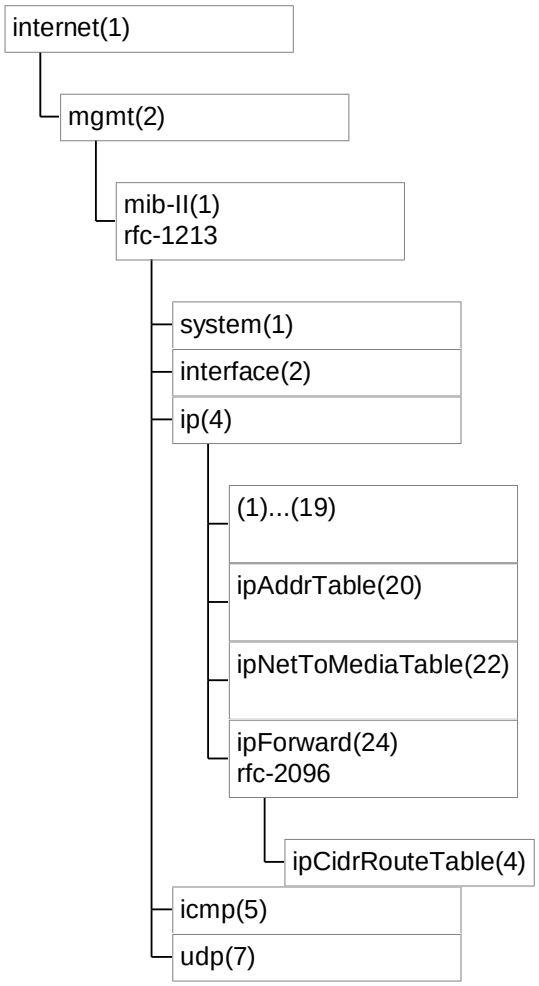


Figure 12: Supported Parts of MIB-II

[1] ipRouteTable and ipRoutingDiscards are not supported. ipForward.ipCidrRouteTable (RFC2096) is supported instead

B.3 SatLink FLS MIB

B.3.1 Overview of SatLink FLS MIB

The SatLink FLS transmitter MIB contains proprietary MIB objects that together with the supported MIB-II objects allow the complete configuration and management of the SatLink 85xx FLS transmitter.

B.3.2 MIB object definitions

The SatLink FLS transmitter MIB is distributed separately in the standard ASN.1 syntax text file format used for an IETF STD58 compliant MIB. A set of MIB objects sufficient for the SatLink 85xx FLS transmitter is available as a separate distribution.

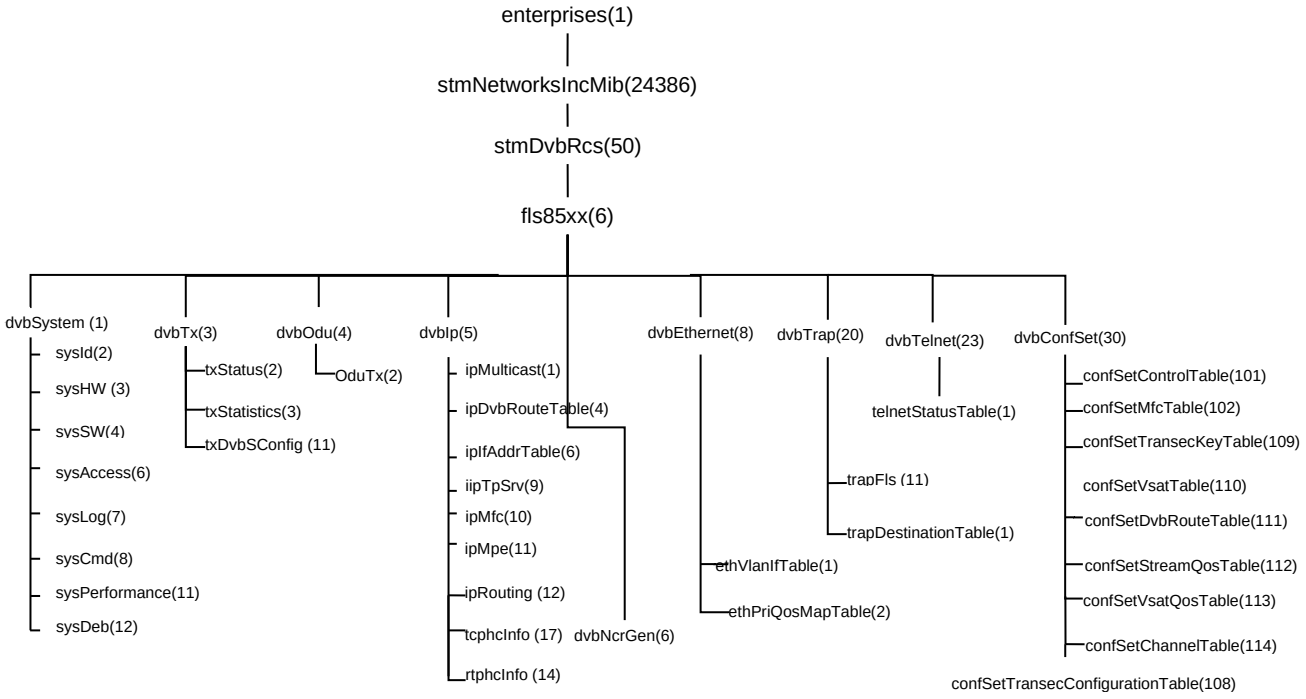


Figure 13: The Part of the MIB Supported by the SatLink 85xx FLS transmitter.

B.4 Access Policies

Access to the SatLink 85xx FLS MIBs is limited as follows: first by a restriction based on community name and maximum access right combination, and then optionally by the SNMP request's source IP address and netmask and/or source interface.

When only community name and maximum access rights limit the access, then filtering in the SatLink 85xx FLS is achieved by checking the SNMP message's community name and maximum access rights only. Otherwise, the source IP address, netmask, and/or source interface of the SNMP message is checked. If all these parameters of the SNMP message match the values stored in the MIB object that controls the access rights, the SNMP message is processed. Otherwise, it is discarded.

The SatLink 85xx FLS transmitter is configured with default community name public with read-only access and private with read-write access when shipped from factory.

B.4.1 CLI Commands for Configuring SNMP Access

CLI commands	User Privilege Level
device snmp community <name> <ro|rw> [<ipaddr> <mask>]	1
device snmp delcommunity <name>	1
device snmp show	5
device manager add snmp <if> [<ip> <mask>]	1
device manager del snmp <if> [<ip> <mask>]	1
device manager show	5

B.4.2 Access Configuration

To be able to access the SatLink 85xx FLS MIB, it is necessary to configure both the SatLink 85xx FLS transmitter and the MIB browser application.

1. The MIB browser application must be configured with the correct 'community' name both for read access and write access.
2. The SatLink 85xx FLS transmitter SNMP access list must be configured via CLI, using the # `device snmp community` command and optionally the # `device manager add snmp` command.

Example 1:
Define an access type with the name "public", with read-write maximum access right and with no restriction on the SNMP request's IP address and netmask.

```
# device snmp community public rw
# device snmp show

SNMP management access:
-----------------------
Community String         Access              IpAddress          Subnet
public                   Read/Write            0.0.0.0         0.0.0.0
```

Example 2:
Define an access type with name "user", with read-only maximum access and with restriction to the 10.10.20.0 sub-net for the SNMP request source.

```
# device snmp community user ro 10.10.20.0 255.255.255.0
# device snmp show

SNMP management access:
-----------------------
Community String         Access              IpAddress          Subnet
user                     Read only         10.10.20.0   255.255.255.0
public                   Read/Write            0.0.0.0         0.0.0.0
```

Example 3:
Remove the access type with the name "user".

```
# device snmp delcommunity user
# device snmp show

SNMP management access:
```

```
-----------------------
Community String         Access              IpAddress          Subnet
public                   Read/Write            0.0.0.0        0.0.0.0
```

B.5 SNMP Traps for SatLink 85xx

The SatLink 85xx FLS supports SNMP Traps V2. To send traps to the SNMP Manager, the trap destination address must be configured with the IP address of the SNMP Manager.

A detailed description of alarms and events that may be reported by the SatLink 85xx FLS transmitter is given in Appendix D. SNMP TRAPS and list of alarms.

B.5.1 Access CLI Commands for Configuring SNMP TRAP Destination Addresses

CLI commands	User Privilege Level
device snmp trapdest add <manager Ip> <community name>[-port <manager port> -ver <snmp version>]	2
device snmp trapdest del <manager Ip>	2
device snmp show	5

Example:
Define a destination address for reception of the SNMP traps.

```
# device snmp trapdest add 10.10.10.16 public
# device snmp show

# device snmp show

SNMP management access:
-----------------------

Community String         Access              IpAddress          Subnet
operator                 Read/Write            0.0.0.0        0.0.0.0


SNMP Trap Destination
Trap Dest Ip    Port       Community            Version
-------------------------------------------------------------------
10.10.10.16     162        public               SnmpV1 & V2
```

The default manager port and SNMP version number are 162 and SNMP V2.

B.6 Setting an MIB Object and Saving the Configuration

When the SatLink 85xx is shipped from the factory, the essential MIB objects of the SatLink 85xx FLS MIB are given default values.

When changing the value of a MIB object with write access, the new value will in general be activated when they are set. The value will apply when the SatLink 85xx FLS transmitter is kept powered on. If no special action is taken to save the new MIB value, the value will revert to the default value upon power-on.

To save a new value so that it will survive a unit power off-on, one must explicitly issue a MIB save command by setting the MIB object sysCmdSaveConfig to 1.

Saving the configuration can take up to 20 seconds.

Appendix C. Troubleshooting

C.1 Frequently Asked Questions (FAQ)

	Question	Answer
1.	I see a lot of Time server not responding alarms logged with minor severity by the SatLink 85xx.	There has been experienced similar problems with some Time Servers. The SatLink 85xx only needs to retrieve the time during the initialization phase. Once configured, the SatLink 85xx continues to pool the Time Server every 20 seconds and an event is logged each time the response times out. This does not affect the performance of the SatLink 85xx.
2.	How do I load new Software on my SatLink 85xx?	See description in chapter 7.
3.	SI input missing	Check if the correct IP addresses have been assigned to interface 13 and 15. It is NCC's responsibility to send SI to FLS.
4.	I cannot find the answer to my question in the list above	Contact the System Operator or NSSLGlobal Technologies at http://www.sat.link/

C.2 Troubleshooting with LEDs

The SatLink 85xx supports front and rear panel LEDs that may be used to give a rapid operating status of the unit as described in the table below.

LED	Description/Action
Rear TX	The TX rear panel LED may be in one of the following states: 1. The LED is off when no TX signal is sent by the SatLink 2. The LED is on or blinking when the TX signal is sent
Rear panel 10MHz	Will light when 10MHz input is detected, if not there is something wrong with the 10MHz source or the cable.
Rear panel 1PPS	Will light when 1PPS input is detected, if not there is something wrong with the 1PPS source or the cable.
Rear panel LAN TRF	Will light if Traffic ethernet cable is connected
Rear panel LAN MGT	Will light if management ethernet cable is connected
Front panel LAN Tx	Will light or blink when LAN TRF is connected
Front panel SAT Tx	See Rear TX
Front panel Error	Normally off, if on check status on the LCD display or by using CLI command 'log show'. If blinking AND the LCD display is blank AND not possible to access console CLI. Try restart using the main power switch, if same after restart contact support. This indicate that boot have not found any CPU code file to load.
Power button light	Will light if power input connected and main switch on back switched on.

Troubleshooting with SatLink 85xx LEDs

C.3 Software Upgrade Fails

Firmware upgrade or download of file using CLI command 'dload' may fail if there is not sufficient available memory in the SatLink 85xx file system. This is likely to happen when too many files have been downloaded to the file system without deleting the older backup images.

The SatLink 8575 FLTx file directory normally contains four application files, namely:

- fls_x301-X.X.X.X.tgz[2] The current firmware file set
- xxx.bak The back-up firmware file set
- satlink301.elf The current CPU code file
- satlink301.elf .bak The back-up CPU code file

…in addition to the smaller configuration and log files.

To view the SatLink 8575 FTLx file directory, type the CLI command 'dir'. There should not be more than the above listed application files.

Example:

```
FLS-00 # dir
FileName                                  Size         Date       Time
oldLog.txt                                9801   01/01/1970   00:03:16
activeLog.txt                             4662   19/05/2021   12:30:15
fls_301-19.0.0.28.tgz                  3385048   19/05/2021   12:25:08
xxx.bak                                3364086   07/05/2021   12:49:48
config.old                                6451   05/05/2021   11:24:18
config.txt                                6490   19/05/2021   12:27:52
satlink301.elf                         2703036   19/05/2021   12:25:42
satlink301.elf.bak                     2703452   19/05/2021   11:03:55
```

If the directory list reveals that there are other large files present, please delete these files using the CLI command 'del' and retry the firmware upgrade procedure.

It is not possible to delete satlink301.elf or satlink301.elf.bak, the boot SW would then not find any file to load and the unit would have to be sent for repair!

Firmware upgrade/downgrade can also be done using 'dload', note that then the satlink301.elf have to be manually extracted using 'unzip -elf'. This is slower than using 'sw upgrade' and normally not recommended.

C.4 Collecting Information if a Problem Occurs

If a problem occurs with the SatLink 85xx for which support might be needed, having the information listed below available will be helpful.

1. The unit log from the copsole.
   If possible, log the output from the unit to the console when the problem occurs.

   The output from the console can either be copied to a text file by setting the capture text options (in Tera Term: -> File -> Log) or copied directly from the console window using the normal Windows copy function (CTRL+C). The content can then be pasted in a text editor such as Notepad or Word to generate a file suitable for being included as an e-mail attachment.

   When logging to the console, please issue the following CLI commands and capture the output.

[2] The name may differ, but the extension will be "tgz".

```
ip show
eth show
dvb tx show
ncr show
fls show
test tx
ncr show –si
sw show
log show
test memory
test memory all
dir
```

2. The unit configuration file, config.txt.

   If possible please upload the configuration file to a PC with a TFTP server using the CLI command `upload config.txt <TFTP-Ipaddress> [<remotefilename>]`, where `TFTP-Ipaddress` is the IP address for the TFTP server and `remotefilename` is an optional parameter specifying the filename to store the file as on the TFTP server if a different name than config.txt is wanted. Please refer to **Appendix A. TFTP server** for an example of how to install and set up a TFTP server.

   If it is not possible to upload the unit configuration file to a TFTP server the config.txt file might be dumped to the console by using the CLI command `'type config.txt'`. The output from the console can then be copied to a text file or dumped using the log feature of the Tera Term.

Appendix D. SNMP TRAPS and list of alarms

The following section gives a general description of alarms that may be reported with SNMP TRAPS by the SatLink 85xx.

D.1 Alarm Format

An alarm describes a situation that is persistent. An alarm is reported to the SNMP TRAP manager with the following format:

Severity:	Each alarm must be classified in one of the following severities: Critical Failure affecting half (or more) of the SatLink Hub traffic capacity, or if applicable, failure affecting half (or more) of the SatLink Hub traffic capacity for a given coverage area. Major Failure affecting less than half of the SatLink Hub traffic capacity. Minor Failure not affecting the SatLink Hub traffic capacity.
Message:	Text that is presented to the SatLink Hub operator when an alarm is raised.

D.2 Alarm Definitions

Alarm:	**TimeSrvNotResponding**
Severity:	Critical
Message:	None of the configured TP servers is responding, NCR generator cannot start.
Action:	
Alarm:	**LostExtClock**
Severity:	
Message:	The 10 Mhz input not detected.
Action:	Make sure that the 10 MHz cable is connected to FLS.
Alarm:	**1PPS Missing**
Severity:	Critical
Message:	The 1 PPs input not detected, NCR generator cannot start.
Action:	Make sure that 1PPS cable is connected to FLS.
Alarm:	**TXFifoUnderflow**
Severity:	
Message:	CPU not filling sufficient data.
Action:	
Alarm:	**EthTrfMissing**
Severity:	
Message:	Ethernet traffic port not connected.
Action:	Make sure that Ethernet traffic cable is connected to FLS.
Alarm:	**SIInputTrfError**
Severity:	
Message:	Continuity error or duplicates in SI table input above 1 %.
Action:	
Alarm:	**SIInputTrfMissing**
Severity:	
Message:	No SI table input.

Action:

Alarm:	**EthRxPacketDrop**
Severity:	
Message:	More than 1 of 1000 packet dropped on traffic Ethernet.
Action:	

Appendix E. Cable Specification

This appendix provides the cable specification for the cables to be used between SatLink 8575 FLTx and BUC/Up Converter and time server. Three coaxial cables are required - one cable for the transmitting signal (TX) signal and two cables for receiving respectively the 10 MHz and 1 PPS external references.

E.1 TX L-band Cable Requirements

Frequency range: 950 – 2200 MHz
Impedance: 50 Ohm
Connectors: SMA-M-type

E.2 10 MHz- 1PPS Cable Requirements

Frequency range: DC-10MHz
Impedance: 50 Ohm
Connectors: SMA male for cables RG141
Cable model: RG141

Appendix F. Conformity

F.1 EU Radio Equipment Directive

The SatLink 8575 FLTx is in conformity with the essential requirements of the Radio Equipment Directive, when used in an application it is designed for.

Refer to the EU Declaration of Conformity provided with the unit.

F.2 EU Restrictions on Hazardous Substances (RoHS) directive

The SatLink 8575 FLTx is in conformity with the RoHS directive.

Refer to the EU Declaration of Conformity provided with the unit.

F.3 EU REACH directive

The SatLink 8575 FLTx is manufactured in conformity with the REACH directive.

F.4 EU Waste Electrical and Electronic Equipment (WEEE) directive

The SatLink 8575 FLTx is handled in conformity with the WEEE directive.

F.5 US Safety Requirements

This device is designed to be a permanent part of a customized assembly. It is tested and evaluated to meet the requirements of the following standard:

- UL 62368-1:2014

F.6 US FCC Requirements

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

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.